ICC-ES Evaluation Report

ESR-2196

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This report also contains:

- City of LA Supplement
- FL Supplement w/ HVHZ

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DIVISION: 05 00 00—METALS Section: 05 05 23—Metal Fastenings	REPORT HOLDER: HILTI, INC.	EVALUATION SUBJECT: HILTI SELF-DRILLING AND SELF-PIERCING SCREWS	

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2024, 2021, 2018 and 2015 *International Building Code*® (IBC)
- 2024, 2021, 2018 and 2015 *International Residential Code* (IRC)

Property evaluated:

Structural

2.0 USES

The Hilti Self-drilling and Self-piercing Screws are used to connect cold-formed steel members together. The screws are used in engineered connections of cold-formed steel and prescriptive connections prescribed by the code for cold-formed steel framing.

3.0 DESCRIPTION

3.1 General:

The Hilti Self-drilling and Self-piercing Screws are tapping screws, case-hardened from carbon steel conforming to ASTM A510, Grades 1018 to 1022. Table 1 provides screw designations, sizes, head styles, point styles, drilling/piercing ranges, maximum total thickness of steel members to be connected and coatings. Screws are supplied in boxes of individual screws, or in collated plastic strips. See Figures 1 through 9 for depictions of the screws described in Sections 3.2 through 3.10, respectively.

3.2 HWH and HHWH Self-drilling Screws:

The #8, #12 and 1/4-inch Hex Washer head (HWH) self-drilling screws and the #10, #12 and 1/4-inch High Hex Washer head (HHWH) self-drilling screws comply with ASTM C1513 and SAE J78. The #10 Hex Washer head (HWH) self-drilling screws comply with the material and performance requirements of ASTM C1513 and the dimensional requirements in the manufacturer's quality documentation. The 1/4-inch HWH screws have a larger diameter than #14 screws complying with ASME B18.6.4, and may be used where #14 self-drilling tapping screws are specified. The screws have an electroplated zinc coating or a proprietary coating, as indicated in Table 1.

3.3 HWH and HHWH Self-piercing Screws:

The #8 and #10 HWH and HHWH self-piercing screws comply with ASTM C1513. The screws have an electroplated zinc coating or a proprietary coating, as indicated in Table 1.

3.4 PPH Self-drilling Screws:

The #8 and #10 Phillips Pan head (PPH) self-drilling screws comply with ASTM C1513 and SAE J78. The screws have an electroplated zinc coating as indicated in Table 1.

3.5 PPH SD Framer Self-drilling Screws:

The #7 Phillips Pan head (PPH) SD Framer self-drilling screws comply with the material and performance requirements of ASTM C1513. The dimensions of the screws comply with the manufacturer's quality documentation. The screws have an electroplated zinc coating or a proprietary phosphate coating, as indicated in Table 1.

3.6 PTH SD Framer Self-drilling Screws:

The #10 Phillips Truss head (PTH) self-drilling screws comply with ASTM C1513 except for the number of threads per inch. The screws have an electroplated zinc coating as indicated in Table 1.

3.7 PTH SD Self-drilling Screws:

The #8 Phillips Truss head (PTH) self-drilling screws comply with ASTM C1513. The screws have an electroplated zinc coating as indicated in Table 1.

3.8 PPCH SD Framer Self-drilling Screws:

The #10 Phillips Pancake head (PPCH) SD Framer self-drilling screws comply with ASTM C1513. The screws have an electroplated zinc coating as indicated in Table 1.

3.9 TPCH SD Framer Self-drilling Screws:

The #12 Torx Pancake head (TPCH) SD Framer self-drilling screws comply with ASTM C1513. The screws have an electroplated zinc coating as indicated in Table 1.

3.10 PFTH SD Framer Self-drilling Screws:

The #10 Phillips Flat Truss head (PFTH) SD Framer self-drilling screws comply with ASTM C1513. The screws have an electroplated zinc coating as indicated in Table 1.

3.11 Cold-formed Steel:

Cold-formed steel material must comply with Section A3 of AISI S100 (Section A2 for the 2015 and 2012 IBC).

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 General: Screw thread length and point style must be selected on the basis of thickness of the fastened material and thickness of the supporting steel, respectively, based on the maximum total thickness of the steel members to be connected (see Figure 10) and drilling/piercing capacity given in Table 1.

When tested for corrosion resistance in accordance with ASTM B117, screws with coatings described in Table 1 met the minimum requirement listed in ASTM F1941, as required by ASTM C1513, with no white corrosion after three hours and no red rust after 12 hours.

4.1.2 Prescriptive Design: Hilti HWH, HHWH, PPH, PTH SD Framer, PTH SD, PPCH SD Framer, TPCH SD Framer and PFTH SD Framer Screws (Sections 3.2, 3.3, 3.4 and 3.6 through 3.10) may be used where ASTM C1513 screws of the same size and type (self-drilling and/or self-piercing) are prescribed in the IRC and in the AISI Standards referenced in IBC Section 2206 (2021, 2018 and 2015 IBC Section 2211).

4.1.3 Engineered Design: The Hilti self-drilling and self-piercing screws described in Sections 3.2 through 3.10 may be used in engineered connections of cold-formed steel light-framed construction.

For the self-drilling screws, design of the connections must comply with Section J4 of AISI S100 (Section E4 for the 2015 IBC), using the nominal and allowable fastener tension and shear strengths for the screws, shown in Table 5. Allowable connection strengths for use in Allowable Strength Design (ASD) for pull-out, pull-over, and shear (bearing) capacity for common sheet steel thicknesses are provided in Tables 2, 3 and 4A, respectively, based upon calculations in accordance with AISI S100 .

For the self-piercing screws, design of connections must comply with Section J4 of AISI S100 (Section E4 for the 2015 IBC), using the nominal and allowable fastener tension and shear strengths for the screws, shown in Table 5. Allowable connection strengths for use in Allowable Strength Design (ASD) for pull-over capacity for common sheet steel thicknesses are provided in Table 3, based upon calculations in accordance with AISI S100. Allowable connection strengths for use in Allowable Strength Design (ASD) for pull-out and shear (bearing) capacity for common sheet steel thicknesses are provided in Tables 2 and 4B, respectively, based upon results of testing in accordance with AISI S905.

Instructions on how to calculate connection design strengths for use in Load and Resistance Factor Design (LRFD) are found in the footnotes of Tables 2, 3 and 4. For connections subject to tension, the least of the allowable pull-out, pullover, and tension fastener strength of screws found in Tables 2, 3, and 5, respectively, must be used for design. For connections subject to shear, the lesser of the allowable shear (bearing) and fastener strength found in Tables 4 and 5, respectively, must be used for design. Design provisions for tapping screw connections subjected to combined shear and tension loading are outside the scope of this report.

Under the 2024 and 2021 IBC, for screws used in framing connections, in order for the screws to be considered fully effective, the minimum spacing between the fasteners must be 3 times the nominal screw diameter and the minimum edge distance must be 1.5 times the nominal screw diameter. Under the 2018 and 2015 IBC, for screws used in framing connections, in order for the screws to be considered fully effective, the minimum spacing between the fasteners and the minimum edge distance must be 3 times the nominal diameter of the screws, except when the edge is parallel to the direction of the applied force, the minimum edge distance must be 1.5 times the nominal screw diameter. When the spacing between screws is less than 3 times the nominal screw diameter, but at least 2 times the fastener diameter, the connection shear strength values in Tables 4A and 4B must be reduced by 20 percent [Refer to Section B1.5.1.3 of AISI S240 (Section D1.5 of AISI S200 for the 2015 IBC)].

For screws used in applications other than framing connections, the minimum spacing between the fasteners must be three times the nominal screw diameter and the minimum edge and end distances must be 1.5 times the nominal screw diameter.

Connected members must be checked for rupture in accordance with Section J6 of AISI S100 (Section E6 for the 2015 IBC).

4.2 Installation:

Installation of the Hilti Self-drilling and Self-piercing Screws must be in accordance with the manufacturer's published installation instructions and this report. The manufacturer's published installation instructions must be available at the jobsite at all times during installation.

The screws must be installed perpendicular to the work surface using a variable speed screw driving tool. The screw must penetrate through the supporting steel with a minimum of three threads protruding past the back side of the supporting steel.

5.0 CONDITIONS OF USE:

The Hilti Self-drilling and Self-piercing Screws described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Fasteners must be installed in accordance with the manufacturer's published installation instructions and this report. If there is a conflict between the manufacturer's published installation instructions and this report, this report governs.

5.2 The allowable loads specified in Section 4.1 are not to be increased when the fasteners are used to resist short term loads, such as wind or seismic forces.

5.3 The utilization of the nominal strength values contained in this evaluation report, for the design of cold-formed steel diaphragms, is outside the scope of this report. Diaphragms constructed using the Hilti self-drilling or self-piercing screws must be addressed in a current ICC-ES evaluation report based upon the ICC-ES Acceptance Criteria for Steel Deck Roof and Floor Systems (AC43).

5.4 Evaluation of screws subjected to cyclic or fatigue loading is outside the scope of this report. Applicable Seismic Design Categories shall be determined in accordance with the code for the entire assembly constructed with the screws.

5.5 The construction documents prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed specifying the screws must indicate compliance with this evaluation report, and applicable codes, and must be submitted to the code official for approval.

5.6 The rust-inhibitive (corrosion-resistant) coating on the screws must be suitable for the intended use, as determined by the registered design professional.

5.7 The screws 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 Tapping Screw Fasteners Used in Steel-to-steel Connections (AC118), dated January 2018 (editorially revised February 2024).

7.0 IDENTIFICATION

7.1 The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-2196) along with the name, registered trademark, or registered logo of the report holder must be included in the product label.

7.2 In addition, the Hilti Self-drilling and Self-piercing Screws are marked with an "H" on the top of the heads, as shown in Figures 1 through 9. Packages of Hilti Self-drilling and Self-piercing Screws are labeled with the report holder's name (Hilti, Inc.), the fastener type and size.

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

HILTI, INC.
7250 DALLAS PARKWAY, SUITE 1000
PLANO, TEXAS 75024
(800) 879-8000
www.hilti.com

TABLE 1—HILTI SELF-DRILLING AND SELF-PIERCING STEEL-TO-STEEL SCREWS (ASTM C1513)

DESIGNATION	DESCRIPTION (Size - TPI)	NOMINAL DIAMETER (inch)	NOMINAL SCREW LENGTH[3] (inch)	HEAD STYLE[1]	NOMINAL HEAD DIAMETER	DRILL POINT (Number)	DRILLING/ PIERCING CAPACITY (inch)		MAXIMUM TOTAL THICKNESS (MT) [3] (inch)	MINIMUM PROTRUSION LENGTH (inch) [3]	COATING[2]
							Min.	Max.			
7 X 7/16 PPH SD Framer	#7-18	0.151	7/16	PPH	0.303	2	0.035	0.100	0.063	0.374	GP
7 X 7/16 PPH SD Framer Zinc	#7-18	0.151	7/16	PPH	0.303	2	0.035	0.100	0.063	0.374	Zinc-2
8 X 1/2 PTH SD LATH ZN 02	#8-18	0.164	1/2	PTH	0.449	2	0.036	0.104	0.125	0.375	Zinc-2
8 X 3/4 PTH SD LATH ZN 02	#8-18	0.164	3/4	PTH	0.449	2	0.036	0.104	0.375	0.375	Zinc-2
8 X 1 PTH SD LATH ZN 02	#8-18	0.164	1	PTH	0.449	2	0.036	0.104	0.625	0.375	Zinc-2
8 X 1 1/4 PTH SD LATH ZN 02	#8-18	0.164	1 1/4	PTH	0.449	2	0.036	0.104	0.875	0.375	Zinc-2
8 X 1 5/8 PTH SD LATH ZN 02	#8-18	0.164	1 5/8	PTH	0.449	2	0.036	0.104	1.250	0.375	Zinc-2
8 X 1 7/8 PTH SD LATH ZN 02	#8-18	0.164	1 7/8	PTH	0.449	2	0.036	0.104	1.500	0.375	Zinc-2
S-MD 8-18 X 1/2 PPH #2	#8-18	0.164	1/2	PPH	0.311	2	0.035	0.100	0.125	0.375	Zinc-2
S-MD 8-18 X 1/2 HWH #2	#8-18	0.164	1/2	HWH	0.335	2	0.035	0.100	0.125	0.375	Zinc-2
S-MD 8-18 X 3/4 HWH #2	#8-18	0.164	3/4	HWH	0.335	2	0.035	0.100	0.375	0.375	Zinc-2
S-MS 8-18 X 1/2 HWH	#8-18S	0.164	1/2	HWH	0.315	Self-piercing	0.015	0.072	0.072	0.428	Zinc-2
S-MD 8-18 X 3/4 HWH #2 (CRC)	#8-18	0.164	3/4	HWH	0.335	2	0.035	0.100	0.375	0.375	CRC
S-MD 10-16 X 5/8 PPH #3	#10-16	0.190	5/8	PPH	0.364	3	0.110	0.175	0.187	0.438	Zinc-2
S-MD 10-16 X 3/4 PPH #3	#10-16	0.190	3/4	PPH	0.364	3	0.110	0.175	0.375	0.375	Zinc-2
S-DD 10-18 X 3/4 PTH #3	#10-18	0.190	3/4	PTH	0.433	3	0.110	0.175	0.375	0.375	Zinc-2
S-DD 10-16 X 5/8 PPCH #3	#10-16	0.190	5/8	PPCH	0.409	3	0.110	0.175	0.313	0.312	Zinc-2
S-DD 10-12 X 3/4 PFTH #3	#10-12	0.190	3/4	PFTH	0.364	3	0.110	0.175	0.375	0.375	Zinc-2
S-MD 10-16 X 1/2 HWH #2	#10-16	0.190	1/2	HWH	0.399	2	0.035	0.110	0.125	0.375	Zinc-2
S-MD 10-16 X 3/4 HWH #2	#10-16	0.190	3/4	HWH	0.399	2	0.035	0.110	0.313	0.437	Zinc-2
S-MD 10-16 X 1 HWH #2	#10-16	0.190	1	HWH	0.399	2	0.035	0.110	0.500	0.500	Zinc-2
S-MD 10-16 X 5/8 HWH #3	#10-16	0.190	5/8	HWH	0.399	3	0.110	0.175	0.187	0.438	Zinc-2
S-MD 10-16 X 3/4 HWH #3	#10-16	0.190	3/4	HWH	0.399	3	0.110	0.175	0.375	0.375	Zinc-2
S-MD 10-16 X 1 HWH #3	#10-16	0.190	1	HWH	0.399	3	0.110	0.175	0.625	0.375	Zinc-2
S-MD 10-16 X 1 1/4 HWH #3	#10-16	0.190	1 1/4	HWH	0.399	3	0.110	0.175	0.875	0.375	Zinc-2
S-MD 10-16 X 1 1/2 HWH #3	#10-16	0.190	1 1/2	HWH	0.399	3	0.110	0.175	1.125	0.375	Zinc-2
S-MD 10-16 X 3/4 HHWH #3	#10-16	0.190	3/4	HHWH	0.399	3	0.110	0.175	0.375	0.375	Zinc-2
S-MD 10-16 X 7/8 HHWH Pilot Point	#10-16	0.190	7/8	HHWH	0.399	1	0.028	0.120	0.188	0.687	Zinc-2
S-MS 10-12 X 3/4 HHWH	#10-12S	0.190	3/4	HHWH	0.399	Self-piercing	0.018	0.096	0.100	0.650	Zinc-2
S-MD 10-16 X 5/8 HWH #3 Kwik-Cote	#10-16	0.190	5/8	HWH	0.399	3	0.110	0.175	0.187	0.438	Kwik-Cote
S-MD 10-16 X 3/4 M HHWH #3 Collated	#10-16	0.190	3/4	HHWH	0.399	3	0.110	0.175	0.375	0.375	Zinc-2
S-MD 10-16 X 5/8 PPH #3 (CRC)	#10-16	0.190	5/8	PPH	0.364	3	0.110	0.175	0.187	0.438	CRC
S-MD 10-16 X 3/4 HWH #3 (CRC)	#10-16	0.190	3/4	HWH	0.399	3	0.110	0.175	0.375	0.375	CRC
S-MD 10-16 X 3/4 HHWH #3 (CRC)	#10-16	0.190	3/4	HHWH	0.399	3	0.110	0.175	0.375	0.375	CRC
S-MD 10-16 X 3/4 HWH #3 Kwik-Cote	#10-16	0.190	3/4	HWH	0.399	3	0.110	0.175	0.375	0.375	Kwik-Cote
S-MD 10-16 X 1 HWH #3 Kwik-Cote	#10-16	0.190	1	HWH	0.399	3	0.110	0.175	0.625	0.375	Kwik-Cote
S-MD 10-16 X 3/4 HHWH #3 Kwik-Cote	#10-16	0.190	3/4	HHWH	0.399	3	0.110	0.175	0.375	0.375	Kwik-Cote
S-MD 10-16 X 3/4 HHWH #3 KC M Collated	#10-16	0.190	3/4	HHWH	0.399	3	0.110	0.175	0.375	0.375	Kwik-Cote
S-DD 12-14 X 1 TPCH #3	#12-14	0.216	1	TPCH	0.409	3	0.110	0.210	0.500	0.500	Zinc-2
S-MD 12-14 X 3/4 HWH #3	#12-14	0.216	3/4	HWH	0.415	3	0.110	0.210	0.313	0.437	Zinc-2
S-MD 12-14 X 1 HWH #3	#12-14	0.216	1	HWH	0.415	3	0.110	0.210	0.562	0.438	Zinc-2
S-MD 12-14 X 1 1/2 HWH #3	#12-14	0.216	1 1/2	HWH	0.415	3	0.110	0.210	1.062	0.438	Zinc-2
S-MD 12-14 X 2 HWH #3	#12-14	0.216	2	HWH	0.415	3	0.110	0.210	1.562	0.438	Zinc-2

TABLE 1—HILTI SELF-DRILLING AND SELF-PIERCING STEEL-TO-STEEL SCREWS (ASTM C1513) (cont'd)

DESIGNATION	DESCRIPTION (Size - TPI)	NOMINAL DIAMETER (inch)	NOMINAL SCREW LENGTH[3] (inch)	HEAD STYLE[1]	NOMINAL HEAD DIAMETER	DRILL POINT (Number)	DRILLING/ PIERCING CAPACITY (inch)		MAXIMUM TOTAL THICKNESS (MT) [3] (inch)	MINIMUM PROTRUSION LENGTH (inch) [3]	COATING[2]
							Min.	Max.			
S-MD 12-24 X 7/8 HWH #4	#12-24	0.216	7/8	HWH	0.415	4	0.175	0.250	0.313	0.562	Zinc-2
S-MD 12-24 X 1 1/4 HWH #4	#12-24	0.216	1 1/4	HWH	0.415	4	0.175	0.250	0.625	0.625	Zinc-2
S-MD 12-24 X 1 1/4 HWH #5	#12-24	0.216	1 1/4	HWH	0.415	5	0.250	0.500	0.437	0.813	Zinc-2
S-MD 12-24 X 7/8 M HWH #4 Collated	#12-24	0.216	7/8	HWH	0.399	4	0.175	0.250	0.375	0.500	Zinc-2
S-SLC 02 M HWH	#12-14	0.216	1	HWH	0.415	1	0.028	0.120	0.375	0.625	Zinc-2
S-MD 12-14 X 1 HHWH Pilot Point	#12-14	0.216	1	HHWH	0.415	1	0.028	0.120	0.375	0.625	Zinc-2
S-MD 12-24 X 7/8 HWH #4 (CRC)	#12-24	0.216	7/8	HWH	0.415	4	0.175	0.250	0.313	0.562	CRC
S-MD 12-14 X 3/4 HWH #3 Kwik-Cote	#12-14	0.216	3/4	HWH	0.415	3	0.110	0.210	0.313	0.437	Kwik-Cote
S-MD 12-14 X 1 HWH #3 Kwik-Cote	#12-14	0.216	1	HWH	0.415	3	0.110	0.210	0.562	0.438	Kwik-Cote
S-MD 12-14 X 1 1/4 HWH #3 Kwik-Cote	#12-14	0.216	1 1/4	HWH	0.415	3	0.110	0.210	0.813	0.437	Kwik-Cote
S-MD 12-14 X 1 1/2 HWH #3 Kwik-Cote	#12-14	0.216	1 1/2	HWH	0.415	3	0.110	0.210	1.062	0.438	Kwik-Cote
S-MD 12-14 X 2 HWH #3 Kwik-Cote	#12-14	0.216	2	HWH	0.415	3	0.110	0.210	1.562	0.438	Kwik-Cote
S-MD 12-24 X 1 1/4 HWH #5 Kwik Cote	#12-24	0.216	1 1/4	HWH	0.415	5	0.250	0.500	0.437	0.813	Kwik-Cote
S-MD 12-24 X 1 1/4 HWH #5 Kwik Cote with Bonded Washer	#12-24	0.216	1 1/4	HWH	0.415	5	0.250	0.500	0.313	0.937	Kwik-Cote
S-MD 12-24 X 2 HWH #5 Kwik Cote	#12-24	0.216	2	HWH	0.415	5	0.250	0.500	1.187	0.813	Kwik-Cote
S-MD 12-24 X 3 HWH #5 Kwik Cote	#12-24	0.216	3	HWH	0.415	5	0.250	0.500	2.187	0.813	Kwik-Cote
S-MD 12-14 x 3/4 HWH #3 Kwik Seal	#12-14	0.216	3/4	HWH	0.415	3	0.110	0.210	0.125	0.625	Kwik-Cote
S-MD 12-14 x 1 HWH #3 Kwik Seal	#12-14	0.216	1	HWH	0.415	3	0.110	0.210	0.375	0.625	Kwik-Cote
S-MD 12-14 X 1 1/4 HWH #3 Kwik Seal	#12-14	0.216	1 1/4	HWH	0.415	3	0.110	0.210	0.625	0.625	Kwik-Cote
S-MD 12-14 X 1 1/2 HWH #3 Kwik Seal	#12-14	0.216	1 1/2	HWH	0.415	3	0.110	0.210	0.875	0.625	Kwik-Cote
S-MD 12-14 X 2 HWH #3 Kwik Seal	#12-14	0.216	2	HWH	0.415	3	0.110	0.210	1.375	0.625	Kwik-Cote
S-MD 1/4-14 X 3/4 HHWH #3	1/4 - 14	0.250	3/4	HHWH	0.500	3	0.110	0.220	0.187	0.563	Zinc-2
S-MD 1/4-14 X 1 HHWH #3	1/4 - 14	0.250	1	HHWH	0.500	3	0.110	0.220	0.562	0.438	Zinc-2
S-MD 1/4-14 X 1 1/2 HHWH #3	1/4 - 14	0.250	1 1/2	HHWH	0.500	3	0.110	0.220	1.062	0.438	Zinc-2
S-MD 1/4-14 X 2 HHWH #3	1/4 - 14	0.250	2	HHWH	0.500	3	0.110	0.220	1.562	0.438	Zinc-2
S-MD 1/4-14 X 7/8 HWH Pilot Point Kwik Seal	1/4 - 14	0.250	7/8	HWH	0.415	1	0.028	0.140	0.313	0.562	Kwik-Cote
S-MD 1/4-14 x 1 HWH #3 Kwik Seal	1/4 - 14	0.250	1	HWH	0.500	3	0.110	0.220	0.375	0.625	Kwik-Cote
S-MD 1/4-14 X 1 1/2 HWH #3 Kwik Seal	1/4 - 14	0.250	1 1/2	HWH	0.500	3	0.110	0.220	0.875	0.625	Kwik-Cote

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

1. Refer to Section 3.0 and Figures 1 through 9 for head configuration abbreviations.
2. For coating abbreviations, GP = grey phosphate per EN ISO 3892; Zinc-2 = EN ISO 4042 A1F; Kwik-Cote = proprietary organic zinc coating; CRC = Proprietary Duplex Coating.
3. Minimum protrusion length is equal to the nominal screw length (L) – maximum total thickness (MT).

TABLE 2—ALLOWABLE TENSILE PULL-OUT LOADS (P_{NOT}/Ω), pounds-force[1,2,3,4]

Steel F_u = 45 ksi Applied Factor of Safety, Ω = 3.0												
Screw Description	Nominal Diameter (in.)	Design thickness of member not in contact with the screw head (in.)										
		0.015	0.018	0.024	0.030	0.036	0.048	0.060	0.075	0.090	0.105	0.135
Self-drilling Screws for Steel-to-Steel Connections[5]												
#7-18	0.151	-	-	-	-	69	92	116	144	173	202	260
#8-18	0.164	-	-	-	-	75	100	125	157	188	220	282
#10-12 #10-16 #10-18	0.190	-	-	-	-	87	116	145	182	218	254	327
#12-14 #12-24	0.216	-	-	-	-	99	132	165	207	248	289	373
1/4-14	0.250	-	-	-	-	115	153	191	239	287	333	430
Self-piercing Screws for Steel-to-Steel Connections[6]												
#8-18S	0.164	37	49	68	86	109	-	-	-	-	-	-
#10-12S	0.190	44	53	77	102	117	150	-	-	-	-	-

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.4 N, 1 ksi = 6.89 MPa.
[1]For tension connections, the lower of the allowable pull-out, pullover, and tension fastener strength of screw found in Tables 2, 3, and 5, respectively must be used for design.
[2]Unless otherwise noted, load values are based upon calculations in accordance with Section J4 of AISI S100-16 (2020). ANSI/ASME standard screw diameters were used in the calculations and are listed in the tables.
[3]The allowable pull-out capacity for intermediate member thicknesses can be determined by interpolating within the table.
[4]To calculate LRFD values, multiply values in table by the ASD safety factor of 3.0 and multiply again with the LRFD Φ factor of 0.5.
[5]For $F_u \geq 65$ ksi steel, multiply values by 1.44.
[6]Load values are based on testing in accordance with AISI S905.

TABLE 3—ALLOWABLE TENSILE PULL-OVER LOADS (P_{NOV}/Ω), FOR HILTI SCREWS, pounds-force[1,2,3,4,5]

Steel F_u = 45 ksi Applied Factor of Safety, Ω = 3.0												
Screw Description	Washer or Head Diameter (in.)	Design thickness of member in contact with the screw head (in.)										
		0.015	0.018	0.024	0.030	0.036	0.048	0.060	0.075	0.090	0.105	0.135
Hex Washer Head (HWH) or High Hex Washer Head (HHWH)												
#8-18S	0.315	106	128	170	–	–	–	–	–	–	–	–
#8-18	0.335	113	136	181	225	271	363	453	567	680	790	1020
#10-16 #10-12S	0.399	135	162	215	268	323	430	540	673	807	943	1210
#12-14 #12-24	0.415	140	168	224	279	337	447	560	700	840	980	1260
1/4-14	0.500	169	203	270	336	407	540	677	843	1010	1180	1520
Phillips Pan Head (PPH)												
#8-18	0.311	105	126	168	210	252	336	420	525	630	735	945
#10-16	0.364	123	147	197	246	295	393	491	614	737	860	1106
Phillips Truss Head (PTH)												
#8-18	0.449	152	182	242	303	364	485	606	758	909	1061	–
#10-18	0.433	146	175	234	292	351	468	585	731	877	1023	1315
Phillips Pan Head (PPH)												
#7-18	0.303	102	123	164	205	245	327	409	511	614	716	920
Phillips Pancake Head (PPCH)												
#10-16	0.409	138	166	221	276	331	442	552	690	828	966	1242
Torx Pancake Head (TPCH)												
#12-14	.0409	138	166	221	276	331	442	552	690	828	966	1242
Phillips Flat Truss Head (PFTH)												
#10-12	0.364	123	147	197	246	295	393	491	614	737	860	1106

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.4 N, 1 ksi = 6.89 Mpa.
[1]For tension connections, the lower of the allowable pull-out, pullover, and tension fastener strength of screw found in Tables 2, 3, and 5, respectively must be used for design.
[2]Load values are based upon calculations in accordance with Section J4 of AISI S100-16 (2020). ANSI/ASME standard screw head diameters were used in the calculations and are listed in the tables.
[3]The allowable pull-over capacity for intermediate member thicknesses can be determined by interpolating within the table.
[4]To calculate LRFD values, multiply values in table by the ASD safety factor of 3.0 and multiply again with the LRFD Φ factor of 0.5.
[5]For $F_u \geq 65$ ksi steel, multiply values by 1.44.

TABLE 4A—ALLOWABLE SHEAR (BEARING) CAPACITY OF STEEL-TO-STEEL CONNECTIONS USING HILTI SELF-DRILLING SCREWS, pounds-force[1,2,3,4,5]

Steel F_u = 45 ksi Applied Factor of Safety, Ω = 3.0									
Screw Description	Nominal Diameter (in.)	Design thickness of member in contact with screw head, (in.)	Design thickness of member not in contact with the screw head (in.)						
			0.036	0.048	0.060	0.075	0.090	0.105	0.135
#7-18	0.151	0.036	167	220	220	220	220	220	220
		0.048	167	257	294	294	294	294	294
		0.060	167	257	360	367	367	367	367
		0.075	167	257	360	459	459	459	459
		0.090	167	257	360	459	550	550	550
		0.105	167	257	360	459	550	642	642
		0.135	167	257	360	459	550	642	826
#8-18	0.164	0.036	174	239	239	239	239	239	239
		0.048	174	268	319	319	319	319	319
		0.060	174	268	373	400	400	400	400
		0.075	174	268	373	497	497	497	497
		0.090	174	268	373	497	597	597	597
		0.105	174	268	373	497	597	697	697
		0.135	174	268	373	497	597	697	897
#10-12 #10-16 #10-18	0.190	0.036	188	277	277	277	277	277	277
		0.048	188	289	370	370	370	370	370
		0.060	188	289	403	463	463	463	463
		0.075	188	289	403	563	577	577	577
		0.090	188	289	403	563	693	693	693
		0.105	188	289	403	563	693	807	807
		0.135	188	289	403	563	693	807	1040
#12-14 #12-24	0.216	0.036	200	309	315	315	315	315	315
		0.048	200	308	420	420	420	420	420
		0.060	200	308	430	523	523	523	523
		0.075	200	308	430	600	657	657	657
		0.090	200	308	430	600	787	787	787
		0.105	200	308	430	600	787	920	920
		0.135	200	308	430	600	787	920	1180
$^1/_4$-14	0.250	0.036	215	340	363	363	363	363	363
		0.048	215	331	467	487	487	487	487
		0.060	215	331	463	607	607	607	607
		0.075	215	331	463	647	760	760	760
		0.090	215	331	463	647	850	910	910
		0.105	215	331	463	647	850	1060	1060
		0.135	215	331	463	647	850	1060	1370

TABLE 4B—ALLOWABLE SHEAR (BEARING) CAPACITY OF STEEL-TO-STEEL CONNECTIONS USING HILTI SELF-PIERCING SCREWS, pounds-force[1,3,4,6]

Steel F_u = 45 ksi Applied Factor of Safety, Ω = 3.0								
Screw Description	Nominal Diameter (in.)	Design thickness of member in contact with screw head, (in.)	Design thickness of member not in contact with the screw head (in.)					
			0.015	0.018	0.024	0.030	0.036	0.048
#8-18S	0.164	0.015	73	87	105	107	107	-
		0.018	79	90	113	113	113	-
		0.024	81	90	149	158	158	-
		0.030	82	117	149	186	186	-
		0.036	106	114	184	236	287	-
#10-12S	0.190	0.018	-	77	125	152	173	173
		0.024	-	77	137	191	220	253
		0.030	-	109	167	228	255	309
		0.036	-	121	167	228	298	373
		0.048	-	121	191	241	298	444

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.4 N, 1 ksi = 6.89 MPa.

[1]The lower of the allowable shear (bearing) and the allowable fastener shear strength found in Tables 4 and 5, respectively must be used for design.

[2]Load values in Table 4A are based upon calculations in accordance with Section J4 of AISI S100-16(2020). ANSI/ASME standard screw diameters were used in the calculations and are listed in the tables

[3]The allowable bearing capacity for other member thicknesses can be determined by interpolating within the table.

[4]To calculate LRFD values, multiply values in table by the ASD safety factor of 3.0 and multiply again with the LRFD Φ factor of 0.5.

[5]For $F_u \geq 65$ ksi steel, multiply values by 1.44.

[6]Load values in Table 4B are based on testing in accordance with AISI S905.

TABLE 5—FASTENER STRENGTH OF SCREW

SCREW DESCRIPTION	DIAMETER (in.)	NOMINAL FASTENER STRENGTH DETERMINED BY TESTING		ALLOWABLE FASTENER STRENGTH[4]	
		Tension, P_{ts} (lbf)	Shear, P_{ss} (lbf)	Tension (P_{ts}/Ω)[1] (lbf)	Shear (P_{ss}/Ω)[2,3] (lbf)
#7-18 PPH	0.151	1000	890	335	295
#8-18 HWH, PPH	0.164	1000	1170	335	390
#8-18S HWH	0.164	1915	1570	640	525
#10-12 PFTH	0.190	2170	1645	720	550
#10-12S HWH	0.190	1915	1905	640	635
#10-16 HWH, HHWH, PPH, PPCH	0.190	1370	1215	455	405
#10-18 PTH	0.190	1390	1845	465	615
#12-14 HWH, TPCH	0.216	2325	1880	775	625
#12-24 HWH	0.216	3900	2285	1300	760
1/4-14 HWH	0.250	4580	2440	1525	815
#8-18 PTH	0.164	1,860	1,635	620	545

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.4 N, 1 ksi = 6.89 MPa.

[1]For tension connections, the lower of the allowable pull-out, pullover, and tension fastener strength of screw found in Tables 2, 3, and 5, respectively must be used for design.

[2]For shear connections, the lower of the allowable shear (bearing) and the allowable fastener shear strength found in Tables 4 and 5, respectively must be used for design.

[3]See Section 4.1.3 for fastener spacing and end distance requirements.

[4]To calculate LRFD values, multiply the nominal fastener strengths by the LRFD Φ factor of 0.5.

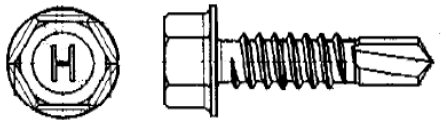

FIGURE 1—HEX WASHER HEAD (HWH) AND HIGH HEX WASHER HEAD (HHWH) SELF-DRILLING SCREW

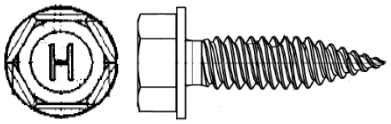

FIGURE 2—HEX WASHER HEAD (HWH) SELF-PIERCING SCREW

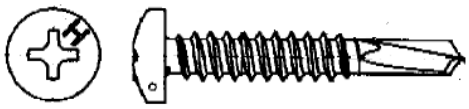

FIGURE 3—PHILLIPS PAN HEAD (PPH) SELF-DRILLING SCREW

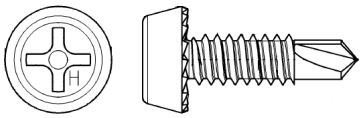

FIGURE 4—PHILLIPS PAN HEAD (PPH) SD FRAMER SELF-DRILLING SCREW

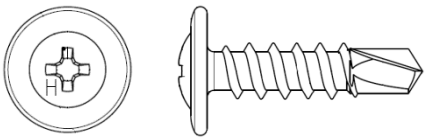

FIGURE 5—PHILLIPS TRUSS HEAD (PTH) SD FRAMER SELF-DRILLING SCREW

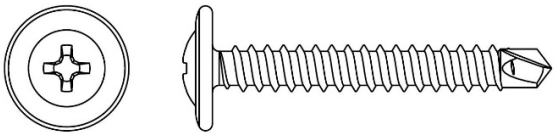

FIGURE 6—PHILLIPS TRUSS HEAD (PTH) SD SELF-DRILLING SCREW

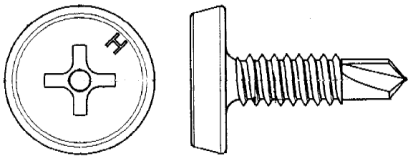

FIGURE 7—PHILLIPS PANCAKE HEAD (PPCH) SD FRAMER SELF-DRILLING SCREW

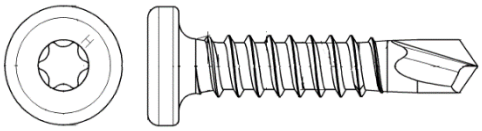

FIGURE 8—TORX PANCAKE HEAD (TPCH) SD FRAMER SELF-DRILLING SCREW

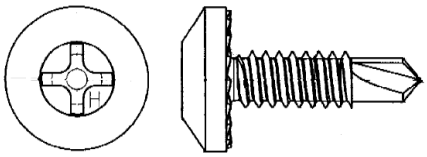

FIGURE 9—PHILLIPS FLAT TRUSS HEAD (PFTH) SD FRAMER SELF-DRILLING SCREW

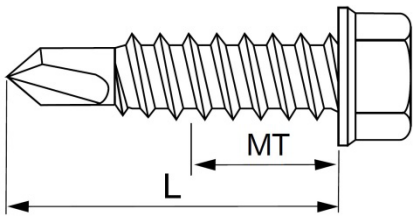

FIGURE 10—DESCRIPTION OF NOMINAL SCREW LENGTH (L) AND MAXIMUM TOTAL THICKNESS (MT)

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

REPORT HOLDER:

HILTI, INC.

EVALUATION SUBJECT:

HILTI SELF-DRILLING AND SELF-PIERCING SCREWS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Hilti Self-Drilling and Self-Piercing Screws, described in ICC-ES evaluation report ESR-2196, have also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:

- 2023 *City of Los Angeles Building Code* (LABC)
- 2023 *City of Los Angeles Residential Code* (LARC)

2.0 CONCLUSIONS

The Hilti Self-Drilling and Self-Piercing Screws, described in Sections 2.0 through 7.0 of the evaluation report ESR-2196, comply with the LABC Chapter 22, and the LARC, and are subjected to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Hilti Self-Drilling and Self-Piercing Screws described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-2196.
- The design, installation, conditions of use and identification of the Hilti Self-Drilling and Self-Piercing Screws are in accordance with the 2021 *International Building Code®* (IBC) provisions noted in the evaluation report ESR-2196.
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16 and 17, as applicable.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.

This supplement expires concurrently with the evaluation report, reissued October 2024.

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

REPORT HOLDER:

HILTI, INC.

EVALUATION SUBJECT:

HILTI SELF-DRILLING AND SELF-PIERCING SCREWS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Hilti Self-drilling and Self-piercing Screws, described in evaluation report ESR-2196, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2023 *Florida Building Code—Building*
- 2023 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The Hilti Self-drilling and Self-piercing Screws described in Sections 2.0 through 7.0 of the evaluation report, ESR-2196, comply with the *Florida Building Code—Building* and the *Florida Building Code—Residential*, provided the design is in accordance with the *Florida Building Code—Building* or the *Florida Building Code—Residential*, as applicable. The installation requirements noted in the ICC-ES evaluation report ESR-2196 for the2021 *International Building Code®* meet the requirements of the *Florida Building Code—Building* or the *Florida Building Code—Residential*, as applicable.

Use of the Hilti Self-drilling and Self-piercing Screws has also been found to be in compliance with the High-velocity Hurricane Zone provisions on the *Florida Building Code—Building* and the *Florida Building Code—Residential*.

For products falling under Florida Rule 61G20-3, 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 October 2024.