ICC-ES Evaluation Report

ESR-3223

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

REPORT HOLDER:

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EVALUATION SUBJECT:

ITW BUILDEX TEKS SELECT™ SELF-DRILLING STRUCTURAL FASTENERS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2012, 2009 and 2006 *International Building Code*® (IBC)
- 2012 and 2009 *International Residential Code*® (IRC)

Property evaluated:

Structural

2.0 USES

The ITW Buildex Teks Select™ Structural Fasteners are used in engineered connections of cold-formed steel members. The fasteners may be used under the IRC when an engineered design is submitted for review in accordance with IRC Section R301.1.3.

3.0 DESCRIPTION

3.1 General:

ITW Buildex Teks Select™ Structural Fasteners are proprietary self-drilling tapping screws which have a dual heat treatment and are coated with a corrosion preventive coating identified as Climaseal ACR™. The drill point and lead threads of the screws are heat-treated to a relatively high hardness to facilitate drilling and thread forming. The balance of the fastener is treated to a lower hardness complying with the hardness limits for SAE J 429 Grade 5 screws and the hardness limits for ASTM A449-10 Type 1 screws. The threaded portion of the screw with the lower hardness is considered the load-bearing area, used to transfer loads between connected elements. Table 1 provides screw descriptions (size, tpi, length), nominal diameters, head style, head diameters, point style, drilling capacities and length of load-bearing area.

3.2 Material:

The screws are formed from steel wire complying with the manufacturer's specifications. The drilling point and lead threads are heat-treated to a minimum through-hardness of 55 HRC. The remainder of the screw is heat-treated to a through-hardness of 30 to 34 HRC.

4.0 DESIGN AND INSTALLATION

4.1 Design:

ITW Buildex TEKS Select™ Structural Fasteners are recognized for use in engineered connections of cold-formed steel construction. Design of the connections must comply with Section E4 of AISI S100 (AISI-NAS for the 2006 IBC). Nominal and allowable fastener tension and shear strengths for the screws are shown in Table 4. Allowable connection capacities for use in Allowable Strength Design (ASD), for pull-out, pull-over, and shear (bearing), are provided in Tables 2, 3 and 5, respectively, based upon laboratory testing. Instructions on how to determine connection design capacities for use in Load and Resistance Factor Design (LRFD) are found in the footnotes of Tables 2, 3 and 5. For steel-to-steel connections subject to tension, the least of the allowable pull-out capacity, pull-over capacity, and fastener tension strength found in Tables 2, 3, and 4, respectively, must be used for design. For steel-to-steel connections subject to shear, the lesser of the allowable fastener shear strength and the allowable shear (bearing) capacity found in Tables 4 and 5, respectively, must be used for design. Connections subject to combined tension and shear loading must be designed in accordance with Section E4.5 of AISI S100 (AISI-NAS for the 2006 IBC). Connected members must be checked for rupture in accordance with Section E5 of AISI S100-07/S2-10.

The values in the tables are based on a minimum spacing between the centers of fasteners of three times the nominal diameter of the screw, and a minimum distance from the center of a fastener to the edge of any connected part of 1.5 times the nominal diameter of the screw. Minimum edge distance when connecting cold-formed framing members must be three times the diameter of the screw, in accordance with Section D1.5 of AISI S200 (AISI-General for 2006 IBC). Under the 2009 and 2006 IBC, when the distance to the end of the connected part is parallel to the line of the applied force, the allowable connection shear strength determined in accordance with Section E4.3.2 of Appendix A of AISI S100 (AISI-NAS for 2006 IBC) must be considered.

When tested for corrosion resistance in accordance with ASTM B117, the screws meet 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.

4.2 Installation:

Installation of ITW Buildex Teks Select™ Structural Fasteners 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 screw driving tool. The installation speed for $^1/_4$-inch screws should not exceed 1,800 rpm. The installation speed for all other screws should not exceed 2,500 rpm.

Screw length and point style must be selected by considering, respectively, the length of load-bearing area and the drilling capacities shown in Table 1. The screw must penetrate through the supporting metal with a minimum of three threads protruding past the back side of the supporting metal.

5.0 CONDITIONS OF USE

The ITW Buildex Teks Select™ Structural Fasteners described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 The 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 connection capacities specified in Section 4.1 are not to be increased when the fasteners are used to resist wind or seismic forces.

5.3 The utilization of the nominal connection capacities contained in this evaluation report, for the design of cold-formed steel diaphragms, is outside the scope of this report.

5.4 Drawings and calculations verifying compliance with this report and the applicable code must be submitted to the code official for approval. The drawings and calculations are to be prepared by a registered design professional when required by the statutes of the jurisdiction in which the project is to be constructed.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Tapping Screw Fasteners (AC118), dated June 2012.

7.0 IDENTIFICATION

The heads of the ITW Buildex Teks Select™ Structural Fasteners are marked with "$\overline{BX}$" as shown in Figure 1. Each box of the fasteners has a label bearing the company name (ITW Buildex), product name, part number, size, lot number and the evaluation report number (ESR-3223).

TABLE 1—ITW BUILDEX TEKS SELECT™ STRUCTURAL FASTENERS

DESCRIPTION (nom. size-tpi x length)	NOMINAL DIAMETER (in.)	HEAD STYLE[1]	HEAD DIAMETER (in.)	DRILL POINT	DRILLING CAPACITY		LENGTH OF LOAD-BEARING AREA[2]	COATING
					Min.	Max.		
#10-16x$^3/_4$"	0.190	HWH	0.400	Tek/3	0.036"	0.150"	0.500"	Climaseal ACR
#12-14x$^7/_8$"	0.216	HWH	0.415	Tek/3	0.036"	0.187"	0.470"	Climaseal ACR
#12-14x1"	0.216	HWH	0.415	Tek/3	0.036"	0.187"	0.500"	Climaseal ACR
#12-14x1"	0.216	UPFH	0.418	Tek/3	0.036"	0.187"	0.500"	Climaseal ACR
#12-14x1$^1/_2$"	0.216	HWH	0.415	Tek/3	0.036"	0.187"	1.000"	Climaseal ACR
#12-14x2"	0.216	HWH	0.415	Tek/3	0.036"	0.187"	1.500"	Climaseal ACR
$^1/_4$-14x1"	0.250	HWH	0.510	Tek/3	0.036"	0.210"	0.450"	Climaseal ACR
$^1/_4$-14x1$^1/_2$"	0.250	HWH	0.510	Tek/3	0.036"	0.210"	0.950"	Climaseal ACR
$^1/_4$-20x1$^1/_8$"	0.250	HWH	0.510	Tek/4	0.210"	0.312"	0.500"	Climaseal ACR
$^1/_4$-20x1$^1/_2$"	0.250	HWH	0.510	Tek/4	0.210"	0.312"	0.830"	Climaseal ACR
$^1/_4$-20x2"	0.250	HWH	0.510	Tek/4	0.210"	0.312"	1.330"	Climaseal ACR
$^1/_4$-20x2$^1/_2$"	0.250	HWH	0.510	Tek/4	0.210"	0.312"	1.830"	Climaseal ACR

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

[1]Head styles: HWH = hex washer head; UPFH = undercut Phillips flat head.
[2]The load-bearing area is the threaded portion of the screw that is heat-treated to HRC 30-34. See Sections 3.0 and 4.2 and Figures 1 and 2 for further clarification.

TABLE 2—ALLOWABLE TENSILE PULL-OUT LOADS (pounds-force)[1,2,3,4,5]

SCREW DESIGNATION	NOMINAL DIAMETER (in.)	DESIGN THICKNESS OF STEEL SHEET NOT IN CONTACT WITH THE SCREW HEAD (inch)						
		0.048	0.060	0.075	0.105	$^1/_8$	$^3/_{16}$	$^1/_4$
#10-16 HWH	0.190	139	181	211	388	404	–	–
#12-14 HWH	0.216	138	186	229	481	496	808	–
#12-14 UPFH	0.216	140	218	250	473	507	836	–
$^1/_4$-14 HWH	0.250	169	224	273	431	582	971	–
$^1/_4$-20 HWH	0.250	157	231	281	427	571	1065	1422

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, pull-over, and fastener tension strength found in Tables 2, 3, and 4, respectively, must be used for design.
[2]Nominal strengths are based on laboratory tests.
[3]Steel must comply with AISI S100 (AISI-NAS for the 2006 IBC) and have a minimum tensile strength of 58 ksi.
[4]To calculate LRFD values, multiply values in the table by the ASD safety factor of 3.0 and multiply again with the LRFD resistance factor of 0.5.
[5]The "–" symbol denotes pull-out not tested.

TABLE 3—ALLOWABLE TENSILE PULL-OVER LOADS (pounds-force)[1,2,3,4,5]

SCREW DESIGNATION	NOMINAL DIAMETER (in.)	NOMINAL EFFECTIVE PULL-OVER DIAMETER (in.)	DESIGN THICKNESS OF STEEL SHEET IN CONTACT WITH SCREW HEAD (inch)				
			0.048	0.060	0.075	0.105	$^1/_8$
#10-16 HWH	0.190	0.400	557	641	714	–	–
#12-14 HWH	0.216	0.415	619	793	893	1092	–
#12-14 UPFH	0.216	0.418	489	620	712	–	–
$^1/_4$-14 HWH	0.250	0.510	661	952	1069	1515	–
$^1/_4$-20 HWH	0.250	0.510	667	910	1070	1568	–

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, pull-over, and fastener tension strength found in Tables 2, 3, and 4, respectively, must be used for design.
[2]Nominal strengths are based on laboratory tests.
[3]Steel must comply with AISI S100 (AISI-NAS for 2006 IBC) and have a minimum tensile strength of 58 ksi.
[4]To calculate LRFD values, multiply values in the table by the ASD safety factor of 3.0 and multiply again with the LRFD resistance factor of 0.5.
[5]The "–" symbol denotes pull-over not tested.

TABLE 4—FASTENER STRENGTH (pounds-force)[1,2,3,4]

SCREW DESIGNATION	NOMINAL FASTENER STRENGTH (TESTED)		ALLOWABLE FASTENER STRENGTH, Ω = 3	
	Tensile, P_{ts}	Shear, P_{ss}	Tensile, P_{ts}/Ω	Shear, P_{ss}/Ω
#10-16 HWH	2598	1607	866	536
#12-14 HWH	3227	2091	1076	697
#12-14 UPFH	3118	1935	1039	645
$^1/_4$-14 HWH	4400	2727	1467	909
$^1/_4$-20 HWH	4490	2725	1497	908

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

[1]For tension connections, the lower of the allowable pull-out, pull-over, and fastener tension strength found in Tables 2, 3, and 4, respectively, must be used for design.
[2]For shear connections, the lower of the allowable fastener shear strength and the allowable shear (bearing) capacity found in Tables 4 and 5, respectively, must be used for design.
[3]Nominal strengths are based on laboratory tests;
[4]To calculate LRFD values, multiply nominal values in the table by the LRFD resistance factor of 0.5.

TABLE 5—ALLOWABLE SHEAR (BEARING) CAPACITY (pounds-force)[1,2,3,4,5]

SCREW DESIGNATION	NOMINAL DIAMETER (in.)	THICKNESS OF TOP SHEET – THICKNESS OF BOTTOM SHEET (inch-inch)[6]						
		0.048-0.048	0.048-0.075	0.060-0.060	0.075-0.075	$^1/_8$ - $^3/_{16}$	0.105 - $^1/_4$	$^3/_{16}$ - $^1/_4$
#10-16 HWH	0.190	331	583	475	–	–	–	–
#12-14 HWH	0.216	372	646	520	646	–	–	–
#12-14 UPFH	0.216	375	662	542	636	–	–	–
$^1/_4$-14 HWH	0.250	376	622	536	785	841	–	–
$^1/_4$-20 HWH	0.250	356	687	520	760	858	860	–

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

[1]For shear connections, the lower of the allowable fastener shear strength and the allowable shear (bearing) capacity found in Tables 4 and 5, respectively, must be used for design.
[2]Nominal strengths are based on laboratory tests.
[3]Steel must comply with AISI S100 (AISI-NAS for the 2006 IBC) and have a minimum tensile strength of 58 ksi.
[4]To calculate LRFD values, multiply values in the table by the ASD safety factor of 3.0 and multiply again with the LRFD resistance factor of 0.5.
[5]The "–" symbol denotes shear capacity not tested.
[6]The top sheet is in contact with the fastener head, while the bottom sheet is not.

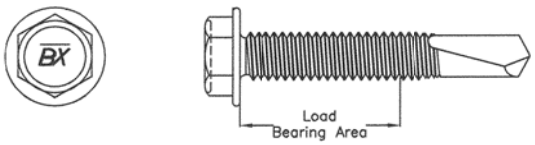

FIGURE 1—TEKS SELECT HEX WASHER HEAD (HWH) FASTENER

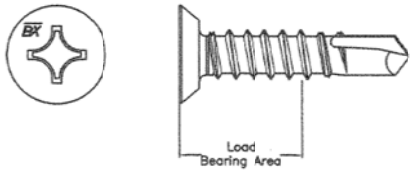

FIGURE 2—TEKS SELECT UNDERCUT PHILLIPS FLAT HEAD (UPFH) FASTENER