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DIVISION: 05 – METALS
Section: 050523 – Metal Fastenings

REPORT HOLDER:

SIMPSON STRONG-TIE COMPANY INC.
5956 WEST LAS POSITAS BOULEVARD
PLEASANTON, CALIFORNIA 94588
(800) 999-5099
www.strongtie.com

EVALUATION SUBJECT:

SIMPSON STRONG-TIE® SHOULDERED SELF-DRILLING TAPPING SCREWS

1.0 EVALUATION SCOPE

1.1 Compliance with the following codes

- 2012 *International Building Code*® (2012 IBC)
- 2009 *International Building Code*® (2009 IBC)
- 2006 *International Building Code*® (2006 IBC)

1.2 Evaluated in accordance with

- ICC-ES *Acceptance Criteria for Tapping Screw Fasteners* (AC118), approved October 2010

1.3 Property evaluated

- Structural

2.0 USES

The Simpson Strong-Tie® shouldered self-drilling tapping screws are used to resist shear and tension loads in engineered connections of the Simpson Strong-Tie connectors for cold-formed steel curtain wall construction to cold-formed steel with thicknesses ranging from 33 mils (0.84 mm) to 97 mils (2.45 mm).

3.0 DESCRIPTION

3.1 Product Information: The Simpson Strong-Tie shouldered self-drilling tapping screws, illustrated in Figure 1 of this report, are No. 14 self-drilling tapping screws complying with ASTM C 1513. The screws have a nominal major shank diameter of 0.242 inch (6.15 mm) and nominal minor shank diameter of 0.192 inch (4.90 mm), with 14 threads per inch. The screws

include a hex washer head with a 0.553 inch (14.05 mm) nominal diameter, and a custom drill point. Screws are ¾ inch (19.05 mm) in length, with a nominal 0.070 inch (1.78 mm) tall shoulder below the head. Table 1 provides a description of the screws recognized in this report.

3.2 Materials

3.2.1 Shouldered Screws: The screws described in this report are manufactured from carbon steel conforming to ASTM A 510, Grade 1022, are case hardened, and are coated with a yellow zinc coating.

3.2.2 Cold-Formed Steel Members: Connected members for connections covered in this report must be manufactured from materials in compliance with the American Iron and Steel Institute *North American Specification for the Design of Cold-Formed Steel Structural Members* (AISI S100), with base steel thickness and corresponding designation thickness and design thickness in compliance with AISI S201, Table B2-1. Loads provided in this report are based on members in contact with the screw head manufactured from steel conforming with ASTM A 653, SS Grade 40 with a minimum yield strength of 40,000 psi (275 MPa) and a minimum tensile strength of 55,000 psi (380 MPa). The member must have a minimum base metal thickness of 0.0555 in., and a minimum G90 zinc coating specification per ASTM A 653. Loads provided in this report are based on the following material properties for members not in contact with the screw head:

MEMBER THICKNESS DESIGNATION	DESIGN THICKNESS (in.)	MINIMUM YIELD STRESS (psi)	MINIMUM TENSILE STRESS (psi)
33 mil (20 ga.)	0.0346	33,000	45,000
43 mil (18 ga.)	0.0451	33,000	45,000
54 mil (16 ga.)	0.0566	50,000	65,000
68 mil (14 ga.)	0.0713	50,000	65,000
97 mil (12 ga.)	0.1017	50,000	65,000

4.0 DESIGN AND INSTALLATION

4.1 Design

The nominal, design, and allowable shear and tensile strengths of the screws are provided in Table 2. The nominal shear strength, P_{ss}, and nominal tensile

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strength, P_{ts} , of the screws are the average ultimate values from testing. The tabulated LRFD design strength and ASD allowable strength values are based on a resistance factor, ϕ , of 0.5, and a safety factor, Ω , of 3.0, respectively.

The nominal, design, and allowable strengths for shear, pull-over, and pull-out of steel-to-steel connections are provided in Tables 3, 4, and 5, respectively. The resistance factors and safety factors used to determine the LRFD and ASD strengths are determined in accordance with AISI S100.

For connections subject to shear, the lesser of the fastener shear strength (Table 2) and the connection shear strength (Table 3) must be used for design. For connections subject to tension, the least of the tension strength of screws (Table 2), connection pull-over strength (Table 4), and connection pull-out strength (Table 5) 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, using strength values found in this report.

The values in the tables are based on a minimum spacing between the centers of fasteners of three times the diameter of the screw, and a minimum distance of 1.5 times the diameter of the screw from the center of a fastener to the edge of any connected part.

4.2 Installation: Installation of the Simpson Strong-Tie® shouldered self-drilling tapping screws must be in accordance with AISI S100, 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 screw must be installed perpendicular to the work surface using a tool with a maximum recommended speed of 2,000 rpm. 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 Simpson Strong-Tie shouldered self-drilling tapping screws described in this report are in compliance with, or are acceptable alternatives to what is specified in, those codes listed in Section 1.0 of this report subject to the following conditions:

5.1 Screws must be installed in accordance with AISI S100, the manufacturer's published installation instructions and this report.

5.2 The allowable strengths (ASD) specified in Section 4.1 may not to be increased when the screws are used to resist wind or seismic forces.

5.3 The screws may only be used with the Simpson Strong-Tie connectors for cold-formed steel curtain wall construction in accordance with IAPMO ES ER-238.

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

6.0 EVIDENCE SUBMITTED

Data in accordance with ICC-ES *Acceptance Criteria for Tapping Screw Fasteners* (AC118), approved October 2010, including test results from laboratories in compliance with ISO/IEC 17025.

7.0 IDENTIFICATION

The Simpson Strong-Tie shouldered self-drilling tapping screws described in this report are identified with a "≠" on the top surface of the screw head, as shown in Figure 1. Packages of the screws are labeled with the report holder's name (Simpson Strong-Tie), the model number (XSH34B1414-XX), where XX represents the screw quantity in the package, and the number of the evaluation report (ER-0242).



IAPMO #0242



Director of Evaluation Services

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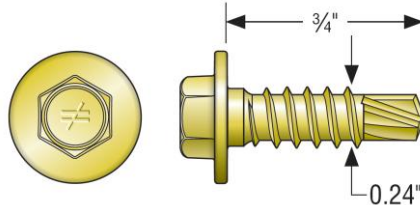


FIGURE 1 - SIMPSON STRONG-TIE® SHOULDERED SELF-DRILLING TAPPING SCREW

TABLE 1 – SHOULDERED SELF-DRILLING TAPPING SCREW SPECIFICATIONS

MODEL NO.	DESIGNATION	SIZE	NOMINAL DIAMETER (in.)	NOMINAL SCREW LENGTH (in.)	HEAD STYLE	NOMINAL POINT LENGTH (in.)
XSH34B1414	#14-14	#14 x 3/4"	0.242	3/4	Hex Washer	0.25

For SI: 1 inch = 25.4 mm, 1 lb = 4.45 N

TABLE 2 – SHOULDERED SELF-DRILLING TAPPING SCREW STRENGTH (lbs)

MODEL NO.	NOMINAL STRENGTH		DESIGN STRENGTH (LRFD)		ALLOWABLE STRENGTH (ASD)	
	Shear (P_{ss})	Tension (P_{ts})	Shear (ϕP_{ss})	Tension (ϕP_{ts})	Shear (P_{ss}/Ω)	Tension (P_{ts}/Ω)
XSH34B1414	3300	2875	1650	1435	1100	960

For SI: 1 inch = 25.4 mm, 1 lb = 4.45 N

TABLE 3 – SHOULDERED SELF-DRILLING SCREW LAP-JOINT CONNECTION SHEAR STRENGTH LIMITED BY TILTING AND BEARING (lbs)

MODEL NO.	STRENGTH	MINIMUM BASE STEEL THICKNESS OF MEMBER NOT IN CONTACT WITH SCREW HEAD				
		33 mil	43 mil	54 mil	68 mil	97 mil
XSH34B1414	Nominal Strength, P_{ns}	640	1075	1495	1960	2765
	Design Strength (LRFD), ϕP_{ns}	450	755	1050	1380	1945
	Allowable Strength (ASD), P_{ns}/Ω	280	475	655	860	1215

For SI: 1 inch = 25.4 mm, 1 lb = 4.45 N

- The tabulated shear values are based on screws installed through a pre-drilled 1/4" diameter hole in the steel member in contact with the screw head, with the shoulder of the screw snug to the steel member not in contact with the screw head.

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TABLE 4 – SHOULDERED SELF-DRILLING SCREW CONNECTION PULL-OVER STRENGTH (lbs)

MODEL NO.	STRENGTH	MINIMUM BASE STEEL THICKNESS OF MEMBER IN CONTACT WITH SCREW HEAD
		54 mil
XSH34B1414	Nominal Strength, P_{nov}	1955
	Design Strength (LRFD), ϕP_{nov}	1180
	Allowable Strength (ASD), P_{nov}/Ω	735

For SI: 1 inch = 25.4 mm, 1 lb = 4.45 N

1. The tabulated pull-over values are based on screws installed through a pre-drilled ¼" diameter hole in the steel member.

TABLE 5 – SHOULDERED SELF-DRILLING SCREW CONNECTION PULL-OUT STRENGTH (lbs)

MODEL NO.	STRENGTH	MINIMUM BASE STEEL THICKNESS OF MEMBER NOT IN CONTACT WITH SCREW HEAD				
		33 mil	43 mil	54 mil	68 mil	97 mil
XSH34B1414	Nominal Strength, P_{not}	325	455	675	920	1410
	Design Strength (LRFD), ϕP_{not}	190	300	440	600	630
	Allowable Strength (ASD), P_{not}/Ω	120	185	275	375	390

For SI: 1 inch = 25.4 mm, 1 lb = 4.45 N