

ESR-3046

Used for Florida State Wide Product Approval #

FL14101

Products on this Report which are approved:

Product	FL#
SD10112	14101.1
SD10212	14101.1
SD9112	14101.2
SD9212	14101.2



SIMPSON STRONG-TIE COMPANY, INC.

ICC-ES Evaluation Report

ESR-3046

Issued August 1, 2010

This report is subject to re-examination in one year.

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

REPORT HOLDER:

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EVALUATION SUBJECT:
SIMPSON STRONG-DRIVE SD SERIES WOOD SCREWS
1.0 EVALUATION SCOPE
Compliance with the following codes:

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

Property evaluated:

Structural

2.0 USES

The Simpson Strong-Drive SD series wood screws described in this report are used for steel-to-wood and wood-to-wood connections that are designed in accordance with the IBC and IRC.

3.0 DESCRIPTION
3.1 General:

The SD series wood screws are manufactured using a standard cold-forming process, and are heat-treated. The screws have rolled threads, spaced 8.5 threads per inch (0.335 thread per millimeter) for the SD9 screws and 10 threads per inch (0.393 thread per millimeter) for the SD10 screws. They have a plain (unslotted) 1/4-inch (6.35 mm) hex washer head, and a sharp point with serrated threads. The length of the threaded portion of the shank is approximately 1 inch (25.4 mm). Table 1 provides a description of screws recognized in this report, and specifies the screws' dimensions, nominal bending yield strength and allowable tensile and shear loads.

3.2 Materials:

3.2.1 SD Series Wood Screws: The SD series wood screws are manufactured from ASTM F 2282, grade 10B18, steel wire. The screws are mechanically galvanized per ASTM B 695, Type II, Class 55.

3.2.2 Wood Members: Wood main members must be either solid-sawn lumber or engineered lumber (e.g., LVL, PSL, and LSL). Wood side members must be either solid-sawn lumber, engineered lumber or wood structural panel (OSB or plywood). For the purposes of fastener design, wood members must have a minimum assigned specific gravity or equivalent specific gravity as indicated in Tables 2, 3 and 4. Assigned specific gravity for solid-sawn lumber must be determined in accordance with Table 11.3.2A of the NDS. The thickness of the wood main member, t_m , must be equal to or greater than the screw length less the thickness of the side member.

3.2.3 Steel Members: Steel side members must have a minimum tensile strength, F_u , equal to 45 ksi (310.1 MPa), and design thicknesses (base-metal thickness exclusive of any coatings) ranging from 0.0352 inch to 0.1026 inch (0.894 mm to 2.606 mm), i.e., 20 gage to 12 gage. The hole in the steel side member for the SD screw must be predrilled or prepunched, and must have a standard round hole diameter no greater than 0.156 inch (3.962 mm) for the SD9, and 0.171 inch (4.343 mm) for the SD10. Hole sizes may deviate from these limitations when the screws are recognized in a current evaluation report for use with a specific steel member with larger holes.

4.0 DESIGN AND INSTALLATION
4.1 Design:

4.1.1 General: Reference lateral and withdrawal design values in the report are for allowable stress design, and must be multiplied by all applicable adjustment factors specified in the NDS to determine adjusted design values. When the capacity of a connection is controlled by fastener or side plate metal strength, rather than wood strength, the metal strength is not permitted to be multiplied by the adjustment factors specified in the NDS. When designing a connection, the structural members must be checked for load-carrying capacity in accordance with Section 10.1.2 of the NDS, and local stresses within multiple-fastener connections must be checked against Appendix E of the NDS to ensure the capacity of the connection and fastener group. Structural members forming the connection must be designed in accordance with the code.

4.1.2 Reference Lateral Design Values: Reference lateral (Z) design values for SD series wood screws for single shear steel-to-wood connections loaded perpendicular and parallel to grain are shown in Table 2. Reference lateral (Z) design values for SD series wood screws for single shear wood-to-wood connections loaded perpendicular and parallel to grain are shown in Table 3. Minimum connection geometries must comply with Table 5.

4.1.3 Reference Withdrawal Design Values and Pull-through Design Values: Design values for SD series wood screws that are loaded in tension are limited by the allowable withdrawal load, with the exception that design values for connections having nominally $1^{5}/_{32}$ -inch-thick (11.9 mm) plywood or OSB side members must not exceed the head pull-through design value of 130 pounds. Reference withdrawal (W) design values for SD series wood screws are shown in Table 4, and are given in pounds per inch of thread penetration into the main member. Thread lengths for the SD series wood screws are shown in Table 1.

4.2 Installation:

SD series wood screws are installed with a $1/4$ -inch (6.35 mm) hex head driver. Installation may be performed without predrilling wood members. Edge distances, end distances and spacing of the screws must be sufficient to prevent splitting of the wood, or as required by Table 5 of this report, whichever is more restrictive. The bottom of the screw head must be installed flush to the surface of the member being connected. The screws must not be overdriven. SD screws must be installed such that the threaded portion of the shank is fully embedded within the main member.

5.0 CONDITIONS OF USE

The Simpson Strong-drive SD series wood 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 The SD series wood screws must be installed in accordance with the manufacturer's published installation instructions, this evaluation report and the applicable code. The instructions within this report govern if there are any conflicts between the manufacturer's published installation instructions and this report.

5.2 For applications under the IBC, SD series screws may not be used in contact with preservative-treated or fire-retardant-treated wood, with the exception that for applications under the 2009 IBC, SD series screws may be used with SBX/DOT and zinc borate preservative-treated wood in interior, dry environments. For applications under the 2006 and 2009 IRC, the SD series wood screws may be used in contact with preservative-treated or fire-retardant-treated wood.

5.3 The SD series wood screws are manufactured under a quality control program with inspections by Professional Service Industries (AA-660).

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Alternate Dowel-type Threaded Fasteners (AC233), dated June 2010.

7.0 IDENTIFICATION

The packaging for the SD series wood screws is labeled with the designation "Simpson Strong-Drive SD," the Simpson Strong-Tie Company name and address, the fastener size, and the ICC-ES evaluation report number (ESR-3046). Each screw head is marked with the not-equal-to symbol (\neq), and three or four numbers designating the screw size and length, as shown in Table 1.

TABLE 1—SD SERIES WOOD SCREW SPECIFICATIONS, NOMINAL BENDING YIELD STRENGTH, AND FASTENER ALLOWABLE STEEL STRENGTH

FASTENER DESIGNATION	HEAD MARKING	SCREW SPECIFICATIONS (inches)				NOMINAL BENDING YIELD STRENGTH ³ , F_{yb} (psi)	FASTENER ALLOWABLE STEEL STRENGTH ⁴ (lbf)	
		Screw Length, L	Thread Length ¹ , T	Unthreaded Shank Length, $L - T$	Minor Thread (root) Diameter ² , D_r		Tension	Shear
SD9112	915	1.5	1.0	0.5	0.109	188,000	510	425
SD9212	925	2.5		1.5				
SD10112	1015	1.5		0.5	0.122		555	445
SD10212	1025	2.5		1.5				

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

¹Length of thread includes tip. See Figure 1.

²Minor thread diameter shown in the table is the minimum minor diameter.

³Bending yield strength determined in accordance with ASTM F 1575 using the minor thread (root) diameter, D_r .

⁴Allowable fastener loads are based on steel properties of the screw. Refer to Tables 2 and 3 for allowable reference lateral (Z) design values for steel-to-wood and wood-to-wood connections, respectively.

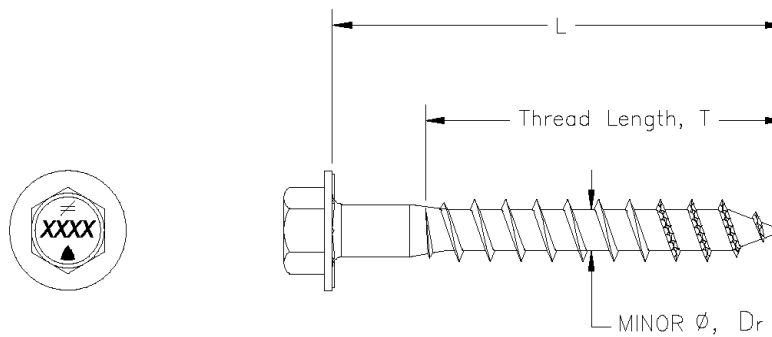


FIGURE 1—SD SCREW

TABLE 2—REFERENCE LATERAL DESIGN VALUES (Z) FOR SINGLE SHEAR STEEL-TO-WOOD CONNECTIONS WITH SD SERIES WOOD SCREWS (pounds) ^{1, 2, 3, 4, 5, 6, 7, 8}

FASTENER DESIGNATION	REFERENCE LATERAL DESIGN VALUE (Z)	
	$0.42 \leq SG < 0.50$ ⁽²⁾	$SG \geq 0.50$ ⁽²⁾
SD9112	112	171
SD9212	112	200
SD10112	138	173
SD10212	165	215

For **SI**: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 ksi = 6.89 MPa.

¹The side member must consist of steel having a minimum tensile strength (F_u) of 45 ksi, and must have a design thickness (t_s) no less than 0.0352 inches (20 gage) and no greater than 0.1026 inches (12 gage).

²The main member must be either solid-sawn lumber or engineered lumber (e.g., LVL, PSL, and LSL). Main members must have a minimum assigned specific gravity or equivalent specific gravity (SG) of either 0.42 or 0.50, as indicated in the table above. The thickness of the wood main member, t_m , must be equal to or greater than the screw length less the thickness of the side member. See Table 5 for minimum end and edge distances and fastener spacing.

³The uncoated minimum steel thickness of the cold-formed product delivered to the jobsite must not be less than 95 percent of the design thickness, t_s .

⁴Holes in the steel side member must be predrilled or prepunched. Hole diameter must comply with Section 3.2.3 of this report.

⁵Tabulated lateral design values (Z) must be multiplied by all applicable adjustment factors, including the load duration factor, C_D , from the NDS as referenced in the IBC or IRC.

⁶Screws must be installed straight into the side grain of the wood main member with the screw axis at a 90-degree angle to the wood fibers.

⁷Minimum fastener penetration must be equal to the screw length less the thickness of the metal side plate.

⁸Tabulated reference lateral design values apply to both parallel- and perpendicular-to-grain loading.

TABLE 3—REFERENCE LATERAL DESIGN VALUES (Z) FOR SINGLE SHEAR WOOD-TO-WOOD CONNECTIONS WITH SD SERIES WOOD SCREWS (pounds) ^{1, 2, 3, 4, 5, 6, 7}

FASTENER DESIGNATION	REFERENCE LATERAL DESIGN VALUE (Z)					
	0.42 ≤ SG < 0.50 ^(1, 2)			SG ≥ 0.50 ^(1, 2)		
	¹⁵ / ₃₂ " Side Member	²³ / ₃₂ " Side Member	1 1/2" Side Member	¹⁵ / ₃₂ " Side Member	²³ / ₃₂ " Side Member	1 1/2" Side Member
SD9112	93	—	—	105	—	—
SD9212	99	94	109	118	133	130
SD10112	102	—	—	127	—	—
SD10212	106	126	123	147	168	152

For **SI**: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 ksi = 6.89 MPa.

¹The nominal ¹⁵/₃₂- and ²³/₃₂-inch-thick side members must be plywood or OSB with minimum equivalent specific gravities (SG) of either 0.42 or 0.50, as indicated in the table above.

²The main member and 1 1/2-inch-thick side member must be either solid-sawn lumber or engineered lumber (e.g., LVL, PSL, and LSL) with a minimum assigned specific gravity or equivalent specific gravity (SG) of either 0.42 or 0.50, as indicated in the table above. The thickness of the wood main member, *t_m*, must be equal to or greater than the screw length less the thickness of the side member. See Table 5 for minimum end and edge distances and fastener spacing.

³When the assigned specific gravities or equivalent specific gravity (SG) of the main and side members are different, the design values of the wood with the lowest specific gravity (SG) must be used.

⁴Tabulated lateral design values (Z) must be multiplied by all applicable adjustment factors, including the load duration factor, *C_D*, from the NDS as referenced in the IBC or IRC.

⁵Screws must be installed straight into the side grain of the wood members with the screw axis at a 90-degree angle to the wood fibers.

⁶Minimum fastener penetration must be equal to the screw length less the thickness of the wood side member.

⁷Tabulated reference lateral design values apply to both parallel- and perpendicular-to-grain loading.

TABLE 4—REFERENCE WITHDRAWAL DESIGN VALUES (W) FOR SCREWS INSTALLED IN THE SIDE GRAIN OF A WOOD OR STRUCTURAL COMPOSITE LUMBER MAIN MEMBER

FASTENER DESIGNATION	SCREW LENGTH, <i>L</i>	THREAD LENGTH, <i>T</i>	REFERENCE WITHDRAWAL DESIGN VALUE, <i>W</i> (lbs/inch) ^{1, 2, 3}	
			0.42 ≤ SG < 0.50 ⁽⁴⁾	SG ≥ 0.50 ⁽⁴⁾
SD9112	1.5	1.0	122	173
SD9212	2.5			
SD10112	1.5		122	173
SD10212	2.5			

For **SI**: 1 inch = 25.4 mm, 1 lbf/inch = 4.44 kPa.

¹The tabulated reference withdrawal design value, *W*, is in pounds per inch of the thread penetration into the side grain of the main member. Thread penetration is the portion of the threaded length held in the main member, including the screw tip. SD screws must be installed such that the threaded portion of the shank is fully embedded within the main member.

²The tabulated reference withdrawal design value, *W*, must be multiplied by all applicable adjustment factors from the NDS as referenced in the IBC or IRC.

³For connections with nominal ¹⁵/₃₂-inch-thick plywood or OSB side members, reference withdrawal design values, *W*, must be limited by the head pull-through design value of 130 pounds.

⁴Wood main members must have a minimum assigned specific gravity or equivalent specific gravity (SG) as indicated in the table above.

TABLE 5—CONNECTION GEOMETRY

CONDITION ¹		MINIMUM DISTANCE OR SPACING (in.)	
		Main Member	Wood Side Member
Edge distance	Perpendicular to grain loading	1	1
	Parallel to grain loading	1/2	1/2
End distance	Perpendicular to grain loading	2	2 ⁷ / ₁₆
	Parallel to grain loading	2	2 ⁷ / ₁₆
Spacing	Between fasteners in a row	2	2 ⁷ / ₁₆
	Between rows	1/2	1 ³ / ₁₆
	Between staggered rows	1/2	1/2

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

¹Edge distances, end distances and spacing of the screws must be sufficient to prevent splitting of the wood, or as required by this table, whichever is the more restrictive.