EVALUATION SUBJECT:
SIMPSON STRONG-DRIVE® SDWC WOOD SCREWS

REPORT HOLDER:
Simpson Strong-Tie Company Inc.
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CSI Division: 06 – WOOD, PLASTICS, AND COMPOSITES
CSI Section: 06 05 23 – Wood, Plastic and Composite Fastenings

1.0 SCOPE OF EVALUATION

1.1 Compliance to the following codes & regulations:
- 2015, 2012 and 2009 International Building Code® (IBC)
- 2015, 2012 and 2009 International Residential Code® (IRC)

1.2 Evaluated in accordance with:
- ICC-ES AC233
- ICC-ES AC257

1.3 Properties assessed:
- Structural
- Corrosion Resistance

2.0 PRODUCT USE

The Simpson Strong-Drive® SDWC fasteners described in this report are dowel-type threaded and self-drilling fasteners used for wood-to-wood connections. These fasteners comply with 2015 IBC Section 2304.10 (2012 and 2009 IBC Section 2304.9). The fasteners are permitted when an engineered design is submitted in accordance with IRC Section R301.1.3.

The Simpson Strong-Tie Strong-Drive® SDWC15450 may be used where fasteners are required to exhibit corrosion resistance when exposed to adverse environmental conditions and/ or in chemically treated wood, which are subject to limitations of Section 5.5 of this report, and are alternatives to hot-dipped-zinc-coated galvanized fasteners with a coating weight in compliance with ASTM A153, Class D. Fasteners with these proprietary corrosion-resistant coatings were evaluated for contact with wood chemically treated withwaterborne alkaline copper quaternary, Type (D) (ACQ-D), to a maximum retention level of 0.4 pcf (6.4 kg/m^3), which was shown to be more corrosive than Chromated Copper Arsenate, Type C (CCA-C), Micronized Copper Azole (MCA), and Dispersed Copper Azole (µCA-C).

3.0 PRODUCT DESCRIPTION

3.1 General: The SDWC screws (Figure 1 of this report) are fully threaded with rolled threads spaced approximately at 7 threads per inch (0.28 threads/mm) and a type 17 point. The head is a cap-style head with a T-30 recess. The SDWC screws are available in two lengths: 4½ inches and 6 inches (114 and 152 mm). The SDWC15600 screws have a clear zinc coating and are acceptable for dry-service conditions, and the SDWC15450 screws have a proprietary black electrocoat, applied over a clear zinc undercoating. Table 1 of this report describes the screws recognized in this report including the bending yield strength, tensile strength, and shear strength.

3.2 Materials

3.2.1 SDWC Wood Screws: The SDWC screws are manufactured from C1022 carbon steel complying with ASTM A510. The manufacturing process involves cold-forming followed by heat treatment.

3.2.2 Wood Members: Wood side and main members shall consist of solid-sawn lumber with a specific gravity of 0.42 to 0.55 or structural composite lumber (e.g., LVL, PSL, LSL etc.) shall have a minimum 0.8E for lateral and withdrawal loading. The structural composite lumber shall be recognized in an evaluation report and shall have an equivalent specific gravity of 0.50 minimum for lateral and 0.42 for withdrawal. The combined thickness of the main and side members shall be equal to or greater than the screw length. The side member thickness shall be at least 1.5 inches (38 mm).

Chemicals used to preservative treat wood are limited to the following:

1. Alkaline Copper Quaternary Type D (ACQ-D), with a maximum retention level of 0.4 pcf (6.4 kg/m^3).
2. Wood treatments that have been demonstrated to have lower levels of corrosivity compared to ACQ-D.

4.0 DESIGN AND INSTALLATION

4.1 Design

4.1.1 General: Reference lateral, withdrawal and pull-through design values in the report are for allowable stress design, and shall be multiplied by all applicable adjustment factors specified in the ANSI/AWC NDS to determine adjusted design values, including wet service condition specified in Section 11.3.3 of the ANSI/AWC NDS - 2015 (Section 10.3.3 of the ANSI/AWC NDS – 2012 and ANSI/AF&PA NDS – 2005). The fastener strength taken from Table 1 of this report shall not be multiplied by the ANSI/AWC NDS adjustment factors.

Local stresses in connections using multiple fasteners shall be checked in accordance with Section 11.1.2 of ANSI/AWC NDS - 2015 (Section 10.1.2 of the ANSI/AWC NDS – 2012 and ANSI/AF&PA NDS – 2005). Structural members forming the connection shall be designed in accordance with the IBC.

The following requirements shall be observed when designing with the fasteners:

1. The allowable load for a single-screw connection in which the screw is subject to tension is the least of: (a) the reference withdrawal design value given in Table **3** of this report, adjusted by all applicable adjustment factors; (b) the reference head pull-through design value given in Table **3** of this report, adjusted by all applicable adjustment factors; and (c) the allowable screw tension strength given in Table **1** of this report.
2. The allowable lateral load for a single-fastener connection is the lesser of: (a) the reference lateral design value given in Table **2** of this report, adjusted by all applicable adjustment factors, and (b) the allowable screw shear strength given in Table **1** of this report.
3. Connections containing multiple fasteners shall be designed in accordance with Sections 11.2.2 and 12.6 of ANSI/AWC NDS - 2015 (Sections 10.2.2 and 11.6 of ANSI/AWC NDS – 2012 and ANSI/AF&PA NDS – 2005).
4. Where the screws are subjected to combined lateral and withdrawal loads, connections shall be designed in accordance with Section 12.4.1 of ANSI/AWC NDS - 2015 (Section 11.4.1 of ANSI/AWC NDS – 2012 and ANSI/AF&PA NDS – 2005).
5. When designing a connection, the structural members shall be checked for load-carrying capacity in accordance with Section 11.1.2 of ANSI/AWC NDS - 2015 (Section 10.1.2 of the ANSI/AWC NDS – 2012 and ANSI/AF&PA NDS – 2005). and local stresses within the connection shall be checked against Appendix E in the ANSI/AWC NDS to ensure the capacity of the connection and fastener group.
6. When use is in structural composite lumber products, the minimum fastener end and edge distances and spacings shall be in accordance with Table 4 of this report or in accordance with the recommendations of the structural composite lumber manufacturer, whichever is more restrictive.

The SDWC15450 wood screws have corrosion-resistant coatings that are recognized for use in wood members with chemical treatments as set forth in Section 3.2.2 of this report. These fasteners shall be limited to use in applications and limitations defined in Table 5 of this report.

4.1.2 Lateral Design Values: Reference lateral (Z) design values for SDWC wood screws for single shear wood-to-wood connections loaded perpendicular to grain and parallel to grain are shown in Table 2 of this report.

4.1.3 Reference Withdrawal Design Values: Reference withdrawal (W) design values for SDWC wood screws are shown in Table 3 of this report and are given in pounds per inch of thread penetration into the main member.

4.1.4 Pull-through Design Values: Reference pull-through design values for SDWC wood screws are shown in Table 3 of this report and are given in pounds per inch of thread penetration into the side member.

4.2 Installation: The SDWC wood screws shall be installed in accordance with the manufacturer's installation instructions, the evaluation report and the codes listed in Section 1.1 of this report. Installation may be performed without pre-drilling wood members. Edge distances, end distances and spacing of the screws shall be sufficient to prevent splitting of the wood, or as required by Table 4 of this report, whichever is more restrictive. The top of the screw head shall be installed flush to the surface of the member being connected.

5.0 LIMITATIONS

The Simpson Strong-Drive® SDWC 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 fasteners shall be manufactured, identified and installed in accordance with the manufacturer's published installation instructions, this report, and the applicable code. A copy of the instructions shall be available at the jobsite continuously during installation. If there is a conflict between this report and the manufacturer's published installation instructions, the more restrictive shall govern.

5.2 Calculations and details showing compliance with this report shall be submitted to the code official. The calculations and details shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.3 Design and installation shall conform to Section 4.0 of this report.

5.4 Calculations and details showing compliance with this report shall be submitted to the code official. The calculations and details shall 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 Use of fasteners in locations exposed to saltwater or saltwater spray is outside the scope of this evaluation report.

5.6 The SDWC wood screws are manufactured under a quality control program with inspections by IAPMO Uniform ES.

6.0 SUBSTANTIATING DATA

6.1 Data and test reports submitted are from laboratories in compliance with ISO/IEC 17025 and in accordance with the ICC-ES Acceptance Criteria for Alternate Dowel-type Threaded Fasteners (AC233), approved April 2015, editorially revised August 2015.

6.2 Data in accordance with the ICC-ES Acceptance Criteria for Corrosion-Resistant Fasteners and Evaluation of Corrosion Effects of Wood Treatment Chemicals (AC 257), dated October 2009 (editorially revised May 2015).

7.0 IDENTIFICATION

The packaging for the SDWC wood screws is labeled with designation "Simpson Strong-Drive® SDWC15450 or SDWC15600", the Simpson Strong-Tie Co. name and address, the fastener size, and the IAPMO UES evaluation report number (ER-262). Each screw head is marked with the No-Equal to symbol (≠) and the numeric number "4.5 or 6" indicating screws length, as shown in Figure 1.
A die-stamp label may also substitute for the label. Either Mark of Conformity may be used as shown below:

or

IAPMO ER #262

Brian Gerber, P.E., S.E.
Vice President, Technical Operations
Uniform Evaluation Service

Richard Beck, PE, CBO, MCP
Vice President, Uniform Evaluation Service

GP Russ Chaney
CEO, The IAPMO Group

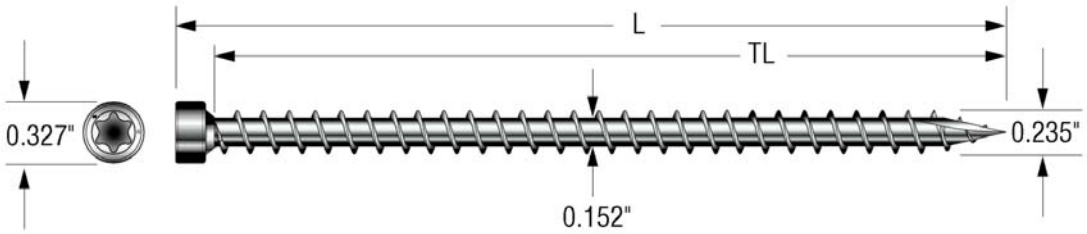
For additional information about this evaluation report please visit www.uniform-es.org or email us at info@uniform-es.org

TABLE 1 – SDWC WOOD SCREW SPECIFICATIONS, ALLOWABLE BENDING YIELD STRENGTH, AND FASTENER ALLOWABLE STEEL STRENGTH

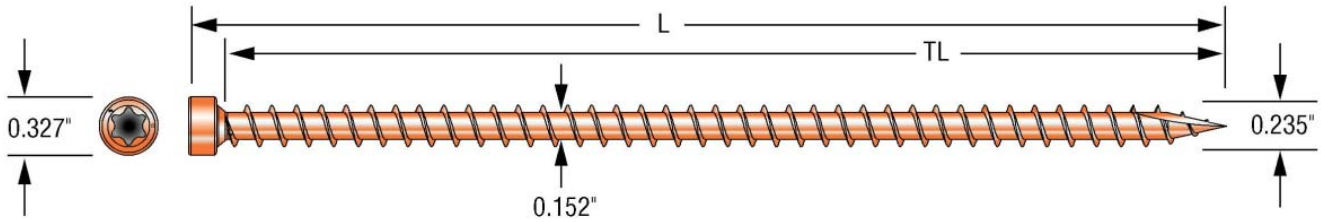
FASTENER DESIGNATION	HEAD MARKING	FASTENER LENGTH[1] L (in)	LENGTH OF THREAD[2] TL (in)	MAJOR THREAD DIAMETER (in)	MINOR THREAD (ROOT) DIAMETER (in)	FASTENER ALLOWABLE PROPERTIES[4]		
						Bending Yield Strength[3] (Fyb) (psi)	Tension (lbs)	Shear (lbs)
SDWC15450	≠, 4.5	4.5	4 ¼	0.235	0.152	195,000	1,160	815
SDWC15600	≠, 6	6.0	5 3/4					

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

1. For purposes of measuring overall fastener length, screw fasteners are measured from the top of head to bottom of tip.
2. Length of thread includes tip. Figure 1 of this report shows the location of dimensions.
3. Bending yield strength determined per methods specified in ASTM F1575 and based on the minor thread (root) diameter.
4. Allowable connection loads include consideration of fastener properties. Tables 3 and 4 of this report provide allowable reference lateral (Z), withdrawal (W) and pull-through design values for the screws in wood-to-wood connections.



SDWC15450



SDWC15600

FIGURE 1 – SDWC SCREWS

TABLE 2 – REFERENCE LATERAL (Z) DESIGN VALUES FOR WOOD-TO-WOOD CONNECTIONS [1,2,3,4,5,8]

FASTENER DESIGNATION	FASTENER LENGTH (in)	THREAD LENGTH TL (in)	SIDE MEMBER	MAIN MEMBER	LATERAL DESIGN VALUE (Z) FOR SINGLE SHEAR (TWO-MEMBER) CONNECTIONS (lbs.)					
					Zpara[6]			Zperp[7]		
					SP	DF	SPF	SP	DF	SPF
SDWC15450	4 1/2	4 1/4	2x (Face)	2x (End Grain)	-	-	-	225	205	192
SDWC15600	6	5 3/4	(2)2x (Face)	2x (Edge)	245	240	180	240	240	240
			2x (Face)	2x (End Grain)	-	-	-	225	205	192
			(2)2x (Face)	2x (End Grain)	-	-	-	225	225	186

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

1. The connection conditions of this table are for specific intended applications. Reference lateral design values for all other shear connections shall be calculated in accordance with the NDS. Minimum fastener penetration into the main member shall be 1.0 inch.
2. The main and side members shall be wood having a minimum NDS referenced specific gravity of 0.50 for DF, 0.55 for SP and 0.42 for SPF and HF. Lateral table values for sawn lumber are also applicable for fasteners installed into structural composite lumber described in Section 3.2.2 of this report.
3. Reference lateral design values (Z) shall be multiplied by all applicable adjustment factors, including the load duration factor, C_D, from the NDS as referenced in the IBC or IRC.
4. Screws shall be installed into the side grain of the wood main member with the screw axis at a 90-degree angle to the surface of the member.
5. DF is Douglas Fir-Larch. SP is Southern Pine. SPF is Spruce-Pine-Fir.
6. Parallel to grain loading in the side member and perpendicular to grain loading in the main member.
7. Perpendicular to grain loading in the side member and perpendicular to grain loading in the main member, except for 2x (edge) where main member is loaded parallel to grain.
8. Specific gravities for each species combination are based on values in ANSI/AWC NDS Table 11.3.3A.

TABLE 3 – REFERENCE WITHDRAWAL (W) AND PULL-THROUGH DESIGN VALUES FOR WOOD-TO-WOOD CONNECTIONS[1,2,3,4,8]

FASTENER DESIGNATION	FASTENER LENGTH (in)	THREAD LENGTH (in)	MAIN MEMBER	WITHDRAWAL DESIGN VALUE (W) (lbs./in)[5, 7]			PULL-THROUGH DESIGN VALUE (lbs./in)[6]		
				SP	DF	SPF	SP	DF	SPF
SDWC15450 SDWC15600	4 1/2 6	4 1/4 5 3/4	2x (Edge)	250	230	149	-	-	-
			2x (End Grain)	200	140	103	208	179	175
			2x (Face)	210	177	118	255	195	159
			(2) 2x (Face)	220	199	163	240	225	188

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

1. The reference withdrawal and pull-through values are in pounds per inch of the thread penetration into the main member and a minimum 1½ inch thick side member, respectively.
2. The reference withdrawal and pull- through design values shall be multiplied by all applicable adjustment factors in the ANSI/AWC NDS, including the load duration factor, C_D, as referenced in the IBC or IRC.
3. Screws shall be installed into the side grain of the main member with the screw axis at a 90-degree angle to the surface.
4. Specific gravities for each species combination are based on values in ANSI/AWC NDS Table 11.3.3A.
5. The reference withdrawal values shall be multiplied by the length of thread penetration in the main member. The length includes the threaded tip.
6. The reference pull-through values shall be multiplied by the length of thread penetration in the side member.
7. The main members shall be wood having a minimum NDS referenced specific gravity of 0.50 for DF, 0.55 for SP, and 0.42 for SPF and HF. Withdrawal table values for sawn lumber are also applicable for fasteners installed into structural composite lumber described in Section 3.2.2 of this report.
8. DF is Douglas Fir-Larch. SP is Southern Pine. SPF is Spruce-Pine-Fir. HF is Hem-Fir.

TABLE 4 – CONNECTION GEOMETRY REQUIREMENTS[1,2,3]

CONDITION		MINIMUM DIMENSION (in.)
End Distance	Load toward end	2
	Load away from end	2
	Load perpendicular to grain	1
Edge Distance	Load any direction	½
Spacing Between Fasteners in a Row	Load parallel to grain	3 1/2
	Load perpendicular to grain	2 3/8
Spacing between rows	In-line rows	1
	Staggered rows	½

For SI: 1 inch = 25.4 mm

1. For fasteners installed in side grain.
2. Edge distances, end distances and spacing of the screws shall be sufficient to prevent splitting of the wood, or as required by this table, or when applicable, as recommended by the structural composite lumber manufacturer, whichever is the more restrictive.
3. Values for spacing between staggered rows apply where fasteners in adjacent rows are off-set by half of the spacing between fasteners in a row.

TABLE 5 – RECOGNIZED EXPOSURE CONDITIONS FOR SIMPSON STRONG-TIE SDWC15450 FASTENERS

EXPOSURE CONDITION	TYPICAL APPLICATIONS	RECOGNITION LIMITATIONS
1	Treated wood in dry use applications	Limited to use where equilibrium moisture content of the chemically treated wood meets the dry services condition as described in NDS
3	General Construction	Limited to freshwater and chemically treated wood exposure, e.g., no salt water exposure