

# ICC-ES Evaluation Report

**ESR-1472**

Issued September 1, 2009

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**DIVISION: 06—WOOD AND PLASTICS**  
**Section: 06090—Wood and Plastic Fastenings****REPORT HOLDER:****SIMPSON STRONG-TIE COMPANY, INC.**  
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[www.strongtie.com](http://www.strongtie.com)**EVALUATION SUBJECT:****SIMPSON STRONG-TIE WSNTL WOOD SCREWS****1.0 EVALUATION SCOPE****Compliance with the following codes:**

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

**Property evaluated:**

Structural

**2.0 USES**

The Simpson Strong-Tie WSNTL wood screws described in this report are used as substitutes for designs in accordance with the IBC where 8d and 10d common nails are specified for horizontal wood structural sheathing panel diaphragm applications in IBC Tables 2306.3.1 and 2306.3.2; for wood structural sheathing panel shear wall applications in Table 2306.4.1; for code-prescribed wood connections in Table 2304.9.1; for single diagonally sheathed lumber diaphragm fastening in Table 2306.3.3; and for alternative bracing fastening in IBC Sections 2308.9.3.1 and 2308.9.3.2 and Figure 2308.9.3.2. The WSNTL screws are also used as substitutes for 8d and 10d common nails in structures built in accordance with the IRC, in prescriptive sheathing applications in Table R602.3(1) and in structures regulated by the IRC, where an engineered design is submitted in accordance with IRC Section R301.1.3.

**3.0 DESCRIPTION****3.1 General:**

The WSNTL wood screws are used to fasten wood structural sheathing panels to wood framing members in the construction of horizontal diaphragms and vertical shear walls. Reference Tables 1 through 6 for the required installation spacings and allowable loads.

**3.2 Material:**

The WSNTL wood screws are No. 8 flat head, countersunk wood screws complying with ANSI/ASME B18.6.1, except that the screws have a minimum thread diameter of 0.175 inch (4.44 mm) and a minimum shank diameter of 0.132 inch (3.35 mm). The screws have either a yellow dichromatic finish plating or a proprietary coating.

The WSNTL2L, WSNTL2L-17, WSNTLG2, and WSNTLQ2 are 2 inches (51 mm) long. The WSNTL212, WSNTLG212, and WSNTLQ212 are 2½ inches (63.5 mm) long. The WSNTL3, WSNTLG3, and WSNTLQ3 are 3 inches (76 mm) long. The designation -17 indicates the presence of a Type 17 tip. The designations G and Q indicate proprietary coatings. The model name may end in the designation S, R, or B indicating the screws are in a collated, loose, or bulk form, respectively.

**4.0 INSTALLATION****4.1 Allowable Stress and Prescriptive Design:**

Allowable shear values for horizontal diaphragms consisting of wood structural sheathing panels attached to Douglas fir–larch or Southern pine lumber framing are shown in Tables 1 and 2. Allowable in-plane shear values for shear walls consisting of wood structural sheathing panels attached to Douglas fir–larch or Southern pine lumber framing are shown in Table 3. Allowable shear values of other wood species are adjusted by factors noted in the corresponding footnote to each table. The allowable shear capacities shown in Tables 1, 2, and 3 are permitted to be increased by 40 percent for wind design. The diaphragm and shear wall deflections must be calculated in accordance with Sections 2305.2.2 and 2305.3.2 of the IBC, using the  $e_n$  values for the 10d common nail shown in Table 2305.2.2(1), as applicable.

The WSNTL withdrawal and pull-through values exceed those of a 10d common nail.

The prescriptive fastening schedule for IBC sheathing connections are shown in Table 4.

The prescriptive fastening schedule of single diagonally sheathed lumber diaphragms is shown in Table 5.

WSNTL screws may be used in lieu of 8d nails in accordance with IBC Sections 2308.9.3.1 and 2308.9.3.2 and Figure 2308.9.3.2.

The prescriptive fastening schedule for IRC sheathing connections is shown in Table 6.

The use of glue between the side and main member is not required by the code.

#### 4.2 Installation:

Screws must be installed in accordance with Section 11.1.4 of the 2005 National Design Specification for Wood Construction (NDS), with the exception that no predrilling is required. The screws must be installed with minimum panel edge and end distances of  $\frac{3}{8}$  inch (9.5 mm). Fasteners used in contact with preservative-treated or fire-retardant-treated lumber must, as a minimum, comply with IBC Section 2304.9.5 and IRC Section R319.3. For proprietary preservative-treated or fire-retardant-treated lumber, the lumber treater or the report holder (Simpson Strong-Tie Company) should be contacted for recommendations on minimum corrosion resistance and connection capacities of fasteners.

#### 4.3 Special Inspection:

Periodic special inspection must be provided for diaphragms and shearwall components within the seismic-force-resisting system in accordance with IBC Section 1707.1, with the exception of those structures that qualify under IBC Section 1704.1. High load diaphragms noted in Table 2 of this report are subject to special inspection in accordance with IBC Section 1704.6.1. For jurisdictions adopting the IRC, special inspections are not required.

#### 5.0 CONDITIONS OF USE

The Simpson Strong-Tie WSNTL 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 Fasteners are installed in accordance with Simpson Strong-Tie instructions and this report. In the case of

conflict between this report and the manufacturer's installation instructions, this report governs.

- 5.2 Horizontal wood structural panel diaphragm design shear loads are less than or equal to the allowable loads shown in Tables 1 and 2, as applicable.
- 5.3 Wood structural panel design shear wall loads are less than or equal to the allowable loads shown in Table 3.
- 5.4 Use of fasteners with preservative-treated or fire-retardant-treated lumber must be in accordance with Section 4.2 of this report.
- 5.5 WSNTL wood screws may be used to attach sheathing on shear walls used for wind, as well as seismic design in Seismic Design Categories A, B, and C where  $R = 1.5$  and  $\Omega_0 = 2.5$ , and  $C_d = 1.5$ .
- 5.6 Diagonally sheathed lumber diaphragm design shear loads are less than or equal to the allowable loads indicated in IBC Section 2306.3.4.
- 5.7 Recognition of fasteners for corrosion resistance is outside the scope of this report.

#### 6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Wood Screws Used in Horizontal Diaphragms and Vertical Shear Walls (AC120), dated February 2006.

#### 7.0 IDENTIFICATION

Fastener packages bear a label noting the Simpson Strong-Tie Company, Inc., name and address; the product size; the evaluation report number (ESR-1472).

**TABLE 1—ALLOWABLE SHEAR (POUNDS PER FOOT) FOR WOOD STRUCTURAL PANEL DIAPHRAGMS WITH FRAMING OF DOUGLAS FIR–LARCH OR SOUTHERN PINE<sup>a</sup> FOR WIND OR SEISMIC LOADING<sup>b</sup>**

PANEL GRADE	MINIMUM SCREW PENETRATION IN FRAMING (inches)	MINIMUM NOMINAL PANEL THICKNESS (inches)	MINIMUM NOMINAL WIDTH OF FRAMING MEMBERS AT ADJOINING PANEL EDGES AND BOUNDARIES (inches) <sup>c,d</sup>	BLOCKED DIAPHRAGMS				UNBLOCKED DIAPHRAGMS	
				Screw spacing (inches) at diaphragm boundaries (all cases), at continuous panel edges parallel to load (Cases 3 and 4), and at all edges (Cases 5 and 6) <sup>e</sup>				Screws spaced 6 inches maximum, at support edges <sup>e</sup>	
				6	4	2 <sup>1/2</sup> <sup>f</sup>	2 <sup>f</sup>	Case 1 (no unblocked edges or continuous joints parallel to load)	All other configurations (Cases 2, 3, 4, 5, and 6)
				Screw spacing (inches) at other panel edges					
				6	6	4	3		
Structural I / OSB		3/8	2	270	360	530	600	240	180
			3	300	400	600	675	265	200
		15/32	2	320	425	640	730	285	215
			3	360	480	720	820	320	240
Sheathing, single floor, and other grades covered in DOC PS1 and PS2	1 1/4	3/8	2	240	320	480	545	215	160
			3	270	360	540	610	240	180
		7/16	2	255	340	505	575	230	170
			3	285	380	570	645	255	190
		15/32	2	290	385	575	655	255	190
			3	325	430	650	735	290	215
		19/32	2	320	421	640	730	285	215
			3	360	480	720	820	320	240

For SI: 1 inch = 25.4 mm, 1 pound per foot = 14.6 N/m.

<sup>a</sup>For framing of other species: (1) Find specific gravity for species of lumber in AF&PA National Design Specification (NDS). (2) Find shear value from table above for actual grade and multiply value by the following adjustment factor: Specific Gravity Adjustment Factor = [1-(0.5-SG)], where SG= Specific Gravity of the framing lumber. This adjustment factor must not be greater than 1.0.

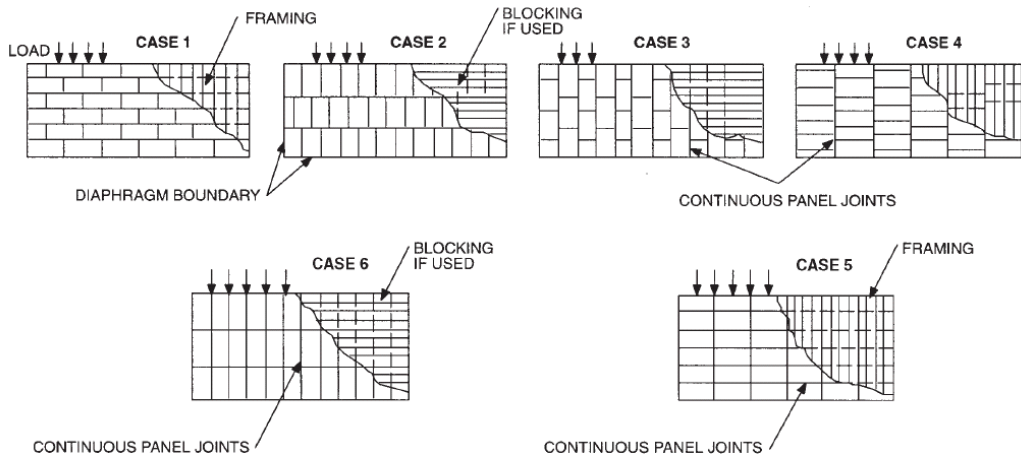
<sup>b</sup>For shear loads of normal or permanent load duration as defined by the NDS, the values in the table above must be multiplied by 0.63 or 0.56, respectively.

<sup>c</sup>The minimum nominal width of framing members not located at boundaries or adjoining panel edges must be 2 inches.

<sup>d</sup>Framing at adjoining panel edges must be 3 inches nominal or wider, and screws must be staggered where both of the following conditions are met: (1) screws having penetration into framing of more than 1 1/2 inches and (2) screws are spaced 3 inches o.c. or less.

<sup>e</sup>Space screws maximum 12 inches o.c. along intermediate framing members (6 inches o.c. where supports are spaced 48 inches o.c.).

<sup>f</sup>Framing at adjoining panel edges must be 3-inch nominal or wider, and screws must be staggered where screws are spaced 2 inches or 2 1/2 inches on center.



**TABLE 2—ALLOWABLE SHEAR (POUNDS PER FOOT) FOR WOOD STRUCTURAL PANEL BLOCKED DIAPHRAGMS UTILIZING MULTIPLE ROWS OF FASTENERS (HIGH LOAD DIAPHRAGMS) WITH FRAMING OF DOUGLAS FIR–LARCH OR SOUTHERN PINE<sup>a</sup> FOR WIND OR SEISMIC LOADING<sup>b,c,d</sup>**

PANEL GRADE <sup>e</sup>	MINIMUM SCREW PENETRATION IN FRAMING (inches)	MINIMUM NOMINAL PANEL THICKNESS (inches)	MINIMUM NOMINAL WIDTH OF FRAMING MEMBERS AT ADJOINING PANEL EDGES AND BOUNDARIES (inches) <sup>f</sup>	LINES OF FASTENERS	BLOCKED DIAPHRAGMS					
					Cases 1 and 2 <sup>g</sup>					
					Fastener Spacing Per Line at Boundaries (inches)					
					4		2 <sup>1</sup> / <sub>2</sub>			
					Fastener Spacing Per Line at Other Panel Edges (inches)					
6		4	4	3						
Structural I / OSB	1 <sup>1</sup> / <sub>4</sub>	15 <sup>1</sup> / <sub>32</sub>	3	2	605	815	875	1,150		
			4	2	700	915	1,005	1,290		
			4	3	875	1,220	1,285	1,395		
		19 <sup>1</sup> / <sub>32</sub>	3	2	670	880	965	1,255		
			4	2	780	990	1,110	1,440		
			4	3	965	1,320	1,405	1,790		
		23 <sup>1</sup> / <sub>32</sub>	3	2	730	955	1,050	1,365		
			4	2	855	1,070	1,210	1,565		
			4	3	1,050	1,430	1,525	1,800		
		Sheathing single floor and other grades covered in DOC PS1 and PS2	1 <sup>1</sup> / <sub>4</sub>	15 <sup>1</sup> / <sub>32</sub>	3	2	525	725	765	1,010
					4	2	605	815	875	1,105
					4	3	765	1,085	1,130	1,195
19 <sup>1</sup> / <sub>32</sub>	3			2	650	860	935	1,225		
	4			2	755	965	1,080	1,370		
	4			3	935	1,290	1,365	1,485		
23 <sup>1</sup> / <sub>32</sub>	3			2	710	935	1,020	1,335		
	4			2	825	1,050	1,175	1,445		
	4			3	1,020	1,400	1,480	1,565		

For **SI**: 1 inch = 25.4 mm, 1 pound per foot = 14.6 N/m.

<sup>a</sup>For framing of other species: (1) Find specific gravity for species of lumber in 2005 AF&PA National Design Specification (NDS). (2) Find shear value from table above for actual grade and multiply value by the following adjustment factor: Specific Gravity Adjustment Factor = [1 - (0.5-SG)], where SG = Specific Gravity of the framing lumber. This adjustment factor must not be greater than 1.

<sup>b</sup>For shear loads of normal or permanent load duration as defined by the NDS, the values in the table above must be multiplied by 0.63 or 0.56, respectively.

<sup>c</sup>High load diaphragms must be subject to special inspection in accordance with IBC Section 1704.6.1.

<sup>d</sup>Fastening along intermediate framing members: Space screws maximum 12 inches o.c., except 6 inches o.c. for spans greater than 32 inches.

<sup>e</sup>Panels conforming to PS 1 or PS 2.

<sup>f</sup>The minimum nominal depth of framing members must be 3 inches. The minimum nominal depth width of framing members not located at boundaries or adjoining panel edges must be 2 inches.

<sup>g</sup>This table gives shear values for Cases 1 and 2 as shown in Table 1. The values shown are applicable to Cases 3, 4, 5, and 6 as shown in Table 1, providing fasteners at all continuous panel edges are spaced in accordance with the boundary fastener spacing.

**TABLE 3—ALLOWABLE SHEAR (POUNDS PER FOOT) FOR WOOD STRUCTURAL PANEL SHEAR WALLS WITH FRAMING OF DOUGLAS FIR–LARCH OR SOUTHERN PINE<sup>a</sup> FOR WIND OR SEISMIC LOADING<sup>b, c, d</sup>**

PANEL GRADE	MINIMUM NOMINAL PANEL THICKNESS (inch)	MINIMUM SCREW PENETRATION INTO FRAMING (inches)	PANELS APPLIED DIRECTLY TO FRAMING			
			Screw Spacing at Panel Edges (inches)			
			6	4	3	2 <sup>g</sup>
Structural I/OSB Sheathing	3/8	1 1/4	230	360	460	610
	7/16		255	395	505	670
	15/32		340	510	665 <sup>g</sup>	870
Sheathing, Plywood Siding <sup>e</sup> Except Group 5 Species	3/8	1 1/4	220	320	410	530
	7/16		240	350	450	585
	15/32		310	460	600 <sup>g</sup>	770
	19/32		340	510	665 <sup>g</sup>	870

For **SI**: 1 Inch = 25.4 mm, 1 pound/foot = 0.146 N/mm.

<sup>a</sup>For framing of other species: (1) Find specific gravity for species of lumber in 2005 AF&PA National Design Specification (NDS). (2) Find shear value from table above for actual grade and multiply value by the following adjustment factor: Specific Gravity Adjustment Factor = [1-(0.5-SG)], where SG = Specific Gravity of the framing lumber. This adjustment factor must not be greater than 1.

<sup>b</sup>For shear loads of normal or permanent load duration as defined by the NDS, the values in the table above must be multiplied by 0.63 or 0.56, respectively.

<sup>c</sup>Panel edges backed with 2 inch nominal or wider framing. Install panels are either horizontally or vertically. Space screws maximum 12 inches o.c. along intermediate supports.

<sup>d</sup>Where panels are applied on both faces of a wall and screw spacing is less than 6 inches o.c. on either side, panel joints must be offset to fall on different framing members, or framing must be 3 inch nominal or thicker at adjoining panel edges and screws on each side must be staggered.

<sup>e</sup>Values apply to all-veneer plywood. Thickness at point of fastening on panel edges govern shear values.

<sup>f</sup>Framing at adjoining panel edges must be 3 inches nominal or wider, and screws must be staggered where both of the following conditions are met: (1) screws having penetration into framing of more than 1 1/2 inches and (2) screws are spaced 3 inches o.c.

<sup>g</sup>Framing at adjoining panel edges must be 3-inch nominal or wider, and screws must be staggered where screws are spaced 2 inches or 2 inches on center.

<sup>h</sup>Use of screws as shear wall sheathing fasteners must be permitted only for wind and seismic design in Seismic Design Categories A, B, and C where R = 1.5 and Ω<sub>0</sub> = 2.5.

**TABLE 4—IBC EQUIVALENT PRESCRIPTIVE FASTENING SCHEDULE**

IBC TABLE 2304.9.1 CONNECTION	FASTENING	LOCATION
3. 1" X 6" subfloor or less to each joist	2 screws	face
4. Wider than 1" x 6" subfloor to each joist	3 screws	face
20. 1" diagonal brace to each stud and plate	2 screws	face
21. 1" x 8" sheathing to each bearing	3 screws	face
22. Wider than 1" x 8" sheathing to each bearing	3 screws	face

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

**TABLE 5—IBC EQUIVALENT PRESCRIPTIVE FASTENING SCHEDULE FOR DIAGONALLY SHEATHED LUMBER DIAPHRAGMS**

SHEATHING NOMINAL DIMENSION	FASTENING TO INTERMEDIATE AND END-BEARING STUDS	NAILING AT THE SHEAR PANEL BOUNDARIES
	NUMBER OF FASTENERS PER BOARD	
1" X 6"	2	3
1" X 8"	3	4

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

**TABLE 6—IRC EQUIVALENT PRESCRIPTIVE FASTENING SCHEDULE**

IRC TABLE R602.3(1) BUILDING ELEMENTS		FASTENING DESCRIPTION	
1" X 6" subfloor or less to each joist, face		2 screws	
1" brace to each stud and plate, face		2 screws	
1" x 6" sheathing to each bearing, face		2 screws	
1" x 8" sheathing to each bearing, face		2 screws	
Wider than 1" x 8" sheathing to each bearing, face		3 screws	
Description of Building Materials	Description of Fastener <sup>a</sup>	Spacing of Fasteners	
		Edges (inches)	Intermediate supports (inches)
<b>Wood structural panels, subfloor, roof and wall sheathing to framing</b>			
$\frac{5}{16}$ " - $\frac{1}{2}$ "	1 screw (all lengths)	6	12
$\frac{19}{32}$ " - 1"	1 screw (all lengths)	6	12
1 $\frac{1}{8}$ "	1 screw (min. 2 $\frac{1}{2}$ " length)	6	12
<b>Wood structural panels, combination subfloor underlayment to framing</b>			
$\frac{3}{4}$ " and less	1 screw (all lengths)	6	12
$\frac{7}{8}$ " - 1"	1 screw (all lengths)	6	12
1 $\frac{1}{8}$ "	1 screw (min. 2 $\frac{1}{2}$ " length)	6	12

For **SI**: 1 inch = 25.4 mm; 1 mile per hour = 0.447m/s.

<sup>a</sup>Screws shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater.

<sup>b</sup>For regions having basic wind speed of 100 mph or less, screws for attaching wood structural panel roof sheathing to gable end wall framing shall be spaced 6 inches on center. When basic wind speed is greater than 100 mph, screws for attaching panel roof sheathing to intermediate supports shall be spaced 6 inches on center for minimum 48-inch distance from ridges, eaves and gable end walls; and 4 inches on center to gable end wall framing.

<sup>c</sup>Spacing of fasteners on floor sheathing panel edges applies to panel edges supported by framing members and required blocking and at all floor perimeters only. Spacing of fasteners on roof sheathing panel edges applies to panel edges supported by framing members and required blocking. Blocking of roof or floor sheathing panel edges perpendicular to the framing members need not be provided except as required by other provisions of the code. Floor perimeter shall be supported by framing members or solid blocking.