ICC-ES Evaluation Report

ESR-4549

Reissued June 2025

This report also contains:

- CA Supplement

Subject to renewal June 2027

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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES Section: 06 05 23—Wood, Plastic and Composite Fastenings	REPORT HOLDER: SCHMID SCHRAUBEN HAINFELD GMBH	EVALUATION SUBJECT: RAPID® WOOD DRILLING SCREWS	

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2024, 2021, 2018 and 2015 *International Building Code*® (IBC)
- 2024, 2021, 2018 and 2015 *International Residential Code*® (IRC)

Property evaluated:

- Structural

2.0 USES

Rapid® Wood-drilling Screws are dowel-type threaded fasteners used in engineered wood-to-wood and steel-to-wood connections. For structures regulated under the IRC, the screws may be used where an engineered design is submitted in accordance with IRC Section R301.1.3.

3.0 DESCRIPTION

3.1 Notation and Symbols:

a	=	Connection geometry parameter
D	=	Outside thread diameter
D_H	=	Diameter of screw head or integral washer
D_{nom}	=	Screw size designation
D_r	=	Minor thread (root) diameter
D_s	=	Unthreaded shank diameter
$F_{yb,spec}$	=	Minimum specified bending yield strength, determined in accordance with ASTM F1575 using D_r.
L	=	Overall screw length

$L_{eff,m}$	=	Effective embedded thread length in the wood main member (See Section 4.1.6.)
$L_{eff,s}$	=	Effective embedded thread length in the wood side member (See Section 4.1.6.)
$L_{emb,l}$	=	Minimum required embedded thread length in holding member, including tip, applicable to tabulated lateral design values
$L_{emb,w}$	=	Minimum required embedded thread length in holding member, including tip, applicable to tabulated withdrawal design values
L_{thread}	=	Length of thread
L_{tip}	=	Length of tip
L_{un}	=	Length of unthreaded portion of the screw, measured from the head of the screw to the start of the threads
R_{α}	=	Reduction factor for withdrawal resistance of inclined fasteners
SG_{eq}	=	Equivalent specific gravity for structural composite lumber, as reported by ICC-ES
SG_{NDS}	=	Assigned specific gravity for the applicable species combination (See Section 3.3.)
$t_{s,s}$	=	Thickness of steel side member
$t_{s,w}$	=	Thickness of wood side member
W	=	Reference unit withdrawal design value for screws installed perpendicular to face of the wood
W_H	=	Reference head pull-through design value
Z	=	Reference lateral design value
α	=	Angle between the axis of the screw and the grain of the applicable wood member, degrees

3.2 Screws - General:

RAPID® screws are manufactured from carbon steel material which is specified in the manufacturer's quality documentation. The screw shape is formed from the carbon steel wire, and then the screws are heat-treated and galvanized. Several head styles are available, each with a star drive recess.

3.2.1 Partially-threaded Screws: RAPID® partially threaded screws all have a sharp self-tapping tip, a reamer knurl and detailing toward the tip of the screw referred to as a "compressor". The reamer knurl can have a spiral pattern or knurls which are parallel to the axis of the screw, as shown in Figure 1. Two styles of compressor are available as shown in Figure 3. Screw sizes $^1/_4$, $^5/_{16}$ and $^3/_8$ inch (6, 8 and 10 mm) have a "HiLo" thread design, while $^1/_2$ inch (12 mm) screws have a single thread, as shown in Figure 2. Four head styles are available, as shown in Table 1. See Table 1 for dimensions.

3.2.2 Fully-threaded Screws: RAPID® fully threaded screws are self-tapping and have a single thread. Two tip styles and two compressor designs are available, as shown in Figure 3. Three head styles are available, as shown in Table 2. See Table 2 for dimensions.

3.3 Wood Material:

Wood members may be sawn lumber, structural glued laminated timber (glulam) or laminated veneer lumber (LVL). Screws may also be used in the face of cross-laminated timber (CLT) panels. Use of the screws in engineered wood products (EWP) other than those addressed above is outside the scope of this report.

For purposes of connection design, sawn lumber, glulam and CLT members must have , SG_{NDS}, as indicated in the tables in this report and the moisture content of the lumber must be less than or equal to 19 percent at the time of screw installation and while in service. SG_{NDS} for sawn lumber is the assigned specific gravity for the applicable grade mark, which must be determined in accordance with Table 12.3.3A of the ANSI/AWC National Design Specification for Wood Construction® (NDS) or the latest NDS Supplement. SG_{NDS} for glulam members is the Specific Gravity for Fastener Design addressed in Tables 5A through 5D of the NDS Supplement. When designing connections with screws installed into CLT panels, all of the laminations must have a minimum SG_{NDS} as indicated in the tables in this report.

For the purposes of connection design, the LVL must be Versa-Lam® LVL addressed in ESR-1040, and must have SG_{eq} shown in the tables in this report. The moisture content of the LVL must be in accordance with ESR-1040.

For lateral wood-to-wood connections addressed in Table 7, the tabulated side member thickness is an absolute value (not a minimum or maximum value). The thickness of the wood main member must be sufficient to ensure that the tip of the screw is fully embedded in the wood. The minimum thickness of both wood main members and wood side members must also be as follows: $^{15}/_{16}$ inch (24 mm) for $^1/_4$-inch-diameter (6 mm)

screws; $1^3/_{16}$ inches (30 mm) for $^5/_{16}$-inch-diameter (8 mm) screws; $1^9/_{16}$ inches (40 mm) for $^3/_8$-inch-diameter (10 mm) screws; and $3^3/_{16}$ inches (80 mm) for $^1/_2$-inch-diameter (12 mm) screws.

3.4 Steel Members:

Steel side plates must be designed in accordance with AISI S100 or AISC 360, as applicable. Steel side members must have a minimum tensile strength, F_u, equal to 52 ksi (360 MPa) and a minimum design thickness (base-metal thickness exclusive of any coating) of 0.236 inch (6 mm). The holes in the steel side member must be predrilled or otherwise formed prior to screw installation. The holes must be just large enough to accommodate the outside thread dimension, *D*, of the screw or the shoulder diameter of the Super Senk Fix screws, as applicable. Holes for countersunk head screws must be chamfered to receive the screw head.

4.0 DESIGN AND INSTALLATION

4.1 Design:

The design values in this report are intended to aid the registered design professional in meeting the requirements of IBC Section 1604.2. For connections not completely described in this report, determination of the suitability of the screws for the specific application is the responsibility of the registered design professional and is outside the scope of this report. The registered design professional is responsible for determining the available strengths for the connection, considering all applicable limit states, and for considering serviceability issues. The designer is responsible for determining the required spacing, edge distance and end distance for the screws, based on the characteristics of the connected building materials.

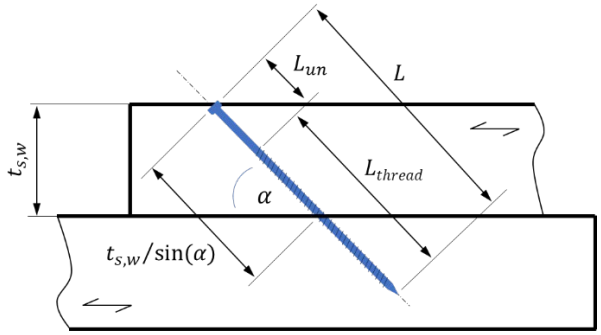
4.1.1 Screw Strength: Available screw tension strengths and minimum specified bending yield strengths for the screws are shown in Table 3.

4.1.2 Adjustments to Reference Design Values: The reference design values must be adjusted in accordance with the NDS provisions for dowel-type fasteners to determine allowable strengths for use with ASD and the design strengths for use with LRFD.

4.1.3 Connections with Multiple Screws: See Sections 11.1.2, 11.2.2 and 12.6 of the NDS regarding multiple fastener connections and consideration of local stresses in the wood members.

4.1.4 Combined Loading: Where the fasteners are subjected to combined lateral and withdrawal loads, connections shall be designed in accordance with Section 12.4.1 of the NDS, as applicable.

4.1.5 Effective Embedded Thread Length: The effective embedded thread length is the length of fastener thread in a wood member that is completely surrounded by the wood. For example, for a wood-to-wood connection the effective lengths in the side and main members are determined as follows:



$$L_{eff,s} = \left(t_{s,w}/sin_\alpha\right) - L_{un} \quad \text{(Eq. 4.1.6-1)}$$

$$L_{eff,m} = \left(L - \left(t_{s,w}/sin_\alpha\right) - L_{tip}\right) \leq L_{thread} \quad \text{(Eq. 4.1.6-2)}$$

4.1.6 Reference Withdrawal Design Values: Reference withdrawal (*W*) design values in pounds per inch of thread penetration, for screws installed perpendicular to the face of the wood member are shown in Table 4. For inclined fastening with a minimum embedment of 6D, measured along the axis of the screw, and the applicable reduction factor from the following table must be applied:

α	R_α
90	1.00
85	1.00
80	0.99
75	0.99
70	0.98
65	0.97
60	0.95
55	0.94
50	0.92
45	0.91
40	0.89
35	0.84
30	0.77

4.1.7 Reference Pull-through Design Values: Reference head pull-through values (W_H) for partially threaded screws are shown in Table 5 for installation with 90° ≥ α ≥ 30°. Lesser angles of installation are outside the scope of this report. For fully threaded screws, the reference pull-through design value is the reference withdrawal design value in the side member determined in accordance with Sections 4.1.5 and 4.1.6.

4.1.8 Lateral Design Values Based on Testing: Reference lateral design values for two-member steel-to-wood connections based on testing with screws installed perpendicular to the wood grain are shown in Table 6. Reference lateral design values for two-member wood-to-wood connections based on testing with screws installed perpendicular to the wood grain are shown in Table 7.

4.1.9 Lateral Connections Designed in Accordance with the NDS: The reference lateral design strength for connections of two or more wood members using the Rapid screws may be designed in accordance with the NDS, subject to the following conditions:

1. $F_{yb,spec}$ from Table 3 must be used for design.
2. D_r must be used where 'D' is referenced in Tables 12.3.1A, 12.3.1B and 12.3.3 of the NDS. For partially-threaded screws, when determining if Footnote 1 to Table 12.3.1B applies, D_s must be considered the nominal diameter.
3. Wood must have SG_{NDS} of 0.50 or less.
4. Wood side member thickness must be a minimum of 1.5 inches (38 mm).
5. Steel side member thickness must be a minimum of 0.236 inch (6 mm) and must have minimum yield and tension strengths of 34 and 52 psi (235 and 360 N/mm^2), respectively.
6. Fastener penetration into the main member must be a minimum of 6D.
7. Dowel bearing length is the fastener embedment minus the tip length, L_{tip}, shown in Tables 1 and 2, as applicable.
8. Spacing, edge and end distance must be in accordance with Table 8, and as needed to prevent splitting of the wood.

4.2 Installation:

RAPID® screws must be installed in accordance with the report holder's installation instructions and this report. The screws must be installed at the angle specified in the approved construction documents. Screws must be installed with the minimum spacing, end distances, and edge distances needed to prevent splitting of the wood or as noted in Table 8, whichever is more restrictive.

For Dual, SSF and WH partially threaded screws, the underside of the flat screw head must bear against the surface of the wood side member. For Dual partially threaded screws and T-Lift fully threaded screws, the underside of the screw head must bear against the surface of the steel plate. For CS partially threaded screws and CS and CYL fully threaded screws, the top of the screw head must be flush with the surface of the wood, or must be recessed into the wood accordance with the approved construction documents. For CS fully threaded screws used with steel plates, the screws must fully bear on steel plates with holes contoured to match the shape of the screw head, or on washers with contoured holes, used in conjunction with the steel plates.

The screws must be installed by turning with a power driver, not by driving with a hammer. Screws must not be overdriven. Installation may be performed without predrilling, but predrilled holes no more than $0.90D_r$ in diameter may be used to reduce the likelihood of splitting.

5.0 CONDITIONS OF USE:

The RAPID® 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 screws must be installed in accordance with the report holder's installation instructions and this report. In the case of a conflict between this report and the report holder's instructions, this report governs.

5.2 Design loads for the screws must not exceed the available strengths described in Section 4.1.

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

5.4 Connection design for lateral loading applications using inclined fasteners is outside the scope of this report.

5.5 Connection geometry for inclined fastening must be justified to the satisfaction of the code official, including the minimum required wood thickness between crossing fasteners.

5.6 The screws have only been evaluated for use in dry service applications. Use in wet service conditions is outside the scope of this report.

5.7 Use of the screws in locations exposed to saltwater or saltwater spray is outside the scope of this evaluation report.

5.8 Use of the screws in contact with preservative-treated or fire-retardant-treated wood is outside the scope of this report.

5.9 The screws are manufactured under a quality control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Dowel-type Threaded Fasteners Used in Wood (AC233), dated June 2023 (editorially revised June 2024).

7.0 IDENTIFICATION

7.1 The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-4549) along with the name, registered trademark, or registered logo of the report holder must be included on the package labeling.

7.2 In addition, the package labeling must include the product name (RAPID®), the screw head style and thread condition (if fully threaded), the screw size and length in both imperial and metric units and the required bit size. Where possible, each screw head is marked with "RAPID" and numbers denoting the screw length in millimeters.

7.3 The report holder's contact information is the following:

SCHMID SCHRAUBEN HAINFELD GMBH
LANDSTAL 10
HAINFELD 3170
AUSTRIA
+43 2764 26520
www.schmid-screw.com

Technical Support:
F3 Timber Technologies
+1 604-330-0993
form.fit.function@f3timbertech.com
https://f3timbertech.com

TABLE 1—RAPID® PARTIALLY THREADED SCREW SPECIFICATIONS

D_{nom} [inch (mm)]	HEAD STYLE	D_H [inch (DRIVE SIZE)]	D_s (inch)	D_r (inch)	D (inch)	L^1 (inches)	L_{thread}^2 (inches)	L_{tip} (inch)
1/4 (6)	SuperSenkFix (SSF) 	0.512 (T-30) (max. shoulder dia. = 0.331)	0.169	0.157	0.236	2*	1 3/16	0.287
						2 3/8*, 2 3/4	1 1/2	
						3 1/8, 3 1/2	2	
						4	2 3/8	
						4 3/4 to 7 7/8	2 3/4	
5/16 (8)		0.748 (T-40) (max. shoulder dia. = 0.413)	0.232	0.210	0.315	3 1/8	2	0.323
						4	2 3/8	
						4 3/4 to 6 1/4	3 1/8	
						7 1/8 to 23 5/8	4	
3/8 (10)		0.945 (T-50) (max. shoulder dia. = 0.537)	0.280	0.244	0.394	3 1/8	2	0.398
						4	2 3/8	
						4 3/4 to 6 1/4	3 1/8	
						7 1/8 to 23 5/8	4	
1/4 (6)	Countersunk (CS) 	0.472 (T-30)	0.169	0.157	0.236	2	1 3/16	0.287
						2 3/8, 2 3/4	1 1/2	
						3 1/8, 3 1/2	2	
						4, 4 3/8	2 3/8	
						4 3/4 to 11 3/4	2 3/4	
5/16 (8)		0.591 (T-40)	0.232	0.210	0.315	2*	1 3/16	0.323
						2 3/8*, 2 3/4*	1 1/2	
						3 1/8, 3 1/2	2	
						4	2 3/8	
						4 3/4 to 6 1/4	3 1/8	
						7 1/8 to 23 5/8	4	
3/8 (10)	Countersunk (CS) 	0.728 (T-50)	0.280	0.244	0.394	3 1/8	2	0.398
						4	2 3/8	
						4 3/4 to 6 1/4	3 1/8	
						7 1/8 to 23 5/8	4	
1/2 (12)		0.827 (T-50)	0.323	0.268	0.472	4	2 3/8	0.441
						4 3/4 to 6 1/4	3 1/8	
						7 1/8 to 11	4	
						11 3/4 to 23 5/8	4 3/4	
1/4 (6)	Washer Head (WH) 	0.551 (T-30)	0.169	0.157	0.236	2*	1 3/16	0.287
						2 3/8*, 2 3/4	1 1/2	
						3 1/8, 3 1/2	2	
						4	2 3/8	
						4 3/4 to 11 3/4	2 3/4	
5/16 (8)		0.787 (T-40)	0.232	0.210	0.315	2*	1 3/16	0.323
						2 3/8*, 2 3/4*	1 1/2	
						3 1/8	2	
						4	2 3/8	
						4 3/4 to 6 1/4	3 1/8	
						7 1/8 to 23 5/8	4	
3/8 (10)		0.984 (T-50)	0.280	0.244	0.394	4	2 3/8	0.398
						4 3/4 to 6 1/4	3 1/8	
						7 1/8 to 23 5/8	4	

TABLE 1—RAPID® PARTIALLY THREADED SCREW SPECIFICATIONS (cont.)

D_{nom} [inch (mm)]	HEAD STYLE	D_H [inch (DRIVE SIZE)]	D_s (inch)	D_r (inch)	D (inch)	L^1 (inches)	L_{thread}^2 (inches)	L_{tip} (inch)
5/16 (8)	Dual 	0.472 Across flats (T-30)	0.232	0.210	0.315	2*	1 3/16	0.323
						2 3/8*, 2 3/4*	1 1/2	
						3 1/8	2	
						4	2 3/8	
						4 3/4 to 6 1/4	3 1/8	
						7 1/8 to 23 5/8	4	
3/8 (10)		0.591 Across flats (T-40)	0.280	0.244	0.394	2	1 3/16	0.398
						2 3/8, 2 3/4	1 1/2	
						3 1/8	2	
						4	2 3/8	
						4 3/4 to 6 1/4	3 1/8	
						7 1/8 to 23 5/8	4	
1/2 (12)		0.669 Across flats (T-40)	0.323	0.268	0.472	3 1/8	2	0.441
						4	2 3/8	
						4 3/4 to 6 1/4	3 1/8	
						7 1/8 to 11	4	
						11 3/4 to 23 5/8	4 3/4	

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

[1]Overall length for SSF and CS screws is measured from the top of the head to the tip. Overall length for the WH and Dual screws is measured from beneath the head to the tip. For lengths shown with an asterisk (*), the screws have no reamer knurl (friction part).

[2]Thread length includes the tip and compressor, but does not include the reamer knurl.

TABLE 2— RAPID® FULLY THREADED SCREW SPECIFICATIONS (in.)

D_{nom} [inch (mm)]	HEAD STYLE	D_H [inch (DRIVE SIZE)]	D_r (inch)	D (inch)	L^1 (inches)	L_{un} (inches)	L_{tip}^2 (inch)
5/16 (8)	Countersunk (CS) 	0.591 (T-40)	0.205	0.315	4 3/4 to 15 3/4	0.394	0.323 (0.433)
					17 3/4 to 39 3/8	0.906	
3/8 (10)		0.728 (T-50)	0.240	0.394	4 3/4 to 11 3/4	0.472	0.398 (0.512)
					12 3/4 to 39 3/8	0.945	
1/2 (12)		0.827 (T-50)	0.268	0.472	7 7/8 to 39 3/8	0.787	0.441 (0.591)
5/16 (8)	Cylinder (CYL) 	0.402 (T-40)	0.205	0.315	4 3/4 to 15 3/4	0.394	0.323 (0.433)
					17 3/4 to 39 3/8	0.906	
3/8 (10)		0.528 (T-50)	0.240	0.394	7 7/8 to 11 3/4	0.472	0.398 (0.512)
					12 3/4 to 39 3/8	0.945	
1/2 (12)	T-Lift 	0.669 (T-40)	0.268	0.472	2 3/8 to 3 7/8	0.472	0.441
					4 to 39 3/8	0.591	

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

[1]Overall length for CS and CYL screws is measured from the top of the head to the tip. Overall length for the T-Lift head screws is measured from beneath the head to the tip.

[2]The values in parentheses are for the half-tip design.

Spiral

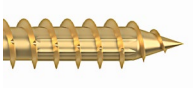
Straight

FIGURE 1—REAMER KNURLS (friction part)

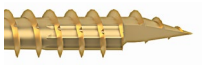
HiLo

Single

FIGURE 2—THREADS

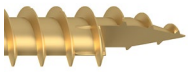


Standard Tip with Compressor Option 1



Half Tip with Compressor Option 1

Standard Tip with Compressor Option 2 (ridged core)



Half Tip with Compressor Option 2 (ridged core)

FIGURE 3—TIPS AND COMPRESSORS

TABLE 3—SCREW STEEL STRENGTHS

SCREW TYPE	D_{nom} [inch (mm)]	$F_{yb,spec}$[1] (psi)	ALLOWABLE SCREW TENSION STRENGTH (ASD) (lbf)	DESIGN SCREW TENSION STRENGTH (LRFD) (lbf)
Partially Threaded	1/4 (6)	208,700	1,270	1,900
	5/16 (8)	142,000	2,100	3,160
	3/8 (10)	174,300	3,540	5,310
	1/2 (12)	192,900	3,900	5,820
Fully threaded	5/16 (8)	209,300	1,920	2,890
	3/8 (10)	206,400	3,490	5,240
	1/2 (12)	193,300	3,880	5,820

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

[1]Bending yield strengths determined in accordance with ASTM F1575 using D_r.

TABLE 4—REFERENCE WITHDRAWAL DESIGN VALUES FOR INSTALLATION PERPENDICULAR TO THE FACE OF THE WOOD MEMBER (*W*)

D_{nom} [inch (mm)]	THREAD TYPE	$L_{emb,w}$, (inches)	REFERENCE WITHDRAWAL DESIGN VALUE, *W* (lbf/in) [1]		
			SG_{NDS} = 0.42	SG_{NDS} = 0.50	LVL, SG_{eq} = 0.50
Partially Threaded Screws					
1/4 (6)	HiLo	1.57	112	148	136
		2.75	125	159	167
5/16 (8)	HiLo	1.18	107	164	141
		3.98	162	198	199
3/8 (10)	HiLo	1.97	147	213	181
		3.98	180	249	212
1/2 (12)	Single	1.97	194	232	201
		4.72	219	296	249
Fully Threaded Screws					
5/16 (8)	Single	1.89	160	181	197
		5.67	176	–	202
3/8 (10)	Single	2.36	182	224	197
		7.09	214	–	233
1/2 (12)	Single	2.83	223	251	224
		6.61	–	–	250
		8.50	235	–	–

For **SI:** 1 inch = 25.4 mm, 1 lbf/in = 175N/m; 1 lbf = 4.45 N.

[1]The tabulated values must be multiplied by the embedded thread length, including the tip length, to determine the total reference withdrawal capacity.

TABLE 5—REFERENCE HEAD PULL THROUGH DESIGN VALUES

D_{nom} [inch (mm)]	HEAD STYLE	$t_{s,w}$ (inches)	REFERENCE HEAD PULL-THROUGH DESIGN VALUE, W_H (lbf)		
			SG_{NDS} = 0.42	SG_{NDS} = 0.50	LVL, SG_{eq} = 0.50
Partially Threaded Screws					
1/4 (6)	SSF	0.787	174	–	224
	CS		146	–	188
	WH		219	221	239
5/16 (8)	SSF	0.984	314	–	360
	CS		205	–	280
	WH		351	370	388
	Dual		175	–	254
3/8 (10)	SSF	1.38	522	–	576
	CS		287	–	416
	WH		557	696	601
	Dual		266	–	411
1/2 (12)	CS	1.50	301	–	426
	Dual		303	–	448
Fully Threaded Screws					
5/16 (8)	CS, CYL	Reference pull-through design values must be determined based on thread withdrawal as described in Section 4.1.7.			
3/8 (10)	CS, CYL				
1/2 (12)	CS, T-Lift				

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

TABLE 6—REFERENCE LATERAL DESIGN VALUES (*Z*) FOR TWO MEMBER STEEL-TO-WOOD CONNECTIONS BASED ON TESTING[1,2]

D_{nom} [inch (mm)]	HEAD STYLE		$t_{s,s}$ (inches)	$L_{emb,l}$ (inches)	REFERENCE LATERAL DESIGN VALUES (lbf)					
					SG_{NDS} = 0.42		SG_{NDS} = 0.50		LVL, SG_{eq} = 0.50	
					Parallel to Grain, $Z_{\parallel}$	Perp. to Grain, $Z_{\perp}$	Parallel to Grain, $Z_{\parallel}$	Perp. to Grain, $Z_{\perp}$	Parallel to Grain, $Z_{\parallel}$	Perp. to Grain, $Z_{\perp}$
Fully Threaded Screws										
5/16 (8)	CS		0.236	10.0	574	574	633	605	675	648
3/8 (10)	CS		0.236	7.64	627	722	–	–	–	–
1/2 (12)	CS		0.236	11.6	636	738	1,214	1,263	1,204	1,225
Partially Threaded Screws										
1/4 (6)	SSF		0.236	7.64	–	–	404	–	377	397
3/8 (10)	SSF		0.236	7.64	–	–	–	1,034	–	–
1/4 (6)	CS		0.236	7.64	–	–	433	–	418	–
1/2 (12)	CS		0.236	7.64	–	–	–	1,142	–	1,116
1/4 (6)	WH		0.236	6.85	–	–	433	–	–	–
3/8 (10)	WH		0.236	8.43	–	–	–	1,076	–	–
5/16 (8)	Dual		0.236	1.73	–	–	261	–	–	–
1/2 (12)	Dual		0.236	2.91	–	–	–	820	–	–

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

[1]Design values have been determined by testing of screws installed perpendicular to the grain of the wood member, and must be adjusted in accordance with the NDS.
[2]See Section 3.4 for steel side member requirements.

TABLE 7—REFERENCE LATERAL DESIGN VALUES (*Z*) FOR TWO MEMBER WOOD-TO-WOOD CONNECTIONS BASED ON TESTING[1,2,3]

D_{nom} [inch (mm)]	HEAD STYLE	$t_{s,w}$ (inches)	$L_{emb,l}$ (inches)	REFERENCE LATERAL DESIGN VALUES (lbf)	
				SG_{NDS} = 0.50	LVL, SG_{eq} = 0.50
Partially Threaded Screws					
1/4 (6)	SSF	4.72	3.15	245	245
1/2 (12)	CS	3.54	4.33	590	615

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

[1]Design values have been determined by testing of screws installed perpendicular to the grain of the wood member, and must be adjusted in accordance with the NDS.
[2]See Section 3.3 for wood member requirements.
[3]Tabulated values apply to parallel-to-grain or perpendicular-to-grain loading.

TABLE 8—CONNECTION GEOMETRY REQUIREMENTS BASED ON OUTSIDE THREAD DIAMETER, D[1,2,3,4]

CONDITION		MINIMUM DISTANCE OR SPACING		
		Self-drilled		Predrilled Hole[5]
		SG_{NDS} < 0.50	SG_{NDS} ≥ 0.50	
For D_{nom} of 1/4" (6 mm) and 5/16" (8 mm):				
End distance (see Figures 4 and 6)	Loading toward end, $a_{end,1}$	15D	20D	12D
	Loading perpendicular to grain or away from end, $a_{end,2}$	10D	15D	7D
	Axial loading, $a_{end,2}$	10D	10D	7D
	Inclined fastener, $a_{end,2}$			
Edge distance (see Figures 4 and 6)	Loading toward edge, $a_{edge,1}$	10D	12D	7D
	Loading parallel to grain or away from edge, $a_{edge,2}$	5D	7D	3D
	Axial Loading, $a_{edge,2}$	4D	4D	3D
	Inclined fastener, $a_{edge,CG}$			
Spacing between fasteners, parallel to grain (see Figures 5 and 6)	Loading parallel to grain, a_1	15D	15D	10D
	Loading perpendicular to grain, a_1	10D	10D	5D
	Axial loading, a_1	7D	7D	7D
	Inclined fastener, a_1			
Spacing between fasteners, perpendicular to grain (see Figures 5 and 6)	Lateral loading, a_2	5D	7D	4D
	Axial loading, a_2	4D	4D	3D
	Inclined fastener, a_2			
	Inclined fastener, crossed screws, $a_{2,cross}$	1.5D	1.5D	1.5D
For D_{nom} of 3/8" (10 mm) and 1/2" (12 mm) screws:				
End distance (see Figures 4 and 6)	Loading toward end, $a_{end,1}$	15D	20D	7D
	Loading perpendicular to grain or away from end, $a_{end,2}$	10D	15D	4D
	Axial loading, $a_{end,2}$	10D	10D	4D
	Inclined fastener, $a_{end,CG}$			
Edge distance (see Figures 4 and 6)	Loading toward edge, $a_{edge,1}$	10D	12D	4D
	Loading parallel to grain or away from edge, $a_{edge,2}$	5D	7D	3D
	Axial Loading, $a_{edge,2}$	4D	4D	3D
	Inclined fastener, $a_{edge,CG}$			
Spacing between fasteners, parallel to grain (see Figures 5 and 6)	Loading parallel to grain, a_1	15D	15D	5D
	Loading perpendicular to grain, a_1	10D	10D	5D
	Axial loading, a_1	7D	7D	5D
	Inclined fastener, a_1			
Spacing between fasteners, perpendicular to grain (see Figures 5 and 6)	Lateral loading, a_2	5D	7D	5D
	Axial loading, a_2	5D	5D	5D
	Inclined fastener, a_2			
	Inclined fastener, crossed screws, $a_{2,cross}$	1.5D	1.5D	1.5D

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

[1]End distances, edge distances and fastener spacing must be sufficient to prevent splitting of the wood, or as required by this table, whichever is the more restrictive.
[2]Wood member stresses must be checked in accordance with Section 11.1.2 and Appendix E of the NDS, and end distances, edge distances and fastener spacing may need to be increased accordingly.
[3]Tabulated values are applicable for wood-to-wood and metal-to-wood connections.
[4]For CLT products, parallel and perpendicular-to-grain descriptions apply to the grain orientation at the shear plane for lateral loading and to the face grain orientation for withdrawal loading.
[5]Tabulated geometry is applicable to fasteners installed in predrilled holes that meet the following requirements:

- For installation in Douglas Fir and other species of similar or greater density, the hole must have a diameter between $0.60D_s$ and $0.75D_s$.
- For installation in SPF and other species of similar density, the hole must have a diameter between $0.40D_s$ and $0.70D_s$.
- The hole diameter must not exceed $0.9D_r$.

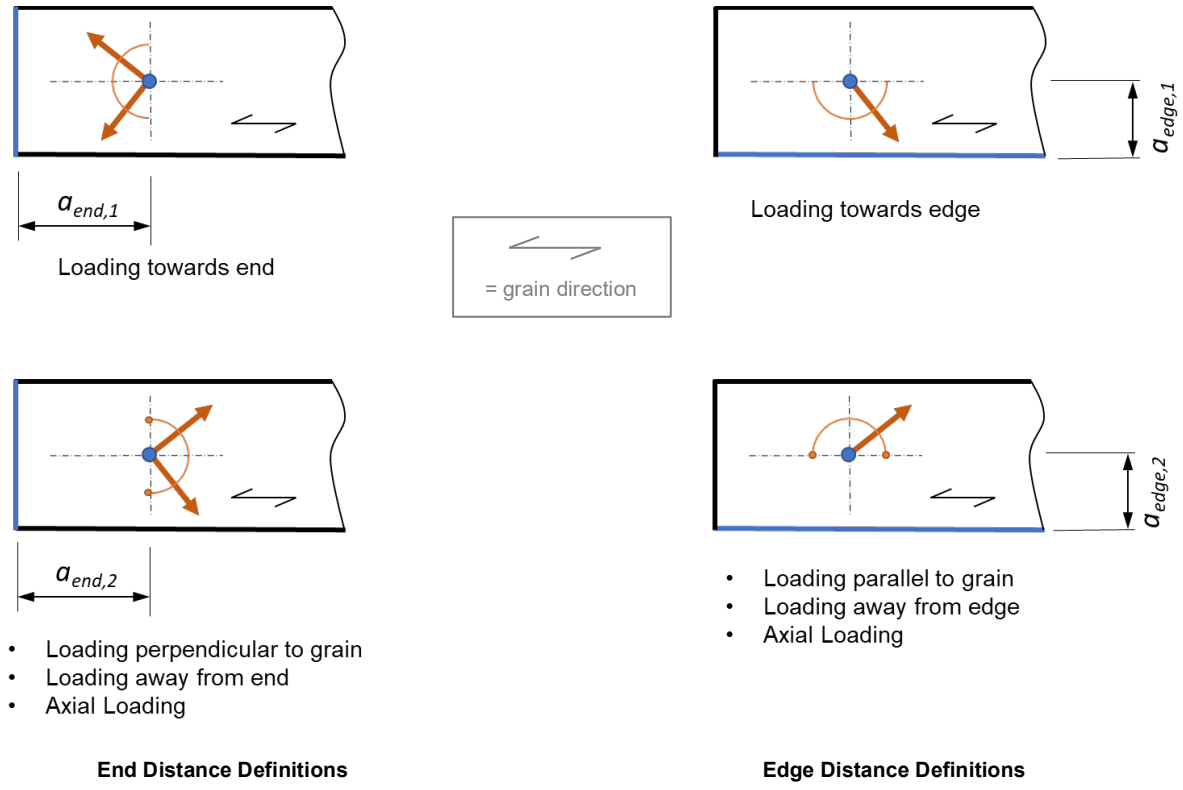


FIGURE 4—END AND EDGE DISTANCE DEFINITIONS FOR SCREWS INSTALLED PERPENDICULAR TO GRAIN

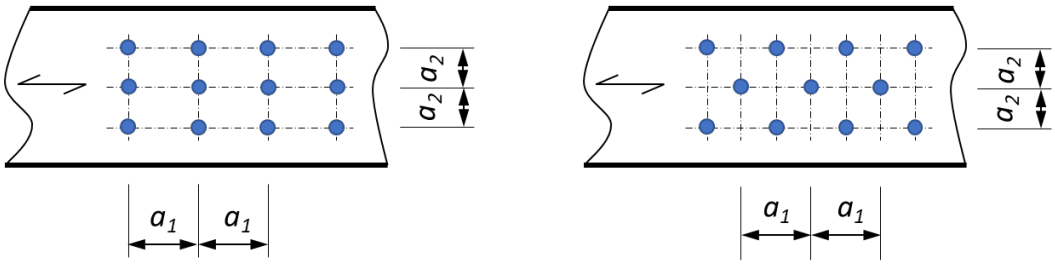


FIGURE 5—SPACING DEFINITIONS FOR SCREWS INSTALLED PERPENDICULAR TO GRAIN

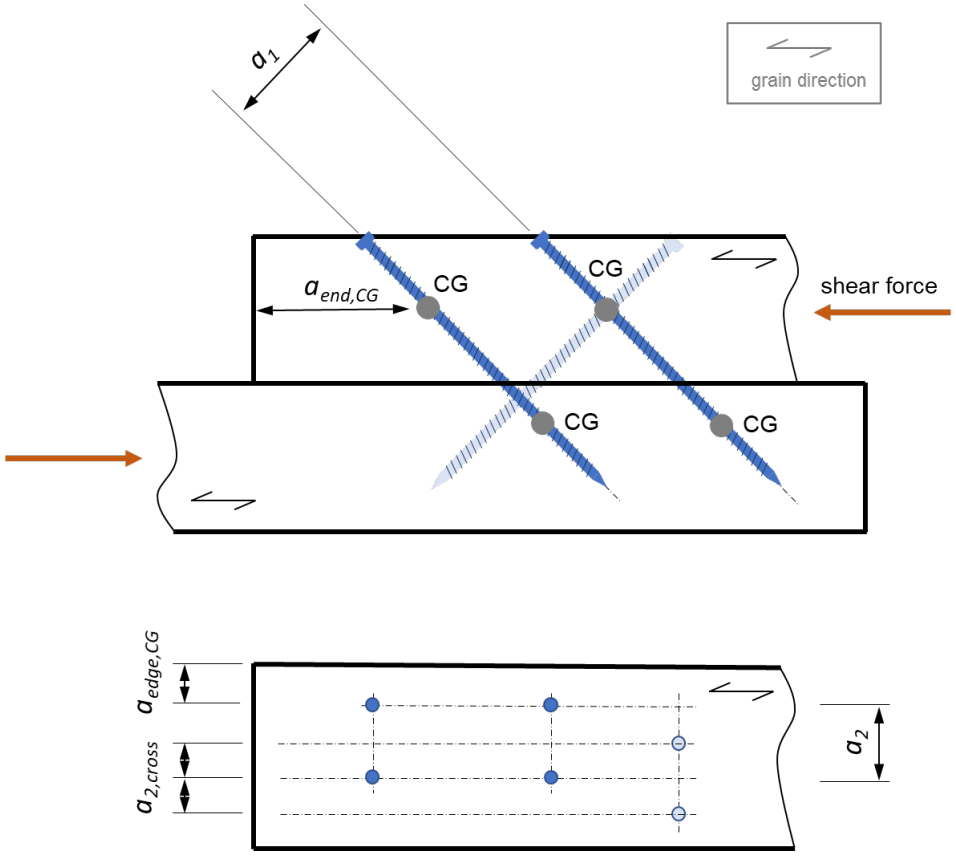


FIGURE 6—SPACING DEFINITIONS FOR INCLINED AND CROSSED SCREWS

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

REPORT HOLDER:

SCHMID SCHRAUBEN HAINFELD GMBH

EVALUATION SUBJECT:

RAPID® WOOD DRILLING SCREWS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Rapid® Wood Drilling Screws, described in ICC-ES evaluation report ESR-4549, have also been evaluated for compliance with the codes noted below.

Applicable code edition*(s)*:

- *2022 California Building Code* (CBC)

For evaluation of applicable Chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) AKA: California Department of Health Care Access and Information (HCAI) and the Division of State Architect (DSA), see Sections 2.1.1 and 2.1.2 below.

- *2022 California Residential Code* (CRC)

2.0 CONCLUSIONS

2.1 CBC:

The Rapid® Wood Drilling Screws, described in Sections 2.0 through 7.0 of the evaluation report ESR-4549, comply with CBC Chapter 23, provided the design and installation are in accordance with the 2021 *International Building Code®* (IBC) provisions noted in the evaluation report and the additional requirements of CBC Chapters 16 and 17, as applicable.

2.1.1 OSHPD:

The applicable OSHPD Sections and Chapters of the CBC are beyond the scope of this supplement.

2.1.2 DSA:

The applicable DSA Sections and Chapters of the CBC are beyond the scope of this supplement.

2.2 CRC:

The Rapid® Wood Drilling Screws, described in Sections 2.0 through 7.0 of the evaluation report ESR-4549, comply with CRC Chapter 3, provided the design and installation are in accordance with the 2021 *International Residential Code®* (IRC) provisions noted in the evaluation report and the additional requirements of CRC Chapter 3, as applicable.

This supplement expires concurrently with the evaluation report, reissued June 2025.