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ICC-ES Evaluation Report
ESR-4549

Issued June 2023

This report is subject to renewal June 2024.

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:

- 2021, 2018, 2015 and 2012 *International Building Code®* (IBC)
- 2021, 2018, 2015 and 2012 *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}	=	Bending yield strength
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.)
$L_{emb,w}$	=	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_{NDS}	=	Assigned specific gravity for the applicable species combination, in accordance with Table 12.3.3A of the NDS
$t_{s,w}$	=	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:

For purposes of connection design, sawn lumber members must have an assigned specific gravity as indicated in the tables in this report. Assigned specific gravity for sawn lumber must be determined in accordance with Table 12.3.3A of the ANSI/AWC National Design Specification for Wood Construction® (NDS). Sawn lumber members must have a moisture content of 19 percent or less.

For the purposes of connection design, structural glued laminated timber (GL) must have a Specific Gravity for Fastener Design (addressed in Tables 5A through 5D of the NDS Supplement), as indicated in the tables in this report. GL must have a moisture content of less than 16 percent.

When designing connections with screws installed into the face of cross-laminated timber (CLT) panels fabricated with sawn lumber laminations, all of the laminations must have a minimum assigned specific gravity in accordance with the NDS as indicated in the tables in this report. Moisture content must be less than 16 percent.

Use of the screws in engineered wood products (EWP) other than those addressed above is outside the scope of this report.

The thickness of the wood main member, t_m, must be adequate to fully encapsulate the screw in the wood.

3.4 Steel Members:

Steel side members must have a minimum tensile strength, F_u, equal to 58 ksi (360 MPa) and design thickness (base-metal thickness exclusive of any coating) ranging from 0.236 to 0.5 inch (6 to 12.5 mm). The hole in the steel side member for the fully threaded screw with countersunk head must be predrilled or prepunched and must have a standard round hole no greater than 0.5 inch (13 mm) in diameter, chamfered to receive the countersunk 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.

4.1.1 Screw Strength: Available screw tension strengths and bending yield strengths are shown in Table 3.

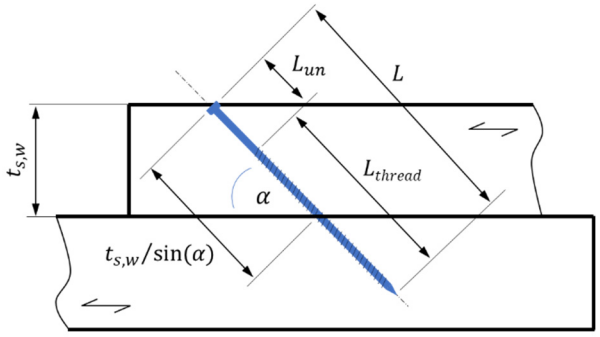
4.1.2 Adjustments to Reference Design Values: The reference design values must be adjusted in accordance with the requirements for dowel-type fasteners in Section 11.3 of the NDS (Section 10.3 of the NDS for the 2012 IBC), to determine allowable loads for use with ASD or design loads for use with LRFD. The reference design values must also be adjusted in accordance with Section 12.5 of the NDS (Section 11.5 of the NDS for the 2012 IBC), as applicable. When the capacity of a connection is controlled by the fastener strength, the allowable connection strength must not be increased by the adjustment factors specified in the NDS.

4.1.3 Design of Metal Parts: Design of connections using metal side plates must comply with Section 11.2.3 of the NDS (Section 10.2.3 of the NDS for the 2012 IBC).

4.1.4 Capacity Requirements for Wood Members: When designing a connection, the structural members must be checked for load-carrying capacity in accordance with Section 11.1.2 of the NDS (Section 10.1.2 of the NDS for the 2012 IBC), 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.

4.1.5 Connections with Multiple Screws: Connections made with multiple screws must be designed in accordance with Sections 11.2.2 and 12.6 of the NDS (Sections 10.2.2 and 11.6 of the NDS for the 2012 IBC) and the requirements in Table 7 of this report.

4.1.6 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:



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

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

4.1.7 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

4.1.8 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 4.1.6 and 4.1.7.

4.1.9 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.

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 7, 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. The screws must be driven into the wood members without pre-drilling or after pre-drilling in accordance with the manufacturer's recommendations.

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

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

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

5.7 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 February 2022.

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.schrauben.at

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)	0.169	0.157	0.236	3 1/8	2	0.287
						4	2 3/8	
						4 3/4 to 7 7/8	2 3/4	
5/16 (8)		0.748 (T-40)	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)	0.280	0.244	0.394	4 3/4 to 6 1/4	3 1/8	0.398
						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	3 1/8, 3 1/2	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)	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 3/8	1 1/2	0.287
						3 1/8	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	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)		0.984 (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.

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

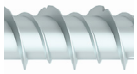
TABLE 2— RAPID® FULLY THREADED SCREW SPECIFICATIONS (in.)

D_{nom} [inch (mm)]	HEAD STYLE	D_H [inch (DRIVE SIZE)]	D_r (inch)	D (inch)	L^1 (inches)	L_{un} (inches)	L_{tip} (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
					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
					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
5/16 (8)	Cylinder (CYL) 	0.402 (T-40)	0.205	0.315	4 3/4 to 15 3/4	0.394	0.323
					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
					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 3/4 to 39 3/8	0.591	

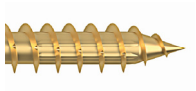
For **SI:** 1 inch = 25.4 mm.

[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.

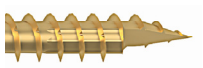
Spiral



HiLo



Standard Tip with Compressor Option 1

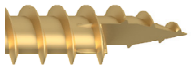


Half Tip with Compressor Option 1

Straight

Single

Standard Tip with Compressor Option 2



Half Tip with Compressor Option 2

FIGURE 1—REAMER KNURLS

FIGURE 2—THREADS

FIGURE 3—TIPS AND COMPRESSORS

TABLE 3—SCREW STEEL STRENGTHS

SCREW TYPE	D_{nom} [inch (mm)]	$F_{yb,test}$[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 from testing 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*)

RAPID® SCREW SIZE [inch (mm)]	THREAD TYPE	$L_{emb,w}$, (inches)	REFERENCE WITHDRAWAL DESIGN VALUE, *W* (lbf/in)
			SG_{NDS} = 0.42
Partially Threaded Screws			
1/4 (6)	HiLo	1.57	112
		2.75	125
5/16 (8)	HiLo	1.18	107
		3.98	162
3/8 (10)	HiLo	1.97	147
		3.98	180
1/2 (12)	Single	1.97	194
		4.72	219
Fully Threaded Screws			
5/16 (8)	Single	1.89	160
		5.67	176
3/8 (10)	Single	2.36	182
		7.09	214
1/2 (12)	Single	2.83	223
		8.50	235

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

TABLE 5—REFERENCE HEAD PULL THROUGH DESIGN VALUES

RAPID® SCREW SIZE [inch (mm)]	HEAD STYLE	$t_{s,w}$ (inches)	REFERENCE HEAD PULL-THROUGH DESIGN VALUE, W_H (lbf)
			SG_{NDS} = 0.42
Partially Threaded Screws			
1/4 (6)	SSF	0.787	174
	CS		146
	WH		219
5/16 (8)	SSF	0.984	314
	CS		205
	WH		351
	Dual		175
3/8 (10)	SSF	1.38	522
	CS		287
	WH		557
	Dual		266
1/2 (12)	CS	1.50	301
	Dual		303
Fully Threaded Screws			
5/16 (8)	CS, CYL	Reference pull-through design values must be determined based on thread withdrawal as described in Section 4.1.8.	
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]

RAPID® SCREW SIZE [inch (mm)]	HEAD STYLE	MINIMUM OVERALL LENGTH, *L* (inches)	SIDE MEMBER THICKNESS l_s (inches)	MINIMUM PENETRATION IN MAIN MEMBER (inches)	Z^2 (lbf)	
					SG_{NDS} = 0.42	
					Parallel to Grain, $Z_{\parallel}$	Perp. to Grain, $Z_{\perp}$
Fully Threaded Screws						
$^5/_{16}$ (8)	CS	$10^1/_4$	0.236	10	574	574
$^1/_2$ (12)	CS	$11^7/_8$	0.236	$11^1/_2$	636	738

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. See Section 3.4 for steel side member requirements.

TABLE 7—CONNECTION GEOMETRY REQUIREMENTS BASED ON OUTSIDE THREAD DIAMETER, D[1,2,3]

CONDITION		MINIMUM DISTANCE OR SPACING		
		Self-drilled		Predrilled Hole
		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	5D	7D	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	5D	7D	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.

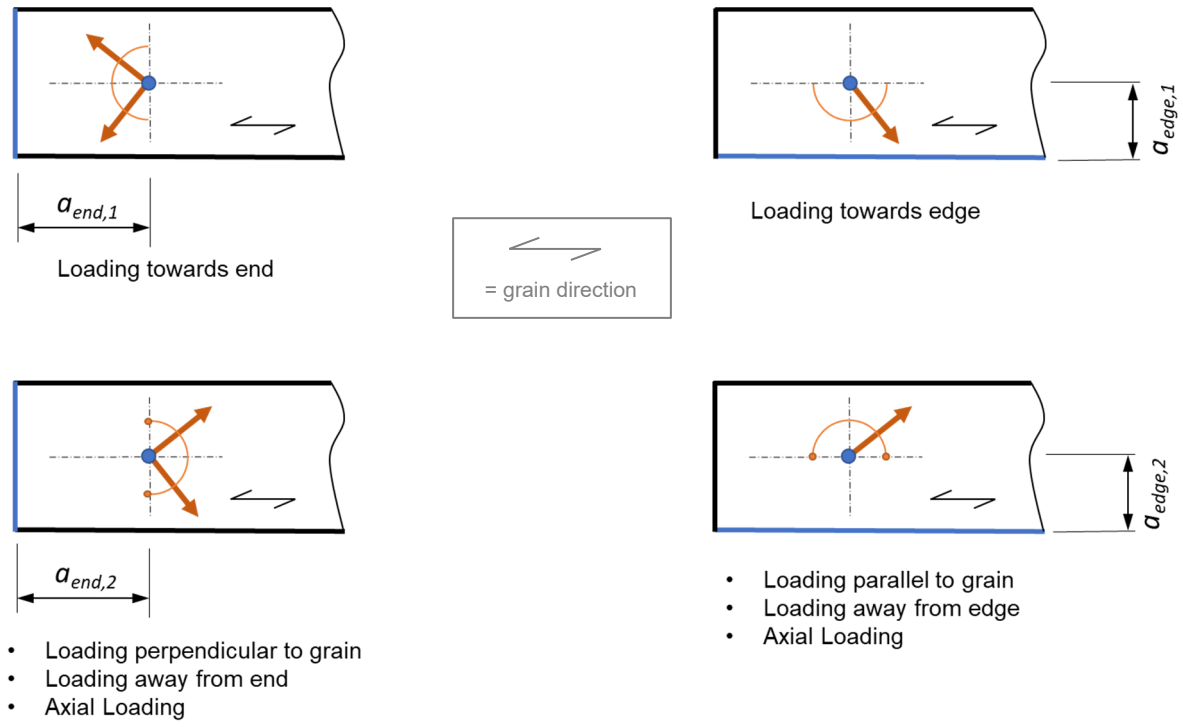


FIGURE 4—END AND EDGE DISTANCE DEFINITIONS FOR SCREWS INSTALLED PERPENDICULAR TO GRAIN

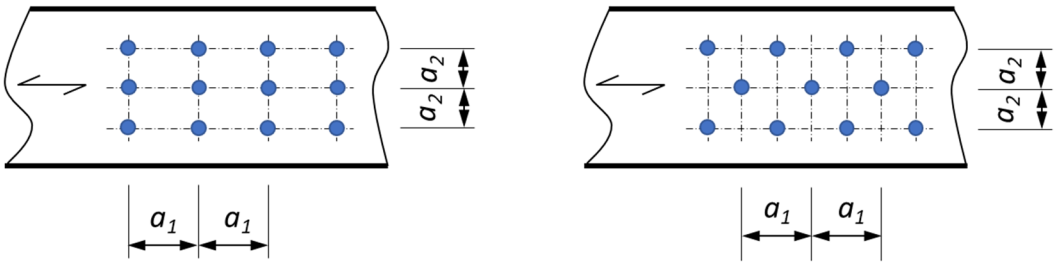


FIGURE 5—SPACING DEFINITIONS FOR SCREWS INSTALLED PERPENDICULAR TO GRAIN

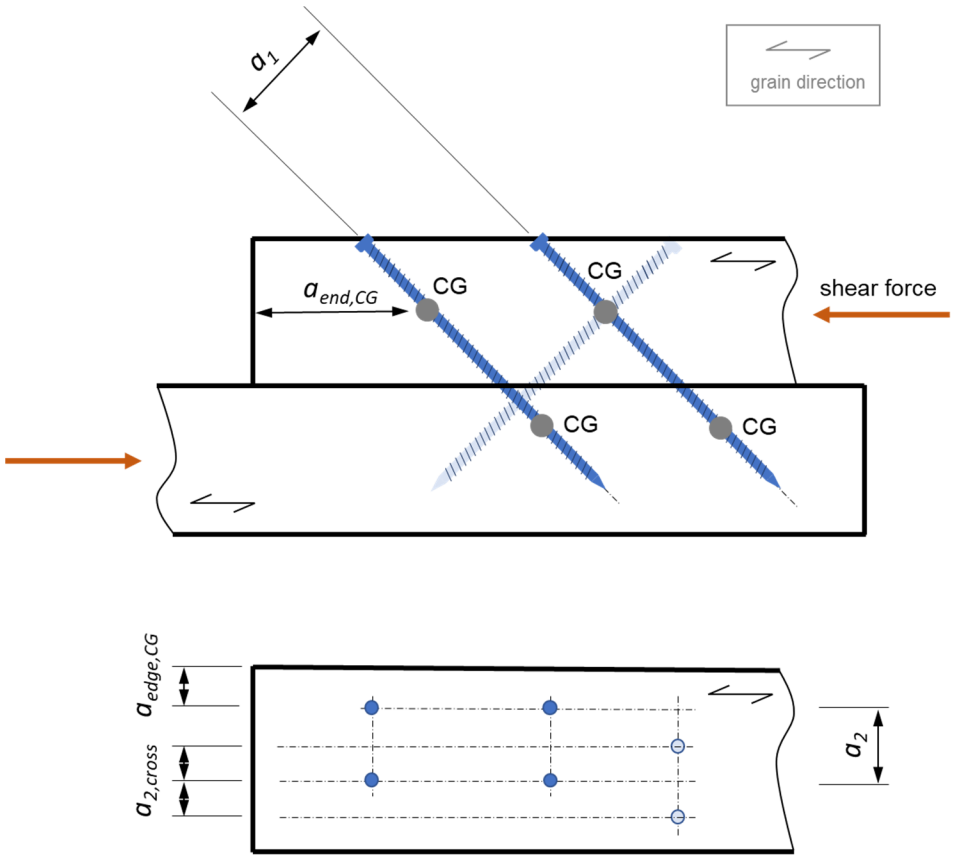


FIGURE 6—SPACING DEFINITIONS FOR INCLINED AND CROSSED SCREWS