

ICC-ES Evaluation Report

ESR-5358

Reissued March 2026

This report also contains:

- [City of Chicago Supplement](#)
- [City of LA Supplement](#)
- [CA Supplement](#)
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Subject to renewal March 2028



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DIVISION: 06 00 00— WOOD, PLASTICS AND COMPOSITES Section: 06 05 23.20— Screws	REPORT HOLDER: ALTENLOH, BRINCK, AND CO. 	EVALUATION SUBJECT: SPAX® X-SERIES STRUCTURAL WOOD FASTENERS	
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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® \(IRC\)](#)

Properties evaluated:

- Structural
- Corrosion resistance

2.0 USES

The SPAX® X-series Structural Wood Fasteners are used for wood-to-wood and steel-to-wood connections that are designed in accordance with the IBC. For structures regulated under the IRC, the fasteners may be used where an engineered design is submitted in accordance with IRC Section R301.1.3.

The SPAX® X-series Structural Wood Fasteners described in Section 4.2 are intended for use in the exposure conditions described in [Table 16](#).

3.0 DESCRIPTION

3.1 Notation and Symbols:

C_{eg-w}	=	End grain reduction factor for withdrawal loading (See Section 4.1.3)
C_M	=	Wet-service factor
D	=	Outside thread diameter
D_H	=	Diameter of fastener head or integral washer
D_{nom}	=	Fastener size designation
D_r	=	Minor thread (root) diameter
D_s	=	Unthreaded shank diameter
F_u	=	Minimum specified tensile strength of steel material

F_y	=	Minimum specified yield strength of steel material
$F_{yb,spec}$	=	Minimum specified bending yield strength, determined in accordance with ASTM F1575 using D_r .
L	=	Fastener length (See Figure 2)
$L_{emb,w}$	=	Minimum required embedded thread length in holding member, including tip, applicable to tabulated withdrawal design values.
L_{thread}	=	Length of thread (including tip)
L_{tip}	=	Length of tip
N_a	=	Allowable tension strength of the fastener for use in ASD
$SG_{eq,l}$	=	Equivalent specific gravity for structural composite lumber for lateral, as reported by ICC-ES
$SG_{eq,w}$	=	Equivalent specific gravity for structural composite lumber for withdrawal, as reported by ICC-ES
SG_{NDS}	=	Assigned specific gravity (See Section 3.4)
$t_{s,w}$	=	Thickness of wood side member
V_a	=	Allowable shear strength of the fastener for use in ASD
W_t	=	Total reference withdrawal design value for fasteners installed perpendicular to face of the wood
W_H	=	Reference head pull-through design value
Z	=	Reference lateral design value
$Z_{ }$	=	Reference lateral design value for fasteners loaded parallel to the wood grain
$Z_{\perp}$	=	Reference lateral design value for fasteners loaded perpendicular to the wood grain
α	=	Angle between the axis of the fastener and the grain of the applicable wood member, degrees

3.2 General

The SPAX[®] X-series Structural Wood Fasteners, described in this report are carbon steel dowel-type threaded fasteners manufactured using a standard cold-forming process and subsequently heat-treated.

The SPAX[®] X-series fasteners are available in four different tip and thread designs in combination with several head styles and relative thread lengths. Fasteners with a head style other than Hex have a star-shaped driving recess. See [Figure 1](#) for the naming convention. See [Figure 2](#) for depictions of the fasteners. See [Table 1](#) for typical product dimensions. See [Table 2](#) through [5](#) for available head styles and associated lengths and thread lengths for each fastener series.

3.2.1 XF Series Fasteners:

3.2.2 The XF series fasteners are typically partially threaded screws but a fully threaded #14 size fastener is also available. An upper reamer knurl is typically present for the partially threaded fasteners. The upper reamer knurl may not be present for fasteners less than 6 inches (152 mm) in length. The XF series fasteners have a proprietary tip design (designated 4CUT) and serrated starter threads. The fasteners are available with Pancake, Hex, Washer, Flat and Cylinder head styles, and in #14, 1/4-inch, 5/16-inch and 3/8-inch diameters, as shown in [Table 1](#). Typical dimensions are shown in [Table 1](#) and product lengths and thread lengths are shown in [Table 2](#).

3.2.3 XC Series Fasteners: The XC series fasteners are fully-threaded screws with a proprietary tip design (designated CUT Point) and serrated starter threads. The fasteners are available with Flat and Cylinder head styles and in 5/16-inch and 3/8-inch diameters, as shown in [Table 1](#). Typical dimensions are shown in [Table 1](#) and product lengths and thread lengths are shown in [Table 3](#).

3.2.4 XS Series Fasteners: The XS series fasteners have a sharp, pointed tip with serrated starter threads. Longer fasteners are partially-threaded with no reamer knurl. Shorter fasteners are fully-threaded. The fasteners are available with Hex head style and a nominal diameter of 1/2-inch as shown in [Table 1](#). Typical dimensions are shown in [Table 1](#) and product lengths and thread lengths are shown in [Table 4](#).

3.2.5 XR Series Fasteners: The XR series fasteners are fully-threaded screws with a blunt end, a Hex head style and a nominal diameter of 5/8-inch as shown in [Table 1](#). Typical dimensions are shown in [Table 1](#) and product lengths and thread lengths are shown in [Table 5](#).

3.3 Fastener Materials:

3.3.1 Fastener Base Material: The fasteners are manufactured from hardened carbon steel wire grade 1022 or 10B21 conforming to ASTM A510, or grade 17MnB3 or 19MnB4 wire conforming to DIN 1654 in accordance with the documented specifications.

3.3.2 Coatings: The fasteners are available with different colored coatings. The black proprietary coating, designated as HCR[™], is the only coating evaluated for corrosion resistance when in contact with preservative-treated or fire-retardant-treated wood, as detailed in Section 4.2.

3.4 Wood Members:

Wood members may be sawn lumber, structural glued laminated timber (glulam); laminated veneer lumber (LVL); or laminated strand lumber (LSL), as indicated in the tables in this report. Fasteners may also be used in the face of cross-laminated timber (CLT) panels. Use of the fasteners 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 must be less than or equal to 19 percent at the time of fastener installation and while in service, unless otherwise noted. 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 fasteners installed into CLT panels, all of the laminations must have a minimum SG_{NDS} as indicated in the tables in this report.

Tabulated values for LVL and LSL are applicable to specific products identified in the footnotes to the applicable tables. The moisture content must be in accordance with the applicable ICC-ES evaluation report on the LVL or LSL.

For wood-to-wood connections, the tabulated side member thickness for lateral loading 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 fastener is fully embedded in the wood.

3.5 Steel Side Plates:

Steel side plates must comply with and be designed in accordance with AISC 360 or AISI S100, as applicable. The steel must have a minimum yield strength, F_y , of 36 ksi (248 MPa), a minimum tensile strength, F_u , of 58 ksi (400 MPa) and a minimum base-metal thickness exclusive of any coating of $1/8$ inch (125 mm). The hole in the steel side member for the fastener must be predrilled, and must have a diameter equal to or greater than the nominal diameter for the fastener but not more than $1/16$ inch (1.59 mm) larger than the fastener diameter.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 General: The design values in this report are intended to aid the designer in meeting the requirements of IBC Section 1604.2. For connections not completely described in this report, determination of the suitability of the SPAX[®] X-series Structural Wood Fasteners for the specific application is the responsibility of the designer and is outside the scope of this report. The designer 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 fasteners, based on the characteristics of the connected building materials.

4.1.2 Fastener Strength: Allowable fastener shear and tension strengths (ASD) and minimum specified bending yield strengths for the fasteners are shown in [Table 2](#).

4.1.3 Reference Withdrawal Design Values: Total reference withdrawal (W_t) design values for fasteners installed perpendicular to the face of the wood member are shown in [Table 13](#) for sawn lumber and [Table 14](#) for LVL and LSL. An end grain withdrawal factor C_{eg-w} of 0.65 has been validated for sawn lumber members. The end grain embedment depth parallel to the fastener must be a minimum of 1.5 inches (38mm) for the #14, $1/4$ -inch and $5/16$ -inch diameter fasteners; 2.0 inches (51 mm) for $3/8$ -inch diameter fasteners; and 3.0 inches (76 mm) for $1/2$ -inch and $5/8$ -inch diameter fasteners.

4.1.4 Reference Head Pull-through Design Values: For fasteners used with wood side members, reference head pull-through values (W_H) are shown in [Table 12](#) for installation with $90^\circ \geq \alpha \geq 30^\circ$. Lesser angles of installation are outside the scope of this report. For fully threaded fasteners, the reference pull-through design value is the reference withdrawal design value in the side member determined in accordance with Section 4.1.3.

4.1.5 Reference Lateral Design Values Based on Testing: Reference lateral design values based on testing for LVL-to-wood connections are shown in [Table 15](#).

4.1.6 Lateral Connections Designed in Accordance with the NDS: For connection configurations with XF, XC and XS series fasteners, the reference lateral design strength for connections of two or more members may be designed in accordance with the NDS, subject to the following conditions:

1. $F_{yb,spec}$ from [Table 1](#) 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 fasteners, when determining if footnote 1 to Table 12.3.1 applies, D_s must be considered the nominal diameter.
3. Wood must have SG_{NDS} of no more than 0.55.
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 $1/8$ inch (3.2 mm) and the steel must have minimum yield and tension strengths of 36 and 58 ksi (248 and 400 MPa), respectively. Use of steel side members is not allowed with cylinder head fasteners.
6. Fastener penetration into the main member must be a minimum of 1.5 inches (38 mm) for the #14, $1/4$ -inch and $5/16$ -inch fasteners; 2 inches (51 mm) for the $3/8$ -inch fasteners; and 3 inches (76 mm) for the $1/2$ -inch fasteners.
7. Dowel bearing length must be determined in accordance with Section 12.3.5.3 of the NDS, using the applicable tip length given in [Table 1](#).
8. Spacing, edge and end distance must be in accordance with [Table 6](#) through [11](#), as applicable, and as needed to prevent splitting of the wood.

4.1.7 Adjustments to Reference Design Values: Reference design values must be adjusted in accordance with the NDS provisions for dowel-type fasteners to determine the allowable strengths for use in ASD and the design strengths for use in LRFD. Where use in wet services conditions is allowed by Section 5.4, the wet service factor, C_M , for withdrawal, pull-through and lateral loading must be limited to 0.59.

4.1.8 Connections with Multiple Fasteners: 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.

4.1.9 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.

4.2 Corrosion Resistance:

The SPAX[®] XF, XC and XS series fasteners having the proprietary black colored HCR[™] coating may be used in Southern Pine and other species commercially available in the United States with waterborne micronized copper azole (MCA) preservatives with a minimum retention of 0.15 pcf (2.4 kg/m³) subject to the limitations described in [Table 16](#).

4.3 Installation:

SPAX[®] X-series Structural Wood Fasteners must be installed in accordance with the report holder's published installation instructions and this report. In the case of a conflict between this report and the report holder's instructions, the more restrictive requirements govern. The fasteners must be installed at the angle required by the construction documents, with the minimum spacing, end distances, and edge distances needed to prevent splitting of the wood or as noted in [Table 6](#) through [11](#), as applicable, whichever is more restrictive. For the Pancake, Hex and Washer head styles, the underside of the head or integral washer must bear against the surface of the wood side member or steel plate. For the Flat and Cylinder head styles, the top of the screw head must be flush with the surface of the wood side member.

The SPAX[®] XF, XC and XS series fasteners with nominal diameter less than or equal to $3/8$ inch do not require predrilling for installation into wood with $SG_{NDS} \leq 0.55$. Predrilled holes may be used to improve end, edge, and spacing requirements, in accordance with [Table 6](#) through [9](#), as applicable. Predrilled holes of $1/4$ inch (6.35 mm) are required for the $1/2$ -inch diameter fasteners, and predrilled holes of $1/2$ inch (12.7 mm) are required for $5/8$ -inch diameter fasteners. Fasteners must be installed using the manufacturer-recommended drive bit with a rotary drill or an impact drill, not by driving with a hammer. The fasteners must not be overdriven.

5.0 CONDITIONS OF USE:

The SPAX[®] X-series Structural Wood Fasteners 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 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.
- 5.2 Connection design for lateral loading applications using inclined fasteners is outside the scope of this report.
- 5.3 Use of cylinder head style fasteners is limited to wood-to-wood connections.
- 5.4 Use in wet service conditions has been evaluated for the SPAX[®] XF ($1/4$, $5/16$, and $3/8$ inch) and XS series structural wood fasteners. Use of other fasteners in wet service conditions is outside the scope of this report.
- 5.5 Use of fasteners in locations exposed to saltwater or saltwater spray is outside the scope of this evaluation report.
- 5.6 Use of fasteners with HCR[™] coating in contact with preservative-treated or fire-retardant-treated wood is addressed in Section 4.2. Use of other SPAX[®] X-series structural wood fasteners and other coatings addressed in this report in contact with preservative-treated or fire-retardant-treated wood is outside the scope of this report.
- 5.7 The fasteners are manufactured under a quality control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

- 6.1 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).
- 6.2 Data in accordance with the [ICC-ES Acceptance Criteria for Corrosion-resistant Fasteners and Evaluation of Corrosion Effects of Wood Treatments \(AC257\)](#), dated June 2023 (editorially revised April 2024).

7.0 IDENTIFICATION

- 7.1 The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-5358) along with the name, registered trademark, or registered logo of the report holder must be included in the product label.
- 7.2 In addition, packages of fasteners are identified with the brand name(s) (SPAX[®], with or without the brand name PowerLag[®]); the series name (XF, XC, XS or XR); the fastener description, including fastener head type, nominal diameter, nominal length and coating type, and the model number, which includes the designations shown in [Table 2](#) through [5](#). Each fastener head is marked with “SPAX”, the nominal diameter, and a length designation where practical with respect to the available space on the fastener head, as shown in [Figure 2](#).
- 7.3 The report holder’s contact information is the following:

ALTENLOH, BRINCK, AND CO.
2105 COUNTY RD. 12C
BRYAN, OHIO, 43506
UNITED STATES OF AMERICA
(419)-636-6715
[https://www.altenloh.us/](https://www.altenloh.us/contact@altenloh.us)
contact@altenloh.us

X	α	α	###	α	###
	Series	Head Style	Dia.	Thread Length	Length

SERIES: Describes tip style

F = 4CUT Tip
 S = Sharp Tip
 C = CUT Tip
 R = Threaded Rod

HEAD STYLE: Describes head style

P = Pancake
 H = Hex
 F = Flat (Countersunk)
 W = Washer
 C = Cylinder

NOMINAL In thousandths of inch or number

DIAMETER:
 14 = #14
 250 = 1/4"
 312 = 5/16"
 375 = 3/8"
 500 = 1/2"
 625 = 5/8"

THREAD LENGTH: Describes thread length style

P = Partially threaded
 F = Fully threaded
 L = Long threaded (usually longer than P)

LENGTH: In inches and 2-digit fraction

400 = 4"
 612 = 6 1/2"
 1034 = 10 3/4"

EXAMPLE XFP312P412

5/16" x 4 1/2" partially threaded fastener with a 4CUT tip and a pancake head

FIGURE 1 – SPAX® X-SERIES STRUCTURAL WOOD FASTENER NAMING CONVENTION

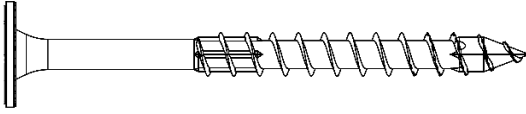
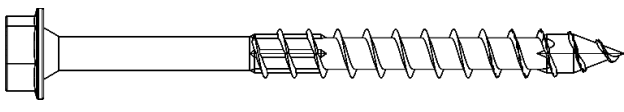
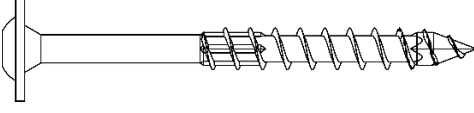
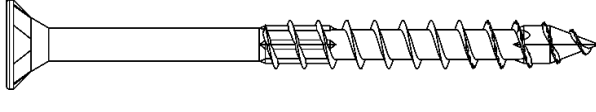
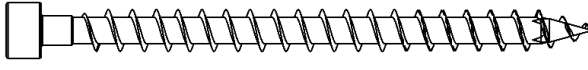
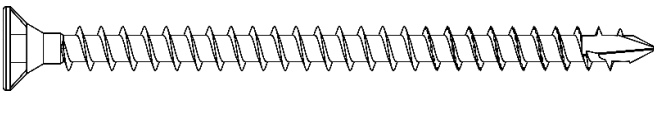
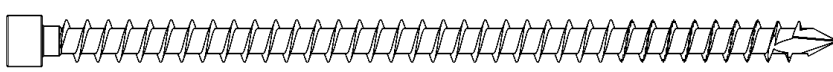
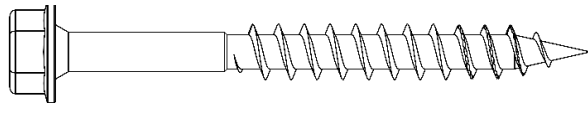
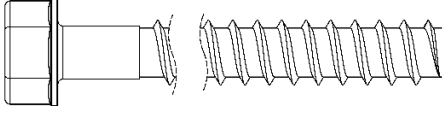
SERIES	HEAD STYLE	FIGURE	
XF	PANCAKE		
	HEX		
	WASHER		
	FLAT		
	CYLINDER		
XC	FLAT		
	CYLINDER		
XS	HEX		
XR	HEX		

FIGURE 2 – SPAX[®] X-SERIES STRUCTURAL WOOD FASTENERS

TABLE 1 – FASTENER DIMENSIONS AND STEEL STRENGTHS¹

D_{nom} (in.)	Series	HEAD STYLE	D_H (in.)	D (in.)	D_r (in.)	D_s (in.)	L_{tip} (in.)	Threads Per Inch (threads/in)	Allowable Steel Strength (ASD)		$F_{yb, spec}$ (psi)
									N_a (lbf)	V_a (lbf)	
#14	XF	Washer	0.535	0.236	0.154	0.169	0.25	7.0	980	730	160,000
		Cylinder	0.331								
1/4 inch	XF	Pancake	0.675	0.276	0.183	0.199	0.30	6.0	1280	930	150,000
		Hex	0.545								
5/16 inch	XF	Pancake	0.765	0.315	0.200	0.220	0.33	5.3	1630	1130	160,000
		Hex	0.590								
		Washer	0.787								
		Flat	0.594								
	XC	Flat	0.594	0.315	0.200	n/a	0.20	6.4	1400	1030	
		Cylinder	0.394								
3/8 inch	XF	Pancake	0.980	0.394	0.240	0.271	0.40	4.2	2300	1740	150,000
		Hex	0.748								
		Washer	0.948								
		Flat	0.732								
	XC	Flat	0.732	0.394	0.240	n/a	0.25	5.0	2480	1860	
1/2 inch	XS	Hex	0.861	0.474	0.289	0.336	0.50	4.2	3420	2570	160,000
5/8 inch	XR	Hex	1.024	0.630	0.472	n/a	0.00	4.2	5770	3930	100,000

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

¹See Tables 2 through 5 for available fastener lengths/thread lengths and applicable product designations.

TABLE 2 – XF SERIES PRODUCT DESIGNATIONS, LENGTHS AND THREAD LENGTHS^{1,2}

D _{nom}	L (in)	DESIGNATION AND THREAD LENGTH BY HEAD STYLE									
		PANCAKE		HEX		WASHER		FLAT		CYLINDER	
		DESIGNATION	L _{thread} (in.)	DESIGNATION	L _{thread} (in.)	DESIGNATION	L _{thread} (in.)	DESIGNATION	L _{thread} (in.)	DESIGNATION	L _{thread} (in)
#14	1.375					XFW14L138	0.945			-	-
	1.625					XFW14L158	0.945			-	-
	1.750					XFW14L134	1.142			-	-
	2.000					XFW14L200	1.260			-	-
	2.125					XFW14L218	1.460			-	-
	2.375					XFW14L238	1.460			XFC14F238	1.784
	2.625					XFW14L258	1.614			XFC14F258	2.034
	2.750					XFW14L234	1.614			XFC14F234	2.159
	3.000					XFW14L300	1.614			XFC14F300	2.409
	3.125					XFW14L318	1.810			XFC14F318	2.534
	3.500					XFW14L312	1.810			XFC14F312	2.909
	4.000					XFW14L400	2.400			XFC14F400	3.409
	4.375					-	-			XFC14F438	3.784
	4.750					XFW14L434	2.680			XFC14F434	4.159
	5.125					XFW14L518	2.680			XFC14F518	4.534
	5.500					-	-			XFC14F512	4.909
	5.875					-	-			XFC14F578	5.284
	6.250					XFW14L614	2.680			XFC14F614	5.659
	7.125					-	-			XFC14F718	6.534
	7.825					-	-			XFC14F778	7.284
	(Intermediate lengths)					XFW14L###	2.680			-	-
	11.875					XFW14L1178	2.680			-	-
1/4 inch	1.500	XFP250P112	Full	XFH250P112	Full						
	2.000	XFP250P200	1.535	XFH250P200	1.535						
	2.500	XFP250P212	1.535	XFH250P212	1.535						
	3.000	XFP250P300	1.535	XFH250P300	1.535						
	3.500	XFP250P312	2.010	XFH250P312	2.010						
	4.000	XFP250P400	2.125	XFH250P400	2.125						
	4.500	XFP250P412	2.125	XFH250P412	2.125						
	5.000	XFP250P500	2.755	XFH250P500	2.755						
	5.500	XFP250P512	2.755	XFH250P512	2.755						
	6.000	XFP250P600	2.755	XFH250P600	2.755						
	(Intermediate lengths)	XFP250P###	2.755	XFH250P###	2.755						
42.000	XFP250P4200	2.755	XFH250P4200	2.755							
5/16 inch	1.500	XFP312P112	Full	XFH312P112	Full	-	-	-	-		
	2.000	XFP312P200	1.535	XFH312P200	1.535	XFW312L200	1.260	XFF312L200	1.260		
	2.125	-	-	-	-	XFW312L218	1.260	XFF312L218	1.260		
	2.375	-	-	-	-	XFW312L238	1.460	XFF312L238	1.460		
	2.500	XFP312P212	1.535	XFH312P212	1.535	-	-	-	-		
	2.625	-	-	-	-	XFW312L258	1.460	XFF312L258	1.460		
	2.750	-	-	-	-	XFW312L234	1.650	XFF312L234	1.650		
	3.000	XFP312P300	1.535	XFH312P300	1.535	XFW312L300	1.650	XFF312L300	1.650		
	3.125	-	-	-	-	XFW312L318	1.850	XFF312L318	1.850		
	3.500	XFP312P312	2.010	XFH312P312	2.010	XFW312L312	2.050	XFF312L312	2.050		
	4.000	XFP312P400	2.045	XFH312P400	2.045	XFW312L400	2.245	XFF312L400	2.245		
	4.375	-	-	-	-	XFW312L438	2.755	XFF312L438	2.755		
	4.500	XFP312P412	2.045	XFH312P412	2.045	-	-	-	-		
	4.750	-	-	-	-	XFW312L434	2.755	XFF312L434	2.755		
	5.000	XFP312P500	2.675	XFH312P500	2.675	-	-	-	-		
	5.125	-	-	-	-	XFW312L518	2.755	XFF312L518	2.755		
	5.500	XFP312P512	2.675	XFH312P512	2.675	XFW312L512	3.190	XFF312L512	3.190		
	5.875	-	-	-	-	XFW312L578	3.190	XFF312L578	3.190		
	6.000	XFP312P600	2.675	XFH312P600	2.675	-	-	-	-		
	6.250	-	-	-	-	XFW312L614	3.150	XFF312L614	3.150		
	7.125	-	-	-	-	XFW312L718	3.150	XFF312L718	3.150		
	7.875	-	-	-	-	XFW312L778	3.150	XFF312L778	3.150		
	(Intermediate lengths)	XFP312P###	2.675	XFH312P###	2.675	XFW312L###	3.150	XFF312L###	3.150		
	23.625	-	-	-	-	XFW312L2358	3.150	XFF312L2358	3.150		
(Intermediate lengths)	-	-	-	-	-	-	-	-			
42.000	XFP312P4200	2.675	XFH312P4200	2.675	-	-	-	-			
3/8 inch	2.000	XFP375P200	Full	XFH375P200	Full	-	-	-	-		
	2.500	XFP375P212	Full	XFH375P212	Full	-	-	-	-		
	3.000	XFP375P300	Full	XFH375P300	Full	-	-	-	-		
	3.125	-	-	-	-	XFW375L318	1.970	XFF375L318	1.970		
	3.500	XFP375P312	2.165	XFH375P312	2.165	XFW375L312	2.165	XFF375L312	2.165		
	4.000	XFP375P400	2.360	XFH375P400	2.360	XFW375L400	2.360	XFF375L400	2.360		
	4.375	-	-	-	-	XFW375L438	3.190	XFF375L438	3.190		
	4.500	XFP375P412	3.190	XFH375P412	3.190	-	-	-	-		
	4.750	-	-	-	-	XFW375L434	3.190	XFF375L434	3.190		
	5.000	XFP375P500	3.190	XFH375P500	3.190	-	-	-	-		
	5.125	-	-	-	-	XFW375L518	3.190	XFF375L518	3.190		
	5.500	XFP375P512	3.190	XFH375P512	3.190	XFW375L512	3.190	XFF375L512	3.190		
	5.875	-	-	-	-	XFW375L578	3.190	XFF375L578	3.190		
	6.000	XFP375P600	3.150	XFH375P600	3.150	-	-	-	-		
	6.250	-	-	-	-	XFW375L614	3.150	XFF375L618	3.150		
	7.125	-	-	-	-	XFW375L718	3.150	XFF375L718	3.150		
	7.875	-	-	-	-	XFW375L778	3.150	XFF375L778	3.150		
	(Intermediate lengths)	XFP375P###	3.150	XFH375P###	3.150	XFW375L###	3.150	XFF375L###	3.150		
	23.625	-	-	-	-	XFW375L2358	3.150	XFF375L2358	3.150		
	(Intermediate lengths)	-	-	-	-	-	-	-	-		
	42.000	XFP375P4200	3.150	XFH375P4200	3.150	-	-	-	-		

For S1: 1 inch = 25.4 mm.

¹Length is measured from the top of the fastener head for flat heads and cylinder heads, and from the underside of head for pancake heads, hex heads and washer heads. See Figure 2.²Thread length includes the length of the tip.

TABLE 3 – XC SERIES PRODUCT DESIGNATIONS, LENGTHS AND THREAD LENGTHS^{1,2}

D _{nom}	L (in)	HEAD STYLE			
		FLAT		CYLINDER	
		DESIGNATION	L _{thread} (in.) (Full)	DESIGNATION	L _{thread} (in.) (Full)
5/16 inch	2.375	XCF312F238	1.775	XCC312F238	1.775
	2.625	XCF312F258	2.025	XCC312F258	2.025
	2.750	XCF312F234	2.150	XCC312F234	2.150
	3.000	XCF312F300	2.400	XCC312F300	2.400
	3.125	XCF312F318	2.525	XCC312F318	2.525
	3.500	XCF312F312	2.900	XCC312F312	2.900
	4.000	XCF312F400	3.400	XCC312F400	3.400
	4.375	XCF312F438	3.775	XCC312F438	3.775
	4.750	XCF312F434	4.150	XCC312F434	4.150
	5.125	-	-	XCC312F518	4.525
	5.500	XCF312F512	4.900	XCC312F512	4.900
	5.875	-	-	XCC312F578	5.275
	6.250	XCF312F614	5.650	XCC312F614	5.650
	7.125	XCF312F###	Full	XCC312F718	6.525
	7.875			XCC312F778	7.275
	(Intermediate lengths)			XCC312F###	Full
	23.625	XCF312F2358	22.625	XCC312F2358	22.625
3/8 inch	2.375	XCF375F238	1.775	-	-
	2.625	XCF375F258	2.025		
	2.750	XCF375F234	2.150		
	3.000	XCF375F300	2.400		
	3.125	XCF375F318	2.525		
	3.500	XCF375F312	3.400		
	4.000	XCF375F400	3.775		
	4.375	XCF375F438	3.775		
	4.750	XCF375F434	4.150		
	6.250	XCF375F614	5.650		
	7.875	XCF375F778	7.275		
	(Intermediate lengths)	XCF375F###	Full		
	31.500	XCF375F3112	30.500		

For SI: 1 inch = 25.4 mm.

¹Length is measured from the top of the fastener head.²Thread length includes the length of the tip.TABLE 4 – XS SERIES PRODUCT DESIGNATIONS, LENGTHS AND THREAD LENGTHS^{1,2,3}

D _{nom}	L (in.)	HEAD STYLE	
		HEX	
		DESIGNATION	L _{thread} (in.)
1/2 inch	2.000	XSH500P200	Full
	2.500	XSH500P212	Full
	3.000	XSH500P300	Full
	3.500	XSH500P312	Full
	4.000	XSH500P400	3.150
	4.500	XSH500P412	3.150
	5.000	XSH500P500	3.150
	5.500	XSH500P512	3.150
	6.000	XSH500P600	3.150
	(Intermediate lengths)	XSH500P###	3.150
	42.000	XSH500P4200	3.150

For SI: 1 inch = 25.4 mm.

¹Length is measured from the underside of head.²Thread length includes the length of the tip.³Fully threaded short length fasteners are designated as "P" for threaded length style.TABLE 5 – XR SERIES PRODUCT DESIGNATIONS, LENGTHS AND THREAD LENGTHS¹

D _{nom}	L (in)	HEAD STYLE	
		HEX	
		DESIGNATION	L _{thread} (in)
5/8 inch	4	XRH625F400	3.213
	4.375	XRH625F438	3.588
	4.750	XRH625F434	3.963
	5.125	XRH625F518	4.338
	5.500	XRH625F512	4.713
	5.875	XRH625F578	5.088
	6.250	XRH625F614	5.463
	7.125	XRH625F718	6.338
	7.875	XRH625F778	7.088
	(Intermediate lengths)	XRH625F###	L - 0.787
	118.125	XRH625F11818	117.338

For SI: 1 inch = 25.4 mm.

¹Length is measured from the underside of head.

TABLE 6 – CONNECTION GEOMETRY REQUIREMENTS FOR #14 SPAX[®] X-SERIES STRUCTURAL WOOD FASTENERS INSTALLED PERPENDICULAR TO THE FACE OF WOOD MEMBERS^{1,2,3,4}

CONDITION		SELF-DRILLED		PREDRILLED
		$SG_{NDS} < 0.50$	$SG_{NDS} \geq 0.50$	HOLE ⁵
		MINIMUM DISTANCE OR SPACING (INCHES)		
End Distance (See Figure 3)	Loading toward end, $a_{end,1}$	$3\frac{1}{2}$	$4\frac{3}{4}$	$2\frac{7}{8}$
	Loading perpendicular to grain or way from end, $a_{end,2}$	$2\frac{3}{8}$	$3\frac{1}{2}$	$1\frac{5}{8}$
	Axial loading, $a_{end,2}$	$2\frac{3}{8}$	$2\frac{3}{8}$	$1\frac{5}{8}$
Edge Distance (See Figure 3)	Loading toward edge, $a_{edge,1}$	$2\frac{3}{8}$	$2\frac{7}{8}$	$1\frac{5}{8}$
	Loading parallel to grain or away from edge, $a_{edge,2}$	$1\frac{1}{8}$	$1\frac{5}{8}$	$\frac{3}{4}$
	Axial loading, $a_{edge,2}$	1	1	$\frac{3}{4}$
Spacing between fasteners parallel to grain (See Figure 4)	Loading parallel to grain, a_1	$3\frac{1}{2}$	$3\frac{1}{2}$	$2\frac{3}{8}$
	Loading perpendicular to grain, a_1	$2\frac{3}{8}$	$2\frac{3}{8}$	$1\frac{1}{8}$
	Axial loading, a_1	$1\frac{5}{8}$	$1\frac{5}{8}$	$1\frac{5}{8}$
Spacing between fasteners perpendicular to grain (See Figure 4)	Loading parallel to grain, a_2	$1\frac{1}{8}$	$1\frac{5}{8}$	1
	Loading perpendicular to grain, a_2	$1\frac{1}{8}$	$1\frac{5}{8}$	1
	Axial loading, a_2	1	1	$\frac{3}{4}$

For SI: 1 inch = 25.4 mm.

TABLE 7 – CONNECTION GEOMETRY REQUIREMENTS FOR $\frac{1}{4}$ -INCH SPAX[®] X-SERIES STRUCTURAL WOOD FASTENERS INSTALLED PERPENDICULAR TO THE FACE OF WOOD MEMBERS^{1,2,3,4}

CONDITION		SELF-DRILLED		PREDRILLED
		$SG_{NDS} < 0.50$	$SG_{NDS} \geq 0.50$	HOLE ⁵
		MINIMUM DISTANCE OR SPACING (INCHES)		
End Distance (See Figure 3)	Loading toward end, $a_{end,1}$	$4\frac{1}{8}$	$5\frac{1}{2}$	$3\frac{3}{8}$
	Loading perpendicular to grain or way from end, $a_{end,2}$	$2\frac{3}{4}$	$4\frac{1}{8}$	2
	Axial loading, $a_{end,2}$	$2\frac{3}{4}$	$2\frac{3}{4}$	2
Edge Distance (See Figure 3)	Loading toward edge, $a_{edge,1}$	$2\frac{3}{4}$	$3\frac{3}{8}$	2
	Loading parallel to grain or away from edge, $a_{edge,2}$	$1\frac{3}{8}$	2	$\frac{7}{8}$
	Axial loading, $a_{edge,2}$	$1\frac{1}{8}$	$1\frac{1}{8}$	$\frac{7}{8}$
Spacing between fasteners parallel to grain (See Figure 4)	Loading parallel to grain, a_1	$4\frac{1}{8}$	$4\frac{1}{8}$	$2\frac{3}{4}$
	Loading perpendicular to grain, a_1	$2\frac{3}{4}$	$2\frac{3}{4}$	$1\frac{3}{8}$
	Axial loading, a_1	2	2	2
Spacing between fasteners perpendicular to grain (See Figure 4)	Loading parallel to grain, a_2	$1\frac{3}{8}$	2	$1\frac{1}{8}$
	Loading perpendicular to grain, a_2	$1\frac{3}{8}$	2	$1\frac{1}{8}$
	Axial loading, a_2	$1\frac{1}{8}$	$1\frac{1}{8}$	$\frac{7}{8}$

For SI: 1 inch = 25.4 mm.

TABLE 8 – CONNECTION GEOMETRY REQUIREMENTS FOR $\frac{5}{16}$ -INCH SPAX[®] X-SERIES STRUCTURAL WOOD FASTENERS INSTALLED PERPENDICULAR TO THE FACE OF WOOD MEMBERS^{1,2,3,4}

CONDITION		SELF-DRILLED		PREDRILLED
		$SG_{NDS} < 0.50$	$SG_{NDS} \geq 0.50$	HOLE ⁵
		MINIMUM DISTANCE OR SPACING (INCHES)		
End Distance (See Figure 3)	Loading toward end, $a_{end,1}$	$4\frac{3}{4}$	$6\frac{1}{4}$	$3\frac{3}{4}$
	Loading perpendicular to grain or way from end, $a_{end,2}$	$3\frac{1}{8}$	$4\frac{3}{4}$	$2\frac{1}{4}$
	Axial loading, $a_{end,2}$	$3\frac{1}{8}$	$3\frac{1}{8}$	$2\frac{1}{4}$
Edge Distance (See Figure 3)	Loading toward edge, $a_{edge,1}$	$3\frac{1}{8}$	$3\frac{3}{4}$	$2\frac{1}{4}$
	Loading parallel to grain or away from edge, $a_{edge,2}$	$1\frac{5}{8}$	$2\frac{1}{4}$	1
	Axial loading, $a_{edge,2}$	$1\frac{1}{4}$	$1\frac{1}{4}$	1
Spacing between fasteners parallel to grain (See Figure 4)	Loading parallel to grain, a_1	$4\frac{3}{4}$	$4\frac{3}{4}$	$3\frac{1}{8}$
	Loading perpendicular to grain, a_1	$3\frac{1}{8}$	$3\frac{1}{8}$	$1\frac{5}{8}$
	Axial loading, a_1	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{4}$
Spacing between fasteners perpendicular to grain (See Figure 4)	Loading parallel to grain, a_2	$1\frac{5}{8}$	$2\frac{1}{4}$	$1\frac{1}{4}$
	Loading perpendicular to grain, a_2	$1\frac{5}{8}$	$2\frac{1}{4}$	$1\frac{1}{4}$
	Axial loading, a_2	$1\frac{1}{4}$	$1\frac{1}{4}$	1

For SI: 1 inch = 25.4 mm.

TABLE 9 – CONNECTION GEOMETRY REQUIREMENTS FOR $\frac{3}{8}$ -INCH SPAX[®] X-SERIES STRUCTURAL WOOD FASTENERS INSTALLED PERPENDICULAR TO THE FACE OF WOOD MEMBERS^{1,2,3,4}

CONDITION		SELF-DRILLED		PREDRILLED HOLE ⁵
		SG _{NDS} < 0.50	SG _{NDS} ≥ 0.50	
		MINIMUM DISTANCE OR SPACING (INCHES)		
End Distance (See Figure 3)	Loading toward end, <i>a</i> _{end,1}	5 ⁷ / ₈	7 ¹ / ₈	2 ³ / ₄
	Loading perpendicular to grain or way from end, <i>a</i> _{end,2}	4	5 ⁷ / ₈	1 ⁵ / ₈
	Axial loading, <i>a</i> _{end,2}	4	4	1 ⁵ / ₈
Edge Distance (See Figure 3)	Loading toward edge, <i>a</i> _{edge,1}	4	4 ³ / ₄	1 ⁵ / ₈
	Loading parallel to grain or away from edge, <i>a</i> _{edge,2}	2	2 ³ / ₄	1 ¹ / ₄
	Axial loading, <i>a</i> _{edge,2}	1 ⁵ / ₈	1 ⁵ / ₈	1 ¹ / ₄
Spacing between fasteners parallel to grain (See Figure 4)	Loading parallel to grain, <i>a</i> ₁	5 ⁷ / ₈	5 ⁷ / ₈	2
	Loading perpendicular to grain, <i>a</i> ₁	4	4	2
	Axial loading, <i>a</i> ₁	2 ³ / ₄	2 ³ / ₄	2
Spacing between fasteners perpendicular to grain (See Figure 4)	Loading parallel to grain, <i>a</i> ₂	2	2 ³ / ₄	2
	Loading perpendicular to grain, <i>a</i> ₂	2	2 ³ / ₄	2
	Axial loading, <i>a</i> ₂	2	2	2

For SI: 1 inch = 25.4 mm.

TABLE 10 – CONNECTION GEOMETRY REQUIREMENTS FOR $\frac{1}{2}$ -INCH SPAX[®] X-SERIES STRUCTURAL WOOD FASTENERS INSTALLED PERPENDICULAR TO THE FACE OF WOOD MEMBERS^{1,2,3,4,5}

CONDITION		PREDRILLED HOLE MINIMUM DISTANCE OR SPACING (INCHES)
End Distance (See Figure 3)	Loading toward end, $a_{end,1}$	$3\frac{3}{8}$
	Loading perpendicular to grain or way from end, $a_{end,2}$	$1\frac{7}{8}$
	Axial loading, $a_{end,2}$	$1\frac{7}{8}$
Edge Distance (See Figure 3)	Loading toward edge, $a_{edge,1}$	$1\frac{7}{8}$
	Loading parallel to grain or away from edge, $a_{edge,2}$	$1\frac{3}{8}$
	Axial loading, $a_{edge,2}$	$1\frac{3}{8}$
Spacing between fasteners parallel to grain (See Figure 4)	Loading parallel to grain, a_1	$2\frac{3}{8}$
	Loading perpendicular to grain, a_1	$2\frac{3}{8}$
	Axial loading, a_1	$2\frac{3}{8}$
Spacing between fasteners perpendicular to grain (See Figure 4)	Loading parallel to grain, a_2	$2\frac{3}{8}$
	Loading perpendicular to grain, a_2	$2\frac{3}{8}$
	Axial loading, a_2	$2\frac{3}{8}$

For SI: 1 inch = 25.4 mm.

TABLE 11 – CONNECTION GEOMETRY REQUIREMENTS FOR $\frac{5}{8}$ -INCH SPAX[®] X-SERIES STRUCTURAL WOOD FASTENERS INSTALLED PERPENDICULAR TO THE FACE OF WOOD MEMBERS^{1,2,3,4,5}

CONDITION		PREDRILLED HOLE MINIMUM DISTANCE OR SPACING (INCHES)
End Distance (See Figure 3)	Loading toward end, $a_{end,1}$	$4\frac{3}{8}$
	Loading perpendicular to grain or way from end, $a_{end,2}$	$2\frac{1}{2}$
	Axial loading, $a_{end,2}$	$2\frac{1}{2}$
Edge Distance (See Figure 3)	Loading toward edge, $a_{edge,1}$	$2\frac{1}{2}$
	Loading parallel to grain or away from edge, $a_{edge,2}$	$1\frac{7}{8}$
	Axial loading, $a_{edge,2}$	$1\frac{7}{8}$
Spacing between fasteners parallel to grain (See Figure 4)	Loading parallel to grain, a_1	$3\frac{1}{8}$
	Loading perpendicular to grain, a_1	$3\frac{1}{8}$
	Axial loading, a_1	$3\frac{1}{8}$
Spacing between fasteners perpendicular to grain (See Figure 4)	Loading parallel to grain, a_2	$3\frac{1}{8}$
	Loading perpendicular to grain, a_2	$3\frac{1}{8}$
	Axial loading, a_2	$3\frac{1}{8}$

For SI: 1 inch = 25.4 mm.

Footnotes for [Table 6](#) through [11](#):¹End 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.²Wood 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.³Tabulated values are applicable to wood-to-wood and steel-to-wood connections.⁴For 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.⁵Tabulated 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 $0.9D_s$.

For XS and XR fasteners, predrilled holes must also comply with Section 4.3.

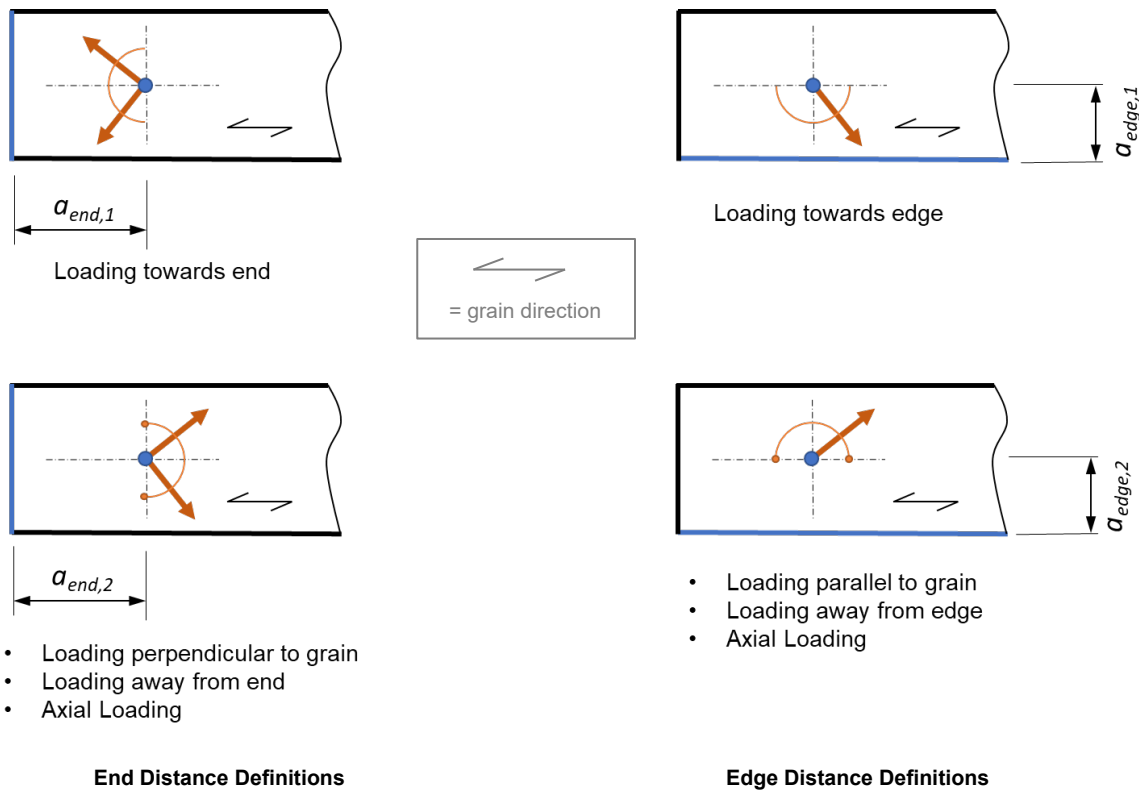


FIGURE 3—END AND EDGE DISTANCE DEFINITIONS FOR FASTENERS INSTALLED PERPENDICULAR TO GRAIN

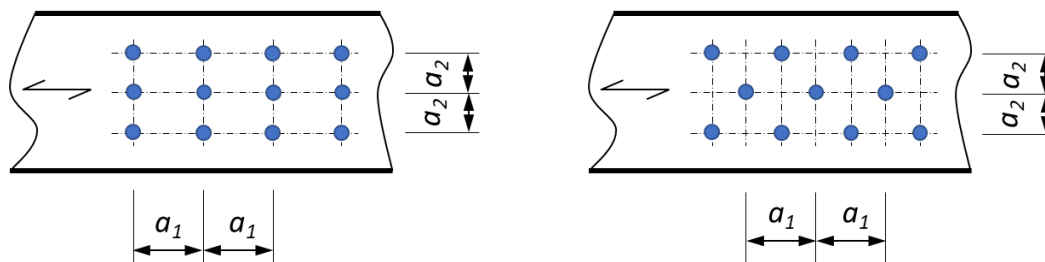


FIGURE 4—SPACING DEFINITIONS FOR FASTENERS INSTALLED PERPENDICULAR TO GRAIN

TABLE 12 – REFERENCE HEAD PULL-THROUGH DESIGN VALUES (W_H)^{1,2}

D_{nom}	SERIES	HEAD STYLE	$t_{s,w}$ (in.)	W_H FOR SELECTED SG_{NDS} VALUES (lbf)		
				0.42	0.50	0.55
#14	XF	Washer	1.50	300	370	420
1/4	XF	Pancake	1.50	450	550	620
	XF	Hex	1.50	300	400	450
5/16 inch	XF	Pancake	1.50	520	630	630
	XF	Hex	1.50	360	460	500
	XF, XC	Flat	1.50	230	330	340
	XF	Washer	1.50	500	680	680
3/8 inch	XF	Pancake	1.50	610	760	920
	XF	Hex	1.50	510	620	620
	XF, XC	Flat	1.50	330	450	480
	XF	Washer	1.50	690	790	1030
1/2 inch	XS	Hex	1.50	580	660	720

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

¹Tabulated values are applicable to fasteners installed with $90^\circ \geq \alpha \geq 30^\circ$.

TABLE 13 – REFERENCE WITHDRAWAL DESIGN VALUES (W_t) – SOLID SAWN LUMBER^{1,2,3}

D_{nom}	$L_{emb,w}$ (in.)	SERIES	W_t FOR SELECTED SG_{NDS} VALUES (lbf)		
			0.42	0.50	0.55
#14	1.50	XF	$131 * L_{thread} \leq 393$	$158 * L_{thread} \leq 474$	$194 * L_{thread} \leq 582$
1/4 inch	1.50	XF	$141 * L_{thread} \leq 467$	$170 * L_{thread} \leq 544$	$170 * L_{thread} \leq 654$
	3.00		467	544	654
5/16 inch	1.50	XF	$139 * L_{thread} \leq 432$	$167 * L_{thread} \leq 568$	$167 * L_{thread} \leq 593$
	3.00		432	568	593
	3.50		542	666	756
	1.50	XC	216	260	314
3/8 inch	2.00	XF	$167 * L_{thread} \leq 690$	$206 * L_{thread} \leq 764$	$238 * L_{thread} \leq 935$
	3.50		690	764	935
	2.00	XC	263	412	459
1/2 inch	3.00	XS	629	839	870
5/8 inch	3.00	XR	520	856	856

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

¹Tabulated values are applicable to fasteners installed perpendicular to the face of the wood member.

²Unless otherwise noted, tabulated values are the total reference value for the screw and must not be multiplied by the thread length, L_{thread} .

³See Section 4.1.3 for adjustments required for end grain installation.

TABLE 14 – REFERENCE WITHDRAWAL DESIGN VALUES (W_t) – LVL, LSL¹

D_{nom}	$L_{emb,w}$ (in)	SERIES	W_t FOR SELECTED $SG_{eq,w}$ VALUES (lbf)		
			LVL		LSL
			$SG_{eq,w} = 0.46^2$	$SG_{eq,w} = 0.50^3$	$SG_{eq,w} = 0.44^4$
#14	1.50	XF	194	-	261
1/4 inch	1.50	XF	-	227	296
5/16 inch	1.50	XF	-	211	282
	1.50	XC	205	-	281
3/8 inch	2.00	XF	-	344	494
	2.00	XC	347	-	452
1/2 inch	3.00	XS	-	604	951
5/8 inch	3.00	XR	778	-	1288

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

¹Tabulated values are applicable to fasteners installed perpendicular to the face of the wood member.

²Tabulated values are applicable to LVL members addressed in ESR-1898.

³Tabulated values are applicable to LVL members addressed in ESR-1210.

⁴Tabulated values are applicable to LSL members addressed in ESR-2725.

**TABLE 15 – REFERENCE LATERAL DESIGN VALUES (Z) FOR SINGLE SHEAR (TWO-MEMBER)
LVL-TO-WOOD AND LVL-TO-LVL CONNECTIONS BASED ON TESTING¹**

FASTENER	L (in.)	SIDE MEMBER			MAIN MEMBER			LATERAL CAPACITY (lbf)
		Material	SG _{NDS} or SG _{eq,l}	THICKNESS (in.)	Material ⁵	SG _{NDS} or SG _{eq,l}	THICKNESS (in.)	
Loading parallel to grain, Z								
XFH250P400	4.000	LVL ⁴	0.50	1.50	SPF	0.42	3.50	270
XFF375L434	4.800	LVL ⁴	0.50	1.50	SPF	0.42	3.50	270
XFH250P400	4.000	LVL ⁴	0.50	1.50	LVL ⁴	0.50	3.00	290
XSH500P500	5.000	LVL ⁴	0.50	1.50	LVL ⁴	0.50	4.50	320
XFH250P400	4.000	LVL ⁴	0.50	1.50	SP	0.55	3.50	285
XFF375L434	4.800	LVL ⁴	0.50	1.50	SP	0.55	3.50	265
XSH500P500	5.000	LVL ⁴	0.50	1.50	SP	0.55	3.50	325
XFC14F318	3.100	LVL ³	0.43	1.50	RP	0.44	3.50	125
XFC14F318	3.100	LVL ³	0.43	1.50	SP	0.55	3.50	220
XFC14F318	3.100	LVL ³	0.43	1.50	LVL ³	0.43	1.50	180
XCC312F614	6.200	LVL ³	0.43	3.00	RP	0.44	3.50	295
XCC312F614	6.200	LVL ³	0.43	3.00	SP	0.55	3.50	430
XCF375F434	4.600	LVL ³	0.43	1.50	RP	0.44	3.50	400
XCF375F434	4.600	LVL ³	0.43	1.50	SP	0.55	3.50	525
XRH625F2400	6.100	LVL ³	0.43	3.00	RP	0.44	3.50	740
XRH625F2400	6.200	LVL ³	0.43	3.00	SP	0.55	3.50	935

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

¹Tabulated values are applicable to fasteners installed perpendicular to the face of the side and main members.

²The main member thickness must be equal to or greater than the fastener length less the thickness of the side member so that the fastener is fully embedded in the wood.

³Tabulated values are applicable to LVL members addressed in ESR-1898.

⁴Tabulated values are applicable to LVL members addressed in ESR-1210.

⁵SPF = Spruce-Pine-Fir, RP = Red Pine, SP = Southern Pine.

TABLE 16—APPLICABLE EXPOSURE CONDITIONS FOR SPAX[®] X-SERIES STRUCTURAL WOOD FASTENERS WITH HCR[™] COATING^{1,2}

COATING SYSTEM	EXPOSURE CONDITION	TYPICAL APPLICATIONS	EVALUATION LIMITATIONS
HCR [™]	1	Treated wood in dry use applications	Limited to use where equilibrium moisture content of the chemically treated wood meets the dry service conditions as described in the NDS with occasional exposure to high humidity.
	3	General construction	Limited to freshwater and chemically treated wood exposure, without saltwater exposure.

¹Qualified fasteners are described in Section 4.2.

²Treated wood refers to the specific wood species, treatment and retention level described in Section 4.2.

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES

Section: 06 05 23.20—Screws

REPORT HOLDER:

ALTENLOH, BRINCK, AND CO.

EVALUATION SUBJECT:

SPAX® SERIES STRUCTURAL WOOD FASTENERS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Spax® Series Structural Wood Fasteners, described in ICC-ES evaluation report [ESR-5358](#), have also been evaluated for compliance with the Chicago Construction Codes (Title 14 of the Chicago Municipal Code) as noted below.

Applicable code editions:

- 2019 *Chicago Building Code* (Title 14B)

2.0 CONCLUSIONS

The Spax® Series Structural Wood Fasteners, described in Sections 2.0 through 7.0 of the evaluation report [ESR-5358](#) comply with Title 14B, and are subject to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Spax® Series Structural Wood Fasteners described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report [ESR-5358](#).
- The design, installation, conditions of use and identification of the Spax® Series Structural Wood Fasteners are in accordance with the 2018 *International Building Code*® (IBC) provisions noted in the evaluation report [ESR-5358](#).
- The design, installation and inspection are in accordance with additional requirements of Chapters 16, 17 and 23 of Title 14B, as applicable.

This supplement expires concurrently with the evaluation report, reissued March 2026.

ICC-ES Evaluation Report

ESR-5358 City of LA Supplement

Reissued March 2026

This report is subject to renewal March 2028.

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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 05 23.20—Screws

REPORT HOLDER:

ALTENLOH, BRINCK, AND CO.

EVALUATION SUBJECT:

SPAX® SERIES STRUCTURAL WOOD FASTENERS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Spax® Series Structural Wood Fasteners, described in ICC-ES evaluation report [ESR-5358](#), have also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:

- 2023 City of Los Angeles Building Code ([LABC](#))
- 2023 City of Los Angeles Residential Code ([LARC](#))

2.0 CONCLUSIONS

The Spax® Series Structural Wood Fasteners, described in Sections 2.0 through 7.0 of the evaluation report [ESR-5358](#), comply with the LABC Chapter 23 and the LARC and are subject to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Spax® Series Structural Wood Fasteners described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report [ESR-5358](#).
- The design, installation, conditions of use and identification of the Spax® PowerLag® Series Structural Wood Fasteners are in accordance with the 2021 *International Building Code*® (IBC) and 2021 *International Residential Code*® (IRC) provisions, as applicable, noted in the evaluation report [ESR-5358](#).
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16, 17 and 23, as applicable.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.

This supplement expires concurrently with the evaluation report, reissued March 2026.

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES

Section: 06 05 23.20—Screws

REPORT HOLDER:

ALTENLOH, BRINCK, AND CO.

EVALUATION SUBJECT:

SPAX® SERIES STRUCTURAL WOOD FASTENERS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Spax® Series Structural Wood Fasteners, described in ICC-ES evaluation report [ESR-5358](#), 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 Spax® Series Structural Wood Fasteners, described in Sections 2.0 through 7.0 of the evaluation report [ESR-5358](#), 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, 17 and 23, 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 Spax® Series Structural Wood Fasteners, described in Sections 2.0 through 7.0 of the evaluation report [ESR-5358](#), comply with the CRC, 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 March 2026.

DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES
Section: 06 05 23.20—Screws

REPORT HOLDER:

ALTENLOH, BRINCK, AND CO.

EVALUATION SUBJECT:

SPAX® SERIES STRUCTURAL WOOD FASTENERS

1.0 REPORT PURPOSE AND SCOPE**Purpose:**

The purpose of this evaluation report supplement is to indicate that the Spax® Series Structural Wood Fasteners, described in ICC-ES evaluation report [ESR-5358](#), has also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2023 Florida Building Code—Building
- 2023 Florida Building Code—Residential

2.0 CONCLUSIONS

The Spax® Series Structural Wood Fasteners, described in Sections 2.0 through 7.0 of the evaluation report [ESR-5358](#), complies with the *Florida Building Code—Building* and the *Florida Building Code—Residential*. The design requirements must be determined in accordance with the *Florida Building Code—Building* or the *Florida Building Code—Residential*, as applicable. The installation requirements noted in ICC-ES evaluation report [ESR-5358](#) for the 2021 *International Building Code*® meet the requirements of the *Florida Building Code—Building* or the *Florida Building Code—Residential*, as applicable.

Use of the Spax® Series Structural Wood Fasteners for compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* or the *Florida Building Code—Residential* has not been evaluated, and is outside the scope of this supplemental report.

For products falling under Florida Rule 61G20-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official, when the report holder does not possess an approval by the Commission). Florida Rule 61G20-3 is applicable to products and/or systems which comprise the building envelope and structural frame for compliance with the structural requirements of the Florida Building Code.

This supplement expires concurrently with the evaluation report, reissued March 2026.