



Listing and Technical Evaluation Report™

A Duly Authenticated Report from an Approved Agency

Report No: 2410-103



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SPAX® PowerLags® XF-Series Fasteners for Use in Multi-Ply Applications

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CSI Designations:

DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

Section: 06 00 90 - Wood and Plastic Fastenings

Section: 06 05 23 - Wood, Plastic, and Composite Fastenings

1 Innovative Products Evaluated¹

1.1 SPAX PowerLags XF-Series Structural Wood Fasteners:

1.1.1 1/4" SPAX PowerLags XF Screws:

1.1.1.1 XFP250

1.1.1.2 XFH250

1.1.2 5/16" SPAX PowerLags XF Screws:

1.1.2.1 XFP312

1.1.2.2 XFH312

1.1.3 3/8" SPAX PowerLags XF Screws:

1.1.3.1 XFP375

1.1.3.2 XFH375

2 Product Description and Materials

2.1 The innovative products evaluated in this report are shown in **Figure 1** through **Figure 6**.

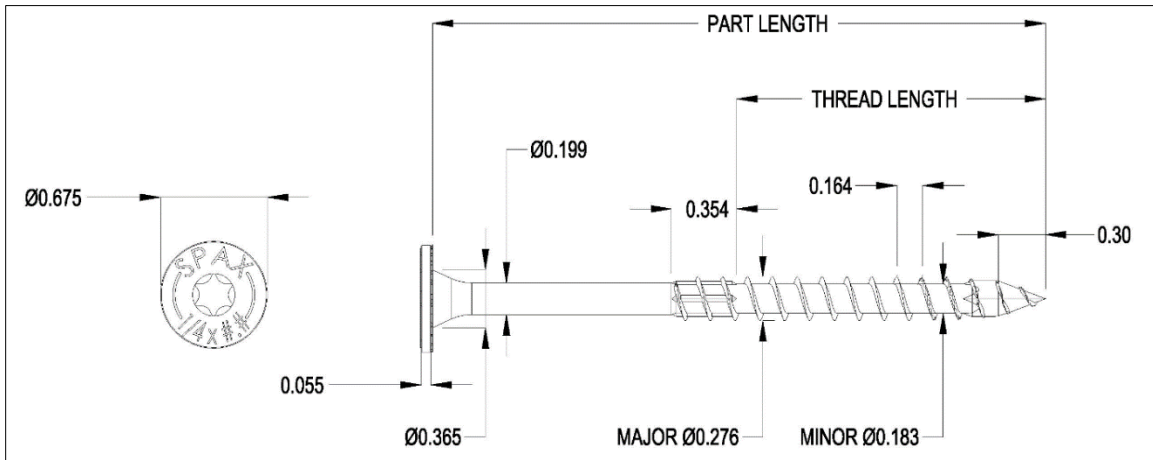


Figure 1. 1/4" SPAX PowerLags XF Screws – Pancake Head (XFP250)

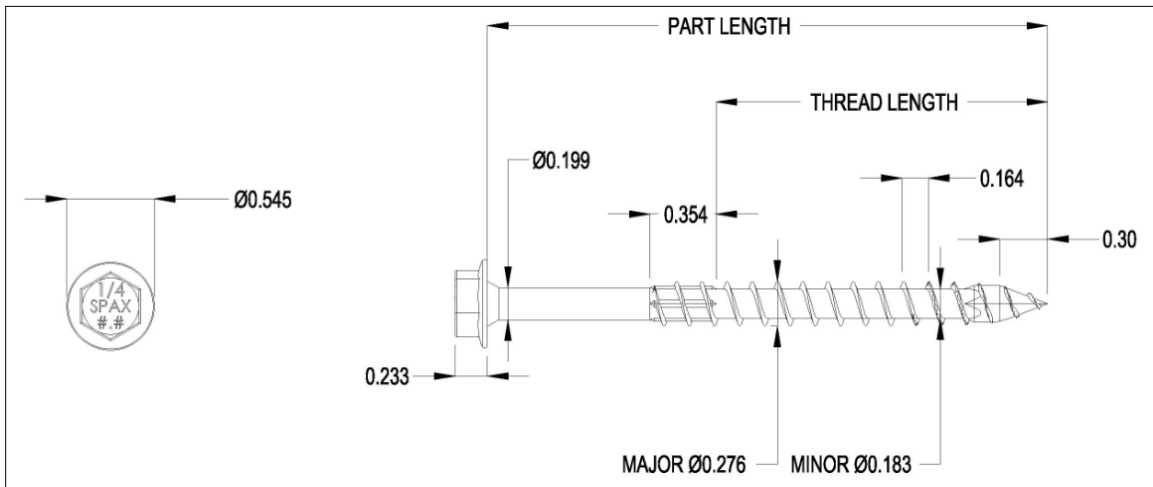


Figure 2. 1/4" SPAX PowerLags XF Screws – Hex Head (XFH250)

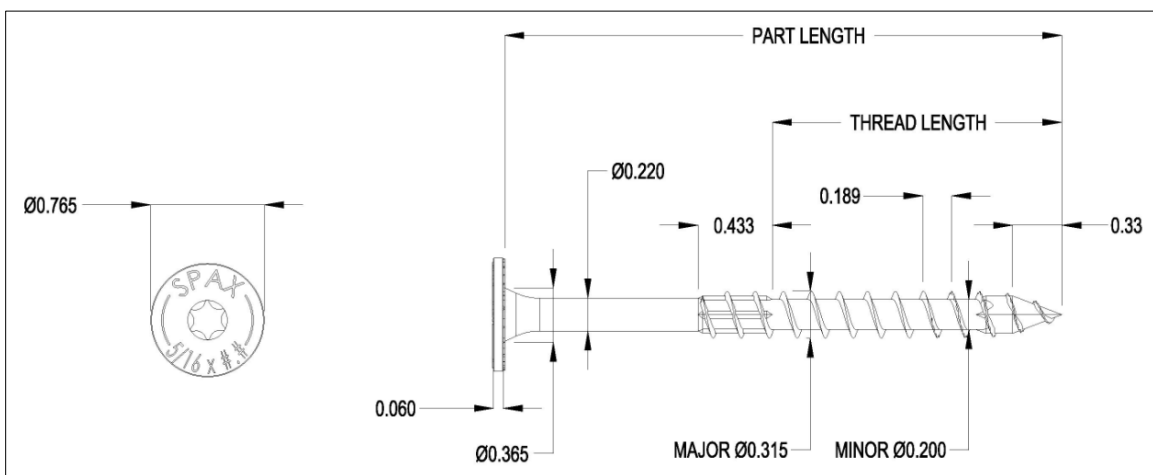


Figure 3. 5/16" SPAX PowerLags XF Screws – Pancake Head (XFP312)

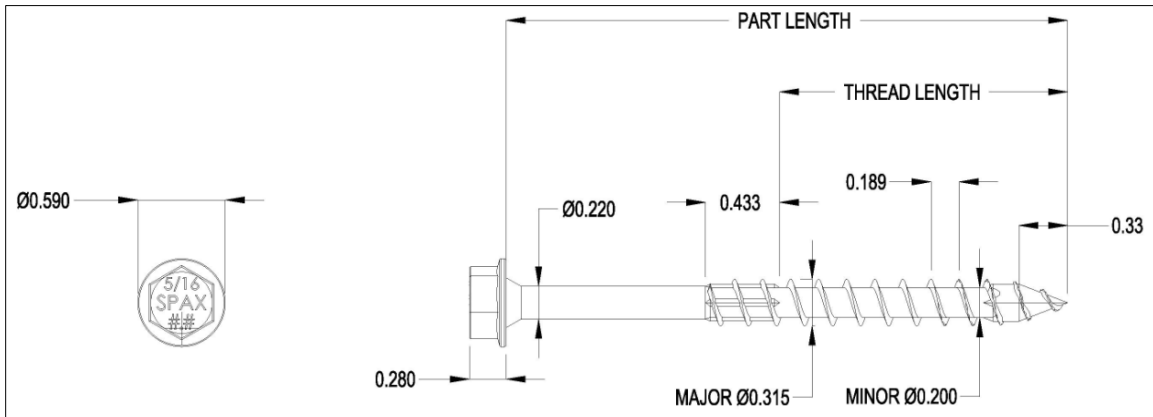


Figure 4. 5/16" SPAX PowerLags XF Screws – Hex Head (XFH312)

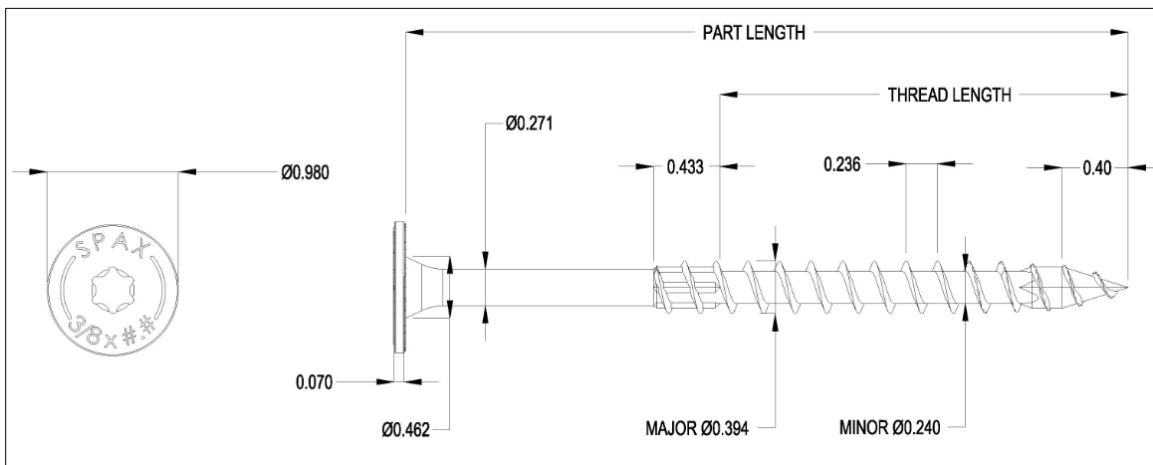


Figure 5. 3/8" SPAX PowerLags XF Screws – Pancake Head (XFP375)

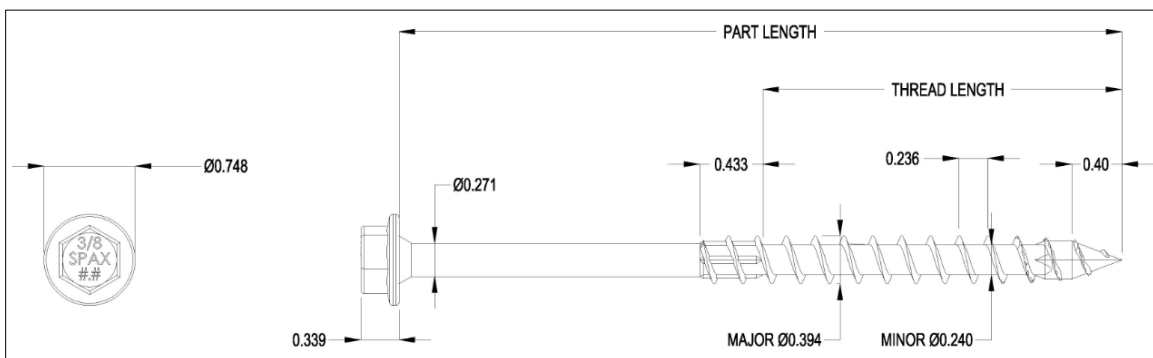


Figure 6. 3/8" SPAX PowerLags XF Screws – Hex Head (XFH375)



2.2 General

- 2.2.1 SPAX PowerLags XF-Series Structural Wood Fasteners are manufactured from carbon steel grade 1022 or 10B21 wire conforming to ASTM A510 or grade 17MnB3 or 19MnB4 wire conforming to DIN 1654 using a standard cold-formed process followed by a heat-treating process.
 - 2.2.1.1 SPAX PowerLags XF-Series Structural Wood Fasteners heads are available with a pancake head or a hex head with an integrated washer.
 - 2.2.1.2 SPAX PowerLags XF-Series Structural Wood Fasteners have a proprietary 4CUT™ Point.²
 - 2.2.1.3 1/4" SPAX PowerLags XF Screws, 5/16" SPAX PowerLags XF Screws, and 3/8" SPAX PowerLags XF Screws having the 4CUT Point, may not require pre-drilling during installation. Pre-drilling may be required if wood is prone to splitting, or for fasteners with diameters larger than 3/8".

2.3 Corrosion Resistance

- 2.3.1 SPAX PowerLags XF-Series Structural Wood Fasteners are available with the proprietary HCR® coating, which exceeds the protection provided by code approved hot-dipped galvanized coatings meeting ASTM A153 (IBC Section 2304.10.6 and IRC Section R304.3³).
 - 2.3.1.1 SPAX PowerLags XF-Series Structural Wood Fasteners with the HCR coating are alternatives to hot-dipped, zinc-coated galvanized fasteners specified in IBC Section 2304.10.6.1, IBC Section 2304.10.6.3, IRC Section R304.3.1,⁴ and IRC Section R304.3.3.⁵
 - 2.3.1.1.1 SPAX PowerLags XF-Series Structural Wood Fasteners with the HCR coating are approved for use in ground-contact and preservative-treated wood (Alkaline Copper Quaternary, or ACQ) in general construction (freshwater) applications, provided the conditions set forth by the preservative-treated lumber manufacturer be met, including appropriate strength reductions.
 - 2.3.1.1.2 SPAX PowerLags XF-Series Structural Wood Fasteners with the HCR coating are approved for use in fire-retardant treated lumber, provided the conditions set forth by the fire-retardant treated lumber manufacturer be met, including appropriate strength reductions.

2.3.2 The HCR coating is available in black.

2.4 Wood Members

- 2.4.1 Solid sawn wood members connected with SPAX PowerLags XF-Series Structural Wood Fasteners shall consist of lumber species or species combinations having a specific gravity of 0.42 to 0.55. See **Table 2**, **Table 3**, and **Table 4**.
- 2.4.2 Structural composite lumber (including, but not limited to, LVL, LSL, PSL, etc.) connected with SPAX PowerLags XF-Series Structural Wood Fasteners shall be recognized in evaluation reports having published equivalent Specific Gravity (SG) for lateral and withdrawal resistance of 0.50. See **Table 5**, **Table 6**, and **Table 7**.

2.5 Fastener Specifications

- 2.5.1 SPAX PowerLags XF-Series Structural Wood Fasteners are set forth in **Table 1**.



Table 1. SPAX PowerLags XF-Series Structural Wood Fasteners Specifications⁵

Fastener Nominal Diameter	Fastener Designation	Head			Length ^{1,2} (in)		Diameter (in)			Bending Yield Strength ³ F _{yb} (psi)	Allowable Steel Strength (lbf)	
		Type	Diameter (in)	Height (in)	Fastener	Thread	Shank	Minor	Major		Tensile	Shear ⁴
1/4"	XFH250P300	Hex Washer Head, 3/8" Hex Driver	0.545	0.233	3	1.535	0.199	0.183	0.276	150,000	1,280	930
	XFH250P312				3 1/2	2.101						
	XFH250P400				4	2.125						
	XFH250P500				5	2.755						
	XFH250P600				6	2.755						
	XFP250P300	Pancake Head, T-40 6 Lobe Recess	0.675	0.055	3	1.535	0.199	0.183	0.276	150,000	1,280	930
	XFP250P312				3 1/2	2.010						
	XFP250P400				4	2.125						
	XFP250P500				5	2.755						
	XFP250P600				6	2.755						
5/16"	XFH312P300	Hex Washer Head, 7/16" Hex Driver	0.590	0.280	3	1.535	0.220	0.200	0.315	160,000	1,630	1,130
	XFH312P312				3 1/2	2.010						
	XFH312P400				4	2.045						
	XFH312P500				5	2.675						
	XFH312P600				6	2.675						
	XFP312P300	Pancake Head, T-40 6 Lobe Recess	0.765	0.060	3	1.535	0.220	0.200	0.315	160,000	1,630	1,130
	XFP312P312				3 1/2	2.010						
	XFP312P400				4	2.045						
	XFP312P500				5	2.675						
	XFP312P600				6	2.675						
XFP312P634	6 3/4	2.675										
3/8"	XFH375P500	Hex Washer Head, 1/2" Hex Driver	0.748	0.339	5	3.190	0.271	0.240	0.394	150,000	2,300	1,740
	XFH375600P				6	3.150						
	XFP375P500	Pancake Head, T-50 6 Lobe Recess	0.980	0.070	5	3.190	0.271	0.240	0.394	150,000	2,300	1,740
	XFP375P600				6	3.150						

SI: 1 in = 25.4 mm, 1 lb = 4.45 N, 1-psi = 0.00689 MPa

1. Fastener length is measured from the underside of the head to the tip.
2. Thread length includes tapered tip (see **Figure 1** through **Figure 6**).
3. Bending yield strength, F_{yb}, is determined in accordance with ASTM F1575 using minor thread diameter when fastener is tested in the threaded section.
4. Shear strength is determined in accordance with ASTM F1575 using shank diameter.
5. Tabulated fastener dimensions are measured on uncoated fasteners. Finished dimensions are larger due to the proprietary coatings added.



- 2.6 In-plant quality control procedures, under which the SPAX PowerLags XF-Series Structural Wood Fasteners are manufactured, are audited through an inspection process performed by an approved agency.
- 2.7 As needed, review material properties for design in **Section 6** and the regulatory evaluation in **Section 8**.

3 Definitions⁶

- 3.1 New Materials⁷ are defined as building materials, equipment, appliances, systems, or methods of construction, not provided for by prescriptive and/or legislatively adopted regulations, known as alternative materials.⁸ The design strength and permissible stresses shall be established by tests⁹ and/or engineering analysis.¹⁰
- 3.2 Duly authenticated reports¹¹ and research reports¹² are test reports and related engineering evaluations that are written by an approved agency¹³ and/or an approved source.¹⁴
 - 3.2.1 This report utilizes intellectual property and/or trade secrets to create public domain material properties for commercial end-use.
 - 3.2.1.1 This report protects confidential Intellectual Property and trade secrets under the regulation, 18.U.S.Code.90, also known as Defend Trade Secrets Act of 2016 (DTSA).¹⁵
- 3.3 An approved agency is “approved” when it is ANAB ISO/IEC 17065 accredited. DrJ Engineering, LLC (DrJ) is accredited and listed in the ANAB directory.
- 3.4 An approved source is “approved” when a professional engineer (i.e., Registered Design Professional, hereinafter RDP) is properly licensed to transact engineering commerce. The regulatory authority governing approved sources is the state legislature via its professional engineering regulations.¹⁶
- 3.5 Testing and/or inspections conducted for this duly authenticated report were performed by an ISO/IEC 17025 accredited testing laboratory, an ISO/IEC 17020 accredited inspection body, and/or a licensed RDP.
 - 3.5.1 The Center for Building Innovation (CBI) is ANAB¹⁷ ISO/IEC 17025 and ISO/IEC 17020 accredited.
- 3.6 The regulatory authority shall enforce¹⁸ the specific provisions of each legislatively adopted regulation. If there is a non-conformance, the specific regulatory section and language of the non-conformance shall be provided in writing¹⁹ stating the nonconformance and the path to its cure.
- 3.7 The regulatory authority shall accept duly authenticated reports from an approved agency and/or an approved source with respect to the quality and manner of use of new materials or assemblies as provided for in regulations regarding the use of alternative materials, designs, or methods of construction.²⁰
- 3.8 ANAB is an International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA) signatory. Therefore, recognition of certificates and validation statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA with the appropriate scope shall be approved.²¹ Thus, all ANAB ISO/IEC 17065 duly authenticated reports are approval equivalent,²² and can be used in any country that is an MLA signatory found at this link: <https://iaf.nu/en/recognised-abs/>
- 3.9 Approval equity is a fundamental commercial and legal principle.²³



4 Applicable Local, State, and Federal Approvals; Standards; Regulations²⁴

4.1 Local, State, and Federal

- 4.1.1 Approved in all local jurisdictions pursuant to ISO/IEC 17065 duly authenticated report use, which includes, but is not limited to, the following featured local jurisdictions: Austin, Baltimore, Broward County, Chicago, Clark County, Dade County, Dallas, Detroit, Denver, DuPage County, Fort Worth, Houston, Kansas City, King County, Knoxville, Las Vegas, Los Angeles City, Los Angeles County, Miami, Nashville, New York City, Omaha, Philadelphia, Phoenix, Portland, San Antonio, San Diego, San Jose, San Francisco, Seattle, Sioux Falls, South Holland, St. Louis County, Texas Department of Insurance, and Wichita.²⁵
- 4.1.2 Approved in all state jurisdictions pursuant to ISO/IEC 17065 duly authenticated report use, which includes, but is not limited to, the following featured states: California, Florida, New Jersey, Oregon, New York, Texas, Washington, and Wisconsin.²⁶
- 4.1.3 Approved by the Code of Federal Regulations Manufactured Home Construction: Pursuant to Title 24, Subtitle B, Chapter XX, Part 3282.14²⁷ and Part 3280²⁸ pursuant to the use of ISO/IEC 17065 duly authenticated reports.
- 4.1.4 Approved means complying with the requirements of local, state, or federal legislation.

4.2 Regulations

- 4.2.1 *IBC – 18, 21, 24: International Building Code®*
- 4.2.2 *IRC – 18, 21, 24: International Residential Code®*

4.3 Standards

- 4.3.1 *ANSI/AWC NDS: National Design Specification (NDS) for Wood Construction*
- 4.3.2 *ASTM A153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*
- 4.3.3 *ASTM A510: Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel*
- 4.3.4 *ASTM B117: Standard Practice for Operating Salt Spray (Fog) Apparatus*
- 4.3.5 *ASTM D1761: Standard Test Methods for Mechanical Fasteners in Wood*
- 4.3.6 *ASTM D2395: Standard Test Methods for Density and Specific Gravity (Relative Density) of Wood and Wood-Based Materials*
- 4.3.7 *ASTM D4442: Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials*
- 4.3.8 *ASTM F1575: Standard Test Methods for Determining Bending Yield Moment of Nails, Spikes, and Dowel-type Threaded Fasteners*
- 4.3.9 *ASTM G85: Standard Practice for Modified Salt Spray (Fog) Testing*

5 Listed²⁹

- 5.1 Equipment, materials, products, or services included in a List published by a nationally recognized testing laboratory (e.g., CBI), an approved agency (e.g., CBI and DrJ), and/or and approved source (e.g., DrJ), or other organization(s) concerned with product evaluation (e.g., DrJ), that maintains periodic inspection (e.g., CBI) of production of listed equipment or materials, and whose listing states either that the equipment or material meets nationally recognized standards or has been tested and found suitable for use in a specified manner.

6 Tabulated Properties Generated from Nationally Recognized Standards

6.1 General

- 6.1.1 SPAX PowerLags XF-Series Structural Wood Fasteners are self-tapping screws used for attaching multi-ply wood members including trusses, sawn lumber, and engineered wood products.
- 6.1.2 SPAX PowerLags XF-Series Structural Wood Fasteners may be installed without lead holes, as prescribed in the NDS.

6.2 Design

- 6.2.1 The design of SPAX PowerLags XF-Series Structural Wood Fasteners are governed by the applicable code and the provisions for dowel type fasteners in the NDS.
- 6.2.2 Unless otherwise noted, adjustment of the design stresses for duration of load shall be in accordance with the applicable code.

6.3 Multi-Ply Connection Design Values for Solid Sawn Lumber

- 6.3.1 Reference lateral design values for multi-ply beams secured with SPAX PowerLags XF-Series Structural Wood Fasteners as depicted in **Figure 7**, and are specified in **Table 2** through **Table 7**.

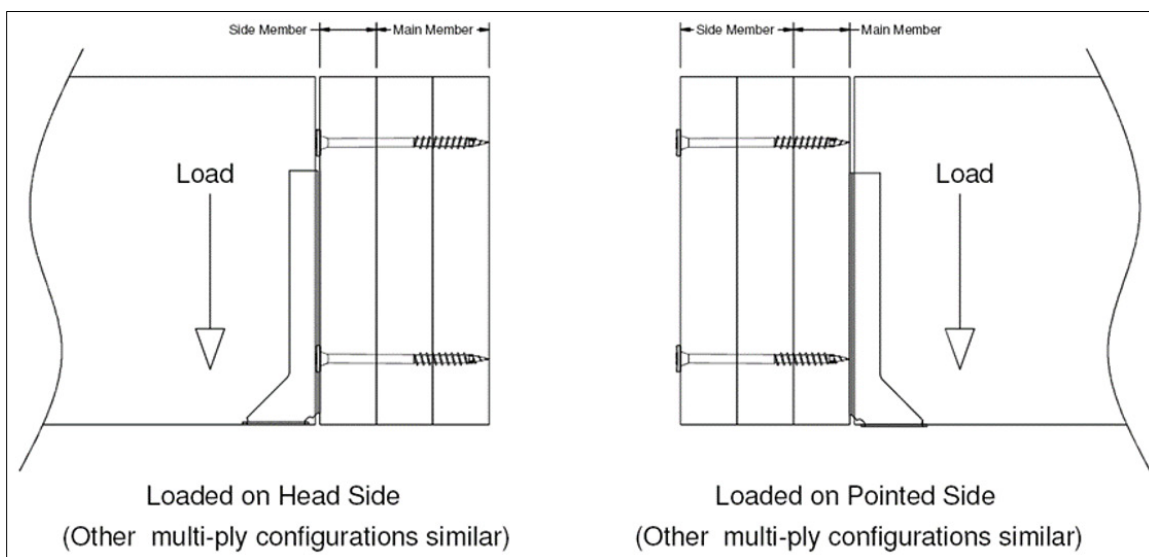


Figure 7. Loading Diagram for Shear Perpendicular to Grain

6.3.2 Multi-ply solid sawn beam assembly configurations are shown in **Figure 8**.

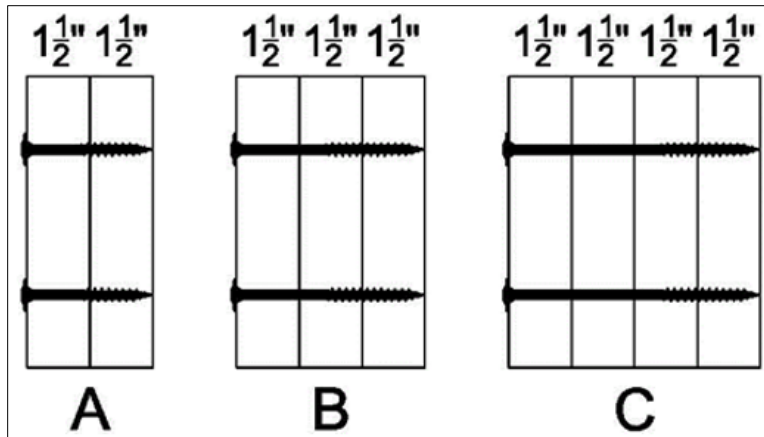


Figure 8. Multi-Ply Assemblies Installed with SPAX PowerLags XF-Series Structural Wood Fasteners

6.3.3 Allowable uniform loads (plf), applied to either outside member (i.e., loaded on the head side of the fastener or loaded on the point side of the fastener), for multi-ply solid sawn lumber beams fastened with:

6.3.3.1 $1/4$ " SPAX PowerLags XF-Series Structural Wood Fasteners are provided in **Table 2**.

6.3.3.2 $5/16$ " SPAX PowerLags XF-Series Structural Wood Fasteners are provided in **Table 3**.

6.3.3.3 $3/8$ " SPAX PowerLags XF-Series Structural Wood Fasteners are provided in **Table 4**.

Table 2. $1/4$ " SPAX PowerLags XF-Series Structural Wood Fasteners Allowable Lateral Design Values^{2,3,4,5} (plf)

Multi-Ply Members		Minimum Fastener Length ¹ (in)	Loaded Side	SPF/HF (SG = 0.42)						DF/SP (SG = 0.50)					
Assembly	Components			12" o.c.		16" o.c.		24" o.c.		12" o.c.		16" o.c.		24" o.c.	
				2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows
A	2-Ply 1 1/2"	3	Either	480	715	360	540	240	360	630	940	470	705	315	470
B	3-Ply 1 1/2"	4	Head	415	620	310	465	205	310	525	790	395	590	265	395
			Point	320	485	240	360	160	240	390	580	290	435	195	290
C	4-Ply 1 1/2"	6	Head	370	555	275	415	185	275	465	700	350	525	235	350
			Point	330	495	250	370	165	250	420	630	315	470	210	315

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

- Fastener length is measured from the underside of the head to the top.
- For wood species with an assigned specific gravity between 0.42 and 0.50, use the tabulated values for specific gravity of 0.42. For wood species with an assigned specific gravity greater than 0.50, use the tabulated values for specific gravity of 0.50.
- Allowable design values are based on a load duration factor $C_D = 1.0$ and shall be multiplied by all applicable adjustment factors per the NDS.
- Where loads are applied to both sides of the beam simultaneously, the load applied to the either side of beam shall not exceed the tabulated load for the corresponding side.
- All design values are also applicable to top-loaded assemblies with even loading across the width of the entire assembly. For top-loaded members with even loading across the width of the entire assembly, fasteners shall be installed in two (2) rows with a maximum distance of 32" o.c. between fasteners in the same row.



Table 3. ⁵/₁₆" SPAX PowerLags XF-Series Structural Wood Fasteners Allowable Lateral Design Values^{2,3,4,5} (plf)

Multi-Ply Members		Minimum Fastener Length ¹ (in)	Loaded Side	SPF/HF (SG = 0.42)						DF/SP (SG = 0.50)					
Assembly	Components			12" o.c.		16" o.c.		24" o.c.		12" o.c.		16" o.c.		24" o.c.	
				2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows
A	2-Ply 1 1/2"	3	Either	480	725	360	545	240	360	665	995	500	750	330	500
B	3-Ply 1 1/2"	4	Head	445	670	335	505	225	335	575	860	430	645	285	430
			Point	365	550	275	410	185	275	435	650	325	490	215	325
C	4-Ply 1 1/2"	6	Head	400	595	300	445	200	300	510	765	380	575	255	380
			Point	360	540	270	405	180	270	450	675	335	505	225	335

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

1. Fastener length is measured from the underside of the head to the top.
2. For wood species with an assigned specific gravity between 0.42 and 0.50, use the tabulated values for specific gravity of 0.42. For wood species with an assigned specific gravity greater than 0.50, use the tabulated values for specific gravity of 0.50.
3. Allowable design values are based on a load duration factor $C_D = 1.0$ and shall be multiplied by all applicable adjustment factors per the NDS.
4. Where loads are applied to both sides of the beam simultaneously, the load applied to the either side of beam shall not exceed the tabulated load for the corresponding side.
5. All design values are also applicable to top-loaded assemblies with even loading across the width of the entire assembly. For top-loaded members with even loading across the width of the entire assembly, fasteners shall be installed in two (2) rows with a maximum distance of 32" o.c. between fasteners in the same row.

Table 4. ³/₈" SPAX PowerLags XF-Series Structural Wood Fasteners Allowable Lateral Design Values^{2,3,4,5} (plf)

Multi-Ply Members		Minimum Fastener Length ¹ (in)	Loaded Side	SPF/HF (SG = 0.42)						DF/SP (SG = 0.50)					
Assembly	Components			12" o.c.		16" o.c.		24" o.c.		12" o.c.		16" o.c.		24" o.c.	
				2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows
C	4-Ply 1 1/2"	6	Head	445	670	335	505	225	335	565	845	425	635	280	425
			Point	410	610	305	460	205	305	500	750	375	560	250	375

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

1. Fastener length is measured from the underside of the head to the top.
2. For wood species with an assigned specific gravity between 0.42 and 0.50, use the tabulated values for specific gravity of 0.42. For wood species with an assigned specific gravity greater than 0.50, use the tabulated values for specific gravity of 0.50.
3. Allowable design values are based on a load duration factor $C_D = 1.0$ and shall be multiplied by all applicable adjustment factors per the NDS.
4. Where loads are applied to both sides of the beam simultaneously, the load applied to the either side of beam shall not exceed the tabulated load for the corresponding side.
5. All design values are also applicable to top-loaded assemblies with even loading across the width of the entire assembly. For top-loaded members with even loading across the width of the entire assembly, fasteners shall be installed in two (2) rows with a maximum distance of 32" o.c. between fasteners in the same row.

6.4 Multi-Ply Connection Design Values for Structural Composite Lumber (SCL)

6.4.1 Multi-ply SCL beam assembly configurations are shown in **Figure 9**.

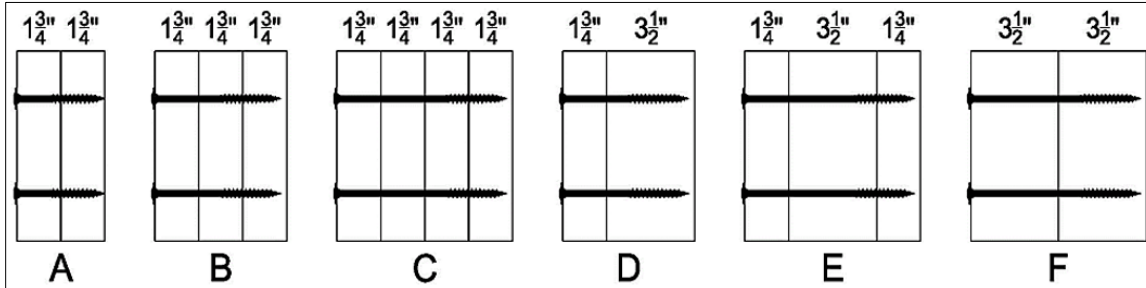


Figure 9. Multi-ply Assemblies Installed with SPAX PowerLags XF-Series Structural Wood Fasteners

6.4.2 Allowable uniform loads (plf) applied to either outside member for multi-ply SCL beams fastened with:

6.4.2.1 1/4" SPAX PowerLags XF-Series Structural Wood Fasteners are provided in **Table 5**.

6.4.2.2 5/16" SPAX PowerLags XF-Series Structural Wood Fasteners are provided in **Table 6**.

6.4.2.3 3/8" SPAX PowerLags XF-Series Structural Wood Fasteners are provided in **Table 7**.

Table 5. 1/4" SPAX PowerLags XF-Series Structural Wood Fasteners Allowable Lateral Design Values^{2,3,4,5} (plf)

Multi-Ply Members		Minimum Fastener Length ¹ (in)	Loaded Side	12" o.c.		16" o.c.		24" o.c.	
Assembly	Components			2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows
A	2-Ply 1 3/4"	3	Either	700	1,050	525	790	350	525
B	3-Ply 1 3/4"	5	Head	525	790	395	590	265	395
			Point	470	705	355	530	235	355
C	4-Ply 1 3/4"	6	Head	465	700	350	525	235	350
			Point	330	495	250	370	165	250
D	2-Ply 1 3/4" and 3 1/2"	5	Head	700	1,050	525	790	350	525
			Point	630	940	470	705	315	470
E	3-Ply 1 3/4" and 3 1/2"	6	Head	525	790	395	590	265	395
			Point	370	555	280	420	185	280
F	2-Ply 3 1/2"	6	Either	700	1,050	525	790	350	525

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

- Fastener length is measured from the underside of the head to the top.
- Wood members (SCL) shall have an equivalent specific gravity of 0.50 or greater.
- Allowable design values are based on a load duration factor of $C_D = 1.0$ and shall be multiplied by all applicable adjustment factors per the NDS.
- Where loads are applied to both sides of the beam simultaneously, the load applied to the either side of beam shall not exceed the tabulated load for the corresponding side.
- All design values are also applicable to top-loaded assemblies with even loading across the width of the entire assembly. For top-loaded members with even loading across the width of the entire assembly, and a depth of 18" or less, fasteners shall be installed in two (2) rows with a maximum distance of 24" o.c. between fasteners in the same row. Use three (3) rows for members deeper than 18".



Table 6. ⁵/₁₆" SPAX PowerLags XF-Series Structural Wood Fasteners Allowable Lateral Design Values^{2,3,4,5} (pf)

Multi-Ply Members		Minimum Fastener Length ¹ (in)	Loaded Side	12" o.c.		16" o.c.		24" o.c.	
Assembly	Components			2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows
A	2-Ply 1 ³ / ₄ "	3 ¹ / ₂	Either	740	1,110	555	835	370	555
B	3-Ply 1 ³ / ₄ "	5	Head	605	905	455	680	300	455
			Point	505	755	380	565	250	380
C	4-Ply 1 ³ / ₄ "	6 ³ / ₄	Head	535	805	405	605	270	405
			Point	450	675	335	505	225	335
D	2-Ply 1 ³ / ₄ " and 3 ¹ / ₂ "	5	Head	805	1,210	605	905	405	605
			Point	675	1,010	505	755	335	505
E	3-Ply 1 ³ / ₄ " and 3 ¹ / ₂ "	6 ³ / ₄	Head	605	905	455	680	300	455
			Point	505	755	380	565	250	380
F	2-Ply 3 ¹ / ₂ "	6 ³ / ₄	Either	805	1,210	605	905	405	605

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

1. Fastener length is measured from the underside of the head to the top.
2. Wood members (SCL) shall have an equivalent specific gravity of 0.50 or greater.
3. Allowable design values are based on a load duration factor of $C_D = 1.0$ and shall be multiplied by all applicable adjustment factors per the NDS.
4. Where loads are applied to both sides of the beam simultaneously, the load applied to the either side of beam shall not exceed the tabulated load for the corresponding side.
5. All design values are also applicable to top-loaded assemblies with even loading across the width of the entire assembly. For top-loaded members with even loading across the width of the entire assembly, and a depth of 18" or less, fasteners shall be installed in two (2) rows with a maximum distance of 24" o.c. between fasteners in the same row. Use three (3) rows for members deeper than 18".

Table 7. ³/₈" SPAX PowerLags XF-Series Structural Wood Fasteners Allowable Lateral Design Values^{2,3,4,5} (pf)

Multi-Ply Members		Minimum Fastener Length ¹ (in)	Loaded Side	12" o.c.		16" o.c.		24" o.c.	
Assembly	Components			2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows
B	3-Ply 1 ³ / ₄ "	5	Head	690	1,035	515	775	345	515
			Point	560	840	420	630	280	420
C	4-Ply 1 ³ / ₄ "	6 ⁶	Head	615	920	460	690	305	460
D	2-Ply 1 ³ / ₄ " and 3 ¹ / ₂ "	5	Head	920	1,380	690	1,035	460	690
			Point	750	1,120	560	840	375	560
E	3-Ply 1 ³ / ₄ " and 3 ¹ / ₂ "	6 ⁶	Head	690	1,035	515	775	345	515
F	2-Ply 3 ¹ / ₂ "	6	Either	970	1,450	725	1,090	485	725

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

1. Fastener length is measured from the underside of the head to the top.
2. Wood members (SCL) shall have an equivalent specific gravity of 0.50 or greater.
3. Allowable design values are based on a load duration factor of $C_D = 1.0$ and shall be multiplied by all applicable adjustment factors per the NDS.
4. Where loads are applied to both sides of the beam simultaneously, the load applied to the either side of beam shall not exceed the tabulated load for the corresponding side.
5. All design values are also applicable to top-loaded assemblies with even loading across the width of the entire assembly. For top-loaded members with even loading across the width of the entire assembly, and a depth of 18" or less, fasteners shall be installed in two (2) rows with a maximum distance of 24" o.c. between fasteners in the same row. Use three (3) rows for members deeper than 18".
6. Loading on point-side lamination is not permitted.



6.5 Alternative techniques shall be permitted in accordance with accepted engineering practice and experience. These provisions for the use of alternative materials, designs, and methods of construction are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed herein. This includes, but is not limited to, the following areas of engineering: mechanics of materials, structures, building science, and fire science.

7 Certified Performance³⁰

- 7.1 All construction methods shall conform to accepted engineering practices to ensure durable, livable, and safe construction and shall demonstrate acceptable workmanship reflecting journeyman quality of work of the various trades.³¹
- 7.2 The strength and rigidity of the component parts and/or the integrated structure shall be determined by engineering analysis or by suitable load tests to simulate the actual loads and conditions of application that occur.³²

8 Regulatory Evaluation and Accepted Engineering Practice

- 8.1 SPAX PowerLags XF-Series Structural Wood Fasteners comply with the following legislatively adopted regulations and/or accepted engineering practice for the following reasons:
- 8.1.1 SPAX PowerLags XF-Series Structural Wood Fasteners were evaluated to determine their ability to provide multi-ply attachment in trusses, sawn lumber, and engineered wood applications using the methodology and provisions in the NDS.
- 8.1.2 Corrosion resistance in accordance with ASTM B117 and ASTM G85, Annex A5.
- 8.2 Any building code, regulation and/or accepted engineering evaluations (e.g., research reports, duly authenticated reports, etc.) that are conducted for this Listing were performed by DrJ, which is an ISO/IEC 17065 accredited certification body and a professional engineering company operated by RDP or approved sources. DrJ is qualified³³ to practice product and regulatory compliance services within its scope of accreditation and engineering expertise,³⁴ respectively.
- 8.3 Engineering evaluations are conducted with DrJ's ANAB accredited ICS code scope of expertise, which is also its areas of professional engineering competence.

9 Installation

- 9.1 Installation shall comply with the approved construction documents, the manufacturer installation instructions, this report, and the applicable building code.
- 9.2 In the event of a conflict between the manufacturer installation instructions and this report, contact the manufacturer for counsel on the proper installation method.
- 9.3 *Installation Procedure*
- 9.3.1 SPAX PowerLags XF-Series Structural Wood Fasteners shall be installed using the driver bits specified in **Table 1**.
- 9.3.1.1 SPAX PowerLags XF-Series Structural Wood Fasteners shall be installed using a high-torque, low speed drill in accordance with the manufacturer installation instructions, applicable code, the approved construction documents, this report, the NDS, and standard framing practice as applied to wood fasteners.
- 9.3.1.2 Use of an impact driver is also permitted.
- 9.3.1.3 Fasteners shall not be struck with a hammer during installation.



- 9.3.2 Pre-drilling of pilot holes for 1/4" SPAX PowerLags XF Screws, 5/16" SPAX PowerLags XF Screws, and 3/8" SPAX PowerLags XF Screws, is not required but may be used where lumber is prone to splitting using the provisions in NDS Chapter 12.
- 9.3.3 The bottom of the fastener head must be installed flush to the surface of the wood side member being connected. Fastener must not be overdriven.
- 9.3.4 Minimum penetration into main member (final member in multi-ply assembly) is 1.5", unless otherwise stated in this report.
- 9.3.5 Minimum edge distance, end distance, and spacing between rows shall be as specified in **Table 8**.
- 9.3.6 For applications outside the scope of this report, an engineered design is required.

Table 8. SPAX PowerLags XF-Series Structural Wood Fasteners Spacing Requirements

Connection Geometry	Minimum Spacing/Distance ^{1,2,3} (in)		
	Nominal Diameter		
	1/4"	5/16"	3/8"
Edge Distance – Load in any direction	1/2	5/8	3/4
End Distance – Load parallel to grain, towards end	3	3 3/8	4 1/8
End Distance – Load parallel to grain, away from end	2	2 1/4	2 3/4
End Distance – Load perpendicular to grain	2	2 1/4	2 3/4
Spacing between Fasteners in a Row – Parallel to grain	3	3 3/8	4 1/8
Spacing between Fasteners in a Row – Perpendicular to grain	2	2 1/4	2 3/4
Spacing between Rows of Fasteners – In-line	1	1 1/8	1 3/8
Spacing between Rows of Fasteners – Staggered	1/2	5/8	3/4

SI: 1 in = 25.4 mm

1. Edge distances, end distances, and spacing of fasteners shall be sufficient to prevent splitting of the wood or as shown in this table, whichever is more restrictive.
2. Values for "Spacing between Rows of Fasteners – Staggered" apply where the fasteners in adjacent rows are offset by one-half of the "Spacing between Fasteners in a Row".

10 Substantiating Data

- 10.1 Testing has been performed under the supervision of a professional engineer and/or under the requirements of ISO/IEC 17025 as follows:
 - 10.1.1 Bending yield testing in accordance with ASTM F1575
 - 10.1.2 Tensile strength testing in accordance with AISI S904
 - 10.1.3 Shear strength testing in accordance with AISI S904
 - 10.1.4 Reference lateral design values in accordance with the NDS
 - 10.1.5 Multi-Ply design value calculations by DrJ Engineering, LLC



- 10.2 Information contained herein may include the result of testing and/or data analysis by sources that are approved agencies, approved sources, and/or an RDP. Accuracy of external test data and resulting analysis is relied upon.
- 10.3 Where applicable, testing and/or engineering analysis are based upon provisions that have been codified into law through state or local adoption of regulations and standards. The developers of these regulations and standards are responsible for the reliability of published content. DrJ's engineering practice may use a regulation-adopted provision as the control. A regulation-endorsed control versus a simulation of the conditions of application to occur establishes a new material as being equivalent to the regulatory provision in terms of quality, strength, effectiveness, fire resistance, durability, and safety.
- 10.4 The accuracy of the provisions provided herein may be reliant upon the published properties of raw materials, which are defined by the grade mark, grade stamp, mill certificate, or duly authenticated reports from approved agencies and/or approved sources provided by the supplier. These are presumed to be minimum properties and relied upon to be accurate. The reliability of DrJ's engineering practice, as contained in this duly authenticated report, may be dependent upon published design properties by others.
- 10.5 *Testing and Engineering Analysis*
- 10.5.1 The strength, rigidity, and/or general performance of component parts and/or the integrated structure are determined by suitable tests that simulate the actual conditions of application that occur and/or by accepted engineering practice and experience.³⁵
- 10.6 Where additional condition of use and/or regulatory compliance information is required, please search for SPAX PowerLags XF-Series Structural Wood Fasteners on the DrJ Certification website.

11 Findings

- 11.1 As outlined in **Section 6**, SPAX PowerLags XF-Series Structural Wood Fasteners have performance characteristics that were tested and/or meet applicable regulations. In addition, they are suitable for use pursuant to its specified purpose.
- 11.2 When used and installed in accordance with this duly authenticated report and the manufacturer installation instructions, SPAX PowerLags XF-Series Structural Wood Fasteners shall be approved for the following applications:
- 11.2.1 SPAX PowerLags XF-Series Structural Wood Fasteners are suitable to provide multi-ply attachment in trusses, sawn lumber, and engineered wood applications.
- 11.2.2 HCR coated SPAX PowerLags XF-Series Structural Wood Fasteners are approved for use in:
- 11.2.2.1 Pressure-treated (ACQ) lumber, provided the conditions set forth by the pressure-treated lumber manufacturer be met, including appropriate strength reductions.
- 11.2.2.2 Fire-retardant treated lumber, provided the conditions set forth by the fire-retardant treated lumber manufacturer be met, including appropriate strength reductions.
- 11.3 Unless exempt by state statute, when SPAX PowerLags XF-Series Structural Wood Fasteners are to be used as a structural and/or building envelope component in the design of a specific building, the design shall be performed by an RDP.
- 11.4 Any application specific issues not addressed herein can be engineered by an RDP. Assistance with engineering is available from Altenloh, Brinck & Company U.S., Inc.
- 11.5 IBC Section 104.2.3³⁶ (IRC Section R104.2.2³⁷ and IFC Section 104.2.3³⁸ are similar) in pertinent part state:

104.2.3 Alternative Materials, Design and Methods of Construction and Equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative is not specifically prohibited by this code and has been approved.



- 11.6 **Approved:**³⁹ Building regulations require that the building official shall accept duly authenticated reports.⁴⁰
- 11.6.1 An approved agency is “*approved*” when it is ANAB ISO/IEC 17065 accredited.
- 11.6.2 An approved source is “*approved*” when an RDP is properly licensed to transact engineering commerce.
- 11.6.3 Federal law, Title 18 US Code Section 242, requires that, where the alternative product, material, service, design, assembly, and/or method of construction is not approved, the building official shall respond in writing, stating the reasons why the alternative was not approved. Denial without written reason deprives a protected right to free and fair competition in the marketplace.
- 11.7 DrJ is a licensed engineering company, employs licensed RDPs and is an ANAB Accredited Product Certification Body – Accreditation #1131.
- 11.8 Through the IAF Multilateral Arrangement (MLA), this duly authenticated report can be used to obtain product approval in any jurisdiction or country because all ANAB ISO/IEC 17065 duly authenticated reports are equivalent.⁴¹

12 Conditions of Use

- 12.1 As defined in **Section 6**, where material and/or engineering mechanics properties are created for load resisting design purposes, the resistance to the applied load shall not exceed the ability of the defined properties to resist those loads using the principles of accepted engineering practice.
- 12.2 As listed herein, SPAX PowerLags XF-Series Structural Wood Fasteners shall be:
- 12.2.1 Installed in accordance with this report and the manufacturer installation instructions.
- 12.2.2 Limited to freshwater and chemically treated wood exposure.
- 12.3 For conditions not covered in this report, connections shall be designed in accordance with generally accepted engineering practice. When the capacity of a connection is controlled by fastener metal strength rather than wood strength, the metal strength must not be multiplied by the adjustment factors specified in the NDS.
- 12.4 When required by adopted legislation and enforced by the building official, also known as the Authority Having Jurisdiction (AHJ) in which the project is to be constructed:
- 12.4.1 Any calculations incorporated into the construction documents shall conform to accepted engineering practice and, when prepared by an approved source, shall be approved when signed and sealed.
- 12.4.2 This report and the installation instructions shall be submitted at the time of permit application.
- 12.4.3 These innovative products have an internal quality control program and a third-party quality assurance program.
- 12.4.4 At a minimum, these innovative products shall be installed per **Section 9**.
- 12.4.5 The review of this report by the AHJ shall comply with IBC Section 104.2.3.2 and IBC Section 105.3.1.
- 12.4.6 These innovative products have an internal quality control program and a third party quality assurance program in accordance with IBC Section 104.7.2, IBC Section 110.4, IBC Section 1703, IRC Section R104.7.2, and IRC Section R109.2.
- 12.4.7 The application of these innovative products in the context of this report is dependent upon the accuracy of the construction documents, implementation of installation instructions, inspection as required by IBC Section 110.3, IRC Section R109.2, and any other regulatory requirements that may apply.
- 12.5 The approval of this report by the AHJ shall comply with IBC Section 1707.1, where legislation states in part, “*the building official shall make, or cause to be made, the necessary tests and investigations; or the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in Section 104.2.3*”, all of IBC Section 104, and IBC Section 105.3.



- 12.6 Design loads shall be determined in accordance with the regulations adopted by the jurisdiction in which the project is to be constructed and/or by the building designer (i.e., owner or RDP).
- 12.7 The actual design, suitability, and use of this report for any particular building, is the responsibility of the owner or the authorized agent of the owner.

13 Identification

- 13.1 SPAX PowerLags XF-Series Structural Wood Fasteners ($1/4$ ", $5/16$ " and $3/8$ " SPAX PowerLags XF Screws), as listed in **Section 1**, are identified by a label on the board or packaging material bearing the manufacturer name, product name, this report number, and other information to confirm code compliance.
- 13.2 Additional technical information can be found at spax.us.

14 Review Schedule

- 14.1 This report is subject to periodic review and revision. For the latest version, visit www.drjcertification.org.
- 14.2 For information on the status of this report, please contact [DrJ Certification](#).



Notes

1 For more information, visit drjcertification.org or call us at 608-310-6748.

2 The unique 4CUT™ Point prevents splitting and requires no pre-drilling in wood applications.

3 [2021 IRC Section R317.3](#)

4 [2021 IRC Section R317.3.1](#)

5 [2021 IRC Section R317.3.3](#)

6 Capitalized terms and responsibilities are defined pursuant to the applicable building code, applicable reference standards, the latest edition of [TPI 1](#), the [NDS](#), [AISI S202](#), [US professional engineering law](#), [Canadian building code](#), [Canada professional engineering law](#), [Qualitum External Appendix A: Definitions/Commentary](#), [Qualitum External Appendix B: Project/Deliverables](#), [Qualitum External Appendix C: Intellectual Property and Trade Secrets](#), definitions created within Design Drawings and/or definitions within Reference Sheets. Beyond this, terms not defined shall have ordinarily accepted meanings as the context implies. Words used in the present tense include the future; words stated in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural, the singular.

7 <https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1702>

8 Alternative Materials, Design and Methods of Construction and Equipment: The provisions of any regulation code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by a regulation. Please review <https://www.justice.gov/atr/mission> and <https://up.codes/viewer/mississippi/ibc-2024/chapter/1/scope-and-administration#104.2.3>

9 <https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1706.2>:-:text=the%20design%20strengths%20and%20permissible%20stresses%20shall%20be%20established%20by%20tests

10 The [design strengths](#) and [permissible stresses](#) of any structural material shall conform to the specifications and methods of design of accepted engineering practice. <https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1706.1>:-:text=Conformance%20to%20Standards-.The%20design%20strengths%20and%20permissible%20stresses,-of%20any%20structural

11 <https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1707.1>:-:text=the%20building%20official%20shall%20make%20or%20cause%20to%20be%20made%20the%20necessary%20tests%20and%20investigations%3B%20or%20the%20building%20official%20shall%20accept%20duly%20authenticated%20reports%20from%20approved%20agencies%20in%20respect%20to%20the%20quality%20and%20manner%20of%20use%20of%20new%20materials%20or%20assemblies%20as%20provided%20for%20in%20Section%20104.2.3.

12 <https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1703.4.2>

13 https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#approved_agency

14 https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#approved_source

15 <https://www.law.cornell.edu/uscode/text/18/1832> (b) Any organization that commits any offense described in subsection (a) shall be fined not more than the greater of \$5,000,000 or 3 times the value of the stolen trade secret to the organization, including expenses for research and design and other costs of reproducing the trade secret that the organization has thereby avoided. The [federal government](#) and each state have a [public records act](#). To follow DTSA and comply state public records and trade secret legislation requires approval through [ANAB ISO/IEC 17065 accredited certification bodies](#) or [approved sources](#). For more information, please review this website: [Intellectual Property and Trade Secrets](#).

16 <https://www.nspe.org/resources/issues-and-advocacy/professional-policies-and-position-statements/regulation-professional> AND <https://apassociation.org/list-of-engineering-boards-in-each-state-archive/>

17 <https://www.cbiteest.com/accreditation/>

18 <https://up.codes/viewer/mississippi/ibc-2024/chapter/1/scope-and-administration#104.1>:-:text=directed%20to%20enforce%20the%20provisions%20of%20this%20code

19 <https://up.codes/viewer/mississippi/ibc-2024/chapter/1/scope-and-administration#104.2.3> AND <https://up.codes/viewer/mississippi/ibc-2024/chapter/1/scope-and-administration#105.3.1>

20 <https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1707.1>

21 <https://iaf.nu/en/about-iaf-mia/#>:-:text=Once%20an%20accreditation%20body%20is%20a%20signatory%20of%20the%20IAF%20MLA%20it%20is%20required%20to%20recognise%20certificates%20and%20validation%20and%20verification%20statements%20issued%20by%20conformity%20assessment%20bodies%20accredited%20by%20all%20other%20signatories%20of%20the%20IAF%20MLA%20with%20the%20appropriate%20scope

22 True for all ANAB accredited product evaluation agencies and all International Trade Agreements.

23 <https://www.justice.gov/crt/deprivation-rights-under-color-law> AND <https://www.justice.gov/atr/mission>

24 Unless otherwise noted, the links referenced herein use un-amended versions of the [2024 International Code Council \(ICC\) 2024 International Code Council \(ICC\) model codes](#) as foundation references. Mississippi versions of the [IBC 2024](#) and the [IRC 2024](#) are un-amended. This material, product, design, service and/or method of construction also complies with the 2000-2012 versions of the referenced codes and the standards referenced therein. As pertinent to this technical and code compliance evaluation, CBI and/or DrJ staff have reviewed any state or local regulatory amendments to assure this report is in compliance.

25 See [Adoptions by Publisher](#) for the latest adoption of a non-amended or amended model code by the local jurisdiction. <https://up.codes/codes/general>

26 See [Adoptions by Publisher](#) for the latest adoption of a non-amended or amended model code by state. <https://up.codes/codes/general>

27 <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3282/subpart-A/section-3282.14>

28 <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280>

29 <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#p-3280.2>(Listed%20or%20certified); <https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#listed> AND <https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#labeled>

30 <https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1703.4>

31 <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#>:-:text=All%20construction%20methods%20shall%20be%20in%20conformance%20with%20accepted%20engineering%20practices%20to%20insure%20durable%20livable%20and%20safe%20housing%20and%20shall%20demonstrate%20acceptable%20workmanship%20reflecting%20journeyman%20quality%20of%20work%20of%20the%20various%20trades



- 32 <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#:~:text=The%20strength%20and%20rigidity%20of%20the%20component%20parts%20and/or%20the%20integrated%20structure%20shall%20be%20determined%20by%20engineering%20analysis%20or%20by%20suitable%20load%20tests%20to%20simulate%20the%20actual%20loads%20and%20conditions%20of%20application%20that%20occur>
- 33 Qualification is performed by a legislatively defined Accreditation Body. ANSI National Accreditation Board (ANAB) is the largest independent accreditation body in North America and provides services in more than 75 countries. DrJ is an ANAB accredited product certification body.
- 34 <https://anabpd.ansi.org/Accreditation/product-certification/AllDirectoryDetails?prgID=1&orgID=2125&statusID=4#:~:text=Bill%20Payment%20Date,Accredited%20Scopes,-13%20ENVIRONMENT.%20HEALTH>
- 35 See Code of Federal Regulations (CFR) Title 24 Subtitle B Chapter XX Part 3280 for definition: <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280>
- 36 2021 IBC Section 104.11
- 37 2021 IRC Section R104.11
- 38 2018: <https://up.codes/viewer/wyoming/ifc-2018/chapter/1/scope-and-administration#104.9> AND 2021: <https://up.codes/viewer/wyoming/ibc-2021/chapter/1/scope-and-administration#104.11>
- 39 Approved is an adjective that modifies the noun after it. For example, Approved Agency means that the Agency is accepted officially as being suitable in a particular situation. This example conforms to IBC/IRC/IFC Section 201.4 (<https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#201.4>) where the building code authorizes sentences to have an ordinarily accepted meaning such as the context implies.
- 40 <https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1707.1>
- 41 Multilateral approval is true for all ANAB accredited product evaluation agencies and all International Trade Agreements.