DrJ CERTIFICATION

Technical Evaluation Report™

TER 2010-02

SPAX® Construction Screw Properties

Altenloh, Brinck & Company U.S., Inc.

Products:

#6, #8, #9, #10, #14 SPAX® Construction Screws

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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 Product Evaluated[1,2]

1.1 #6, #8, #9, #10, #14 SPAX® Construction Screws

2 Applicable Codes and Standards[3]

2.1 *Codes*

2.1.1 *IBC—15, 18, 21: International Building Code®*

2.1.2 *IRC—15, 18, 21: International Residential Code®*

2.1.3 *FBC-B—17, 20: Florida Building Code – Building[4]*

2.1.4 *FBC-R—17, 20: Florida Building Code – Residential[4]*

2.2 *Standards and Referenced Documents*

2.2.1 *AISI S904: Standard Test Methods for Determining the Tensile and Shear Strengths of Screws*

2.2.2 *ANSI/AWC NDS: National Design Specification (NDS) for Wood Construction*

2.2.3 *ASTM A153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*

2.2.4 *ASTM A510: Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel*

2.2.5 *ASTM B117: Standard Practice for Operating Salt Spray (Fog) Apparatus*

2.2.6 *ASTM D1761: Standard Test Methods for Mechanical Fasteners in Wood*

2.2.7 *ASTM F1575: Standard Test Method for Determining Bending Yield Moment of Nails*

2.2.8 *ASTM G85: Standard Practice for Modified Salt Spray (Fog) Testing*

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

[2] This TER is a code defined research report provided by an approved source (see IBC Section 1703.4.2) and an approved agency (see IBC Section 1703.1). Given that this TER is for new materials, as defined in IBC Section 1702, for which there are no approved rules or standards, IBC Section 1707.1 states that, "In the absence of approved rules or other approved standards, the building official shall accept duly authenticated reports (i.e. research reports) from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in IBC Section 104.11". A professional engineer is approved as an approved source when that professional engineer is properly licensed to transact engineering commerce.

[3] Unless otherwise noted, all references in this TER are from the 2021 version of the codes and the standards referenced therein. This material, design, or method of construction also complies with the 2000-2018 versions of the referenced codes and the standards referenced therein.

[4] All references to the FBC-B and FBC-R are the same as the 2018 IBC and 2018 IRC, respectively, unless otherwise noted in the supplement at the end of this TER.

2.2.9 *DIN (Deutsches Institut fur Normung E.V.) 1654: Cold Heading & Cold Extruding Steels; Technical Delivery Conditions for Stainless Steels*

2.2.10 *DIN 17440: Technical Delivery Conditions for Stainless Steel Plate, Hot Rolled Strip and bars for Pressure Purposes, Drawn Wire and Forgings*

3 Performance Evaluation

3.1 Testing and related engineering evaluations are defined as intellectual property and/or trade secrets.

3.2 SPAX® Construction Screws were tested and evaluated to determine their structural resistance properties, which are used to develop reference design values for allowable stress design (ASD). The following properties were evaluated:

3.2.1 Bending yield in accordance with ASTM F1575.

3.2.2 Tensile strength in accordance with AISI S904.

3.2.3 Shear strength in accordance with AISI S904.

3.2.4 Head pull-through in accordance with ASTM D1761.

3.2.5 Withdrawal strength in accordance with ASTM D1761.

3.2.6 Lateral resistance in accordance with NDS and ASTM D1761.

3.2.7 Corrosion resistance in accordance with ASTM B117 and ASTM G85.

3.3 Use of fasteners in locations exposed to saltwater or saltwater spray is outside the scope of this TER.

3.4 Engineering evaluations are conducted with DrJ's ANAB accredited ICS code scope, which are also its areas of professional engineering competence.

3.5 Any regulation specific issues not addressed in this section are outside the scope of this TER.

4 Product Description and Materials

4.1 SPAX® Construction Screws are made of hardened carbon steel conforming to ASTM A510 or DIN 1654. Select Construction Screws are made of 304 or 316 stainless steel conforming to ASTM A493 or DIN 17440.

4.2 The fasteners are available with a variety of coatings, including proprietary coating systems designated as zinc, yellow zinc, HCR™, HCR-X™, and WIROX®.

4.3 The SPAX® Construction Screws are available in a variety of sizes with different diameters, head types, and lengths.

4.3.1 #6 SPAX® Construction Screws are shown in Figure 1 and specified in Table 1.

4.3.2 #8 SPAX® Construction Screws are shown in Figure 2 and specified in Table 2.

4.3.3 #9 SPAX® Construction Screws are shown in Figure 3 and specified in Table 3.

4.3.4 #10 SPAX® Construction Screws are shown in Figure 4 and specified in Table 4.

4.3.5 #14 SPAX® Construction Screws are shown in Figure 5 and specified in Table 5.[5]

[5] The #14 x 4" SPAX® T-Star plus Flat-Head Partial Thread Construction Screw is referred to as the XFT14P-4000 throughout this TER.

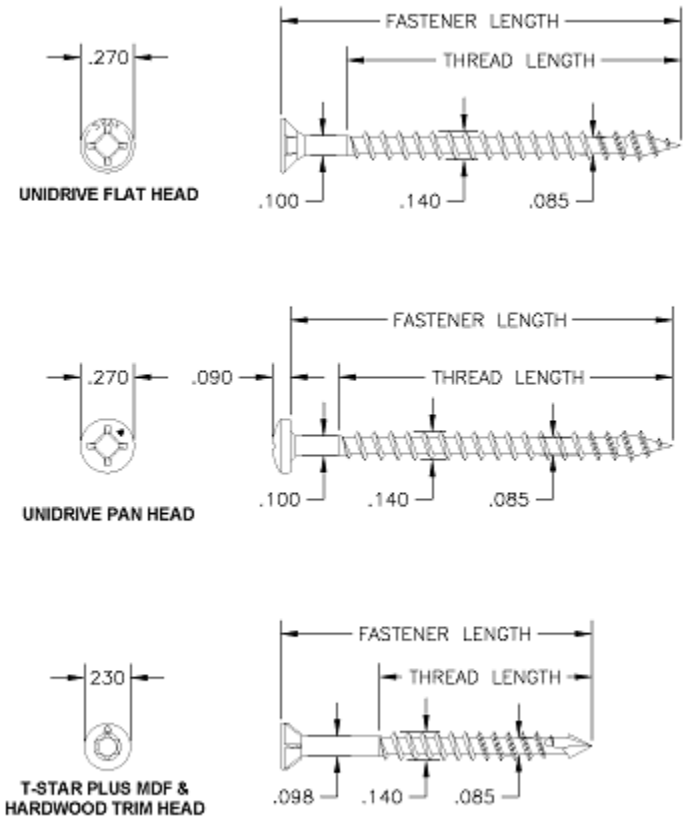

Figure 1. #6 SPAX® Construction Screws

Table 1. #6 SPAX® Construction ScrewSpecifications[5]

Fastener Designation	Part Number	Head				Length (in)		Diameter (in)			TPI	Bending Yield Strength[3], f_{yb} (psi)	Allowable Steel Strength (lbs.)	
		Style	Drive System	Diameter (in)	Height (in)	Fastener[1]	Thread[2]	Shank	Minor	Major			Tensile	Shear[4]
Carbon Steel														
#6 x 3/4"	XFU06-0750	Flat	Unidrive (#2 Cross & #1 Square)	0.270	N/A	0.750	Full	0.100	0.085	0.140	12	198,000	310	265
#6 x 1"	XFU06-1000					1.000								
#6 x 1-1/4"	XFU06-1250					1.250								
#6 x 1-1/2"	XFU06-1500					1.500								
#6 x 1-3/4"	XFU06-1750					1.750	1.575	0.100	0.085	0.140	12	198,000	310	265
#6 x 2"	XFU06-2000					2.000								
#6 x 3/4"	XPU06-0750	Pan	Unidrive (#2 Cross & #1 Square)	0.270	0.090	0.750	Full	0.100	0.085	0.140	12	198,000	310	265
#6 x 1-1/2"	XMT06-1500	MDF/Hard-wood Trim	T15 T-Star Plus	0.230	N/A	1.5	1.06	0.098	0.085	0.140	14	196,000	270	270

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

1. Fastener length is measured from the topside of the head to the tip for flat and MDF/hardwood trim screws and from the underside of the head to the tip for the pan screws.
2. Thread length includes tapered tip (Figure 1).
3. Bending yield strength, F_{yb}, is determined in accordance with ASTM F1575 using minor thread diameter when fastener is tested in threaded section.
4. Shear strength is determined in accordance with AISI S904 using minor thread diameter when fastener is tested in threaded section.
5. Tabulated fastener dimensions are measured on uncoated fasteners. Finished dimensions are larger due to the proprietary coatings added.

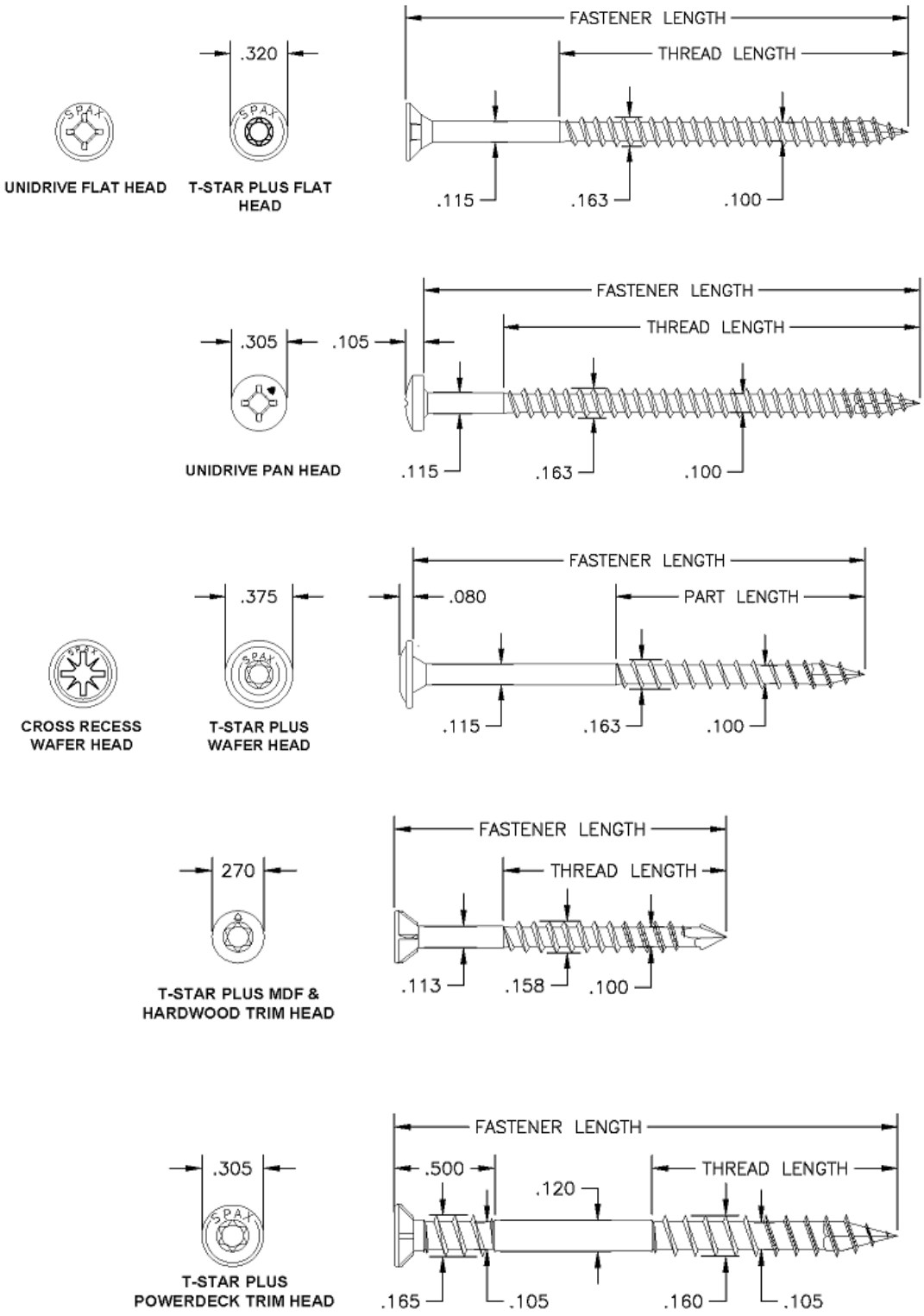

Figure 2. #8 SPAX® Construction Screws

Table 2. #8 SPAX® Construction Screw Specifications[5]

Fastener Designation	Part Number	Head				Length (in)		Diameter (in)			TPI	Bending Yield Strength[3], f_{yb} (psi)	Allowable Steel Strength (lbs.)	
		Style	Drive System	Diameter (in)	Height (in)	Fastener[1]	Thread[2]	Shank	Minor	Major			Tensile	Shear[4]
Carbon Steel														
#8 x 1-1/4"	XFT08P-1250	Flat	T20 T-Star Plus	0.320	N/A	1.250	0.670	0.115	0.100	0.163	11	187,000	460	345
#8 x 1-1/2"	XFT08P-1500					1.500	0.865							
#8 x 2"	XFT08P-2000					2.000	1.240							
#8 x 2-1/2"	XFT08P-2500					2.500	1.340							
#8 x 1"	XFU08-1000		#2 Unidrive			1.000	Full	0.115	0.100	0.163	11	187,000	460	345
#8 x 1-1/4"	XFU08-1250					1.250								
#8 x 1-1/2"	XFU08-1500					1.500								
#8 x 1-3/4"	XFU08-1750					1.750								
#8 x 2"	XFU08-2000					2.000								
#8 x 2-1/2"	XFU08-2500					2.500	1.970							
#8 x 1"	XPU08-1000	Pan	#2 Unidrive	0.305	0.102	1.000	Full	0.115	0.100	0.163	11	187,000	460	345
#8 x 1-1/4"	XPU08-1250					1.250								
#8 x 1-1/2"	XPU08-1500					1.500								
#8 x 2"	XPU08-2000					2.000								
#8 x 1-1/4"	XWP08-1250	Wafer	#2 Cross	0.375	0.080	1.250	Full	0.115	0.100	0.163	11	187,000	460	345
#8 x 1-1/4"	XWT08P-1250		T20 T-Star Plus			1.250	0.670							
#8 x 1-1/2"	XWT08P-1500					1.500	0.875							
#8 x 2"	XWT08P-2000					2.000	1.250							
#8 x 2-1/2"	XWT08P-2500					2.500	1.375							
#8 x 1-3/4"	XMT08-1750	MDF/Hard-wood Trim	T20 T-Star Plus	0.270	N/A	1.750	1.160	0.113	0.100	0.158	12.5	171,000	340	305
#8 x 2-1/2"	XMT08-2500					2.500	1.495							
Stainless Steel														
#8 x 1-5/8"	XDT08-SS	Power Deck Trim	T20 T-Star Plus	0.305	N/A	1.625	0.700	0.120	0.105	0.160	11	110,000	355	340

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

1. Fastener length is measured from the topside of the head to the tip for flat, MDF/hardwood trim, and PowerDeck® screws and from the underside of the head to the tip for the pan and wafer screws.
2. Thread length includes tapered tip (Figure 2).
3. Bending yield strength, F_{yb}, is determined in accordance with ASTM F1575 using minor thread diameter when fastener is tested in threaded section.
4. Shear strength is determined in accordance with AISI S904 using minor thread diameter when fastener is tested in threaded section.
5. Tabulated fastener dimensions are measured on uncoated fasteners. Finished dimensions are larger due to the proprietary coatings added.

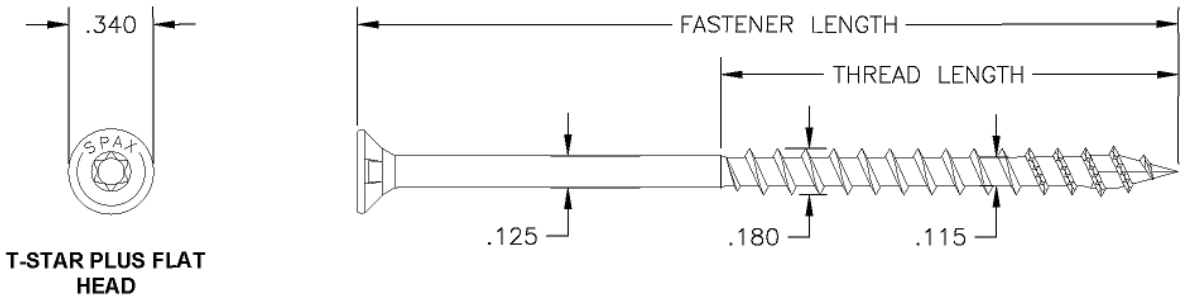

Figure 3. #9 SPAX® Construction Screws

Table 3. #9 SPAX® Construction Screw Specifications[5]

Fastener Designation	Part Number	Head				Length (in)		Diameter (in)			TPI	Bending Yield Strength[3], f_{yb} (psi)	Allowable Steel Strength (lbs.)	
		Style	Drive System	Diameter (in)	Height (in)	Fastener[1]	Thread[2]	Shank	Minor	Major			Tensile	Shear[4]
Carbon Steel														
#9 x 2-1/2"	XFT09P-2500	Flat	T20 T-Star Plus	0.340	N/A	2.500	1.655	0.125	0.115	0.180	9.5	201,000	540	435
#9 x 3-1/4"	XFT09P-3250					3.250	1.810							
Stainless Steel														
#9 x 1-1/2"	XFT09-1500	Flat	T20 T-Star Plus	0.340	N/A	1.500	1.000	0.125	0.115	0.180	9.5	129,000	395	380
#9 x 2"	XFT09-2000					2.000	1.280							

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

1. Fastener length is measured from the topside of the head to the tip.
2. Thread length includes tapered tip (Figure 3).
3. Bending yield strength, F_{yb}, is determined in accordance with ASTM F1575 using minor thread diameter when fastener is tested in threaded section.
4. Shear strength is determined in accordance with AISI S904 using minor thread diameter when fastener is tested in threaded section.
5. Tabulated fastener dimensions are measured on uncoated fasteners. Finished dimensions are larger due to the proprietary coatings added.

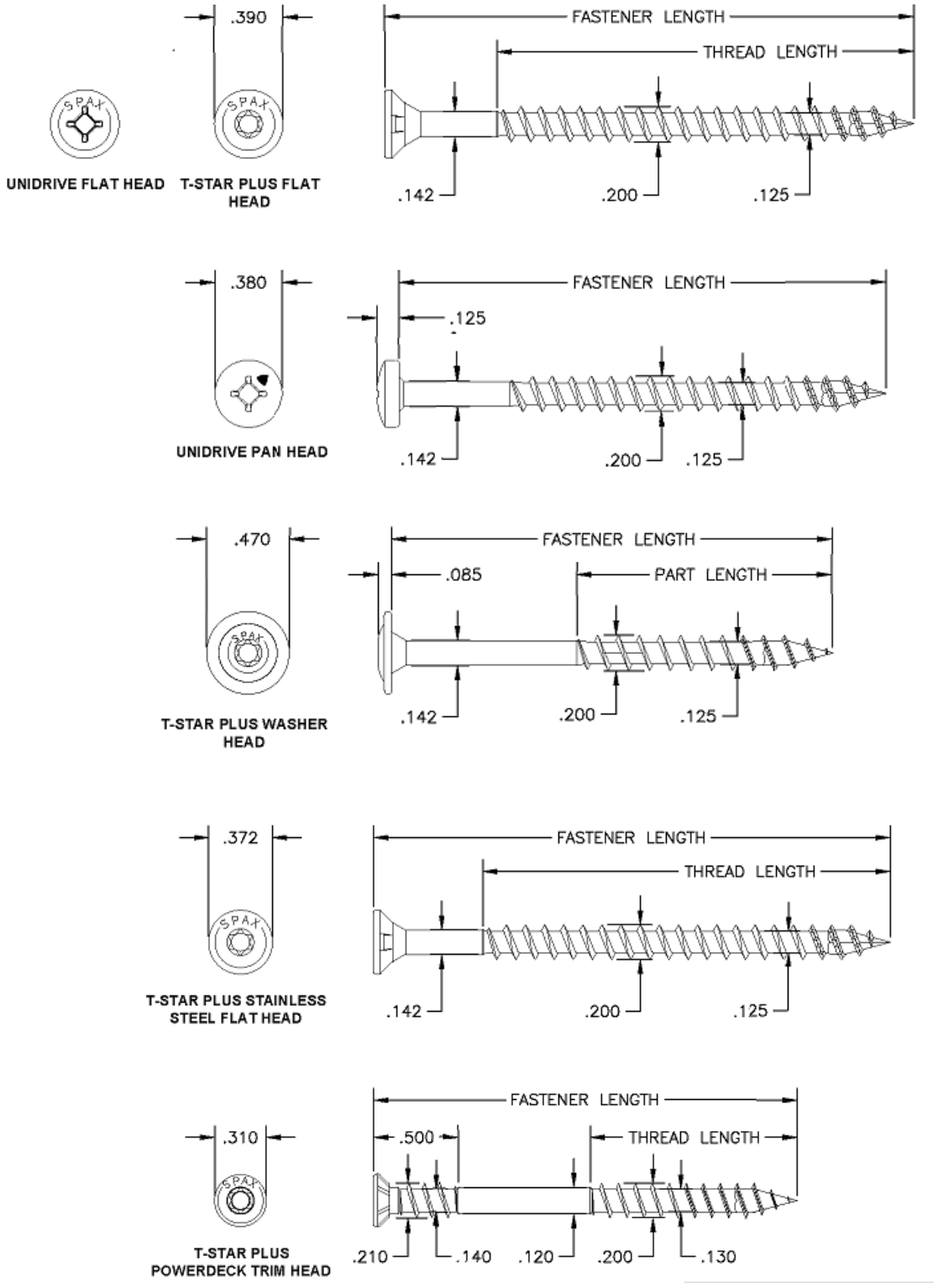

Figure 4. #10 SPAX® Construction Screws

Table 4. #10 SPAX® Construction Screw Specifications[5]

Fastener Designation	Part Number	Head				Length (in)		Diameter (in)			TPI	Bending Yield Strength[3], f_{yb} (psi)	Allowable Steel Strength (lbs.)	
		Style	Drive System	Diameter (in)	Height (in)	Fastener[1]	Thread[2]	Shank	Minor	Major			Tensile	Shear[4]
Carbon Steel														
#10 x 1-1/2"	XFT10P-1250	Flat	T20 T-Star Plus	0.390	N/A	1.500	1.000	0.142	0.125	0.200	8.5	187,000	690	545
#10 x 2"	XFT10P-2000					2.000	1.250							
#10 x 2-1/2"	XFT10P-2500					2.500	1.600							
#10 x 2-3/4"	XFT10P-2750					2.750								
#10 x 3"	XFT10P-3000					3.000								
#10 x 3-1/2"	XFT10P-3500					2.500	2.375							
#10 x 1"	XFU10-1000		#2 Unidrive	0.390	N/A	1.000	Full	0.142	0.125	0.200	8.5	187,000	690	545
#10 x 1-1/4"	XFU10-1250					1.250								
#10 x 1-1/2"	XFU10-1500					1.500								
#10 x 2"	XFU10-2000					2.000								
#10 x 2-1/2"	XFU10-2500					2.500	2.275							
#10 x 3"	XFU10-3000					3.000	2.375							
#10 x 3-1/2"	XFU10-3500					3.500								
#10 x 5/8"	XPU10-0625	Pan	#2 Unidrive	0.380	0.125	0.625	Full	0.142	0.125	0.200	8.5	187,000	690	545
#10 x 1"	XPU10-1000					1.000								
#10 x 2-1/2"	XWT10-2500	Washer	T20 T-Star Plus	0.470	0.085	2.500	1.500	0.142	0.125	0.200	8.5	187,000	690	545
#10 x 3"	XWT10-3000					3.000	1.625							
Stainless Steel														
#10 x 2-1/2"	XFT10-2500-SS	Flat	T20 T-Star Plus	0.372	N/A	2.375	1.450	0.142	0.125	0.200	8.5	126,000	480	440
#10 x 3"	XFT10-3000-SS					3.000	1.600							
#10 x 2-1/2"	XDT10-2500-SS	Power Deck Trim	T20 T-Star Plus	0.310	N/A	2.500	1.260	0.155	0.130	0.200	8.5	129,000	485	455
#10 x 3"	XDT10-3000-SS					3.000	1.540							
#10 x 3-1/2"	XDT10-3500-SS					3.500	1.610							

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

1. Fastener length is measured from the topside of the head to the tip for flat and PowerDeck® screws and from the underside of the head to the tip for the pan and washer screws.
2. Thread length includes tapered tip (Figure 4).
3. Bending yield strength, F_{yb}, is determined in accordance with ASTM F1575 using minor thread diameter when fastener is tested in threaded section.
4. Shear strength is determined in accordance with AISI S904 using minor thread diameter when fastener is tested in threaded section.
5. Tabulated fastener dimensions are measured on uncoated fasteners. Finished dimensions are larger due to the proprietary coatings added.

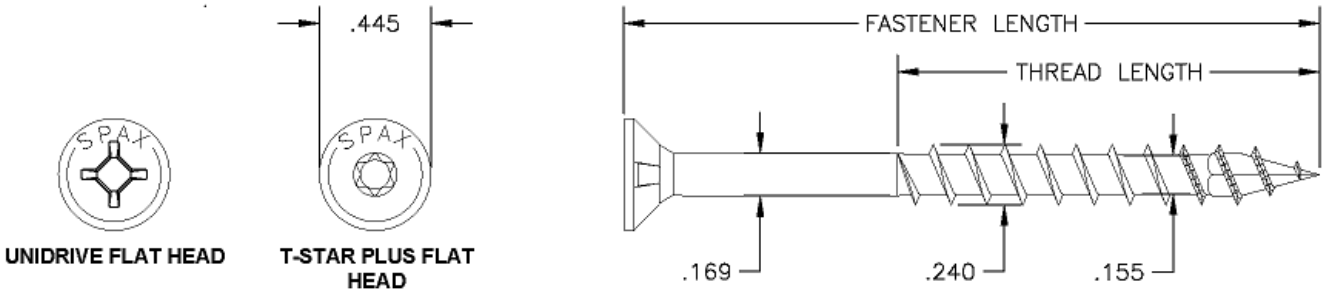

Figure 5. #14 SPAX® Construction Screws

Table 5. #14 SPAX® Construction Screw Specifications[5]

Fastener Designation	Part Number	Head				Length (in)		Diameter (in)			TPI	Bending Yield Strength[3], f_{yb} (psi)	Allowable Steel Strength (lbs.)	
		Style	Drive System	Diameter (in)	Height (in)	Fastener[1]	Thread[2]	Shank	Minor	Major			Tensile	Shear[4]
Carbon Steel														
#14 x 1-1/4"	XFT14-1000	Flat	T30 T-Star Plus or Unidrive	0.445	N/A	1.25	0.925	0.169	0.155	0.240	7	160,000	990	750
#14 x 1-1/2"	XFT14-1500					1.5	1.240							
#14 x 2"	XFT14-2000					2	1.675							
#14 x 2-1/2"	XFT14P-2500					2.5	1.595							
#14 x 3"	XFT14P-3000					3								
#14 x 3-1/2"	XFT14P-3500					3.5	2.385							
#14 x 4"	XFT14P-4000					4								
#14 x 4-3/4"	XFT14P-4750					4.75	2.660							

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

1. Fastener length is measured from the topside of the head to the tip.
2. Thread length includes tapered tip (Figure 5).
3. Bending yield strength, F_{yb}, is determined in accordance with ASTM F1575 using minor thread diameter when fastener is tested in threaded section.
4. Shear strength is determined in accordance with AISI S904 using minor thread diameter when fastener is tested in threaded section.
5. Tabulated fastener dimensions are measured on uncoated fasteners. Finished dimensions are larger due to the proprietary coatings added.

4.4 *Fastener Material*

4.4.1 SPAX® Construction Screws are made of hardened carbon steel grade 10B18 wire conforming to ASTM A510 or stainless steel Grade 316 wire.

4.5 *Corrosion Resistance*

4.5.1 Interior Wood Applications:

4.5.1.1 The SPAX® PowerLags® series structural wood fasteners having the proprietary zinc, yellow zinc, ecote and WIROX® coatings are equivalent to the protection provided by code-approved hot-dipped galvanized coatings meeting ASTM A153, Class D (IBC Section 2304.10.5 and IRC Section R317.3) when recognized for use by the American Wood Protection Association in untreated wood and above ground contact pressure treated wood for interior, dry/damp general construction applications (e.g., ABOVE GROUND AWPA UC1-UC2).

4.5.2 Exterior Wood Applications:

4.5.2.1 The SPAX® PowerLags® series structural wood fasteners having the proprietary HCR coatings are equivalent to the protection provided by code-approved hot-dipped galvanized coatings meeting ASTM A153, Class D (IBC Section 2304.10.5 and IRC Section R317.3) when recognized for use by the American Wood Protection Association in untreated wood and above ground contact pressure treated wood for exterior, freshwater, general construction applications (e.g., GROUND CONTACT AWPA UC1-UC4A).

4.5.3 *Stainless Steel Wood Applications:*

4.5.3.1 The stainless steel SPAX® Construction Screws meet the material requirements in ASTM F1667 per IBC Section 2304.10.5 and IRC Section R317.3 and are recognized for use in untreated, preservative-treated, and fire-retardant-treated wood in interior and exterior applications.

4.5.4 Fire Retardant Treated (FRT) Wood Applications:

4.5.4.1 SPAX® Construction Screws proprietary coating systems designated as zinc, yellow zinc, HCR™, HCR-X™, and WIROX® are recognized for use in FRT lumber, provided the conditions set forth by the FRT lumber manufacturer are met, including appropriate strength reductions.

4.6 *Wood Material*

4.6.1 Wood main and side members must be solid-sawn lumber or OSB or plywood boards having an assigned specific gravity as given in the respective tables of this TER. Assigned specific gravity must be determined in accordance with NDS Table 12.3.3A.

5 Applications

5.1 SPAX® Construction Screws are used to attach wood framing members in conventional light-frame construction and provide resistance against head pull-through, withdrawal, and shear loads.

5.2 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.

5.3 *Design*

5.3.1 Design of SPAX® Construction Screws is governed by the applicable code and the provisions for dowel-type fasteners in NDS.

5.3.2 Unless otherwise noted, adjustment of the design stresses for duration of load shall be in accordance with the applicable code.

5.4 *Head Pull-Through Design Values*

5.4.1 Reference design values for head pull-through for SPAX® Construction Screws are specified in Table 6 for OSB and plywood and Table 7 for sawn lumber.

5.4.2 Reference design values for head pull-through for XFT14P-4000 fasteners are specified in Table 8.

Table 6. Reference Pull-Through Design Values (P) for SPAX® Construction Screws – OSB and Plywood

Fastener Series	Head Style	Reference Pull-Through Design Value[1,2,3], P (lbf)									
		Plywood Thickness (Specific Gravity)						OSB Thickness (Specific Gravity)			
		1/8" (0.33)	1/4" (0.39)	11/32" (0.39)	15/32" (0.39)	19/32" (0.39)	23/32" (0.50)	7/16" (0.50)	15/32" (0.50)	19/32" (0.50)	23/32" (0.50)
Carbon Steel											
#6	MDF/Hardwood Trim	17	52	52	57	63	114	34	40	45	45
#8	Flat	21	59	74	120	120	212	65	68	78	110
	Wafer	28	76	88	146	190	319	62	86	110	131
	MDF/Hardwood Trim	17	58	58	77	80	139	39	53	53	56
#9	Flat	22	59	78	125	145	258	65	68	78	110
#10	Flat	23	79	89	151	177	293	73	78	78	110
	Washer	28	95	103	183	246	322	73	87	126	131
Stainless Steel											
#8	PowerDeck® Trim	-	-	69	78	130	145	44	77	91	103
#9	Flat	-	-	69	78	130	145	44	77	91	103
#10	Flat	-	-	69	78	130	145	44	77	91	103
	PowerDeck® Trim	-	-	67	78	126	145	44	68	81	88

SI: 1 in = 25.4 mm, 1 lb = 4.45 N

1. Minimum wood member thickness as specified
2. Tabulated pull-through values shall be adjusted by all applicable adjustment factors per NDS Table 11.3.1.
3. For wood species with an assigned specific gravity between 0.33 and 0.39, use the tabulated values for specific gravity (SG) of 0.33. For wood species with an assigned specific gravity between 0.39 and 0.50, use the tabulated values for specific gravity of 0.39. For wood species with an assigned specific gravity greater than or equal to 0.50, use the tabulated values for specific gravity of 0.50.

Table 7. Reference Pull-Through Design Values (P) for SPAX® Construction Screws – Sawn Lumber

Fastener Series	Head Style	Reference Pull-Through Design Value[1,2,3], P (lbf)												
		SPF (G = 0.42)					DF-L (G = 0.50)				SP (G = 0.55)			
		1/4"	3/8"	3/4"	1"	1-1/2"	3/8"	3/4"	1"	1-1/2"	3/8"	3/4"	1"	1-1/2"
Carbon Steel														
#6	Flat	-	-	-	125	-	-	-	150	-	-	-	179	
	MDF/Hardwood Trim	33	48	48	-	-	51	48	-	-	58	82	-	
#8	Flat	54	79	79	-	123	95	104	-	157	95	138	-	157
	Wafer	59	85	201	-	268	118	201	-	297	118	250	-	335
	MDF/Hardwood Trim	39	48	64	-	149	77	79	-	161	77	83	-	240
#9	Flat	59	79	95	-	177	114	188	-	211	114	188	-	303
#10	Flat	63	90	130	-	177	121	188	-	238	121	228	-	315
	Washer	59	112	249	-	338	133	251	-	387	133	265	-	461
Stainless Steel														
#8	PowerDeck® Trim	-	-	118	-	118	-	143	-	143	-	168	-	168
#9	Flat	-	-	118	-	118	-	143	-	143	-	168	-	168
#10	Flat	-	-	118	-	118	-	143	-	143	-	168	-	168
	PowerDeck® Trim	-	-	129	145	153	-	144	165	165	-	185	190	231

SI: 1 in = 25.4 mm, 1 lb = 4.45 N

1. Minimum wood member thickness as specified
2. Tabulated pull-through values shall be adjusted by all applicable adjustment factors per NDS Table 11.3.1.
3. For wood species with an assigned specific gravity between 0.42 and 0.50, use the tabulated values for specific gravity (SG) of 0.42. For wood species with an assigned specific gravity between 0.50 and 0.55, use the tabulated values for specific gravity of 0.50. For wood species with an assigned specific gravity greater than or equal to 0.55, use the tabulated values for specific gravity of 0.55.

Table 8. Head Pull-Through Design Values for XFT14P-4000 Fastener

Member Type (Specific Gravity)[1,2]	Member Description[3]	Head Pull-Through Value[5] (lbs.)
SPF[2] (0.42)	Dry	190
	Wet	135
SP[2] (0.55)	Dry	240
	Wet	155
LVL (0.50)[4]	Dry	350

SI: 1 in = 25.4 mm, 1 lb = 4.45 N

1. For wood species with an assigned specific gravity between 0.42 and 0.55, use the tabulated values for specific gravity of 0.42. For wood species with an assigned specific gravity greater than or equal to 0.55, use the tabulated values for specific gravity of 0.55.
2. Minimum thickness is 1.5".
3. The dry service condition is defined as lumber with an in-service moisture content of less than or equal to 19%. The wet service condition is defined as lumber with an in-service moisture content of greater than 19%.
4. LVL member minimum thickness is 1.5". Listed specific gravity is an equivalent specific gravity.
5. Tabulated withdrawal values shall be adjusted by all applicable adjustment factors per NDS Table 11.3.1.

5.5 *Reference Withdrawal Design Values in Face Grain Applications*

5.5.1 Reference withdrawal design values for SPAX® Construction Screws are specified in Table 9 for OSB and plywood and Table 10 for sawn lumber.

5.5.2 Reference withdrawal design values for XFT14P-4000 fasteners are specified in Table 11.

Table 9. Reference Withdrawal Design Values (W) for SPAX® Construction Screws – OSB and Plywood

Fastener Series	Head Style	Reference Withdrawal Design Values[1,2], W (lbf)						
		Plywood Thickness (Specific Gravity)			OSB Thickness (Specific Gravity)			
		15/32" (0.39)	19/32" (0.39)	23/32" (0.50)	7/16" (0.50)	15/32" (0.50)	19/32" (0.50)	23/32" (0.50)
Carbon Steel								
#6	Flat	51	83	134	26	29	36	52
	Pan							
	MDF/Hardwood Trim	46	73	144	29	36	41	41
#8	Flat	51	83	162	26	36	48	52
	Pan							
	Wafer							
	MDF/Hardwood Trim	68	75	179	29	37	41	64
#9	Flat	51	92	186	39	54	54	66
#10	Flat	90	92	186	39	54	54	66
	Pan							
	Washer							
Stainless Steel								
#8	PowerDeck® Trim	68	75	179	29	37	41	64
#9	Flat	51	92	186	39	54	54	66
#10	Flat	90	92	186	39	54	54	66
	PowerDeck® Trim							

SI: 1 in = 25.4 mm, 1 lb = 4.45 N

1. Applies to withdrawal from face grain only where the screw has full thread penetration in the board.
2. Tabulated withdrawal values shall be adjusted by all applicable adjustment factors per NDS Table 11.3.1.
3. For wood species with an assigned specific gravity (SG) between 0.39 and 0.50, use the tabulated values for specific gravity of 0.39. For wood species with an assigned specific gravity greater than or equal to 0.50, use the tabulated values for specific gravity of 0.50.

Table 10. Reference Withdrawal Design Values (W) for SPAX® Construction Screws – Sawn Lumber

Fastener Series	Head Style	Reference Withdrawal Design Values[1,2], W (lbf/in)		
		Wood Species (Specific Gravity[3])		
		SPF (0.42)	DF-L (0.50)	SP (0.55)
Carbon Steel				
#6	Flat	105	133	140
	Pan			
	MDF/Hardwood Trim	64	108	124
#8	Flat	127	133	175
	Pan			
	Wafer			
	MDF/Hardwood Trim	106	114	124
#9	Flat	132	146	190
#10	Flat	144	176	190
	Pan			
	Washer			
Stainless Steel				
#8	PowerDeck® Trim	106	114	124
#9	Flat	132	146	190
#10	Flat	144	176	190
	PowerDeck® Trim			

SI: 1 in = 25.4 mm, 1 lb = 4.45 N

1. Applies to withdrawal from face grain only.
2. Tabulated withdrawal values shall be adjusted by all applicable adjustment factors per NDS Table 11.3.1. A minimum thread penetration of 1" (including the tip) is required to achieve the tabulated loads.
3. Full withdrawal strength is calculated by multiplying the length of thread embedded in the main member by the tabulated reference withdrawal values.
4. 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 between 0.50 and 0.55, use the tabulated values for specific gravity of 0.50. For wood species with an assigned specific gravity greater than or equal to 0.55, use the tabulated values for specific gravity of 0.55.

Table 11. Reference Withdrawal Value for XFT14P-4000 Fastener in Face Grain

Member Type (Specific Gravity)[1,2]	Member Service Condition	Penetration[4] into Member (in)	Reference Withdrawal Value (lbs./in)[5,6]
SPF (0.42)	Dry	1	130
	Wet	1	95
SP (0.55)	Dry	1	205
		2	240
	Wet	1	140
		2	170
LVL (0.50)[3]	Dry	1	180
		2	225

SI: 1 in = 25.4 mm, 1 lb = 4.45 N

1. For wood species with an assigned specific gravity between 0.42 and 0.55, use the tabulated values for specific gravity of 0.42. For wood species with an assigned specific gravity greater than or equal to 0.55, use the tabulated values for specific gravity of 0.55.
2. The dry service condition is defined as lumber with an in-service moisture content of less than or equal to 19%. The wet service condition is defined as lumber with an in-service moisture content of greater than 19%.
3. Listed specific gravity is an equivalent specific gravity.
4. Fastener penetration is the threaded length embedded in the wood member, including the tip.
5. The full design withdrawal value (W) in pounds is equal to: $W = w_1 + [w_2 + (w_2 - w_1)]*(L_T - 1)$; where w_1 = reference withdrawal corresponding to 1" penetration, L_T = embedded thread length (minimum 1"), and w_2 = reference withdrawal corresponding to 2" penetration.
6. Tabulated withdrawal values shall be adjusted by all applicable adjustment factors per NDS Table 11.3.1.

5.6 *Lateral Design Values*

5.6.1 Reference lateral design values for shear load parallel and perpendicular to grain for SPAX® Construction Screws are specified in the following tables:

5.6.1.1 Solid sawn main member with OSB or Plywood side member:

5.6.1.1.1 #6 SPAX® Construction Screws: Table 12

5.6.1.1.2 #8 SPAX® Construction Screws: Table 13

5.6.1.1.3 #9 SPAX® Construction Screws: Table 14

5.6.1.1.4 #10 SPAX® Construction Screws: Table 15

5.6.1.1.5 #14 SPAX® Construction Screws: Table 16

5.6.1.2 Sawn lumber main and side members: Table 17

5.6.2 See Section 5.6.3 for lateral reference design values for the XFT14P-4000 fastener.

Table 12. #6 SPAX® Construction Screw Lateral Design Values – OSB and Plywood Side Member

Fastener Designation	Head Style	Minimum Main Member Penetration[2] (in)	Minimum Side Member Thickness (in)	Reference Lateral Shear Value[1,3,4], Z (lbf)	
				OSB[5] (0.50)	Plywood[5] (0.39)
Carbon Steel					
#6 x 1"	Flat or Pan	9/16	7/16	28	-
		17/32	15/32	28	22
#6 x 1-1/4"		13/16	7/16	35	-
		25/32	15/32	35	29
		21/32	19/32	36	28
		17/32	23/32	38	29
#6 x 1-1/2"		1-1/16	7/16	41	-
		1-1/32	15/32	42	35
		29/32	19/32	42	35
		25/32	23/32	43	34
#6 x 1-3/4"		1-5/16	7/16	41	-
		1-9/32	15/32	42	35
		1-5/32	19/32	46	37
		1-1/32	23/32	50	40
#6 x 2"		1-9/16	7/16	41	-
		1-17/32	15/32	42	35
		1-13/32	19/32	46	37
		1-9/32	23/32	51	40
#6 x 1-1/2"	MDF/Hardwood Trim	1-1/16	7/16	41	-
		1-1/32	15/32	42	35
		29/32	19/32	42	35
		25/32	23/32	43	34

SI: 1 in = 25.4 mm, 1 lbf = 4.45 N

1. Reference lateral design values apply to two-member single shear connections where the side member is OSB or plywood, the main member is SPF (SG = 0.42), and the fastener is installed in the face of the member and oriented perpendicular to grain. The underside of the fastener head shall be installed flush with the surface of the side member.
2. Penetration depth includes the length of tapered tip.
3. Lateral design values apply to both perpendicular to grain ($Z_{\perp}$) and parallel to grain ($Z_{\parallel}$) orientations.
4. Tabulated lateral design values shall be adjusted by all applicable adjustment factors per NDS Table 11.3.1.
5. OSB shall comply with DOC PS 2 and have a minimum specific gravity of 0.50. Plywood shall comply with DOC PS 1 and have a minimum specific gravity of 0.39.

Table 13. #8 SPAX® Construction Screw Lateral Design Values – OSB and Plywood Side Member

Fastener Designation	Head Style	Minimum Main Member Penetration[2] (in)	Minimum Side Member Thickness (in)	Reference Lateral Shear Value[1,3,4], Z (lbf)	
				OSB[5] (0.50)	Plywood[5] (0.39)
Carbon Steel					
#8 x 1-1/4"	Flat, Pan, or Wafer	13/16	7/16	40	-
		25/32	15/32	40	33
		21/32	19/32	42	32
#8 x 1-1/2"		1-1/16	7/16	51	-
		1-1/32	15/32	50	44
		29/32	19/32	49	41
		25/32	23/32	51	39
#8 x 1-3/4"		1-5/16	7/16	53	-
		1-9/32	15/32	54	46
		1-5/32	19/32	59	48
		1-1/32	23/32	58	48
#8 x 2" #8 x 2-1/2"		1-9/16	7/16	53	-
		1-17/32	15/32	54	46
		1-13/32	19/32	59	48
		1-9/32	23/32	64	51
#8 x 1-3/4"	MDF/Hardwood Trim	1-5/16	7/16	51	-
		1-9/32	15/32	52	44
		1-5/32	19/32	57	46
		1-1/32	23/32	59	48
#8 x 2-1/2"		2-1/16	7/16	51	-
		2-1/32	15/32	52	44
		1-29/32	19/32	57	46
		1-25/32	23/32	63	49
Stainless Steel					
#8 x 1-5/8"	PowerDeck® Trim	1-3/16	7/16	48	-
		1-5/32	15/32	49	40
		1-1/32	19/32	55	43
		29/32	23/32	55	46

SI: 1 in = 25.4 mm, 1 lbf = 4.45 N

1. Reference lateral design values apply to two-member single shear connections where the side member is OSB or plywood, the main member is SPF (SG = 0.42), and the fastener is installed in the face of the member and oriented perpendicular to grain. The underside of the fastener head shall be installed flush with the surface of the side member.
2. Penetration depth includes the length of tapered tip.
3. Lateral design values apply to both perpendicular to grain ($Z_{\perp}$) and parallel to grain ($Z_{\parallel}$) orientations.
4. Tabulated lateral design values shall be adjusted by all applicable adjustment factors per NDS Table 11.3.1.
5. OSB shall comply with DOC PS 2 and have a minimum specific gravity of 0.50. Plywood shall comply with DOC PS 1 and have a minimum specific gravity of 0.39.

Table 14. #9 SPAX® Construction Screw Lateral Design Values – OSB and Plywood Side Member

Fastener Designation	Head Style	Minimum Main Member Penetration[2] (in)	Minimum Side Member Thickness (in)	Reference Lateral Shear Value[1,3,4], Z (lbf)	
				OSB[5] (0.50)	Plywood[5] (0.39)
Carbon Steel					
#9 x 2-1/2" #9 x 3-1/4"	Flat	2-1/16	7/16	71	-
		2-1/32	15/32	71	62
		1-29/32	19/32	76	63
		1-25/32	23/32	81	66
Stainless Steel					
#9 x 1-1/2"	Flat	1-1/16	7/16	57	-
		1-1/32	15/32	57	50
		29/32	19/32	56	46
		25/32	23/32	59	45
#9 x 2"		1-9/16	7/16	59	-
		1-17/32	15/32	60	51
		1-13/32	19/32	66	53
		1-9/32	23/32	72	57

SI: 1 in = 25.4 mm, 1 lbf = 4.45 N

1. Reference lateral design values apply to two-member single shear connections where the side member is OSB or plywood, the main member is SPF (SG = 0.42), and the fastener is installed in the face of the member and oriented perpendicular to grain. The underside of the fastener head shall be installed flush with the surface of the side member.
2. Penetration depth includes the length of tapered tip.
3. Lateral design values apply to both perpendicular to grain ($Z_{\perp}$) and parallel to grain ($Z_{\parallel}$) orientations.
4. Tabulated lateral design values shall be adjusted by all applicable adjustment factors per NDS Table 11.3.1.
5. OSB shall comply with DOC PS 2 and have a minimum specific gravity of 0.50. Plywood shall comply with DOC PS 1 and have a minimum specific gravity of 0.39.

Table 15. #10 SPAX® Construction Screw Lateral Design Values – OSB and Plywood Side Member

Fastener Designation	Head Style	Minimum Main Member Penetration[2] (in)	Minimum Side Member Thickness (in)	Reference Lateral Shear Value[1,3,4], Z (lbf)	
				OSB[5] (0.50)	Plywood[5] (0.39)
Carbon Steel					
#10 x 1-1/4"	Flat, Pan, or Washer	13/16	7/16	48	-
		25/32	15/32	48	40
#10 x 1-1/2"		1-1/16	7/16	61	-
		1-1/32	15/32	60	53
		29/32	19/32	60	49
		25/32	23/32	63	48
#10 x 2"		1-9/16	7/16	80	-
		1-17/32	15/32	81	70
		1-13/32	19/32	85	72
		1-9/32	23/32	83	71
#10 x 2-1/2" #10 x 2-3/4" #10 x 3" #10 x 3-1/2"		2-1/16	7/16	80	-
		1-17/32	15/32	81	70
		1-29/32	19/32	85	72
		1-25/32	23/32	90	74
Stainless Steel					
#10 x 2-1/2" #10 x 3"	Flat	2-1/16	7/16	68	-
		2-1/32	15/32	69	59
		1-29/32	19/32	74	61
		1-25/32	23/32	81	64
#10 x 2-1/2" #10 x 3" #10 x 3-1/2"	PowerDeck® Trim	2-1/16	7/16	79	-
		2-1/32	15/32	80	69
		1-29/32	19/32	85	71
		1-25/32	23/32	92	74

SI: 1 in = 25.4 mm, 1 lbf = 4.45 N

1. Reference lateral design values apply to two-member single shear connections where the side member is OSB or plywood, the main member is SPF (SG = 0.42), and the fastener is installed in the face of the member and oriented perpendicular to grain. The underside of the fastener head shall be installed flush with the surface of the side member.
2. Penetration depth includes the length of tapered tip.
3. Lateral design values apply to both perpendicular to grain ($Z_{\perp}$) and parallel to grain ($Z_{\parallel}$) orientations.
4. Tabulated lateral design values shall be adjusted by all applicable adjustment factors per NDS Table 11.3.1.
5. OSB shall comply with DOC PS 2 and have a minimum specific gravity of 0.50. Plywood shall comply with DOC PS 1 and have a minimum specific gravity of 0.39.

Table 16. #14 SPAX® Construction Screw Lateral Design Values – OSB and Plywood Side Member

Fastener Designation	Head Style	Minimum Main Member Penetration[2] (in)	Minimum Side Member Thickness (in)	Reference Lateral Shear Value[1,3,4], Z (lbf)	
				OSB[5] (0.50)	Plywood[5] (0.39)
Carbon Steel					
#14 x 1-1/2"	Flat	1-1/16	7/16	73	-
		1-1/32	15/32	72	63
#14 x 2"		1-9/16	7/16	110	-
		1-17/32	15/32	108	97
		1-13/32	19/32	103	91
		1-9/32	23/32	100	85
#14 x 2-1/2" #14 x 3" #14 x 3-1/2" #14 x 4" #14 x 4-1/2"		2-1/16	7/16	112	-
		2-1/32	15/32	113	97
		1-29/32	19/32	117	101
		1-25/32	23/32	123	103

SI: 1 in = 25.4 mm, 1 lbf = 4.45 N

1. Reference lateral design values apply to two-member single shear connections where the side member is OSB or plywood, the main member is SPF (SG = 0.42), and the fastener is installed in the face of the member and oriented perpendicular to grain. The underside of the fastener head shall be installed flush with the surface of the side member.
2. Penetration depth includes the length of tapered tip.
3. Lateral design values apply to both perpendicular to grain ($Z_{\perp}$) and parallel to grain ($Z_{\parallel}$) orientations.
4. Tabulated lateral design values shall be adjusted by all applicable adjustment factors per NDS Table 11.3.1.
5. OSB shall comply with DOC PS 2 and have a minimum specific gravity of 0.50. Plywood shall comply with DOC PS 1 and have a minimum specific gravity of 0.39.

Table 17. SPAX® Construction Screw Lateral Design Values – Sawn Lumber Side Member

Fastener Designation	Head Style	Minimum Main Member Penetration[1] (in)	Minimum Side Member Thickness (in)	Reference Lateral Shear Value[4,5,6], Z (lbf)		
				Wood Species (Specific Gravity[2,3])		
				SPF/HF (0.42)	DF-L (0.50)	SP (0.55)
Carbon Steel						
#6 x 1-1/2"	Flat	3/4	3/4	37	50	57
#6 x 1-3/4" #6 x 2"		1	3/4	44	56	63
#6 x 1-1/2"	MDF/Hardwood Trim	3/4	3/4	37	50	57
#8 x 1-1/2"	Flat, Pan, Wafer	3/4	3/4	43	59	70
#8 x 1-3/4"		1	3/4	50	69	80
#8 x 2"		1-1/4	3/4	55	70	80
#8 x 2-1/2"		1	1-1/2	58	75	84
#8 x 1-3/4"	MDF/Hardwood Trim	1	3/4	51	69	79
#8 x 2-1/2"		1	1-1/2	57	74	81
#9 x 2-1/2"	Flat	1	1-1/2	73	92	105
#9 x 3-1/4"		1-3/4	1-1/2	90	106	116
#10 x 1-1/2"	Flat, Washer	3/4	3/4	53	72	86
#10 x 2"		1-1/4	3/4	73	99	112
#10 x 2-1/2"		1	1-1/2	81	101	115
#10 x 2-3/4"		1-1/4	1-1/2	91	117	132
#10 x 3" #10 x 3-1/2"		1-1/2	1-1/2	103	121	132
#14 x 2"	Flat	1-1/4	3/4	88	121	145
#14 x 2-1/2"		1	1-1/2	109	134	151
#14 x 3"		1-1/2	1-1/2	133	171	187
#14 x 3-1/2" #14 x 4" #14 x 4-1/2"		2	1-1/2	146	172	187
Stainless Steel						
#8 x 1-5/8"	PowerDeck® Trim	7/8	3/4	49	65	71
#9 x 1-1/2"	Flat	3/4	3/4	49	67	78
#9 x 2"		1-1/4	3/4	62	79	91
#10 x 2-1/2"	Flat	1	1-1/2	72	92	106
#10 x 3"		1-1/2	1-1/2	84	99	108
#10 x 2-1/2"	PowerDeck® Trim	1	1-1/2	82	103	118
#10 x 3" #10 x 3-1/2"		1-1/2	1-1/2	100	117	128

Fastener Designation	Head Style	Minimum Main Member Penetration[1] (in)	Minimum Side Member Thickness (in)	Reference Lateral Shear Value[4,5,6], Z (lbf)		
				Wood Species (Specific Gravity[2,3])		
				SPF/HF (0.42)	DF-L (0.50)	SP (0.55)

SI: 1 in = 25.4 mm, 1 lbf = 4.45 N

1. Penetration depth includes the length of tapered tip.
2. The species applies to both the main and side members. Where the members are different specific gravities, use the lower of the two.
3. 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 between 0.50 and 0.55, use the tabulated values for specific gravity of 0.50. For wood species with an assigned specific gravity greater than or equal to 0.55, use the tabulated values for specific gravity of 0.55.
4. The fastener shall be oriented perpendicular to grain, and the underside of the fastener head shall be installed flush with the surface of the side member.
5. Lateral design values apply to both perpendicular to grain ($Z_{\perp}$) and parallel to grain ($Z_{\parallel}$) orientations.
6. Tabulated lateral design values shall be adjusted by all applicable adjustment factors per NDS Table 11.3.1.

5.6.3 *Reference Lateral Design Values for XFT14P-4000 Fasteners:*

5.6.3.1 Reference lateral design values (lbs.) for shear load perpendicular and parallel to the side member grain for XFT14P-4000 fasteners are specified in Table 18.

5.6.3.2 Reference lateral design values in Table 18 apply to two-member single shear connections where:

5.6.3.2.1 The main member has an assigned specific gravity equal to or greater than 0.55.

5.6.3.2.2 The main member is loaded parallel to grain.

5.6.3.2.3 The fastener is oriented perpendicular to grain.

5.6.3.2.4 The fastener penetrates the face of the side member and edge of the main member.

5.6.3.2.5 The minimum edge distance in the main member is nominally ¾″. Care shall be taken not to split the wood. See Table 20 for other spacing, edge, and end distance requirements.

Table 18. Lateral Design Values For XFT14P-4000 Fastener[4,5,6]

Main Member Species (Specific Gravity)[1,3]	Side Member Species (Specific Gravity)[2,3]	Reference Lateral Shear Value, Z (lbf)	
		$Z_{\perp}$	$Z_{\parallel}$
SP (0.55)	SPF (0.42)	NT	180
	SP (0.55)	285	205
	LVL (0.50)	410	290

SI: 1 in = 25.4 mm, 1 lb = 4.45 N

1. Main member is loaded parallel to grain.
2. For side member wood species with an assigned specific gravity between 0.42 and 0.55, use the tabulated values for specific gravity of 0.42. For wood species with an assigned specific gravity greater than or equal to 0.55, use the tabulated values for specific gravity of 0.55.
3. Main member and side member minimum thickness is 1.5".
4. $Z_{\perp}$ = Lateral Design Values Perpendicular to Side Member Grain, $Z_{\parallel}$ = Lateral Design Values Parallel to Side Member Grain (see Figure 6).
5. Tabulated lateral design values shall be adjusted by all applicable adjustment factors per NDS Table 11.3.1.
6. NT = Not Tested

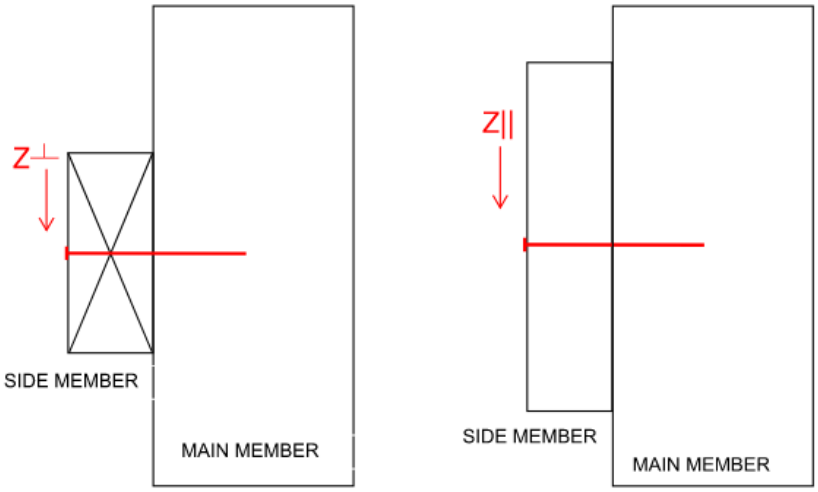

FIGURE 6. LATERAL LOAD DIRECTIONS

5.7 Where the application falls outside of the performance evaluation, conditions of use and/or installation requirements set forth herein, alternative techniques shall be permitted in accordance with accepted engineering practice and experience. This includes but is not limited to the following areas of engineering: mechanics or materials, structural, building science and fire science.

6 Installation

6.1 Installation shall comply with the approved construction documents, the manufacturer installation instructions, this TER, and the applicable building code.

6.2 In the event of a conflict between the manufacturer installation instructions and this TER, the more restrictive shall govern.

6.3 SPAX® Construction Screws shall be installed using the driver bits specified in Table 1, Table 2, Table 3, Table 4, and Table 5 as applicable.

6.4 Fasteners shall not be struck with a hammer during installation.

6.5 Lead holes are not required for SPAX® Construction Screws.

6.6 The fastener head must be installed flush to the surface of the wood side member being connected. The fastener must not be overdriven.

6.7 Minimum main member penetration is 1½″ unless otherwise stated in this TER.

6.8 Minimum requirements for fastener spacing, edge distance, and end distance shall be in accordance with Table 19.

6.8.1 Minimum requirements for XFT14P-4000 fastener spacing, edge distance, and end distance are found in Figure 7 and Table 20.

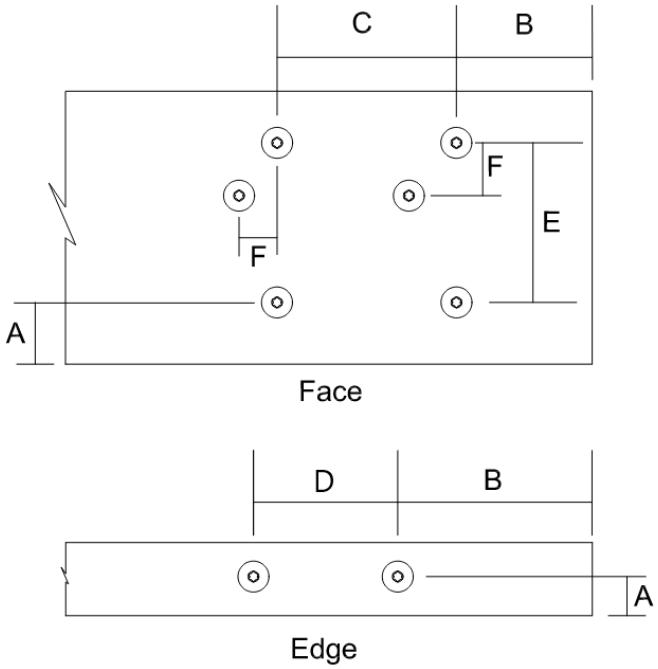

Figure 7. Fastener Spacing in Wood Reference Diagram

Table 19. Minimum Spacing, Edge Distance, and End Distance Requirements

Reference (from Figure 7)	Connection Geometry	Minimum Spacing/Distance[1,2] (in)					
		#6 Flat/Pan/ MDF/Hardwood Trim	#8 Flat/Pan/Wafer MDF/Hardwood Trim	#8 PowerDeck® Trim, #9 Flat	#10 Flat/Pan/Washer	#10 PowerDeck® Trim	#14 Pan
A	Edge Distance – Load in any direction	¼	3/8	3/8	3/8	½	½
B	End Distance – Load parallel to grain, towards end	1½	1¾	1 7/8	2¼	2 3/8	2 5/8
	End Distance – Load parallel to grain, away from end	1	1¼	1¼	1½	1 5/8	1¾
	End Distance – Load perpendicular to grain	1	1¼	1¼	1½	1 5/8	1¾
C	Spacing between Fasteners in a Row – Parallel to grain	1½	1¾	1 7/8	2¼	2 3/8	2 5/8
D	Spacing between Fasteners in a Row – Perpendicular to grain	1	1¼	1¼	1½	1 5/8	1¾
E	Spacing between Rows of Fasteners – In-line	½	5/8	5/8	¾	7/8	7/8
F	Spacing between Rows of Fasteners – Staggered	¼	3/8	3/8	3/8	½	½

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 the 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."

Table 20. Minimum Spacing, Edge Distance, and End Distance Requirements – XFT14P-4000

Reference (from Figure 7)	Connection Geometry[1,2]	Minimum Spacing/Distance[1,2] (in)
A	Edge Distance – Load perpendicular to grain	1½
	Edge Distance – Load parallel to grain	¾
B	End Distance – Load parallel to grain, towards end	1¾
	End Distance – Load parallel to grain, away from end	¾
	End Distance – Load perpendicular to grain	¾
C	Spacing between Fasteners in a Row – Parallel to grain	1¾
D	Spacing between Fasteners in a Row – Perpendicular to grain	⅞
E	Spacing between Rows of Fasteners – In-line	½
F	Spacing between Rows of Fasteners – Staggered	½

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 the 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"

7 Substantiating Data

7.1 Testing has been performed under the supervision of a professional engineer and/or under the requirements of ISO/IEC 17025 as follows:

7.1.1 Bending yield testing in accordance with ASTM F1575.

7.1.2 Tensile strength testing in accordance with AISI S904.

7.1.3 Shear strength testing in accordance with AISI S904.

7.1.4 Head pull-through testing in accordance with ASTM D1761.

7.1.5 Withdrawal testing in accordance with ASTM D1761.

7.1.6 Lateral resistance testing in accordance with ASTM D1761.

7.1.7 Corrosion resistance testing in accordance with ASTM B117 and ASTM G85.

7.2 Information contained herein may include the result of testing and/or data analysis by sources that are approved agencies (i.e. ANAB accredited agencies), approved sources (i.e., registered design professionals [RDP]), and/or professional engineering regulations. Accuracy of external test data and resulting analysis is relied upon.

7.3 Where pertinent, DrJ's analysis is based upon provisions that have been codified into law through state or local adoption of codes and standards. The developers of these codes and standards are responsible for the reliability of published content. DrJ's engineering practice may use a code-adopted provision as the control sample. A control sample versus a test sample establishes products as being equivalent to the code-adopted provision in terms of quality, strength, effectiveness, fire resistance, durability, and safety.

7.4 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, Listings, certified reports, duly authenticated reports from approved agencies, and research reports prepared by approved agencies and/or approved sources provided by the suppliers of any raw materials. These are presumed to be minimum properties and relied upon to be accurate. The reliability of DrJ's engineering practice, as contained in this TER, may be dependent upon published design properties by others.

7.5 Testing and engineering analysis. 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.[6]

8 Findings

8.1 As delineated in Section 3, the #6, #8, #9, #10, #14 SPAX® Construction Screws have performance characteristics that were tested and/or meet pertinent standards and is suitable for use pursuant to its specified purpose.

8.2 When used and installed in accordance with this TER and the manufacturer installation instructions, #6, #8, #9, #10, #14 SPAX® Construction Screws shall be approved for the following applications:

8.2.1 Provide resistance to head pull-through loads as shown in Table 6, Table 7, and Table 8.

8.2.2 Provide resistance to reference withdrawal loads as shown in Table 9, Table 10, and Table 11.

8.2.3 Provide resistance to lateral loads applied to the fastener in a wood connection as shown in Table 12, Table 13, Table 14, Table 15, Table 16, Table 17, and Table 18.

8.3 These products have been evaluated in the context of the codes listed in Section 2 and is compliant with all known state and local building codes. Where there are known variations in state or local codes applicable to this TER, they are listed here.

8.3.1 No known variations

8.4 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.

8.5 IBC Section 104.11 (IRC Section R104.11 and IFC Section 104.10[7] are similar) in pertinent part states:

> **104.11 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. Where the alternative material, design or method of construction is not approved, the building official shall respond in writing, stating the reasons the alternative was not approved.

8.6 Approved[8]: Building codes require that the building official shall accept duly authenticated reports[9] or research reports[10] from approved agencies and/or approved sources (i.e., licensed RDP) with respect to the quality and manner of use of new products, materials, designs, services, assemblies or methods of construction.

8.6.1 Acceptability of an approved agency, by a building official, is performed by verifying that the agency is accredited by a recognized accreditation body of the International Accreditation Forum (IAF).

8.6.2 Acceptability of a licensed RDP, by a building official, is performed by verifying that the RDP and/or their business entity is listed by the licensing board of the relevant jurisdiction.

8.6.3 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, as denial without written reason deprives a protected right to free and fair competition in the marketplace.

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[6] See Code of Federal Regulations (CFR) Title 24 Subtitle B Chapter XX Part 3280 for definition.

[7] 2018 IFC Section 104.9

[8] 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 where the building code authorizes sentences to have an ordinarily accepted meaning such as the context implies.

[9] https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1707.1

[10] https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1703.4.2

8.7 DrJ is an engineering company, employs RDPs and is an ISO/IEC 17065 ANAB-Accredited Product Certification Body – Accreditation #1131.

8.8 Through ANAB accreditation and the IAF Multilateral Agreements, this TER can be used to obtain product approval in any jurisdiction or country that has IAF MLA Members & Signatories to meet the Purpose of the MLA – "*certified once, accepted everywhere*."

9 Conditions of Use

9.1 Material properties shall not fall outside the boundaries defined in Section 3.

9.2 As defined in Section 3, 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.

9.3 Wood main and side members must have a moisture content of less than or equal to 19 percent. Where fasteners are installed in a wet service condition, the appropriate reduction factors shall be applied per NDS Table 11.3.1.

9.4 Use of fasteners in locations exposed to saltwater or saltwater spray is outside the scope of this TER.

9.5 In cases where fastener metal capacity (instead of the wood member) controls the connection design, the allowable connection strength shall not be multiplied by the adjustment factors specified in NDS.

9.6 When required by regulation and enforced by the building official, also known as the authority having jurisdiction (AHJ) in which the project is to be constructed:

9.6.1 Any calculations, incorporated into the construction documents that are required to show compliance with this TER, shall conform to accepted engineering practice, and shall be approved when requirements of the pertinent regulations are met.

9.6.2 This TER and the installation instructions shall be submitted at the time of permit application.

9.6.3 These products have an internal quality control program and a third-party quality assurance program.

9.6.4 At a minimum, these products shall be installed per Section 6 of this TER.

9.6.5 The review of this TER, by the AHJ, shall be in compliance with IBC Section 104 and IBC Section 105.4.

9.6.6 These products have an internal quality control program and a third party quality assurance program in accordance with IBC Section 104.4, IBC Section 110.4, IBC Section 1703, IRC Section R104.4 and IRC Section R109.2.

9.6.7 The application of these products in the context of this TER 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.

9.7 Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed and/or by the building designer (e.g., owner or RDP).

9.8 The actual design, suitability, and use of this TER, for any particular building, is the responsibility of the owner or the owner's authorized agent.

10 Identification

10.1 The products listed in Section 1.1 are identified by a label on the board or packaging material bearing the manufacturer name, product name, TER number, and other information to confirm code compliance.

10.2 Additional technical information can be found at www.spax.us.

11 Review Schedule

11.1 This TER is subject to periodic review and revision. For the most recent version, visit drjcertification.org.

11.2 For information on the current status of this TER, contact DrJ Certification.

12 Approved for Use Pursuant to US and International Legislation Defined in Appendix A

12.1 #6, #8, #9, #10, #14 SPAX® Construction Screws are included in this TER published by an approved agency that is concerned with evaluation of products or services, maintains periodic inspection of the production of listed materials or periodic evaluation of services, and whose TER Listing states either that the material, product, or service meets identified standards or has been tested and found suitable for a specified purpose. This TER meets the legislative intent and definition of being acceptable to the AHJ.

1 Appendix A: Legislation that Authorizes AHJ Approval

1.1 **Fair Competition**: State legislatures have adopted Federal regulations for the examination and approval of building code referenced and alternative products, materials, designs, services, assemblies and/or methods of construction that:

1.1.1 Advance Innovation,

1.1.2 Promote competition so all businesses have the opportunity to compete on price and quality in an open market on a level playing field unhampered by anticompetitive constraints, and

1.1.3 Benefit consumers through lower prices, better quality, and greater choice.

1.2 **Adopted Legislation**: The following local, state, and federal regulations affirmatively authorize #6, #8, #9, #10, #14 SPAX® Construction Screws to be approved by AHJs, delegates of building departments, and/or delegates of an agency of the federal government:

1.2.1 Interstate commerce is governed by the Federal Department of Justice to encourage the use of innovative products, materials, designs, services, assemblies and/or methods of construction. The goal is to "protect economic freedom and opportunity by promoting free and fair competition in the marketplace."

1.2.2 Title 18 US Code Section 242 affirms and regulates the right of individuals and businesses to freely and fairly have new products, materials, designs, services, assemblies and/or methods of construction approved for use in commerce. Disapproval of alternatives shall be based upon non-conformance with respect to specific provisions of adopted legislation, and shall be provided in writing stating the reasons why the alternative was not approved, with reference to the specific legislation violated.

1.2.3 The federal government and each state have a public records act. In addition, each state also has legislation that mimics the federal Defend Trade Secrets Act 2016 (DTSA).

1.2.3.1 Compliance with public records and trade secret legislation requires approval through the use of listings, certified reports, Technical Evaluation Reports, duly authenticated reports and/or research reports prepared by approved agencies and/or approved sources.

1.2.4 For new materials[11] that are not specifically provided for in any building code, the design strengths and permissible stresses shall be established by tests, where suitable load tests simulate the actual loads and conditions of application that occur.

1.2.5 The design strengths and permissible stresses of any structural material shall conform to the specifications and methods of design using accepted engineering practice.[12]

1.3 **Approved**[13] **by Los Angeles**: The Los Angeles Municipal Code (LAMC) states in pertinent part that the provisions of LAMC are not intended to prevent the use of any material, device, or method of construction not specifically prescribed by LAMC. The Department shall use Part III, Recognized Standards in addition to Part II, Uniform Building Code Standards of Division 35, Article 1, Chapter IX of the LAMC in evaluation of products for approval where such standard exists for the product or the material and may use other approved standards, which apply. Whenever tests or certificates of any material or fabricated assembly are required by Chapter IX of the LAMC, such tests or certification shall be made by a testing agency approved by the Superintendent of Building to conduct such tests or provide such certifications. The testing agency shall publish the scope and limitation(s) of the listed material or fabricated assembly.[14] The Superintendent of Building roster of approved testing agencies is provided by the Los Angeles Department of Building and Safety (LADBS). The Center for Building Innovation (CBI) Certificate of Approval License is TA24945. Tests and certifications found in a CBI Listing are LAMC approved. In addition, the Superintendent of Building 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 the California Building Code (CBC) Section 1707.1.[15]

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[11] https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706.2

[12] IBC 2021, Section 1706.1 Conformance to Standards

[13] See section 8.3 for the distilled building code definition of Approved.

[14] Los Angeles Municipal Code, SEC. 98.0503. TESTING AGENCIES

[15] https://up.codes/viewer/california/ca-building-code-2022/chapter/17/special-inspections-and-tests#1707.1

1.4 **Approved by Chicago**: The Municipal Code of Chicago (MCC) states in pertinent part that an Approved Agency is a Nationally Recognized Testing Laboratory (NRTL) acting within its recognized scope and/or a certification body accredited by the American National Standards Institute (ANSI) acting within its accredited scope. Construction materials and test procedures shall conform to the applicable standards listed in the MCC. Sufficient technical data shall be submitted to the building official to substantiate the proposed use of any product, material, service, design, assembly and/or method of construction not specifically provided for in the MCC. This technical data shall consist of research reports from approved sources (i.e., MCC defined Approved Agencies).

1.5 **Approved by New York City**: The NYC Building Code 2022 (NYCBC) states in pertinent part that an approved agency shall be deemed[16] an approved testing agency via ISO/IEC 17025 accreditation, an approved inspection agency via ISO/IEC 17020 accreditation, and an approved product evaluation agency via ISO/IEC 17065 accreditation. Accrediting agencies, other than federal agencies, must be members of an internationally recognized cooperation of laboratory and inspection accreditation bodies subject to a mutual recognition agreement[17] (i.e., ANAB, International Accreditation Forum (IAF), etc.).

1.6 **Approved by Florida**: Statewide approval of products, methods, or systems of construction shall be approved, without further evaluation, by 1) A certification mark or listing of an approved certification agency, 2) A test report from an approved testing laboratory, 3) A product evaluation report based upon testing or comparative or rational analysis, or a combination thereof, from an approved product evaluation entity; 4) A product evaluation report based upon testing or comparative or rational analysis, or a combination thereof, developed and signed and sealed by a professional engineer or architect, licensed in Florida. For local product approval, products or systems of construction shall demonstrate compliance with the structural wind load requirements of the Florida Building Code (FBC) through one of the following methods; 1) A certification mark, listing, or label from a commission-approved certification agency indicating that the product complies with the code; 2) A test report from a commission-approved testing laboratory indicating that the product tested complies with the code; 3) A product-evaluation report based upon testing, comparative or rational analysis, or a combination thereof, from a commission-approved product evaluation entity which indicates that the product evaluated complies with the code; 4) A product-evaluation report or certification based upon testing or comparative or rational analysis, or a combination thereof, developed and signed and sealed by a Florida professional engineer or Florida registered architect, which indicates that the product complies with the code; 5) A statewide product approval issued by the Florida Building Commission. The Florida Department of Business and Professional Regulation (DBPR) website provides a listing of companies certified as a Product Evaluation Agency (i.e., EVLMiami 13692), a Product Certification Agency (i.e., CER10642), and as a Florida Registered Engineer (i.e., ANE13741).

1.7 **Approved by Miami-Dade County (i.e., Notice of Acceptance [NOA])**: A Florida statewide approval is an NOA. An NOA is a Florida local product approval. By Florida law, Miami-Dade County shall accept the statewide and local Florida Product Approval as provided for in Florida legislation 553.842 and 553.8425.

[16] New York City, The Rules of the City of New York, § 101-07 Approved Agencies

[17] New York City, The Rules of the City of New York, § 101-07 Approved Agencies

1.8 **Approved by New Jersey**: Pursuant to Building Code 2018 of New Jersey in IBC Section 1707.1 General,[18] it states: "In the absence of approved rules or other approved standards, 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 the administrative provisions of the Uniform Construction Code (N.J.A.C. 5:23)".[19] Furthermore N.J.A.C 5:23-3.7 states: Municipal approvals of alternative materials, equipment, or methods of construction. **(a) Approvals**: Alternative materials, equipment, or methods of construction shall be approved by the appropriate subcode official provided the proposed design is satisfactory and that the materials, equipment, or methods of construction are suitable for the intended use and are at least the equivalent in quality, strength, effectiveness, fire resistance, durability and safety of those conforming with the requirements of the regulations. 1. A field evaluation label and report or letter issued by a nationally recognized testing laboratory verifying that the specific material, equipment, or method of construction meets the identified standards or has been tested and found to be suitable for the intended use, shall be accepted by the appropriate subcode official as meeting the requirements of (a) above. 2. Reports of engineering findings issued by nationally recognized evaluation service programs, such as, but not limited to, the Building Officials and Code Administrators (BOCA), the International Conference of Building Officials (ICBO), the Southern Building Code Congress International (SBCCI), the International Code Council (ICC), and the National Evaluation Service, Inc., shall be accepted by the appropriate subcode official as meeting the requirements of (a) above. The New Jersey Department of Community Affairs has confirmed that technical evaluation reports, from any accredited entity listed by ANAB, meets the requirements of item 2 given that the listed entities are no longer in existence and/or do not provide "reports of engineering findings".

1.9 **Approved by the Code of Federal Regulations Manufactured Home Construction and Safety Standards**: Pursuant to Title 24, Subtitle B, Chapter XX, Part 3282.14[20] and Part 3280,[21] the Department encourages innovation and the use of new technology in manufactured homes. The design and construction of a manufactured home shall conform with the provisions of Part 3282 and Part 3280 where key approval provisions in mandatory language follow: 1) "All construction methods shall be in conformance with accepted engineering practices"; 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."; and 3) "The design stresses of all materials shall conform to accepted engineering practice."

1.10 **Approved by US, Local, and State Jurisdictions in General**: In all other local and state jurisdictions, the regulations require approval per Sections 8.3, 8.4, and 8.5 above.

1.11 **Approved by International Jurisdictions**: The USMCA and GATT agreements provide for approval of innovative materials, products, designs, services, assemblies and/or methods of construction through the Technical Barriers to Trade agreements and the International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA), where these agreements:

1.11.1 Permit participation of conformity assessment bodies located in the territories of other Members (defined as GATT Countries) under conditions no less favourable than those accorded to bodies located within their territory or the territory of any other country.

1.11.2 State that conformity assessment procedures (i.e., ISO/IEC 17020, 17025, 17065, etc.) are prepared, adopted, and applied so as to grant access for suppliers of like products originating in the territories of other Members under conditions no less favourable than those accorded to suppliers of like products of national origin or originating in any other country, in a comparable situation.

1.11.3 State that conformity assessment procedures are not prepared, adopted, or applied with a view to or with the effect of creating unnecessary obstacles to international trade. This means that conformity assessment procedures shall not be more strict or be applied more strictly than is necessary to give the importing Member adequate confidence that products conform to the applicable technical regulations or standards.

[18] https://up.codes/viewer/new_jersey/ibc-2018/chapter/17/special-inspections-and-tests#1707.1

[19] https://www.nj.gov/dca/divisions/codes/codreg/ucc.html

[20] https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3282/subpart-A/section-3282.14

[21] https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280

1.11.4 **Approved**: The purpose of the IAF MLA is to ensure mutual recognition of accredited certification and validation/verification statements between signatories to the MLA, and subsequently acceptance of accredited certification and validation/verification statements in many markets based on one accreditation for the timely approval of innovative materials, products, designs, services, assemblies and/or methods of construction. Accreditations granted by IAF MLA signatories are recognised worldwide based on their equivalent accreditation programs, therefore reducing costs and adding value to businesses and consumers.

Issue Date: December 16, 2021
Subject to Renewal: January 1, 2024

FBC Supplement to TER 2010-02

REPORT HOLDER: Altenloh, Brinck & Company U.S., Inc.

2 Evaluation Subject

2.1 #6, #8, #9, #10, #14 SPAX® Construction Screws

3 Purpose and Scope

3.1 *Purpose*

3.1.1 The purpose of this Technical Evaluation Report (TER) supplement is to show #6, #8, #9, #10, #14 SPAX® Construction Screws, recognized in TER 2010-02, has also been evaluated for compliance with the codes listed below as adopted by the Florida Building Commission.

3.2 *Applicable Code Editions*

3.2.1 *FBC-B—17, 20: Florida Building Code – Building*

3.2.2 *FBC-R—17, 20: Florida Building Code – Residential*

4 Conclusions

4.1 #6, #8, #9, #10, #14 SPAX® Construction Screws, described in TER 2010-02, complies with the FBC-B and FBC-R and is subject to the conditions of use described in this supplement.

4.2 Where there are variations between the IBC and IRC and the FBC-B and FBC-R applicable to this TER, they are listed here.

4.2.1 FBC-B Section 104.4 and Section 110.4 are reserved.

4.2.2 FBC-R Section R104 and Section R109 are reserved.

5 Conditions of Use

5.1 #6, #8, #9, #10, #14 SPAX® Construction Screws, described in TER 2010-02, must comply with all of the following conditions:

5.1.1 All applicable sections in TER 2010-02

5.1.2 The design, installation, and inspections are in accordance with additional requirements of FBC-B Chapter 16 and Chapter 17, as applicable.