DrJ™ CERTIFICATION

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Technical Evaluation Report

TER 2001-01

SPAX® PowerTrim™ Screw Properties

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

Products:

SPAX® #8 and #9 PowerTrim™ Screws (XTT-08, XTT-09, and XTT-08D)

Issue Date:

January 14, 2021

Revision Date:

December 2, 2021

Subject to Renewal:

January 1, 2023

COMPANY
INFORMATION:

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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]

1.1 SPAX® #8 and #9 PowerTrim™ Screws (XTT-08, XTT-09, and XTT-08D)

2 APPLICABLE CODES AND STANDARDS[2,3]

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 *IECC—15, 18, 21: International Energy Conservation Code®*

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] 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.

[3] All terms defined in the applicable building codes are italicized.

3 Performance Evaluation

3.1 SPAX® #8 and #9 PowerTrim™ 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:

3.1.1 Bending yield in accordance with *ASTM F1575*

3.1.2 Tensile strength in accordance with *AISI S904*

3.1.3 Shear strength in accordance with *AISI S904*

3.1.4 Head pull-through polyvinyl chloride (PVC) trim in accordance with *ASTM D1761*

3.1.5 Withdrawal strength in accordance with *ASTM D1761*

3.1.6 Corrosion resistance in accordance with *ASTM B117* (modified) and *ASTM G85*

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

3.3 Any code compliance issues not specifically addressed in this section are outside the scope of this TER.

3.4 Any engineering evaluation conducted for this TER was performed within DrJ's ANAB "accredited ICS code scope" and/or the defined professional engineering scope of work on the dates provided herein.

4 Product Description and Materials

4.1 The SPAX® #8 and #9 PowerTrim™ Screws are partially threaded with a cylinder head and a SPAX® T-10 T-Star Plus drive (#8) or SPAX® T-15 T-Star Plus drive (#9). The point is a threaded tip.

4.2 The SPAX® #8 PowerTrim™ Screws are manufactured in a single thread and double thread option.

4.3 Figure 1 shows the XTT08 single thread SPAX® #8 PowerTrim™ Screw. The XTT09 SPAX® #9 PowerTrim™ Screw follows a similar layout, with a SPAX® T-15 T-Star Plus drive.

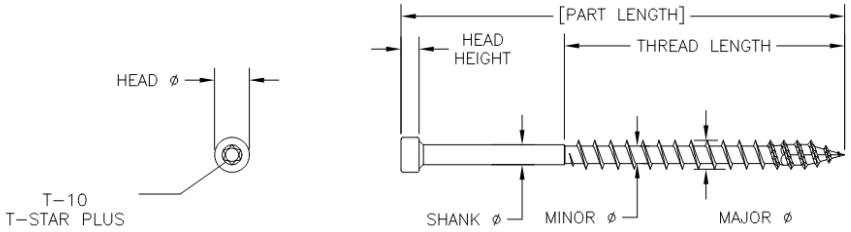

Figure 1. SPAX® XTT08 Fastener

4.4 Figure 2 shows the XTT08D double thread SPAX® #8 PowerTrim™ Screw.

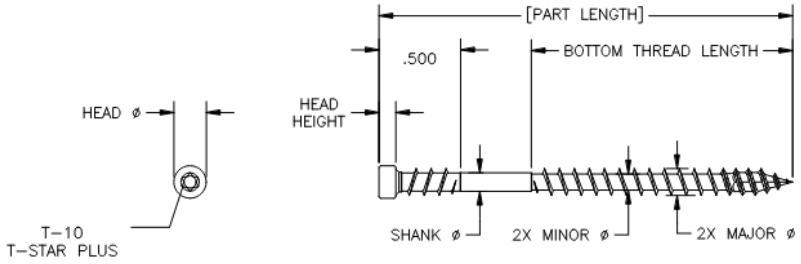

Figure 2. SPAX® XTT08D Fastener

4.5 SPAX® #8 and #9 PowerTrim™ Screws are made of hardened carbon steel grade 1022 or 10B21 wire conforming to *ASTM A510*, or grade 17MnB3 or 19MnB4 wire conforming to DIN 1654.

4.6 SPAX® #8 and #9 PowerTrim™ Screws are manufactured using a standard cold-formed process followed by heat treating and coating processes.

4.7 The single and double thread fasteners evaluated in this TER are designated in Table 1 and Table 2, respectively.

TABLE 1. XTT08 AND XTT09 FASTENER SPECIFICATIONS[5]

Fastener Name	Head (in)					Length (in)		Diameters (in)			Bending Yield Strength[3], f_{yb} (psi)	Allowable Steel Strength (lbs)	
	Style	Drive Size/Type	Marking	Diameter	Height	Fastener[1]	Thread[2]	Shank	Minor	Major		Tension	Shear[4]
#8 x 1¼"	Trim	T10 T-Star Plus	n/a	0.200	0.100	1.250	0.815	0.112	0.100	0.160	181,000	390	310
#8 x 1½"						1.500	0.975						
#8 x 2"						2.000	1.270						
#8 x 2½"						2.500	1.565						
#8 x 2¾"						2.750	1.860						
#8 x 3⅛"						3.125	1.960						
#9 x 4"		T15 T-Star Plus		0.240	0.115	4.000	2.040	0.125	0.115	0.180	175,000	560	445
#9 x 5"						5.000							

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 (see 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.

TABLE 2. XTT08D FASTENER SPECIFICATIONS[5]

Fastener Name	Head (in)					Length (in)		Diameters (in)			Bending Yield Strength[3], f_{yb} (psi)	Allowable Steel Strength (lbs)	
	Style	Drive Size/Type	Marking	Diameter	Height	Fastener[1]	Thread[2]	Shank	Minor	Major		Tension	Shear[4]
#8 x 2"	Trim	T10 T-Star Plus	n/a	0.200	0.100	2.000	1.270	0.112	0.100	0.160	181,000	390	310
#8 x 2½"						2.500	1.565						
#8 x 2¾"						2.750	1.860						
#8 x 3⅛"						3.125	1.960						

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 (see 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.

4.8 SPAX® #8 and #9 PowerTrim™ Screws are available with a proprietary coating:

4.8.1 Exterior Grade: Proprietary HCR™ coating that is equivalent to the protection provided by code-approved hot-dipped galvanized coatings meeting ASTM A153, Class D (*IBC* Section 2304.10.6[4] and *IRC* Section R317.3).

4.8.1.1 HCR™ coating is tested and recognized for use in ground contact pressure treated lumber (ACQ-D), exterior, freshwater, general construction applications (e.g., Ground Contact AWPA UC1-UC4A ACQ-D).

4.8.1.2 HCR™ coated fasteners are approved for use in FRT lumber, provided the conditions set forth by the FRT lumber manufacturer are met, including appropriate strength reductions.

5 APPLICATIONS

5.1 SPAX® #8 and #9 PowerTrim™ Screws are used to attach wood, composite wood, or composite (PVC) trim and fascia to wood main members in conventional light-frame construction and provide resistance against head pull-through and withdrawal.

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® #8 and #9 PowerTrim™ 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® #8 and #9 PowerTrim™ Screws are specified in Table 3.

TABLE 3. HEAD PULL-THROUGH DESIGN VALUES FOR SPAX® POWERTRIM™ SCREW

Trim Thickness[1]	Head Pull-Through Design Value (lbs)
½"	26
¾"	37
1"	37

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

1. Any brand of trim board can be used provided it has a minimum head pull-through strength as shown in this table, using the SPAX® PowerTrim™ Screw when tested in accordance with *ASTM D1761*. Note that Royal® Mouldings Limited Royal Trim Board meets this requirement.

[4] 2018 *IBC* Section 2304.10.5

5.5 *Reference Withdrawal Design Values in Face Grain Applications*

5.5.1 Reference withdrawal Design Values for SPAX® #8 and #9 PowerTrim™ Screws are specified in Table 4.

TABLE 4. REFERENCE WITHDRAWAL VALUES FOR SPAX® POWERTRIM™ SCREW IN FACE GRAIN

Member Type[1] (Specific Gravity)	Reference Withdrawal Value[2,3] (lbs/in)
SPF (0.42)	130
DF-L (0.50)	160
SP (0.55)	175

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

1. For wood species with an assigned specific gravity between 0.42 and 0.50, 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.
2. Fastener penetration is the threaded length embedded in the wood member, including the tip.
3. Tabulated withdrawal values shall be adjusted by all applicable adjustment factors per *NDS* Table 11.3.1.

6 INSTALLATION

6.1 Installation shall comply with the manufacturer's installation instructions and this TER. In the event of a conflict between the manufacturer's installation instructions and this TER, the more restrictive shall govern.

6.2 The SPAX® PowerTrim™ Screw #8 shall be installed using a T-10 or SPAX® T-10 plus driver bit.

6.3 The SPAX® PowerTrim™ Screw #9 shall be installed using a T-15 or SPAX® T-15 plus driver bit.

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

6.5 Lead holes are not required.

6.6 The fastener head must be installed flush with the surface of the wood, composite wood, or composite (PVC) side member being connected. The fastener must not be overdriven.

6.7 Minimum 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 5.

TABLE 5. MINIMUM SPACING, EDGE DISTANCE, AND END DISTANCE REQUIREMENTS

Connection Geometry	Minimum Spacing/Distance[1,2] (in)	
	#8	#9
Edge Distance – Load in any direction	3/8	3/8
End Distance – Load parallel to grain, towards end	1¾	1 7/8
End Distance – Load parallel to grain, away from end	1 1/8	1¼
End Distance – Load perpendicular to grain	1 1/8	1¼
Spacing between Fasteners in a Row – Parallel to grain	1¾	1 7/8
Spacing between Fasteners in a Row – Perpendicular to grain	1 1/8	1¼
Spacing between Rows of Fasteners – In-line	5/8	5/8
Spacing between Rows of Fasteners – Staggered	3/8	3/8

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 Test Engineering 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 Testing for bending yield by SBCRI in accordance with *ASTM F1575*

7.1.2 Testing for tensile strength by SBCRI in accordance with *AISI S904*

7.1.3 Testing for shear strength by SBCRI in accordance with *AISI S904*

7.1.4 Testing for head pull-through by SBCRI in accordance with *ASTM D1761*

7.1.5 Testing for withdrawal by SBCRI in accordance with *ASTM D1761*

7.1.6 Testing for corrosion by Element in accordance with *ASTM B117* (modified) and *ASTM G85*

7.2 Information contained herein is the result of testing and/or data analysis by sources which conform to *IBC* Section 1703 and/or professional engineering regulations. DrJ relies upon accurate data to perform its ISO/IEC 17065 evaluations.

7.3 Where appropriate, DrJ's analysis is based on provisions that have been codified into law through state or local adoption of codes and standards. The providers of the codes and standards are legally responsible for their content. DrJ analysis may use code-adopted provisions as a control sample. A control sample versus a test sample establishes a product as being equivalent to that prescribed in this code in quality, *strength*, effectiveness, *fire resistance*, durability, and safety. Where the accuracy of the provisions provided herein is reliant upon the published properties of materials, DrJ relies upon the grade mark, grade stamp, mill certificate, and/or test data provided by material suppliers to be minimum properties. DrJ analysis relies upon these properties to be accurate.

8 Findings

8.1 When used and installed in accordance with this TER and the manufacturer's installation instructions, the product(s) listed in Section 1.1 are approved for the following:

8.1.1 Provide resistance to head pull-through loads as shown in Table 3.

8.1.2 Provide resistance to reference withdrawal loads as shown in Table 4.

8.2 This product has 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.

8.2.1 No known variations

8.3 Building codes require data from valid *research reports* be obtained from *approved sources* (i.e., licensed *registered design professionals* [RDPs]).

8.3.1 Building official approval of a licensed RDP is performed by verifying the RDP and/or their business entity is listed by the licensing board of the relevant *jurisdiction*.

8.4 Agencies who are accredited through ISO/IEC 17065 have met the code requirements for approval by the *building official*. DrJ is an ISO/IEC 17065 ANAB-Accredited Product Certification Body – Accreditation #1131 and employs RDPs.

8.5 Through ANAB accreditation and the IAF MLA, DrJ certification 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."

8.6 *IBC* Section 104.11 (*IRC* Section R104.11 and *IFC* Section 104.10[5] are similar) 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*.

9 Conditions of Use

9.1 Wood main and side members must have a moisture content of less than or equal to 19 percent.

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

9.3 Where required by the *building official*, also known as the authority having jurisdiction (AHJ) in which the project is to be constructed, this TER and the installation instructions shall be submitted at the time of *permit* application.

9.4 Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the AHJ for review and approval.

9.5 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).

9.6 At a minimum, this product shall be installed per Section 6 of this TER.

9.7 This product has an internal quality control program and a third-party quality assurance program in accordance with *IBC* Section 104.4 and Section 110.4 and *IRC* Section R104.4 and Section R109.2.

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.

9.9 This TER shall be reviewed for code compliance by the AHJ in concert with *IBC* Section 104.

9.10 The implementation of this TER for this product is dependent on the design, quality control, third-party quality assurance, proper implementation of installation instructions, inspections required by *IBC* Section 110.3, and any other code or regulatory requirements that may apply.

10 Identification

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

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

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.

[5] 2018 *IFC* Section 104.9