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Technical Evaluation Report

TER 1911-04

Big Timber® WTX Wood Screw Properties

Western Builders Supply
DBA Big Timber®

Product:

WTX Wafer Head Wood Screws

Issue Date:
December 22, 2020
Revision Date:
March 9, 2022
Subject to Renewal:
October 1, 2022

COMPANY INFORMATION:

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DBA Big Timber®

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DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

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

1 PRODUCT EVALUATED[1]

1.1 WTX Wafer Head Wood Screws

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 *FBC-B—17, 20: Florida Building Code – Building[4] (FL 41095)*

2.1.4 *FBC-R—17, 20: Florida Building Code – Residential[4] (FL 41095)*

2.2 *Standards and Referenced Documents*

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

2.2.2 *ANSI/APA PRS 610.1: Standard for Performance-Rated Structural Insulated Panels in Wall Applications*

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 Practices for Operating Salt Spray (Fog) Apparatus*

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

2.2.7 *ASTM D2395: Standard Test Methods for Density and Specific Gravity (Relative Density) of Wood and Wood-Based Materials*

2.2.8 *ASTM D2915: Standard Practice for Sampling and Data-Analysis for Structural Wood and Wood-Based Products*

[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.

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

2.2.9 *ASTM D4442: Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials*

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

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

2.2.12 *DOC PS 2: Performance Standard for Wood-based Structural-use Panels*

3 Performance Evaluation

3.1 Big Timber® WTX Wafer Head Wood Screws were tested and evaluated to determine their structural resistance properties, which were 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 Lateral shear in accordance with *ASTM D1761*

3.1.5 Withdrawal strength in accordance with *ASTM D1761*

3.1.6 Head pull-through in accordance with *ASTM D1761*

3.1.7 Corrosion resistance in accordance with *ASTM B117* and *ASTM G85*

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

3.3 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 WTX screws have a round wafer head with a star drive (torx screw) and are partially threaded with a Type 17 tip. The product evaluated in this TER is shown in Figure 1.

Figure 1. WTX Wafer Head Screw

4.2 WTX screws are manufactured using a standard cold-formed process followed by heat-treating process.

4.3 WTX screws are coated with a proprietary coating, designated as Black.

4.4 WTX screws approved for use in chemically treated or untreated lumber where *ASTM A153, Class D* coatings are approved for use in accordance with *IBC* Section 2304.10 and *IRC* Section R317.3.

4.4.1 The proprietary coating has been tested and found to exceed the protection provided by code-approved hot-dipped galvanized coatings meeting *ASTM A153, Class D* (*IBC* Section 2304.10.6[5] and *IRC* Section R317.3), allowing for its use in pressure treated wood.

4.4.2 Fasteners are approved for use in fire-retardant-treated lumber, provided the conditions set forth by the fire-retardant-treated lumber manufacturer are met, including appropriate strength reductions.

4.5 The fasteners evaluated in this TER are set forth in Table 1.

[5] 2018 *IBC* Section 2304.10.5

TABLE 1. FASTENER SPECIFICATIONS

Fastener Name	Designation	Head (in)		Nominal Length[1] (in)	Thread Length[2] (in)	Shank Diameter[3] (in)	Thread Diameter (in)		Specified Minimum Core Hardness[5] (HV 0.3)	Nominal Bending Yield, f_{yb} (psi)	Allowable Fastener Strength (lbf)	
		Diameter	Drive Type				Minor	Major			Tensile	Shear[4]
WTX	15 x 3"	0.659	Torx 30	3	2¾	0.205	0.187	0.274	286	190,000	1,545	1,165
	15 x 3½"			3½	2							
	15 x 4"			4	2							
	15 x 4½"			4½	2							
	15 x 5"			5	2							
	15 x 6"			6	2½							
	15 x 8"			8	2½							

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

1. Fastener length is measured from the top of the head to the tip.
2. Thread length excludes the knurl. The WTX 15x3" is fully threaded (no knurl).
3. Shank diameter based on manufactured thickness. Finished dimensions are larger, due to the proprietary coatings added.
4. Shear determined at thread or smooth shank diameter.
5. Based on a 300 gram load using the Vickers indenter.

5 APPLICATIONS

5.1 *General*

5.1.1 WTX screws are used to attach wood framing members in conventional light-frame construction and provide resistance against withdrawal, head pull-through, axial, and shear loads. See Section 6 for installation requirements.

5.1.2 WTX screws are installed without lead holes, as prescribed in *NDS*.

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

5.2 *Design*

5.2.1 Design of WTX screws is governed by the applicable code and the provisions for dowel-type fasteners in *NDS*.

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

5.3 *WTX Reference Lateral Design Values (Z)*

5.3.1 Reference lateral design values (lbf) for shear load perpendicular to grain and parallel to grain for WTX screws in sawn lumber are specified in Table 2.

TABLE 2. WTX SCREW REFERENCE LATERAL DESIGN VALUES (Z) FOR CONNECTIONS IN SAWN LUMBER, LBF[1,2,3,4]

Fastener Name	Designation	Nominal Length (in)	Thread Length (in)	Minimum Side Member Thickness (in)	Minimum Main Member Penetration[5] (in)	Wood Species (Specific Gravity)			
						HF/SPF (0.42)		DF-L (0.50)	
						$Z_{\perp}$	$Z_{\parallel}$	$Z_{\perp}$	$Z_{\parallel}$
WTX	15 x 3"	3	2¾	1½	1½	200	210	250	220
	15 x 3½"	3½	2						
	15 x 4"	4	2						
	15 x 4½"	4½	2						
	15 x 5"	5	2						
	15 x 6"	6	2½						
	15 x 8"	8	2½						

SI: 1 in = 25.4 mm, 1 lb = 4.45 N, 1 lb/in = 0.175 kN/m

1. Reference lateral design values apply to two-member single shear connections where both members are of the same specific gravity, and the fastener is oriented perpendicular to grain. Where the members are of different specific gravities, use the lower of the two.
2. For wood species with a specific gravity between 0.42 and 0.50, use the tabulated values for specific gravity of 0.42.
3. Tabulated lateral design values (Z) shall be adjusted by all applicable adjustment factors per *NDS* Table 11.3.1.
4. $Z_{\perp}$ = Lateral Design Values Perpendicular to Grain, $Z_{\parallel}$ = Lateral Design Values Parallel to Grain.
5. Fastener main member penetration is the length embedded in the main member, including the tip.

5.3.2 Reference lateral design values (lbf) for structural insulation panels (SIPs) are specified in Table 3.

TABLE 3. WTX SCREW REFERENCE LATERAL DESIGN VALUES (Z) IN SIPS, LBF

Fastener Name	Designation	Nominal Length (in)	Thread Length (in)	SIP Total Thickness[1,2,3] (in)	Main Member Wood Species[4,5] (Specific Gravity)	Lateral Design Values[6], Z (lbf)
WTX	15 x 5"	5	2	3½	HF/SPF (0.42)	215
	15 x 8"	8	2½	6½		235
	15 x 8"	8	2½	6½	DF-L (0.50)	245

SI: 1 in = 25.4 mm, 1 lb = 4.45 N, 1 lb/in = 0.175 kN/m

1. SIP thickness is measured from exterior face to exterior face. Each SIP consists of two $^{7}/_{16}$" OSB faces with a foam core in between.
2. The OSB faces on the SIPs shall comply with *ANSI/APA PRS 610.1*.
3. Fastener shall be driven such that the underside of the head is flush with the face of the SIP.
4. For main member wood species with a specific gravity between 0.42 and 0.50, use the tabulated values for specific gravity of 0.42.
5. The fastener is driven into the face of the main member and is loaded parallel to grain.
6. Tabulated lateral design values (Z) shall be adjusted by all applicable adjustment factors per *NDS* Table 11.3.1.

5.4 *WTX Reference Withdrawal Design Values (W) in Side Grain Applications*

5.4.1 Reference withdrawal design values (lbf/in) for WTX screws are specified in Table 4.

TABLE 4. WTX SCREW REFERENCE WITHDRAWAL VALUES (W) – SIDE GRAIN APPLICATIONS, LBF/IN

Fastener Name	Designation	Nominal Length (in)	Thread Length (in)	Withdrawal Design Value[1,2,4], W (lbf/in)	
				Wood Species[3] (Specific Gravity)	
				HF/SPF (0.42)	DF-L (0.50)
WTX	15 x 3"	3	2¾	130	165
	15 x 3½"	3½	2		
	15 x 4"	4	2		
	15 x 4½"	4½	2		
	15 x 5"	5	2		
	15 x 6"	6	2½		
	15 x 8"	8	2½		

SI: 1 in = 25.4 mm, 1 lb = 4.45 N, 1 lb/in = 0.175 kN/m

1. Tabulated withdrawal values (W) shall be adjusted by all applicable adjustment factors per *NDS* Table 11.3.1.
2. Minimum fastener penetration into main member of 1" is required. Fastener penetration is the threaded length embedded in the main member, including the tip.
3. For wood species with a specific gravity between 0.42 and 0.50, use the tabulated values for specific gravity of 0.42.
4. The full design withdrawal value is equal to the reference withdrawal value multiplied by the length of the threaded portion of the fastener embedded in the main member.

5.5 *WTX Reference Head Pull-Through Design Values (P)*

5.5.1 Reference design values for head pull-through (lbf) for WTX screws are specified in Table 5.

TABLE 5. WTX SCREW REFERENCE HEAD PULL-THROUGH DESIGN VALUES (P), LBF

Fastener Name	Designation	Nominal Length (in)	Thread Length (in)	Head Pull-Through Design Value[1], P (lbf)		
				OSB Grade and Assembly		
				7/16" OSB[2]	7/16" OSB SIP Face Material[3]	7/16" OSB SIP Face Material[3] with Metal Washer[4]
WTX	15 x 3"	3	2¾	120	140	185
	15 x 3½"	3½	2			
	15 x 4"	4	2			
	15 x 4½"	4½	2			
	15 x 5"	5	2			
	15 x 6"	6	2½			
	15 x 8"	8	2½			

SI: 1 in = 25.4 mm, 1 lb = 4.45 N, 1 lb/in = 0.175 kN/m

1. Tabulated pull-through values (P) shall be adjusted by all applicable adjustment factors per *NDS* Table 11.3.1.
2. OSB shall comply with *DOC PS 2* and shall have a specific gravity of at least 0.50.
3. The OSB faces on the SIPs shall comply with *ANSI/APA PRS 610.1*.
4. The fastener shall be installed with a minimum 2" diameter 20 gage metal washer between the fastener head and the face of the OSB.

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 Minimum penetration is 1″, unless otherwise stated in this TER. Install fasteners with the underside of the head flush to the surface of the wood member.

6.3 Lead holes are not required.

6.4 Screws shall be installed with the appropriate rotating powered driver.

6.5 Minimum requirements for screw spacing, edge distance, and end distance shall be in accordance with Table 6.

TABLE 6. WTX 15 SCREW SPACING, EDGE DISTANCE, AND END DISTANCE REQUIREMENTS[1]

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

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 screws 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 Shear and tensile testing in accordance with *ASTM S904*

7.1.3 Lateral strength testing in accordance with *ASTM D1761*

7.1.4 Withdrawal strength testing in accordance with *ASTM D1761*

7.1.5 Head pull-through testing in accordance with *ASTM D1761*

7.1.6 Corrosion resistance testing in accordance with *ASTM B117 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 have the reference design value properties defined herein and are approved for use in accordance with the applicable code.

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

8.2.1 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*.

8.3 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.

8.4 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."

8.5 *IBC* Section 104.11 (*IRC* Section R104.11 and *IFC* Section 104.10[6] 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 member moisture content shall be less than or equal to 19% for sawn lumber and less than 16% for OSB.

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

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.

[6] 2018 *IFC* Section 104.9

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 bigtimberfasteners.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.

Issue Date: March 9, 2022
Subject to Renewal: October 1, 2022

FBC Supplement to TER 1911-04

REPORT HOLDER: Western Builders Supply
DBA Big Timber®

1 Evaluation Subject

1.1 WTX Wafer Head Wood Screws

2 Purpose and Scope

2.1 *Purpose*

2.1.1 The purpose of this Technical Evaluation Report (TER) supplement is to show WTX Wafer Head Wood Screws, recognized in TER 1911-04, has also been evaluated for compliance with the codes listed below as adopted by the Florida Building Commission.

2.2 *Applicable Code Editions*

2.2.1 *FBC-B—17, 20: Florida Building Code – Building (FL 41095)*

2.2.2 *FBC-R—17, 20: Florida Building Code – Residential (FL 41095)*

3 Conclusions

3.1 WTX Wafer Head Wood Screws, described in TER 1911-04, complies with the *FBC-B* and *FBC-R* and is subject to the conditions of use described in this supplement.

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

3.2.1 *FBC-B* Section 104.4 and Section 110.4 are reserved.

3.2.2 *FBC-R* Section R104 and Section R109 are reserved.

4 Conditions of Use

4.1 WTX Wafer Head Wood Screws, described in TER 1911-04, must comply with all of the following conditions:

4.1.1 All applicable sections in TER 1911-04

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