



**CERTIFICATION**



**Approved. Sealed. Code Compliant.**

**Technical Evaluation Report**

**TER 1911-03**

Big Timber® RWH Screw Properties

**Western Builders Supply DBA  
Big Timber®**

**Products:**

**Round Washer Head (RWH)  
Screws**

Issue Date:

September 24, 2020

Revision Date:

September 26, 2022

Subject to Renewal:

October 1, 2023



COMPANY  
INFORMATION:

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Western Builders Supply DBA Big Timber®  
53 N 15th St Ste 1  
Billings, MT 59101-2501

406-252-6309

[sales@bigtimberfasteners.com](mailto:sales@bigtimberfasteners.com)

[bigtimberfasteners.com](http://bigtimberfasteners.com)

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DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

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

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## 1 Product Evaluated<sup>1</sup>

- 1.1 Round Washer Head (RWH) Screws<sup>2</sup>

## 2 Applicable Codes and Standards<sup>3,4</sup>

### 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 (FL 35216)*
- 2.1.4 *FBC-R—17, 20: Florida Building Code – Residential (FL 35216)*

### 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 A208.1 Particleboard*
- 2.2.3 *ANSI/AWC NDS: National Design Specification (NDS) for Wood Construction*
- 2.2.4 *ASTM A153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*
- 2.2.5 *ASTM A510: Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel*
- 2.2.6 *ASTM D1554: Standard Terminology Relating to Wood-Base Fiber and Particle Panel Materials*
- 2.2.7 *ASTM D1761: Standard Test Methods for Mechanical Fasteners in Wood*
- 2.2.8 *ASTM D2395: Standard Test Methods for Density and Specific Gravity (Relative Density) of Wood and Wood-Based Materials*
- 2.2.9 *ASTM D2915: Standard Practice for Sampling and Data-Analysis for Structural Wood and Wood-Based Products*

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<sup>1</sup> For more information, visit [drjcertification.org](http://drjcertification.org) or call us at 608-310-6748.

<sup>2</sup> Formerly known as "CAB, CAB WHT, and CAB BLK Cabinet Screws."

<sup>3</sup> 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.

<sup>4</sup> All terms defined in the applicable building codes are italicized.

- 2.2.10 *ASTM D4442: Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials*
- 2.2.11 *ASTM F1575: Standard Test Method for Determining Bending Yield Moment of Nails*
- 2.2.12 *DOC PS 1: Structural Plywood*

### 3 Performance Evaluation

- 3.1 Big Timber® “Low Profile” Round Washer Head (RWH) 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*
- 3.2 RWH screws were tested and evaluated for corrosion resistance of fasteners meeting or exceeding the protection afforded hot-dipped galvanized fasteners in accordance with *ASTM A153*, Class D.
- 3.3 Use of screws in locations exposed to saltwater or saltwater spray are outside the scope of this TER.
- 3.4 Any code compliance issues not specifically addressed in this section are outside the scope of this TER.
- 3.5 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 RWH screws have a round washer head with a star drive, are partially threaded, and are coated for exterior use. The RWH screw is shown in Figure 1.



Figure 1. RWH Screw

- 4.2 RWH screws are manufactured using a standard cold-formed process followed by a heat-treating process.
- 4.3 RWH screws are coated with a proprietary coating, designated as Bronze, which exceeds the protections provided by hot-dipped galvanized coatings conforming to *ASTM A153*.
  - 4.3.1 RWH screw is available from the manufacturer in multiple colors.
- 4.4 RWH screws are 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 in accordance with *IBC Section 2304.10.6*<sup>5</sup> and *IRC Section R317.3*, allowing for its use in pressure-treated wood.
  - 4.4.2 Screws 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.

<sup>5</sup> 2018 *IBC Section 2304.10.5*

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

Table 1. Screw Specifications

Screw Name	Designation	Head (in)		Nominal Length <sup>1</sup> (in)	Thread Length <sup>1</sup> (in)	Shank Diameter <sup>2</sup> (in)	Thread Diameter (in)		Specified Minimum Core Hardness <sup>4</sup> (HV 0.3)	Nominal Bending Yield, $f_{yb}$ (psi)	Allowable Screw Strength (lbf)	
		Diameter	Drive Type				Minor	Major			Tensile	Shear <sup>3</sup>
RWH	8 x 1¼"	0.433	T20	1¼	⅞	0.119	0.107	0.171	240	179,000	480	415
	8 x 1⅝"			1⅝	1							
	8 x 2"			2	1⅜							
	8 x 2½"			2½	2							
	8 x 3"			3	2							
	10 x 2½"	0.500	T25	2½	1½	0.144	0.122	0.190	240	190,000	885	680
	10 x 3"			3	2							
	10 x 3"			3	2							

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

1. Screw length is measured from the underside of the head to the tip. Thread length includes tapered tip.
2. Shank diameter based on manufactured thickness. Finished dimensions are larger, due to the proprietary coatings added.
3. Shear strength applicable at both the smooth shank and thread diameter.
4. Based on a 300 gram load using the Vickers indenter.

## 5 Applications

### 5.1 General

- 5.1.1 RWH screws are used for 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 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 RWH 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 Reference Lateral Design Values (Z)

- 5.3.1 Reference lateral design values (lbf) for shear load parallel and perpendicular to grain for RWH screws are specified in Table 2 for plywood with gypsum wallboard (GWB) between the main and side members and in Table 3 for sawn lumber.

Table 2. Reference Lateral Design Values (Z) for <sup>23</sup>/<sub>32</sub>" Plywood Side Member with <sup>5</sup>/<sub>8</sub>" GWB

Screw Name	Designation	Nominal Length (in)	Thread Length (in)	Minimum Side Member Thickness (in)	Minimum Main Member Penetration <sup>4</sup> (in)	Lateral Design Value <sup>1,2,3,6</sup> , Z (lbf)	
						Main Member Wood Species <sup>5</sup> (Specific Gravity)	
						SPF (0.42)	DF-L (0.50)
RWH	8 x 2½"	2½	2	<sup>23</sup> / <sub>32</sub>	1½	125	150
	8 x 3"	3	2	<sup>23</sup> / <sub>32</sub>	1½		
	10 x 2½"	2½	1½	<sup>23</sup> / <sub>32</sub>	1½	125	150
	10 x 3"	3	2	<sup>23</sup> / <sub>32</sub>	1½	200	200

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

- Reference lateral design values apply to two-member single shear connections where the side member is plywood and GWB, the main member is DF-L (SG = 0.50) or SPF (SG = 0.42) respectively, and the screw is installed in the face of the member. The main member shall have a minimum thickness of 1.5".
- Tabulated lateral design values (Z) shall be adjusted by all applicable adjustment factors per NDS Table 11.3.1.
- Lateral design values apply to both perpendicular ( $Z_{\perp}$ ) and parallel ( $Z_{\parallel}$ ) to main member grain orientations.
- Screw main member penetration is the length embedded in the main member, including the tip.
- For wood species of main member with a SG between 0.42 and 0.50, use the tabulated values for SG of 0.42.
- Plywood shall comply with DOC PS 1. Plywood shall have a SG of at least 0.42.

Table 3. Reference Lateral Design Values (Z) for Sawn Lumber Main and Side Members

Screw Name	Designation	Nominal Length (in)	Thread Length (in)	Minimum Side Member Thickness (in)	Minimum Main Member Penetration <sup>5</sup> (in)	Lateral Design Value, <sup>1,2,3,4</sup> Z (lbf)			
						SPF (SG = 0.42)		DF-L (SG = 0.50)	
						$Z_{\perp}$	$Z_{\parallel}$	$Z_{\perp}$	$Z_{\parallel}$
RWH	8 x 1½"	1½	1	<sup>3</sup> / <sub>4</sub>	<sup>7</sup> / <sub>8</sub>	50	50	70	70
	8 x 2"	2	1¾	<sup>3</sup> / <sub>4</sub>	1¼	60	60	75	75
	8 x 2½"	2½	2	1½	1	65	65	80	80
	8 x 3"	3	2	1½	1½	75	75	85	85
	10 x 2½"	2½	1½	1½	1	80	80	100	100
	10 x 3"	3	2	1½	1½	100	165	115	225

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

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

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

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

Table 4. Reference Withdrawal Design Values (W)

Screw Name	Designation	Nominal Length (in)	Thread Length (in)	Withdrawal Design Value <sup>1,3,4</sup> , W (lbf/in)	
				Wood Species <sup>2</sup> (Specific Gravity)	
				SPF (0.42)	DF-L (0.50)
RWH	8 x 1¼"	1¼	⅞	175	225
	8 x 1⅝"	1⅝	1		
	8 x 2"	2	1⅜		
	8 x 2½"	2½	2		
	8 x 3"	3	2		
	10 x 2½"	2½	1½		
	10 x 3"	3	2		

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

- Tabulated withdrawal values (W) shall be adjusted by all applicable adjustment factors per *NDS* Table 11.3.1.
- For wood species with a SG between 0.42 and 0.50, use the tabulated values for SG of 0.42.
- The full design withdrawal value is equal to the reference withdrawal value multiplied by the length of the threaded portion of the screw embedded in the main member.
- Screw penetration is the threaded length embedded in the main member, including the tip.

### 5.5 Reference Head Pull-Through Design Values (P)

5.5.1 Reference design values for head pull through (lbf) for RWH screws are specified in Table 5 for particleboard, plywood, and sawn lumber.

Table 5. Reference Head Pull-Through Design Values

Screw Name	Designation	Nominal Length (in)	Thread Length (in)	Head Pull-Through Design Value <sup>1,5</sup> , P (lbf)		
				Side Member		
				¾" Particleboard <sup>2</sup>	23/32" Plywood <sup>3</sup>	1.5" SPF <sup>4</sup>
RWH	8 x 1¼"	1¼	⅞	255	350	-
	8 x 1⅝"	1⅝	1			
	8 x 2"	2	1⅜			
	8 x 2½"	2½	2			
	8 x 3"	3	2			
	10 x 2½"	2½	1½			180
	10 x 3"	3	2			525

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

- Tabulated pull-through values (P) shall be adjusted by all applicable adjustment factors per *NDS* Table 11.3.1.
- Particleboard shall be medium density and comply with *ANSI A208.1* per *IBC Section 2303.1.8*. Particleboard shall have a minimum density of 40 lb/ft<sup>3</sup> (640 kg/m<sup>3</sup>).
- Plywood shall comply with *DOC PS 1*. Plywood shall have a SG of at least 0.42.
- Wood species shall have a SG of at least 0.42.
- Pull-through design values apply to connections having the listed minimum wood side member thickness.



## 6 Installation

- 6.1 Installation shall comply with the manufacturer installation instructions and this TER. In the event of a conflict between the manufacturer installation instructions and this TER, the more restrictive shall govern.
- 6.2 Minimum penetration is 1", unless otherwise stated in this TER. Install screws with 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. Screw Spacing, Edge Distance, and End Distance Requirements<sup>1,2</sup>

Connection Geometry	Minimum Spacing/Distance (in)	
	RWH #8	RWH #10
Edge Distance – Load in any direction	3/8	3/8
End Distance – Load parallel to grain, towards end	1 7/8	2 1/4
End Distance – Load parallel to grain, away from end	1 1/4	1 1/2
End Distance – Load perpendicular to grain	1 1/4	1 1/2
Spacing between Screws in a Row – Parallel to grain	1 7/8	2 1/4
Spacing between Screws in a Row – Perpendicular to grain	1 1/4	1 1/2
Spacing between Rows of Screws – In-line	5/8	3/4
Spacing between Rows of Screws – Staggered	3/8	3/8

SI: 1 in. = 25.4 mm

1. Edge distances, end distances, and spacing of screws 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 Screws-Staggered" apply where the screws in adjacent rows are offset by one half of the "Spacing between Screws 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 Lateral strength testing in accordance with *ASTM D1761*
  - 7.1.5 Withdrawal testing in accordance with *ASTM D1761*
  - 7.1.6 Head pull-through 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 is the result of testing and/or data analysis by sources that 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 installation instructions, the product listed in Section 1.1 has 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<sup>6</sup> 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 Moisture content of wood members shall be the following.
- 9.1.1 Sawn lumber: less than or equal to 19% per *NDS* Section 4.1.4
- 9.1.2 Plywood: less than 16% per *NDS* Section 9.1.4
- 9.1.3 Particleboard: less than 10% per *ANSI A208.1*
- 9.2 Use of screws 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.

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<sup>6</sup> 2018 *IFC* Section 104.9





- 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 listed in Section 1.1 is 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 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: December 22, 2020  
Subject to Renewal: October 1, 2023

## FBC Supplement to TER 1911-03

REPORT HOLDER: Western Builders Supply DBA Big Timber®

### 1 Evaluation Subject

- 1.1 Round Washer Head (RWH) Screws

### 2 Purpose and Scope

#### 2.1 Purpose

- 2.1.1 The purpose of this Technical Evaluation Report (TER) supplement is to show Round Washer Head (RWH) Screws, recognized in TER 1911-03, have 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 35216)*
- 2.2.2 *FBC-R—17, 20: Florida Building Code – Residential (FL 35216)*

### 3 Conclusions

- 3.1 Round Washer Head (RWH) Screws, described in TER 1911-03, comply with the *FBC-B* and *FBC-R* and are 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 Round Washer Head (RWH) Screws, described in TER 1911-03, must comply with all of the following conditions:
  - 4.1.1 All applicable sections in TER 1911-03
  - 4.1.2 The design, installation, conditions of use, and identification of Round Washer Head (RWH) Screws are in accordance with the 2018 *IBC* provisions noted in TER 1911-03.
  - 4.1.3 The design, installation, and inspections are in accordance with additional requirements of *FBC-B* Chapter 16 and Chapter 17, as applicable.