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## Technical Evaluation Report

**TER 1911-01**

Big Timber® BTX and YTX General  
Purpose Screw Properties

**Western Builders Supply  
DBA Big Timber**

**Product:**

**BTX and YTX General Purpose  
Screws**

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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 PRODUCTS EVALUATED<sup>1</sup>

- 1.1 BTX and YTX General Purpose Screws

## 2 APPLICABLE CODES AND STANDARDS<sup>2,3</sup>

### 2.1 Codes

- 2.1.1 *IBC—12, 15, 18: International Building Code®*
- 2.1.2 *IRC—12, 15, 18: International Residential Code®*

### 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/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 D1761: Standard Test Methods for Mechanical Fasteners in Wood*

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<sup>1</sup> Building codes require data from valid [research reports](#) be obtained from [approved sources](#). 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.

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.”

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<sup>2</sup> Unless otherwise noted, all references in this TER are from the 2018 version of the codes and the standards referenced therein (e.g., ASCE 7, NDS, ASTM). This material, design, or method of construction also complies with the 2000-2015 versions of the referenced codes and the standards referenced therein.

<sup>3</sup> All terms defined in the applicable building codes are italicized.

- 2.2.6 *ASTM D2395: Standard Test Methods for Density and Specific Gravity (Relative Density) of Wood and Wood-Based Materials*
- 2.2.7 *ASTM D2915: Standard Practice for Sampling and Data-Analysis for Structural Wood and Wood-Based Products*
- 2.2.8 *ASTM D4442: Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials*
- 2.2.9 *ASTM F1575: Standard Test Method for Determining Bending Yield Moment of Nails*
- 2.2.10 *DOC PS 2: Performance Standard for Wood-based Structural-use Panels*

### 3 PERFORMANCE EVALUATION

- 3.1 Big Timber® BTX and YTX General Purpose 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 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 Big Timber® BTX General Purpose 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.
  - 3.2.1 Corrosion resistance of Big Timber® YTX General Purpose Screws are outside the scope of this TER.
- 3.3 Use of fasteners in locations exposed to saltwater or saltwater spray is 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 on the dates provided in this TER and within DrJ's professional scope of work.

### 4 PRODUCT DESCRIPTION AND MATERIALS

- 4.1 BTX and YTX screws have a round flat head with a star drive (torx screw) and are partially threaded. The BTX (Figure 1) has a 1200hr Bronze coating for exterior use and the YTX (Figure 2) has a gold zinc coating for interior use.



FIGURE 1. BTX GENERAL PURPOSE SCREW (EXTERIOR USE)



FIGURE 2. YTX GENERAL PURPOSE SCREW (INTERIOR USE)



- 4.1 BTX and YTX screws are manufactured using a standard cold-formed process followed by a heat-treating process.
- 4.2 BTX 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 BTX fasteners 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<sup>4</sup>* and *IRC Section R317.3*.
  - 4.3.1 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 2304.10.5<sup>5</sup>* and *IRC Section R317.3*), allowing for its use in pressure-treated wood.
  - 4.3.2 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.
- 4.4 YTX screws are coated with a proprietary zinc coating, designated as Gold Star.
- 4.5 The fasteners evaluated in this TER are set forth in Table 1 and Table 2.

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<sup>4</sup> [2012 IBC Section 2304.9](#)

<sup>5</sup> [2012 IBC Section 2304.9.5](#)



TABLE 1. BTX FASTENER SPECIFICATIONS

Fastener Name(s)	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 Fastener Strength (lbF)	
		Diameter	Drive Type				Minor	Major			Tensile	Shear <sup>3</sup>
BTX	8 x ¾"	0.325	T20	¾	¾	0.119	0.102	0.163	355	198,000	640	515
	8 x 1"			1	¾							
	8 x 1¼"			1¼	¾							
	8 x 1½"			1½	1							
	8 x 1¾"			1¾	1¼							
	8 x 2"			2	1¼							
	9 x 1½"	0.344	T25	1½	1	0.135	0.122	0.175	355	211,000	820	595
	9 x 2"			2	1¼							
	9 x 2½"			2½	1½							
	9 x 2¾"			2¾	1½							
	9 x 3"			3	1½							
	9 x 3⅛"			3⅛	1½							
	10 x 2"	0.374	T25	2	1¼	0.151	0.134	0.209	355	205,000	960	710
	10 x 2½"			2½	1½							
	10 x 3"			3	1½							
	10 x 3½"			3½	2							
	10 x 4"			4	2							
	10 x 5"			5	2½							
	14 x 5"	0.465	T30	5	2½	0.169	0.145	0.232	286	211,000	1,270	960
	14 x 6"			6	2½							
14 x 7"	7			2½								
14 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. Thread length includes the tapered tip and excludes the knurl (see Figure 1).
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.

TABLE 2. YTX FASTENER SPECIFICATIONS

Fastener Name(s)	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 Fastener Strength (lb $f$ )	
		Diameter	Drive Type				Minor	Major			Tensile	Shear <sup>3</sup>
YTX	8 x 1"	0.325	T20	1	¾	0.119	0.102	0.163	355	198,000	640	515
	8 x 1¼"			1¼	¾							
	8 x 1½"			1½	1							
	8 x 1¾"			1¾	1¼							
	8 x 2"			2	1¼							
	8 x 2½"			2½	1½							
	9 x 2"	0.344	T25	2	1¼	0.135	0.122	0.175	355	211,000	820	595
	9 x 2½"			2½	1½							
	9 x 2¾"			2¾	1½							
	9 x 3"			3	1½							
	9 x 3⅛"			3⅛	1½							
	10 x 1½"	0.374	T25	1½	1	0.151	0.134	0.209	355	205,000	960	710
	10 x 2"			2	1¼							
	10 x 2½"			2½	1½							
	10 x 3"			3	1½							
	10 x 3⅛"			3⅛	1½							
	10 x 3½"			3½	2							
	10 x 4"			4	2							
10 x 5"	5			2½								
10 x 6"	6	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. Thread length includes the tapered tip and excludes the knurl (see Figure 2).
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 BTX and YTX 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 BTX and YTX 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 BTX and YTX 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 BTX and YTX Reference Lateral Design Values (Z)

- 5.3.1 Reference lateral design values (lbf) for shear load parallel and perpendicular to grain for BTX and YTX screws are specified in Table 3 for oriented strand board (OSB) and Table 4 and Table 5 for sawn lumber.

TABLE 3. REFERENCE LATERAL DESIGN VALUES FOR SPF MAIN MEMBER AND OSB SIDE MEMBER CONNECTIONS<sup>1</sup>

Fastener 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>2,3</sup> , Z (lbf)	
						OSB <sup>5</sup> (SG = 0.50)	
						Z <sub>⊥</sub>	Z <sub>  </sub>
BTX	8 x 1½"	1½	1	23/32	¾	55	55
	8 x 1¾"	1¾	1¼		1	60	60
	8 x 2"	2	1¼		1¼	100	95
	8 x 1¼"	1¼	¾	7/16	¾	40	40
	8 x 1½"	1½	1		1	50	50
	8 x 1¾"	1¾	1¼		1¼	55	55
	8 x 2"	2	1¼		1½	100	95
YTX	8 x 1½"	1½	1	23/32	¾	55	55
	8 x 1¾"	1¾	1¼		1	60	60
	8 x 2"	2	1¼		1¼	100	95
	8 x 2½"	2½	1½	7/16	¾	50	50
	8 x 1¼"	1¼	¾		¾	50	50
	8 x 1½"	1½	1		1	50	50
	8 x 1¾"	1¾	1¼		1¼	55	55
	8 x 2"	2	1¼		1½	100	95
	8 x 2½"	2½	1½		1½	100	95

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 OSB, 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 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.
- Z<sub>⊥</sub> = Lateral Design Values Perpendicular to Main Member Grain, Z<sub>||</sub> = Lateral Design Values Parallel to Main Member Grain.
- Fastener main member penetration is the length embedded in the main member, including the tip.
- OSB shall comply with *DOC PS 2*. OSB shall have a specific gravity of at least 0.50.

TABLE 4. BTX REFERENCE LATERAL DESIGN VALUES FOR CONNECTIONS IN SAWN LUMBER<sup>1,2,3,4</sup>

Fastener Name	Designation	Nominal Length (in)	Thread Length (in)	Minimum Side Member Thickness (in)	Minimum Main Member Penetration <sup>5</sup> (in)	Lateral Design Value, Z (lbf)			
						DF-L (SG = 0.50)		SPF (SG = 0.42)	
						Z <sub>⊥</sub>	Z <sub>∥</sub>	Z <sub>⊥</sub>	Z <sub>∥</sub>
BTX	9 x 1½"	1½	1	¾	¾	70	70	65	65
	9 x 2"	2	1¼	¾	1¼	100	100	80	80
	9 x 2½"	2½	1½	¾	1½	100	100	90	90
	9 x 2¾"	2¾	1½						
	9 x 3"	3	1½	1½	1½	210	130	160	120
	9 x 3⅛"	3⅛	1½						
	10 x 2"	2	1¼	¾	1¼	105	105	90	90
	10 x 2½"	2½	1½	1½	1	115	115	100	100
	10 x 3"	3	1½	1½	1½	155	165	165	155
	10 x 3½"	3½	2						
	10 x 4"	4	2						
	10 x 5"	5	2½						
	10 x 6"	6	2½						
	14 x 5"	5	2½	1½	1½	395	260	305	265
	14 x 6"	6	2½						
	14 x 7"	7	2½						
14 x 8"	8	2½							

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 fastener 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 specific gravity between 0.42 and 0.50, use the tabulated values for specific gravity of 0.42.
- Tabulated lateral design values (Z) shall be adjusted by all applicable adjustment factors per NDS Table 11.3.1.
- Z<sub>⊥</sub> = Lateral Design Values Perpendicular to Grain, Z<sub>∥</sub> = Lateral Design Values Parallel to Grain.
- Fastener main member penetration is the length embedded in the main member, including the tip.



TABLE 5. YTX REFERENCE LATERAL DESIGN VALUES FOR CONNECTIONS IN SAWN LUMBER<sup>1,2,3,4</sup>

Fastener Name	Designation	Nominal Length (in)	Thread Length (in)	Minimum Side Member Thickness (in)	Minimum Main Member Penetration <sup>5</sup> (in)	Lateral Design Value, Z (lbf)			
						DF-L (SG = 0.50)		SPF (SG = 0.42)	
						Z <sub>⊥</sub>	Z <sub>∥</sub>	Z <sub>⊥</sub>	Z <sub>∥</sub>
YTX	9 x 2"	2	1¼	¾	1¼	100	100	80	80
	9 x 2½"	2½	1½	¾	1½	100	100	90	90
	9 x 2¾"	2¾	1½	¾	1½	100	100	90	90
	9 x 3"	3	1½	1½	1½	210	130	160	120
	9 x 3⅛"	3⅛	1½						
	10 x 2"	2	1¼	¾	1¼	105	105	90	90
	10 x 2½"	2½	1½	1½	1	115	115	100	100
	10 x 3"	3	1½	1½	1½	155	165	165	155
	10 x 3⅛"	3⅛	1½						
	10 x 3½"	3½	2						
	10 x 4"	4	2						
	10 x 5"	5	2½						
	10 x 6"	6	2½						

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 fastener 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 specific gravity between 0.42 and 0.50, use the tabulated values for specific gravity of 0.42.
- Tabulated lateral design values (Z) shall be adjusted by all applicable adjustment factors per NDS Table 11.3.1.
- Z<sub>⊥</sub> = Lateral Design Values Perpendicular to Grain, Z<sub>∥</sub> = Lateral Design Values Parallel to Grain.
- Fastener main member penetration is the length embedded in the main member, including the tip.

**5.4 BTX and YTX Reference Withdrawal Design Values (W) in Side Grain Applications**

5.4.1 Reference withdrawal design values (lbf/in) for BTX and YTX screws in sawn lumber are specified in Table 6 and Table 7 respectively.

**TABLE 6. BTX REFERENCE WITHDRAWAL DESIGN VALUES<sup>1</sup>**

Fastener Name	Designation	Nominal Length (in)	Thread Length (in)	Withdrawal Design Value <sup>3,4</sup> , W (lbf/in)	
				Wood Species <sup>2</sup> (Specific Gravity)	
				DF-L (0.50)	SPF (0.42)
BTX	8 x ¾"	¾	¾	150	100
	8 x 1"	1	¾		
	8 x 1¼"	1¼	¾		
	8 x 1½"	1½	1		
	8 x 1¾"	1¾	1¼		
	8 x 2"	2	1¼		
	9 x 1½"	1½	1	155	120
	9 x 2"	2	1¼		
	9 x 2½"	2½	1½		
	9 x 2¾"	2¾	1½		
	9 x 3"	3	1½		
	9 x 3⅛"	3⅛	1½	160	110
	10 x 2"	2	1¼		
	10 x 2½"	2½	1½		
	10 x 3"	3	1½		
	10 x 3½"	3½	2		
	10 x 4"	4	2		
	10 x 5"	5	2½	200	125
	10 x 6"	6	2½		
	14 x 5"	5	2½		
14 x 6"	6	2½			
14 x 7"	7	2½			
14 x 8"	8	2½			

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 specific gravity between 0.42 and 0.50, use the tabulated values for specific gravity 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 fastener embedded in the main member.
- Fastener penetration is the threaded length embedded in the main member, including the tip.

TABLE 7. YTX REFERENCE WITHDRAWAL DESIGN VALUES<sup>1</sup>

Fastener Name	Designation	Nominal Length (in)	Thread Length (in)	Withdrawal Design Value <sup>3,4</sup> , W (lbf/in)	
				Wood Species <sup>2</sup> (Specific Gravity)	
				DF-L (0.50)	SPF (0.42)
YTX	8 x 1"	1	¾	150	100
	8 x 1¼"	1¼	¾		
	8 x 1½"	1½	1		
	8 x 1¾"	1¾	1¼		
	8 x 2"	2	1¼		
	8 x 2½"	2½	1½		
	9 x 2"	2	1¼	155	120
	9 x 2½"	2½	1½		
	9 x 2¾"	2¾	1½		
	9 x 3"	3	1½		
	9 x 3⅛"	3⅛	1½	160	110
	10 x 1½"	1½	1		
	10 x 2"	2	1¼		
	10 x 2½"	2½	1½		
	10 x 3"	3	1½		
	10 x 3⅛"	3⅛	1½		
	10 x 3½"	3½	2		
	10 x 4"	4	2		
	10 x 5"	5	2½		
	10 x 6"	6	2½		

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

1. Tabulated withdrawal values (W) shall be adjusted by all applicable adjustment factors per *NDS* Table 11.3.1.
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. 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.
4. Fastener penetration is the threaded length embedded in the main member, including the tip.

5.5 BTX and YTX Reference Head Pull-Through Design Values (P)

5.5.1 Reference design values for head pull-through (lbf) for BTX and YTX screws are specified in Table 8 and Table 9 for OSB and Table 10 and Table 11 for sawn lumber.

TABLE 8. BTX REFERENCE HEAD PULL-THROUGH DESIGN VALUES IN OSB<sup>1</sup>

Fastener Name	Designation	Nominal Length (in)	Thread Length (in)	Head Pull-Through Design Value, P (lbf)	
				OSB <sup>2</sup> Thickness (SG = 0.50)	
				2 <sup>3</sup> / <sub>32</sub> "	7 <sup>1</sup> / <sub>16</sub> "
BTX	8 x ¾"	¾	¾	115	50
	8 x 1"	1	¾		
	8 x 1¼"	1¼	¾		
	8 x 1½"	1½	1		
	8 x 1¾"	1¾	1¼		
	8 x 2"	2	1¼		
	9 x 1½"	1½	1	135	80
	9 x 2"	2	1¼		
	9 x 2½"	2½	1½		
	9 x 2¾"	2¾	1½		
	9 x 3"	3	1½		
	9 x 3 1/8"	3 1/8	1½		
	10 x 2"	2	1¼	145	90
	10 x 2½"	2½	1½		
	10 x 3"	3	1½		
	10 x 3½"	3½	2		
	10 x 4"	4	2		
	10 x 5"	5	2½		
	14 x 5"	5	2½	180	110
	14 x 6"	6	2½		
14 x 7 "	7	2½			
14 x 8"	8	2½			

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

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. OSB and have a specific gravity of at least 0.50. Listed thicknesses are minimums.

TABLE 9. YTX REFERENCE HEAD PULL-THROUGH DESIGN VALUES IN OSB<sup>1</sup>

Fastener Name	Designation	Nominal Length (in)	Thread Length (in)	Head Pull-Through Design Value, P (lbf)	
				OSB <sup>2</sup> Thickness (SG = 0.50)	
				2 <sup>3</sup> / <sub>32</sub> "	7 <sup>1</sup> / <sub>16</sub> "
YTX	8 x 1"	1	3/4	115	50
	8 x 1 1/4"	1 1/4	3/4		
	8 x 1 1/2"	1 1/2	1		
	8 x 1 3/4"	1 3/4	1 1/4		
	8 x 2"	2	1 1/4		
	8 x 2 1/2"	2 1/2	1 1/2		
	9 x 2"	2	1 1/4	135	80
	9 x 2 1/2"	2 1/2	1 1/2		
	9 x 2 3/4"	2 3/4	1 1/2		
	9 x 3"	3	1 1/2		
	9 x 3 1/8"	3 1/8	1 1/2		
	10 x 1 1/2"	1 1/2	1	145	90
	10 x 2"	2	1 1/4		
	10 x 2 1/2"	2 1/2	1 1/2		
	10 x 3"	3	1 1/2		
	10 x 3 1/8"	3 1/8	1 1/2		
	10 x 3 1/2"	3 1/2	2		
	10 x 4"	4	2		
	10 x 5"	5	2 1/2		
	10 x 6"	6	2 1/2		

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

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. OSB shall have a specific gravity of at least 0.50. Listed thicknesses are minimums.

TABLE 10. BTX REFERENCE HEAD PULL-THROUGH DESIGN VALUES IN SAWN LUMBER<sup>1</sup>

Fastener Name	Designation	Nominal Length (in)	Thread Length (in)	Head Pull-Through Design Value <sup>3</sup> , P (lbf)	
				Wood Species <sup>2</sup> (Specific Gravity)	
				DF-L (0.50)	SPF (0.42)
BTX	9 x 1½"	1½	1	185	125
	9 x 2"	2	1¼		
	9 x 2½"	2½	1½		
	9 x 2¾"	2¾	1½		
	9 x 3"	3	1½		
	9 x 3⅛"	3⅛	1½		
	10 x 2"	2	1¼	215	140
	10 x 2½"	2½	1½		
	10 x 3"	3	1½		
	10 x 3½"	3½	2		
	10 x 4"	4	2		
	10 x 5"	5	2½		
	10 x 6"	6	2½	290	210
	14 x 5"	5	2½		
	14 x 6"	6	2½		
	14 x 7"	7	2½		
	14 x 8"	8	2½		

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

1. Tabulated pull-through values (P) shall be adjusted by all applicable adjustment factors per NDS Table 11.3.1.
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. Pull-through design values apply to connections having a minimum wood side member thickness of at least 1.5".

TABLE 11. YTX REFERENCE HEAD PULL-THROUGH DESIGN VALUES IN SAWN LUMBER<sup>1</sup>

Fastener Name	Designation	Nominal Length (in)	Thread Length (in)	Head Pull-Through Design Value <sup>3</sup> , P (lbf)	
				Wood Species <sup>2</sup> (Specific Gravity)	
				DF-L (0.50)	SPF (0.42)
YTX	9 x 2"	2	1¼	185	125
	9 x 2½"	2½	1½		
	9 x 2¾"	2¾	1½		
	9 x 3"	3	1½		
	9 x 3⅛"	3⅛	1½		
	10 x 1½"	1½	1	215	140
	10 x 2"	2	1¼		
	10 x 2½"	2½	1½		
	10 x 3"	3	1½		
	10 x 3⅛"	3⅛	1½		
	10 x 3½"	3½	2		
	10 x 4"	4	2		
	10 x 5"	5	2½		
	10 x 6"	6	2½		

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

1. Tabulated pull-through values (P) shall be adjusted by all applicable adjustment factors per *NDS* Table 11.3.1.
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. Pull-through design values apply to connections having a minimum wood side member thickness of at least 1.5".

## 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 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 12.

TABLE 12. BTX AND YTX SCREW SPACING, EDGE DISTANCE, AND END DISTANCE REQUIREMENTS<sup>1,2</sup>

Connection Geometry	Minimum Spacing/Distance (in)			
	BTX8 and YTX8	BTX9 and YTX9	BTX10 and YTX10	BTX14
Edge Distance – Load in any direction	3/8	3/8	1/2	1/2
End Distance – Load parallel to grain, towards end	1 7/8	2 1/4	2 3/8	2 3/4
End Distance – Load parallel to grain, away from end	1 1/4	1 3/8	1 5/8	1 3/4
End Distance – Load perpendicular to grain	1 1/4	1 3/8	1 5/8	1 3/4
Spacing between Fasteners in a Row – Parallel to grain	1 7/8	2 1/4	2 3/8	2 3/4
Spacing between Fasteners in a Row – Perpendicular to grain	1 1/4	1 3/8	1 5/8	1 3/4
Spacing between Rows of Fasteners – In-line	3/4	3/4	7/8	7/8
Spacing between Rows of Fasteners – Staggered	3/8	3/8	1/2	3/8

SI: 1 in. = 25.4 mm

- 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.
- 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 TEST ENGINEERING SUBSTANTIATING DATA

- Testing for bending yield by SBCRI in accordance with *ASTM F1575*
- Testing for tensile strength by SBCRI in accordance with *AISI S904*
- Testing for shear strength by SBCRI in accordance with *AISI S904*
- Testing for lateral strength by SBCRI in accordance with *ASTM D1761*
- Testing for withdrawal by SBCRI in accordance with *ASTM D1761*
- Testing for head pull-through by SBCRI in accordance with *ASTM D1037*
- Testing for corrosion resistance by Element
- Some information contained herein is the result of testing and/or data analysis by other sources which conform to *IBC Section 1703* and relevant [professional engineering law](#). DrJ relies on accurate data from these sources to perform engineering analysis. DrJ has reviewed and found the data provided by other professional sources to be credible.
- Where appropriate, DrJ's analysis is based on design values that have been codified into law through codes and standards (e.g., *IBC*, *IRC*, *NDS®*, and *SDPWS*). This includes review of code provisions and any related test data that aids in comparative analysis or provides support for equivalency to an intended end-use application. Where the accuracy of design values provided herein is reliant upon the published properties of commodity materials (e.g., lumber, steel, and concrete), DrJ relies upon the grade mark, stamp, and/or design values provided by raw material suppliers to be accurate and conforming to the mechanical properties defined in the relevant material standard.

## 8 FINDINGS

- 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.
- IBC Section 104.11* (*IRC Section R104.11* and *IFC Section 104.9* 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, provided that any such alternative has been *approved*. An alternative material, design or method of construction shall be *approved* where the *building official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in 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*.

8.3 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.

8.3.1 No known variations

## 9 CONDITIONS OF USE

- 9.1 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 *registered design professional*).
- 9.6 At a minimum, this product shall be installed per Section 6 of this TER.
- 9.7 This product is manufactured under a third-party quality control program in accordance with *IBC Section 104.4* and *110.4* and *IRC Section R104.4* and *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. Therefore, the TER shall be reviewed for code compliance by the *building official* for acceptance.
- 9.9 The use of this TER is dependent on the manufacturer's in-plant QC, the ISO/IEC 17020 third-party quality assurance program and procedures, proper installation per the manufacturer's instructions, the *building official's* inspection, and any other code requirements that may apply to demonstrate and verify compliance with the applicable building code.

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

## 11 REVIEW SCHEDULE

- 11.1 This TER is subject to periodic review and revision. For the most recent version of this TER, visit [drjcertification.org](http://drjcertification.org).
- 11.2 For information on the current status of this TER, contact [DrJ Certification](http://DrJ Certification).