



CERTIFICATION



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Technical Evaluation Report

TER 1911-05

Big Timber® Screws Used in Wall
Connections: Truss/Rafter/Joist to Top
Plate and Bottom Plate to Rim Board

**Western Builders Supply DBA
Big Timber®**

Products:

**CTX Construction Lag Screws
BL Log, Timber & Landscape
Screws**

**SCTX Construction Lag
Stainless Steel Screw**

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For the most recent version or a sealed copy of this Technical Evaluation Report (TER), visit drjcertification.org.



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DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

SECTION: 06 00 90 - Wood and Plastic Fastenings

1 Products Evaluated¹

- 1.1 CTX Construction Lag Screws
 - BL Log, Timber & Landscape Screws
 - SCTX Construction Lag Stainless Steel 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®*

2.2 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 A493: Standard Specification for Stainless Steel Wire and Wire Rods for Cold Heading and Cold Forging*
- 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 B117: Standard Practice for Operating Salt Spray (Fog) Apparatus*
- 2.2.7 *ASTM D1761: Standard Test Method for Mechanical Fasteners in Wood*
- 2.2.8 *ASTM D2395: Standard Test Method 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*

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.

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

3 Performance Evaluation

- 3.1 The Big Timber® fasteners in this TER were evaluated as an alternate means of attaching metal plate connected wood trusses, rafters, or floor joists to the tops of walls for the purpose of providing uplift and lateral load resistance. The following conditions were evaluated:
 - 3.1.1 Withdrawal strength for use as an alternative to toe-nail connections, metal hurricane and seismic clips/straps, or nails in tension (uplift) load applications,
 - 3.1.2 Head pull-through strength for use as an alternative to toe-nail connections, hurricane and seismic clips/straps or nails in tension (uplift) load applications, and
 - 3.1.3 Shear strength for use as an alternative to toe-nail connections, hurricane and seismic clips/straps, or nails in shear (lateral) loaded applications either parallel or perpendicular to wood grain.
- 3.2 The Big Timber® fasteners in this TER were also evaluated as an alternative means of attaching wall bottom plates to the rim board. The following conditions were evaluated:
 - 3.2.1 Shear strength to resist shear (lateral) loads applied parallel to the bottom plate and rim board.
- 3.3 Connections other than those addressed in Section 3 are outside the scope of this TER.
- 3.4 Use of fasteners in locations exposed to saltwater or saltwater spray is outside the scope of this TER, with the exception of stainless steel screws (SCTX).
 - 3.4.1 SCTX screws are allowed for use in locations exposed to saltwater or saltwater spray.
- 3.5 Any code compliance issues not specifically addressed in this section are outside the scope of this TER.
- 3.6 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 Fastener Descriptions

- 4.1.1 Big Timber® CTX Construction Lag Screws have a round washer head with a star drive and are partially threaded. The CTX screw is shown in Figure 1.



Figure 1. CTX Construction Lag Screw

- 4.1.2 Big Timber® BL Log, Timber & Landscape Screws have a hex head washer head and are partially threaded. The BL screw is shown in Figure 2.



Figure 2. BL Log, Timber & Landscape Screws

4.1.3 Big Timber® SCTX Construction Lag Stainless Steel Screws are made from Grade 316 stainless steel, have a round washer head with a star drive, and are partially threaded. The SCTX screw is shown in Figure 3.



Figure 3. SCTX Construction Lag Stainless Steel Screw

4.1.4 CTX and BL screws are manufactured using a standard cold-formed process followed by a heat-treating process.

4.1.5 SCTX screws are manufactured using a standard cold-formed process.

4.2 Fastener Coatings

4.2.1 CTX screws are coated with a proprietary coating, designated as Bronze Star, which exceeds the protections provided by hot-dipped galvanized coatings conforming to *ASTM A153*.

4.2.2 BL screws are coated with a proprietary coating, designated as Black Log, which exceeds the protections provided by hot-dipped galvanized coatings conforming to *ASTM A153*.

4.3 CTX, BL, and SCTX 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*.

4.3.1 The proprietary coating and stainless material have been tested and found to exceed the protection provided by code-approved hot-dipped galvanized coatings meeting *ASTM A153, Class D* (*IBC Section 2304.10.6⁴* 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 SCTX screws are approved for use in chemically treated wood with exposure to saltwater, including coastal construction applications.

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

⁴ 2018 *IBC Section 2304.10.5*

Table 1. Fastener Specifications

Fastener Name	Designation	Head		Nominal Length ¹ (in)	Thread Length ¹ (in)	Shank Diameter ² (in)	Thread Diameter (in)		Specified Minimum Core Hardness ⁴ (HV 0.3)	Nominal Bending Yield, f_{yb} (psi)	Allowable Fastener Strength (lb)	
		Diameter (in)	Drive Type				Minor	Major			Tensile	Shear ³
CTX	14 x 4"	0.531	Torx 25	4	2	0.168	0.146	0.242	355	141,300	930	725
	14 x 6"			6	3							
BL	14 x 4"	0.487	Hex ⁵ / ₁₆	4	2	0.189	0.171	0.258	355	177,700	1,085	725
	14 x 6"			6								
SCTX	15 x 4"	0.620	Torx 30	4	2½	0.202	0.179	0.275	N/A	111,000	855	725
	15 x 6"			6	3							

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

1. Fastener 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 (CTX and BL only).
3. Shear determined at smooth shank diameter.
4. Based on a 300-gram load using the Vickers indenter.

5 Applications

- 5.1 The Big Timber® fasteners in this TER are used in construction of walls that meet the requirements of IBC Section 2308 or IRC Section R602 for the following applications:
 - 5.1.1 To attach minimum 1½ inch-thick wood trusses, rafters, or floor joists to wood walls, and
 - 5.1.2 To attach wall bottom plates to rim boards in the construction of walls
- 5.2 See Sections 5.8 and 5.9 for allowable design loads.
- 5.3 Allowable design loads are applicable to fasteners installed in accordance with Section 6.
- 5.4 Walls shall consist, at a minimum, of a double top plate installed in accordance with IBC Section 2308.5.2 or IRC Section R602.3.2.
- 5.5 The Big Timber® fasteners in this TER are used in buildings requiring design in accordance with IBC Section 1609 or wind analysis in accordance with IRC Section R301.2.1.
- 5.6 The Big Timber® fasteners in this TER are used in buildings requiring design in accordance with IBC Section 1613 or seismic analysis in accordance with IRC Section R301.2.2.
- 5.7 To maintain a continuous uplift load path, connections in the same area must be stacked on the same side of the wall (e.g., rafter to top plate connection and top plate to stud connection).
- 5.8 *Allowable Design Loads – Truss/Rafter/Joist to Top Plate Connection*
 - 5.8.1 Allowable design loads for uplift and lateral resistance for truss, rafter, and joist to top plate connections are provided in Table 2.
 - 5.8.2 Loads parallel to the wall are labeled F1 and loads perpendicular to the wall are labeled F2. See Figure 4 for load directions.
 - 5.8.3 Allowable design loads are applicable to fasteners installed in accordance with Section 6.6 in double top plate applications.

Table 2. Allowable Uplift & Lateral Loads for Fasteners in Truss/Rafter/Joist to Top Plate Connections

Fastener	Min. Penetration into Truss/Rafter/Joist ¹ (in)	Top Plate(s)	Fastener Angle to Vertical ⁷	Allowable Loads ^{2,3,4,5,6} (lb)								
				HF/SPF (0.42)			DF-L (0.50)			SP (0.55)		
				Uplift	F1	F2	Uplift	F1	F2	Uplift	F1	F2
CTX14 x 6"	2½	Double	22.5°	535	415	495	450	230	515	810	425	655
			90°	550	195	410	550	230	410	650	250	410
Double		22.5°	430	295	530	385	325	385	655	435	705	
		90°	335	240	410	335	280	410	385	305	410	
SCTX15 x 6"		Double	22.5°	420	235	235	515	280	280	600	305	305
			90°	545	200	200	550	235	235	775	255	255

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

1. Wood truss, rafter, or floor joist members shall be a minimum of 2" nominal thickness. Design of truss, rafter, or floor joist is by others.
2. Equivalent specific gravity of structural composite lumber (SCL) shall be equal to or greater than the specific gravities provided in this table. Refer to product information from SCL manufacturer.
3. For wood species with an assigned specific gravity between two of the specific gravities above, use the tabulated values for the next lowest specific gravity. For wood species with an assigned specific gravity greater than or equal to 0.55, use the tabulated value for specific gravity of 0.55.
4. For applications involving members with different specific gravities, use the allowable load corresponding to the lowest specific gravity.
5. Includes 1.6 duration of load increase for wind and seismic. No further duration of load increases permitted. Reduce design values for other load durations as applicable.
6. See Figure 4 for load directions. See Figure 5 and Figure 6 installation details.
7. Install fastener at an upward angle from the vertical of 20° to 30° (22.5° is optimal) or 90° (See Figure 5 and Figure 6). For installation between 20° and 30°, design values for 22.5° may be used.

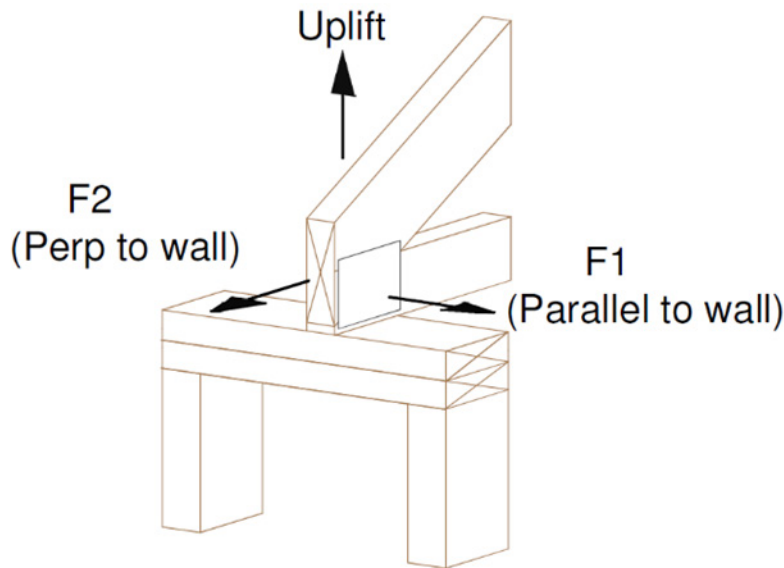


Figure 4. Uplift and Lateral Load Orientations

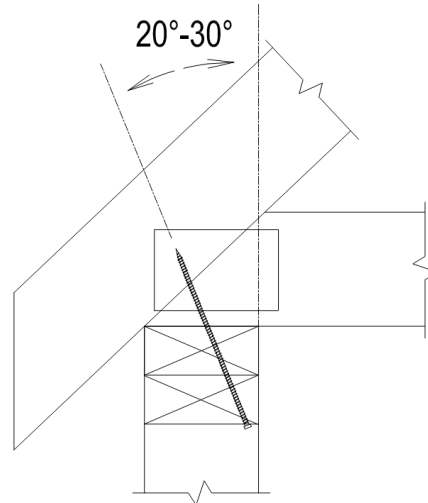


Figure 5. Installation of Fasteners at an Angle in Double Top Plate to Truss/Rafter/Joist Applications

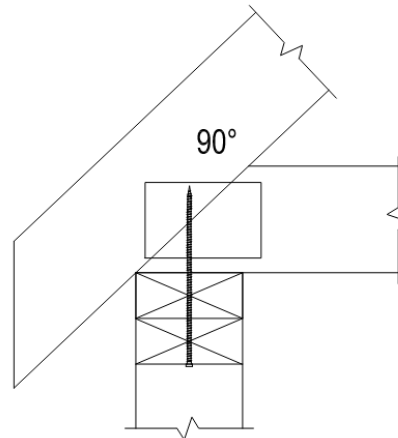


Figure 6. Installation of Fasteners in Double Top Plate Perpendicular to Truss/Rafter/Joist Applications

5.9 Allowable Design Loads – Bottom Plate to Rim Board Connection

- 5.9.1 Allowable design loads for lateral resistance parallel to grain in bottom plate to rim board connections are provided in Table 3. The connection configuration is shown in Figure 7.
 - 5.9.1.1 A wood structural panel (WSP) up 1 1/8" thick is permitted between the rim board and the bottom plate, so long as it is independently fastened to the rim board per the building code and the minimum 2" screw penetration for the Big Timber® fasteners in this TER is met.
 - 5.9.1.2 Double bottom plates are permitted so long as they are independently fastened per the building code and the minimum 2" screw penetration for the Big Timber® fasteners in this TER is met.
- 5.9.2 Allowable design loads are applicable to fasteners installed in accordance with Section 6.7.

Table 3. Allowable Shear Loads Parallel to Grain for Bottom Plate to Rim Board Connections

Fastener	Nominal Bottom Plate Thickness	Min. Penetration into Rim Board (in)	Allowable Shear Loads, Parallel to Grain (lb) ^{1,2,3}								
			Rim Board Species (Specific Gravity)								
			2x HF/SPF (0.42)			2x DF-L or 1-1/4" LVL/LSL (0.50)			2x SP (0.55)		
			Bottom Plate Species (Specific Gravity)								
			HF/SPF (0.42)	DF-L (0.50)	SP (0.55)	HF/SPF (0.42)	DF-L (0.50)	SP (0.55)	HF/SPF (0.42)	DF-L (0.50)	SP (0.55)
CTX 14 x 4"	2x	2	120	130	135	130	145	150	135	150	155
CTX 14 x 6"											
BL 14 x 4"											
BL 14 x 6"											
SCTX 15 x 4"											
SCTX 15 x 6"											

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

- For wood species with an assigned specific gravity between two of the specific gravities above, use the tabulated values for the next lowest specific gravity. For wood species with an assigned specific gravity greater than or equal to 0.55, use the tabulated value for specific gravity of 0.55.
- For applications involving members with different specific gravities, use the allowable load corresponding to the lowest specific gravity.
- Tabulated loads are based on a load duration factor of $C_D = 1.00$. Loads may be increased for load duration per *NDS*.

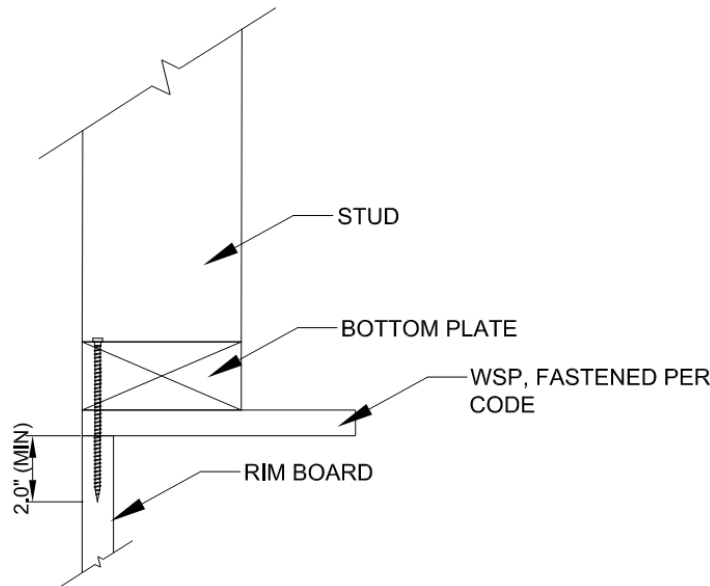


Figure 7. Fastener in Bottom Plate to Rim Board Connection

5.10 Where it is anticipated that loads will be applied to a single fastener simultaneously in more than one direction, additional evaluation is required to account for combined effect of these loads using accepted engineering practice.

5.10.1 Consult a professional engineer, as needed, for complex design conditions.

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

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 CTX and SCTX screws shall be installed using Torx 25 and Torx 30 driver bits, respectively. BL screws shall be installed with a $5/16$ hex.
- 6.3 Fasteners shall not be struck with a hammer during installation.
- 6.4 Lead holes are not required.
- 6.5 The underside of the fastener head must be installed flush to the surface of the wood member being connected. The fastener must not be overdriven.
- 6.6 *Truss/Rafter/Joist to Top Plate Connection*
 - 6.6.1 Install CTX, BL, and SCTX screws upward through the wall top plates or wood structural framing member at the bottom corner of the top plates and into the center of the wood truss or rafter. The fastener should be installed at an upward angle from the vertical of 20° to 30° (Figure 5) and should penetrate the wood truss, rafter, or joist within $1/4$ " of the centerline. Fasteners located between studs may be installed at a 90° angle (Figure 6).
 - 6.6.1.1 If the wood truss, rafter, or floor joist is located directly over a top plate splice, offset the fastener $1/4$ " to one side of the splice. Note that the splice may be in either top plate.
 - 6.6.2 Minimum penetration for truss/rafter/joist to top plate connections is 2.5".
 - 6.6.3 Minimum requirements for fasteners spacing, edge distance, and end distance shall be in accordance with Table 4.

Table 4. Minimum Spacing, Edge Distance, and End Distance Requirements

Connection Geometry	Minimum Spacing/Distance ^{1,2} (in)		
	CTX14	BL14	SCTX15
Edge Distance – Load in any direction	$1/2$	$1/2$	$5/8$
End Distance – Load parallel to grain, towards end	$2 1/2$	$2 7/8$	$3 1/8$
End Distance – Load parallel to grain, away from end	$1 5/8$	$1 7/8$	$2 1/8$
End Distance – Load perpendicular to grain	$1 5/8$	$1 7/8$	$3 1/8$
Spacing between Fasteners in a Row – Parallel to grain	$2 1/2$	$2 7/8$	$3 1/8$
Spacing between Fasteners in a Row – Perpendicular to grain	$1 5/8$	$1 7/8$	$2 1/8$
Spacing between Rows of Fasteners – In-line	$7/8$	1	$1 1/8$
Spacing between Rows of Fasteners – Staggered	$1/2$	$1/2$	$5/8$

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 fasteners in adjacent rows are offset by one half of the "Spacing between Fasteners in a Row."

6.7 Bottom Plate to Rim Board Connection

- 6.7.1 Install CTX, BL, and SCTX screws downward at a 90° angle, a minimum of $1/2$ " from outside face of wall, through the plate and into the rim board (Figure 7).
- 6.7.2 Minimum penetration for bottom plate to rim board connections is 2.0".
- 6.7.3 Minimum requirements for fastener spacing, edge distance, and end distance shall be in accordance with Table 4.

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 Assembly testing in accordance with *ASTM D1761*
- 7.2 Connection design value calculations by DrJ Engineering, LLC in accordance with *NDS* and accepted engineering practice.
- 7.3 Properties for Big Timber® CTX Construction Lag Screws are from [TER 1907-01](#).
- 7.4 Properties for Big Timber® BL Log, Timber & Landscape Screws are from [TER 1907-02](#).
- 7.5 Properties for Big Timber® SCTX Stainless Steel Screws are from [TER 1911-02](#).
- 7.6 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.
- 7.7 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(s) listed in Section 1.1 are approved for the following:
 - 8.1.1 An acceptable alternative means of attaching metal plate connected wood trusses, rafters, or floor joists to the tops of walls to provide uplift and lateral load resistance due to wind and seismic forces as provided in Table 2.
 - 8.1.2 An acceptable alternative means of attached wall bottom plates to rim boards to provide lateral load resistance parallel to the bottom plates as provided in Table 3.
- 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 104.10⁵ 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 For conditions not covered in this TER, connections shall be designed in accordance with accepted engineering practice.
- 9.2 Connected sawn lumber members must have a moisture content of less than or equal to 19 percent.
- 9.3 Use of fasteners in locations exposed to saltwater or saltwater spray is outside the scope of this TER, with the exception of the SCTX screws where exposure to saltwater or saltwater spray is allowed.
- 9.4 Design properties shall not exceed those described in Section 5.
- 9.5 When required by legal stipulation and enforced by the *building official*, also known as the authority having jurisdiction (AHJ) in which the project is to be constructed:
 - 9.5.1 This TER and the installation instructions shall be submitted at the time of *permit* application, and
 - 9.5.2 Any calculations, required to show compliance with this TER, incorporated as part of the construction documents that are to be examined for conformance to the requirements of the pertinent laws shall conform to accepted engineering practice, and be approved when requirements of the pertinent laws are met.
- 9.6 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.
- 9.7 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 At a minimum, this product shall be installed per Section 6 of this TER.
- 9.9 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.
- 9.10 This TER shall be reviewed for code compliance by the AHJ in concert with IBC Section 104.
- 9.11 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 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.

⁵ 2018 IFC Section 104.9