



CERTIFICATION



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Technical Evaluation Report

TER 1907-03

Big Timber® Screws for Use in Deck
Ledger Applications

**Western Builders Supply DBA
Big Timber®**

Products:

**Big Timber® CTX, BL, GL, and WTX
Screws**

Issue Date:

November 20, 2019

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September 26, 2022

Subject to Renewal:

October 1, 2023



COMPANY
INFORMATION:

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DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

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

SECTION: 06 11 00 - Wood Framing

SECTION: 06 15 00 - Wood Decking

1 Products Evaluated¹

- 1.1 Big Timber® CTX, BL, GL, and WTX 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 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*
- 2.2.6 *ASTM F1575: Standard Test Method for Determining Bending Yield Moment of Nails*

¹ For more information, visit drjcertification.org or call us at 608-310-6748.

² Unless otherwise noted, all references in this TER are from the 2021 version of the codes and the standards referenced therein. This material, design, or method of construction also complies with the 2000-2018 versions of the referenced codes and the standards referenced therein.

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

3 Performance Evaluation

- 3.1 The Big Timber® screws listed in Section 1 were evaluated to determine:
 - 3.1.1 Use for attachment of deck ledgers to the building structure. This application includes attachments to Spruce-Pine-Fir (SPF) band joists⁴ and oriented strand board (OSB) band joists.
 - 3.1.2 Lateral strength of ledger connections to wood-framed walls. This application includes zero, one, or two layers of 5/8" gypsum wallboard (GWB) between the ledger and the wall studs.
- 3.2 For conventionally framed buildings, the deck ledger is required to be attached to the band joist in accordance with IBC Section 1604.8.3 or IRC Section R507.9⁵ as applicable.
 - 3.2.1 Where a band joist is not used, as in some truss installations, an engineered design is required.⁶
- 3.3 Any code compliance issues not specifically addressed in this section are outside the scope of this TER.
- 3.4 Any engineering evaluation conducted for this TER was performed within DrJ's ANAB accredited ICS code scope and/or the defined professional engineering scope of work on the dates provided herein.

4 Product Description and Materials

- 4.1 The products evaluated in this TER are shown in Figure 1, Figure 2, Figure 3, and Figure 4.



Figure 1. CTX Construction Lag Screw



Figure 2. BL Log, Timber & Landscaping Screw



Figure 3. GL Gray Structural Screw



Figure 4. WTX Wafer Head Screw

⁴ The term "band joist" is used throughout this report. Other regional terms synonymous with band joist include rim board, band board, header board, and header joist.

⁵ 2015 IRC Section R507.2

⁶ For guidance on designing the connection of the deck ledger to trusses where a band joist is not used, see SBCA Research Report, Deck Ledger Attachment to Residential Wood Truss Floor Systems.



4.2 The Big Timber® screws evaluated in this TER are set forth in Table 1.

Table 1. Big Timber® Fastener Specifications

Fastener Name	Designation	Head (in)		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	Drive Type				Minor	Major			Tensile	Shear ³
CTX ⁽¹⁾	15 x 3½"	0.620	Torx 30	3½	2½	0.202	0.179	0.275	355	151,600	1,475	1,020
	15 x 4"			4	2½							
	15 x 5"			5	3							
	15 x 6"			6	3							
	17 x 4"	0.675	Torx 40	4	2½	0.226	0.210	0.295	355	170,500	1,850	1,240
	17 x 5"			5	3							
17 x 6"	5			3								
BL ⁽¹⁾	17 x 4"	0.570	Hex 5/16	4	2	0.224	0.211	0.297	355	172,600	1,990	1,240
	17 x 5"			5	3							
	17 x 6"			6	3							
GL ⁽¹⁾	17 x 4"	0.570	Hex 5/16	4	2	0.224	0.211	0.297	355	172,600	1,990	1,240
	17 x 5"			5	3							
	17 x 6"			6	3							
WTX ⁽⁵⁾	15 x 3½"	0.659	Torx 30	3½	2	0.205	0.187	0.274	286	190,000	1,545	1,165
	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 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 determined at smooth shank diameter.
4. Based on a 300 gram load using the Vickers indenter.
5. Fastener length is measured from the top of the head to the tip. Thread length includes tapered tip

- 4.3 Big Timber® screws are manufactured using a standard cold-formed process followed by a heat-treating process.
- 4.4 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*.
- 4.5 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*.
- 4.6 GL screws are coated with a proprietary coating, designated as Gray Log, which exceeds the protections provided by hot-dipped galvanized coatings conforming to *ASTM A153*.
- 4.7 WTX screws are coated with a proprietary coating, designated as Black, which exceeds the protections provided by hot-dipped galvanized coatings conforming to *ASTM A153*.

- 4.8 Big Timber® 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*.
- 4.8.1 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*⁷ and *IRC Section R317.3*), allowing for its use in pressure-treated wood.
- 4.8.2 Big Timber® 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.

5 Applications

- 5.1 Big Timber® CTX, BL, GL, and WTX screws are self-tapping fasteners used for attaching the deck ledger to the band joist of a building in accordance with *IBC Section 1604.8.3* and *IRC Section R507.9*⁸. See Section 6 for installation requirements.
- 5.2 Big Timber® CTX, BL, GL, and WTX screws can be used for attaching ledger boards to wall studs with zero, one, or two layers of GWB between the ledger and the wall studs.
- 5.3 Big Timber® CTX, BL, GL, and WTX screws are installed without lead holes, as prescribed in *NDS*.
- 5.4 Design of Big Timber® CTX, BL, GL, and WTX screws are governed by the applicable code and the provisions for dowel-type fasteners in *NDS*.
- 5.5 Unless otherwise noted, adjustment of the design stresses for duration of load shall be in accordance with the applicable code.
- 5.6 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.
- 5.7 *Reference Design Values for Deck Ledger to Band Joist Attachment*
 - 5.7.1 Big Timber® CTX, BL, GL, and WTX screws are designed for attaching the deck ledger to the band joist of a building in accordance with *IBC Section 1604.8.3* and *IRC Section R507.9*.⁹ This connection is shown in Figure 5.

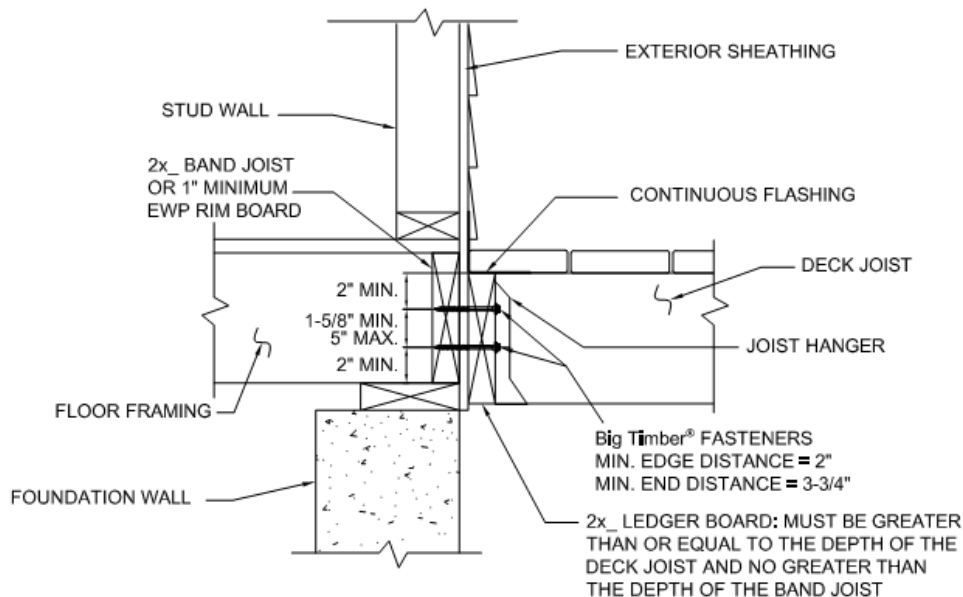


Figure 5. Big Timber® Deck Ledger Connection to Band Joist

⁷ 2018 *IBC Section 2304.10.5*

⁸ 2015 *IRC Section R507.2*

5.7.2 The *IRC* provides prescriptive fastener spacing for the attachment of a deck ledger to a rim joist with 1/2" diameter lag screws or through bolts as shown in *IRC Table R507.9.1.3(1)*.⁹

5.7.2.1 Table 2 provides the Big Timber® CTX, BL, GL, and WTX screw spacing required to provide performance at least equivalent to the lag screws found in *IRC Table R507.9.1.3(1)*⁹ in accordance with *IBC Section 104.11* and *Section 1604.8.3* and *IRC Section R104.11* and *Section R507.9*¹⁰ in accordance with generally accepted engineering practice.

5.7.2.1.1 Table 2 provides screw spacing for materials found in *IRC Section R507.9*¹¹, as well as a wider range of materials commonly used for rim joists. Screw spacing values are provided for two loading conditions.

5.7.2.2 When installed in accordance with the spacing requirements of Table 2, Big Timber® CTX, BL, GL, and WTX screws provide equivalent performance to *IRC Table R507.9.1.3(1)*.⁹

Table 2. Screw Spacing for Items in *IRC Table R507.9.1.3(1)*¹¹ and Other Materials and Loading Conditions¹

Fastener Designation ^{2,8} (in)	Load Case ⁹	2x Nominal Ledger Species ^{3,4,5}	Band Joist Material ^{6,7}	Maximum On-center Spacing of Fasteners (in)						
				Maximum Deck Joist Spans (ft)						
				Up to 6'	Up to 8'	Up to 10'	Up to 12'	Up to 14'	Up to 16'	Up to 18'
CTX 15 x 4" CTX 15 x 5" CTX 15 x 6" CTX 17 x 4" CTX 17 x 5" CTX 17 x 6"	LL + DL 40 + 10	HF	2x Sawn Lumber	18	13	10	8	7	6	5
			1 1/8" OSB	24	18	12	10	9	8	7
		SP	2x Sawn Lumber	22	16	12	10	8	7	6
			1 1/8" OSB	23	17	13	11	9	8	7
	SL + DL 50 + 10	HF	2x Sawn Lumber	14	11	8	7	6	5	4
			1 1/8" OSB	20	13	10	8	7	6	5
		SP	2x Sawn Lumber	18	12	10	8	7	6	5
			1 1/8" OSB	19	14	11	9	8	7	6
	SL + DL 60 + 10	HF	2x Sawn Lumber	12	9	7	6	5	4	4
			1 1/8" OSB	17	11	9	7	6	5	5
		SP	2x Sawn Lumber	14	11	8	7	6	5	4
			1 1/8" OSB	16	12	9	8	6	6	5
SL + DL 70 + 10	HF	2x Sawn Lumber	11	8	6	5	4	4	3	
		1 1/8" OSB	13	10	8	6	5	5	4	
	SP	2x Sawn Lumber	12	9	7	6	5	4	4	
		1 1/8" OSB	14	10	8	7	6	5	4	
BL 17 x 4" BL 17 x 5" BL 17 x 6" GL 17 x 4" GL 17 x 5" GL 17 x 6"	LL + DL 40 + 10	HF	2x Sawn Lumber	22	17	12	10	8	7	6
			1 1/8" OSB	23	17	11	9	8	7	6
		SP	2x Sawn Lumber	24	18	12	10	8	7	6
			1 1/8" OSB	26	20	16	13	11	10	9
	SL + DL	HF	2x Sawn Lumber	18	12	10	8	7	6	5

⁹ 2015 *IRC Table R507.2*

¹⁰ 2015 *IRC Section R507.2*

¹¹ 2015 *IRC Table R507.2*

Fastener Designation ^{2,8} (in)	Load Case ⁹	2x Nominal Ledger Species ^{3,4,5}	Band Joist Material ^{6,7}	Maximum On-center Spacing of Fasteners (in)							
				Maximum Deck Joist Spans (ft)							
				Up to 6'	Up to 8'	Up to 10'	Up to 12'	Up to 14'	Up to 16'	Up to 18'	
	50 + 10		1 1/8" OSB	19	12	9	8	6	6	5	
			SP	2x Sawn Lumber	20	13	10	8	7	6	5
				1 1/8" OSB	22	16	13	11	9	8	7
	SL + DL 60 + 10	HF	2x Sawn Lumber	16	10	8	7	6	5	4	
			1 1/8" OSB	16	10	8	6	5	5	4	
		SP	2x Sawn Lumber	17	11	8	7	6	5	4	
			1 1/8" OSB	19	14	11	9	8	7	6	
	SL + DL 70 + 10	HF	2x Sawn Lumber	12	9	7	6	5	4	4	
			1 1/8" OSB	12	9	7	6	5	4	4	
		SP	2x Sawn Lumber	13	9	7	6	5	4	4	
			1 1/8" OSB	16	13	10	8	7	6	5	

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m²

- Based on load duration of 1.0. Spacing may be adjusted by the applicable load duration as specified in *NDS*.
- Fasteners are required to have full thread penetration into the main member. Excess fastener length extending beyond the main member is not reflected in the table above.
- Solid-sawn ledgers shall be HF or SP species (specific gravity of 0.43 and 0.55, respectively) and designed by others.
- Minimum ledger board requirements: 1 1/2" thickness and 7 1/4" depth
- Ledger materials tested in the wet service condition.
- A maximum 1/2" structural sheathing may be installed between the ledger and band joist. Up to 1/2" thickness of stacked washers shall be permitted to substitute for up to 1/2" on allowable sheathing thickness where combined with wood structural panel or lumber sheathing.
- Minimum band joist requirements: SPF (specific gravity of 0.42) solid-sawn lumber 1 1/2" thick and 7 1/4" depth; OSB 1 1/8" thick and 7 1/4" depth
- Fasteners shall be installed per Section 6 of this TER.
- Snow load shall not be assumed to act concurrently with live load.

5.8 Reference Lateral Design Values for Deck Ledger to Stud Attachment

5.8.1 Without GWB Interlayer:

5.8.1.1 Installation details for ledger to stud connections without GWB for 2"x6", 2"x8", and 2"x10" ledgers are shown in Figure 6, Figure 7, and Figure 8, respectively.

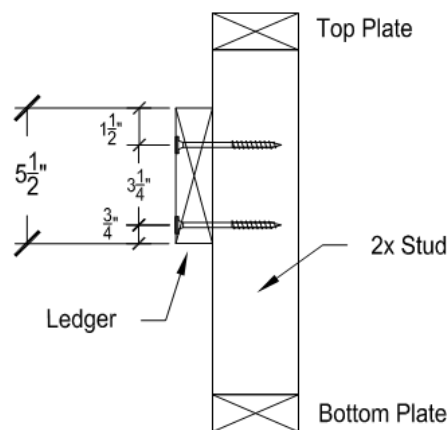


Figure 6. 2"x6" Ledger Directly Attached to Stud

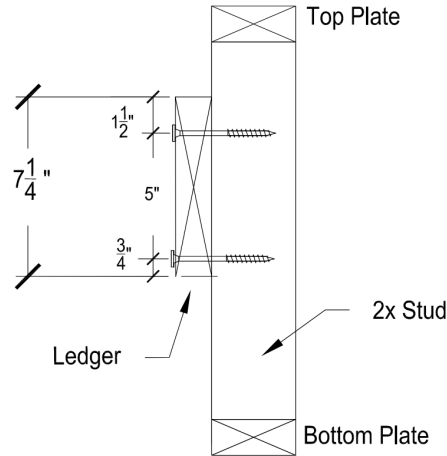


Figure 7. 2"x8" Ledger Directly Attached to Stud

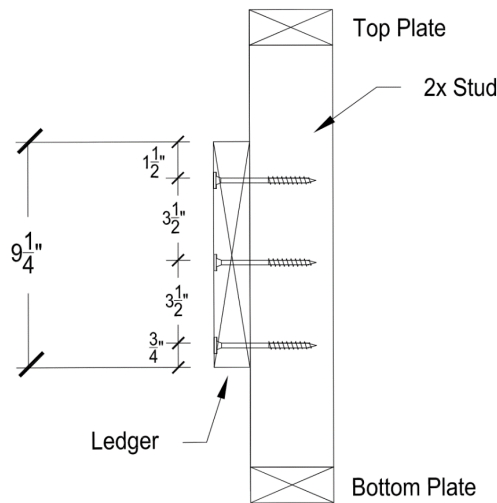


Figure 8. 2"x10" Ledger Directly Attached to Stud

5.8.2 With One Layer *GWB Interlayer*:

5.8.2.1 Installation details for ledger to stud connections with a single layer of *GWB* for 2"x6", 2"x8", and 2"x10" ledgers are shown in Figure 9, Figure 10, and Figure 11, respectively.

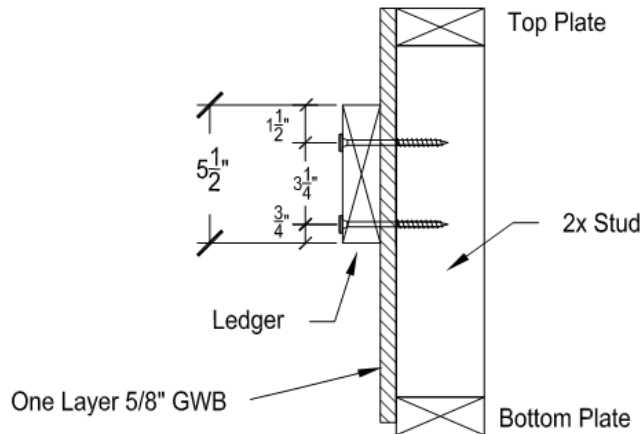


Figure 9. 2"x6" Ledger Attached to Stud Through One Layer of *GWB*

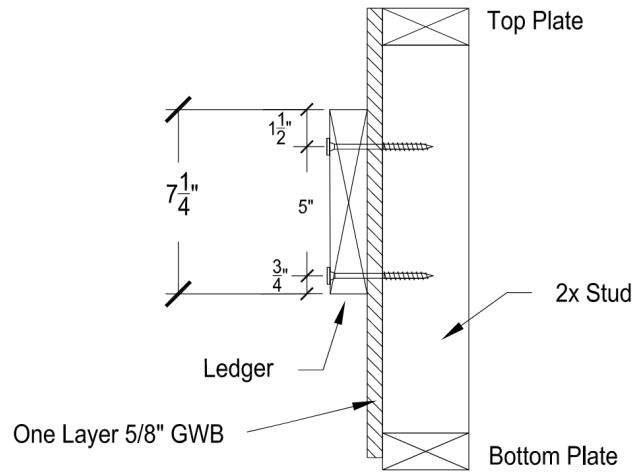


Figure 10. 2"x8" Ledger Attached to Stud Through One Layer of GWB

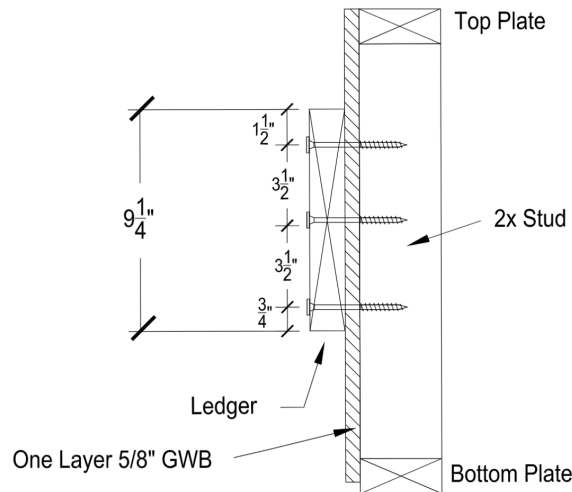


Figure 11. 2"x10" Ledger Attached to Stud Through One Layer of GWB

5.8.3 With Two Layers GWB Interlayer:

5.8.3.1 Installation details for ledger to stud connections with a double layer of GWB for 2"x6", 2"x8", and 2"x10" ledgers are shown in Figure 12, Figure 13, and Figure 14, respectively.

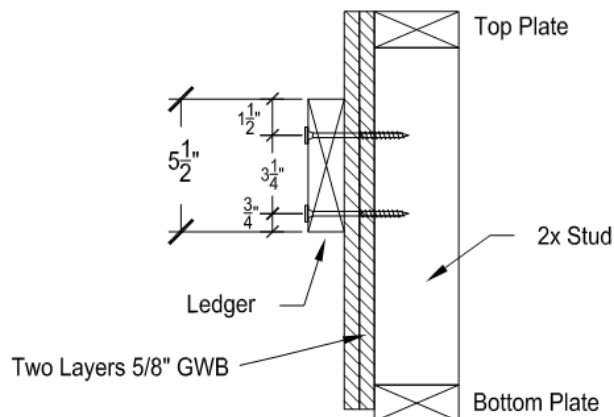


Figure 12. 2"x6" Ledger Attached to Stud Through Two Layers of GWB

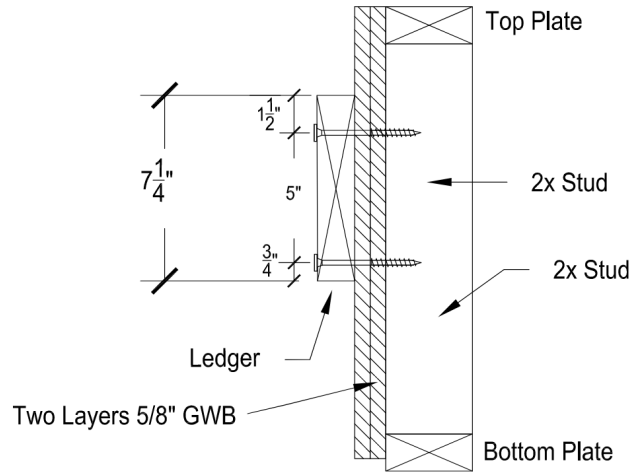


Figure 13. 2"x8" Ledger Attached to Stud Through Two Layers of GWB

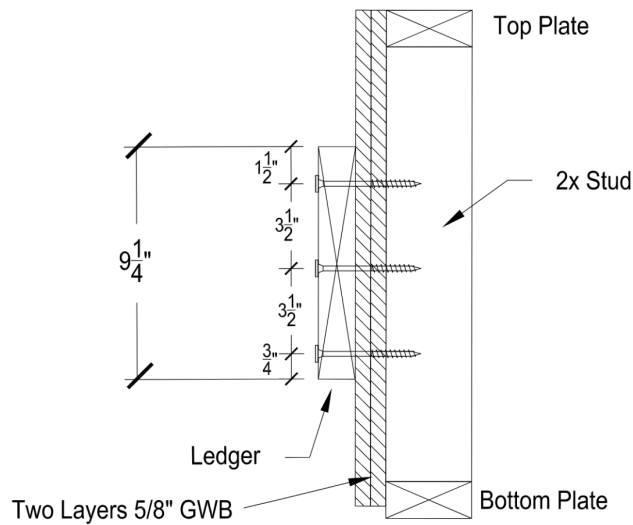


Figure 14. 2"x10" Ledger Attached to Stud Through Two Layers of GWB

5.9 Reference lateral design values for the deck ledger to stud connections detailed in Figure 6 through Figure 14 are provided in Table 3. The values in Table 3 apply where the ledger is applied either directly over the studs or with up to two layers of 5/8" GWB between the ledger and studs.

Table 3. Design Values for Ledger to Stud Attachment

Fastener	Minimum Fastener Length ⁶ (in)	Minimum Penetration into Main Member (in)	Layers of GWB ⁸	Allowable Load per Stud Connection ^{3,4,5,7} (lb)		
				Ledger Size ^{1,2}		
				2x6	2x8	2x10
CTX 15	3½	2	0	295	295	475
		1¾	1	320	320	475
	5	2¼	2	570	570	570
BL 17	4	2½	0	370	370	370
		1¾	1	315	315	435
	5	2¼	2	370	370	435
GL 17	4	2½	0	370	370	370
		1¾	1	315	315	435
	5	2¼	2	370	370	435
WTX 15	3½	2	0	265	265	500
		1¾	1	380	380	575
	5	2¼	2	470	470	650

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

- Two fasteners are required for 2x6 and 2x8 ledger connections. Three fasteners are required for 2x10 ledger connections. Additional fasteners prohibited.
- SPF ledger with minimum specific gravity of 0.42.
- The tabulated values apply where the ledger is installed either directly over the studs or with up to two layers of ½" gypsum between the ledger and studs.
- Allowable loads shall be limited to parallel-to-grain loaded solid sawn main members (minimum 2" nominal). Wood side members shall be loaded perpendicular to grain.
- Allowable loads are shown at the wood load duration factor of $C_D = 1.00$. Loads may be increased for load duration as permitted by the building code up to a $C_D = 1.60$. All adjustment factors shall be applied per *NDS*. For in-service moisture content greater than 19%, use Wet Service Factor (C_M) = 0.70.
- Fasteners shall be centered in the stud and spaced as shown in Figure 6 through Figure 14. The stud minimum end distance is 6¾" when loaded toward the end and 4" when loaded away from the end. The ledger end distance is 6" for full values. For ledger end distances under 6", the reference connection design values shall be adjusted in accordance with *NDS* Section 12.5.
- For LRFD values, the reference connection design values shall be adjusted in accordance with *NDS* Section 11.3.
- Gypsum wall board (GWB) must be attached as required per the building code.

6 Installation

- Installation shall comply with the manufacturer's installation instructions, this TER, the approved construction documents, and the applicable building code.
- In the event of a conflict between the manufacturer's installation instructions and this TER, the more restrictive shall govern.
- Lead holes are not required but may be used where lumber is prone to splitting.
- Big Timber® screws shall be installed with the appropriate rotating powered driver. Do not overdrive.
- Install Big Timber® screws such that the threads fully engage the band joist material and the fastener tip extends beyond the back face of the band joist material when fully seated against the installed ledger.
- For deck ledger connections, stagger the Big Timber® screws from the top to the bottom along the length of the ledger while maintaining the required edge and end distances.
 - Figure 5 provides a deck ledger installation detail, including minimum required spacing, end, and edge distances.
- For applications outside the scope of this TER, an engineered design is required.

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 Deck ledger assembly testing in accordance with *ASTM D1761*
- 7.2 Properties for Big Timber® CTX Construction Lag Screws from [TER 1907-01](#)
- 7.3 Properties for Big Timber® BL and GL Screws from [TER 1907-02](#)
- 7.4 Properties for Big Timber® WTX Wood Screws from [TER 1911-04](#)
- 7.5 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.
- 7.6 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 products listed in Section 1.1 are approved for the following:
 - 8.1.1 Big Timber® screws provide an equivalent connection as that required by the [IBC Section 1604.8.3](#) and [IRC Section R507.9](#).¹²
- 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](#)¹³ 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*.

¹² [2015 IRC Section R507.2](#)

¹³ [2018 IFC Section 104.9](#)



9 Conditions of Use

- 9.1 Big Timber® screws covered by this TER shall be installed in accordance with this report and the manufacturer's installation instruction.
- 9.2 Use of fasteners in locations exposed to saltwater or saltwater spray is outside the scope of this evaluation report.
- 9.3 Design properties shall not exceed those described in Section 5.
- 9.4 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:
 - 9.4.1 This TER and the installation instructions shall be submitted at the time of *permit* application.
 - 9.4.2 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.
- 9.5 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*.
- 9.6 *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).
- 9.7 At a minimum, this product shall be installed per Section 6 of this TER.
- 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 products 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.