



CERTIFICATION



Approved. Sealed. Code Compliant.

Technical Evaluation Report

TER 1105-02

FastenMaster® TimberLOK®
Fasteners to Provide Uplift & Lateral
Resistance to Trusses & Rafters
Attached to the Tops of Walls

**OMG, Inc.
DBA FastenMaster®**

Product:

**FastenMaster® TimberLOK®
Heavy Duty Wood Screw**

Issue Date:

June 20, 2011

Revision Date:

October 14, 2020

Subject to Renewal:

April 1, 2021



COMPANY
INFORMATION:

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DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES
SECTION: 06 00 90 - Wood and Plastic Fastenings

1 PRODUCT EVALUATED¹

- 1.1 FastenMaster® TimberLOK® Heavy Duty Wood Screw

2 APPLICABLE CODES AND STANDARDS^{2,3}

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 *ANSI/AWC NDS: National Design Specification (NDS) for Wood Construction*
- 2.2.2 *ASTM A153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*
- 2.2.3 *ASTM A510: Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel*
- 2.2.4 *ASTM D1761: Standard Test Methods for Mechanical Fasteners in Wood*
- 2.2.5 *AWC TR 12: General Dowel Equations for Calculating Lateral Connection Values*

¹ 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.”

Building official approval of a licensed [registered design professional](#) (RDP) is performed by verifying the RDP and/or their business entity complies with all professional engineering laws of the relevant [jurisdiction](#). Therefore, the work of licensed RDPs is accepted by [building officials](#), except when plan (i.e. peer) review finds an error with respect to a specific section of the code. Where this TER is not approved, the [building official](#) responds in writing stating the reasons for [disapproval](#).

For more information on any of these topics or our mission, product evaluation policies, product approval process, and engineering law, visit drjcertification.org or call us at 608-310-6748.

² 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.

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

3 PERFORMANCE EVALUATION

- 3.1 TimberLOK® fasteners were evaluated, using their tested allowable design values, as an alternate means of attaching wood trusses and rafters to the tops of walls to provide uplift and lateral load resistance. The following conditions were evaluated:
 - 3.1.1 Withdrawal strength of TimberLOK® fasteners for use as an alternative to toe-nail connections, metal hurricane and seismic clips/straps or nails in tension (uplift) loaded applications.
 - 3.1.2 Shear strength of TimberLOK® fasteners 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.
 - 3.1.3 Head pull through strength of TimberLOK® fasteners for use as an alternative to toe-nail connections, hurricane and seismic clips/straps or nails in tension (uplift) loaded applications.
- 3.2 Any code compliance issues not specifically addressed in this section are outside the scope of this TER.
- 3.3 Any engineering evaluation conducted for this TER was performed on the dates provided in this TER and within DrJ's professional scope of work.

4 PRODUCT DESCRIPTION AND MATERIALS

- 4.1 TimberLOK® fasteners (Figure 1) are manufactured from carbon steel wire conforming to *ASTM A510* with a minimum ultimate tensile strength of 60 ksi.

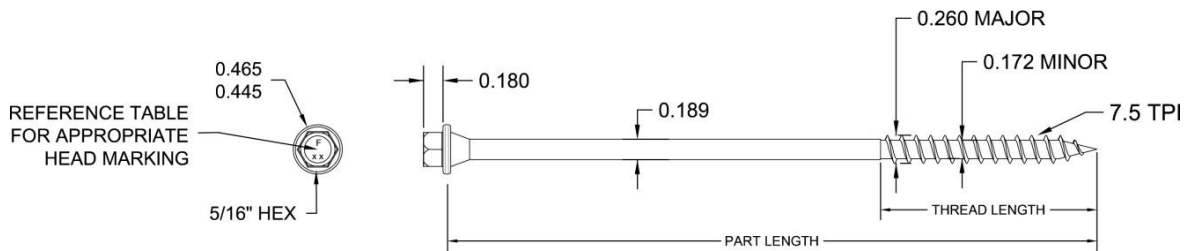


FIGURE 1. TIMBERLOK® FASTENER

- 4.2 TimberLOK® fasteners are manufactured using a standard cold-formed process followed by a heat-treating process.
- 4.3 Fasteners are approved for use in interior and exterior conditions and in pressure-treated wood.
 - 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* (*IBC Section 2304.10.5⁴* and *IRC Section 317.3*), which allows for its use in alkaline copper quaternary (ACQ) pressure-treated wood.
- 4.4 Fasteners are approved for use in fire-retardant-treated lumber, provided the conditions set forth by the fire retardant-treated lumber manufacturer are met, including appropriate strength reductions.
- 4.5 In-plant quality control procedures, under which the TimberLOK® fasteners are manufactured, are audited through an inspection process performed by an approved agency.
- 4.6 The fasteners evaluated in this report are designated in Table 1.

⁴ 2012 *IBC Section 2304.9.5*



TABLE 1: FASTENER DESIGNATION FOR EVALUATED TIMBERLOK® FASTENERS

Product Name	Fastener Designation	Head Marking	Overall Length (in)	Thread Length (in)
TimberLOK® 4"	TLOK04	F4.0	4	2
TimberLOK® 6"	TLOK06	F6.0	6	2

SI: 1 in = 25.4 mm
Fastener designations are found on the product packaging. Individual fasteners may be marked according to Table 1.

5 APPLICATIONS

- 5.1 TimberLOK® fasteners are used to attach minimum 1½"-wide wood trusses, sawn lumber rafters, or structural composite lumber (SCL) rafters to wood walls that meet the requirements of IBC Section 2308 or IRC Section R602 for wood structural framing members. The fasteners provide resistance to uplift or lateral loads applied parallel and/or perpendicular to the wall or structural framing member.
- 5.1.1 Walls shall consist of either a single or double top plate designed in accordance with IBC Section 2308.5.3.2⁵ or IRC Section R602.3.2.
- 5.1.2 See Table 2 for the design procedure and the TimberLOK® allowable design values.
- 5.1.3 See Section 6 for installation requirements.
- 5.1.4 TimberLOK® fasteners are used in buildings requiring wind analysis in accordance with IRC Section R301.2.1 or design in accordance with IBC Section 1609.
- 5.1.5 TimberLOK® fasteners in buildings requiring seismic analysis in accordance with IRC Section R301.2.2 is outside the scope of this TER.
- 5.2 *Design Concepts and Allowable Design Loads*
- 5.2.1 Allowable design loads for uplift and lateral resistance (parallel [F1] and perpendicular [F2] to the plane of the wall or structural member, Figure 2) are provided in Table 2 for TimberLOK® fasteners. Allowable design loads are listed for selected load durations and specific gravities and are applicable to fasteners installed in accordance with the procedures described in Section 6. Table values are applicable for both single and double top plate applications, as shown in Figure 3.

⁵ 2012 IBC Section 2308.9.2.1

TABLE 2. ALLOWABLE LOADS FOR UPLIFT & LATERAL RESISTANCE FOR SELECTED LOAD DURATIONS & WOOD-SPECIFIC GRAVITIES USING TIMBERLOK® FASTENERS

Fastener Designation	Minimum Penetration into Truss/Rafter/Wood Structural Support (in)	Species Group (Specific Gravity)	Uplift (lbf)			Lateral (lbf)					
						F1 – Parallel to Wall			F2 – Perpendicular to Wall		
			1.0	1.33	1.60	1.0	1.33	1.60	1.0	1.33	1.60
TimberLOK® TLOK04 or TLOK06	2	So. Pine (0.55)	390	520	620	255	340	410	280	375	450
		Douglas Fir-Larch (0.50)	340	450	540	240	320	385	265	350	425
		Spruce-Pine-Fir/Hem-Fir (0.42)	260	350	420	210	280	340	230	305	370

SI: 1 in = 25.4 mm, 1 psi = 0.00689 MPa

1. Wood truss and rafter members shall be a minimum of 2" nominal thickness. Design of truss and rafter members to be 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 applications involving members with different specific gravities, use the allowable load corresponding to the lowest specific gravity.
4. Allowable uplift and lateral loads for applications in which the controlling load duration is two months (i.e., 115%) or seven days (i.e., 125%) may be obtained by multiplying the corresponding tabular value in the column marked "1.0" by 1.15 or 1.25, respectively.

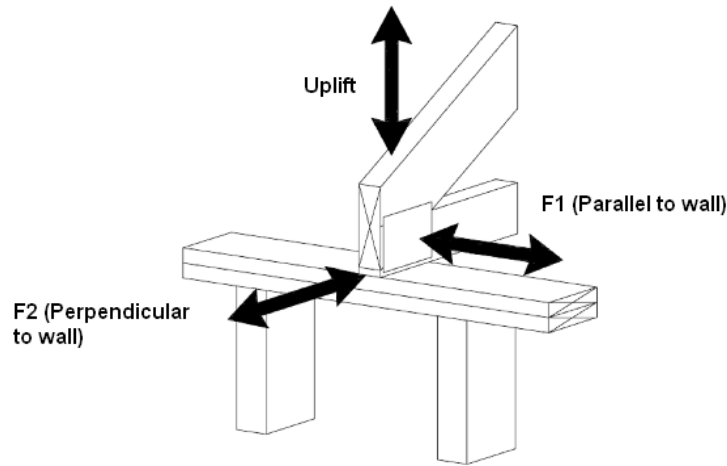


FIGURE 2: UPLIFT & LATERAL LOAD ORIENTATIONS

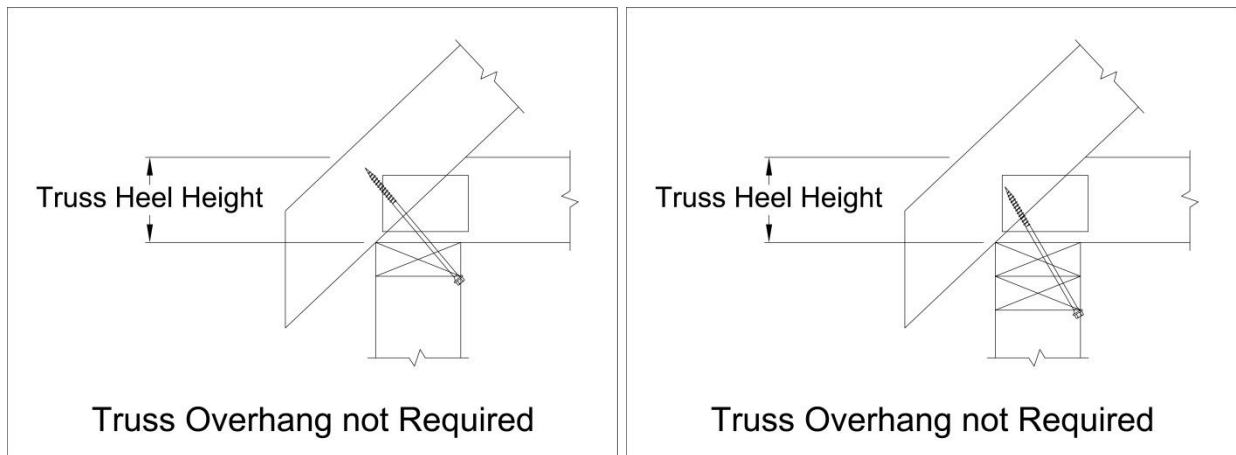


FIGURE 3. INSTALLATION OF TIMBERLOK® FASTENERS ON WALLS WITH SINGLE OR DOUBLE TOP PLATES

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

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

5.2.3.1 Consult a professional engineer as needed for complex design conditions.

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 Installation where double wall top plates are used.

6.2.1 Upward from below truss or rafter.

6.2.1.1 Select a TimberLOK® fastener with a length sufficient to fully embed the 2" threaded portion of the fastener into the truss or rafter. See Figure 4 for guidance.

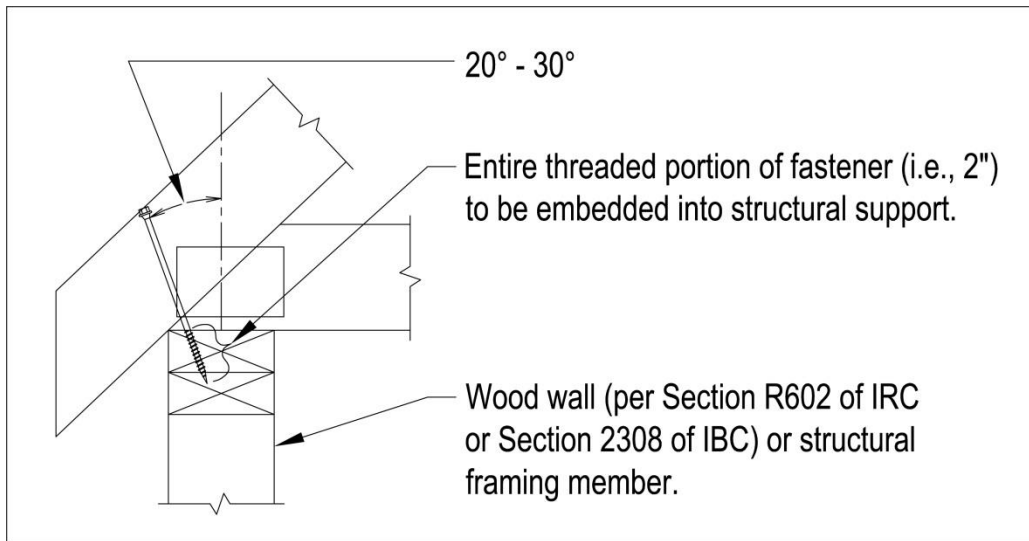


FIGURE 4. FASTENER ORIENTATION REQUIREMENTS FOR ATTACHING WOOD TRUSSES, RAFTERS, OR SCL FROM ABOVE TO THE TOP OF A WOOD WALL OR STRUCTURAL FRAMING MEMBER

6.2.1.2 Install one (1) TimberLOK® fastener upward through the wall top plate(s) or wood structural framing member and into the center of the truss, rafter, or SCL, as shown in Figure 5.

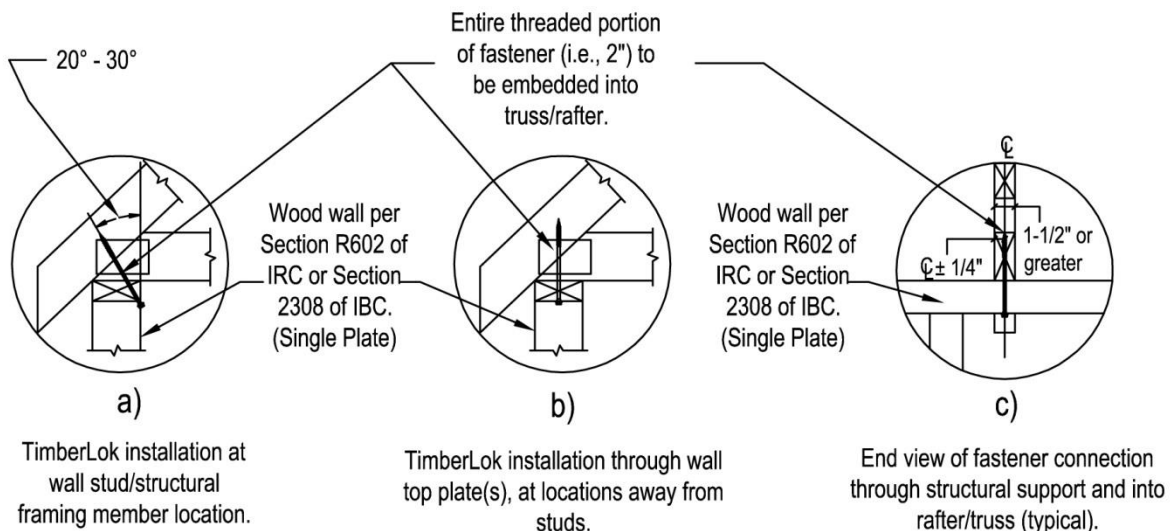


FIGURE 5. FASTENER ORIENTATION REQUIREMENTS FOR ATTACHING WOOD TRUSSES, RAFTERS, OR SCL FROM BELOW TO THE TOP OF A WOOD WALL OR STRUCTURAL FRAMING MEMBER

- 6.2.1.2.1 If the truss, rafter or SCL is located directly over a wall stud, insert the fastener at the joint between the inside top edge of the stud and the inside bottom edge of the top plate at an upward angle from vertical of 20° to 30°, as shown in Figure 5.
- 6.2.1.2.2 If the truss, rafter or SCL is located between the wall studs (double top plate application only), insert the fastener near the middle of the bottom face of the top plate(s) straight upward into the truss, rafter or SCL, as shown in Figure 5.
- 6.2.1.2.3 If the truss, rafter or SCL is located on top of a wood beam or header, insert the fastener approximately 3" below the top edge of the beam or header at an upward angle from vertical of 20° to 30°, as shown in Figure 5.
- 6.2.1.3 Locate the fastener in line with the truss, rafter or SCL above so that it penetrates within +/-1/4" of the centerline of the narrow edge of the truss, rafter or SCL, as shown in Figure 5.
- 6.2.1.4 Use a 1/2" low RPM/high torque drill to drive the fastener head flush with the surface of the wall framing or wood structural framing member.
- 6.2.2 Downward from on top of the truss, rafter or SCL.
 - 6.2.2.1 Select a TimberLOK® fastener with a length sufficient to fully embed the 2" threaded portion of the fastener into the wall top plates or wood structural framing member.
 - 6.2.2.2 Install one (1) TimberLOK® fastener at a downward angle from vertical of 20° to 30° through the center of the truss, rafter or SCL and into the wall top plate(s) or wood structural framing member, as shown in Figure 6.
 - 6.2.2.3 Locate the fastener so that it penetrates within +/-1/4" of the centerline of the narrow edge of the truss, rafter or SCL and at or near the center of the wall top plate(s) or wood structural framing member.
 - 6.2.2.4 Use a 1/2" low RPM/high torque drill to drive the fastener head flush with the surface of the wall framing or wood structural framing member.
- 6.3 Installation where single top plates are used.
 - 6.3.1 Select a TimberLOK® fastener with a length sufficient to fully embed the 2" threaded portion of the fastener into the truss, rafter or SCL.
 - 6.3.2 Where the truss, rafter or SCL is located directly over a wall stud, insert the fastener at the joint between the inside top edge of the stud and the inside bottom edge of the top plate at an upward angle from vertical of 20° to 30°, as shown in Figure 6.

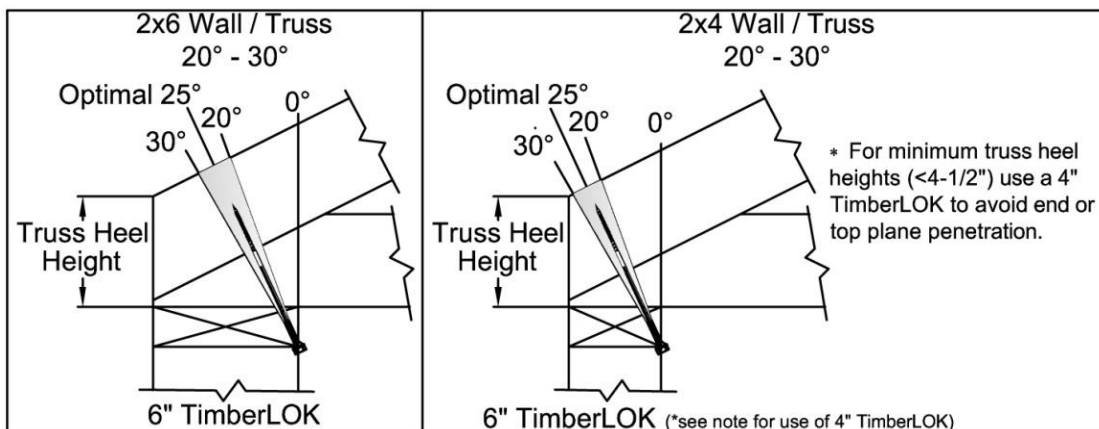


FIGURE 6. INSTALLATION OF TIMBERLOK® FASTENERS INTO A SINGLE TOP PLATE

- 6.3.3 Ensure that the angle is sufficient to prevent the fastener from protruding out of the truss, rafter or SCL.
- 6.3.4 Locate the fastener in line with the truss, rafter or SCL above so that it penetrates within +/-1/4" of the centerline of the narrow edge of the truss, rafter or SCL.
- 6.3.5 Use a 1/2" low RPM/high torque drill to drive the fastener head flush with the surface of the wall framing or wood structural framing member.



- 6.3.6 Where the centerline of the truss, rafter or SCL is not located directly over the stud, install the fastener vertically up through the top plate and into the truss, rafter or SCL, as shown in Figure 5.

7 TEST ENGINEERING SUBSTANTIATING DATA

- 7.1 Comparative equivalency for use as an alternative material in accordance with IBC Section 104.11⁶ and IRC Section R104.11.
- 7.2 Uplift capacity of TimberLOK® fasteners as evaluated for head pull through and withdrawal of fasteners
- 7.3 TimberLOK® heavy duty wood screw performance when used as a truss hold-down
- 7.4 TimberLOK® heavy duty wood screw performance when loaded laterally
- 7.5 Testing according to *ASTM D1761* for verifying edge and end distances
- 7.6 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.
- 7.7 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.

⁶ 2012 IBC Section 104.11



8 FINDINGS

- 8.1 When used and installed in accordance with this TER and the manufacturer's installation instructions, TimberLOK® fasteners can be used as an acceptable alternative to toe-nail connections, metal hurricane and seismic clips/straps or nails to resist the uplift and lateral loads as provided for in Table 2.
- 8.2 When used and installed in accordance with this TER and the manufacturer's installation instructions, TimberLOK® fasteners can be used as an acceptable alternative to provide resistance to uplift loads due to wind negative pressure applied from the truss above lifting up on the top plate of the wall, per Table 2.
- 8.3 When used and installed in accordance with this TER and the manufacturer's installation instructions, TimberLOK® fasteners can be used as an acceptable alternative to provide resistance to lateral loads due to wind pressure applied parallel or perpendicular to the wall, per Table 2.
- 8.4 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*.

- 8.5 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 evaluation, they are listed here.
 - 8.5.1 No known variations

9 CONDITIONS OF USE

- 9.1 The TimberLOK® fasteners covered in this TER shall be installed in accordance with this report and the manufacturer's installation instructions.
- 9.2 For conditions not covered in this TER, connections shall be designed in accordance with accepted engineering practice.
- 9.3 Loads applied shall not exceed those recommended by the manufacturer or as defined in this TER.
- 9.4 Structural framing members (e.g., wood, masonry, concrete, steel, etc.) connected with TimberLOK® fasteners shall be designed in accordance with the requirements of their specific design standards/specifications as referenced in the building code adopted by the jurisdiction in which the project is to be constructed.
- 9.5 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.
- 9.6 Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the AHJ for review and approval.
- 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 *registered design professional*).
- 9.8 At a minimum, this product shall be installed per Section 5.2.1 of this TER.
- 9.9 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.
- 9.10 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.



- 9.11 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 fasteners are identified by the designation, “TimberLOK®” on the packaging. The head of each fastener is marked with an “F6.0” corresponding to the length of the fastener (i.e., 6”) to be used for the applications described in this TER.
- 10.2 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.
- 10.3 Additional technical information can be found at fastenmaster.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.
- 11.2 For information on the current status of this TER, contact [DrJ Certification](#).