



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:

April 1, 2021

Subject to Renewal:

April 1, 2022



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 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 2018 version of the codes and the standards referenced therein. 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 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 product evaluated in this TER is shown in Figure 1 and is manufactured from carbon steel wire conforming to *ASTM A510* with a minimum ultimate tensile strength of 60 ksi.

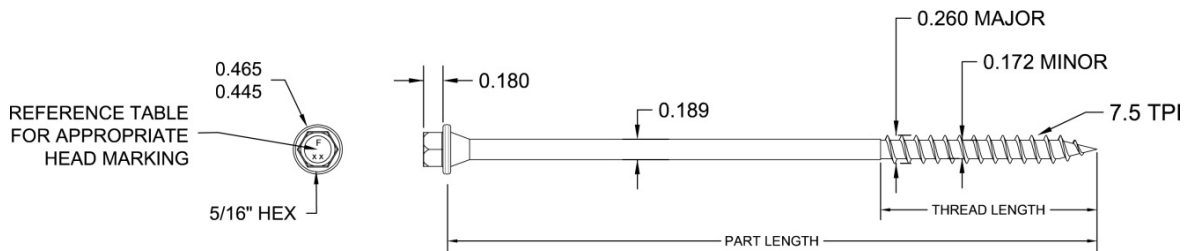


FIGURE 1. TIMBERLOK® FASTENER

- 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 2304.10.5*⁴ 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
 1. 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 Use of 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, see 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.

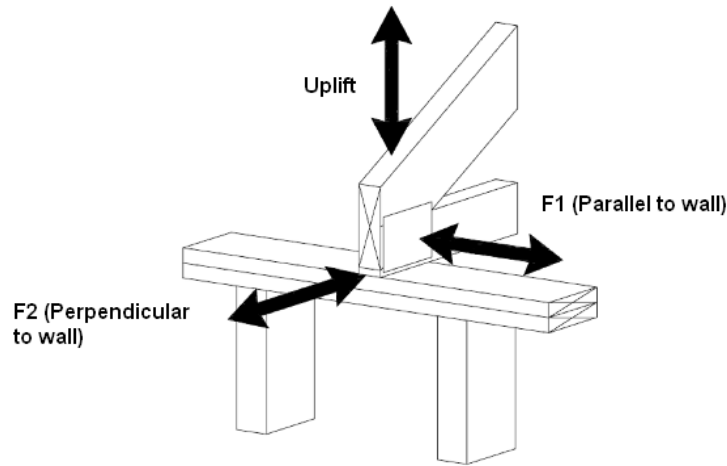


FIGURE 2: UPLIFT & LATERAL LOAD ORIENTATIONS

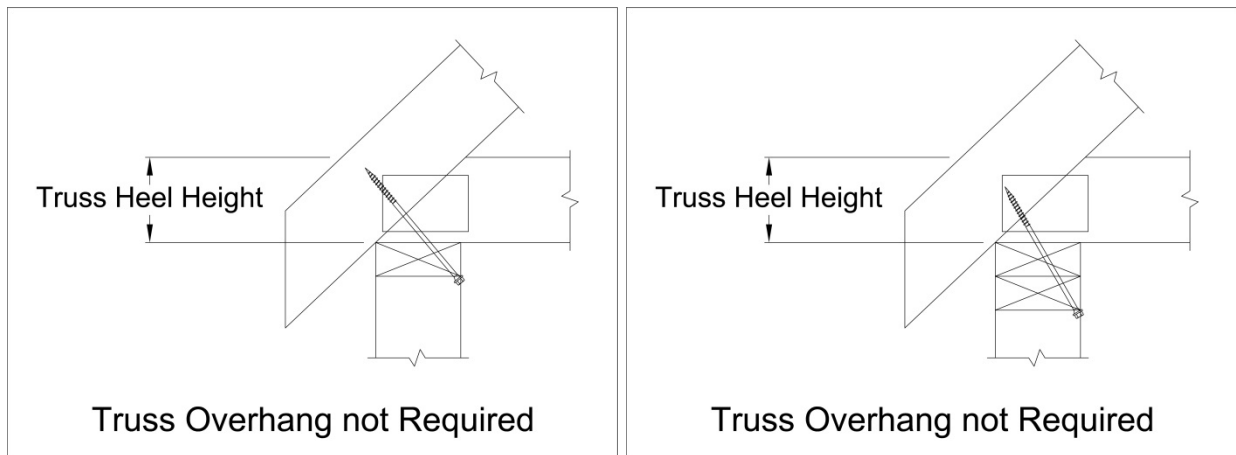


FIGURE 3. INSTALLATION OF TIMBERLOK® FASTENERS ON WALLS WITH SINGLE OR DOUBLE TOP PLATES

- 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.

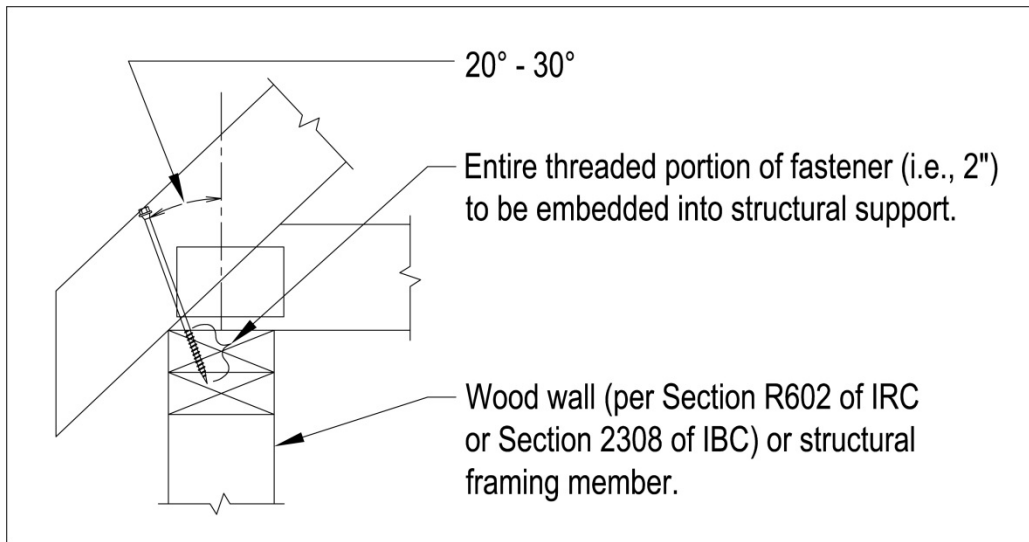


FIGURE 4. FASTENER ORIENTATION REQUIREMENTS FOR ATTACHING WOOD TRUSSES, RAFTERS, OR SCL FROM ABOVE TO THE TOP OF A WOOD WALL OR STRUCTURAL FRAMING MEMBER

- 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.

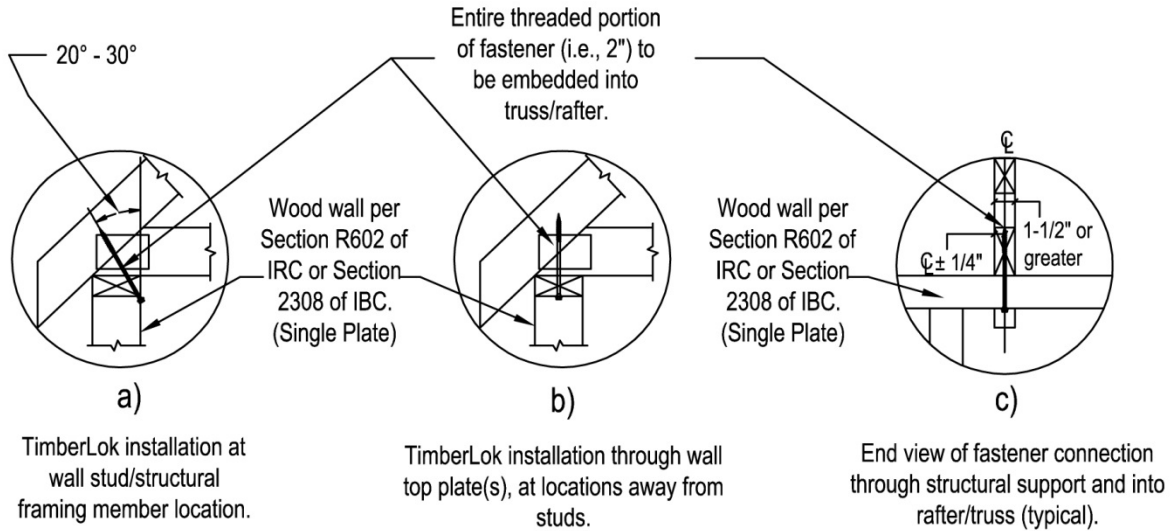


FIGURE 5. FASTENER ORIENTATION REQUIREMENTS FOR ATTACHING WOOD TRUSSES, RAFTERS, OR SCL FROM BELOW TO THE TOP OF A WOOD WALL OR STRUCTURAL FRAMING MEMBER

- 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.

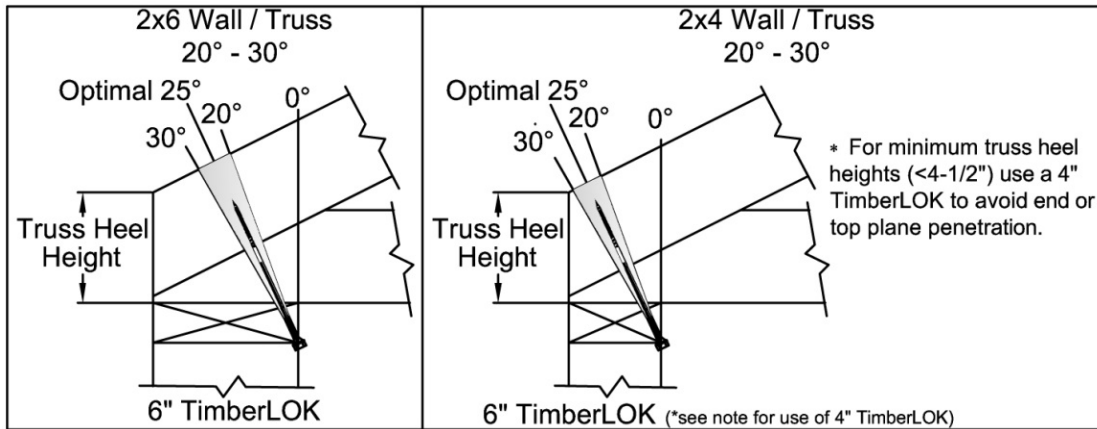


FIGURE 6. INSTALLATION OF TIMBERLOK® FASTENERS INTO A SINGLE TOP PLATE

- 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 $\pm 1/4$ " 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 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 Edge and end distances verification testing in accordance with *ASTM D1761*.
- 7.2 TimberLOK® fasteners were evaluated for head pull through and withdrawal for uplift capacity.
- 7.3 TimberLOK® fasteners were evaluated for heavy duty wood screw performance when used as a truss hold-down.
- 7.4 TimberLOK® fasteners were evaluated for heavy duty wood screw performance when loaded laterally.
- 7.5 Information contained herein is the result of testing and/or data analysis by sources that conform to IBC Section 1703 and/or professional engineering regulations. DrJ relies upon accurate data to perform its ISO/IEC 17065 evaluations.
- 7.6 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 product listed in Section 1.1 is approved for the following:
- 8.1.1 Use 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.
 - 8.1.2 Use 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.
 - 8.1.3 Use as an acceptable alternative to provide resistance to lateral loads due to wind pressure applied parallel or perpendicular to the wall, per Table 2.
- 8.2 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.
- 8.2.1 No known variations
- 8.3 Building codes require data from valid research reports be obtained from approved sources (i.e., licensed registered design professionals [RDPs]).
- 8.3.1 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.
- 8.4 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.
- 8.5 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.”
- 8.6 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...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 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 RDP).
- 9.8 At a minimum, this product shall be installed per Section 6 of this TER.



- 9.9 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.
- 9.10 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.
- 9.11 This TER shall be reviewed for code compliance by the AHJ in concert with IBC Section 104.
- 9.12 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 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 listed in Section 1.1 is 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, visit drjcertification.org.
- 11.2 For information on the current status of this TER, contact DrJ Certification.