



CERTIFICATION



Approved. Sealed. Code Compliant.

Technical Evaluation Report

TER 1611-01

FastenMaster® FlatLOK® Fasteners –
Ledger Connection to Wood-Framed
Walls

OMG, Inc. DBA FastenMaster®

Product:

**FastenMaster® FlatLOK®
Fasteners**

Issue Date:

December 16, 2016

Revision Date:

June 27, 2019

Subject to Renewal:

July 1, 2020



COMPANY
INFORMATION:

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DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

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

1 PRODUCT EVALUATED¹

- 1.1 FastenMaster® FlatLOK® Fasteners

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*

¹ Building codes require data from valid research reports be obtained from approved sources. An approved agency, which is an approved source, is defined as “an established and recognized agency that is regularly engaged in...furnishing product certification where such agency has been approved...” Being approved, defined as “acceptable to the building official,” is accomplished via accreditation using ISO/IEC 17065 evaluation procedures meeting code requirements of independence, adequate equipment, and experienced personnel. DrJ is an ISO/IEC 17065 ANSI-Accredited Product Certification Body – Accreditation #1131.

Through ANSI accreditation, DrJ certification can be used to obtain product approval in any country that is an IAF MLA Signatory and covered by an IAF MLA Evaluation per the Purpose of the MLA – “certified once, accepted everywhere.” Manufacturers can go to jurisdictions in any IAF MLA Signatory Country and have their products readily approved by authorities having jurisdiction using DrJ’s ANSI accreditation.

For more information on any of these topics or our mission, product evaluation policies, product approval process, and engineering law, see drjcertification.org.

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. As required by code, where this TER is not approved, the building official shall respond in writing stating the reasons this TER was not approved. For any variations in state and local codes, see Section 8.

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

3 PERFORMANCE EVALUATION

- 3.1 FlatLOK® fasteners were tested and evaluated to determine their structural resistance properties, which are used to develop reference design values for allowable stress design (ASD). The following conditions were evaluated:
 - 3.1.1 Lateral strength of ledger connections to wood framed walls in accordance with *ASTM D1761*. This application includes zero, one, or two layers of 5/8" gypsum between the ledger and the wall studs (Figure 2, Figure 3, and Figure 4).
- 3.2 Use in wet service conditions is outside the scope of this evaluation.
- 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 on the dates provided in this TER and within DrJ's professional scope of work.

4 PRODUCT DESCRIPTION AND MATERIALS

- 4.1 The product evaluated in this TER is shown in Figure 1.

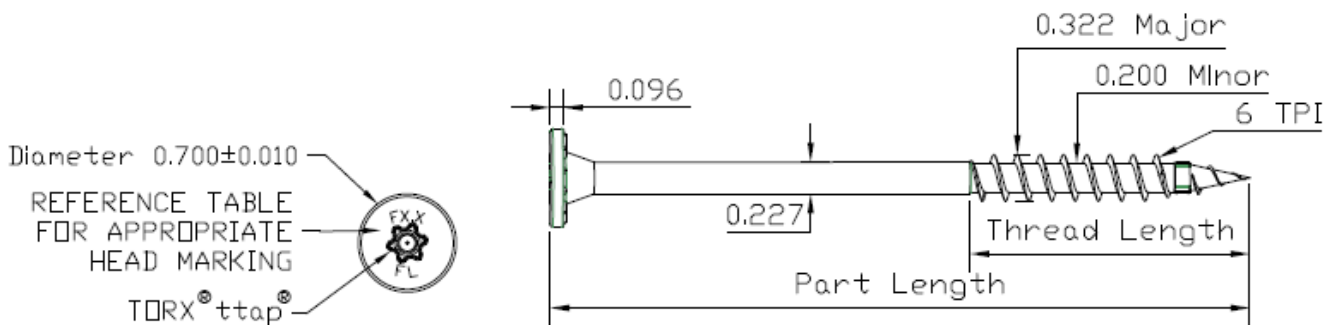


FIGURE 1. FASTENMASTER® FLATLOK®

- 4.2 FlatLOK® fasteners are manufactured using a standard cold-formed process followed by a heat-treating process.
- 4.3 Fasteners are coated with a proprietary coating that exceeds the protection provided by hot-dipped galvanized coatings conforming to *ASTM A153*.
- 4.4 Fasteners are approved for use in interior or exterior conditions and in chemically treated or untreated lumber where *ASTM A153* coatings are approved for use in accordance with *IBC Section 2304.10⁴* and *IRC Section R317.3*.
 - 4.4.1 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 2304.10.5⁵* and *IRC Section R317.3*), allowing for its use in pressure treated (ACQ) wood.
 - 4.4.2 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.
- 4.5 The fasteners evaluated in this TER are set forth in Table 1.

⁴ 2012 *IBC Section 2304.9*

⁵ 2012 *IBC Section 2304.9.5*

TABLE 1. FASTENER DIMENSIONS AND STRENGTH DETAILS

Fastener Name	Marking	Head (in)		Fastener Length ¹ (in)	Shank Diameter ² (in)	Thread Length ¹ (in)	Thread Diameter (in)		Nominal Bending Yield, ³ f_{yb} (psi)	Allowable Fastener Strength (lbf)	
		Diameter	Thickness				Minor	Major		Tensile	Shear
FlatLOK®	F5.0FL	0.70	0.095	5	0.227	2.00	0.200	0.322	171,600	1940	1230

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

1. Fastener length is measured from the topside of the head to the tip. Thread length includes tapered tip (Figure 1).
2. Shank diameter based on manufactured thickness. Finished dimensions are larger, due to the proprietary coatings added.
3. Bending yield determined at shank diameter.

5 APPLICATIONS

5.1 General

- 5.1.1 FlatLOK® fasteners are used to attach a ledger board to a stud through one or two layers of gypsum wall board in conventional light-frame construction and provide resistance to lateral loads applied vertically to the ledger. See Section 6 for installation requirements.
- 5.1.2 FlatLOK® fasteners are installed without the lead holes prescribed in *NDS*.
- 5.1.3 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.

5.1.4 Design:

- 5.1.4.1 Design of FlatLOK® fasteners are governed by the applicable code and the provisions for dowel-type fasteners in *NDS*.
- 5.1.4.2 Unless otherwise noted, adjustment of the design stresses for duration of load shall be in accordance with the applicable code.

5.2 FlatLOK® Reference Lateral Design Values

- 5.2.1 The reference lateral design values in ledger connection applications for FlatLOK® fasteners are specified in Table 2 and Figure 2 through Figure 10.

TABLE 2. FASTENER DESIGN VALUES

Fastener	Ledger Size	Figure ³ Number	Fasteners Per Stud ²	Allowable Load per Stud Connection ¹ (lb)		
				Lumber Species		
				Spruce-Pine-Fir	Douglas Fir-Larch	Southern Yellow Pine
FlatLOK® 5"	2x6	Figure 2, Figure 5, Figure 8	2	360	510	795
	2x8	Figure 3, Figure 6, Figure 9	2	580	735	900
	2x10	Figure 4, Figure 7, Figure 10	3	805	860	1075

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

- Adjusted for specific gravity of lumber
- Additional fasteners prohibited.
- Minimum fastener penetration of 2¼" into the main member
- The above values apply where the ledger is applied either directly over the studs or with up to two layers of 5/8" 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 $C_M = 0.70$.
- Fasteners shall be centered in the stud and spaced as shown in the details. 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 between 2" and 6", use 50% of the table loads. For end distances between 2" and 4", predrill using a 5/32" bit.
- For LRFD values, the reference connection design values shall be adjusted in accordance with the *NDS* Section 11.3.
- Gypsum board must be attached as required per the building code.

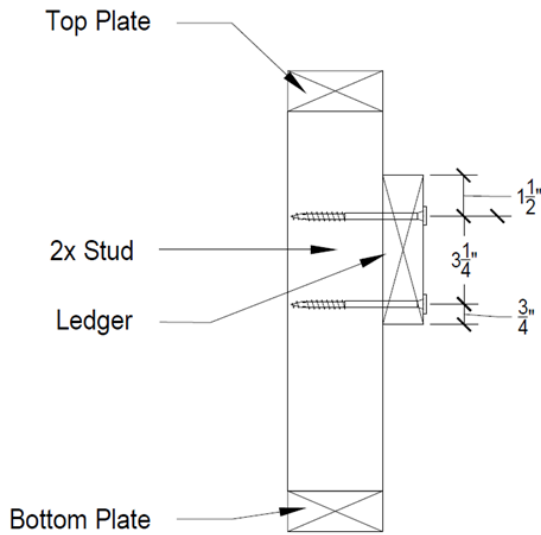


FIGURE 2. 2X6 LEDGER CONFIGURATION WITH NO GWB

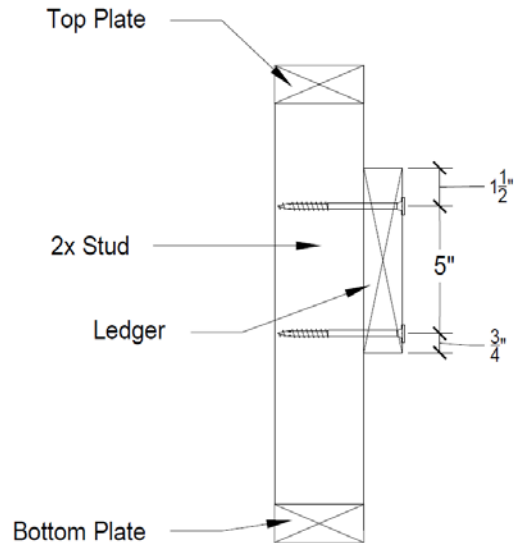


FIGURE 3. 2X8 LEDGER CONFIGURATION WITH NO GWB

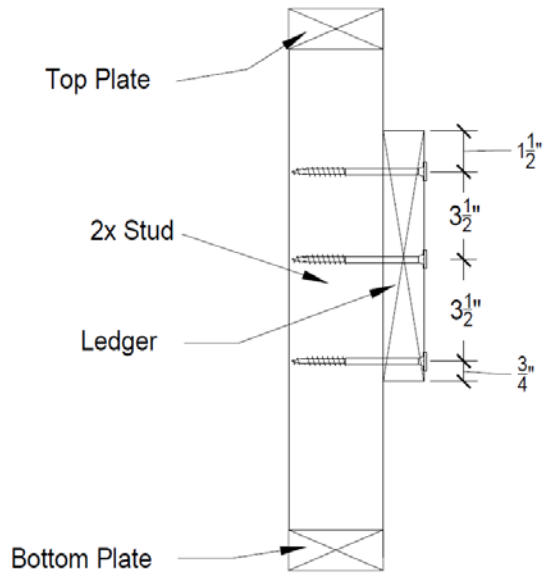


FIGURE 4. 2X10 LEDGER CONFIGURATION WITH NO GWB

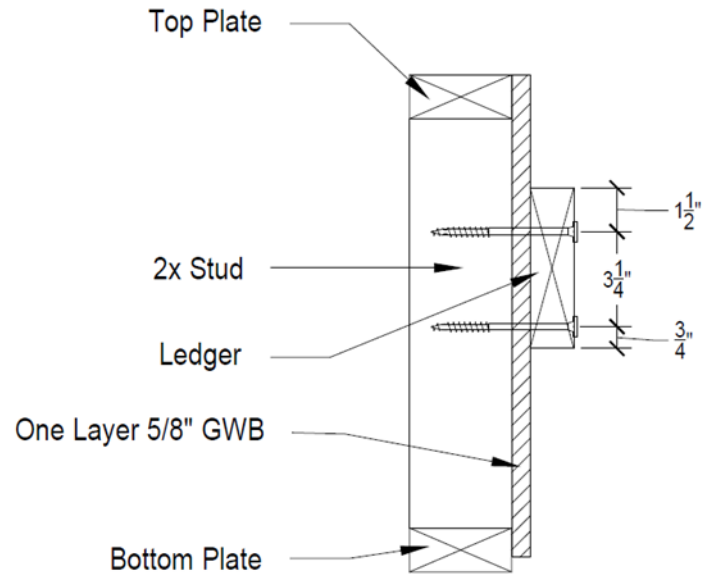


FIGURE 5. 2X6 LEDGER CONFIGURATION WITH ONE LAYER GWB

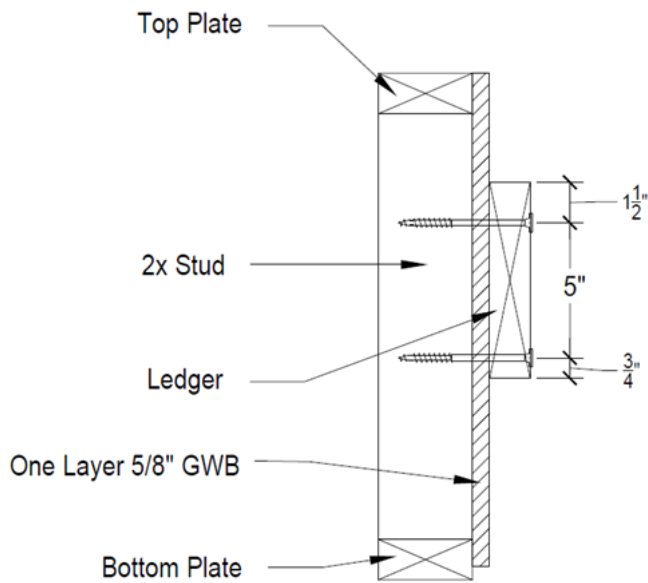


FIGURE 6. 2X8 LEDGER CONFIGURATION WITH ONE LAYER GWB

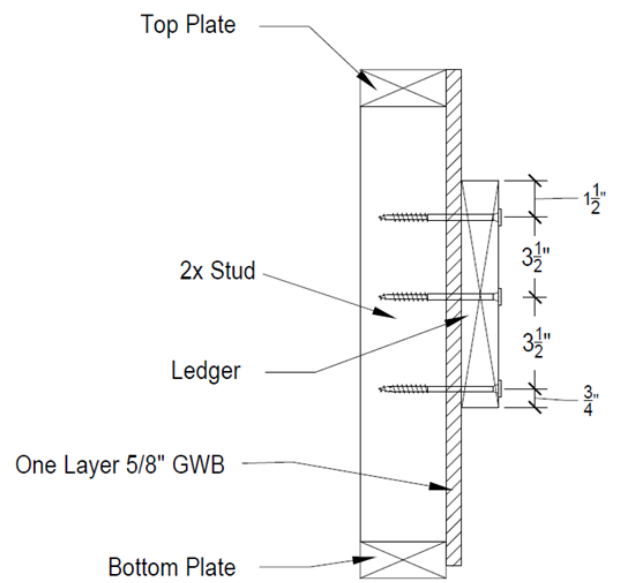


FIGURE 7. 2X10 LEDGER CONFIGURATION WITH ONE LAYER GWB

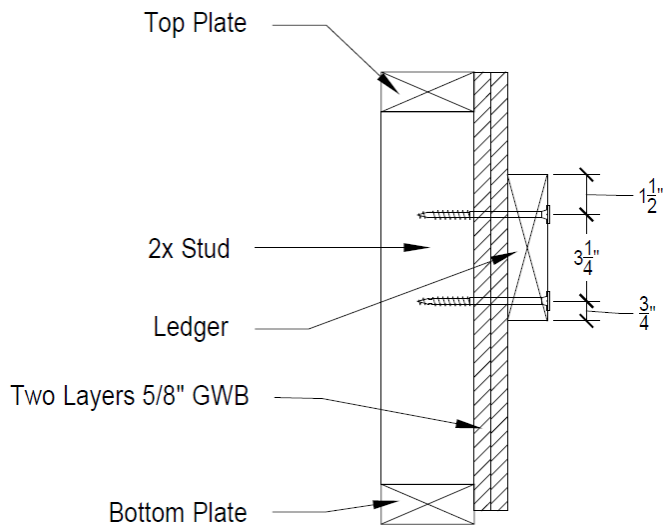


FIGURE 8. 2X6 LEDGER CONFIGURATION WITH TWO LAYERS GWB

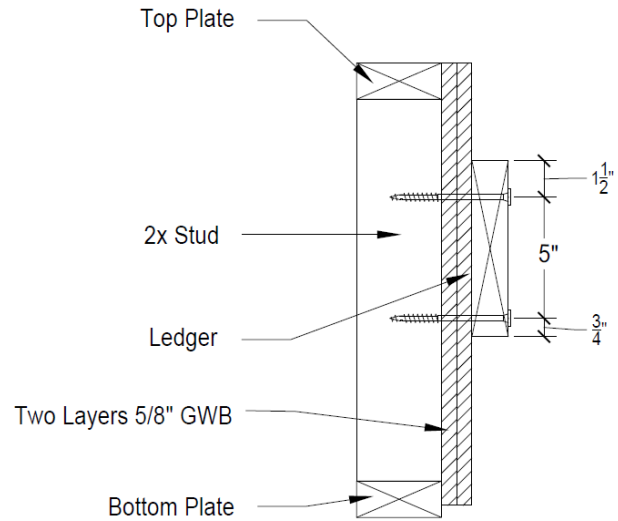


FIGURE 9. 2X8 LEDGER CONFIGURATION WITH TWO LAYERS GWB

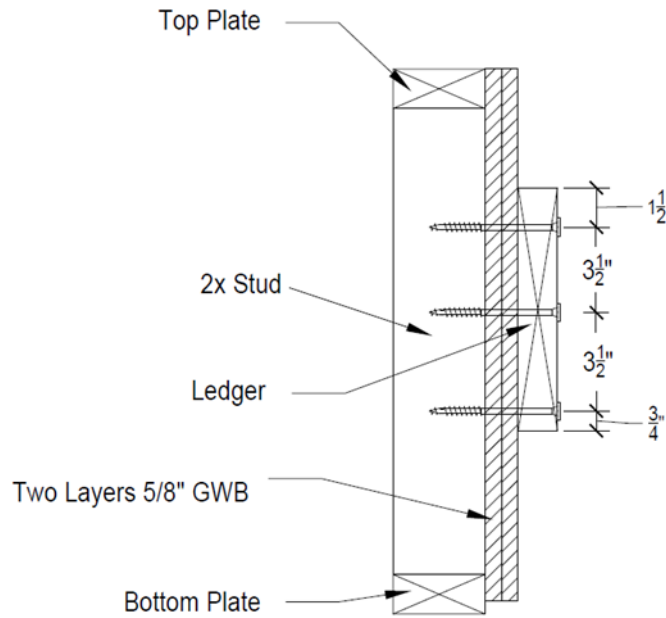


FIGURE 10. 2X10 LEDGER CONFIGURATION WITH TWO LAYERS GWB

6 INSTALLATION

- 6.1 Installation shall comply with the applicable code, the approved construction documents, this TER, the manufacturer's installation instructions, *NDS*, and standard framing practice as applied to wood fasteners. In the event of a conflict between the manufacturer's installation instructions and this TER, the more restrictive shall govern.
- 6.2 Use a 1/2" low RPM/high torque drill to drive the fastener head flush with the surface of the framing member using the driver bit included with the fasteners.

7 TEST ENGINEERING SUBSTANTIATING DATA

- 7.1 Testing for lateral strength by SBCRI, under contract with Qualtim, Inc., in accordance with *ASTM D1761*.
- 7.2 *ASTM A153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*
- 7.3 *ASTM A510: Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel*
- 7.4 *ANSI/AWC NDS: National Design Specification (NDS) for Wood Construction*
- 7.5 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.
- 7.6 Where appropriate, DrJ's analysis is based on design values that have been codified into law through codes and standards (e.g., *IBC*, *IRC*, *NDS*®, and *SDPWS*). This includes review of code provisions and any related test data that aids in comparative analysis or provides support for equivalency to an intended end-use application. Where the accuracy of design values provided herein is reliant upon the published properties of commodity materials (e.g., lumber, steel, and concrete), DrJ relies upon the grade mark, stamp, and/or design values provided by raw material suppliers to be accurate and conforming to the mechanical properties defined in the relevant material standard.

8 FINDINGS

- 8.1 When used in accordance with the provisions of this TER and the provisions of the applicable building codes defined in Section 2, FlatLOK® fasteners have the reference design value properties defined herein and are approved for use as an alternative to those fasteners prescribed by the applicable code.
- 8.2 *IBC Section 104.11* (*IRC Section R104.11* and *IFC Section 104.9* are similar) states:

104.11 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. An alternative material, design or method of construction shall be *approved* where the *building official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code...Where the alternative material, design or method of construction is not *approved*, the *building official* shall respond in writing, stating the reasons the alternative was not *approved*.
- 8.3 This product has been evaluated in the context of the codes listed in Section 2 and is compliant with all known state and local building codes. Where there are known variations in state or local codes applicable to this evaluation, they are listed here.
 - 8.3.1 No known variations

9 CONDITIONS OF USE

- 9.1 For conditions not covered in this TER, connections shall be designed in accordance with generally accepted engineering practice.
- 9.2 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.
- 9.3 Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the AHJ for review and approval.
- 9.4 *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*).
- 9.5 At a minimum, this product shall be installed per Section 6 of this TER and the *manufacturer's installation instructions*.

- 9.6 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.
- 9.7 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.
- 9.8 The use of this TER is dependent on the manufacturer's in-plant QC, the ISO/IEC 17020 third-party quality assurance program and procedures, proper installation per the manufacturer's instructions, the building official's inspection, and any other code requirements that may apply to demonstrate and verify compliance with the applicable building code.

10 IDENTIFICATION

- 10.1 The product(s) listed in Section 1.1 are identified by a label on the board or packaging material bearing the manufacturer's name, product name, TER number, and other information to confirm code compliance.
- 10.2 Additional technical information can be found at 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.