

**FastenMaster LedgerLOK™ Ledger Board Fasteners
Limit States**

TER No. 1412-01

**OMG, Inc.
d/b/a/ FastenMaster**

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**Issue Date: April 10, 2015
Updated: May 25, 2018
Subject to Renewal: July 1, 2019**

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 Evaluated:

- 1.1. LedgerLOK™ Ledger Board Fasteners
- 1.2. For the most recent version of this Technical Evaluation Report (TER), visit drjengineering.org. For more detailed state professional engineering and code compliance legal requirements and references, visit drjengineering.org/statelaw. DrJ is fully compliant with all state professional engineering and code compliance laws.
- 1.3. This TER can be used to obtain product approval in any country that is an IAF MLA Signatory (all countries found [here](#)) and covered by an [IAF MLA Evaluation](#) per the [Purpose of the MLA](#) (as an example, see [letter to ANSI](#) from the Standards Council of Canada). Manufacturers can go to jurisdictions in the U.S., Canada and other [IAF MLA Signatory Countries](#) and have their products readily approved by authorities having jurisdiction using [DrJ's ANSI accreditation](#).
- 1.4. Building code regulations require that evaluation reports are provided by an approved agency meeting specific requirements. Any agency accredited in accordance with ANSI ISO/IEC 17065 meets this requirement within ANSI's scope of accreditation. For a list of accredited agencies, visit ANSI's [website](#). For more information, see drjcertification.org.

DrJ is a Professional Engineering Approved Source

 **Learn more about DrJ's Accreditation**

- DrJ is an ISO/IEC 17065 accredited product certification body through ANSI Accreditation Services.
- DrJ provides certified evaluations that are signed and sealed by a P.E.
- DrJ's work is backed up by professional liability insurance.
- DrJ is fully compliant with IBC Section 1703.

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- 1.5. Requiring an evaluation report from a specific private company (i.e. ICC-ES, IAPMO, CCMC, DrJ, etc.) can be viewed as discriminatory and is a violation of international, federal, state, provincial and local anti-trust and free trade regulations.
- 1.6. DrJ's code compliance work:
 - 1.6.1. Conforms to code language adopted into law by individual states and any relevant consensus based standard such as an ANSI or ASTM standard.
 - 1.6.2. Complies with accepted engineering practice, all professional engineering laws and by providing an engineer's seal DrJ takes professional responsibility for its specified scope of work.

2. Applicable Codes and Standards:¹

- 2.1. *National Building Code of Canada (NBC), 2015*
- 2.2. *CSA O86 – Engineering Design in Wood, 2014*
- 2.3. *ASTM A510 – Standard Specification for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel*
- 2.4. *ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*
- 2.5. *ASTM F1575 – Standard Test Method for Determining Bending Yield Moment of Nails*

3. Performance Evaluation:

- 3.1. LedgerLOK™ Ledger Board Fasteners were evaluated to determine their ability to provide code complying attachment of deck ledger boards to the building structure.
- 3.2. LedgerLOK™ Ledger Board Fasteners were evaluated for lateral resistance and withdrawal resistance, in accordance with CSA O86 Clause 12.11.4 and 12.11.5.
 - 3.2.1. Where a band joist is not used, as in some truss installations, an engineered design is required.
- 3.3. Any code compliance issues not specifically addressed in this section are outside the scope of this evaluation.

4. Product Description and Materials:

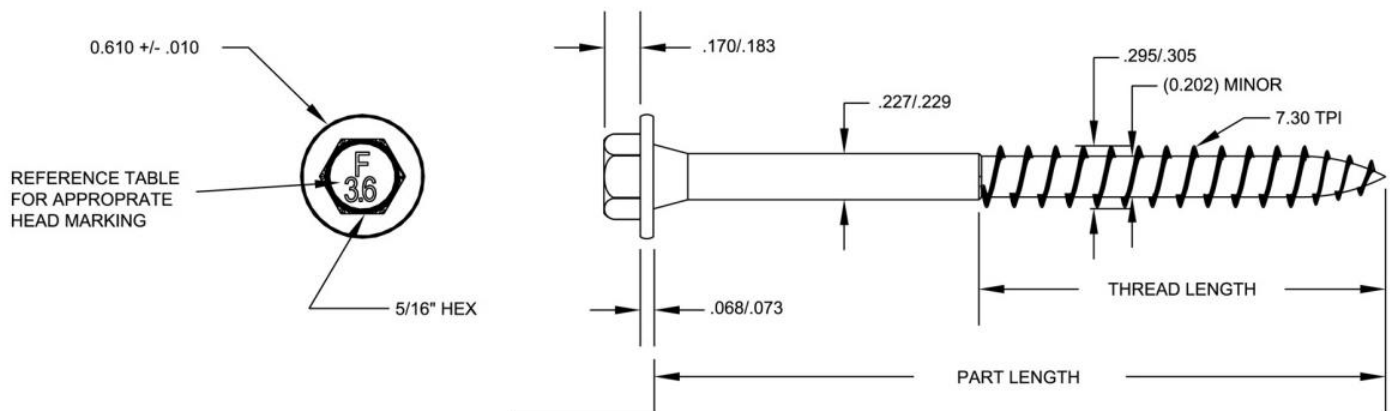


Figure 1: LedgerLOK™ Ledger Board Fasteners (in.)

- 4.1. LedgerLOK™ fasteners are manufactured with carbon steel grade 1022 or 10B21 wire conforming to *ASTM A510* with a minimum ultimate tensile strength of 60 ksi.
- 4.2. LedgerLOK™ fasteners are manufactured using a standard cold-formed process followed by a heat-treating process. Critical dimensions, design values for lumber species and allowable bending yield are found in [Figure 1](#), [Table 1](#) and [Table 2](#).

¹ Unless otherwise noted, all references in this TER are from the 2015 version of the *NBC* and the standards referenced therein, including, but not limited to, *CSA O86-09*.

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- 4.2.1. LedgerLOK™ fastener heads are a $5/16$ " hex drive with a built-in oversized washer.
- 4.2.2. LedgerLOK™ fasteners have a gimlet point.
- 4.2.3. The LedgerLOK™ fasteners listed in [Table 1](#) were evaluated for this TER.

Fastener Name	Fastener Designation	Head Marking	Length ¹ in. (mm)	Thread Length ² in. (mm)	Unthreaded Shank Diameter in. (mm)	Minor Thread (Root) Diameter in. (mm)	Nominal Bending Yield psi ³ (Mpa)
LedgerLOK™	FMLL358	F3.6	3.63 (92)	2.00 (50)	0.227 (5.8)	0.202 (5.1)	200,700 (1383)
LedgerLOK™	FMLL005	F5.0	5.00 (127)	3.00 (76)			

For SI: 1" = 25.4 mm, 1 psi = .00689 Mpa
 1. Measured from the underside of the head to the bottom of the tip.
 2. Includes tapered tip; see [Figure 1](#).
 3. Determined in accordance with methods specified in *ASTM F1575*, based on minor thread diameter using a 5% offset of the load displacement curves developed from the average of bending tests. Nominal bending yield based on the shank diameter using the same method is 186,790 psi (1290 Mpa).

Table 1: Fastener Designation for the LedgerLOK™ Fasteners Evaluated in this TER

- 4.3. Factored lateral strength and withdrawal resistance values for LedgerLOK™ Ledger Board Fasteners are given in [Table 2](#).

Property	Northern Species(G = 0.35)	Spruce-Pine-Fir(G = 0.42)	Hem Fir(G = 0.46)	Douglas Fir(G = 0.49)
Factored Withdrawal Resistance Values ¹ lb./in. (N/mm)	285 (50)	388 (68)	439 (77)	485 (85)
Factored Lateral Strength Resistance Values ² lb. (N)	192 (855)	243 (1080)	272 (1210)	295 (1310)

For SI: 1 lb./in. = 0.1751 N/mm, 1 lb. = 4.4482 N
 1. A phi factor (Φ) of 0.6 has been applied to the Factored Withdrawal Resistance Values. All other applicable factors shall be applied in accordance with *CSA O86* Clause 10.11.5.
 2. A phi factor (Φ) of 0.8 and a wet service factor (K_{sf}) of 0.67 have been applied to the Factored Lateral Strength Resistance Values. All other applicable factors shall be applied in accordance with *CSA O86* Clause 10.11.4.
 3. Withdrawal resistance values are derived from testing using procedures consistent with *CSA-O86*.
 4. Withdrawal capacities only consider extraction of the threaded portion of the fastener from the connected materials. Head pull through resistance should be calculated in accordance with *CSA O86*, clause 10.11.5.3.

Table 2: Design Values for Lumber Species Groups for LedgerLOK™ Fasteners

- 4.4. The fasteners have a proprietary galvanized and epoxy coating, which provides corrosion protection that exceeds that provided by code approved hot-dipped galvanized coatings meeting *ASTM A153*.
 - 4.4.1. Fasteners are approved for use in exterior conditions and in pressure-treated wood, including ground contact ACQ. Treatments other than ACQ that are found to be less corrosive than ACQ are also approved.
- 4.5. 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.
- 4.6. In-plant quality control procedures, under which the LedgerLOK™ fasteners are manufactured, are audited through an inspection process performed by an approved agency.

5. Applications:

- 5.1. LedgerLOK™ Ledger Board Fasteners are designed specifically for attaching the deck ledger to the rim joist of a building in accordance with the *NBC*, 2015 edition, Section 9.4.2.3.
 - 5.1.1. Maximum spacing for LedgerLOK™ Ledger Board Fasteners with deck live load = 40, 60, 80 psf (1.91, 2.87, 3.83 kPa), plus deck dead load = 10 psf (0.48 kPa) is shown in [Table 3](#).
- 5.2. Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience and technical judgment.

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Loading Condition (Live Load, kPa)	2x Nominal Ledger Species	Maximum Deck Joist Spans							
		Meters							
		Up to 2	2.5	3	3.5	4	4.5	5	5.5
		Feet							
		Up to 6.5	8	10	11.5	13	14.5	16.5	18
Maximum On-Center Spacing of LedgerLOK™ Ledger Board Fasteners in. (mm)									
40 psf (1.91 kPa)	Northern Species	10 (250)	8 (200)	6 (175)	6 (150)	5 (125)	4 (100)	4 (100)	4 (100)
	Spruce-Pine-Fir	12 (300)	10 (250)	8 (200)	7 (175)	6 (150)	5 (150)	5 (125)	4 (125)
	Hem Fir	14 (350)	11 (275)	9 (225)	8 (200)	7 (175)	6 (150)	5 (150)	5 (125)
	Douglas Fir	15 (375)	12 (300)	10 (250)	9 (225)	7 (200)	7 (175)	6 (150)	5 (125)
60 psf (2.87 kPa)	Northern Species	7 (175)	6 (150)	5 (125)	4 (100)	3 (75)	3 (75)	3 (75)	3 (75)
	Spruce-Pine-Fir	9 (225)	7 (175)	6 (150)	5 (125)	4 (100)	4 (100)	3 (100)	3 (75)
	Hem Fir	10 (250)	8 (200)	6 (175)	6 (150)	5 (125)	4 (100)	4 (100)	4 (100)
	Douglas Fir	11 (275)	8 (225)	7 (175)	6 (150)	5 (125)	5 (125)	4 (100)	4 (100)
80 psf (3.83 kPa)	Northern Species	7 (175)	6 (150)	5 (125)	4 (100)	3 (75)	3 (75)	3 (75)	3 (75)
	Spruce-Pine-Fir	7 (175)	5 (125)	4 (125)	4 (100)	3 (75)	3 (75)	3 (75)	2 (50)
	Hem Fir	8 (200)	6 (150)	5 (125)	4 (100)	4 (100)	3 (75)	3 (75)	3 (75)
	Douglas Fir	8 (200)	6 (175)	5 (150)	5 (125)	4 (100)	4 (100)	3 (75)	3 (75)

For SI: 1" = 25.4 mm

1. Based on load duration of 1.0. Spacing may be adjusted by the applicable load duration as specified in CSA O86-09.

2. Fasteners are required to have full thread penetration into the OSB and main member. Excess fastener length extending beyond the main member is not reflected in the table above.

3. Solid sawn band joists shall be HF, SPF, DF-L or Northern species, designed by others. For engineered wood band joists having a specific gravity of 0.5 and a minimum thickness of 1 1/8", on-center spacing for Douglas Fir may be used.

4. Spacing is based on non-incised lumber. Where incised lumber is used, reduce spacing requirements by 15%.

5. Table values assume 10 psf (0.48 kPa) dead load.

6. The service condition factor, $K_{SF} = 0.67$ has been applied.

7. Sheathing shall be minimum 11-mm-thick OSB (SG=0.5) or other sheathing with a specific gravity at equal to the specific gravity of the band joist material.

Table 3: LedgerLOK™ Fastener Spacing – Materials & Loading 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. Choose a 3.63" (92 mm) or 5" (127 mm) LedgerLOK™ Ledger Board Fastener, so that the threads fully engage the band joist material and the fastener tip extends beyond the back face of the band joist material when the fastener head is fully seated against the installed ledger.
- 6.3. Using a high-torque, 1/2" variable-speed drill (18V, if cordless), drive the fasteners through the ledger and sheathing. Continue into the rim joist until the built-in washer head is drawn firm and flush to the ledger board. Do not overdrive.
- 6.4. [Figure 2](#) shows a detail of the LedgerLOK™ Ledger Board Fastener deck connection, including minimum edge and end distances.

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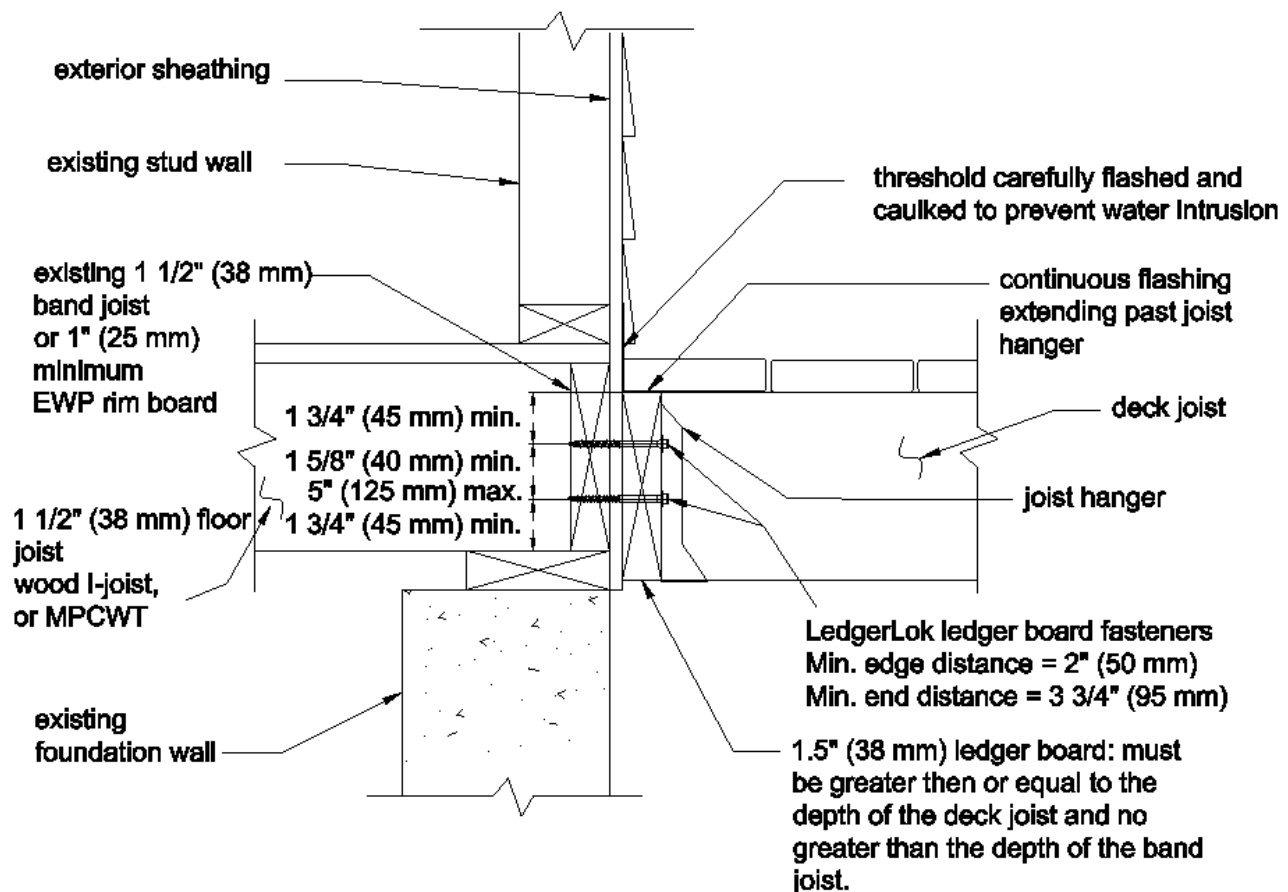


Figure 2: LedgerLOK™ Ledger Board Fastener Deck Connection

6.5. For applications outside the scope of this TER, an engineered design is required.

7. Test and Engineering Substantiating Data:

- 7.1. Testing analysis for derivation of design properties for FastenMaster LOK® Screws, Wood Science and Technology Centre at the University of New Brunswick, 2009.
- 7.2. Testing conducted by Washington State University for OMG; Final report date: August 4, 2005.
- 7.3. Testing conducted by the University of Montana Wood Science Laboratory for OMG, 2004.
- 7.4. *CSA/CAN O86-09 – Engineering Design in Wood*; Canadian Standards Association; Toronto, ON.
- 7.5. The product(s) evaluated by this TER fall within the scope of one or more of the model, state or local building codes for building construction. The testing and/or substantiating data used in this TER is limited to buildings, structures, building elements, construction materials and civil engineering related specifically to buildings.
- 7.6. The provisions of model, state or local building codes for building construction do not intend to prevent the installation of any material or to prohibit any design or method of construction. Alternatives shall use consensus standards, performance-based design methods or other engineering mechanics based means of compliance. This TER assesses compliance with defined standards, accepted engineering analysis, performance-based design methods, etc. in the context of the pertinent building code requirements.
- 7.7. Some information contained herein is the result of testing and/or data analysis by other sources, which DrJ relies on to be accurate, as it undertakes its engineering analysis.
- 7.8. DrJ has reviewed and found the data provided by other professional sources are credible. The information in this TER conforms with DrJ's procedure for acceptance of data from approved sources.
- 7.9. DrJ's responsibility for data provided by approved sources conforms with relevant professional engineering law.

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7.10. Where appropriate, DrJ relies on the derivation of design values, which have been codified into law through codes and standards (e.g., *IRC, WFCM, IBC, SDPWS, NDS, ACI, AISI, PS-20, PS-2*, etc.). 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, concrete, etc), DrJ relies upon grade/properties provided by the raw material supplier to be accurate and conforming to the mechanical properties defined in the relevant material standard.

8. Findings:

- 8.1.** When used in accordance with this TER and the manufacturer's installation instructions, FastenMaster LedgerLOK™ Ledger Board Fasteners meet the requirements of *NBC* Section 9.4.2.3 for deck ledger attachments.
- 8.2.** Testing and analysis of the LedgerLOK™ Ledger Board Fasteners are in accordance with the requirements of *CSA O86-14*.
- 8.3.** *NBC* Section 1.2.1.1 states:
- 1.2.1 Compliance with this Code**
- 1) Compliance with this Code shall be achieved by
- a) complying with the applicable acceptable solutions in Division B (see Note A-1.2.1.1.(1)(a)), or
- b) using alternative solutions that will achieve at least the minimum level of performance required by Division B in the areas defined by the objectives and functional statements attributed to the applicable acceptable solutions (see Note A-1.2.1.1.(1)(b)).
- 2) For the purposes of compliance with this Code as required in Clause 1.2.1.1.(1)(b), the objectives and functional statements attributed to the acceptable solutions in Division B shall be the objectives and functional statements referred to in Subsection 1.1.2. of Division B.
- 8.4.** *NBC* Section 2.3 includes additional guidance for Alternative Solutions.
- 8.5.** This product has been evaluated with the codes listed in [Section 2](#), and is compliant with all known provincial building codes. Where there are known variations in provincial codes that are applicable to this evaluation, they are listed here:
- 8.5.1.** No known variations
- 8.6.** This TER uses professional engineering law, the building code, ANSI/ASTM consensus standards and generally accepted engineering practice as its criteria for all testing and engineering analysis. DrJ's professional engineering work falls under the jurisdiction of the relevant association of professional engineers, when signed and sealed.

9. Conditions of Use:

- 9.1.** Where required by the authority having jurisdiction (AHJ) in which the project is to be constructed, this report and the installation instructions shall be submitted at the time of permit application.
- 9.2.** Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the code official for review and approval.

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- 9.3. Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed.
- 9.4. LedgerLOK™ fasteners covered by this TER shall be installed in accordance with this report and the manufacturer's installation instructions.
- 9.5. LedgerLOK™ fastener spacing shall not exceed [Table 3](#) for code compliance and the installation conditions considered.
- 9.6. For conditions not covered in this TER, connections shall be designed in accordance with generally accepted engineering practice.
- 9.7. The manufacturer's installation instructions shall be followed as provided in [Section 6](#) and at fastenmaster.com/details/product/LedgerLOK™-ledger-board-fastener.html.
- 9.8. LedgerLOK™ fasteners are produced by OMG, Inc.'s facility located in Agawam, Massachusetts.
- 9.9. **LedgerLOK™ fasteners are produced under a quality control program subject to periodic inspections.**
- 9.10. Design
 - 9.10.1. Building Designer Responsibility
 - 9.10.1.1. Unless the AHJ allows otherwise, the Construction Documents shall be prepared by a Building Designer (e.g., Registered Design Professional) for the Building and shall be in accordance with *NBC* Section 2.2.1.2.
 - 9.10.1.2. The Construction Documents shall be accurate and reliable and shall provide the location, direction and magnitude of all applied loads and shall be in accordance with *NBC* Section 2.2.4.3.
 - 9.10.2. Construction Documents
 - 9.10.2.1. Construction Documents shall be submitted to the Building Official for approval and shall contain the plans, specifications and details needed for the Building Official to approve such documents.
- 9.11. Responsibilities
 - 9.11.1. The information contained herein is a product, material, detail, design and/or application TER evaluated in accordance with the referenced building codes, testing and/or analysis through the use of accepted engineering practice, experience and technical judgment.
 - 9.11.2. DrJ TERs provide an assessment of only those attributes specifically addressed in the Products Evaluated or Code Compliance Process Evaluated sections.
 - 9.11.3. The engineering evaluation was performed on the dates provided in this TER, within DrJ's professional scope of work.
 - 9.11.4. This product is manufactured under a third-party quality control program.
 - 9.11.5. 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, and the TER shall be reviewed for code compliance by the Building Official.
 - 9.11.6. 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 "LedgerLOK™" on the packaging. The head of each fastener is marked with an "F" followed by a number corresponding to the length of the fastener.
- 10.2. The packaging shall include OMG's name and address, fastener size, third-party inspection agency, and TER number.
- 10.3. Additional technical information can be found at fastenmaster.com.

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11. Review Schedule:

- 11.1. This TER is subject to periodic review and revision. For the most recent version of this TER, visit drjengineering.org.
- 11.2. For information on the current status of this TER, contact [DrJ Engineering](#).



- [Mission and Professional Responsibilities](#)
- [Product Evaluation Policies](#)
- [Product Approval – Building Code, Administrative Law and P.E. Law](#)