



CERTIFICATION



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Technical Evaluation Report

TER 1412-01

FastenMaster® LedgerLOK™ Ledger
Board Fasteners – Limit States

**OMG, Inc.
DBA FastenMaster®**

Product:

**LedgerLOK™ Ledger Board
Fasteners**

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COMPANY
INFORMATION:

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SECTION: 06 05 23 - Wood, Plastic, and Composite Fastenings
SECTION: 06 11 00 - Wood Framing
SECTION: 06 15 00 - Wood Decking

1 PRODUCT EVALUATED¹

1.1 LedgerLOK™ Ledger Board Fasteners

2 APPLICABLE CODES AND STANDARDS^{2,3}

2.1 *Codes*

2.1.1 *NBC—10, 15: National Building Code of Canada*

2.2 *Standards and Referenced Documents*

2.2.1 *ASTM A153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*

2.2.2 *ASTM A510: Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel*

2.2.3 *ASTM F1575: Standard Test Method for Determining Bending Yield Moment of Nails*

2.2.4 *CSA O86: Engineering Design in Wood*

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 2015 version of the *NBC*. This *alternative solution* is also approved for use with the 2010 *NBC* and the standards referenced therein.

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

3 PERFORMANCE EVALUATION

- 3.1 LedgerLOK™ Ledger Board Fasteners were evaluated to determine their ability to provide code-compliant 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 (rim board) 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 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.
- 3.5 Douglas Consultants Inc. has collaborated with DrJ through the review of this technical evaluation.

4 PRODUCT DESCRIPTION AND MATERIALS

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

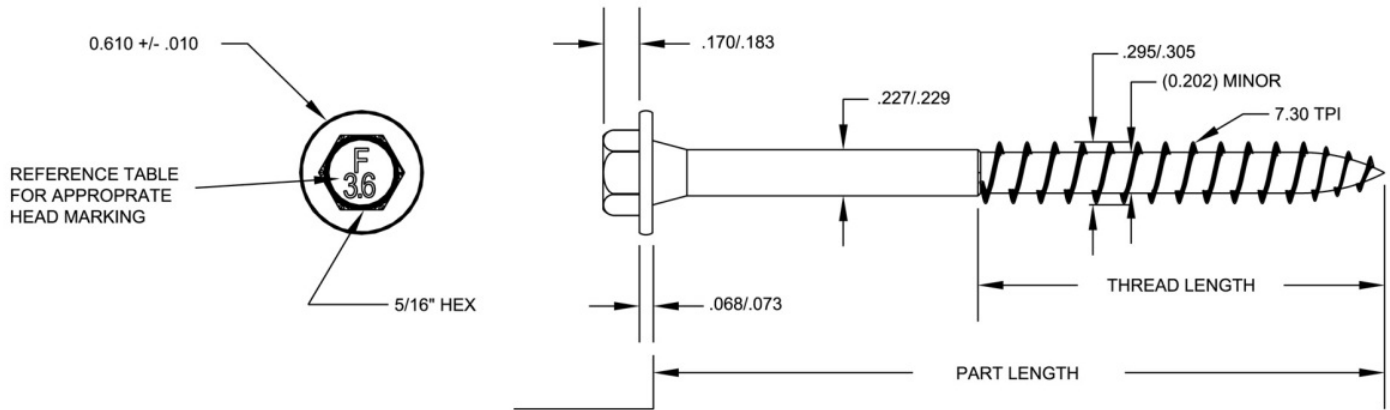


FIGURE 1. LEDGERLOK™ LEDGER BOARD FASTENERS (IN)

- 4.2 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.
- 4.3 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.
 - 4.3.1 LedgerLOK™ fastener heads are a $\frac{5}{16}$ " hex drive with a built-in oversized washer.
 - 4.3.2 LedgerLOK™ fasteners have a gimlet point.
 - 4.3.3 The LedgerLOK™ fasteners listed in Table 1 were evaluated for this TER.

TABLE 1. FASTENER DESIGNATION FOR THE LEDGERLOK™ FASTENERS EVALUATED IN 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)
	FMLL005	F5.0	5.00 (127)	3.00 (76)			

SI: 25.4 mm = 1 in, 1 MPa = 145 psi

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).

4.4 Factored lateral strength and withdrawal resistance values for LedgerLOK™ Ledger Board Fasteners are given in Table 2.

TABLE 2. DESIGN VALUES FOR LUMBER SPECIES GROUPS FOR LEDGERLOK™ FASTENERS

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 ^{1,3,4} 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)

SI: 1 N = 0.225 lb, 1 kN/m = 737.6 lb/ft

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 12.11.5.
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 12.11.4.
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 12.11.5.3.

4.5 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*.

4.5.1 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.

4.6 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.

4.7 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 board of a building in accordance with *NBC* 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.

TABLE 3. LEDGERLOK™ FASTENER SPACING – MATERIALS & LOADING CONDITIONS

Loading Condition ⁵ (Live Load, kPa)	2x Nominal Ledger Species	Maximum On-center Spacing of LedgerLOK™ Ledger Board Fasteners ^{1,2,3,4,6,7} , in (mm)							
		Maximum Deck Joist Spans, ft (m)							
		Up to 6.5 (Up to 2)	8.0 (2.5)	10.0 (3)	11.5 (3.5)	13.0 (4)	14.5 (4.5)	16.5 (5)	18.0 (5.5)
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)

SI: 25.4 mm = 1 in

- Based on load duration of 1.0. Spacing may be adjusted by the applicable load duration as specified in CSA O86.
- 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.
- Solid sawn band joists shall be HF, SPF, DF-L, or Northern species, designed by others. For engineered wood rim boards having a specific gravity of 0.5 and a minimum thickness of 1 1/8", on-center spacing for Douglas Fir may be used.
- Spacing is based on non-incised lumber. Where incised lumber is used, reduce spacing requirements by 15%.
- Table values assume 10 psf (0.48 kPa) dead load.
- The service condition factor, $K_{SF} = 0.67$, has been applied.
- Sheathing shall be minimum 11 mm-thick OSB ($G = 0.5$) or other sheathing with a specific gravity at least equal to the specific gravity of the rim board material.

6 INSTALLATION

- 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.
- Choose a 3.63" (92 mm) or 5" (127 mm) LedgerLOK™ Ledger Board Fastener, so that the threads fully engage the rim board material and the fastener tip extends beyond the back face of the rim board when the fastener head is fully seated against the installed ledger.
- Using a high-torque, 1/2" variable-speed drill (18V, if cordless), drive the fasteners through the ledger and sheathing. Continue into the rim board 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.

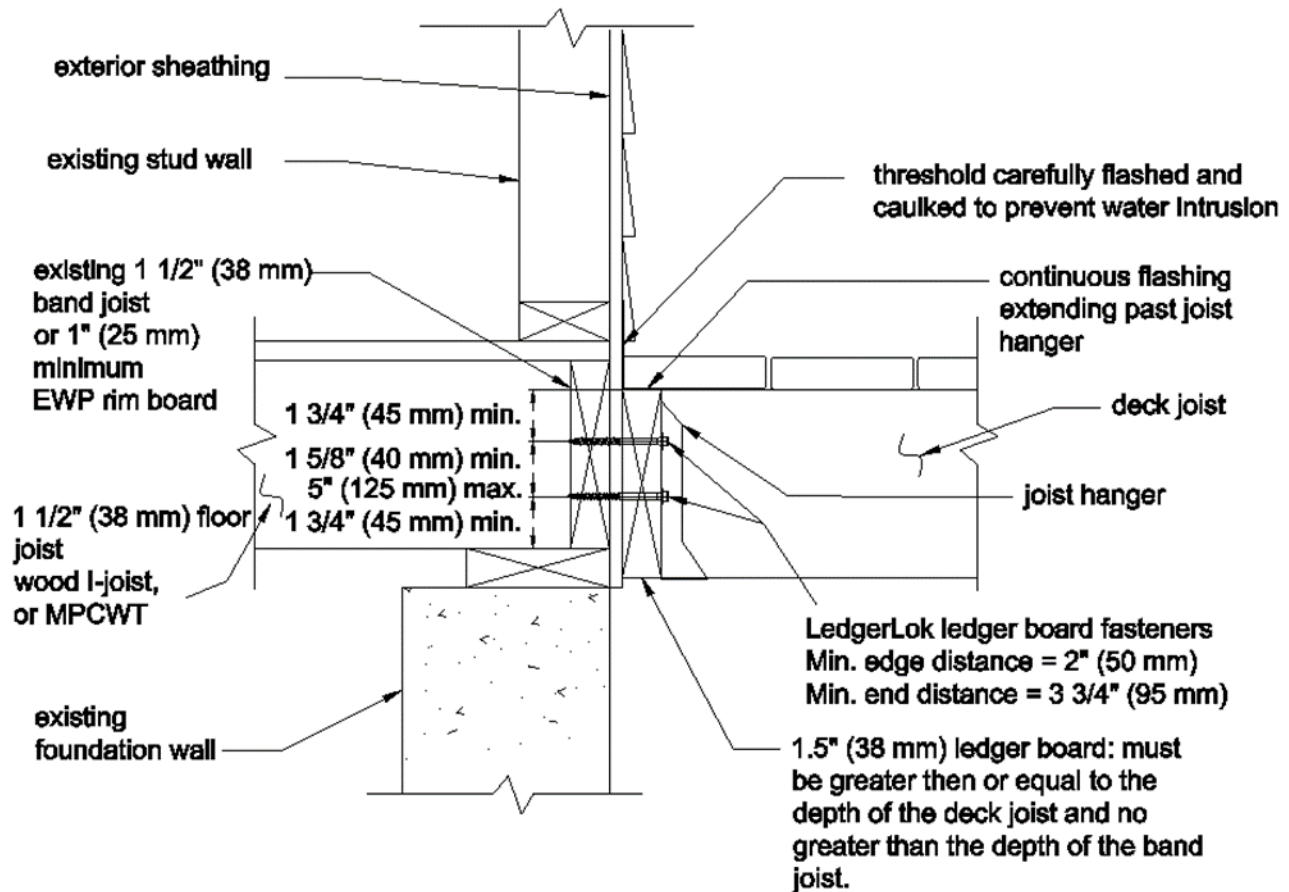


FIGURE 2. LEDGERLOK™ LEDGER BOARD FASTENER DECK CONNECTION

6.5 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 Testing analysis for derivation of design properties for FastenMaster® LOK® Screws, Wood Science and Technology Centre at the University of New Brunswick, 2009.
 - 7.1.2 Testing conducted by Washington State University for OMG; Final report date: August 4, 2005
 - 7.1.3 Testing conducted by the University of Montana Wood Science Laboratory for OMG, 2004
- 7.2 *CSA O86: Engineering Design in Wood*; Canadian Standards Association; Toronto, ON
- 7.3 Information contained herein is the result of testing and/or data analysis by sources which conform to the evaluation requirements of *NBC Volume 1 Relationship of the NBC to Standards Development and Conformity Assessment* and/or professional engineering regulations. DrJ relies upon accurate data to perform its ISO/IEC 17065 evaluations.

- 7.4 Where appropriate, DrJ's analysis is based on provisions that have been codified into law through provincial, territorial, 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 in accordance with this TER and the manufacturer's installation instructions, FastenMaster® LedgerLOK™ Ledger Board Fasteners meet the requirements of *NBC* Article 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*.
- 8.3 This product has been evaluated in the context of the codes listed in Section 2 and is compliant with all known provincial, territorial, and local building codes. Where there are known variations in provincial, territorial, or local codes applicable to this TER, they are listed here.
- 8.3.1 No known variations
- 8.4 *NBC* Volume 1 Relationship of the *NBC* to Standards Development and Conformity Assessment:

Certification

Certification is the confirmation by an independent organization that a product or service meets a requirement...Certification bodies publish lists of certified products and companies.

Evaluation

An evaluation is a written opinion by an independent professional organization that a product will perform its intended function in a building. An evaluation is very often done to determine the ability of an innovative product, for which no standards exist, to satisfy the intent of the Code requirement...Several organizations, including the Canadian Construction Materials Centre (CCMC), offer such evaluation services.

- 8.5 Valid *evaluations* are obtained from *independent professional organizations*, which include but are not limited to ISO/IEC 17065 accredited evaluation services and professional engineers.⁴
- 8.6 ISO/IEC 17065 accreditation bodies, including but not limited to SCC and ANAB, confirm that product certification bodies have the expertise to provide *evaluation* services within their scope of accreditation. All SCC and ANAB product certification bodies meet *NBC* requirements to offer *evaluation* services for *alternative solutions*.⁵
- 8.6.1 DrJ is an ISO/IEC 17065 ANAB-Accredited Product Certification Body – Accreditation #1131 and employs professional engineers.⁶

⁴ *NBC* Division C Article 2.2.1.2

⁵ *NBC* Division A Clause A-1.2.1.1.(1)(b) provides information on code compliance via alternative solutions and defines alternative solutions as "...achiev[ing] at least the minimum level of performance required by Division B." *NBC* Division C Section 2.3 includes additional guidance for documentation of alternative solutions.

⁶ Through ANAB accreditation and the IAF MLA, DrJ certification can be used to obtain material, product, design, or method of construction approval in any jurisdiction or country that has IAF MLA Members & Signatories to meet the Purpose of the MLA – "certified once, accepted everywhere."

- 8.7 Product certification organizations, accredited by the SCC and ANAB, are defined as equivalent *evaluation* services:
- 8.7.1 The [Canada-United States-Mexico Agreement \(CUSMA\) Article 11.6 Conformity Assessment](#) confirms mutual recognition by stating, "...each Party shall accord to conformity assessment bodies located in the territory of another Party treatment no less favorable than that it accords to conformity assessment bodies located in its own territory or in the territory of the other Party."
 - 8.7.2 The SCC [National Conformity Assessment Principles](#) states, "SCC is a member of a number of international organizations developing voluntary conformity assessment agreements that help ensure the international acceptance of Canadian conformity assessment results. Signatories to these agreements (like SCC) recognize each other's accreditations as being equivalent to their own."⁷
- 8.8 Building official approval of a licensed professional engineer is performed by verifying the professional engineer and/or their business entity are listed by the [licensing board](#) of the relevant jurisdiction.

9 CONDITIONS OF USE

- 9.1 LedgerLOK™ fasteners covered by this TER shall be installed in accordance with Section 6 of this TER and the manufacturer's installation instructions.
- 9.2 LedgerLOK™ fastener spacing shall not exceed Table 3 for code compliance and the installation conditions considered.
- 9.3 For conditions not covered in this TER, connections shall be designed in accordance with generally accepted engineering practice.
- 9.4 Where required by 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.
- 9.5 Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the AHJ for review and approval.
- 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 *designer* (e.g., *owner*).
- 9.7 At a minimum, this product shall be installed per Section 6 of this TER.
- 9.8 This product has an internal quality control program and a third-party quality assurance program in accordance with ISO/IEC 17065 certification procedures.
- 9.9 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.
- 9.10 This TER shall be reviewed for code compliance by the AHJ in concert with the duties and powers granted to the building official by the provincial regulations governing such duties and powers.
- 9.11 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, and any other code or regulatory requirements that may apply.

⁷ The National Conformity Assessment Principles states, "Product regulations and standards may vary from country to country. If these are set arbitrarily, they could be deemed as protectionist. The [World Trade Organization \(WTO\) Agreement on Technical Barriers to Trade \(TBT Agreement\)](#) is intended to ensure that technical regulations, standards and conformity assessment procedures of member countries do not create unnecessary obstacles to trade. Under the TBT Agreement, members of the WTO agree to use international standards, including conformity assessment standards and guides, as a basis for their technical requirements."



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.
 - 10.1.1 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.
 - 10.1.2 The packaging shall include OMG's name and address, fastener size, third-party inspection agency, and TER number.
- 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, visit drjcertification.org.
- 11.2 For information on the current status of this TER, contact DrJ Certification.