



**CERTIFICATION**



Approved. Sealed. Code Compliant.

## Technical Evaluation Report

**TER 1201-01**

FastenMaster® HeadLOK® Screws to  
Provide Stud to Top & Bottom Plate  
Uplift Attachment

**OMG, Inc.  
DBA FastenMaster®**

### Product:

**FastenMaster® HeadLOK®  
Heavy Duty Wood Screw**

Issue Date:

March 15, 2012

Revision Date:

March 31, 2020

Subject to Renewal:

April 1, 2021





COMPANY  
INFORMATION:

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DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES  
SECTION: 06 05 23 - Wood, Plastic, and Composite Fastenings

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## 1 PRODUCT EVALUATED<sup>1</sup>

1.1 FastenMaster® HeadLOK® Heavy Duty Wood Screw

## 2 APPLICABLE CODES AND STANDARDS<sup>2,3</sup>

### 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 *AWC TR 12: General Dowel Equations for Calculating Lateral Connection Values*

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<sup>1</sup> 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](http://drjcertification.org) or call us at 608-310-6748.

<sup>2</sup> 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.

<sup>3</sup> All terms defined in the applicable building codes are italicized.

### 3 PERFORMANCE EVALUATION

- 3.1 HeadLOK® fasteners were evaluated as an alternative means of attaching wood studs to the top and bottom plates to provide uplift resistance, thereby establishing a wall top plate to bottom plate continuous load path for code compliance.<sup>4,5</sup>
  - 3.1.1 The withdrawal and head pull through strength of the HeadLOK® fasteners were evaluated as an alternative to toenail connections, uplift clips/straps or the combined shear/uplift capacity of oriented strand board (uplift) loaded applications.
- 3.2 Any engineering evaluation conducted for this TER was performed on the dates provided in this TER and within Dr.J's professional scope of work.

### 4 PRODUCT DESCRIPTION AND MATERIALS

- 4.1 HeadLOK® fasteners (Figure 1) are manufactured of 1022 carbon steel or 10B21 wire conforming to ASTM A510.



FIGURE 1. HEADLOK® FASTENER

- 4.2 HeadLOK® fasteners are manufactured using a standard cold-formed process followed by a heat-treating process.
- 4.3 HeadLOK® fasteners are manufactured under in-plant quality control procedures. These procedures are audited through an inspection process performed by an approved agency.
- 4.4 Fasteners are approved for use in interior and exterior conditions and in chemically treated or untreated lumber.
  - 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 2304.10.5*<sup>6</sup> and *IRC Section 317.3*), allowing for its use in alkaline copper quaternary (ACQ) pressure treated 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 report are designated in Table 1.

TABLE 1. FASTENER DESIGNATIONS<sup>1</sup>

| Product Name    | Fastener Designation | Overall Length (in) | Thread Length (in) |
|-----------------|----------------------|---------------------|--------------------|
| HeadLOK® 4 1/2" | FMHLGM412            | 4 1/2               | 2                  |
| HeadLOK® 6"     | FMHLGM006            | 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.

<sup>4</sup> The *IRC Section R301.1* states, **Application**....The construction of buildings and structures in accordance with the provisions of this code shall result in a system that provides a complete load path that meets all requirements for the transfer of all loads from their point of origin through the load-resisting elements to the foundation. Section.R301.2.1 further states, Wind design criteria.... A continuous load path shall be provided to transmit the applicable uplift forces in Section R802.11.1 from the roof assembly to the foundation. See *IBC Section 1604.4*.

<sup>5</sup> For joist/rafter and truss to top plate connection, see *TER No. 1105-02*.

<sup>6</sup> *2012 IBC Section 2304.9.5*



## 5 APPLICATIONS

- 5.1 HeadLOK® fasteners are used to attach minimum 3½" wide wood studs to wood top and bottom plates of shear wall assemblies that meet the requirements of IBC Section 2308 or IRC Section R602. These fasteners provide resistance to uplift loads due to wind negative pressure applied from the framing above lifting up on the top plate of the wall.
- 5.1.1 See Table 2 for the HeadLOK® allowable design values.
- 5.1.2 See Section 6 for installation requirements.
- 5.2 *Design Concepts and Allowable Design Loads*
- 5.2.1 Allowable design loads for uplift are provided in Table 2. This table lists allowable design loads based on penetration into the stud, number of fasteners used and framing member spacing applicable to fasteners installed in accordance with the procedures described in Section 6.
- 5.2.2 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.

TABLE 2. ALLOWABLE DESIGN LOAD IN UPLIFT

| Fastener Designation                    | Minimum Thread Length into End of Stud (in) | Species Group (Specific Gravity) | Number of Fasteners | Allowable Design Uplift for Designated Stud Spacing (plf) |          |          |          |          |
|---|---|----------------------------------|---------------------|---|----------|----------|----------|----------|
|   |   |                                  |                     | 12" o.c.  | 16" o.c. | 24" o.c. | 32" o.c. | 48" o.c. |
| HeadLOK® 4½" with double plate          | 1.5   | All                              | 1                   | 640   | 480      | 320      | 240      | 160      |
|   |   |                                  | 2                   | 1280  | 960      | 640      | 480      | 320      |
| HeadLOK® 4½" with single plate          | 2   | All                              | 1                   | 855   | 640      | 425      | 320      | 215      |
| HeadLOK® 6" with single or double plate |   |                                  | 2                   | 1710  | 1280     | 850      | 640      | 430      |

SI: 1 in = 25.4 mm, 1 psf = 0.048 kPa

- Wood studs and top plate members shall be a minimum of 2" nominal thickness and have a minimum specific gravity of not less than 0.42.
- Structural composite lumber (SCL) may be used, provided the specific gravity is equal to or greater than 0.42. Refer to product information from the SCL manufacturer.
- Tabulated loads based on SBCRI testing. Uplift load values have been adjusted from the test data conservatively.
- Table design capacities assume a load duration of 1.6. Allowable uplift for other load durations shall be adjusted accordingly (e.g., for a load duration of 1.33, and a fastener spacing of 16", the allowable uplift would be 480 plf from the table divided by 1.6, and the result multiplied by 1.33 = 400 plf).
- The minimum penetration shown is required to achieve the stated uplift capacities.

## 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 Select the proper number and length of HeadLOK® screws based on the uplift loads and allowable HeadLOK® resistant loads from Table 2.
- 6.3 *Installation Procedure*
- 6.3.1 Use a ½" low RPM/high torque drill to drive the fastener to about 75 ft.-lbs.
- 6.3.2 Draw HeadLOK® up tight to the face of the plate, as shown in Figure 2 and Figure 3.



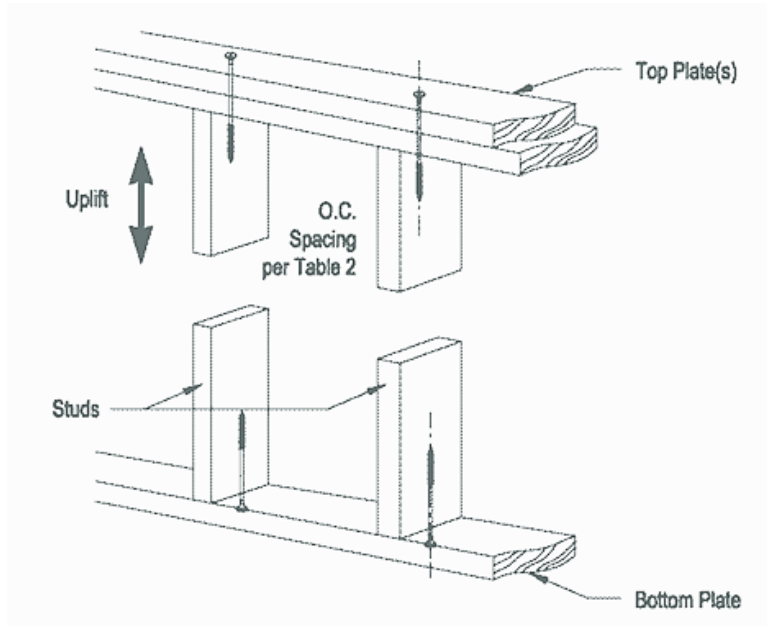


FIGURE 2. INSTALLATION OF ONE (1) HEADLOK® INTO DOUBLE TOP PLATE & SINGLE BOTTOM PLATE (NOTE: SIMILAR INSTALLATION WOULD BE USED FOR A SINGLE TOP PLATE AND/OR A DOUBLE BOTTOM PLATE.)

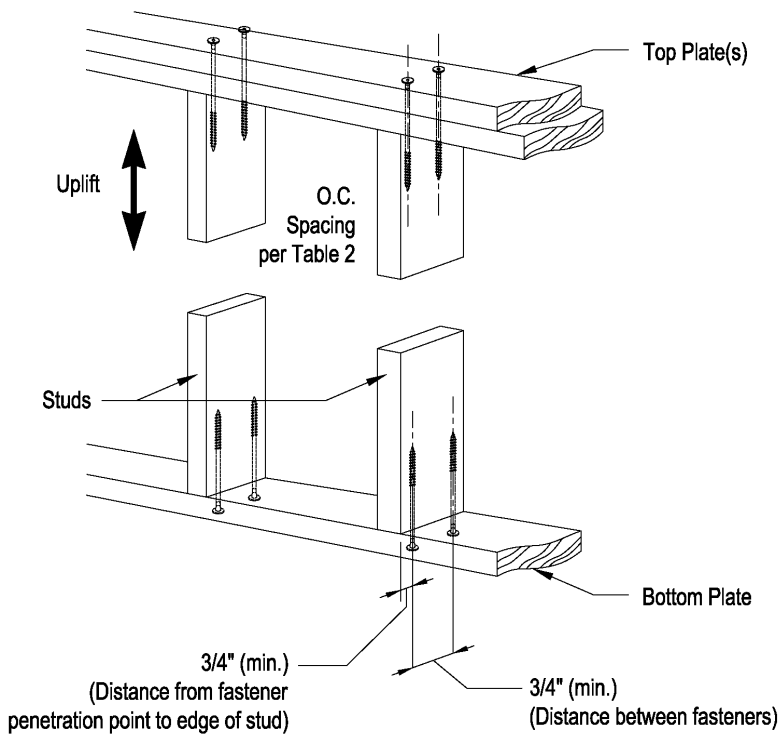


FIGURE 3. INSTALLATION OF TWO (2) HEADLOK® INTO DOUBLE TOP PLATE & SINGLE BOTTOM PLATE (NOTE: SIMILAR INSTALLATION WOULD BE USED FOR A SINGLE TOP PLATE AND/OR A DOUBLE BOTTOM PLATE.)

6.3.2.1 Do not over tighten (free spin) the screw.

6.3.2.2 If the fastener spins freely upon tightening, install one (1) additional HeadLOK® fastener a minimum of 3/4" from the ineffective fastener.



## 6.4 Installation Issues and Solutions

- 6.4.1 If a fastener protrudes outside of the stud prior to engagement into the stud such that threads are visible, install one (1) additional HeadLOK® fastener a minimum of ¾" from the misaligned fastener (see Figure 2).
  - 6.4.1.1 If no fastener threads are visible but the unthreaded shank is visible, the fastener can remain in place and the values in Table 2 may still be used.
- 6.4.2 If a fastener splits the stud, install one (1) additional HeadLOK® fastener a minimum of ¾" from the original fastener, or remove the original fastener and reinstall it a minimum of ¾" from the original location.
- 6.4.3 For the repair scenarios described above, a maximum of three (3) fasteners per stud is allowed.

## 7 TEST ENGINEERING SUBSTANTIATING DATA

- 7.1 Fastener testing for use as a truss hold-down supplemented with top plate to stud withdrawal resistance testing conducted by the SBC Research Institute (SBCRI) under contract with Qualtim, Inc.
- 7.2 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.
- 7.3 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 and installed in accordance with this TER and the manufacturer's installation instructions, the product(s) listed in Section 1.1 are approved for the following:
  - 8.1.1 To provide resistance to uplift loads due to wind negative pressure applied from the framing above lifting up on the top plate of the wall, per Table 2.
  - 8.1.2 To provide resistance to uplift loads due to wind negative pressure applied from the framing above at the stud to bottom plate interface, per Table 2.
- 8.2 For joist/rafter and truss to top plate connection, see TER No. 1105-02: Use of FastenMaster® TimberLOK® Fasteners to Provide Uplift & Lateral Resistance to Trusses & Rafters Attached to the Tops of Walls.
- 8.3 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*.
- 8.4 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.
  - 8.4.1 No known variations



## 9 CONDITIONS OF USE

- 9.1 The HeadLOK® 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 generally accepted engineering practice.
- 9.3 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.
- 9.4 Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the AHJ for review and approval.
- 9.5 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).
- 9.6 At a minimum, this product shall be installed per Section 6 of this TER.
- 9.7 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.
- 9.8 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.
- 9.9 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 FastenMaster® HeadLOK® screws described in this TER are identified by a label on the board or packaging material bearing the manufacturer's name, product name, label of the third-party inspection agency, TER number and other information to confirm code compliance.
- 10.2 Additional technical information can be found at [fastenmaster.com](http://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](http://drjcertification.org).
- 11.2 For information on the current status of this TER, contact [DrJ Certification](http://DrJ Certification).