

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

TER No. 1201-01

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

1. Product(s) Evaluated:

- 1.1. FastenMaster® HeadLOK® Heavy Duty Wood Screw
- 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, such as those found in [IBC Section 1703](#). 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. 2012, 2015 and 2018 International Building Code (IBC)
- 2.2. 2012, 2015 and 2018 International Residential Code (IRC)
- 2.3. ANSI/AWC – National Design Specification® for Wood Construction
- 2.4. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- 2.5. ASTM A510 – Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel
- 2.6. AWC/TR 12 – General Dowel Equations for Calculating Lateral Connection Values

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.^{2,3}
 - 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 code compliance issues not specifically addressed in this section are outside the scope of this TER.

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.

¹Unless otherwise noted, all references in this code compliant technical evaluation report (TER) are from the 2018 version of the codes and the standards referenced therein, including, but not limited to, ASCE 7, SDPWS and WFCM. This product also complies with the 2000-2015 versions of the IBC and IRC and the standards referenced therein. As required by law, where this TER is not approved, the building official shall respond in writing, stating the reasons this TER was not approved. For variations in state and local codes, if any see [Section 8](#).

²The [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](#).

³For joist/rafter and truss to top plate connection, see [TER No. 1105-02](#).

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- 4.3. In-plant quality control procedures, under which the HeadLOK® fasteners are manufactured, are audited through an inspection process performed by an approved agency.⁴
- 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](#)⁵ 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			
Product Name	Fastener Designation	Overall Length	Thread Length
HeadLOK® 4½"	FMHLGM412	4½"	2"
HeadLOK® 6"	FMHLGM006	6"	2"

1. Fastener designations are found on the product packaging. Individual fasteners may be marked according to [Table 1](#).

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 [IRC Section R602](#) or [IBC Section 2308](#). 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.

⁴[IBC Section 2 Approved Agency](#). An established and recognized agency that is regularly engaged in conducting tests, furnishing inspection services or furnishing product certification where such agency has been approved by the building official.

⁵[2012 IBC Section 2304.9.5](#)

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Table 2: Allowable Loads								
Fastener Designation	Minimum Thread Length into End of Stud (in.)	Species Group (Specific Gravity)	Number of Fasteners	Allowable Design Capacity in Uplift for HeadLOK® Screw(s) at the 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

1. 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.
 2. 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.
 3. Tabulated loads based on SBCRI testing. Uplift load values have been adjusted from the test data conservatively.
 4. 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).
 5. 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 2a](#) and [Figure 2b](#).

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Figure 2a: 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.

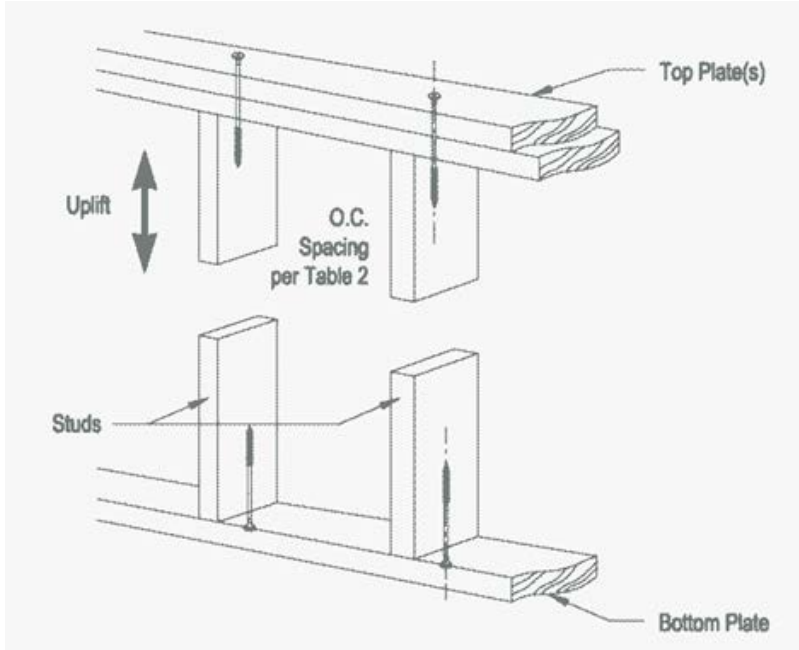
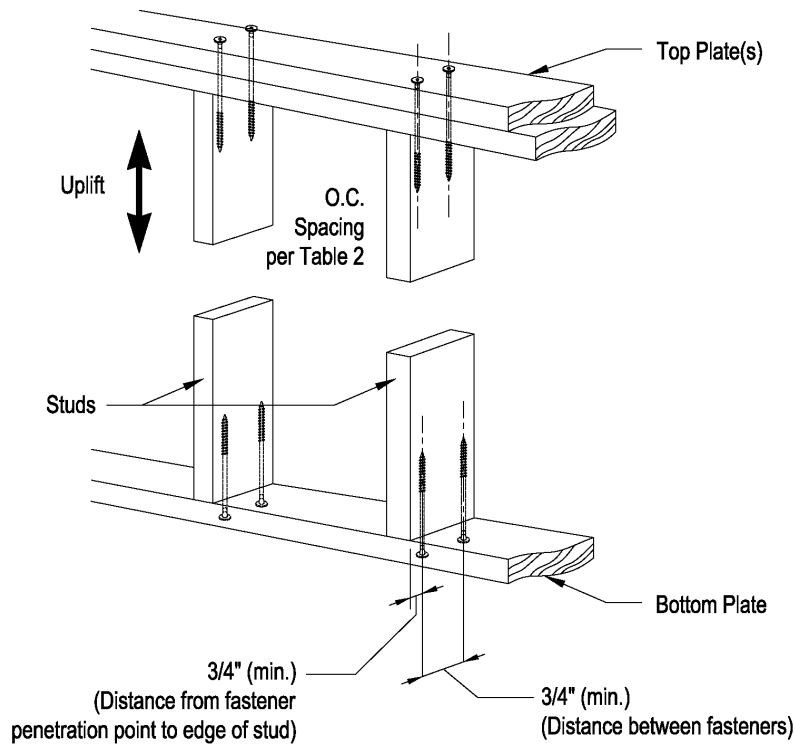


Figure 2b: Installation of Two (2) HeadLOK® into Double Top Plate & Single Bottom Plate
Note: Similar installation would be used for a single top plate and/or a double bottom plate.



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- 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 3/4" from the misaligned fastener (see [Figure 2a](#)).
 - 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 3/4" from the original fastener, or remove the original fastener and reinstall it a minimum of 3/4" 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 and 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. 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.
- 7.3. 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.
- 7.4. 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.
- 7.5. DrJ has reviewed and found the data provided by other professional sources are credible. The information in this TER conforms to DrJ's procedure for acceptance of data from approved sources.
- 7.6. DrJ's responsibility for data provided by approved sources conforms to [IBC Section 1703](#) and any relevant professional engineering law.
- 7.7. Where appropriate, DrJ's analysis is based on design values that 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 and installed in accordance with this TER and the manufacturer's installation instructions, HeadLOK® fasteners can be used as an acceptable alternative 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](#).
- 8.2. When used and installed in accordance with this TER and the manufacturer's installation instructions, HeadLOK® fasteners can be used as an acceptable alternative 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](#).
- 8.3. 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](#).

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- 8.4. [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*.

- 8.5. 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 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 each state Board 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 TER 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.
- 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 and/or by the Building Designer (e.g., Owner, Registered Design Professional, etc.).
- 9.4. The HeadLOK® fasteners covered in this TER shall be installed in accordance with this report and the manufacturer's installation instructions.
- 9.5. For conditions not covered in this TER, connections shall be designed in accordance with generally accepted engineering practice.
- 9.6. The manufacturer's installation instructions shall be followed as provided in [Section 6](#) and at fastenmaster.com.
- 9.7. FastenMaster® products are produced by OMG, Inc. at its facility located in Agawam, Massachusetts.
- 9.8. HeadLOK® fasteners are produced under a quality control program subject to periodic inspections in accordance with [IBC Section 1703.5.2](#).
- 9.9. Design
- 9.9.1. Building Designer Responsibility
- 9.9.1.1. Unless the AHJ allows otherwise, the Construction Documents shall be prepared by a Building Designer for the Building and shall be in accordance with [IRC Section R106](#) and [IBC Section 107](#).
- 9.9.1.2. 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 [IRC Section R301](#) and [IBC Section 1603](#).
- 9.9.2. Construction Documents
- 9.9.2.1. 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.
- 9.10. Responsibilities
- 9.10.1. 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.

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- 9.10.2.** DrJ TERs provide an assessment of only those attributes specifically addressed in the Products Evaluated or Code Compliance Process Evaluated sections.
- 9.10.3.** The engineering evaluation was performed on the dates provided in this TER, within DrJ's professional scope of work.
- 9.10.4.** This product is manufactured under a third-party quality control program in accordance with [/IRC Section R104.4](#) and [R109.2](#) and [/BC Section 104.4](#) and [110.4](#).
- 9.10.5.** 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.
- 9.10.6.** 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.** 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.

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](#)