



CERTIFICATION



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Technical Evaluation Report

TER 1801-02

Use of FastenMaster® FrameFAST™
Structural Wood Screw Fasteners in
Stud to Plate and Plate to Rim Board
Applications

OMG, Inc. DBA FastenMaster®

Product:

**FastenMaster® FrameFAST™
Structural Wood Screw
(FrameFAST™ Fasteners)**

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March 12, 2018

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July 1, 2020

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

1 PRODUCT EVALUATED¹

- 1.1 FastenMaster® FrameFAST™ Structural Wood Screw (FrameFAST™ 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®*
- 2.1.3 *FBC—14, 17: Florida Building Code – Product Approval Number FL21662*

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 D1761: Standard Test Methods for Mechanical Fasteners in Wood*
- 2.2.4 *ASTM D2395: Standard Test Methods for Density and Specific Gravity (Relative Density) of Wood and Wood-Based Materials*
- 2.2.5 *ASTM D4442: Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials*

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.



- 2.2.6 *ASTM F1575: Standard Test Method for Determining Bending Yield Moment of Nails*
- 2.2.7 *ASTM F606: Standard Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets*
- 2.2.8 *AWC TR 12: General Dowel Equations for Calculating Lateral Connection Values*

3 PERFORMANCE EVALUATION

- 3.1 FrameFAST™ fasteners were evaluated as installed in the end use application to derive allowable design values as an alternate means of attaching wood studs to wall top and bottom plates and attaching wall top and bottom plates to the rim board with and without blocking. The following conditions were evaluated:
 - 3.1.1 Uplift resistance in stud to plate connections in accordance with *ASTM D1761*.
 - 3.1.2 Uplift and lateral resistance in plate to rim board connections in accordance with *ASTM D1761*.
- 3.2 Any code compliance issues or fastener connections not specifically addressed in this section are outside the scope of this TER.
- 3.3 Any engineering evaluation 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.

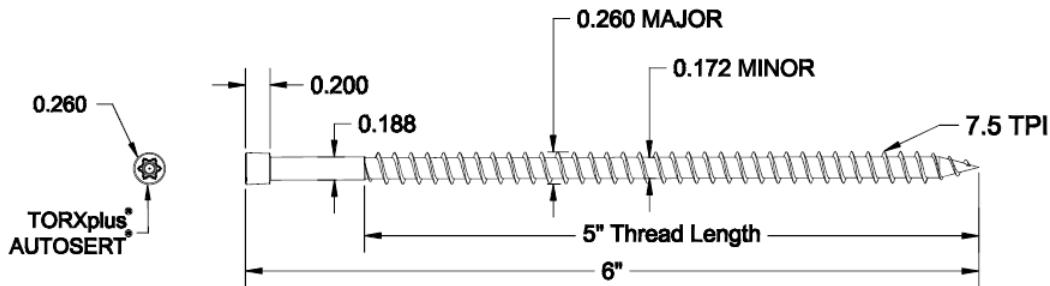


FIGURE 1. FRAMEFAST™ FASTENER SPECIFICATION

- 4.2 FrameFAST™ fasteners are manufactured with modified 10B21 carbon steel wire conforming to the manufacturers specifications and are coated with a proprietary finish.
- 4.3 FrameFAST™ fasteners are manufactured using a standard cold-formed process followed by a heat-treating process.
- 4.4 FrameFAST™ fasteners are approved for use in interior and exterior conditions and in pressure-treated wood.
- 4.5 In-plant quality control procedures, under which the FrameFAST™ fasteners are manufactured, are audited through an inspection process performed by an approved agency.
- 4.6 The FrameFAST™ fasteners evaluated in this TER are designated as shown in Table 1.

TABLE 1. FASTENER DESIGNATION FOR THE EVALUATED FRAMEFAST™ FASTENERS

Fastener	Fastener Designation	Fastener Length ¹ (in)	Thread Length ¹ (in)	Head Diameter (in)	Head Height (in)	Shank Diameter ² (in)	Minor Thread (Root) Diameter (in)	Major Thread (Root) Diameter (in)	Bending Yield Strength ² (psi)	Ultimate Fastener Strength ² (psi)	
										Tensile	Shear
FrameFAST™	FMFF006	6	5	0.260	0.200	0.188	0.172	0.260	166,600	155,900	120,360

SI: 1" = 25.4 mm, 1 psi = 0.00689 MPa

1. Fastener length is measured from the top of the head to the tip. Thread length includes tapered tip (Figure 1).
2. Bending yield, tension, and shear values determined at minor root diameter.

5 APPLICATIONS

5.1 FrameFAST™ fasteners are used to attach minimum 1½"-wide wood studs to wall top and bottom plates and to attach wall top and bottom plates to rim board in the construction of walls that meet the requirements of IBC Section 2308 and IRC Section R602. The fasteners provide resistance to uplift and/or lateral loads applied parallel and/or perpendicular to the wall or structural framing member.

- 5.1.1 Walls shall consist of a single or double top plate designed in accordance with IBC Section 2308.5.3.2⁴ and IRC Section R602.3.2.
- 5.1.2 See Table 2 and Table 3 for the design requirements and the FrameFAST™ fasteners' allowable design values.
- 5.1.3 See Section 6 for installation requirements.
- 5.1.4 FrameFAST™ fasteners are used in buildings requiring design in accordance with IBC Section 1609 or wind analysis in accordance with IRC Section R301.2.1.
- 5.1.5 FrameFAST™ fasteners are used in buildings requiring design in accordance with IBC Section 1613 or seismic analysis in accordance with IRC Section R301.2.2.
- 5.1.6 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.

5.2 Design Concepts and Allowable Design Loads

- 5.2.1 Allowable design loads are provided in Table 2 and Table 3 for FrameFAST™ fasteners. Allowable design loads are applicable to fasteners installed in accordance with the procedures described in Section 6. For stud to plate connections, allowable design loads are applicable for both single and double top plate applications as shown in Figure 2. For plate to rim board connections, allowable design loads are applicable for both single bottom plate with OSB subfloor to rim board applications and to single or double top plate to blocking/rim board applications as shown in Figure 2.

⁴ 2012 IBC Section 2308.9.2.1

TABLE 2. ALLOWABLE DESIGN VALUES FOR FRAMEFAST™ FASTENERS IN STUD TO PLATE CONFIGURATIONS

Configuration	Allowable Design Value for Uplift (lb) ^{1,2,4}		
	Lumber Species (Specific Gravity)		
	SPF (0.42)	DF-L (0.50)	SP (0.55)
Stud to Single or Double Top or Bottom Plate ³	340	560	665

SI: 1 lb = 4.45 N

- For applications involving members with different specific gravities, use the allowable load corresponding to the lowest specific gravity, G. Dimensional lumber members shall be minimum of 2" nominal thickness.
- Design values are based on a load duration factor, C_D, of 1.6. No further duration of load increases permitted. Reduced design values for other load durations as applicable.
- See Figure 2 for installation details.
- Use a reduction factor of 0.80 when connecting each ply of multi-ply stud columns to the top plate.

TABLE 3. ALLOWABLE DESIGN VALUES OF FRAMEFAST™ FASTENERS IN PLATE TO RIM BOARD CONFIGURATIONS

Load Direction	Configuration	Allowable Design Value (lb) ^{1,2}					
		Rim Board Species (Specific Gravity or Equivalent Specific Gravity)					
		SPF (0.42)	DF-L (0.50)	SP (0.55)	1-1/8" OSB (0.50) ⁵	1-1/4" LSL (0.46) ³	1-1/4" LVL (0.47) ³
Uplift	Single Plate to Rim Board	210	245	325	195	165	110
	Double Plate to Rim Board	475	590	595	360	610	570
		SPF (0.42)	DF-L (0.50)	SP (0.55)	1-1/8" OSB (0.50) ⁶	1-1/4" LSL (0.50) ⁴	1-1/4" LVL (0.50) ⁴
Lateral	Single Plate to Rim Board	340	265	395	340	210	320
	Double Plate to Rim Board	495	595	650	230	485	440
	Double Plate to Blocking	495	595	650	230	485	440

SI: 1 lb = 4.45 N

- For applications involving members with different specific gravities, G, use the allowable load corresponding to the lowest specific gravity. For EWP rim boards (i.e., OSB, LSL, LVL), the top/bottom plates shall be minimum SPF dimensional lumber. Dimensional lumber members shall be minimum of 2" nominal thickness.
- Design values are based on a load duration factor, C_D, of 1.6. No further duration of load increases permitted. Reduced design values for other load durations as applicable.
- Equivalent specific gravity values are for withdrawal of nails or screws installed in edge.
- Equivalent specific gravity values are dowel bearing of nails or screws installed in edge.
- Equivalent specific gravity values are for withdrawal of nails installed in face.
- Equivalent specific gravity values are dowel bearing of nails or screws installed in face.
- See Figure 3 for blocking requirements.

5.2.2 Where it is anticipated that loads will be applied to a single fastener simultaneously in more than one direction, additional evaluation is required to account for the combined effect of these loads using accepted engineering practice.

5.2.2.1 Consult a professional engineer, as needed, for complex design 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 Installation Procedure

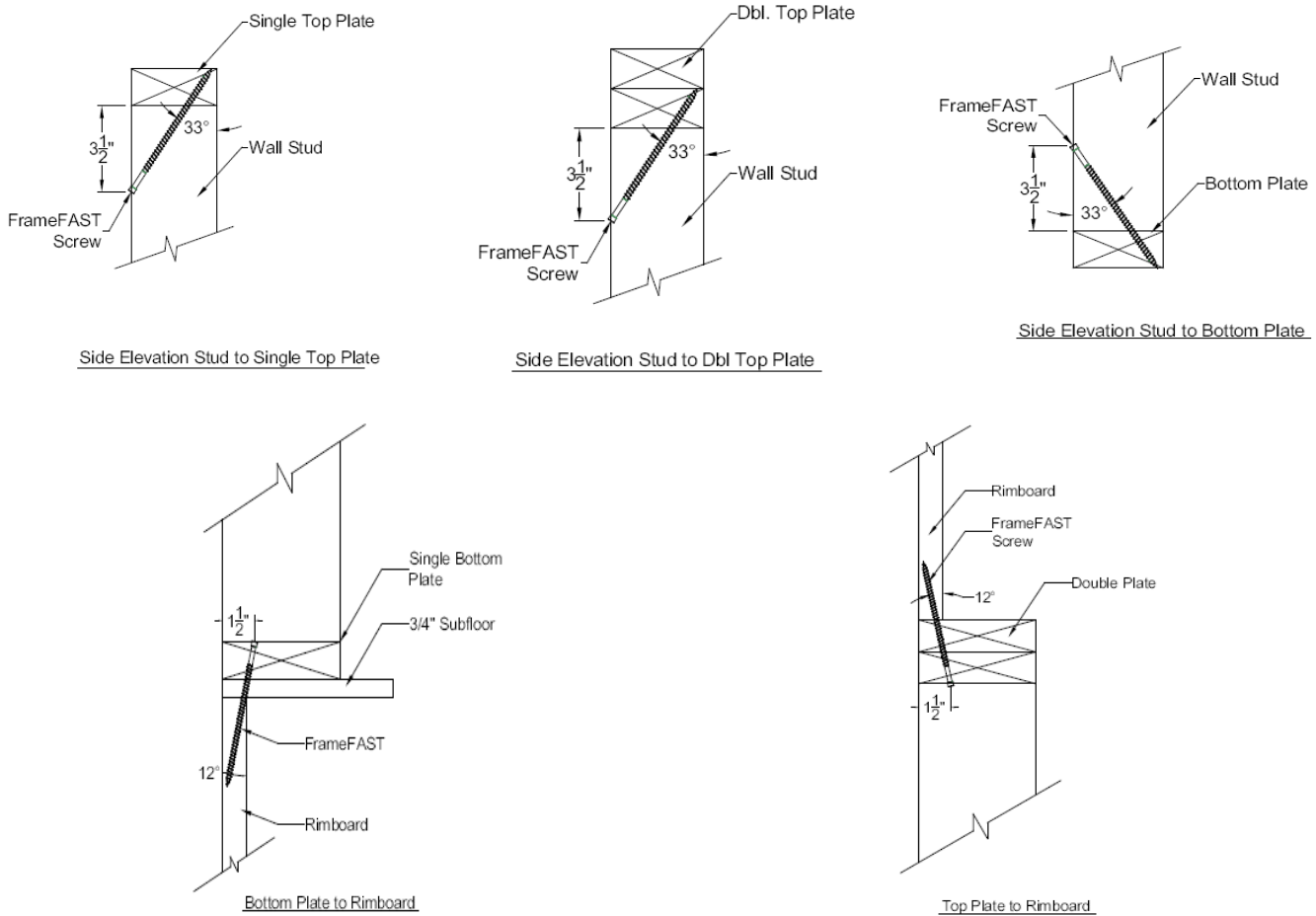


FIGURE 2. INSTALLATION OF FRAMEFAST™ FASTENERS FOR SPECIFIC APPLICATIONS

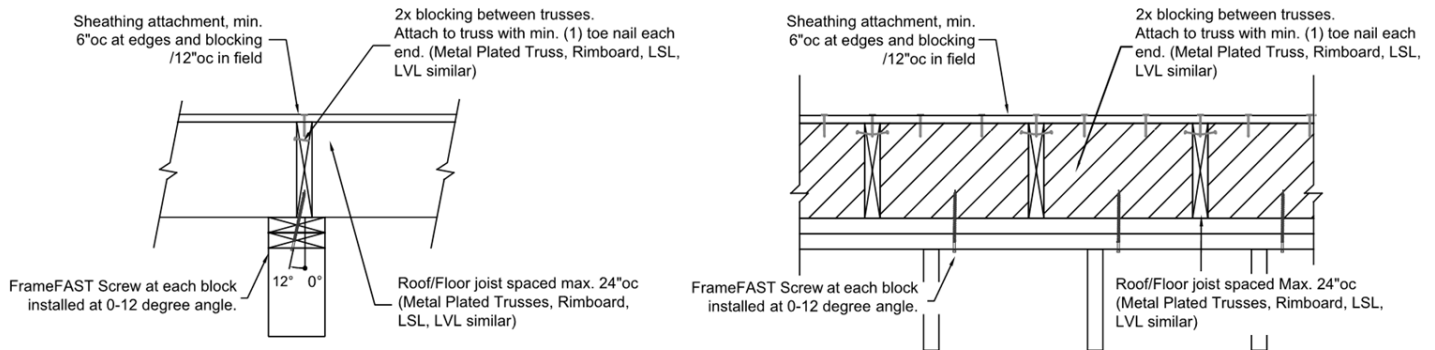


FIGURE 3. SECTION VIEWS OF FRAMEFAST™ FASTENERS WITH BLOCKING

6.2.1 Select a 6" FrameFAST™ fastener to fully embed the fastener into the top plate, blocking, and rim board as shown in Figure 2 and Figure 3.

6.2.1.1 Stud to Plate Connection – Install one (1) FrameFAST™ fastener upward (or downward) through the center of the stud and into the plate. Install at a 25°-35° angle (optimal angle = 33°) and penetrate the wood stud 3½" down from top of stud and within ¼" of the centerline (Figure 2).

- 6.2.1.2 Plate to Rim Connection – Install one (1) FrameFAST™ fastener upward (or downward) at a 0°-12° angle (optimal angle = 12°), 1½" from outside face of wall, through the plates, and into the rim (Figure 2 and Figure 3).
- 6.2.1.3 Plate to Blocking Connection – Install one (1) FrameFAST™ fastener upward (or downward) at a 0°-12° angle (optimal angle = 12°), 1½" from outside face of wall, through the plates and into the blocking (Figure 2 and Figure 3).
- 6.2.2 Use a ½" low RPM/high torque drill to drive the fastener head flush with the surface of the wall framing or wood structural framing member.

7 TEST ENGINEERING SUBSTANTIATING DATA

- 7.1 FrameFAST™ fastener testing conduct by SBCRI, under contract with Qualtim, Inc., 2017 for the following conditions:
 - 7.1.1 FrameFAST™ fastener uplift performance when used in stud to plate and plate to rim board connections.
 - 7.1.2 FrameFAST™ fastener performance when loaded laterally in plate to rim board connections.
- 7.2 FrameFAST™ fastener testing conduct by SBCRI, under contract with Qualtim, Inc., 2018 for performance when laterally loaded with blocking.
- 7.3 Material property testing, conducted by the University of Montana – Wood Science Division, 2016.
- 7.4 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.
- 7.5 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 Provide resistance to lateral loads due to wind or seismic loads applied parallel or perpendicular to the wall in plate to rim board and plate to blocking applications, per Table 3.
 - 8.1.2 Provide uplift resistance for all configurations considered per Table 3.
 - 8.1.3 Fasten wall studs to single or double plate per Table 2.
 - 8.1.4 Fasten double or single plate to blocking/rim board per Table 3.
- 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 Loads applied shall not exceed those recommended by the manufacturer or as defined in this TER.

9.2 The FrameFAST™ fasteners covered in this TER shall be installed in accordance with this TER and the manufacturer's installation instructions.

9.2.1 For conditions not covered in this TER, connections shall be designed in accordance with accepted engineering practice.

9.3 Structural framing members connected with FrameFAST™ fasteners shall be designed in accordance with the requirements of their specific design standards/specifications as referenced in the building code adopted by the AHJ in which the project is to be constructed.

9.4 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.

9.5 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 Building Designer (e.g., owner or registered design professional).

9.7 At a minimum, this product shall be installed per Section 6 of this TER.

9.8 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.

9.9 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. Therefore, the TER shall be reviewed for code compliance by the building official for acceptance.

9.10 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.