



CERTIFICATION



Approved. Sealed. Code Compliant.

Technical Evaluation Report

TER 1608-02

Use of FastenMaster® FrameFAST® Structural Wood Screw Fasteners to Provide Uplift & Lateral Resistance to Wood Trusses & Rafters Attached to the Tops of Walls – Limit States Design

**OMG, Inc.
DBA FastenMaster®**

Product:

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

Issue Date:

October 18, 2016

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June 19, 2019

Subject to Renewal:

July 1, 2020

For the most recent version or a sealed copy of this Technical Evaluation Report (TER), visit drjcertification.org.

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DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES
SECTION: 06 00 90 - Wood and Plastic 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 *NBC—10, 15: National Building Code of Canada*
- 2.1.2 *NECB—17: National Energy Code of Canada for Buildings*

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 D1761: Standard Test Methods for Mechanical Fasteners in Wood*
- 2.2.3 *ASTM F1575: Standard Test Method for Determining Bending Yield Moment of Nails*
- 2.2.4 *ASTM F606: Standard Test Method for Determining Properties of Fasteners*
- 2.2.5 *CSA O86: Engineering Design in Wood*

¹ Building codes require data from valid certification, evaluation, and qualification reports be obtained from accredited third-party organizations. An accredited certifying organization (a type of accredited third-party organization) is a certification body that performs "certification of a product, process, or system." An accredited third-party organization is accomplished via accreditation using ISO/IEC 17065 evaluation procedures meeting code requirements of independence, accredited testing, and professional 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, such as Canada, 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 about DrJ's accreditation, refer to this [letter](#) from the Standards Council of Canada (SCC).

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 2015 version of the NBC. This *alternative solution* is also approved for use with the 2010 NBC and the standards referenced therein (e.g., CAN/CSA, CAN/ULC). Where this TER is not approved, the AHJ shall respond in writing stating the reasons this TER was not approved. For any variations in provincial, territorial, and local codes, see Section 8.

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

3 PERFORMANCE EVALUATION

- 3.1 FrameFAST® fasteners were evaluated, using assembly tests to derive factored design values, as an alternate means of attaching metal-plate-connected wood trusses and rafters to the tops of walls for the purpose of providing uplift and lateral load resistance. The following conditions were evaluated:
 - 3.1.1 Withdrawal strength of FrameFAST® fasteners for use as an alternative to toe-nail connections, metal hurricane and seismic clips/straps, or nails in tension (uplift) loaded applications.
 - 3.1.2 Shear strength of FrameFAST® fasteners for use as an alternative to toe-nail connections, hurricane and seismic clips/straps, or nails in shear (lateral) loaded applications either parallel or perpendicular to wood grain.
 - 3.1.3 Head-pull-through strength of FrameFAST® fasteners for use as an alternative to toe-nail connections, hurricane and seismic clips/straps or nails in tension (uplift) loaded applications.
- 3.2 Connections other than those addressed in Section 3 are outside the scope of this TER.
- 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 Dr.J's professional scope of work.

4 PRODUCT DESCRIPTION AND MATERIALS

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

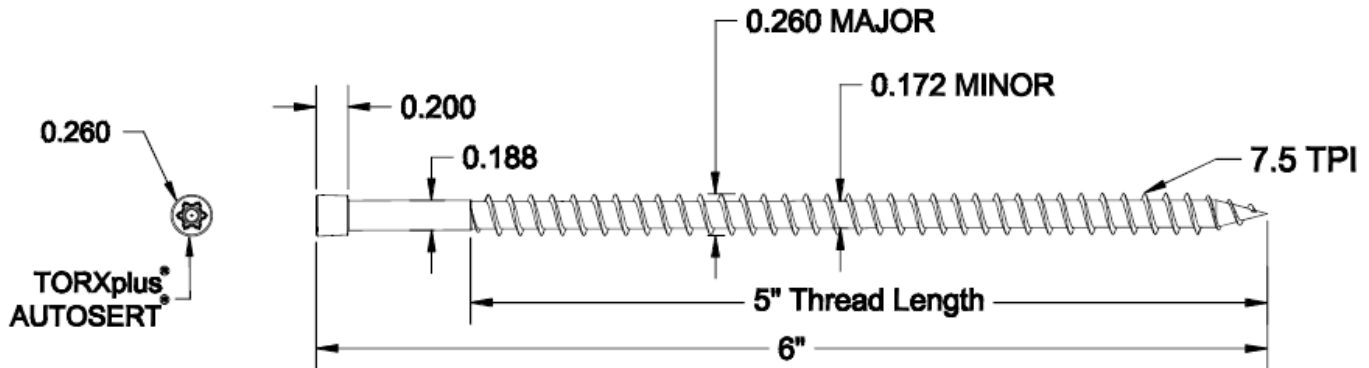


FIGURE 1. FASTENER DESIGNATION FOR THE EVALUATED FRAMEFAST® FASTENERS

- 4.2 FrameFAST® fasteners are manufactured with modified 10B21 carbon steel wire conforming to the manufacturer's 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 (mm)	Thread Length ¹ (mm)	Head Diameter (mm)	Head Height (mm)	Shank Diameter (mm)	Minor Thread (Root) Diameter (mm)	Major Thread Diameter (mm)	Minimum Yield, ² f _y (MPa)
FrameFAST®	FMFF006	152	127	6.6	5.1	4.8	4.4	6.6	1150

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

1. Fastener length is measured from the underside of the head to the tip. Thread length includes tapered tip (Figure 1).
2. Yield strength value determined at minor root diameter.

5 APPLICATIONS

- 5.1 FrameFAST® fasteners are used to attach minimum 38 mm (1½") wide wood trusses and sawn lumber rafters to wood walls that meet the requirements of *NBC* Section 9.23 for wood structural framing members. The fasteners provide resistance to uplift 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 *NBC* Section 9.23.11.
 - 5.1.2 See Table 2 for the design procedure and the FrameFAST® fasteners' allowable design values.
 - 5.1.3 See Section 6 for installation requirements.
- 5.2 FrameFAST® fasteners are used in buildings requiring wind and seismic analysis in accordance with *NBC* Section 4.1.7 and 4.1.8.
- 5.3 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.
- 5.4 *Design Concepts and Resistances*
 - 5.4.1 The uplift and lateral resistance [parallel (F1) and perpendicular (F2)] to the plane of the wall or structural member, Figure 2, are provided in Table 2 for FrameFAST® fasteners. Resistances are applicable to fasteners installed in accordance with the procedures described in Section 6. Resistances are applicable to both single- and double-top-plate applications as shown in Figure 3 and Figure 4.

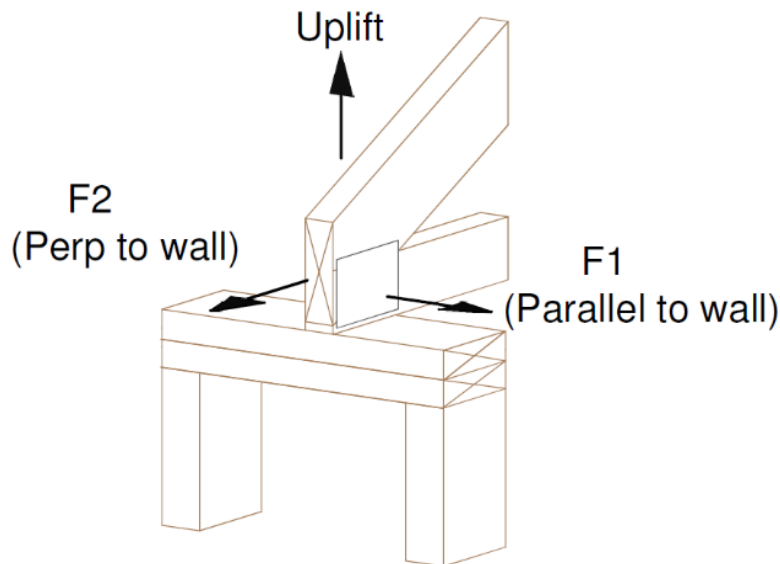


FIGURE 2. UPLIFT & LATERAL LOAD ORIENTATIONS

TABLE 2. SPECIFIED UPLIFT & LATERAL RESISTANCE OF FRAMEFAST® FASTENERS FOR SELECTED WOOD RELATIVE DENSITIES

Fastener Designation	Penetration into Truss/Rafter/Wood Structural Support ¹ (mm)	Visually Graded Lumber (Relative Density) ^{2,3}	Specified Uplift ^{4,5,6} (kN)	Specified Lateral Resistance ^{5,6} (kN)	
				F1 Parallel to Wall	F2 Perpendicular to Wall
FMFF006	63	Southern Pine (0.55)	3.7	2.0	3.5
		Douglas Fir-Larch (0.50)	3.5	2.2	3.2
		Spruce-Pine-Fir/Hem-Fir (0.42)	3.2	2.4	2.9

SI: 25.4 mm = 1", 1 kN/m = 737.6 lb/ft, 1 kN/m² = 20.9 psf, 1 MPa = 145 psi, 1 km/h = 0.621 mph

1. Wood truss and rafter members shall be a minimum of 38 mm (1.5") thickness. Design of truss and rafter members by others.
2. Equivalent relative density of structural composite lumber (SCL) shall be equal to or greater than the relative densities provided in this table. Refer to product information from SCL manufacturer.
3. For applications involving members with different relative densities, use a resistance corresponding to a lower relative density. Install screws so that the threaded part is half in the top plates, half in the truss members.
4. Use reduction factor of 0.80 when connecting each ply of multi-ply trusses to the top plate.
5. Specified loads shall be multiplied by the appropriate factors per Clause 12 of CSA O86.
6. An increase of 1.15 for short-term load duration may be applied where appropriate. See Table 5.3.2.2 of CSA O86.

5.4.1 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 the provisions of CSA O86.

5.4.1.1 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

6.2.1 Select a FrameFAST® fastener with a length sufficient to fully embed 63 mm (2.5") of the fastener length into the truss or rafter, while conserving at least 60 mm (2.4") of thread in the top plates and stud. See Figure 3 and Figure 4 for guidance.

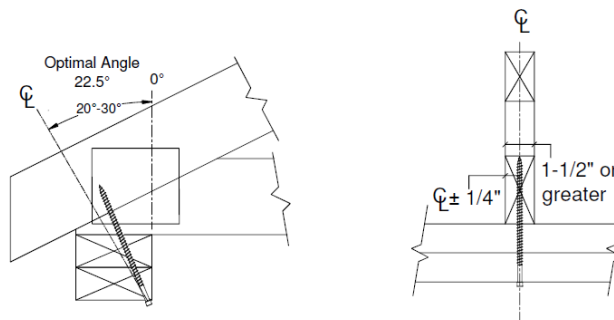


FIGURE 3. INSTALLATION OF FRAMEFAST® FASTENERS ON WOOD TRUSS OR RAFTER TO DOUBLE TOP PLATE

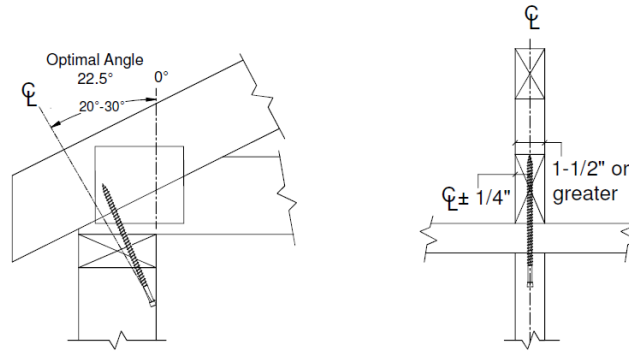


FIGURE 4. INSTALLATION OF FRAMEFAST® FASTENERS ON WOOD TRUSS OR RAFTER TO SINGLE TOP PLATE

- 6.2.2 Install one (1) FrameFAST® fastener upward through the wall top plates or wood structural framing member at the bottom corner of the top plates and into the center of the wood truss or rafter. The fastener should be installed at a 20°-30° angle and should penetrate the wood truss or rafter within 6 mm (0.24”) of the centerline (Figure 3 and Figure 4).
- 6.2.2.1 If the wood truss or rafter is located directly over a top plate splice, offset the fastener 6 mm (0.24”) to one side of the splice and insert the fastener upward through the wall top plates or wood structural framing member at the bottom corner of the top plates and into the center of the truss or rafter. The fastener should be installed at a 20°-30° angle.
- 6.2.3 Use a 12.7 mm (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 conducted by SBCRI, under contract with Qualtim, Inc., for the following conditions:
 - 7.1.1 Uplift capacity of FrameFAST® fasteners as evaluated for head pull through and withdrawal of fasteners.
 - 7.1.2 FrameFAST® fastener performance when used as a truss hold-down.
 - 7.1.3 FrameFAST® fastener performance when loaded laterally.
- 7.2 Material property testing, conducted by the University of Montana - Wood Science Laboratory, 2016
- 7.3 *CSA O86: Engineering Design in Wood*
- 7.4 Some information contained herein is the result of testing and/or data analysis by other sources which conform to *NBC* Volume I commentary on Conformity Assessment 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., *NBC*, *NECB*, *CAN/CSA*). 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 provisions of the applicable building codes defined in Section 2, FrameFAST® fasteners have the factored design value properties defined herein and are approved for use as an alternative to those fasteners prescribed by the applicable code.
- 8.2 *NBC* Article 1.2.1.1. states:
- 1.2.1.1. **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.
- 8.3 *NBC* Division C Section 2.3 includes additional guidance for *alternative solutions*.
- 8.4 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 evaluation, they are listed here.
- 8.4.1 No known variations

9 CONDITIONS OF USE

- 9.1 The FrameFAST® fasteners covered in this TER shall be installed in accordance with Section 6 of this TER and the manufacturer's installation instructions.
- 9.1.1 For conditions not covered in this TER, connections shall be designed in accordance with accepted engineering practice.
- 9.2 Manufacturer's installation instructions shall be shipped to the jobsite with the materials or otherwise be available on the jobsite for inspection.
- 9.3 Loads applied shall not exceed those recommended by the manufacturer or as defined in this TER.
- 9.4 Where required by the *authority having jurisdiction* 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 This product is manufactured under a third-party quality control program with quality control inspections established by the governing legislation of the adopting province or territory, as described in *NBC* Volume 1 commentary on Conformity Assessment.
- 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 AHJ 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 AHJ'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 the designation “FrameFAST®” on the packaging material bearing the manufacturer’s name, product name, TER number, and other information to confirm code compliance.
- 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.

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](#).