



CERTIFICATION



Approved. Sealed. Code Compliant.

Technical Evaluation Report

TER 1503-03

Use of FastenMaster® FrameFAST™
Structural Wood Screw Fasteners to
Provide Uplift & Lateral Resistance to
Wood Trusses, Rafters, or Floor Joists
Attached to the Tops of Walls

OMG, Inc. DBA FastenMaster®

Product:

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

Issue Date:

May 17, 2016

Revision Date:

May 18, 2020

Subject to Renewal:

July 1, 2021



COMPANY
INFORMATION:

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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 *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 FL 21662)*

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 F1575: Standard Test Method for Determining Bending Yield Moment of Nails*
- 2.2.5 *ASTM F606: Standard Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets*

¹ 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 or call us at 608-310-6748.

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.

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

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

3 PERFORMANCE EVALUATION

- 3.1 FrameFAST™ fasteners were evaluated, using assembly tests to derive allowable design values, as an alternate means of attaching metal plate connected wood trusses, rafters, or floor joists 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 toenail 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 toenail 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 toenail connections, hurricane and seismic clips/straps, or nails in tension (uplift) loaded applications.
- 3.2 Any code compliance issues not specifically addressed in this section are outside the scope of this TER.
- 3.3 Any engineering evaluation conducted for this TER 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.

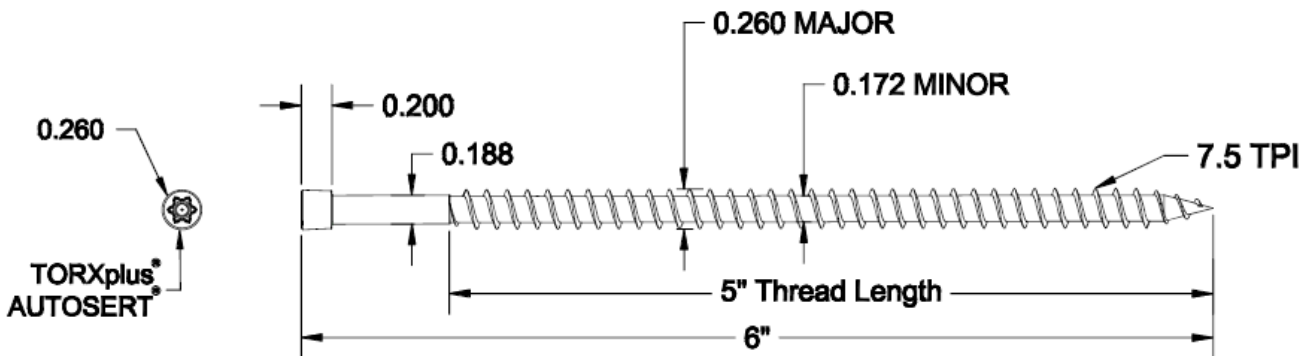


FIGURE 1. FRAMEFAST™ FASTENER SPECIFICATION

- 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 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 FrameFAST™ fasteners are approved for use in interior and exterior conditions and in pressure-treated wood.
- 4.6 In-plant quality control procedures, under which the FrameFAST™ fasteners are manufactured, are audited through an inspection process performed by an approved agency.
- 4.7 The FrameFAST™ fasteners evaluated in this TER are designated in Table 1.



TABLE 1. FASTENER SPECIFICATIONS

Fastener	Fastener Designation	Fastener Length ¹ (in)	Thread Length ¹ (in)	Head Diameter (in)	Head Height	Shank Diameter ² (in)	Minor Thread (Root) Diameter (in)	Major Thread (Root) Diameter (in)	Bending Yield ² , f _{yb} (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 in = 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 Non-Structural Applications

- 5.1.1 FrameFAST™ fasteners are used to attach minimum 1½"-wide wood trusses, sawn lumber rafters, or floor joists to wood walls that meet the requirements of IBC Section 2308 or IRC Section R602 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.
 - 5.1.1.1 Walls shall consist, at a minimum, of a single or double top plate designed in accordance with IBC Section 2308.5.3.2⁴ or IRC Section R602.3.2. More than two top plates is permitted.
 - 5.1.1.2 See Table 2 for the design procedure and allowable design values for FrameFAST™ fasteners.
 - 5.1.1.3 See Section 6 for installation requirements.
 - 5.1.1.4 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.
 - 5.1.1.5 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.

5.2 Design Concepts and Allowable Design Loads

- 5.2.1 Allowable design loads for 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. Allowable design loads are applicable to fasteners installed in accordance with the procedures described in Section 6.
 - 5.2.1.1 Blocking requirements are shown in Figure 3 and Figure 4.
 - 5.2.1.2 Example for calculating reduced uplift values based on embedment depth is shown in Figure 5.
 - 5.2.1.3 Example top plate applications are shown in Figure 6, Figure 7, and Figure 8.
 - 5.2.1.4 A header to truss application is shown in Figure 9.

⁴ 2012 IBC Section 2308.9.2.1



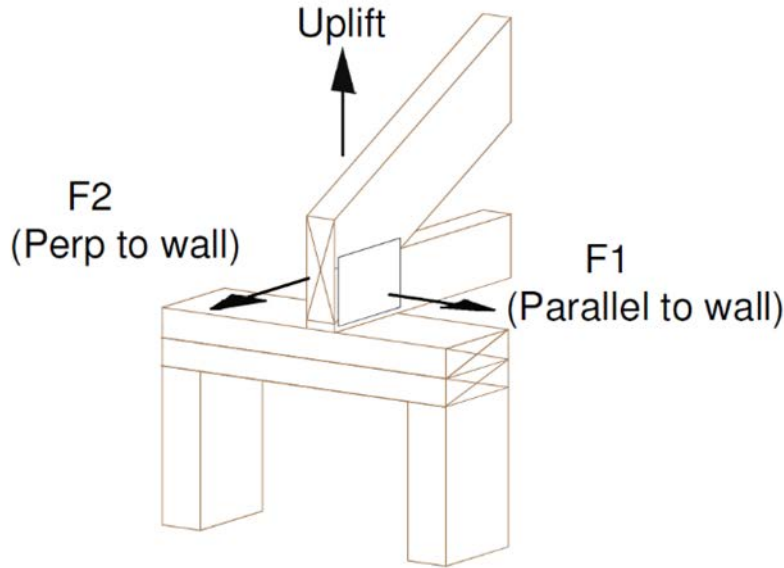


FIGURE 2. UPLIFT AND LATERAL LOAD ORIENTATIONS

TABLE 2. FRAMEFAST™ FASTENERS ALLOWABLE LOADS FOR UPLIFT & LATERAL RESISTANCE

Fastener Designation	Minimum Penetration into Truss/Rafter/Wood Structural Support ¹ (in)	Species Group (Specific Gravity) ^{2,3}	Uplift ^{4,5} (lbf)	Lateral ⁴ (lbf)		
				F1 Parallel to Wall (Without Blocking)	F1 Parallel to Wall (With Blocking ⁶)	F2 Perpendicular to Wall
6" FMFF006	2½	So. Pine (0.55)	690	285	650	485
		Douglas Fir-Larch (0.50)	655	300	600	455
		Spruce-Pine-Fir/Hem-Fir (0.42)	595	330	520	400

SI: 1 in = 25.4 mm, 1 lb = 4.45 N

1. Wood truss, rafter, or floor joist members shall be a minimum of 2" nominal thickness. Design of truss, rafter, or floor joist members is by others.
2. Equivalent specific gravity of structural composite lumber (SCL) shall be equal to or greater than the specific gravities provided in this table. Refer to product information from SCL manufacturer.
3. For applications involving members with different specific gravities, use the allowable load corresponding to the lowest specific gravity.
4. No further duration of load increases permitted.
5. Use reduction factor of 0.80 when connecting each ply of multiply trusses to the top plate.
6. See Figure 3 and Figure 4 for blocking requirements between trusses, rafter, or floor joists.
7. For embedment depths into main member of less than 2½" (full penetration), reduced allowable uplift shall be calculated using Section 5.2.2 and Figure 5. For embedment depths greater than 2½", no further increases allowed.

5.2.1 In the F1 direction, design loads are given for assemblies with and without blocking between the roof or floor trusses. Blocking requirements are shown in Figure 3 and Figure 4.

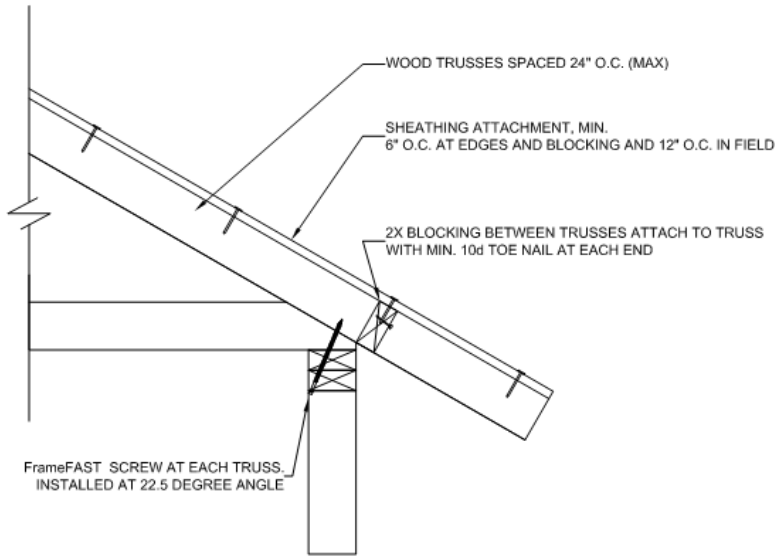


FIGURE 3. TRUSS BLOCKING DETAIL

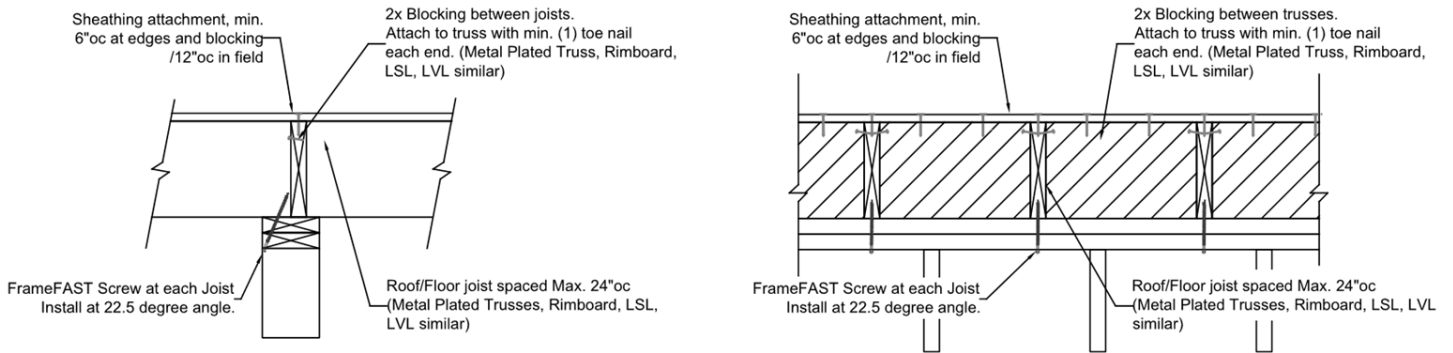


FIGURE 4. SECTION VIEW OF ROOF/FLOOR JOIST BLOCKING

- 5.2.2 For applications where the embedment depth into the main member is less than 2½" (full penetration), calculate the reduced allowable uplift per Figure 5.
 - 5.2.2.1 The reduced thread embedment length does not include the tapered tip.
 - 5.2.2.2 For embedment depths greater than 2½", no further increases are allowed.

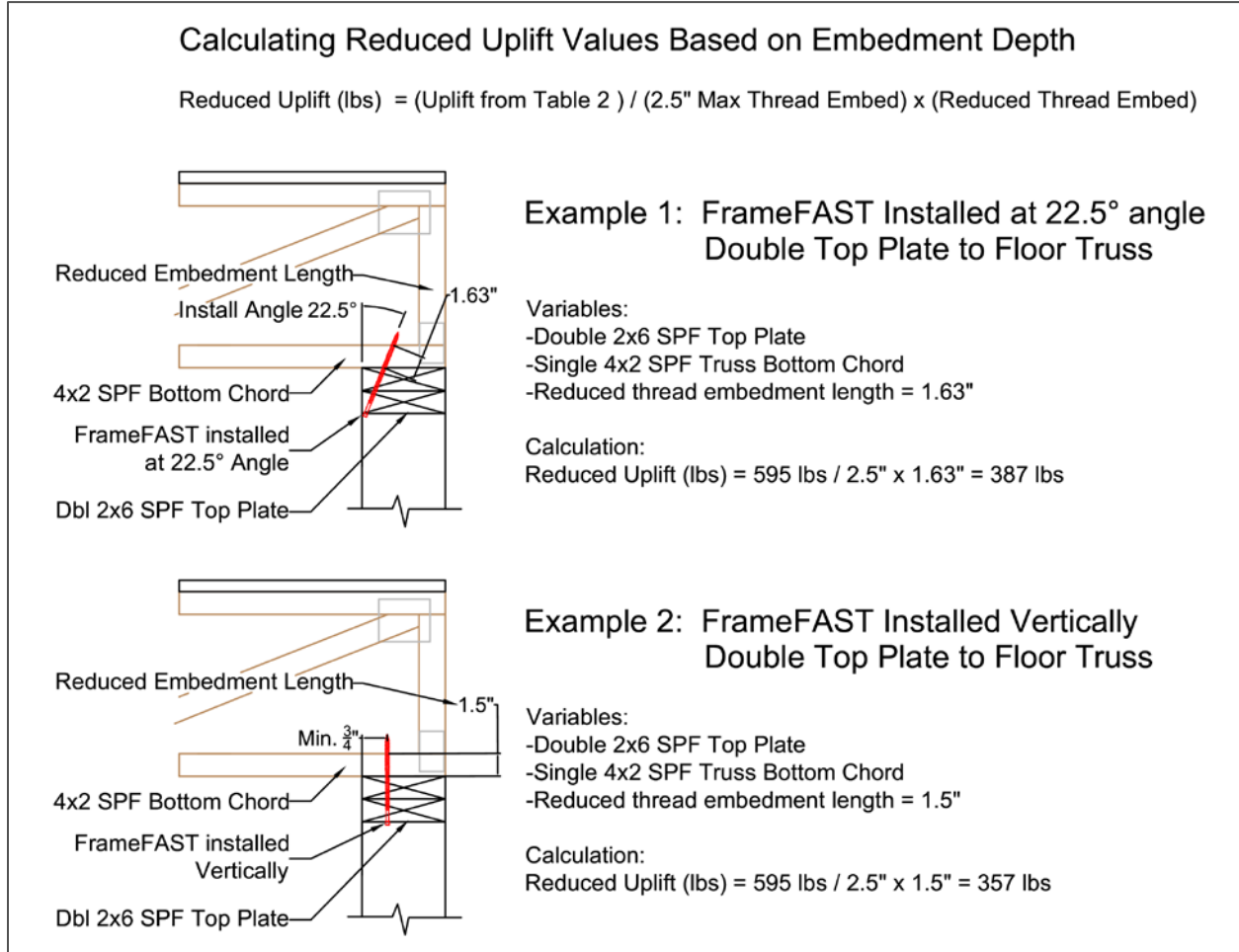


FIGURE 5. CALCULATION EXAMPLE FOR REDUCING UPLIFT VALUES BASED ON EMBEDMENT DEPTH

- 5.2.1 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 accepted engineering practice.
 - 5.2.1.1 Consult a professional engineer, as needed, for complex design conditions.
- 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.

6 INSTALLATION

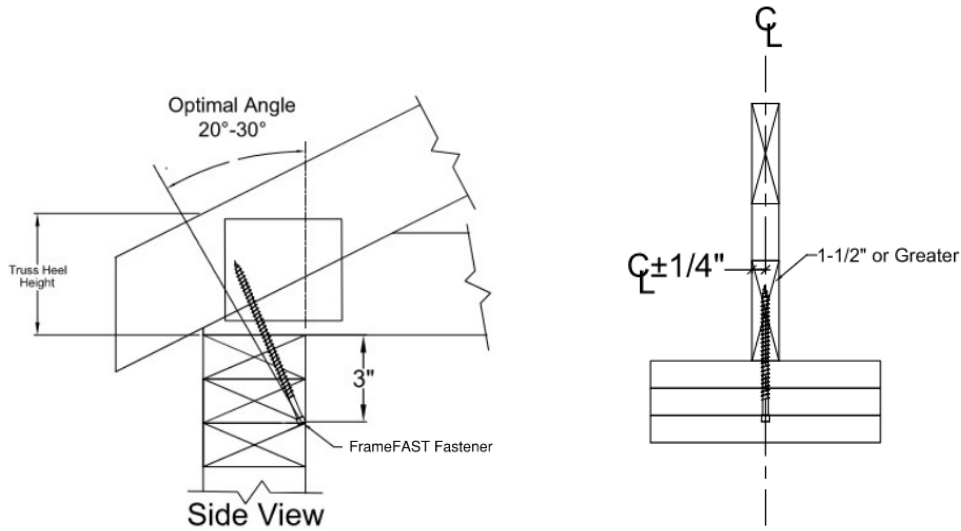


FIGURE 6. INSTALLATION OF FRAMEFAST™ FASTENERS ON WOOD TRUSS OR RAFTER TO TRIPLE TOP PLATE

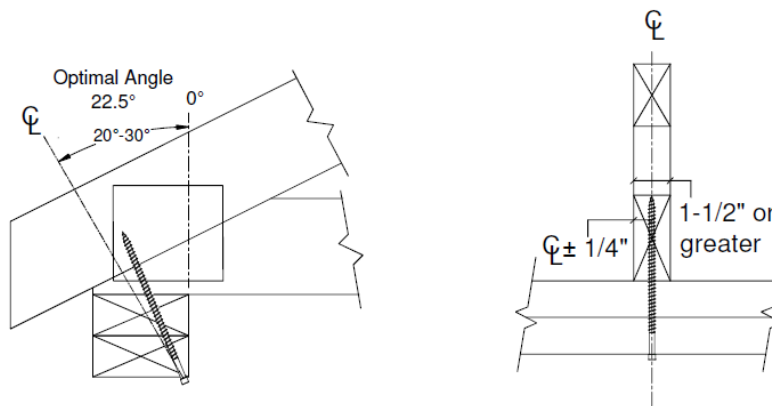


FIGURE 7. INSTALLATION OF FRAMEFAST™ FASTENERS ON WOOD TRUSS OR RAFTER TO DOUBLE TOP PLATE

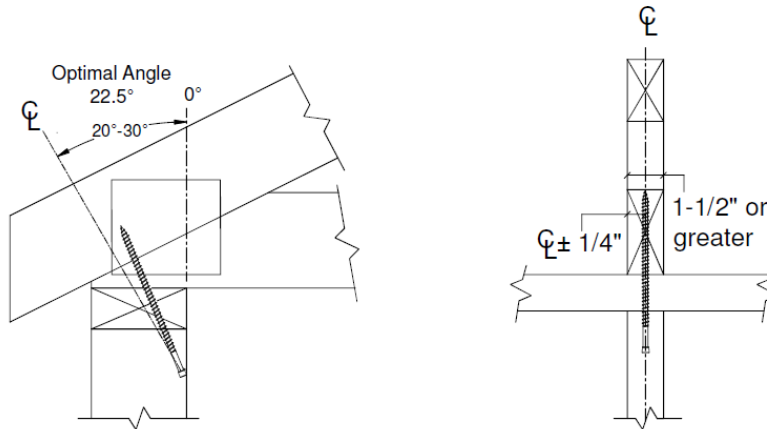


FIGURE 8. INSTALLATION OF FRAMEFAST™ FASTENERS ON WOOD TRUSS OR RAFTER TO SINGLE TOP PLATE

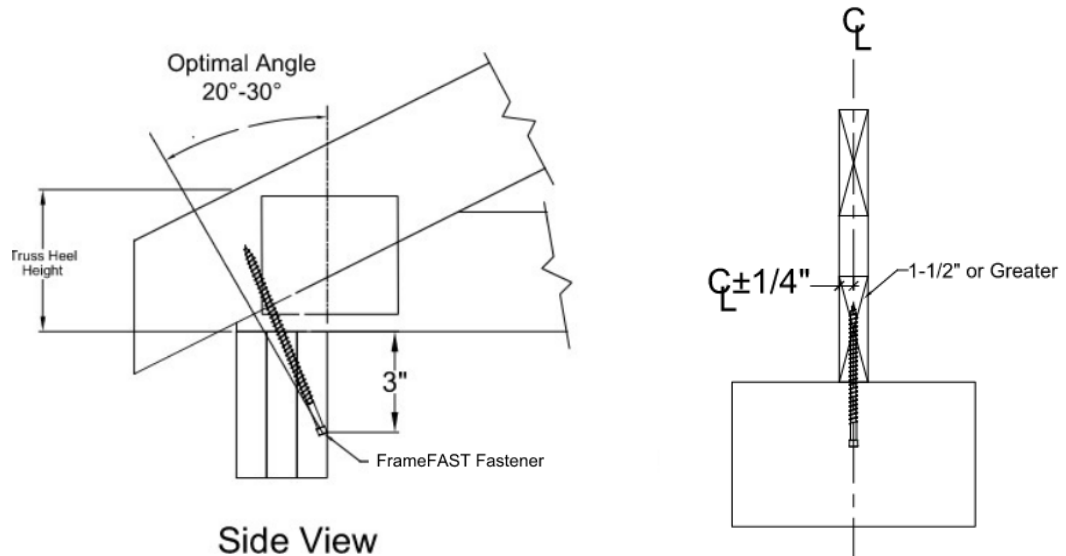


FIGURE 9. INSTALLATION OF FRAMEFAST™ FASTENERS ON WOOD TRUSS OR RAFTER TO HEADER

- 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 a FrameFAST™ fastener with a length sufficient to fully embed 2½" of the fastener length into the truss or rafter. See Figure 6, Figure 7, and Figure 8 for guidance.
- 6.3 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 shall be installed at a 20°-30° angle and shall penetrate the wood truss or rafter within ¼" of the centerline. See Figure 6, Figure 7, and Figure 8.
- 6.4 If the wood truss or rafter is located directly over a top plate splice, offset the fastener ¼" 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 shall be installed at a 20°-30° angle.



- 6.5 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., 2015 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 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.
- 7.4 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 can be used as an acceptable alternative to the following:
 - 8.1.1 Toenail connections, metal hurricane and seismic clips/straps, or nails to resist the uplift and lateral loads due to wind and seismic conditions as provided for in Table 2
 - 8.1.2 Provide resistance to uplift loads due to wind negative pressure applied from the truss above lifting up on the top plate of the wall, per Table 2
 - 8.1.3 Provide resistance to lateral loads due to wind or seismic loads applied parallel or perpendicular to the wall, per Table 2
- 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 TER, they are listed here.
 - 8.3.1 No known variations



9 CONDITIONS OF USE

- 9.1 For conditions not covered in this TER, connections shall be designed in accordance with accepted engineering practice.
- 9.2 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.
- 9.3 Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the AHJ for review and approval.
- 9.4 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*).
- 9.5 At a minimum, this product shall be installed per Section 6 of this TER and the manufacturer's installation instructions.
- 9.6 Manufacturer's installation instructions shall be shipped to the jobsite with the materials or otherwise be available on the jobsite for inspection.
- 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 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.