Technical Evaluation Report™ - Canada

A Duly Authenticated Report from an Approved Agency

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Use of FastenMaster® FrameFAST™ Structural Wood Screw Fasteners to Provide Uplift and Lateral Resistance to Wood Trusses and Rafters Attached to the Tops of Walls - Canada

Trade Secret Report Holder:

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CSI Designations:

DIVISION: 06 00 00 - WOODS, PLASTICS AND COMPOSITES Section: 06 00 90 - Wood and Plastic Fastenings

1 Innovative Product Evaluated[1]

1.1 FastenMaster FrameFAST Structural Wood Screw (FrameFAST Fasteners)

2 Product Description and Materials

2.1 The innovative product evaluated in this report is shown in **Figure 1**.

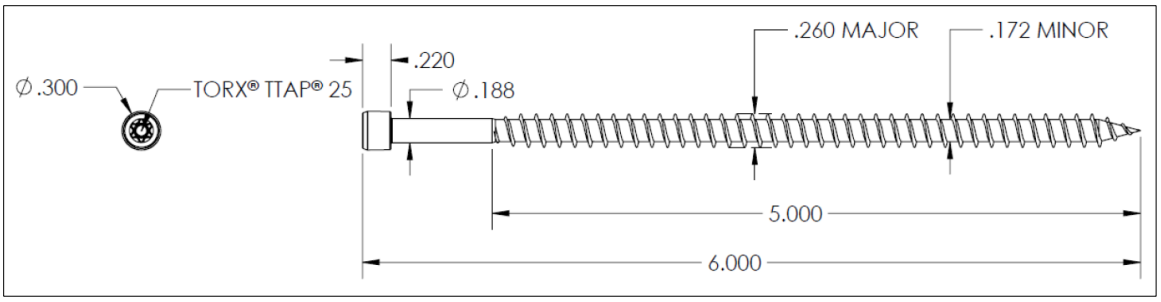

Figure 1. Fastener Designation for FrameFAST Fasteners

2.2 FrameFAST Fasteners are manufactured from carbon steel wire using a standard cold-forming process followed by a heat-treating process conforming to the manufacturer specifications.

2.3 FrameFAST Fasteners are coated with a proprietary coating, red in color, meeting the equivalent protection provided by hot-dip galvanized fasteners coated in accordance with ASTM A153, Class D.

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2.4 FrameFAST Fasteners are approved for use in interior and exterior applications, including pressure-treated wood having ground contact levels of treatment meeting AWPA UC1 through UC4A.

2.5 FrameFAST Fasteners are approved for use in fire-retardant treated lumber, provided the conditions set forth by the fire-retardant treated lumber manufacturer be met, including appropriate strength reductions.

2.6 In-plant quality control procedures, under which FrameFAST Fasteners are manufactured, are audited through an inspection process performed by an approved agency.

2.7 The FrameFAST Fasteners evaluated in this report, are specified in **Table 1**.

Table 1. Fastener Specifications

Fastener	Fastener Designation	Length (mm)		Head (mm)		Diameter (mm)			Minimum Yield Strength,[2] f_y (MPa)	Fastener Factored Resistance[2] (kN)	
		Fastener[1]	Thread[1]	Diameter	Height	Shank	Minor (Root)	Major (Thread)		Tensile	Shear
FrameFAST	FMFF006	152	127	7.6	5.6	4.8	4.4	6.6	1,150	6.45	4.98

Imperial Units: 25.4 mm = 1 in, 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, tensile strength, and shear strength values are determined at minor (root) diameter.

2.8 As needed, review material properties for design in **Section 4** and the regulatory evaluation in **Section 5**.

3 Applicable Codes and Standards[2]

3.1 *Codes*

3.1.1 *NBC - 15, 20, 25: National Building Code of Canada*

3.1.2 *NECB - 17, 20, 25: National Energy Code of Canada for Buildings*

3.1.3 *O Reg. 163/24: Ontario Building Code (OBC)[3]*

3.2 *Standards and Referenced Documents*

3.2.1 *ASTM A153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*

3.2.2 *ASTM D1761: Standard Test Methods for Mechanical Fasteners in Wood*

3.2.3 *ASTM F606: Standard Test Method for Determining Properties of Fasteners*

3.2.4 *ASTM F1575: Standard Test Method for Determining Bending Yield Moment of Nails*

3.2.5 *CSA O86: Engineering Design in Wood*

4 Tabulated Properties Generated from Nationally Recognized Standards

4.1 FrameFAST Fasteners are used to attach minimum 38 mm 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 to the structural framing member.

4.1.1 Walls shall consist of a single or double top plate designed in accordance with NBC Subsection 9.23.11.

4.2 FrameFAST Fasteners are used in buildings requiring wind and seismic analysis in accordance with NBC Subsection 4.1.7 and NBC Subsection 4.1.8, and where, within prescriptive scope, the applicable provisions of NBC Division B, Part 9.

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4.3 FrameFAST Fasteners, when used in the connection of roofs, walls, and beams, provide resistance to uplift and/or lateral loads applied parallel and/or perpendicular to the wall or structural framing that are used with wood structural framing designed in accordance with CSA O86, or where permitted, the applicable prescriptive provisions of NBC Division B, Part 9.

4.4 *Design Concepts and Resistances*

4.4.1 To attach minimum 38 mm (1 1/2") thick wood trusses or rafters to the top plates of wood stud walls using a single fastener.

4.4.1.1 Where the truss or rafter is directly over the stud or beam, fasteners can be installed at an angle through the top plates. See **Figure 2** for installation details.

4.4.1.2 Where the truss or rafter is aligning between studs, fasteners can be installed vertically through double top plates with no reduction in value. See **Figure 3** for installation details.

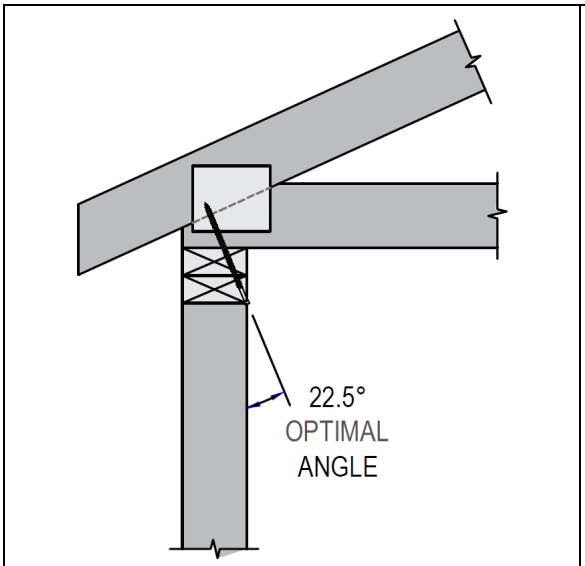

Figure 2. Angled Installation of FrameFAST Fasteners in Truss to Top Plates

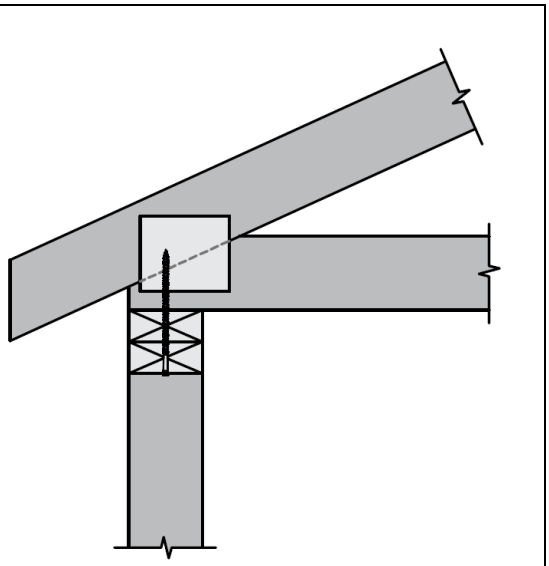

Figure 3. Vertical Installation of FrameFAST Fasteners in Truss to Top Plates

4.4.1.3 Blocking may be installed between trusses or rafters to increase allowable F1 lateral loads. See **Figure 4** for installation details.

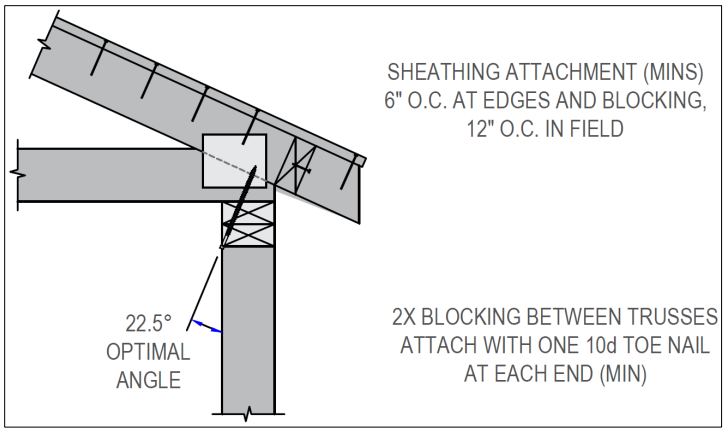

Figure 4. Blocking Between Trusses

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4.4.1.4 Blocking may be installed between roof rafters, floor/ceiling joists, or floor trusses, to increase allowable F1 lateral loads. See **Figure 5** for installation details.

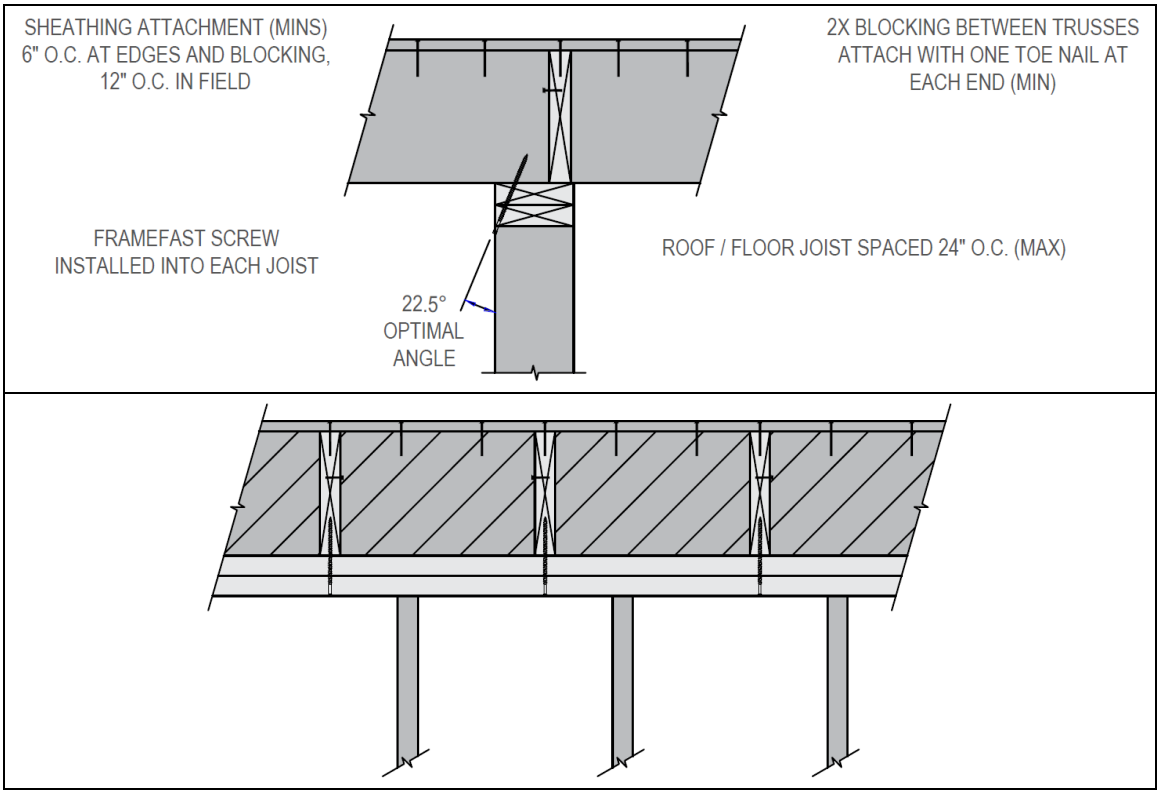

Figure 5. Blocking Between Rafters, Joists, or Floor Trusses

4.4.1.5 Loading orientation is depicted in **Figure 6**.

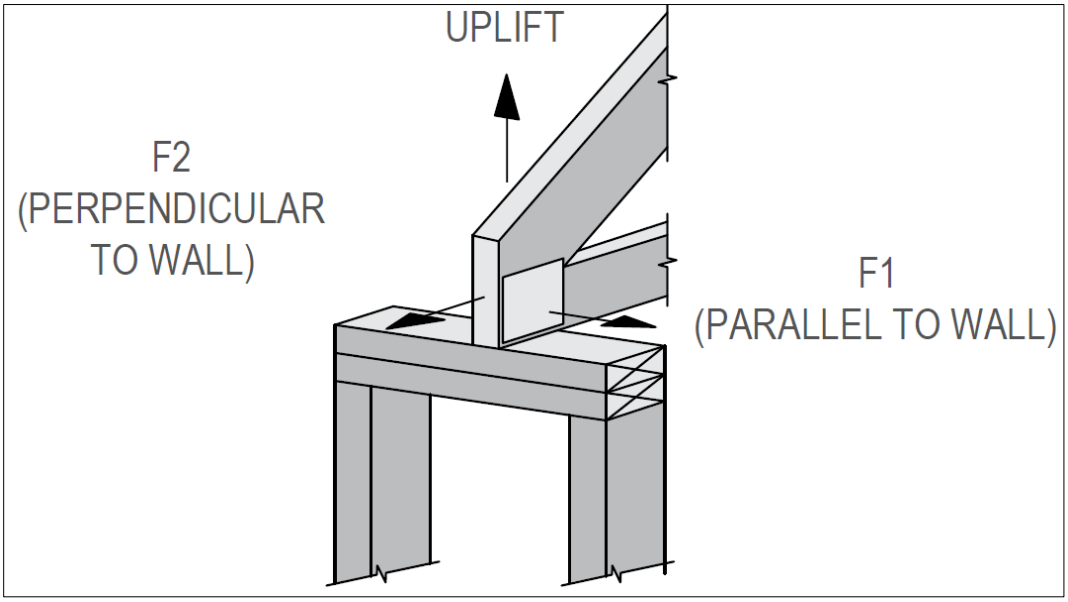

Figure 6. Load Orientations

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4.4.1.6 Available resistances for the connection of minimum 38 mm (1 1/2") thick wood trusses or rafters to the top plates of wood stud walls using a single fastener are provided in **Table 2**.

Table 2. Factored Uplift and Lateral Resistance of FrameFAST Fasteners for Selected Wood Relative Densities[8]

Fastener Designation	Penetration into Truss/Rafter/Wood Structural Support[1] (mm)	Visually Graded Lumber (Relative Density)[2,3]	Factored Uplift Resistance[4,5,6] (kN)	Factored Lateral Resistance[5,6] (kN)		
				F1, Parallel to Wall (Without Blocking)[7]	F1 Parallel to Wall (With Blocking)[7]	F2, Perpendicular to Wall
FMFF006	64	Southern Pine (0.55)	3.7	2.0	4.6	3.5
		Douglas Fir-Larch (0.50)	3.5	2.2	4.3	3.2
		Spruce-Pine-Fir/Hem-Fir (0.42)	3.2	2.4	3.7	2.9

Imperial: 1 mm = 0.039 in, 1 N = 0.225 lb

1. Wood truss and rafter members shall be a minimum of 38 mm (1 1/2") in thickness. Design of truss and rafter members shall be 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 the SCL manufacturer.
3. For applications involving members with different relative densities, use a resistance corresponding to the lowest relative density. Install screws so that the threaded part is half in the top plates, half in the truss members, providing a minimum of 64 mm (2 1/2") of penetration into the truss.
4. Use reduction factor of 0.80 when connecting each ply of multi-ply trusses to the top plate.
5. Factored loads are based on standard term load duration, K_D, of 1.00 and shall be multiplied by the appropriate factors per Clause 12 of CSA O86 (i.e., an increase of 1.15 for short-term load duration may be applied where appropriate. See CSA O86, Table 5.1).
6. See **Figure 4** and **Figure 5** for blocking requirements between trusses, rafter, or floor joists.
7. Factored uplift and lateral resistances are applicable for fastener installation with up to 9.5 mm (3/8") of the head being left exposed (proud), as long as a minimum embedment of 64 mm (2 1/2") in the main member is maintained.

4.4.2 To attach minimum 38 mm (1 1/2") wood trusses, rafters, ceiling joists, or floor joists to headers or beams. See **Figure 7** and **Figure 8** for installation details.

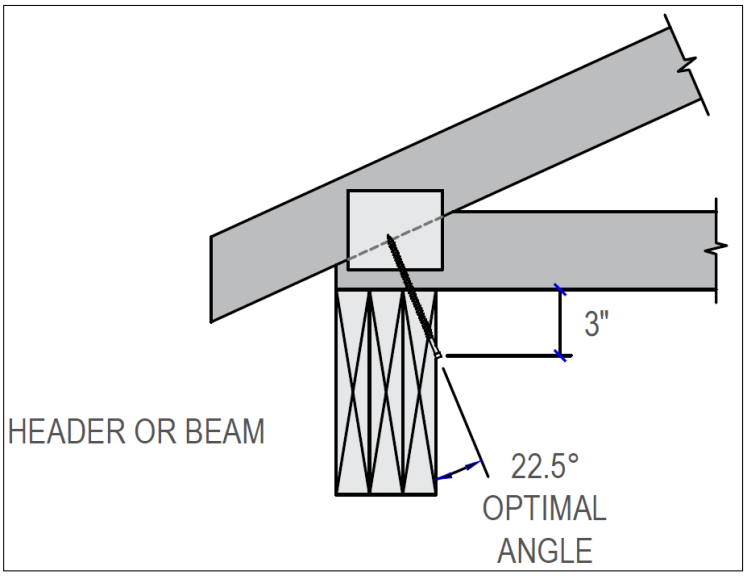

Figure 7. Angled Installation of FrameFAST Fasteners in Truss to Header or Beam

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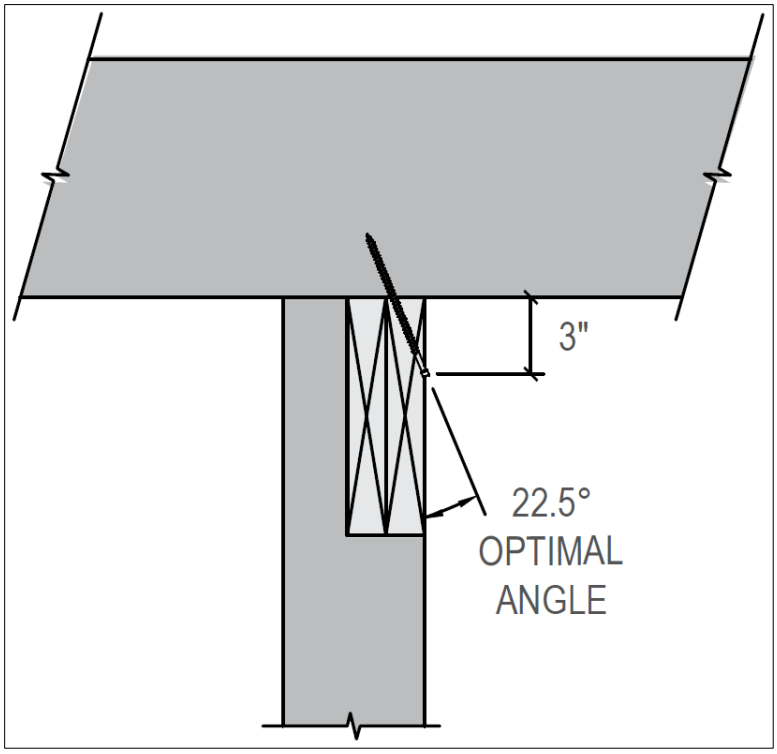

Figure 8. Angled Installation of FrameFAST Fasteners in Joist to Beam

4.4.2.1 The available resistances tabulated in **Table 2** are also applicable for the connection of minimum 38 mm (1 1/2") wood trusses, rafters, ceiling joists, or floor joists to headers or beams.

4.4.3 To attach minimum 38 mm (1 1/2") thick wood trusses or rafters to the top plates of wood stud walls using two fasteners.

4.4.3.1 One fastener is to be installed at an angle through the top plates and into the center of the truss or rafter. The second fastener is to be installed vertically through the top plates into the truss or rafter. See **Figure 9** for installation details.

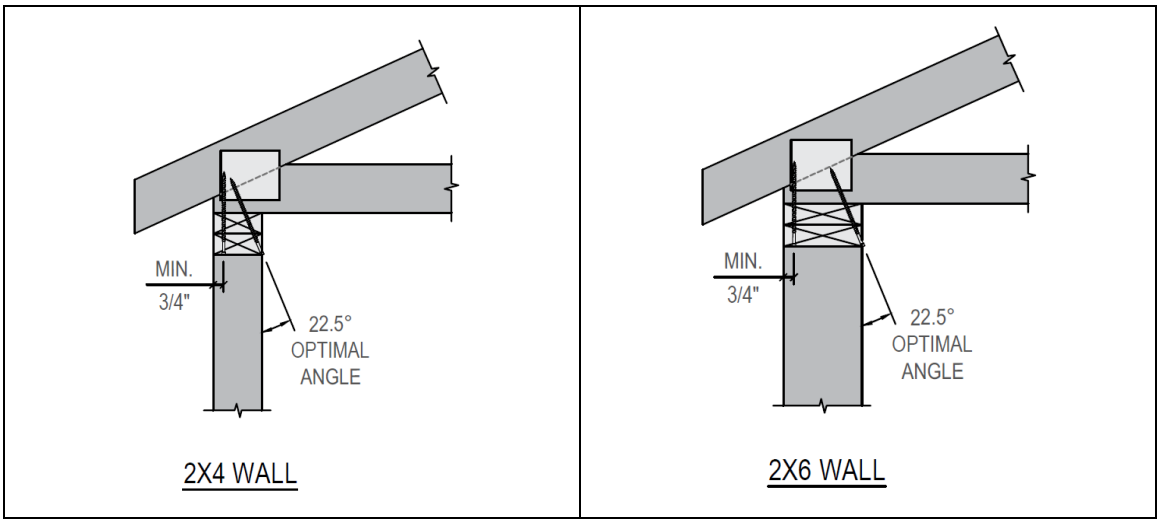

Figure 9. Installation of Two FrameFAST Fasteners in Truss to Top Plate Connection

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4.4.3.2 Where the truss or rafter is aligned directly over a stud, the vertical fastener can be installed up to a 12-degree angle through the top plates to engage the truss or rafter above.

4.4.3.3 Available resistances for the connection of minimum 38 mm (1 1/2") thick wood trusses or rafters to the top plates of wood stud walls using two fasteners are provided in **Table 3**.

Table 3. Factored Uplift and Lateral Resistance for Two FrameFAST Fasteners Connection[6]

Fastener Designation	Species Group (Relative Density)[1,2,3]	Factored Uplift Resistance[4,5] (kN)	Factored Lateral Resistance[4] (kN)		
			F1 Parallel to Wall (Without Blocking)	F1 Parallel to Wall (With Blocking)	F2 Perpendicular to Wall
FMFF006	SP (0.55)	5.9	3.6	5.4	4.6
	DF-L (0.50)	5.6	3.3	4.8	4.1
	SPF/HF (0.42)	5.1	2.7	3.7	3.1

Imperial: 1 mm = 0.039 in, 1 N = 0.225 lb

1. Wood truss, rafter, or floor joist members shall be a minimum of 38 mm (1 1/2") in thickness. Design of truss, rafter, or floor joist members is by others.
2. Equivalent relative density of 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 the factored lateral resistance load corresponding to the lowest relative density.
4. Factored loads are based on standard term load duration, K_D, of 1.00 and shall be multiplied by the appropriate factors per Clause 12 of CSA O86. (i.e., an increase of 1.15 for short-term load duration may be applied where appropriate. See CSA O86, Table 5.1).
5. Use reduction factor of 0.80 when connecting each ply of multiply trusses to the top plate.
6. See **Figure 9** for connection detail requirements.

4.4.4 To attach the 89 mm (3 1/2") thick bottom or top chords of open web floor trusses to the top or bottom plates of wood stud walls.

4.4.4.1 Where the bottom plate is over floor trusses, fasteners can be installed at an angle or vertically through the bottom plate and into the ribbon board below. See **Figure 10** and **Figure 11** for installation details.

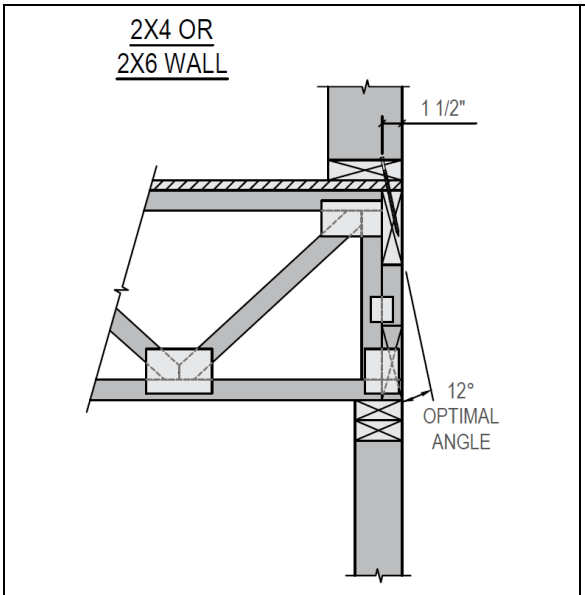

Figure 10. Angled Installation of FrameFAST Fasteners Bottom Plate to Truss Ribbon Board

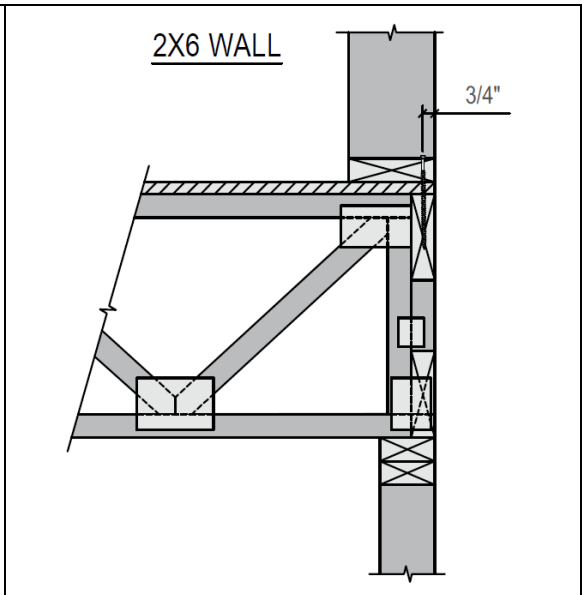

Figure 11. Vertical Installation of FrameFAST Fasteners Bottom Plate to Truss Ribbon Board

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4.4.4.2 Where the floor truss is directly above a stud or header, fasteners can be installed at an angle through the top plates and into the truss chord above.

4.4.4.2.1 For a 2 x 4 wall, see **Figure 12** for installation details.

4.4.4.2.2 For a 2 x 6 wall, see **Figure 13** for installation details.

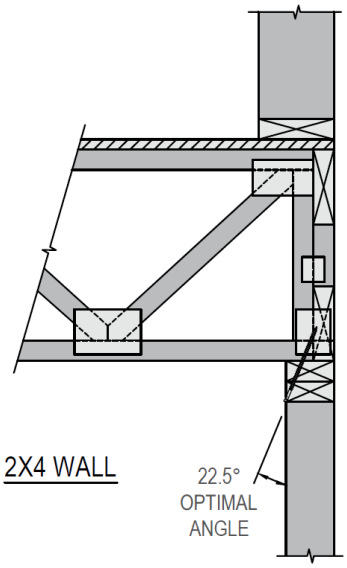

Figure 12. Angled Installation of FrameFAST Fasteners 2 x 4 Top Plates to Bottom Chord

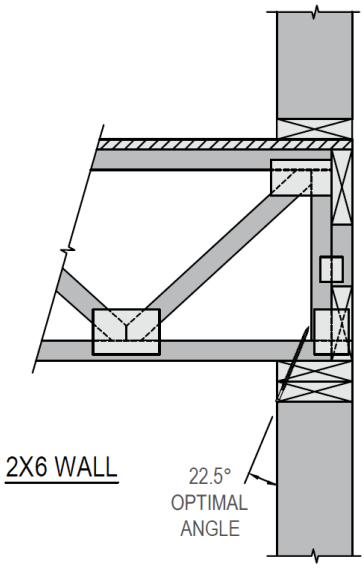

Figure 13. Angled Installation of FrameFAST Fasteners 2 x 6 Top Plates to Bottom Chord

4.4.4.3 Where the floor truss is aligned between studs, fasteners can be installed at an angle or vertically through the top plates and into the ribbon board above. See **Figure 14** and **Figure 15** for installation details.

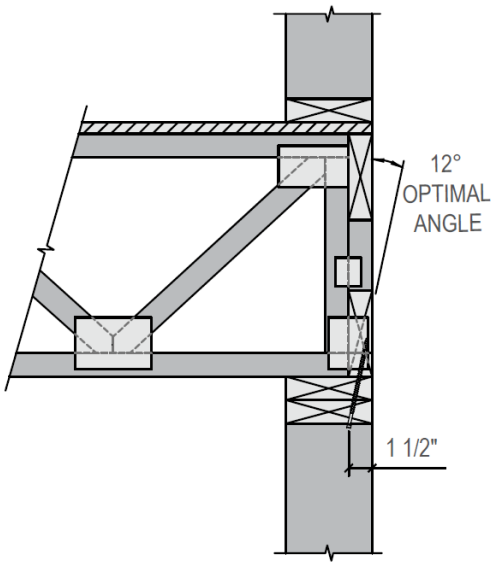

Figure 14. Angled Installation of FrameFAST Fasteners Top Plates to Bottom Chord and Ribbon Board

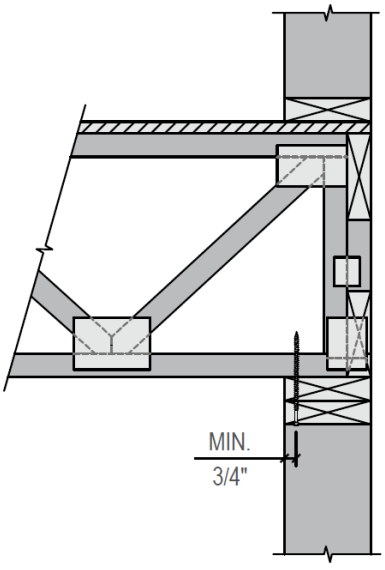

Figure 15. Vertical Installation of FrameFAST Fasteners Top Plates to Bottom Truss Chord

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4.4.4.4 Available resistances for these configurations are provided in **Table 4**. These values include a load reduction where thread penetration into the truss material is less than 64 mm ($2^1/_2$").

Table 4. Factored Uplift and Lateral Resistance of FrameFAST Fasteners in Plate to Floor Truss Configuration

Configuration[3]			Load Orientation	Factored Resistances (kN)[1,2]		
				Species Group (Relative Density)		
				SP (0.55)	DF-L (0.50)	SPF (0.42)
Bottom Plate to Floor Truss	12° Angle into Ribbon Board	**Figure 10**	Uplift	1.2	0.9	0.8
			Lateral - F1	2.2	1.5	1.9
	Vertical into Ribbon Board	**Figure 11**	Uplift	1.2	0.9	0.8
			Lateral - F1	2.2	1.5	1.9
Top Plates to Floor Truss	22.5° Angle into Bottom Chord and Ribbon Board	**Figure 12**	Uplift	3.5	3.3	1.8
			Lateral - F1	3.9	3.3	2.8
	22.5° Angle into Bottom Chord Only	**Figure 13**	Uplift	3.5	3.3	1.8
			Lateral - F1	3.9	3.3	2.8
	12° Angle into Bottom Chord and Ribbon Board	**Figure 14**	Uplift	3.5	3.3	1.8
			Lateral - F1	3.9	3.3	2.8
	Vertical into Bottom Chord Only	**Figure 15**	Uplift	3.3	3.3	1.7
			Lateral - F1	3.9	3.3	2.8

Imperial: 1 N = 0.225 lb

1. For applications involving members with different relative densities, G, use the factored resistance corresponding to the lowest relative density. The top/bottom plates shall be minimum SPF dimensional lumber. Dimensional lumber members shall be minimum of 38 mm ($1^1/_2$") in thickness.
2. Factored loads are based on standard term load duration, K_D, of 1.00 and shall be multiplied by the appropriate factors per CSA O86, Clause 12. (i.e., an increase of 1.15 for short-term load duration may be applied where appropriate. See Table 5.1 of CSA O86).
3. See **Figure 5** for blocking requirements.

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4.4.5 To attach gable trusses or drag trusses to the top plates of wood stud walls. See **Figure 16** for installation details.

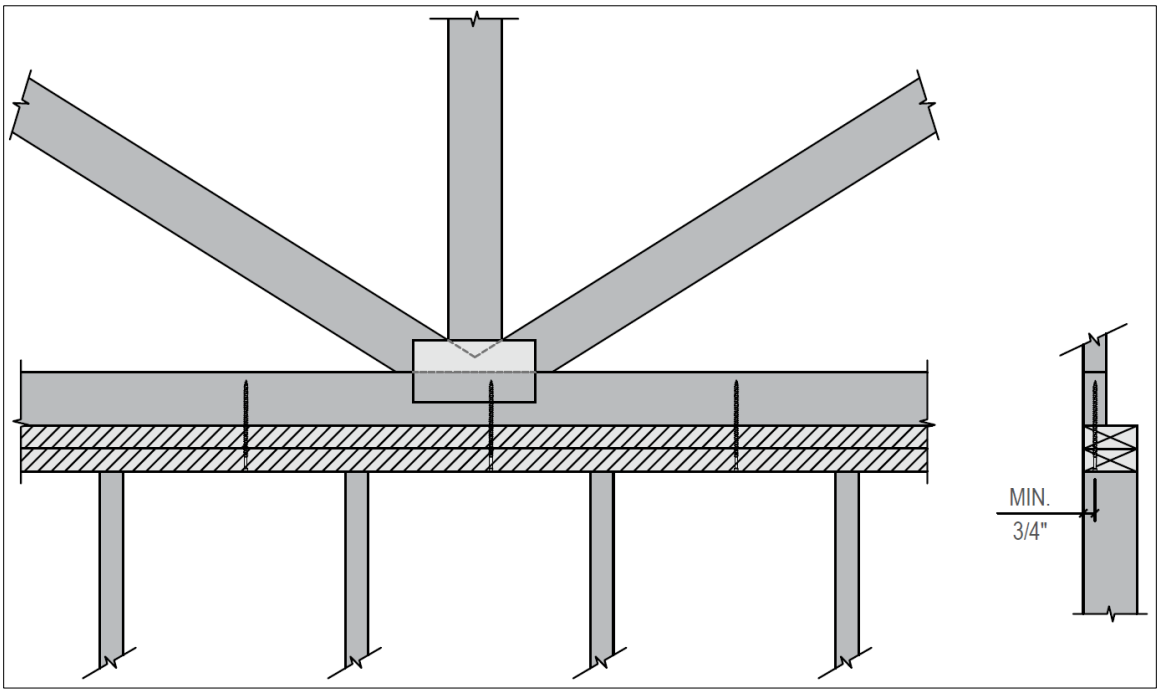

Figure 16. Installation of FrameFAST Fasteners in Gable and Drag Truss to Plates

4.4.5.1 Available resistances for the connection of gable trusses or drag trusses to the top plates of wood stud walls are provided in **Table 5**.

Table 5. Factored Lateral Resistance of FrameFAST Fasteners in Gable and Drag Truss Connections[1,2,3,4,5]

Wood Species	Factored Lateral/Shear Resistance Parallel to Wall (F1)					
	Uniform Load (kN/m) based on Fastening Pattern					
	610 mm o.c.	405 mm o.c.	305 mm o.c.	205 mm o.c.	150 mm o.c.	100 mm o.c.
SP (0.55)	1.2	1.8	2.4	3.5	4.7	7.1
DF-L (0.50)	1.1	1.6	2.2	3.2	4.3	6.4
SPF (0.42)	1.0	1.5	2.0	3.0	4.0	6.0

Imperial: 1 mm = 0.039 in, 1 N = 0.225 lb

1. Wood truss, rafter, or floor joist members shall be a minimum of 38 mm ($1^1/_2$") in thickness. Design of truss, rafter, or floor joist members is by others.
2. For applications involving members with different relative densities, use the factored resistance corresponding to the lowest relative density.
3. Factored loads are based on standard term load duration, K_D, of 1.00 and shall be multiplied by the appropriate factors per CSA O86, Clause 12. (i.e., an increase of 1.15 for short-term load duration may be applied where appropriate. See CSA O86, Table 5.1).
4. Use reduction factor of 0.80 when connecting each ply of multiply trusses to the top plate.
5. Fasteners installed perpendicular to the wood grain of the main member.

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4.4.6 To attach wall studs to the top plates or bottom plates of walls.

4.4.6.1 Fasteners may be installed into the narrow face of the stud or wide face of the stud.

4.4.6.2 Multiple fasteners can be used to obtain greater loads.

4.4.6.2.1 For connections using one fastener, see **Figure 17** and **Figure 18** for installation details.

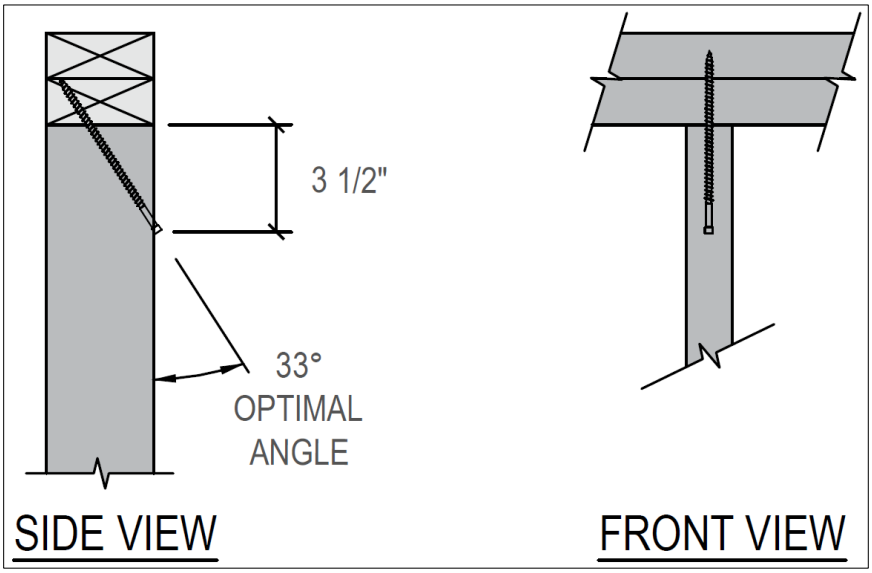

Figure 17. Stud-to Single or Double Top Plate – Single FrameFAST Fasteners Installation

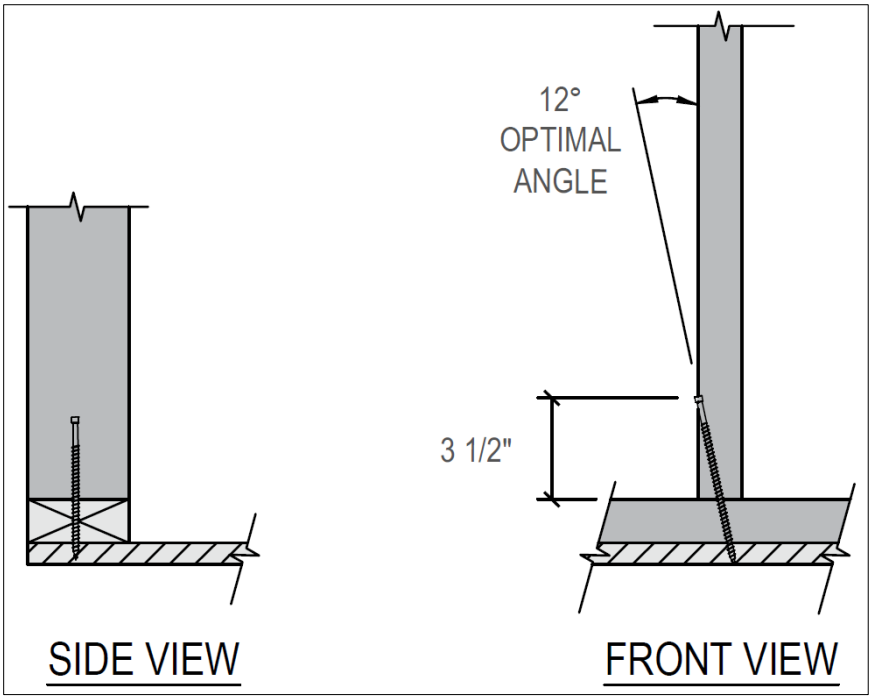

Figure 18. Stud to Bottom Plate – Single FrameFAST Fasteners Installation

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4.4.6.2.2 For connections using two fasteners, see **Figure 19** and **Figure 20** for installation details.

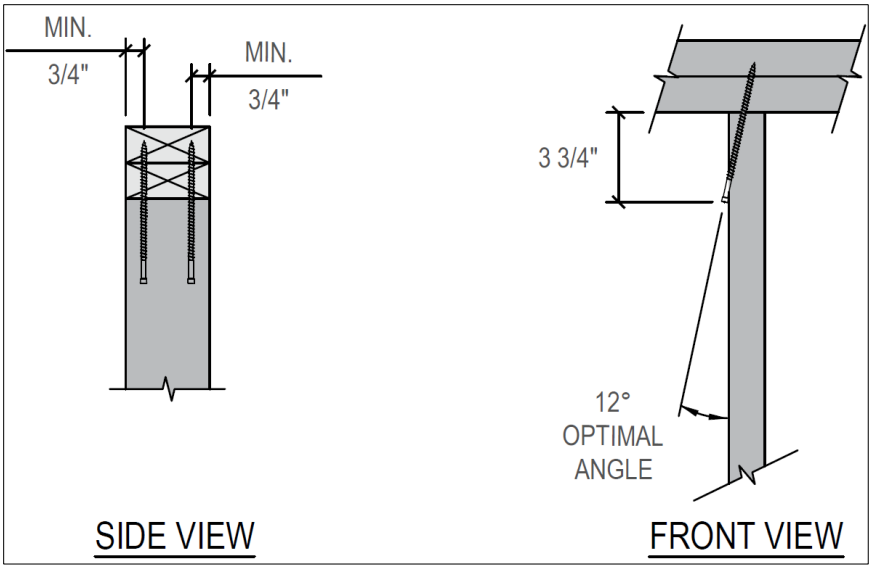

Figure 19. Stud-to Single or Double Top Plate – Two FrameFAST Fasteners Installation

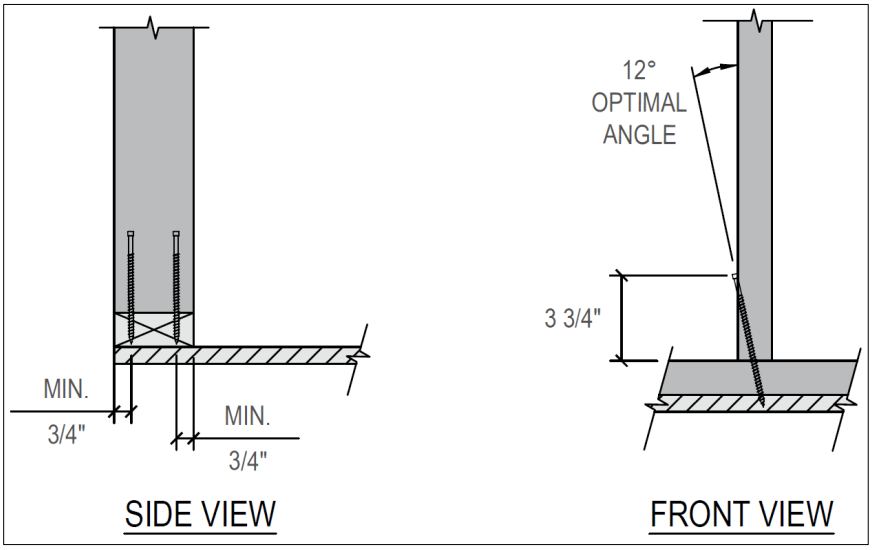

Figure 20. Stud to Bottom Plate – Two FrameFAST Fasteners Installation

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4.4.6.2.3 For connections using three fasteners, see **Figure 21** and **Figure 22** for installation details.

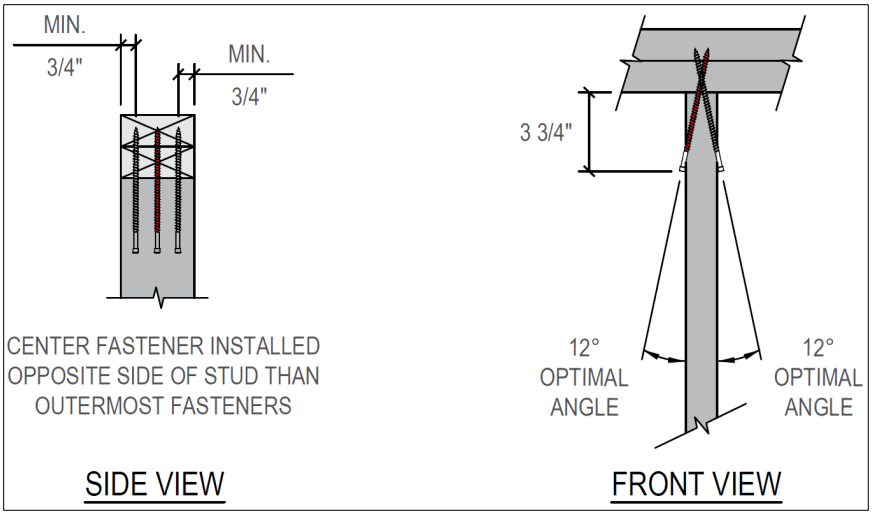

Figure 21. Stud-to Single or Double Top Plate – Three FrameFAST Fasteners Installation

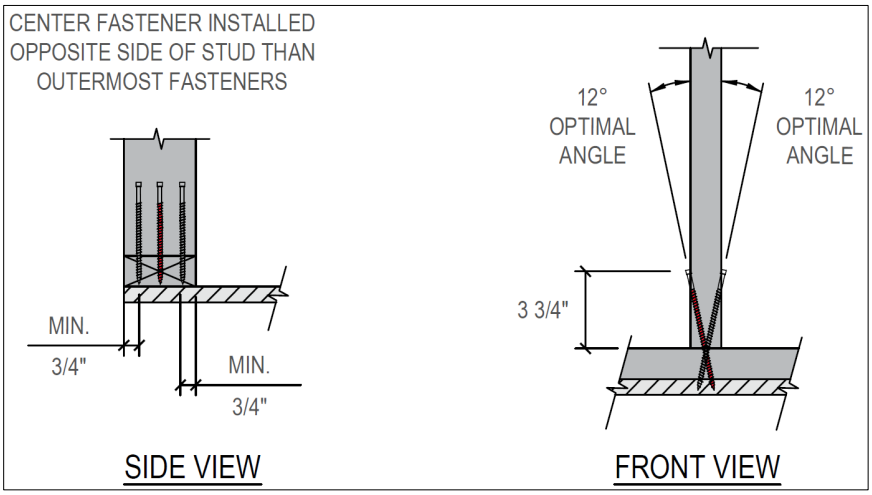

Figure 22. Stud to Bottom Plate – Three FrameFAST Fasteners Installation

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4.4.6.3 Available resistances for the connection of wall studs to the top plates or bottom plates of walls are provided in **Table 6**.

Table 6. Factored Uplift and Lateral Resistance of FrameFAST Fasteners in Stud to Plate Connections[3,4,5]

Wood Species[1,2]	Factored Uplift and Lateral (F1) Resistances Based on Number of Fasteners (kN)					
	Single Fastener		2 Fasteners		3 Fasteners	
	Uplift	Lateral – F2	Uplift	Lateral – F2	Uplift	Lateral – F2
SP (0.55)	3.1	1.2	6.1	2.4	9.2	3.6
DF-L (0.50)	2.5	1.1	4.9	2.2	7.4	3.3
SPF (0.42)	1.3	0.9	2.5	1.9	3.8	2.8

Imperial: 1 N = 0.225 lb

1. For applications involving members with different relative densities, use the factored resistance corresponding to the lowest relative density.
2. Dimensional lumber members shall be minimum of 38 mm (1½") in thickness.
3. Factored loads are based on standard term load duration, K_D, of 1.00 and shall be multiplied by the appropriate factors per CSA O86, Clause 12. (i.e., an increase of 1.15 for short-term load duration may be applied where appropriate. See CSA O86, Table 5.1).
4. Use a reduction factor of 0.80 when connecting each ply of multi-ply stud columns to the top plate.
5. Two 3.33 mm x 76 mm (0.131" x 3") nails shall be installed through the lower top plate and into the studs.

4.4.7 To attach two-ply or three-ply carrying beams to the top of supporting nominal 4x or 6x posts.

4.4.7.1 For 2-ply beams that are attached to 4x posts, see **Figure 23** for installation details.

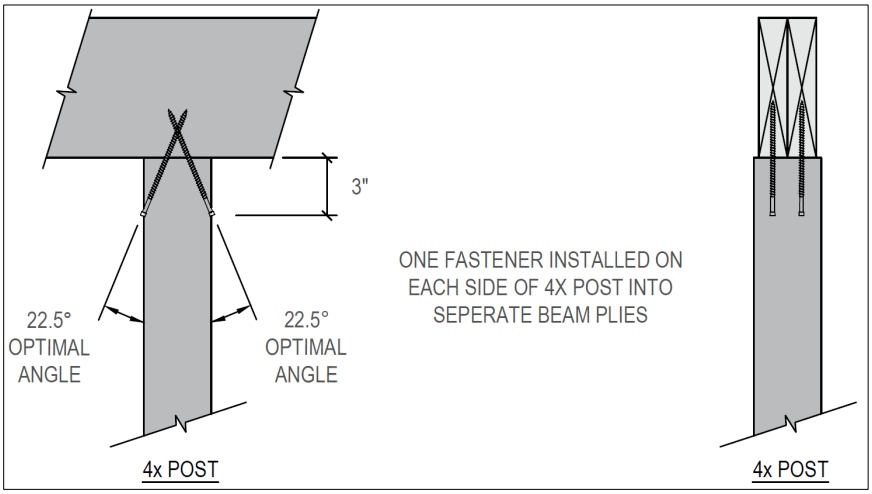

Figure 23. 4x Post to 2-Ply Beam using Two FrameFAST Fasteners

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4.4.7.2 For 2-ply beams that are attached to 6x posts, see **Figure 24** for installation details.

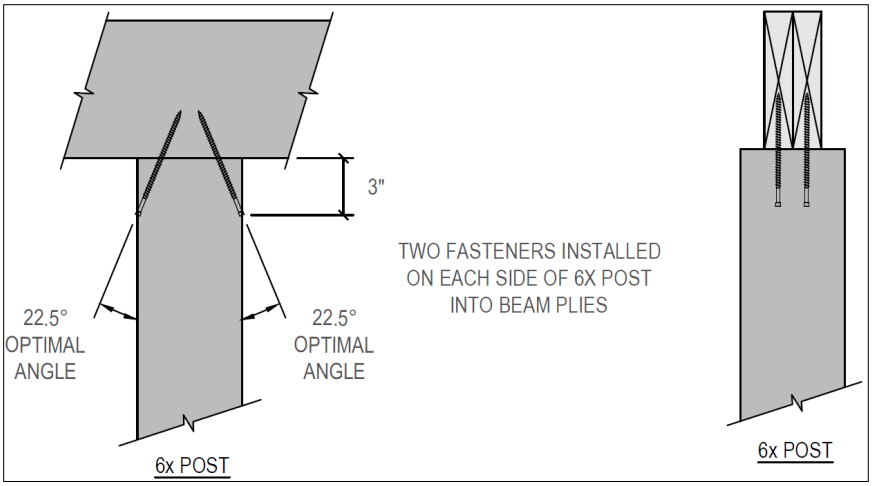

Figure 24. 6x Post to 2-Ply Beam using Four FrameFAST Fasteners

4.4.7.3 For 3-ply beams that are attached to 6x posts, see **Figure 25** for installation details.

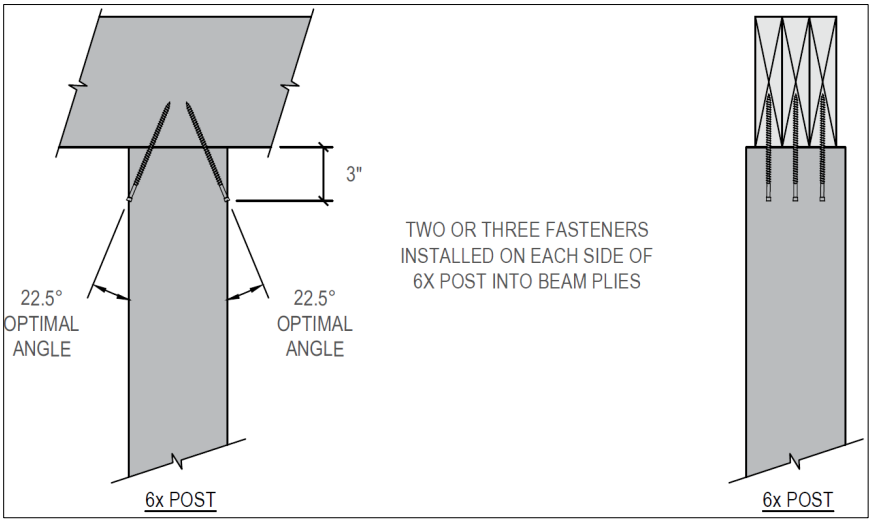

Figure 25. 6x Post to 3-Ply Beam using Six FrameFAST Fasteners

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4.4.7.4 Available resistances for the connection of attach two-ply or three-ply carrying beams to the top of supporting nominal 4x or 6x posts are provided in **Table 7**.

Table 7. Factored Uplift and Lateral Resistance of FrameFAST Fasteners in Post to Beam Connections[1,2,3,4]

Configuration	Number of Fasteners	Wood Species	Factored Resistance (kN)	
			Uplift	Lateral
2-Ply Beam	2	SP (0.55)	7.4	4.7
		DF-L (0.50)	7.0	4.3
		SPF (0.42)	6.4	4.0
2-Ply Beam	4	SP (0.55)	11.8	7.6
		DF-L (0.50)	11.2	6.9
		SPF (0.42)	10.2	6.5
3-Ply Beam	6	SP (0.55)	17.7	11.3
		DF-L (0.50)	16.7	10.3
		SPF (0.42)	15.3	9.7

Imperial: 1 N = 0.225 lb

1. For applications involving members with different relative densities, use the factored resistance corresponding to the lowest relative density.
2. Dimensional lumber members shall be minimum of 38 mm (1½") in thickness.
3. Factored loads are based on standard term load duration, K_D, of 1.00 and shall be multiplied by the appropriate factors per CSA O86, Clause 12. (i.e., an increase of 1.15 for short-term load duration may be applied where appropriate. See CSA O86, Table 5.1).
4. Use a reduction factor of 0.80 when connecting each ply of multi-ply beams to the post.

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4.4.8 To attach top or bottom wall plates to rim boards.

4.4.8.1 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. See **Figure 26** for installation details.

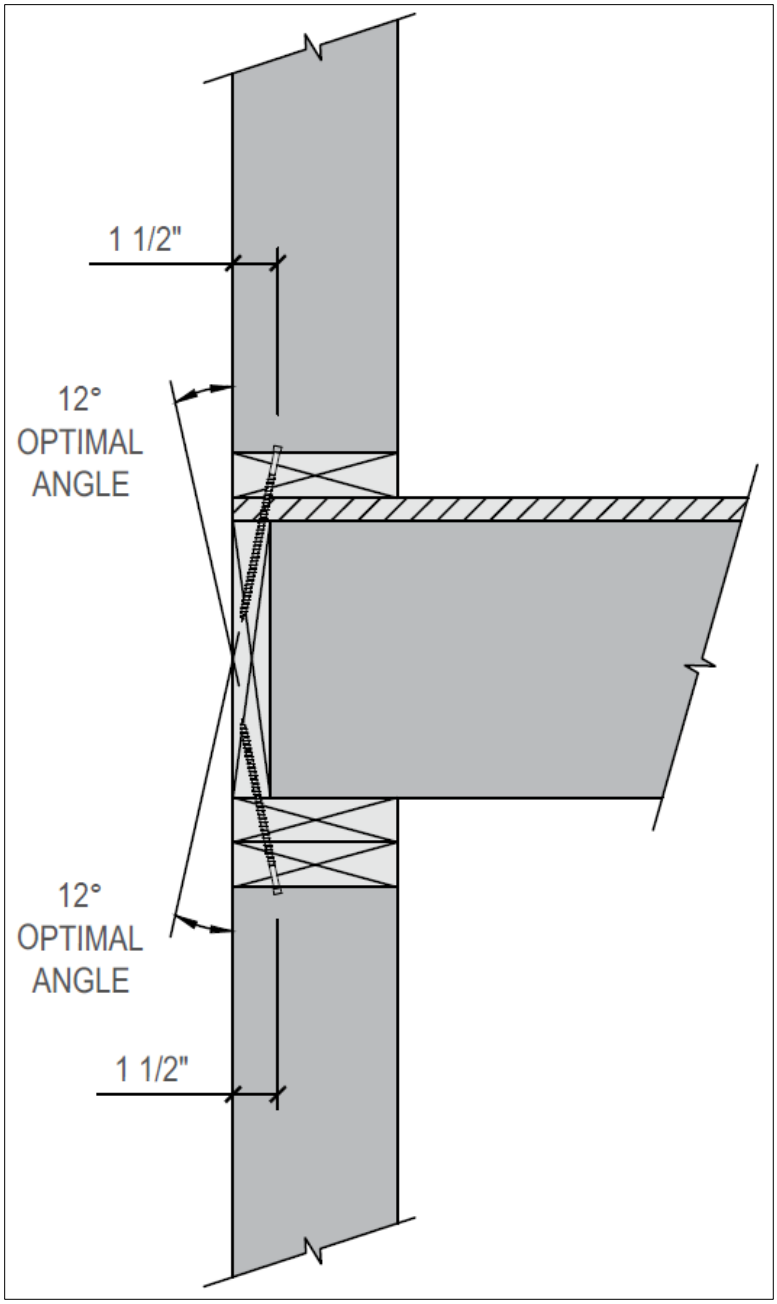

Figure 26. Installation of FrameFAST Fasteners in Plate to Rim Connections

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4.4.8.2 Available resistances for the connection of top or bottom wall plates to rim boards are provided in **Table 8**.

Table 8. Factored Uplift and Lateral Resistance of FrameFAST Fasteners in Plate to Rim Connections

Load Direction	Configuration	Factored Resistance (kN)[1,2]					
		Rim Board Species (Relative Density or Equivalent Relative Density)					
		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	0.8	0.9	1.2	0.7	0.6	0.4
	Double Plate to Rim Board	1.8	3.3	3.5	2.0	3.4	3.2
Load Direction	**Configuration**	**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	1.9	1.5	2.2	1.9	1.1	1.8
	Double Plate to Rim Board	2.8	3.3	3.9	1.3	2.7	2.4
	Double Plate to Blocking[7]	2.8	3.3	3.9	1.3	2.7	2.4

Imperial: 1 N = 0.225 lb

1. For applications involving members with different relative densities, G, use the factored resistance corresponding to the lowest relative density. For EWP rim boards (e.g., OSB, LSL, LVL), the top/bottom plates shall be minimum SPF dimensional lumber. Dimensional lumber members shall be minimum of 38 mm (1 1/2") in thickness.
2. Factored loads are based on standard term load duration, K_D, of 1.00 and shall be multiplied by the appropriate factors per CSA O86, Clause 12. (i.e., an increase of 1.15 for short-term load duration may be applied where appropriate. See CSA O86, Table 5.1).
3. Equivalent relative density values are for withdrawal of nails or screws installed in edge.
4. Equivalent relative density values are dowel bearing of nails or screws installed in edge.
5. Equivalent relative density values are for withdrawal of nails installed in face.
6. Equivalent relative density values are dowel bearing of nails or screws installed in face.
7. See **Figure 5** for blocking requirements.

4.5 See **Section 6** for additional fastener installation requirements.

4.6 When needed, consult a professional engineer for complex design conditions

4.7 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.

4.8 Alternative techniques shall be permitted in accordance with accepted engineering practice and experience. These provisions for the use of alternative materials, designs, and methods of construction are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed herein. This includes, but is not limited to, the following areas of engineering: mechanics of materials, structures, building science, and fire science.

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5 Regulatory Evaluation and Accepted Engineering Practice

5.1 FrameFAST Fasteners were evaluated, using assembly tests to derive factored design values as an alternative 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:

5.1.1 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.

5.1.2 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.

5.1.3 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.

5.2 Connections other than those addressed in **Section 5** are outside the scope of this report.

5.3 Douglas Consultants Inc. has collaborated with DrJ Engineering through the review of this technical evaluation.

5.4 Any building code, regulation and/or accepted engineering evaluations (i.e., research reports, duly authenticated reports, etc.) that are conducted for this report were performed by DrJ, which is an ISO/IEC 17065 accredited certification body and a professional engineering company operated by RDP or approved sources. DrJ is qualified[4] to practice product and regulatory compliance services within its scope of accreditation and engineering expertise,[5] respectively.

5.5 Testing and related engineering evaluations are defined as intellectual property and/or trade secrets.[6]

5.6 Engineering evaluations are conducted with DrJ's ANAB accredited ICS code scope of expertise that is also its areas of professional engineering competence.[7]

6 Installation

6.1 Installation shall comply with the approved construction documents, the manufacturer installation instructions, this report, and the applicable building code.

6.2 In the event of a conflict between the manufacturer installation instructions and this report, contact the manufacturer for counsel on the proper installation method.

6.3 FrameFAST Fasteners shall be installed at the reference angle and offset distance specific to the application detail to obtain the corresponding tabulated loads in **Section 4**.

6.4 Use a $^{1}/_{2}$" low-RPM/high-torque drill to drive the fastener head flush with the surface of the wall framing or wood structural framing member.

6.4.1 The head of the fastener may be left proud a maximum of $^{3}/_{8}$" for inspectability without a reduction in the printed allowable loads.

7 Substantiating Data

7.1 Testing has been performed under the supervision of a professional engineer and/or under the requirements of ISO/IEC 17025 as follows:

7.1.1 Uplift and lateral resistance testing in accordance with ASTM D1761

7.1.2 Fastener bending yield testing in accordance with ASTM F1575

7.1.3 Fastener shear strength testing in accordance with NASM 1312-20

7.1.4 Fastener tensile strength testing in accordance with ASTM F606

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7.2 Information contained herein is the result of testing and/or data analysis by sources that conform to the evaluation requirements of NBC Volume 1 Relationship of the NBC to Standards Development and Conformity Assessment and/or professional engineering regulations. DrJ relies upon accurate data to perform its ISO/IEC 17065 evaluations.

7.3 Where appropriate, DrJ's analysis is based on provisions that have been codified into law through provincial, territorial, or local adoption of codes and standards. The developers of these codes and standards are responsible for the reliability of published content. DrJ analysis may use code-adopted provisions as a control sample. A control sample versus a test sample establishes a product as being equivalent to that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

7.4 The accuracy of the provisions provided herein may be reliant upon the published properties of raw materials, which are defined by the grade mark, grade stamp, mill certificate, listings, certified reports, duly authenticated reports from approved agencies, and research reports prepared by approved agencies and/or approved sources provided by the suppliers of products, materials, designs, assemblies and/or methods of construction. These are presumed to be minimum properties and relied upon to be accurate. The reliability of DrJ's engineering practice, as contained in this report, may be dependent upon published design properties by others.

7.5 *Testing and Engineering Analysis*

7.5.1 The strength, rigidity and/or general performance of component parts and/or the integrated structure are determined by suitable tests that simulate the actual conditions of application that occur and/or by accepted engineering practice and experience.

7.6 Where additional condition of use and/or code compliance information is required, please search for FrameFAST Fasteners on the DrJ Certification website.

8 Findings

8.1 As outlined in **Section 4**, FrameFAST Fasteners have performance characteristics that were tested and/or meet applicable regulations. In addition, they are suitable for use pursuant to its specified purpose.

8.2 When used and installed in accordance with this duly authenticated report and the manufacturer installation instructions, FrameFAST Fasteners shall be approved for the following applications:

8.2.1 As an acceptable means of attaching metal plate connected wood trusses, roof rafters, ceiling or floor joists to the top wall plates or supporting beams as provided in **Table 2**, **Table 3**, **Table 4**, and **Table 5**.

8.2.2 As an acceptable means of attaching studs to top/bottom plate in accordance with **Table 6**.

8.2.3 As an acceptable means of attaching posts/columns to multi-ply beams in accordance with **Table 7**.

8.2.4 As an acceptable means of attaching top/bottom wall plate to rim board/ribbon board in accordance with **Table 8**.

8.3 Any application specific issues not addressed herein can be engineered by an RDP. Assistance with engineering is available from FastenMaster.

8.4 This innovative product has been evaluated in the context of the codes listed in **Section 3** 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 report, they are listed here:

8.4.1 No known variations

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8.5 NBC Volume 1 Relationship of the NBC to Standards Development and Conformity Assessment:

> **Certification**
>
> Certification is the confirmation by an independent organization that a product, service, or system meets a requirement…Certification bodies publish lists of certified products and companies…Several organizations, including the Canadian Construction Materials Centre (CCMC), offer such evaluation services.
>
> **Evaluation**
>
> An evaluation is a written opinion by an independent professional organization that a product will perform its intended function. An evaluation is very often done to determine the ability of an innovative product, for which no standards exist, to satisfy the intent of the Code requirement...

8.6 ISO/IEC 17065 accredited third-party certification bodies,[8] including but not limited to, Standards Council of Canada (SCC)[9] and ANSI National Accreditation Board (ANAB),[10] confirm that product certification bodies have the expertise to provide technical evaluation services within their scope of accreditation. All SCC and ANAB product certification bodies meet NBC requirements to offer evaluation services for alternative solutions.[11]

8.6.1 DrJ is an ISO/IEC 17065 ANAB-Accredited Product Certification Body – Accreditation #1131[12] and employs professional engineers.[13]

8.7 Through ANAB accreditation and the IAF Multilateral Agreements, this report 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*." IAF specifically says, "*Once an accreditation body is a signatory of the IAF MLA, it is required to recognise certificates and validation and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA, with the appropriate scope*."[14]

8.8 Product certification organizations, accredited by the SCC and ANAB, are defined as equivalent evaluation services:

8.8.1 Canada-United States-Mexico Agreement (CUSMA), Article 11.6 Conformity Assessment confirms mutual recognition by stating, "*...each Party shall accord to conformity assessment bodies located in the territory of another Party treatment no less favorable than that it accords to conformity assessment bodies located in its own territory or in the territory of the other Party*."

8.8.2 The SCC National Conformity Assessment Principles states, "*SCC is a member of a number of international organizations developing voluntary conformity assessment agreements that help ensure the international acceptance of Canadian conformity assessment results. Signatories to these agreements (like SCC) recognize each other's accreditations as being equivalent to their own*."[15]

8.9 Building official approval of a licensed professional engineer is performed by verifying the professional engineer and/or their business entity are listed by the engineering regulators of the relevant jurisdiction.

9 Conditions of Use

9.1 As defined in **Section 4**, where material and/or engineering mechanics properties are created for load resisting design purposes, the resistance to the applied load shall not exceed the ability of the defined properties to resist those loads using the principles of accepted engineering practice.

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

9.3 The manufacturer installation instructions shall be shipped to the jobsite with the materials or otherwise be available on the jobsite for inspection.

9.4 Loads applied are limited to those recommended by the manufacturer or as defined in this report.

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9.5 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 authority having jurisdiction (AHJ) in which the project is to be constructed.

9.6 When required by regulation and enforced by the building official, also known as the Authority Having Jurisdiction (AHJ) in which the project is to be constructed:

9.6.1 Any calculations incorporated into the construction documents shall conform to accepted engineering practice and, when prepared by an approved source, shall be approved when signed and sealed.

9.6.2 This report and the installation instructions shall be submitted at the time of permit application.

9.6.3 This innovative product has an internal quality control program and a third-party quality assurance program.

9.6.4 At a minimum, this innovative product shall be installed per **Section 6** of this report.

9.6.5 This report shall be reviewed for code compliance by the AHJ in concert with the duties and powers granted to the building official by the provincial regulations governing such duties and powers.

9.6.6 The application of this innovative product in the context of this report is dependent upon the accuracy of the construction documents, implementation of installation instructions, inspections, and any other regulatory requirements that may apply.

9.7 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 (i.e., owner).

9.8 The actual design, suitability, and use of this report for any particular building, is the responsibility of the owner or the authorized agent of the owner.

10 Identification

10.1 FastenMaster FrameFAST Structural Wood Screw (FrameFAST Fasteners), as listed in **Section 1.1**, are identified by a label on the board or packaging material bearing the manufacturer name, product name, this report number, and other information to confirm code compliance.

10.2 Additional technical information can be found at www.fastenmaster.com/products/framefastscrew.

11 Review Schedule

11.1 This report is subject to periodic review and revision. For the latest version, visit www.drjcertification.org.

11.2 For information on the status of this report, please contact DrJ Certification.

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Notes

1 For more information, visit drjcertification.org or call us at 608-310-6748.

2 Unless otherwise noted, all references in this report are from the 2020 version of the NBC. This alternative solution is also approved for use with the 2010 and 2015 NBC and the standards referenced therein.

3 References in this report to the National Building Code of Canada (NBC) apply to the Ontario Building Code (OBC), unless noted otherwise.

4 Qualification is performed by a legislatively defined Accreditation Body. ANSI National Accreditation Board (ANAB) is the largest independent accreditation body in North America and provides services in more than 75 countries. DrJ is an ANAB accredited product certification body.

5 https://anabpd.ansi.org/Accreditation/product-certification/AllDirectoryDetails?prgID=1&orgID=2125&statusID=4#:~:text=Bill%20Payment%20Date-,Accredited%20Scopes,-13%20ENVIRONMENT.%20HEALTH

6 18 U.S. Code § 1831 - Economic espionage - Whoever, intending or knowing that the offense will benefit any foreign government, foreign instrumentality, or foreign agent, knowingly steals, or without authorization appropriates, takes, carries away, or conceals, or by fraud, artifice, or deception obtains a trade secret shall be fined not more than $5,000,000 or imprisoned not more than 15 years, or both. Any organization that commits any offense described shall be fined not more than the greater of $10,000,000 or 3 times the value of the stolen trade secret to the organization, including expenses for research and design and other costs of reproducing the trade secret that the organization has thereby avoided. https://www.law.cornell.edu/uscode/text/18/part-I/chapter-90.

7 ANAB is part of the USMCA and IAF MLA, where the purpose of these agreements are to ensure mutual recognition of accredited certification and validation/verification statements between agreement signatories, and subsequent acceptance of ANAB accredited certification and validation/verification statements by professional engineers based upon having one universal approval process for the timely approval of innovative materials, products, designs, services, assemblies and/or methods of construction.

8 https://anabpd.ansi.org/Accreditation/product-certification/DirectoryListingAccredited?menuID=1&prgID=1

9 https://iaf.nu/en/member-details/?member_id=91

10 https://iaf.nu/en/member-details/?member_id=14

11 NBC Division A Clause A-1.2.1.1.(1)(b) provides information on code compliance via alternative solutions and defines alternative solutions as *"...achiev[ing] at least the minimum level of performance required by Division B."* NBC Division C Section 2.3 includes additional guidance for documentation of alternative solutions.

12 https://anabpd.ansi.org/Accreditation/product-certification/AllDirectoryDetails?&prgID=1&OrgId=2125&statusID=4

13 Through ANAB accreditation and the IAF MLA, DrJ certification can be used to obtain material, product, design, or method of construction approval in any jurisdiction or country that has IAF MLA Members & Signatories to meet the Purpose of the MLA – "*certified once, accepted everywhere*".

14 https://iaf.nu/en/about-iaf-mla/#:~:text=required%20to%20recognise

15 The National Conformity Assessment Principles states, "*Product regulations and standards may vary from country to country. If these are set arbitrarily, they could be deemed as protectionist. The World Trade Organization (WTO) Agreement on Technical Barriers to Trade (TBT Agreement) is intended to ensure that technical regulations, standards and conformity assessment procedures of member countries do not create unnecessary obstacles to trade. Under the TBT Agreement, members of the WTO agree to use international standards, including conformity assessment standards and guides, as a basis for their technical requirements.*"

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