DrJ CERTIFICATION

Technical Evaluation Report™

Report Number 1608-02

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 – Limit States Design

OMG®, Inc. dba FastenMaster

Product:
FastenMaster FrameFAST Structural Wood Screws
(FrameFAST Fasteners)

Issue Date:
October 18, 2016

Revision Date:
May 16, 2024

Subject to Renewal:
July 1, 2025

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INFORMATION:

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CSI Designations:

DIVISION: 06 00 00 - WOOD, 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 Applicable Codes and Standards[2]

2.1 *Codes*

2.1.1 *NBC—10, 15, 20: National Building Code of Canada*

2.1.2 *NECB—17, 20: 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 F606: Standard Test Method for Determining Properties of Fasteners*

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

2.2.5 *CSA O86: Engineering Design in Wood*

3 Performance Evaluation

3.1 Testing and related engineering evaluations are defined as intellectual property and/or trade secrets.[3]

3.2 Engineering evaluations are conducted within DrJ's ANAB accredited ICS code scope, which are also its areas of professional engineering competence.[4]

3.3 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:

3.3.1 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.

3.3.2 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.

3.3.3 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.

3.4 Connections other than those addressed in **Section 3** are outside the scope of this report.

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

3.6 Any engineering evaluation conducted for this report was performed on the dates provided in this report and within DrJ's professional scope of work.

3.7 Any regulation specific issues not addressed in this section are outside the scope of this report.

4 Product Description and Materials

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

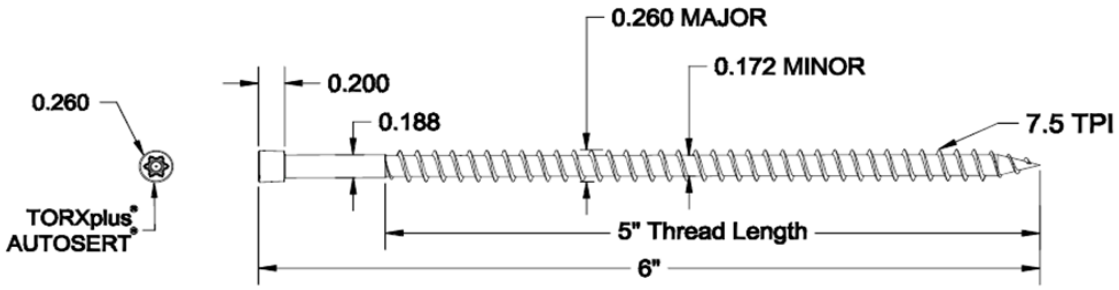


Figure 1. Fastener Designation for FrameFAST Fasteners

4.2 FrameFAST Fasteners are manufactured with modified 10B21 carbon steel wire conforming to the manufacturer 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 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 FrameFAST Fasteners are manufactured, are audited through an inspection process performed by an approved agency.

4.7 The FrameFAST Fasteners evaluated in this report, are designated as shown in **Table 1**.

Table 1. Fastener Specifications

Fastener	Fastener Designation	Length (mm)		Head (mm)		Diameter (mm)			Minimum Yield,[2] f_{yb} (MPa)
		Fastener[1]	Thread[1]	Diameter	Height	Shank	Minor (Root)	Major (Thread)	
FrameFAST	FMFF006	152	127	6.6	5.1	4.8	4.4	6.6	1,150

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 value determined at minor (root) diameter.

5 Applications

5.1 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.

5.1.1 Walls shall consist of a single or double top plate designed in accordance with NBC Subsection 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 Subsection 4.1.7 and 4.1.8.

5.3 *Design Concepts and Resistances*

5.3.1 The uplift and lateral resistance, parallel (F1) and perpendicular (F2), to the plane of the wall or structural member as shown in **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**.

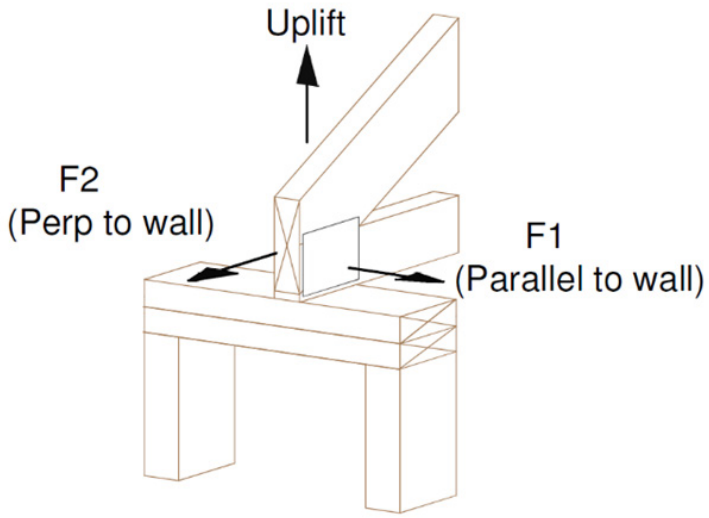


Figure 2. Uplift & Lateral Load Orientations

Table 2. Specified Uplift and 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

Imperial Units: 25.4 mm = 1 in, 1 kN = 224.8 lbf

1. Wood truss and rafter members shall be a minimum of 38 mm (1.5") 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 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 63.5 mm (2.5") 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. 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.

5.3.2 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 the provisions of CSA O86.

5.3.2.1 Consult a professional engineer as needed for complex design conditions.

5.4 Where the application falls outside of the performance evaluation, conditions of use and/or installation requirements set forth herein, alternative techniques shall be permitted in accordance with accepted engineering practice and experience. This includes but is not limited to the following areas of engineering: mechanics or materials, structural, building science and fire science.

6 Installation

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

6.2 In the event of a conflict between the manufacturer installation instructions this report and the applicable building code, the more restrictive shall govern.

6.3 *Installation Procedure*

6.3.1 Select FrameFAST Fasteners 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.

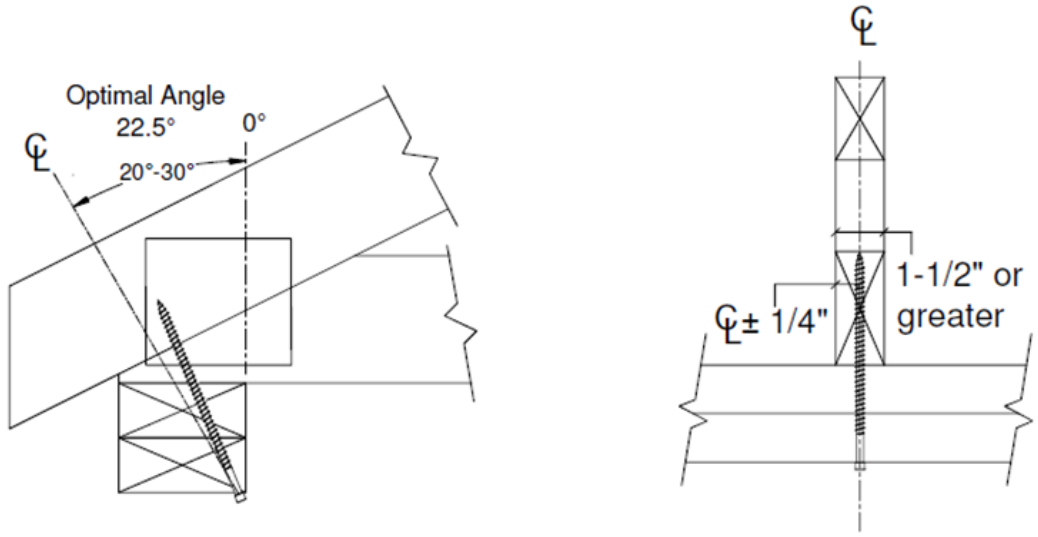


Figure 3. Installation of FrameFAST Fasteners on Wood Truss or Rafter to Double Top Plate

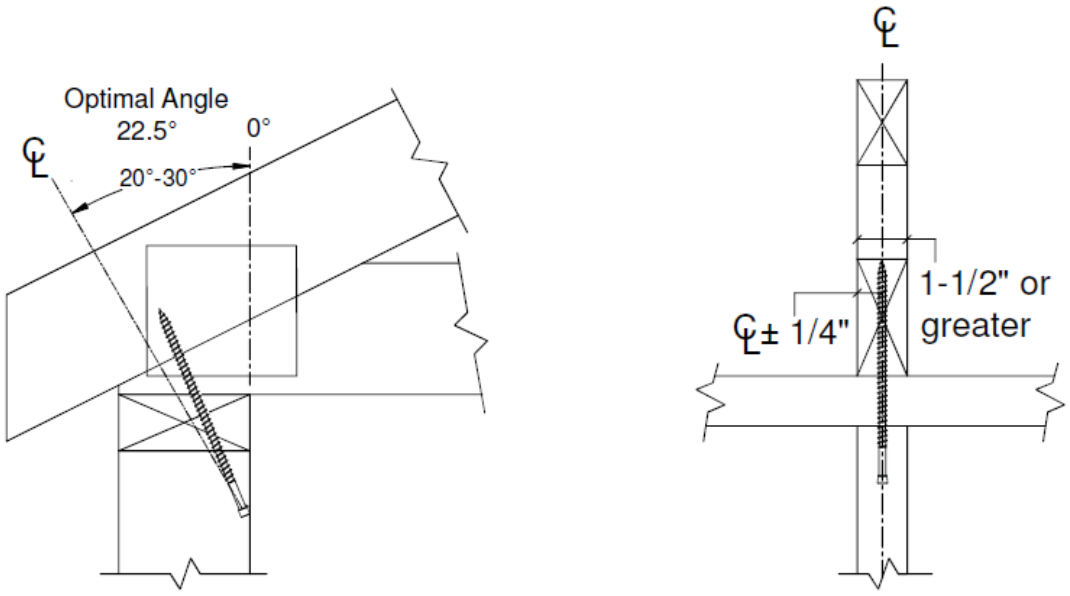


Figure 4. Installation of FrameFAST Fasteners on Wood Truss or Rafter to Single Top Plate

6.3.2 Install one (1) of the FrameFAST Fasteners 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 of the centerline (**Figure 3** and **Figure 4**).

6.3.2.1 If the wood truss or rafter is located directly over a top plate splice, offset the fastener 6 mm 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.

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

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 ASTM F1575

7.1.4 Fastener tensile strength testing in accordance with ASTM F606

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 innovative 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: 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 3**, FrameFAST Fasteners have performance characteristics that were tested and/or meet pertinent standards, and are suitable for use pursuant to their specified purpose.

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

8.2.1 Use as an alternative to those fasteners prescribed by the applicable code.

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 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 report, they are listed here:

8.4.1 No known variations

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,[5] including but not limited to, Standards Council of Canada (SCC)[6] and ANSI National Accreditation Board (ANAB),[7] 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.[8]

8.6.1 DrJ is an ISO/IEC 17065 ANAB-Accredited Product Certification Body – Accreditation #1131[9] and employs professional engineers.[10]

8.7 Through ANAB accreditation and the IAF Multilateral Agreements, this report can be used to obtain innovative 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*."[11]

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*."[12]

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 Material properties shall not fall outside the boundaries defined in **Section 3**.

9.2 As defined in **Section 3**, 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.

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

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

9.5 Loads applied shall not exceed those recommended by the manufacturer or as defined in this report.

9.6 Where 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 on 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 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 The innovative product listed in **Section 1.1** is identified by a label on the board or packaging material bearing the manufacturer name, product name, report number, and other information to confirm code compliance.

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

11 Review Schedule

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

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

12 Legislation that Authorizes New Product Approval in International Markets is Found in Appendix A

12.1 FastenMaster FrameFAST Structural Wood Screw (FrameFAST Fasteners) have been tested by an ISO/IEC 17025 accredited laboratory and/or evaluated to be in conformance with accepted engineering practice to ensure durable, livable and safe construction.

12.2 This report is published by an ISO/IEC 17065 accredited certification body with the expertise to evaluate products, materials, designs, services, assemblies and/or methods of construction.

12.3 This report meets the legislative intent and definition of a duly authenticated report, which shall be accepted by the AHJ, unless there are specific reasons why the alternative shall not be approved as provided for in writing.

Appendix A

1 Legislation that Authorizes New Product Approval in Canada

1.1 The Competition Act is a Canadian federal law governing competition law in Canada. The Act contains both criminal and civil provisions aimed at preventing anti-competitive practices in the marketplace. The Act is enforced and administered by the Competition Bureau, whose regulations encourage the approval of NBC referenced and alternative products, materials, designs, services, assemblies and/or methods of construction that:

1.1.1 Advance Innovation,

1.1.2 Promote competition so all businesses have the opportunity to compete on price and quality in an open market on a level playing field unhampered by anticompetitive constraints, and

1.1.3 Benefit consumers through lower prices, better quality, and greater choice.

1.2 **Approved by International Jurisdictions**: The USMCA and GATT agreements provide for approval of innovative materials, products, designs, services, assemblies and/or methods of construction through the Technical Barriers to Trade (TBT) agreements and the International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA), where these agreements proclaim the desire of both countries to have their markets open to innovation.

1.3 These agreements:

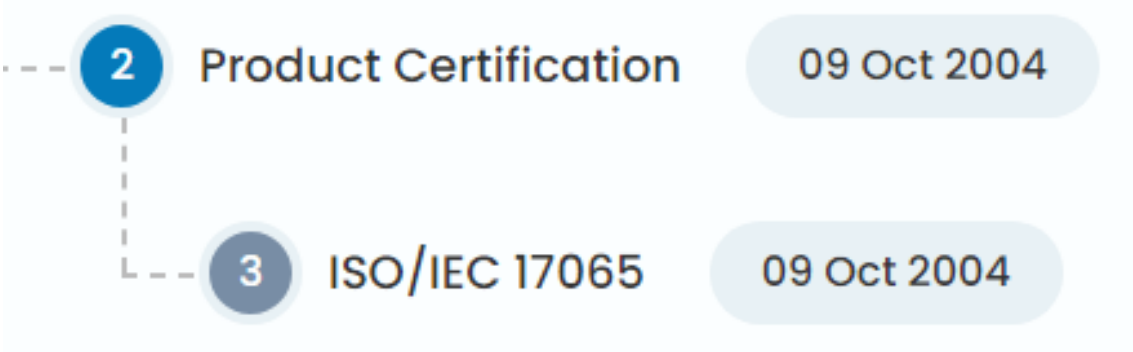
1.3.1 Permit participation of conformity assessment bodies located in the territories of other Members (defined as GATT Countries) under conditions no less favourable than those accorded to bodies located within their territory or the territory of any other country,

1.3.2 State that conformity assessment procedures (i.e., ISO/IEC 17020, 17025, 17065, etc.) are prepared, adopted, and applied so as to grant access for suppliers of like products originating in the territories of other Members under conditions no less favourable than those accorded to suppliers of like products of national origin or originating in any other country, in a comparable situation.

1.3.3 State that conformity assessment procedures are not prepared, adopted, or applied with a view to or with the effect of creating unnecessary obstacles to international trade. This means that conformity assessment procedures shall not be more strict or be applied more strictly than is necessary to give the importing Member adequate confidence that products conform to the applicable technical regulations or standards.

1.4 To this end, Canada operates an accreditation system as follows:

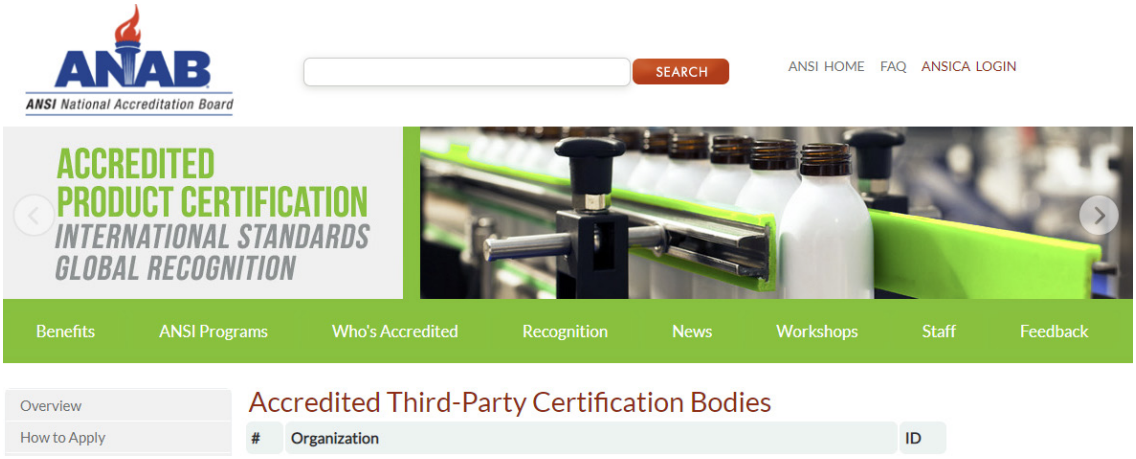
1.5 This includes ISO/IEC 17065 product certification as follows:



1.6 Similarly, the United States operates multiple accreditation process with ANAB being the most prominent ISO/IEC 17065 product certification organization as follows:

1.7 This includes ISO/IEC 17065 product certification as follows:

1.8 The list of ANAB accredited ISO/IEC 17065 product certification organizations can be found at the following link: https://anabpd.ansi.org/Accreditation/product-certification/DirectoryListingAccredited?menuID=1&prgID=1



1.9 Approval is granted via International Agreement, where the purpose of the IAF MLA is to ensure mutual recognition of accredited certification and validation/verification statements between signatories. Subsequent acceptance of accredited certification and validation/verification statements is required so that one accreditation can be used for the timely approval of innovative materials, products, designs, services, assemblies and/or methods of construction. Accreditations granted by IAF MLA signatories are recognised worldwide based on their equivalent accreditation programs, therefore reducing costs and adding value to businesses and consumers.

1.10 Consequently, these agreements permit product approval of innovative Australian and New Zealand products into US markets and vice-versa.

1.11 Finally, a question that often arises is, why do these agreements exist? In addition, another question is why is the ISO/IEC 17065 accredited third-party certification process so important?

1.11.1 The answer is because all countries desire to protect the intellectual property and trade secrets of their country's businesses.

1.11.2 In the US this protection is provided by 18 U.S. Code § 1831 Under Economic Espionage, where it states "*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*."

1.11.3 Any organization that commits any offense described shall be fined not more than the greater of $10,000,000 or three (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.[13]

1.11.4 Protection of intellectual property and trade secrets reinforces the value of the IAF MLA, the GATT/TBT and the ISO/IEC 17065 product approval process.

1.11.5 The goal is to protect everyone's best interests while also facilitating economic freedom and opportunity by promoting free and fair competition in the marketplace.

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] 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.

[4] 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.

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

[6] https://iaf.nu/en/member-details/?member_id=91

[7] https://iaf.nu/en/member-details/?member_id=14

[8] 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.

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

[10] 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*".

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

[12] 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.*"

[13] https://www.law.cornell.edu/uscode/text/18/part-I/chapter-90