

Technical Evaluation Report™ - Canada

A Duly Authenticated Report from an Approved Agency

Report No: 1412-01



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FastenMaster® LedgerLOK® Ledger Board Fasteners - Canada

Trade Secret Report Holder:

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CSI Designations:

DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

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

Section: 06 11 00 - Wood Framing

Section: 06 15 00 - Wood Decking

1 Innovative Product Evaluated¹

1.1 LedgerLOK Ledger Board Fasteners

2 Product Description and Materials

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

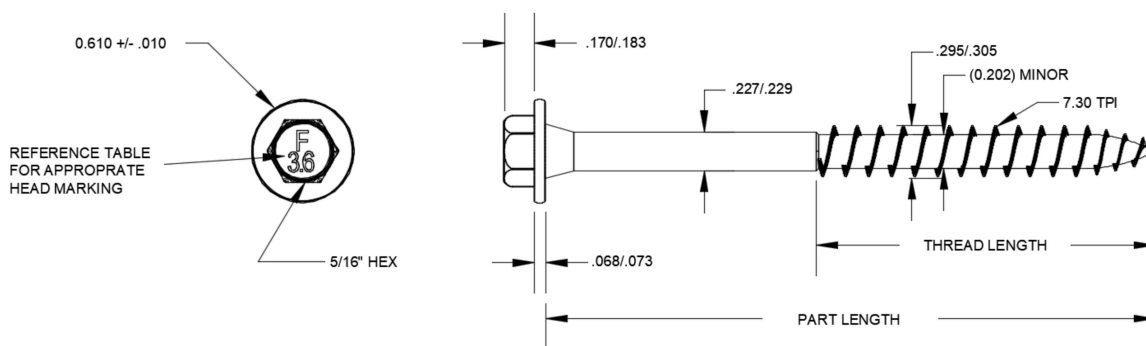


Figure 1. LedgerLOK Ledger Board Fasteners
(Dimensions are in Inches)



- 2.2 LedgerLOK Ledger Board Fasteners are manufactured with carbon steel grade 1022 or 10B21 wire conforming to ASTM A510 with a minimum ultimate tensile strength of 60 ksi.
- 2.3 LedgerLOK Ledger Board Fasteners are manufactured using a standard cold-formed process followed by a heat-treating process. Critical dimensions, design values for lumber species and allowable bending yield are found in **Figure 1**, **Table 1**, and **Table 2**.
- 2.3.1 LedgerLOK Ledger Board Fasteners heads are a $\frac{5}{16}$ " hex drive with a built-in oversized washer.
- 2.3.2 LedgerLOK Ledger Board Fasteners have a gimlet point.
- 2.3.3 LedgerLOK Ledger Board Fasteners, as shown in **Table 1**, were evaluated for this report.

Table 1. Fastener Specifications for the LedgerLOK Ledger Board Fasteners

| Fastener Name | Fastener Designation | Head Marking | Length, in (mm) | | Diameter, in (mm) | | Nominal Bending Yield psi ³ (MPa) |
|----------------------------------|----------------------|--------------|-----------------------|---------------------|-------------------|---------------------|--|
| | | | Fastener ¹ | Thread ² | Unthreaded Shank | Minor Thread (Root) | |
| LedgerLOK Ledger Board Fasteners | FMLL358 | F3.6 | 3.63 (92) | 2.00 (51) | 0.227 (5.8) | 0.202 (5.1) | 200,700 (1,384) |
| | FMLL005 | F5.0 | 5.00 (127) | 3.00 (76) | | | |

Imperial Units: 25.4 mm = 1 in, 1 MPa = 145 psi

- Measured from the underside of the head to the bottom of the tip.
- Includes tapered tip; see **Figure 1**.
- Determined in accordance with methods specified in ASTM F1575, based on minor thread diameter using a five percent (5%) offset of the load-displacement curves developed from the average of bending tests. Nominal bending yield based on the shank diameter using the same method is 186,790 psi (1,290 MPa).

- 2.4 Factored lateral strength and withdrawal resistance values for the listed specific gravities, G, and LedgerLOK Ledger Board Fasteners are provided in **Table 2**.

Table 2. Design Values for Lumber Species Groups for LedgerLOK Ledger Board Fasteners

| Property | Northern Species (G = 0.35) | Spruce-Pine-Fir (G = 0.42) | Hem Fir (G = 0.46) | Douglas Fir (G = 0.49) |
|--|-----------------------------|----------------------------|--------------------|------------------------|
| Factored Withdrawal Resistance Values ^{1,3,4} Lb/in (N/mm) | 285 (50) | 388 (68) | 439 (77) | 485 (85) |
| Factored Lateral Strength Resistance Values ² Lb (N) | 192 (855) | 243 (1,080) | 272 (1,210) | 295 (1,310) |

Imperial Units: 1 N = 0.225 lb, 1 kN/m = 737.6 lb/ft

- A phi factor (Φ) of 0.6 has been applied to the Factored Withdrawal Resistance Values. All other applicable factors shall be applied in accordance with CSA O86 Clause 12.11.5.
- A phi factor (Φ) of 0.8 in accordance with CSA O86 Clause 12.11.3, and a wet service factor (KSF) of 0.67 in accordance with Table 12.1 of CSA O86, have been applied to the Factored Lateral Strength Resistance Values. All other applicable factors shall be applied in accordance with CSA O86 Clause 12.11.4.
- Withdrawal resistance values are derived from testing using procedures consistent with CSA O86.
- Withdrawal capacities only consider extraction of the threaded portion of the fastener from the connected materials. Head pull through resistance should be calculated in accordance with CSA O86, Clause 12.11.5.3.



- 2.5 LedgerLOK Ledger Board Fasteners have a proprietary galvanized and epoxy coating that provides corrosion protection that exceeds that provided by code-approved hot-dipped galvanized coatings meeting ASTM A153.
 - 2.5.1 LedgerLOK Ledger Board Fasteners are approved for use in exterior conditions and in pressure-treated wood, including ground-contact Alkaline Copper Quaternary (ACQ). Treatments other than ACQ that are found to be less corrosive than ACQ, are also approved.
- 2.6 LedgerLOK Ledger Board 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.
- 2.7 In-plant quality control procedures, under which the LedgerLOK Ledger Board Fasteners are manufactured, are audited through an inspection process performed by an approved agency.
- 2.8 As needed, review material properties for design in **Section 4** and the regulatory evaluation in **Section 5**.

3 Applicable Codes and Standards²

3.1 Standards and Referenced Documents

- 3.1.1 *ASTM A153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*
- 3.1.2 *ASTM A510: Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel*
- 3.1.3 *ASTM F1575: Standard Test Method for Determining Bending Yield Moment of Nails*
- 3.1.4 *CSA O86: Engineering Design in Wood*

3.2 Codes

- 3.2.1 *NBC—10, 15, 20: National Building Code of Canada*
- 3.2.2 *NECB—17, 20: National Energy Code of Canada for Buildings*
- 3.2.3 *O Reg. 332/12: Ontario Building Code (OBC)³*



4 Tabulated Properties Generated from Nationally Recognized Standards

4.1 LedgerLOK Ledger Board Fasteners are designed specifically for attaching the deck ledger to the rim board of a building in accordance with NBC Section 9.4.2.3.

4.1.1 Maximum spacing for LedgerLOK Ledger Board Fasteners with deck live load = 40, 60, 80 psf (1.91, 2.87, 3.83 kPa), plus deck dead load = 10 psf (0.48 kPa) is shown in **Table 3**.

Table 3. LedgerLOK Ledger Board Fasteners Spacing – Materials and Loading Conditions

| Loading Condition ⁵ (Live Load, kPa) | 2x Nominal Ledger Species | Maximum On-Center Spacing of LedgerLOK Ledger Board Fasteners, ^{1,2,3,4,6,7,8} in (mm) | | | | | | | |
|--|---------------------------|---|--------------|-------------|---------------|-------------|---------------|-------------|---------------|
| | | Maximum Deck Joist Spans, ft (m) | | | | | | | |
| | | Up to 6.5 (Up to 2) | 8.0 (2.5) | 10.0 (3) | 11.5 (3.5) | 13.0 (4) | 14.5 (4.5) | 16.5 (5) | 18.0 (5.5) |
| 40 psf (1.91 kPa) | Northern Species | 10 (250) | 8 (200) | 6 (175) | 6 (150) | 5 (125) | 4 (100) | 4 (100) | 4 (100) |
| | Spruce-Pine-Fir | 12 (300) | 10 (250) | 8 (200) | 7 (175) | 6 (150) | 5 (150) | 5 (125) | 4 (125) |
| | Hem Fir | 14 (350) | 11 (275) | 9 (225) | 8 (200) | 7 (175) | 6 (150) | 5 (150) | 5 (125) |
| | Douglas Fir | 15 (375) | 12 (300) | 10 (250) | 9 (225) | 7 (200) | 7 (175) | 6 (150) | 5 (125) |
| 60 psf (2.87 kPa) | Northern Species | 7 (175) | 6 (150) | 5 (125) | 4 (100) | 3 (75) | 3 (75) | 3 (75) | 3 (75) |
| | Spruce-Pine-Fir | 9 (225) | 7 (175) | 6 (150) | 5 (125) | 4 (100) | 4 (100) | 3 (100) | 3 (75) |
| | Hem Fir | 10 (250) | 8 (200) | 6 (175) | 6 (150) | 5 (125) | 4 (100) | 4 (100) | 4 (100) |
| | Douglas Fir | 11 (275) | 8 (225) | 7 (175) | 6 (150) | 5 (125) | 5 (125) | 4 (100) | 4 (100) |
| 80 psf (3.83 kPa) | Northern Species | 7 (175) | 6 (150) | 5 (125) | 4 (100) | 3 (75) | 3 (75) | 3 (75) | 3 (75) |
| | Spruce-Pine-Fir | 7 (175) | 5 (125) | 4 (125) | 4 (100) | 3 (75) | 3 (75) | 3 (75) | 2 (50) |
| | Hem Fir | 8 (200) | 6 (150) | 5 (125) | 4 (100) | 4 (100) | 3 (75) | 3 (75) | 3 (75) |
| | Douglas Fir | 8 (200) | 6 (175) | 5 (150) | 5 (125) | 4 (100) | 4 (100) | 3 (75) | 3 (75) |

Imperial Units: 25.4 mm = 1 in, 1 m = 3.28 ft, 1 kPa = 20.9 psf

1. Based on load duration of 1.0. Spacing may be adjusted by the applicable load duration as specified in CSA O86.
2. Fasteners are required to have full thread penetration into the OSB and main member. Excess fastener length extending beyond the main member is not reflected in the table above.
3. Solid sawn band joists shall be HF, SPF, DF-L, or Northern Species, designed by others. For engineered wood rim boards having a specific gravity of 0.5 and a minimum thickness of 1 1/8", on-center spacing for Douglas Fir may be used.
4. Ledger board and rim board are assumed to be of the same species. Where species differ, values for the species with the lower specific gravity, G, shall be used.
5. Spacing is based on non-incised lumber. Where incised lumber is used, reduce spacing requirements by fifteen percent (15%).
6. Table values assume 10 psf (0.48 kPa) dead load.
7. The wet service condition factor, $K_{SF} = 0.67$, has been applied.
8. Sheathing shall be minimum 11 mm-thick OSB ($G = 0.5$) or other sheathing with a specific gravity at least equal to the specific gravity of the rim board material.

4.2 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.

5 Regulatory Evaluation and Accepted Engineering Practice

- 5.1 LedgerLOK Ledger Board Fasteners were evaluated to determine their ability to provide code-compliant attachment of deck ledger boards to the building structure.
- 5.2 LedgerLOK Ledger Board Fasteners were evaluated for lateral resistance and withdrawal resistance in accordance with CSA O86 Clause 12.11.4 and 12.11.5.
 - 5.2.1 As in some truss installations where a band joist (rim board) is not used, an engineered design is required.
- 5.3 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 qualified⁴ to practice product and regulatory compliance services within its scope of accreditation and engineering expertise,⁵ respectively.
- 5.4 Testing and related engineering evaluations are defined as intellectual property and/or trade secrets.⁶
- 5.5 Engineering evaluations are conducted with DrJ's ANAB accredited ICS code scope of expertise that is also its areas of professional engineering competence.⁷
- 5.6 Any code specific issues not addressed in this section are outside the scope of this report.

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 Choose one of 3.63" (92 mm) or 5" (127 mm) LedgerLOK Ledger Board Fasteners, so that the threads fully engage the rim board material and the fastener tip extends beyond the back face of the rim board when the fastener head is fully seated against the installed ledger.
- 6.4 Using a high-torque, 1/2" variable-speed drill, (18V, if cordless) drive the fasteners through the ledger and sheathing. Continue into the rim board until the built-in washer head is drawn firm and flush to the ledger board. Do not overdrive.
- 6.5 **Figure 2** shows a detail of one of LedgerLOK Ledger Board Fasteners deck connection, including minimum edge and end distances.

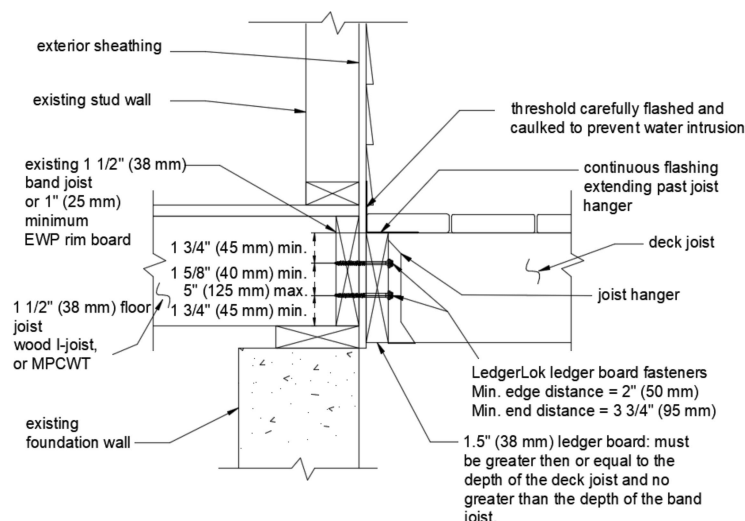


Figure 2. LedgerLOK Ledger Board Fasteners Deck Connection



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 Testing analysis for derivation of design properties for FastenMaster LOK Screws, Wood Science and Technology Centre at the University of New Brunswick, 2009.
 - 7.1.2 Testing conducted by Washington State University for OMG; Final report date: August 4, 2005
 - 7.1.3 Testing conducted by the University of Montana Wood Science Laboratory for OMG, 2004
- 7.2 CSA O86: Engineering Design in Wood; Canadian Standards Association; Toronto, ON
- 7.3 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.
- 7.4 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.
- 7.5 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.
- 7.6 *Testing and Engineering Analysis:*
 - 7.6.1 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.
- 7.7 Where additional condition of use and/or code compliance information is required, please search for LedgerLOK Ledger Board Fasteners on the [DrJ Certification website](#).

8 Findings

- 8.1 As outlined in **Section 4**, LedgerLOK Ledger Board 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, LedgerLOK Ledger Board Fasteners shall be approved for the following applications:
 - 8.2.1 Deck ledger attachments in accordance with the requirements of NBC Article 9.4.2.3.
- 8.3 Testing and analysis of the LedgerLOK Ledger Board Fasteners are in accordance with the requirements of CSA O86.
- 8.4 Any application specific issues not addressed herein can be engineered by an RDP. Assistance with engineering is available from FastenMaster.



8.5 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:

8.5.1 No known variations

8.6 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...

8.7 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

8.7.1 DrJ is an ISO/IEC 17065 ANAB-Accredited Product Certification Body – Accreditation #1131¹² and employs professional engineers.¹³

8.8 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

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

8.9.1 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.*”

8.9.2 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

8.10 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 4**.

9.2 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.

9.3 LedgerLOK Ledger Board Fasteners spacing shall not exceed **Table 3** for code compliance and the installation conditions considered.



- 9.4 For conditions not covered in this report, connections shall be designed in accordance with generally accepted engineering practice.
- 9.5 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:
- 9.5.1 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.
 - 9.5.2 This report and the installation instructions shall be submitted at the time of permit application.
 - 9.5.3 This innovative product has an internal quality control program and a third-party quality assurance program.
 - 9.5.4 At a minimum, this innovative product shall be installed per **Section 6** of this report.
 - 9.5.5 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.
 - 9.5.6 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.
- 9.6 Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed and/or by the building designer (i.e., owner).
- 9.7 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, this 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 latest version, visit www.drjcertification.org.
- 11.2 For information on the status of this report, please contact [DrJ Certification](#).



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."