Listing and Technical Evaluation Report™

Report No: 1703-03

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Subject to Renewal: January 1, 2025

Starborn® Structural F19, F23-W, F23-E and F23 Screws: Multi-Ply Applications

Trade Secret Report Holder:

Starborn® Industries, Inc.

Phone: 800-596-7747 Website: www.starbornindustries.com Email: info@starbornindustries.com

CSI Designations:

DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

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

1 Innovative Products Evaluated[i]

1.1 Starborn® Structural F19 Screws

1.2 Starborn® Structural F23-W Screws

1.3 Starborn® Structural F23-E Screws

1.4 Starborn® Structural F23 Screws

2 Product Description and Materials

2.1 The innovative products evaluated in this report are shown in **Figure 1** through **Figure 4,** and listed in **Table 1**.

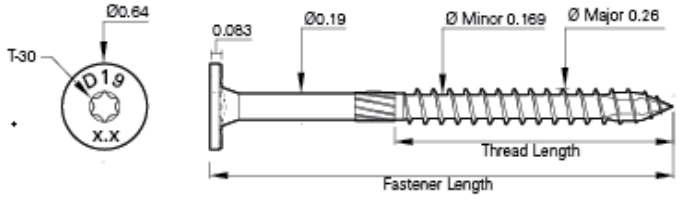

Figure 1. Starborn® Structural F19 Screw

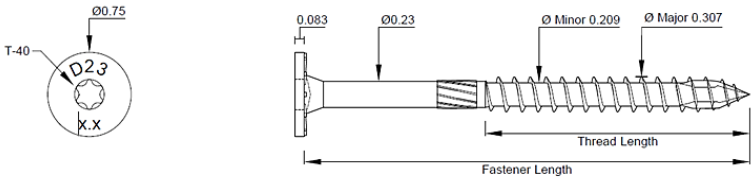

Figure 2. Starborn® Structural F23 Screw

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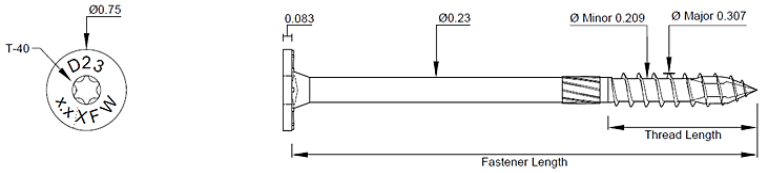

Figure 3. Starborn® Structural F23-W Screw

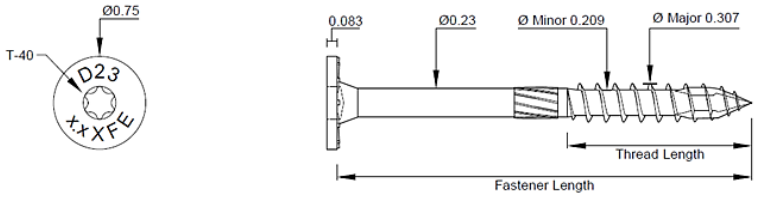

Figure 4. Starborn® Structural F23-E Screw

Table 1. Starborn® Structural Fastener Designation and Product Name

Product Name	Unthreaded Shank Diameter[1] (in)	Head Type	Coating Type (Application)
Structural F19	0.19	Flat (T-30)	Exterior/Interior Use
Structural F23	0.23	Flat (T-40)	
Structural F23-W			Interior Use
Structural F23-E			

SI: 1 in = 25.4 mm

1. Unthreaded shank diameter is measured on uncoated parts. Finished part dimensions are larger due to the thickness of the proprietary coating.

2.2 *General*

2.2.1 Starborn® Structural F19, F23, F23-E, and F23-W Screws are partially-threaded, self-drilling, dowel-type fasteners design for use in wood-to-wood and multi-ply connections.

2.2.1.1 Starborn® Structural F19, F23, F23-E, and F23-W Screws are Torx-driven flat head screws.

2.3 *Fastener Material*

2.3.1 Starborn® Structural F19, F23, F23-E, and F23-W Screws are manufactured with heat-treated carbon steel grade 10B21 wire using a standard cold-forming process.

2.3.2 All fasteners are produced in accordance with the approved quality control procedures referred to in Section **12**.

2.4 *Corrosion Resistance*

2.4.1 Starborn® Structural F19 and F23 screws are zinc plated and overcoated with a proprietary epoxy coating.

2.4.1.1 Starborn® Structural F19 and F23 screws are designed for exterior use and may be used where fasteners are required to exhibit corrosion resistance when exposed to adverse environmental conditions and/or in preservative treated wood subject to the limitations of Section **12**.

2.4.1.1.1 Starborn® Structural F19 and F23 screws were evaluated for use in wood chemically treated with waterborne alkaline copper quaternary, type D (ACQ-D).

2.4.1.1.2 These fasteners are alternates to hot-dip-zinc galvanized fasteners.

2.4.1.1.3 The proprietary coating system meets or exceeds the corrosion protection of hot dipped galvanizing per ASTM A153 in accordance with IBC Section 2304.10 and IRC Section R317.3.

2.4.1.2 Starborn® F23-W and F23-E screws are designated for interior, dry use only.

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2.5 *Pressure-Preservative Treated (PPT) Wood Applications*

2.5.1 Starborn® Structural F19 and F23 screws with the proprietary coating are recognized for use in PPT lumber provided the conditions set forth by the PPT lumber manufacturer are met, including appropriate strength reductions.

2.6 *Fire-Retardant Treated (FRT) Wood Applications*

2.6.1 Starborn® Structural F19 and F23 screws with the proprietary coating are recognized for use in FRT lumber provided the conditions set forth by the FRT lumber manufacturer are met, including appropriate strength reductions.

2.7 *Wood Members*

2.7.1 Solid sawn wood members connected with Starborn® Structural screws shall consist of lumber species or species combinations having a specific gravity of 0.42 to 0.55.

2.7.2 Structural composite lumber (LVL, LSL, PSL, etc.) connected with Starborn® Structural screws shall be recognized in evaluation reports having published equivalent specific gravities for lateral and withdrawal resistance. Equivalent specific gravities for structural composite lumber may be used in the design of connections using the specific gravities of the sawn lumber shown in **Table 3** and **Table 4**.

2.8 *Fastener Specifications*

2.8.1 **Table 2** lists the dimensions and mechanical properties of innovative products that are evaluated in this report.

Table 2. Starborn® Structural Screw Specifications

Product Name	Head Marking	Fastener Length[1] (in)	Thread Length[2] (in)	Unthreaded Shank Diameter[3] (in)	Thread Diameter (in)		Nominal Bending Yield, F_{yb} (psi)	Allowable Fastener Strength (lb)	
					Minor[4]	Major		Tensile	Shear
Structural F19	D19 2.9	$2^{7}/_{8}$	2	0.189	0.169	0.260	192,880	1,495	1,016
	D19 4	$4^{1}/_{2}$	2						
	D19 6	6	2						
	D19 8	8							
	D19 10	10							
	D19 12	12							
	D19 14	14							
	D19 16	16							
Structural F23	D23 2.9	$2^{7}/_{8}$	1.4	0.229	0.209	0.307	183,155	1,980	1,490
	D23 4	4	$2^{3}/_{8}$						

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Table 2. Starborn® Structural Screw Specifications

Product Name	Head Marking	Fastener Length[1] (in)	Thread Length[2] (in)	Unthreaded Shank Diameter[3] (in)	Thread Diameter (in)		Nominal Bending Yield, F_{yb} (psi)	Allowable Fastener Strength (lb)	
					Minor[4]	Major		Tensile	Shear
	D23 5	5	3						
	D23 6	6	$2^{3}/_{4}$						
Structural F23-W	D23 2.9 XFW	$2^{7}/_{8}$	1.4						
	D23 4.4 XFW	$4^{3}/_{8}$							
	D23 5.9 XFW	$5^{7}/_{8}$							
Structural F23-E	D23 3.4 XFE	$3^{3}/_{8}$	$1^{1}/_{2}$						
	D23 5 XFE	5							
	D23 6.8 XFE	$6^{3}/_{4}$							

SI: 1 in = 25.4 mm, 1 lb = 4.45 N, 1 psi = 0.00689 MPa

1. Measured from the underside of the head to the tip.
2. Includes tip.
3. Unthreaded shank diameter is measured on uncoated parts. Finished part dimensions are larger due to the thickness of the proprietary coating.
4. Minor thread diameter is calculated as the average value of upper and lower manufacturing tolerances.

2.9 In-plant quality control procedures, under which the Starborn® Structural F19, F23, F23-E, and F23-W Screws are manufactured, are audited through an inspection process performed by an approved agency.

2.10 As needed, review material properties for design in Section **6** and to regulatory evaluation in Section **8**.

3 Definitions

3.1 New Materials[ii] are defined as building materials, equipment, appliances, systems, or methods of construction not provided for by prescriptive and/or legislatively adopted regulations, known as alternative materials.[iii] The design strengths and permissible stresses shall be established by tests[iv] and/or engineering analysis.[v]

3.2 Duly Authenticated Reports[vi] and Research Reports[vii] are test reports and related engineering evaluations, which are written by an approved agency[viii] and/or an approved source.[ix]

3.2.1 These reports contain intellectual property and/or trade secrets, which are protected by the Defend Trade Secrets Act (DTSA).[x]

3.3 An approved agency is "approved" when it is ANAB ISO/IEC 17065 accredited. DrJ Engineering, LLC (DrJ) is listed in the ANAB directory.

3.4 An approved source is "approved" when a professional engineer (i.e., Registered Design Professional [RDP]) is properly licensed to transact engineering commerce. The regulatory authority governing approved sources is the state legislature via its professional engineering regulations.[xi]

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3.5 Testing and/or inspections conducted for this Duly Authenticated Report were performed by an ISO/IEC 17025 accredited testing laboratory, an ISO/IEC 17020 accredited inspection body, and/or a licensed RDP.

3.5.1 The Center for Building Innovation (CBI) is ANAB[xii] ISO/IEC 17025 and ISO/IEC 17020 accredited.

3.6 The regulatory authority shall enforce[xiii] the specific provisions of each legislatively adopted regulation. If there is a non-conformance, the specific regulatory section and language of the non-conformance shall be provided in writing[xiv] stating the nonconformance and the path to its cure.

3.7 The regulatory authority shall accept Duly Authenticated Reports from an approved agency and/or an approved source with respect to the quality and manner of use of new materials or assemblies as provided for in regulations regarding the use of alternative materials, designs, or methods of construction.[xv]

3.8 ANAB is an International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA) signatory where recognition of certificates, validation, and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA with the appropriate scope, shall be approved.[xvi] Therefore, all ANAB ISO/IEC 17065 Duly Authenticated Reports are approval equivalent.[xvii]

3.9 Approval equity is a fundamental commercial and legal principle.[xviii]

4 Applicable Standards for the Listing; Regulations for the Regulatory Evaluation[xix]

4.1 *Standards*

4.1.1 *ANSI/AWC NDS: National Design Specification (NDS) for Wood Construction*

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

4.2 *Regulations*

4.2.1 *IBC – 15, 18, 21: International Building Code®*

4.2.2 *IRC – 15, 18, 21: International Residential Code®*

5 Listed[xx]

5.1 A nationally recognized testing laboratory such as CBI, states that the materials, designs, methods of construction, and/or equipment have met nationally recognized standards and/or have been tested and found suitable for use in a specified manner.

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6 Tabulated Properties Generated from Nationally Recognized Standards

6.1 *General*

6.1.1 Starborn® Structural F19, F23, F23-E, and F23-W Screws are self-tapping screws used for attaching multi-ply wood members including trusses, sawn lumber, and engineered wood products.

6.1.2 Starborn® Structural F19, F23, F23-E, and F23-W Screws are installed without lead holes, as prescribed in NDS.

6.1.3 *Design*

6.1.3.1 The design of Starborn® Structural F19, F23, F23-E, and F23-W Screws is governed by the applicable code and the provisions for dowel type fasteners in NDS.

6.1.3.2 Unless otherwise noted, adjustment of the design stresses for duration of load shall be in accordance with the applicable code.

6.2 *Multi-Ply Connection Design Values*

6.2.1 *Starborn® Structural F19 Screw:*

6.2.1.1 Design values are set forth in **Table 3**. Assembly conditions are detailed in **Figure 5**.

Table 3. Starborn® Structural F19 Screw Allowable Lateral Design Values[2,3,4] (plf)

Multiple Members		Product Fastener Length[1] (in)	Loaded Side	SPF/HF (SG=0.42)						DF/SP (SG=0.50)					
				12" o.c.		16" o.c.		24" o.c.		12" o.c.		16" o.c.		24" o.c.	
Assembly	Components			2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows
A	2-ply 1 1/2"	2 7/8	Either	1,160	1,740	870	1,305	580	870	1,520	2,280	1,145	1,720	760	1,140
B	3-ply 1 1/2"	4 1/2	Either	1,140	1,710	855	1,285	570	855	870	1,305	655	985	435	655
C	4-ply 1 1/2"	6	Either	870	1,305	655	985	435	655	1,140	1,710	855	1,285	570	855

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

1. Fastener length is measured from the underside of the head to the top.
2. Wood framing shall be any species with Specific Gravity (SG), of 0.42 or greater.
3. Allowable design values are based on a load duration factor C_D = 1.0 and shall be multiplied by all applicable adjustment factors per the NDS.
4. For top-loaded members with even loading across the width of the entire assembly, fasteners shall be installed in two (2) rows with a maximum distance of 32" o.c. between fasteners in the same row.

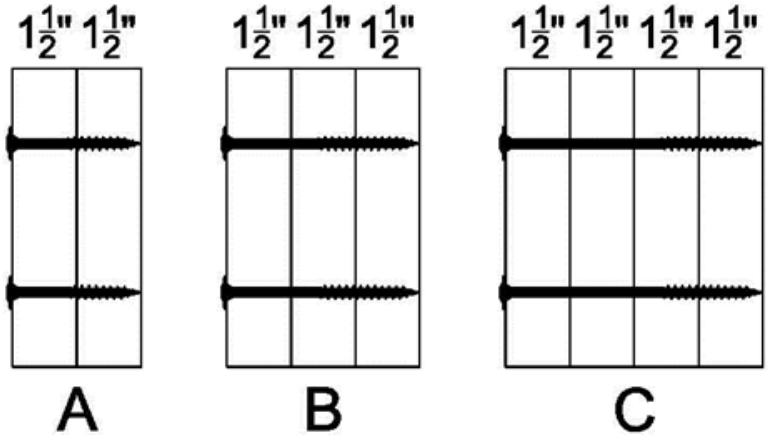

Figure 5. Starborn® Structural F19 Screw Assemblies

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6.2.2 *Starborn® Structural F23-W Screw:*

6.2.2.1 Design values are set forth **Table 4**. Assembly conditions are detailed in **Figure 6**.

Table 4. Starborn® Structural F23 and F23-W Screw Allowable Lateral Design Values[2,3,4] (plf)

Multiple Members		Product Fastener Length[1] (in)	Loaded Side	SPF/HF (SG=0.42)						DF/SP (SG=0.50)					
				12" o.c.		16" o.c.		24" o.c.		12" o.c.		16" o.c.		24" o.c.	
Assembly	Components			2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows
A	2-ply 1½"	F23-W: 2⅞ F23: 2⅞	Either	1,460	2,190	1,100	1,650	730	1,095	1,660	2,490	1,250	1,875	830	1,245
B	3-ply 1½"	F23-W: 4⅜ F23: 4	Either	1,260	1,890	945	1420	630	945	1680	2520	1265	1900	840	1260
C	4-ply 1½"	F23-W: 5⅞ F23: 6	Either	1,260	1,890	945	1,420	630	945	1,680	2,520	1,265	1,900	840	1,260

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

1. Fastener length is measured from the underside of the head to the top.
2. Wood framing shall be any species with SG of 0.42 or greater.
3. Allowable design values are based on a load duration factor C_D = 1.0 and shall be multiplied by all applicable adjustment factors per the NDS.
4. For top-loaded members with even loading across the width of the entire assembly, fasteners shall be installed in two (2) rows with a maximum distance of 32" o.c. between fasteners in the same row.

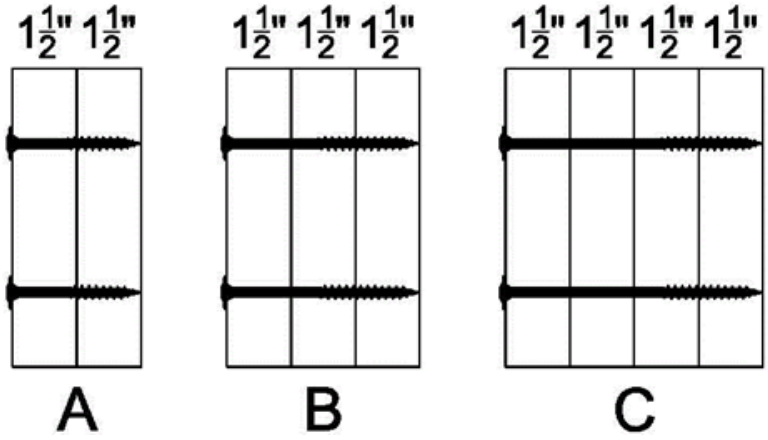

Figure 6. Starborn® Structural F23 and F23-W Screw Assemblies

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6.2.3 *Starborn® Structural F23-E Screw:*

6.2.3.1 Design values are set forth in **Table 5**. Assembly conditions are detailed in **Figure 7**.

Table 5. Starborn® Structural F23-E Screw Allowable Lateral Design Values[2,3,4] (plf)

Multiple Members		Fastener Length[1] (in)	Loaded Side	12" o.c.		16" o.c.		24" o.c.	
Assembly	Components			2 Rows	3 Rows	2 Rows	3 Rows	2 Rows	3 Rows
A	2-ply 1 3/4"	3 3/8	Either	1,660	2,490	1,250	1,875	830	1,245
B	3-ply 1 3/4"	5	Head	1,680	2,520	1,265	1,900	840	1,260
			Point	1,495	2,245	1,125	1,690	750	1,125
C	4-ply 1 3/4"	6 3/4	Either	1,680	2,520	1,265	1,900	840	1,260
D	2-ply 1 3/4" & 3 1/2"	5	Either	1,495	2,245	1,125	1,690	750	1,125
E	3-ply 1 3/4" & 3 1/2"	6 3/4	Either	1660	2490	1250	1875	830	1245
F	2-ply 3 1/2"	6 3/4	Either	1,660	2,490	1,250	1,875	830	1,245

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

1. Fastener length is measured from the underside of the head to the top.
2. Wood framing shall be any species with SG of 0.50 or greater.
3. Allowable design values are based on a load duration factor of C_D = 1.0 and shall be multiplied by all applicable adjustment factors per the NDS.
4. For top-loaded members with even loading across the width of the entire assembly, and a depth of 18" or less, fasteners shall be installed in two (2) rows with a maximum distance of 24" o.c. between fasteners in the same row. Use three (3) rows for members deeper than 18".

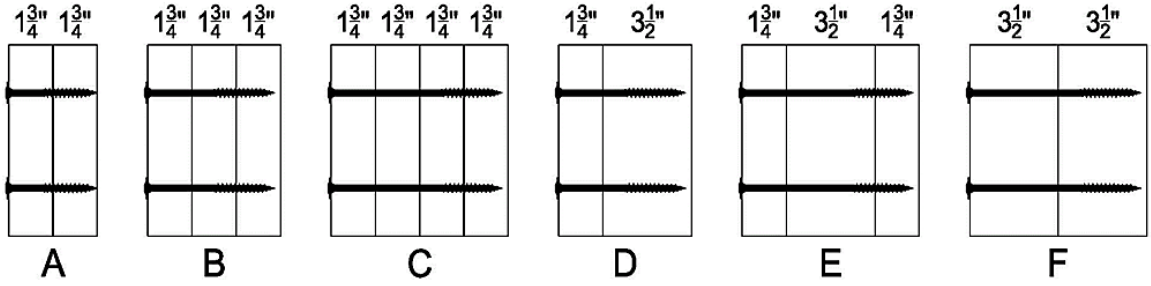

Figure 7. Starborn® Structural F23-E Screw Assemblies

6.3 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.

7 Certified Performance[xxi]

7.1 All construction methods shall conform to accepted engineering practices to ensure durable, livable, and safe construction and shall demonstrate acceptable workmanship reflecting journeyman quality of work of the various trades.[xxii]

7.2 The strength and rigidity of the component parts and/or the integrated structure shall be determined by engineering analysis or by suitable load tests to simulate the actual loads and conditions of application that occur.[xxiii]

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8 Regulatory Evaluation and Accepted Engineering Practice

8.1 Starborn® Structural F19, F23, F23-E, and F23-W Screws comply with the following legislatively adopted regulations and/or accepted engineering practice for the following reasons:

8.1.1 Starborn® Structural F19, F23, F23-E, and F23-W Screws were evaluated to determine their ability to provide multi-ply attachment in trusses, sawn lumber, and engineered wood applications using the methodology and provisions in the NDS.

8.2 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 Engineering, LLC (DrJ), an ISO/IEC 17065 accredited certification body and a professional engineering company operated by RDP/approved sources. DrJ is qualified[xxiv] to practice product and regulatory compliance services within its scope of accreditation and engineering expertise, respectively.

8.3 Engineering evaluations are conducted with DrJ's ANAB accredited ICS code scope of expertise, which are also its areas of professional engineering competence.

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

9 Installation

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

9.2 In the event of a conflict between the manufacturer installation instructions and this report, the more restrictive shall govern.

9.3 *Installation Procedure*

9.3.1 Starborn® Structural F19, F23, F23-E, and F23-W Screws shall be installed using a high-torque, low-speed drill in accordance with the manufacturer installation instructions, applicable code, the approved construction documents, this report, NDS, and standard framing practice as applied to wood fasteners. Use of an impact driver is also permitted.

9.3.2 The fasteners must be installed using a Torx® T-30 star driver bit for the F19 screws and a T-40 star driver bit for the F23 screws. Pre-drilling of pilot holes is not required but may be used where lumber is prone to splitting.

9.3.3 Minimum penetration into main member (final member in multi-ply assembly) is 1" unless otherwise stated in this report.

9.3.4 Starborn® Structural F19, F23, F23-W, and F23-E screw edge and end distances shall be as specified in **Table 6** and **Figure 8**.

9.3.5 For applications outside the scope of this report, an engineered design is required.

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Table 6. Starborn® Structural F19, F23, F23-W, and F23-E Screw Edge and End Distance Requirements

Number	Installed Condition	Minimum Distance or Spacing[1] (in)		
		Face	Edge	End
1	Minimum End Distance	6	3	1 3/4
2	Minimum Edge Distance	1 3/4	3/4	3/4
3	Minimum Spacing Between Fasteners in a Row	3 1/2	3 1/2	3 1/2
4	Minimum Spacing Between Non-Staggered Rows	3 1/2	NA	NA
5	Minimum Spacing Between Staggered Rows	5/8	NA	NA
6	Minimum Stagger Between Fasteners in Adjacent Rows	5/8	NA	NA

SI: 1 in = 25.4 mm

1. Edge distances, end distances, and spacing of fasteners shall be sufficient to prevent splitting of the wood or as shown in this table, whichever is more restrictive.

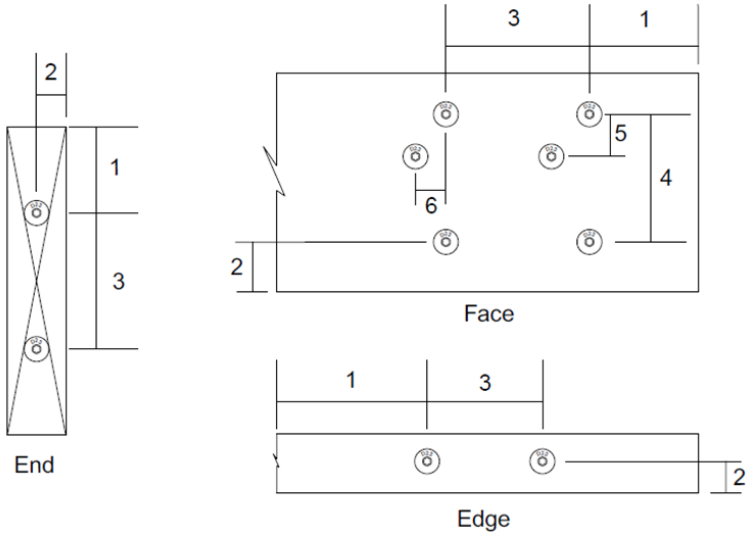

Figure 8. Starborn® Structural Screw Spacing Diagram

10 Substantiating Data

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

10.1.1 ANSI/AWC NDS: National Design Specification (NDS) for Wood Construction

10.1.2 Material properties and design values in accordance with Report Number 1703-05.

10.1.3 Multi-ply design value calculations by DrJ Engineering, LLC, 2019.

10.2 Information contained herein may include the result of testing and/or data analysis by sources that are approved agencies, approved sources, and/or RDPs. Accuracy of external test data and resulting analysis is relied upon.

10.3 Where pertinent, testing and/or engineering analysis are based upon provisions that have been codified into law through state or local adoption of regulations and standards. The developers of these regulations and standards are responsible for the reliability of published content. DrJ's engineering practice may use a regulation-adopted provision as the control. A regulation-endorsed control versus a simulation of the conditions of application to occur establishes a new material as being equivalent to the regulatory provision in terms of quality, strength, effectiveness, fire resistance, durability, and safety.

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10.4 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, or duly authenticated reports from approved agencies and/or approved sources provided by the supplier. These are presumed to be minimum properties and relied upon to be accurate. The reliability of DrJ's engineering practice, as contained in this duly authenticated report, may be dependent upon published design properties by others.

10.5 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.[xxv]

10.6 Where additional condition of use and/or regulatory compliance information is required, please search for Starborn® Structural F19, F23, F23-E, and F23-W Screws on the DrJ Certification website.

11 Findings

11.1 As outlined in Section **8**, Starborn® Structural F19, F23, F23-E, and F23-W Screws have performance characteristics that were tested and/or meet applicable regulations and are suitable for use pursuant to its specified purpose.

11.2 When used and installed in accordance with this duly authenticated report and the manufacturer installation instructions, Starborn® Structural F19, F23, F23-E, and F23-W Screws shall be approved for the following applications:

11.2.1 Starborn® Structural F19, F23, F23-E, and F23-W Screws are suitable to provide multi-ply attachment in trusses, sawn lumber, and engineered wood applications.

11.2.2 Starborn® Structural F19, F23, F23-E, and F23-W Screws have been evaluated in the context of the codes listed in Section **4** and are compliant with all known state and local building codes. Where there are known variations in state or local codes applicable to this TER, they are listed here:

11.2.2.1 No known variations.

11.3 Any application specific issues not addressed herein can be engineered by an RDP. Assistance with engineering is available from Starborn® Industries, Inc.

11.4 IBC Section 104.11 (IRC Section R104.11 and IFC Section 104.10[xxvi] are similar) in pertinent part states:

> **104.11 Alternative materials, design and methods of construction and equipment.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code. Where the alternative material, design or method of construction is not approved, the building official shall respond in writing, stating the reasons the alternative was not approved.

11.5 **Approved**:[xxvii] Building regulations require that the building official shall accept duly authenticated reports.[xxviii]

11.5.1 An approved agency is "approved" when it is ANAB ISO/IEC 17065 accredited.

11.5.2 An approved source is "approved" when an RDP is properly licensed to transact engineering commerce.

11.5.3 Federal law, Title 18 US Code Section 242, requires that where the alternative product, material, service, design, assembly, and/or method of construction is not approved, the building official shall respond in writing, stating the reasons why the alternative was not approved. Denial without written reason deprives a protected right to free and fair competition in the marketplace.

11.6 DrJ is a licensed engineering company, employs licensed RDPs and is an ANAB-Accredited Product Certification Body – Accreditation #1131.

11.7 Through the IAF Multilateral Agreements (MLA), this Duly Authenticated Report can be used to obtain product approval in any jurisdiction or country because all ANAB ISO/IEC 17065 Duly Authenticated Reports are equivalent.[xxix]

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12 Conditions of Use

12.1 Material properties shall not fall outside the boundaries defined in Section **8**.

12.2 As defined in Section **8**, 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.

12.3 As listed herein, Starborn® Structural F19, F23, F23-E, and F23-W Screws shall be:

12.3.1 Installed in accordance with this report and the manufacturer installation instructions.

12.4 For conditions not covered in this TER, connections shall be designed in accordance with generally accepted engineering practice. When the capacity of a connection is controlled by fastener metal strength rather than wood strength, the metal strength must not be multiplied by the adjustment factors specified in the NDS.

12.5 Starborn® Structural F19, F23, F23-E, and F23-W Screws are produced by Starborn® Industries, Inc. at its facilities located in Edison, New Jersey.

12.6 Starborn® Structural F19, F23, F23-E, and F23-W Screws are produced under a quality control program subject to periodic inspections performed by an approved agency in accordance with IBC Section 1703.5.2.

12.7 When required by adopted legislation and enforced by the building official, also known as the authority having jurisdiction (AHJ) in which the project is to be constructed:

12.7.1 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.

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

12.7.3 These innovative products have an internal quality control program and a third-party quality assurance program.

12.7.4 At a minimum, these innovative products shall be installed per Section **9** of this report.

12.7.5 The review of this report by the AHJ shall comply with IBC Section 104 and IBC Section 105.4.

12.7.6 These innovative products have an internal quality control program and a third party quality assurance program in accordance with IBC Section 104.4, IBC Section 110.4, IBC Section 1703, IRC Section R104.4, and IRC Section R109.2.

12.7.7 The application of these innovative products in the context of this report is dependent upon the accuracy of the construction documents, implementation of installation instructions, inspection as required by IBC Section 110.3, IRC Section R109.2, and any other regulatory requirements that may apply.

12.8 The approval of this report by the AHJ shall comply with IBC Section 1707.1, where legislation states in part, "*the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new material or assemblies as provided for in Section 104.11*," all of IBC Section 104, and IBC Section 105.4.

12.9 Design loads shall be determined in accordance with the regulations adopted by the jurisdiction in which the project is to be constructed and/or by the building designer (i.e., owner or RDP).

12.10 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.

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13 Identification

13.1 The innovative products listed in Section **1.1** through Section **1.4** 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.

13.2 Additional technical information can be found at www.starbornindustries.com.

14 Review Schedule

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

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

15 Approved for Use Pursuant to U.S. and International Legislation Defined in Appendix A

15.1 Starborn® Structural F19, F23, F23-E, and F23-W Screws are included in this report published by an approved agency that is concerned with evaluation of products or services, maintains periodic inspection of the production of listed materials or periodic evaluation of services. This report states either that the material, product, or service meets recognized standards or has been tested and found suitable for a specified purpose. This report meets the legislative intent and definition of being acceptable to the AHJ.

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Appendix A

1 Legislation that Authorizes AHJ Approval

1.1 **Fair Competition**: State legislatures have adopted Federal regulations for the examination and approval of building code 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 **Adopted Legislation**: The following local, state and federal regulations affirmatively authorize these innovative products to be approved by AHJs, delegates of building departments and/or delegates of an agency of the federal government:

1.2.1 Interstate commerce is governed by the Federal Department of Justice to encourage the use of innovative products, materials, designs, services, assemblies and/or methods of construction. The goal is to "protect economic freedom and opportunity by promoting free and fair competition in the marketplace."

1.2.2 Title 18 US Code Section 242 affirms and regulates the right of individuals and businesses to freely and fairly have new products, materials, designs, services, assemblies and/or methods of construction approved for use in commerce. Disapproval of alternatives shall be based upon non-conformance with respect to specific provisions of adopted legislation and shall be provided in writing stating the reasons why the alternative was not approved, with reference to the specific legislation violated.

1.2.3 The federal government and each state have a public records act. In addition, each state also has legislation that mimics the federal Defend Trade Secrets Act 2016 (DTSA),[xxx] where providing test reports, engineering analysis and/or other related IP/TS is subject to prison of not more than ten years[xxxi] and/or a $5,000,000 fine or 3 times the value of[xxxii] the Intellectual Property (IP) and Trade Secrets (TS).

1.2.3.1 Compliance with public records and trade secret legislation requires approval through the use of Listings, certified reports, Technical Evaluation Reports, duly authenticated reports and/or research reports prepared by approved agencies and/or approved sources.

1.2.4 For new materials[xxxiii] that are not specifically provided for in any regulation, the design strengths and permissible stresses shall be established by tests, where suitable load tests simulate the actual loads and conditions of application that occur.

1.2.5 The design strengths and permissible stresses of any structural material shall conform to the specifications and methods of design using accepted engineering practice.[xxxiv]

1.2.6 The commerce of approved sources (i.e., registered PEs) is regulated by professional engineering legislation. Professional engineering commerce shall always be approved by AHJs, except where there is evidence provided in writing, that specific legislation has been violated by an individual registered PE.

1.2.7 The AHJ shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in IBC Section 104.11.[xxxv]

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1.3 **Approved**[xxxvi] **by Los Angeles**: The Los Angeles Municipal Code (LAMC) states in pertinent part that the provisions of LAMC are not intended to prevent the use of any material, device, or method of construction not specifically prescribed by LAMC. The Department shall use Part III, Recognized Standards in addition to Part II, Uniform Building Code Standards of Division 35, Article 1, Chapter IX of the LAMC in evaluation of products for approval where such standard exists for the product or the material and may use other approved standards that apply. Whenever tests or certificates of any material or fabricated assembly are required by Chapter IX of the LAMC, such tests or certification shall be made by a testing agency approved by the Superintendent of Building to conduct such tests or provide such certifications. The testing agency shall publish the scope and limitation(s) of the listed material or fabricated assembly.[xxxvii] The Superintendent of Building Approved Testing Agency Roster is provided by the Los Angeles Department of Building and Safety (LADBS). The Center for Building Innovation (CBI) Certificate of Approval License is TA24945. Tests and certifications found in a DrJ Listing are LAMC approved. In addition, the Superintendent of Building shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in the California Building Code (CBC) Section 1707.1.[xxxviii]

1.4 **Approved by Chicago**: The Municipal Code of Chicago (MCC) states in pertinent part that an Approved Agency is a Nationally Recognized Testing Laboratory (NRTL) acting within its recognized scope and/or a certification body accredited by the American National Standards Institute (ANSI) acting within its accredited scope. Construction materials and test procedures shall conform to the applicable standards listed in the MCC. Sufficient technical data shall be submitted to the building official to substantiate the proposed use of any product, material, service, design, assembly and/or method of construction not specifically provided for in the MCC. This technical data shall consist of research reports from approved sources (i.e., MCC defined Approved Agencies).

1.5 **Approved by New York City**: The 2022 NYC Building Code (NYCBC) states in part that an approved agency shall be deemed[xxxix] an approved testing agency via ISO/IEC 17025 accreditation, an approved inspection agency via ISO/IEC 17020 accreditation and an approved product evaluation agency via ISO/IEC 17065 accreditation. Accrediting agencies, other than federal agencies, must be members of an internationally recognized cooperation of laboratory and inspection accreditation bodies subject to a mutual recognition agreement[xl] (i.e., ANAB, International Accreditation Forum (IAF), etc.).

1.6 **Approved by Florida**: Statewide approval of products, methods, or systems of construction shall be approved, without further evaluation by:

1.6.1 A certification mark or listing of an approved certification agency,

1.6.2 A test report from an approved testing laboratory,

1.6.3 A product evaluation report based upon testing or comparative or rational analysis, or a combination thereof, from an approved product evaluation entity, or

1.6.4 A product evaluation report based upon testing, comparative or rational analysis, or a combination thereof, developed, signed and sealed by a professional engineer or architect, licensed in Florida.

1.7 For local product approval, products or systems of construction shall demonstrate compliance with the structural wind load requirements of the Florida Building Code (FBC) through one of the following methods;

1.7.1 A certification mark, listing or label from a commission-approved certification agency indicating that the product complies with the code,

1.7.2 A test report from a commission-approved testing laboratory indicating that the product tested complies with the code,

1.7.3 A product-evaluation report based upon testing, comparative or rational analysis, or a combination thereof, from a commission-approved product evaluation entity which indicates that the product evaluated complies with the code,

1.7.4 A product-evaluation report or certification based upon testing or comparative or rational analysis, or a combination thereof, developed and signed and sealed by a Florida professional engineer or Florida registered architect, which indicates that the product complies with the code, or

1.7.5 A statewide product approval issued by the Florida Building Commission.

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1.8 The Florida Department of Business and Professional Regulation (DBPR) website provides a listing of companies certified as a Product Evaluation Agency (i.e., EVLMiami 13692), a Product Certification Agency (i.e., CER10642) and as a Florida Registered Engineer (i.e., ANE13741).

1.9 **Approved by Miami-Dade County (i.e., Notice of Acceptance [NOA])**: A Florida statewide approval is an NOA. An NOA is a Florida local product approval. By Florida law, Miami-Dade County shall accept the statewide and local Florida Product Approval as provided for in Florida legislation 553.842 and 553.8425.

1.10 **Approved by New Jersey**: Pursuant to the 2018 Building Code of New Jersey in IBC Section 1707.1 General,[xli] it states: "*In the absence of approved rules or other approved standards, the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in the administrative provisions of the Uniform Construction Code (N.J.A.C. 5:23)*".[xlii] Furthermore N.J.A.C 5:23-3.7 states: "*Municipal approvals of alternative materials, equipment, or methods of construction*."

1.10.1 **Approvals**: Alternative materials, equipment, or methods of construction shall be approved by the appropriate subcode official provided the proposed design is satisfactory and that the materials, equipment, or methods of construction are suitable for the intended use and are at least the equivalent in quality, strength, effectiveness, fire resistance, durability and safety of those conforming with the requirements of the regulations.

1.10.1.1 A field evaluation label and report or letter issued by a nationally recognized testing laboratory verifying that the specific material, equipment, or method of construction meets the identified standards or has been tested and found to be suitable for the intended use, shall be accepted by the appropriate subcode official as meeting the requirements of the above.

1.10.1.2 Reports of engineering findings issued by nationally recognized evaluation service programs such as but not limited to, the Building Officials and Code Administrators (BOCA), the International Conference of Building Officials (ICBO), the Southern Building Code Congress International (SBCCI), the International Code Council (ICC) and the National Evaluation Service, Inc., shall be accepted by the appropriate subcode official as meeting the requirements of the above.

1.10.2 The New Jersey Department of Community Affairs has confirmed that technical evaluation reports, from any accredited entity listed by ANAB, meets the requirements of item the previous paragraph, given that the listed entities are no longer in existence and/or do not provide "*reports of engineering findings*".

1.11 **Approved by the Code of Federal Regulations Manufactured Home Construction and Safety Standards**: Pursuant to Title 24, Subtitle B, Chapter XX, Part 3282.14[xliii] and Part 3280,[xliv] the Department encourages innovation and the use of new technology in manufactured homes. The design and construction of a manufactured home shall conform to the provisions of Part 3282 and Part 3280 where key approval provisions in mandatory language follow:

1.11.1 "*All construction methods shall be in conformance with accepted engineering practices*"

1.11.2 "*The strength and rigidity of the component parts and/or the integrated structure shall be determined by engineering analysis or by suitable load tests to simulate the actual loads and conditions of application that occur.*"

1.11.3 "*The design stresses of all materials shall conform to accepted engineering practice.*"

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1.12 **Approval by US, Local and State Jurisdictions in Genera**l: In all other local and state jurisdictions, the adopted building code legislation states in pertinent part that:

1.12.1 For new materials that are not specifically provided for in this code, the design strengths and permissible stresses shall be established by tests.[xlv]

1.12.2 For innovative alternatives and/or methods of construction, the building official shall accept duly authenticated reports from approved agencies with respect to the quality and manner of use of new materials or assemblies.[xlvi]

1.12.2.1 An approved agency is "approved" when it is ANAB ISO/IEC 17065 accredited. DrJ Engineering, LLC (DrJ) is in the ANAB directory.

1.12.2.2 An approved source is "approved" when an RDP is properly licensed to transact engineering commerce. The regulatory authority governing approved sources is the state legislature via its professional engineering regulations.[xlvii]

1.12.3 The design strengths and permissible stresses of any structural material…shall conform to the specifications and methods of design of accepted engineering practice performed by an approved source.[xlviii]

1.13 **Approval by International Jurisdictions**: The USMCA and GATT agreements provide for approval of innovative materials, designs, services and/or methods of construction through the Agreement on Technical Barriers to Trade and the IAF Multilateral Recognition Arrangement (MLA), where these agreements:

1.13.1 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.

1.13.2 **Approved**: The purpose of the MLA is to ensure mutual recognition of accredited certification and validation/verification statements between signatories to the MLA and subsequently, acceptance of accredited certification and validation/verification statements in many markets based on one accreditation for the timely approval of innovative materials, designs, services and/or methods of construction.

1.13.3 ANAB is an IAF-MLA signatory where recognition of certificates, validation and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA, with the appropriate scope, shall be approved.[xlix]

1.13.4 Therefore, all ANAB ISO/IEC 17065 Duly Authenticated Reports are approval equivalent.[l]

1.14 Approval equity is a fundamental commercial and legal principle.[li]

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Notes

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

ii https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1702

iii Alternative Materials, Design and Methods of Construction and Equipment: The provisions of any regulation code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by a regulation. Please review https://www.justice.gov/atr/mission and https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#104.11

iv https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706:~:text=the%20design%20strengths%20and%20permissible%20stresses%20shall%20be%20established%20by%20tests%20as

v The design strengths and permissible stresses of any structural material shall conform to the specifications and methods of design of accepted engineering practice. https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706:~:text=shall%20conform%20to%20the%20specifications%20and%20methods%20of%20design%20of%20accepted%20engineering%20practice

vi https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1707.1:~:text=the%20building%20official%20shall%20accept%20duly%20authenticated%20reports%20from%20approved%20agencies

vii https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1703.4.2

viii https://up.codes/viewer/wyoming/ibc-2021/chapter/2/definitions#approved_agency

ix https://up.codes/viewer/wyoming/ibc-2021/chapter/2/definitions#approved_source

x https://www.law.cornell.edu/uscode/text/18/1832 (b) Any organization that commits any offense described in subsection (a) shall be fined not more than the greater of $5,000,000 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. The federal government and each state have a public records act. To follow DTSA and comply state public records and trade secret legislation requires approval through ANAB ISO/IEC 17065 accredited certification bodies or approved sources. For more information, please review this website: Intellectual Property and Trade Secrets.

xi https://www.nspe.org/resources/issues-and-advocacy/professional-policies-and-position-statements/regulation-professional AND https://apassociation.org/list-of-engineering-boards-in-each-state-archive/

xii https://www.cbitest.com/accreditation/

xiii https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#104:~:text=to%20enforce%20the%20provisions%20of%20this%20code

xiv https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#104.11:~:text=Where%20the%20alternative%20material%2C%20design%20or%20method%20of%20construction%20is%20not%20approved%2C%20the%20building%20official%20shall%20respond%20in%20writing%2C%20stating%20the%20reasons%20why%20the%20alternative%20was%20not%20approved AND https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#105.3.1:~:text=If%20the%20application%20or%20the%20construction%20documents%20do%20not%20conform%20to%20the%20requirements%20of%20pertinent%20laws%2C%20the%20building%20official%20shall%20reject%20such%20application%20in%20writing%2C%20stating%20the%20reasons%20therefore

xv https://up.codes/viewer/colorado/ibc-2021/chapter/17/special-inspections-and-tests#1707.1:~:text=the%20building%20official%20shall%20accept%20duly%20authenticated%20reports%20from%20approved%20agencies%20in%20respect%20to%20the%20quality%20and%20manner%20of%20use%20of%20new%20materials%20or%20assemblies%20as%20provided%20for%20in%20Section%20104.11

xvi https://iaf.nu/en/about-iaf-mla/#:~:text=it%20is%20required%20to%20recognise%20certificates%20and%20validation%20and%20verification%20statements%20issued%20by%20conformity%20assessment%20bodies%20accredited%20by%20all%20other%20signatories%20of%20the%20IAF%20MLA%2C%20with%20the%20appropriate%20scope

xvii True for all ANAB accredited product evaluation agencies and all International Trade Agreements.

xviii https://www.justice.gov/crt/deprivation-rights-under-color-law AND https://www.justice.gov/atr/mission

xix Unless otherwise noted, all references in this report are from the 2021 version of the codes and the standards referenced therein. This material, product, design, service, and/or method of construction also complies with the 2000-2021 versions of the referenced codes and the standards referenced therein.

xx https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#p-3280.2(Listed%20or%20certified); https://up.codes/viewer/colorado/ibc-2021/chapter/2/definitions#listed AND https://up.codes/viewer/colorado/ibc-2021/chapter/2/definitions#labeled

xxi https://up.codes/viewer/colorado/ibc-2021/chapter/17/special-inspections-and-tests#1703.4

xxii https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#:~:text=All%20construction%20methods%20shall%20be%20in%20conformance%20with%20accepted%20engineering%20practices%20to%20insure%20durable%2C%20livable%2C%20and%20safe%20housing%20and%20shall%20demonstrate%20acceptable%20workmanship%20reflecting%20journeyman%20quality%20of%20work%20of%20the%20various%20trades

xxiii https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#:~:text=The%20strength%20and%20rigidity%20of%20the%20component%20parts%20and/or%20the%20integrated%20structure%20shall%20be%20determined%20by%20engineering%20analysis%20or%20by%20suitable%20load%20tests%20to%20simulate%20the%20actual%20loads%20and%20conditions%20of%20application%20that%20occur

xxiv 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.

xxv See Code of Federal Regulations (CFR) Title 24 Subtitle B Chapter XX Part 3280 for definition.

xxvi 2018 IFC Section 104.9

xxvii Approved is an adjective that modifies the noun after it. For example, Approved Agency means that the Agency is accepted officially as being suitable in a particular situation. This example conforms to IBC/IRC/IFC Section 201.4 where the building code authorizes sentences to have an ordinarily accepted meaning such as the context implies.

xxviii https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1707.1

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xxix Multilateral approval is true for all ANAB accredited product evaluation agencies and all International Trade Agreements.

xxx http://www.drjengineering.org/AppendixC AND https://www.drjcertification.org/cornell-2016-protection-trade-secrets

xxxi https://www.law.cornell.edu/uscode/text/18/1832#:~:text=imprisoned%20not%20more%20than%2010%20years

xxxii https://www.law.cornell.edu/uscode/text/18/1832#:~:text=Any%20organization%20that,has%20thereby%20avoided

xxxiii https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706.2

xxxiv IBC 2021, Section 1706.1 Conformance to Standards

xxxv IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General

xxxvi See Section **11.6** for the distilled building code definition of **Approved**.

xxxvii Los Angeles Municipal Code, SEC. 98.0503. TESTING AGENCIES

xxxviii https://up.codes/viewer/california/ca-building-code-2022/chapter/17/special-inspections-and-tests#1707.1

xxxix New York City, The Rules of the City of New York, § 101-07 Approved Agencies

xl New York City, The Rules of the City of New York, § 101-07 Approved Agencies

xli https://up.codes/viewer/new_jersey/ibc-2018/chapter/17/special-inspections-and-tests#1707.1

xlii https://www.nj.gov/dca/divisions/codes/codreg/ucc.html

xliii https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3282/subpart-A/section-3282.14

xliv https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280

xlv IBC 2021, Section 1706 Design Strengths of Materials, 1706.2 New Materials. Adopted law pursuant to IBC model code language 1706.2.

xlvi IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General. Adopted law pursuant to IBC model code language 1707.1.

xlvii https://www.nspe.org/resources/issues-and-advocacy/professional-policies-and-position-statements/regulation-professional AND https://apassociation.org/list-of-engineering-boards-in-each-state-archive/

xlviii IBC 2021, Section 1706 Design Strengths of Materials, Section 1706.1 Conformance to Standards Adopted law pursuant to IBC model code language 1706.1.

xlix https://iaf.nu/en/about-iaf-mla/#:~:text=it%20is%20required%20to%20recognise%20certificates%20and%20validation%20and%20verification%20statements%20issued%20by%20conformity%20assessment%20bodies%20accredited%20by%20all%20other%20signatories%20of%20the%20IAF%20MLA%2C%20with%20the%20appropriate%20scope

l True for all ANAB accredited product evaluation agencies and all International Trade Agreements.

li https://www.justice.gov/crt/deprivation-rights-under-color-law AND https://www.justice.gov/atr/mission

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