Listing and Technical Evaluation Report™

Report No: 1011-01

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Subject to Renewal: October 1, 2025

Wind Pressure Performance of Kingspan® GreenGuard® XPS Insulation Board Used in Exterior Wall Covering Assemblies

Trade Secret Report Holder:

Kingspan® Insulation, LLC

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CSI Designations:

DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

Section: 06 16 00 - Sheathing

DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION

Section: 07 21 00 - Thermal Insulation

1 Innovative Products Evaluated[1]

1.1 GreenGuard XPS Insulation Board:

1.1.1 GreenGuard CM

1.1.2 GreenGuard LG CM

1.1.3 GreenGuard SL

1.1.4 GreenGuard LG SL

1.1.5 GreenGuard SLX

1.1.6 GreenGuard LG SLX

1.1.7 GreenGuard PGU

2 Product Description and Materials

2.1 These innovative products used in accordance with this report, shall comply with the following material standards:

2.1.1 XPS manufactured in compliance with ASTM C578, Type IV

2.2 GreenGuard XPS Insulation Board is produced under a proprietary manufacturing process and formed into rigid insulation panels.

2.2.1 GreenGuard XPS Insulation Board is manufactured with or without edge treatments and facers as follows:

2.2.1.1 CM: square edges

2.2.1.2 SL: shiplap edges

2.2.1.3 SLX: shiplap edges and clear plastic facers on both sides

2.2.1.4 PGU: $^{7}/_{16}$" XPS with a reinforcing polyolefin fabric on one side and a clear plastic facer on the other side.

2.2.2 Kingspan GreenGuard LG XPS has the same physical properties as the GreenGuard XPS except it is produced with a lower GWP (Global Warming Potential) blowing agent formulation. All references in this report to GreenGuard XPS Insulation Board include both the GreenGuard XPS and the GreenGuard LG XPS insulation board.

2.3 GreenGuard XPS Insulation Board is manufactured in 4x8 sheets in $^{1}/_{2}$", $^{3}/_{4}$", 1", $1^{1}/_{2}$", 2" and 3" thicknesses.

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

3 Definitions

3.1 New Materials[2] 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.[3] The design strengths and permissible stresses shall be established by tests[4] and/or engineering analysis.[5]

3.2 Duly authenticated reports[6] and research reports[7] are test reports and related engineering evaluations, which are written by an approved agency[8] and/or an approved source.[9]

3.2.1 These reports contain intellectual property and/or trade secrets, which are protected by the Defend Trade Secrets Act (DTSA).[10]

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) is properly licensed to transact engineering commerce. The regulatory authority governing approved sources is the state legislature via its professional engineering regulations.[11]

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 Registered Design Professional (RDP).

3.5.1 The Center for Building Innovation (CBI) is ANAB[12] ISO/IEC 17025 and ISO/IEC 17020 accredited.

3.6 The regulatory authority shall enforce[13] 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[14] 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.[15]

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.[16] Therefore, all ANAB ISO/IEC 17065 duly authenticated reports are approval equivalent.[17]

3.9 Approval equity is a fundamental commercial and legal principle.[18]

4 Applicable Standards for the Listing; Regulations for the Regulatory Evaluation[19]

4.1 *Standards*

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

4.1.2 *ASCE/SEI 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures*

4.1.3 *ASTM C578: Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation*

4.1.4 *ASTM E2178: Standard Test Method for Air Permeance of Building Materials*

4.1.5 *ASTM E330: Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference*

4.1.6 *ASTM E331: Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference*

4.1.7 *ABTG ANSI/FS 100: Standard Requirements for Wind Pressure Resistance of Foam Plastic Insulating Sheathing Used in Exterior Wall Covering Assemblies*[20]

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[21]

5.1 Equipment, materials, products or services included in a List published by a nationally recognized testing laboratory (i.e., CBI), approved agency (i.e., CBI and DrJ), and/or approved source (i.e., DrJ) or other organization concerned with product evaluation (i.e., DrJ) that maintains periodic inspection (i.e., CBI) of production of listed equipment or materials, and whose listing states either that the equipment or material meets nationally recognized standards or has been tested and found suitable for use in a specified manner.

6 Tabulated Properties Generated from Nationally Recognized Standards

6.1 *General Requirements*

6.1.1 The following are minimum installation requirements for GreenGuard XPS Insulation Board when applied to light-frame wall framing members:

6.1.1.1 Light-frame wood framing members supporting GreenGuard XPS Insulation Board shall have a nominal thickness of not less than 2" ($1^1/_2$" actual).

6.1.1.2 Light-frame steel framing members shall have a flange width of not less than $1^1/_2$" (including bend radius at web and lip).

6.1.1.3 Framing members shall be spaced a maximum of 24" o.c.

6.1.1.3.1 GreenGuard XPS Insulation Board shall be attached to the wall framing in accordance with the manufacturer installation instructions and this report.

6.1.1.3.2 All sheathing edges shall be supported by wall framing or blocking.

6.2 *Wind Pressure Requirements*

6.2.1 *General:*

6.2.1.1 When fastened directly to light-frame wall members (i.e., studs), GreenGuard XPS Insulation Board shall comply with the requirements of **Section 6.1**, in accordance with IBC Section 104.11, IRC Section R104.11 and ASTM C578, as applicable.

6.2.1.2 When installed as over-sheathing, GreenGuard XPS Insulation Board shall not be required to comply with this report.

6.2.2 *Specific Requirements:*

6.2.2.1 When using ASCE 7-16 as referenced by the 2018 IBC for the conditions listed in this section, the wind pressures listed in ASCE 7 shall be multiplied by a factor of 0.6 to convert them to ASD level loads and then compared to the values in **Table 1**.

Table 1. Allowable Wind Pressure Resistance Values (PSF) for GreenGuard XPS Insulation Boards Used in Exterior Wall Covering Assemblies[1,2,5]

Kingspan XPS Products	Sheathing Thickness (in)	Allowable (ASD) Components & Cladding Design Wind Pressure (psf)	
		16" o.c. Framing	24" o.c. Framing
GreenGuard XPS Insulation Board	1/2	19.5	NP[6]
	3/4	25.9	20.5
	1	38.4[(3)]	30.6
	1 1/2	72.8	41.3
	2	122	53.7[(3)]
	3[(4)]	260	139.4
GreenGuard Plygood® Ultra Sheathing (PGU)	7/16	78.6	61.4

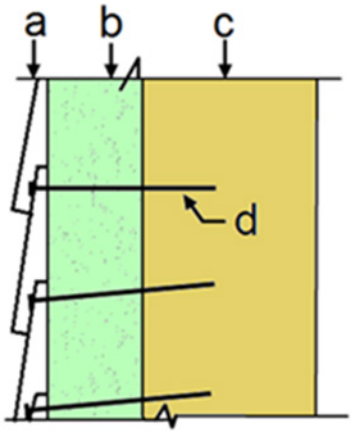
SI: 1in = 25.4 mm, 1 pound per square foot (psf) = 0.0479 kPa.

1. Linear interpolation shall not be permitted.
2. **Table 1** shall be used in accordance with the general requirements of **Section 6.1**. Allowable design wind pressure ratings are based on ASTM E330 testing in accordance with IBC Section 1609 and IRC Section R301.2. These values were determined in accordance with ANSI/ATBG FS100 for a fully-blocked condition (i.e., all horizontal and vertical sheathing joints supported on blocking or framing members) using a Pressure Equalization Factor (PEF) of 1.0.
3. Based on yield load in accordance with ANSI/ATBG FS100.
4. Table values for the 3" GreenGuard XPS Insulation Board are limited to sheathing panels installed with the length dimension parallel to the framing.
5. Design values are applicable to the bending strength of the product only. Fastening to resist wind loads must be achieved by separate specification for attachment of the foam and/or the cladding system over the foam sheathing in addition to the manufacturer minimum attachment requirements.
6. NP = not permitted

6.2.2.2 The minimum thickness of GreenGuard XPS Insulation Board shall comply with **Table 1**, for one of the following two conditions:

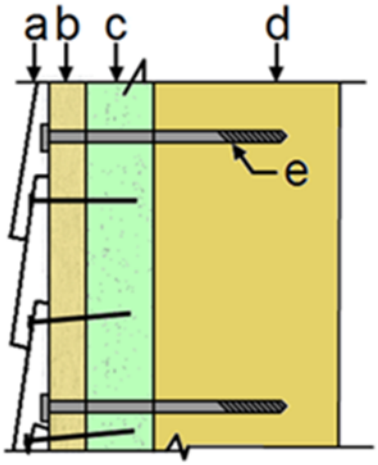
6.2.2.2.1 Where the GreenGuard XPS Insulation Board is directly constrained by a code-compliant cladding material (i.e., no gap between the cladding and GreenGuard XPS Insulation Board product, as shown in **Figure 1**), the components and cladding design wind pressure determined in accordance with IRC Section R301.2 or IBC Section 1609.1 shall not exceed the allowable wind pressure value of the FPIS product per **Table 1**.

6.2.2.2.2 Where a code-compliant cladding system is installed over, but not directly on the surface of the GreenGuard XPS Insulation Board such that there is a space between the sheathing and the cladding (i.e., furring is used over GreenGuard XPS Insulation Board product, as shown in **Figure 2**), the components and cladding design wind pressure determined in accordance with IRC Section R301.2 or IBC Section 1609.1, shall not exceed the allowable wind pressure value of GreenGuard XPS Insulation Board, per **Table 1**.



a. Cladding material and fasteners
b. GreenGuard® Insulation Board
c. Wall framing per code (i.e., wood or steel studs)
d. Cladding fastener per code and of minimum size to support cladding weight

Figure 1. Exterior Wall Covering Assembly with Cladding Installed Directly Over GreenGuard XPS Insulation Board



a. Cladding material and fasteners
b. Wood or steel furring (which battens the foam sheathing to the wall framing and creates an airspace between the foam sheathing and the cladding)
c. GreenGuard® Insulation Board
d. Wall framing per code (i.e., wood or steel studs)
e. Furring fastener by design and with minimum size to support cladding weight

Figure 2. Exterior Wall Covering Assembly with Cladding and Furring Installed Over GreenGuard XPS Insulation Board

6.2.2.3 The basic wind speed for GreenGuard XPS Insulation Board shall not exceed the values in **Table 2**.

Table 2. Basic Wind Speed Values (mph) for GreenGuard XPS Insulation Boards Used in Exterior Wall Covering Assemblies Based on ASCE 7-10 Three-Second Gust[1]

Kingspan XPS Products	Sheathing Thickness (in)	Components & Cladding Basic Wind Speed (mph)	
		16" o.c. Framing	24" o.c. Framing
GreenGuard XPS Insulation Board	1/2	115	NP
	3/4	130	115
	1	160	140
	1 1/2	200	160
	2	200	180
	3	200	200
GreenGuard Plygood Ultra Sheathing (PGU)	7/16	200	190

SI: 1 in = 25.4 mm, 1 mph = 1.61 km/h

1. Allowable wind speeds are based on the following: Mean roof height – 30', Exposure B, 10 sq. ft. effective wind area.

6.2.2.4 Except as noted in **Table 1** footnote 4, GreenGuard XPS Insulation Board can be oriented with the length dimension parallel or perpendicular to the wall-framing members. When perpendicular to framing members, horizontal joints shall be supported by blocking, unless use of unblocked joints qualifies in accordance with IBC Section 104.11, IRC Section R104.11 and ASTM C578, as applicable.

6.3 *Water-Resistive Barrier (WRB)*

6.3.1 GreenGuard Insulation products (***Note:*** Applies to both XPS Insulation Boards and PGU) may be used as a WRB as prescribed in IRC Section R703.2 and IBC Section 1403.2,[22] when installed on exterior walls as described in this section.

6.3.2 GreenGuard Insulation products shall be installed with board joints placed directly over exterior framing spaced a maximum of 24" (610 mm) o.c. The fasteners used to attach the board shall be installed in accordance with **Section 9**.

6.3.3 All seams and joints between boards shall be butt jointed and sealed with an approved construction tape in accordance with **Section 9**. Approved construction tapes include 1 7/8" GreenGuard Seam Tape or equivalent except:

6.3.3.1 7/16" PGU approved construction tape shall be a minimum 3" GreenGuard Seam Tape or equivalent.

6.3.4 A separate WRB may also be provided. If a separate WRB method is used, taping of the sheathing joints is not required.

6.3.5 Flashing must be installed at all sheathing penetrations and shall comply with all applicable code sections.

6.4 *Air Barrier*

6.4.1 GreenGuard XPS Insulation Boards may be used as an air barrier material as prescribed in IRC Section N1102.4.1.1, IECC Section C402.5.1.1 and IECC Section R402.4.1.1.

6.4.2 When used as part of a continuous air barrier, GreenGuard XPS Insulation Boards shall be installed as follows:

6.4.2.1 All sheathing panel edges at the top and bottom of the wall assemblies and all butted joints between sheathing panels shall be sealed with an approved seam tape, self-adhering flashing or sealant.

6.5 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[23]

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.[24]

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.[25]

8 Regulatory Evaluation and Accepted Engineering Practice

8.1 GreenGuard XPS Insulation Boards comply with the following legislatively adopted regulations and/or accepted engineering practice for the following reasons:

8.1.1 The wind pressure resistance performance of GreenGuard XPS Insulation Board was evaluated for use as part of an exterior wall covering assembly in accordance with the following code sections:

8.1.1.1 IBC Section 104.11 and IBC Section 1404.8

8.1.1.2 IRC Section R104.11, IRC Section R703.1.2, IRC Section R703.3 and IRC Table R703.3(1)

8.1.2 This report evaluates the wind pressure resistance performance of GreenGuard XPS Insulation Boards for use as exterior wall sheathing in compliance with the building codes listed in **Section 4**.

8.1.2.1 When used as over-sheathing[26] on light-frame masonry or concrete exterior walls, GreenGuard XPS Insulation Board is not required to meet the wind pressure requirements of this report.

8.1.2.2 This report does not address wind pressure resistance requirements for GreenGuard XPS Insulation Board used as part of an Exterior Insulation Finish System (EIFS). Refer to the EIFS manufacturer installation instructions for building code compliance.

8.1.3 GreenGuard XPS Insulation Board shall comply with the material standard listed in **Section 2** and shall be applied to exterior wall construction in accordance with the general requirements of **Section 6.1**, as well as the prescriptive wind pressure resistance requirements of **Section 6.2**.

8.1.4 GreenGuard XPS Insulation Board used in accordance with this report, that is required to resist wind pressure in exterior wall covering assemblies, shall also comply with the product marking requirements of **Section 13** and the conditions of use listed in **Section 12**.

8.1.5 GreenGuard XPS Insulation Board was also evaluated for the following:

8.1.5.1 Use as an air barrier material in accordance with IRC Section N1102.4.1.1, IECC Section C402.5.1.1 and IRC Section R402.4.1.1.

8.1.5.2 Use as a WRB in accordance with IRC Section R703.2 and IBC Section 1403.2.[27]

8.1.6 Only products listed in this report, with thicknesses ranging from 1" to 3", are certified for wind pressure resistance. Results of testing for other thicknesses are provided for informational purposes only.

8.1.6.1 For the scope of this report, only products with thicknesses ranging from 1" to 3" are subject to an ongoing quality control program for performance to meet wind requirements, in accordance with ANSI/ABTG FS100.

8.2 Any building code, regulation and/or accepted engineering evaluations (i.e., research reports, duly authenticated reports, etc.) that are conducted for this Listing 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[28] 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 *GreenGuard XPS Insulation Board Installation*

9.3.1 Refer to the manufacturer installation instructions, in addition to this report, for complete details and requirements.

9.3.2 All required wall bracing shall be installed prior to GreenGuard XPS Insulation Board installation.

9.3.3 The insulation boards should be oriented with the printed side facing the exterior side of the building.

9.3.3.1 Except as noted in **Table 1** footnote 4, GreenGuard XPS Insulation Board can be oriented with the length dimension parallel or perpendicular to the wall framing members. When perpendicular to framing members, horizontal joints shall be supported by blocking, unless use of unblocked joints qualifies in accordance with IBC Section 104.11, IRC Section R104.11 and ASTM C578, as applicable.

9.3.4 Secure the sheathing to framing members with fasteners capable of resisting the imposed loads in accordance with NDS. Fasteners will vary, depending on the substrate and cladding materials.

9.3.4.1 Fastener heads shall be a minimum of $^{3}/_{8}$" diameter. Do not allow the fastener head to penetrate the sheathing facer. Use of washers at the fastener head is recommended.

9.3.4.2 Space fasteners 12" o.c. in both the field and perimeter.

9.3.4.3 Minimum penetration of the fasteners into the substrate is $^{3}/_{4}$".

9.4 *Cladding Installation*

9.4.1 Wind pressure rating adjustments for vinyl siding installed directly over GreenGuard XPS Insulation Board shall comply with IRC Section R703.11.2 for buildings constructed under the IRC or IBC.

9.4.2 Cladding installation and fastening through foam sheathing shall comply with the applicable building code and the cladding manufacturer installation instructions. The minimum fastener size shall be capable of supporting the cladding weight when cantilevering through the GreenGuard XPS Insulation Board.

9.4.3 Wall assemblies that include GreenGuard XPS Insulation Boards, and that are intended to serve as part of the lateral force resisting system of a structure, shall be braced to resist the in-plane shear force in accordance with IRC Section R602.10, IBC Section 2308.6 or a design in accordance with IRC Section R301 or IBC Section 2305, as applicable.

9.4.4 Wall assemblies with GreenGuard XPS Insulation Boards attached to gravity load supporting members (i.e., studs) that require buckling restraint in a direction parallel to the plane of the wall shall have such restraint provided by other suitable materials. Wall assemblies shall be designed with an effective buckling length equal to the length of the member between points of lateral support provided by attachment to other building assemblies.

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 Air barrier material testing in accordance with ASTM E2178

10.1.2 Water-resistive barrier testing in accordance with ASTM E331

10.1.3 Wind pressure resistance testing in accordance with ABTG ANSI/FS 100

10.2 Attaching Exterior Wall Coverings through Foam Sheathing to Wood or Steel Wall Framing, FSC Tech Matters.

10.3 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.

10.4 Where applicable, 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.

10.5 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 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.

10.6 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.[29]

10.7 Where additional condition of use and/or regulatory compliance information is required, please search for GreenGuard XPS Insulation Board on the DrJ Certification website.

11 Findings

11.1 As outlined in **Section 6**, GreenGuard XPS Insulation Boards 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, GreenGuard XPS Insulation Board shall be approved for the following applications:

11.2.1 Performance for use as a WRB in accordance with IRC Section R703.2 and IBC Section 1403.2.[30]

11.2.2 Performance for use as an air barrier in accordance with IRC Section N1102.4.1.1, IECC Section C402.5.1.1 and IECC Section R402.4.1.1.

11.2.3 Transverse load resistance due to components and cladding pressures on building surfaces as defined in **Section 6**.

11.3 Unless exempt by state statute, when GreenGuard XPS Insulation Boards are to be used as a structural and/or building envelope component in the design of a specific building, the design shall be performed by an RDP.

11.4 Any application specific issues not addressed herein can be engineered by an RDP. Assistance with engineering is available from Kingspan Insulation, LLC.

11.5 IBC Section 104.11 (IRC Section R104.11 and IFC Section 104.10[31] 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.

11.6 **Approved**:[32] Building regulations require that the building official shall accept duly authenticated reports.[33]

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

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

11.6.3 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.

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

11.8 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.[34]

12 Conditions of Use

12.1 Material properties shall not fall outside the boundaries defined in **Section 6**.

12.2 As defined in **Section 6**, 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, GreenGuard XPS Insulation Boards shall be:

12.3.1 Installed in compliance with the manufacturer instructions, the applicable building code and this report.

12.3.2 The manufacturer shall provide the building official and purchaser with evidence of code compliance for matters beyond the wind pressure resistance scope of this report.

12.4 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:

12.4.1 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.

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

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

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

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

12.4.6 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.

12.4.7 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.

12.5 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.

12.6 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).

12.7 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.

13 Identification

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

13.2 Additional technical information can be found at www.kingspan.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 GreenGuard XPS Insulation Boards 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.

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

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),[35] where providing test reports, engineering analysis and/or other related IP/TS is subject to prison of not more than ten years[36] and/or a $5,000,000 fine or 3 times the value of[37] 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[38] 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.[39]

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 have 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.[40]

1.3 **Approved**[41] **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.[42] 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.[43]

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[44] 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[45] (i.e., ANAB, International Accreditation Forum also known as 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.

1.6.5 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:

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

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

1.6.5.3 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,

1.6.5.4 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

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

1.6.6 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).

1.7 **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.

1.8 **Approved by New Jersey**: Pursuant to the 2018 Building Code of New Jersey in IBC Section 1707.1 General,[46] 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)*".[47] Furthermore N.J.A.C 5:23-3.7 states: "*Municipal approvals of alternative materials, equipment, or methods of construction*."

1.8.1 **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.

1.8.1.1 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.

1.8.1.2 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.

1.8.2 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*."

1.9 **Approved by the Code of Federal Regulations Manufactured Home Construction and Safety Standards**: Pursuant to Title 24, Subtitle B, Chapter XX, Part 3282.14[48] and Part 3280,[49] 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:

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

1.9.2 "*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*."

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

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

1.10.1 For new materials that are not specifically provided for in this code, the design strengths and permissible stresses shall be established by tests.[50]

1.10.2 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.[51]

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

1.10.2.2 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.[52]

1.10.3 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.[53]

1.11 **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:

1.11.1 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.

1.11.2 **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.

1.11.3 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.[54]

1.11.4 Therefore, all ANAB ISO/IEC 17065 duly authenticated reports are approval equivalent.[55]

1.12 Approval equity is a fundamental commercial and legal principle.[56]

Notes

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

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

3 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

4 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

5 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

6 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

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

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

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

10 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.

11 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/

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

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

14 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

15 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

16 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

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

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

19 Unless otherwise noted, all references in this Listing 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.

20 Formerly SBCA ANSI/FS 100

21 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

22 2015 IBC Section 1404.2

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

24 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

25 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

26 Over-sheathing definition: As used in this report, over-sheathing refers to the application of foam sheathing over and directly on the surface of wall sheathing material or solid wall construction, such as masonry or concrete, whereby the substrate is capable of resisting the full design transverse wind load required by the applicable building code or latest edition of ASCE 7. In addition, cladding is separately installed over foam sheathing in accordance with **Section 6.2**. An over-sheathing application of foam sheathing does not require that the foam sheathing resist wind pressure in accordance with this report.

27 2015 IBC Section 1404.2

28 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.

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

30 2015 IBC Section 1404.2

31 2018 IFC Section 104.9

32 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.

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

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

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

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

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

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

39 IBC 2021, Section 1706.1 Conformance to Standards

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

41 See **Section 11** for the distilled building code definition of **Approved**

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

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

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

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

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

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

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

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

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

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

52 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/

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

54 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

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

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