

Technical Evaluation Report™

TER 1407-05

NFPA 285 Tested Wall Assemblies Using Kingspan® GreenGuard® Insulation Boards
and Kingspan® GreenGuard® Building Wraps in Exterior Walls of Buildings of Type
I-IV Construction

Kingspan® Insulation LLC

Product:

**Kingspan® GreenGuard® Insulation Board
Products and Kingspan® GreenGuard® Building
Wrap Products**

Issue Date:

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October 1, 2024



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COMPANY
INFORMATION:

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DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION	SECTION: 07 25 00 - Water-Resistive Barriers/Weather Barriers
SECTION: 07 21 00 - Thermal Insulation	SECTION: 07 27 00 - Air Barriers
SECTION: 07 24 00 - Exterior Insulation and Finish Systems	

1 Innovative Products Evaluated^{1,2}

- 1.1 Kingspan® GreenGuard® Insulation Board Products and Kingspan® GreenGuard® Building Wrap Products
 - 1.1.1 Kingspan® GreenGuard® Extruded Polystyrene (XPS) Insulation Board products identified as:
 - 1.1.1.1 Kingspan® GreenGuard® CM
 - 1.1.1.2 Kingspan® GreenGuard® LG CM
 - 1.1.1.3 Kingspan® GreenGuard® SL
 - 1.1.1.4 Kingspan® GreenGuard® LG SL
 - 1.1.1.5 Kingspan® GreenGuard® SB
 - 1.1.1.6 Kingspan® GreenGuard® LG SB
 - 1.1.2 Products referred to as Kingspan® GreenGuard® Insulation Board in this TER apply to any of the products listed in Section 1.1.1.
 - 1.1.3 Kingspan® GreenGuard® Building Wrap products identified as:
 - 1.1.3.1 Kingspan® GreenGuard® MAX™
 - 1.1.3.2 Kingspan® GreenGuard® RainDrop® 3D
 - 1.1.3.3 Kingspan® GreenGuard® C2000
 - 1.1.3.4 Kingspan® GreenGuard® VW
 - 1.1.3.5 Kingspan® GreenGuard® HPW™ (High Performance Wrap)
 - 1.1.3.6 Kingspan® GreenGuard® RainArmor™ Building Wrap
 - 1.1.3.7 Everbilt™ Premium Non-Woven Housewrap
 - 1.1.4 Products referred to as Kingspan® GreenGuard® Building Wrap in this TER apply to any of the products listed in Section 1.1.3.

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

² **Federal Regulation Definition.** 24 CFR 3280.2 "Listed or certified" means included in a list published by a nationally recognized testing laboratory, inspection agency, or other organization concerned with product evaluation that maintains periodic inspection 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. **International Building Code (IBC) Definition of Listed.** Equipment, materials, products or services included in a list published by an organization acceptable to the building official and concerned with evaluation of products or services that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services and whose Listing states either that the equipment, material, product or service meets identified standards or has been tested and found suitable for a specified purpose. **IBC Definition of Labeled.** Equipment, materials or products to which has been affixed a label, seal, symbol or other identifying mark of a nationally recognized testing laboratory, approved agency or other organization concerned with product evaluation that maintains periodic inspection of the production of the above-labeled items and whose labeling indicates either that the equipment, material or product meets identified standards or has been tested and found suitable for a specified purpose.



2 Applicable Codes and Standards^{3,4}

2.1 Codes

- 2.1.1 IBC—15, 18, 21: *International Building Code*®
- 2.1.2 IRC—15, 18, 21: *International Residential Code*®
- 2.1.3 IECC—15, 18, 21: *International Energy Conservation Code*®

2.2 Standards and Referenced Documents

- 2.2.1 ANSI/AWC NDS: *National Design Specification (NDS)*® for Wood Construction
- 2.2.2 ASTM C518: *Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus*
- 2.2.3 ASTM C578: *Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation*
- 2.2.4 ASTM E84: *Standard Test Method for Surface Burning Characteristics of Building Materials*
- 2.2.5 ASTM E119: *Standard Test Methods for Fire Tests of Building Construction and Materials*
- 2.2.6 ASTM E136: *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C*
- 2.2.7 ASTM E331: *Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference*
- 2.2.8 ASTM E1354: *Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter*
- 2.2.9 ASTM E2178: *Standard Test Method for Air Permeance of Building Materials*
- 2.2.10 ASTM E2357: *Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies*
- 2.2.11 NFPA 285: *Standard Fire Test Method for the Evaluation of Fire Propagation Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components*
- 2.2.12 NFPA 286: *Standard Methods of Fire Test for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*

³ This Listing is a code defined research report, which is also known as a duly authenticated report, provided by an approved agency (see IBC Section 1703.1) and/or an approved source (see IBC Section 1703.4.2). An approved agency is “approved” when it is ANAB accredited. DrJ Engineering, LLC (DrJ) is listed in the ANAB directory. A professional engineer is “approved” as an approved source when that professional engineer is properly licensed to transact engineering commerce. Where sealed by a professional engineer, it is also a duly authenticated report certified by an approved source, (i.e., Registered Design Professional). DrJ is an ANAB accredited product certification body.

⁴ 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.

3 Performance Evaluation

- 3.1 Tests, test reports, research reports, duly authenticated reports and related engineering evaluations are defined as intellectual property and/or trade secrets and protected by Defend Trade Secrets Act 2016 (DTSA).⁵
- 3.2 Testing and/or inspections conducted for this TER were performed at an ISO/IEC 17025 accredited testing laboratory,⁶ an ISO/IEC 17020 accredited inspection body,⁷ which are internationally recognized accreditations through International Accreditation Forum (IAF), and/or a licensed Registered Design Professional (RDP).
- 3.3 Kingspan® GreenGuard® Insulation Board products were evaluated to determine:
 - 3.3.1 Material properties in accordance with ASTM C578.
 - 3.3.2 Thermal resistance properties in accordance with IECC Section C402.
 - 3.3.3 Use as a water-resistant barrier (WRB) in accordance with IBC Section 1403.2.⁸
 - 3.3.4 Use as an air barrier material in accordance with IECC Section C402.5.1.1.
 - 3.3.5 Performance for use in buildings of Type I-IV construction in accordance with IBC Section 2603.5.
 - 3.3.6 Performance in accordance with ASTM E84 for flame spread and smoke development ratings in accordance with IBC Section 2603.3 and IBC Section 2603.5.4.
 - 3.3.7 Performance for use without a thermal barrier in accordance with IBC Section 2603.4 and IBC Section 2603.5.2.
 - 3.3.8 Performance with regard to the potential heat generated by the Foam Plastic Insulated Sheathing (FPIS) in accordance with IBC Section 2603.5.3.
 - 3.3.9 Performance with regard to vertical and lateral fire propagation in accordance with IBC Section 2603.5.5.
 - 3.3.10 Performance with regard to ignition in accordance with IBC Section 2603.5.7.
 - 3.3.11 Use as part of an NFPA 285 wall assembly in accordance with IBC Section 2603.5.5.
 - 3.3.12 Fire resistance rating as part of an ASTM E119 wall assembly in accordance with IBC Section 703.
- 3.4 Kingspan® GreenGuard® Building Wrap products were evaluated for:
 - 3.4.1 Use as a WRB in accordance with IBC Section 1403.2⁹ and IBC Section 1402.5.¹⁰
 - 3.4.2 Use as an air barrier material in accordance with IECC Section C402.5.1.1.
 - 3.4.3 Use as part of an approved NFPA 285 wall assembly in accordance with IBC Section 2603.5.5.

⁵ <https://www.law.cornell.edu/uscode/text/18/part-II/chapter-90>. Given our professional duty to inform, please be aware that whoever, with intent to convert a trade secret (TS), that is related to a product or service used in or intended for use in interstate or foreign commerce, to the economic benefit of anyone other than the owner thereof, and intending or knowing that the offense will, injure any owner of that trade secret, knowingly without authorization copies, duplicates, sketches, draws, photographs, downloads, uploads, alters, destroys, photocopies, replicates, transmits, delivers, sends, mails, communicates, or conveys such information; shall be fined under this title or imprisoned not more than 10 years, or both. 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. As the National Society of Professional Engineers states, "Engineers shall not disclose, without consent, confidential information concerning the business affairs or technical processes of any present or former client or employer, or public body on which they serve." Therefore, to protect intellectual property (IP) and TS, and to achieve 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. For more information, please review this website: Intellectual Property and Trade Secrets.

⁶ Internationally recognized accreditations are performed by members of the International Accreditation Forum (IAF). Accreditation Body and Regional Accreditation Group Members of IAF are admitted to the IAF MLA only after a stringent evaluation of their operations by a peer evaluation team, which is charged to ensure that the applicant complies fully with both international standards and IAF requirements. Once an accreditation body is a signatory of the IAF MLA, it is required to recognise certificates and validation and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA, with the appropriate scope.

⁷ Ibid.

⁸ 2015 IBC Section 1404.2

⁹ 2015 IBC Section 1404.2

¹⁰ 2015 IBC Section 1403.5

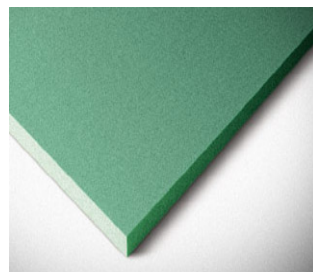
- 3.5 Any building code and/or accepted engineering evaluations (i.e. research reports, duly authenticated reports, etc.) that are conducted for this Listing were performed by DrJ Engineering, LLC (DrJ), an [ISO/IEC 17065 accredited certification body](#) and a professional engineering company operated by RDPs / [approved sources](#). DrJ is qualified¹¹ to practice product and code compliance services within its scope of accreditation and engineering expertise, respectively.
- 3.6 Engineering evaluations are conducted with DrJ's ANAB [accredited ICS code scope](#), which are also its areas of professional engineering competence.
- 3.7 Any regulation specific issues not addressed in this section are outside the scope of this TER.

4 Product Description and Materials

- 4.1 The innovative products evaluated in this TER are shown in Figure 1.



GreenGuard® XPS Label



GreenGuard® XPS CM



GreenGuard® XPS SB



GreenGuard® XPS SL

Figure 1. GreenGuard® XPS - CM, SB, SL

- 4.2 Kingspan® GreenGuard® Insulation Board is:

- 4.2.1 A proprietary FPIS made from Extruded Polystyrene (XPS) in accordance with ASTM C578, Type IV.
 - 4.2.1.1 Kingspan® GreenGuard® LG XPS has the same physical properties as the GreenGuard® XPS except it is produced with a lower Global Warming Potential (GWP) blowing agent formulation. All references in this TER to GreenGuard® insulation board include both the GreenGuard® XPS and the GreenGuard® LG XPS insulation board.
- 4.2.2 Available with various edge treatments and facers as follows:
 - 4.2.2.1 Kingspan® GreenGuard® CM – square edges
 - 4.2.2.2 Kingspan® GreenGuard® SB – scoreboard
 - 4.2.2.3 Kingspan® GreenGuard® SL – shiplap edges
- 4.2.3 *Material Availability*
 - 4.2.3.1 Thickness: 1/2" (13 mm) through 4" (76 mm).
 - 4.2.3.2 Standard product width: 48" (1,219 mm).

¹¹ 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](#).

- 4.3 Kingspan® GreenGuard® Building Wrap products are polyolefin materials of varying thicknesses, weights and coatings as shown in Table 1 and are produced in various sized rolls.

Table 1. Kingspan® GreenGuard® Building Wrap Products

Product Name	Material Type	Coating Type	Thickness (in)	Weight (oz/yd ²)	Water-Resistive Barrier	Air Barrier
Kingspan® GreenGuard® MAX™	Cross woven, non-perforated polyolefin	Vapor permeable polyolefin	0.018	2.2	X	X
Kingspan® GreenGuard® RainDrop® 3D			0.018	2.4	X	X
Kingspan® GreenGuard® C2000	Spun-bonded vapor permeable polyolefin	N/A	0.024	3.6	X	X
Kingspan® GreenGuard® VW	Cross-woven, micro perforated polyolefin	Polyolefin	0.004	1.9	X	
Kingspan® GreenGuard® HPW™ (High Performance Wrap)	Spun-bonded polypropylene non-woven material	N/A	0.012	3.0	X	X
Everbilt™ Premium Non-Woven Housewrap		N/A	0.012	3.0	X	X
Kingspan® GreenGuard® RainArmor™ Building Wrap	Spun-bond polypropylene building wrap with a non-perforated barrier layer	N/A	0.033	3.2	X	
SI: 1 in = 25.4 mm, 1 lb = 4.45 N, 1 lb/ft = 0.0146 kN/m N/A = Not Applicable						

5 Applications

- 5.1 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.
- 5.1.1 Kingspan® GreenGuard® Insulation Board is FPIS complying with [IBC Section 2603](#).
- 5.1.1.1 Kingspan® GreenGuard® Insulation Board is used in buildings of Type I through IV construction in accordance with [IBC Section 2603.5](#).
- 5.1.2 The Kingspan® GreenGuard® Building Wrap products used as WRBs in buildings of Type I through IV construction are in accordance with the [IBC Section 1402.5](#)¹² and [IBC Section 1403.2](#).¹³
- 5.1.3 Kingspan® GreenGuard® MAX™, RainDrop® 3D, and C2000 are air barrier materials used as a component of air barrier assemblies in buildings of Type I through IV construction in accordance with the [IECC Section C402.5.1](#).

¹² 2015 IBC Section 1403.5

¹³ 2015 IBC Section 1404.2

5.2 Water-Resistive Barrier

- 5.2.1 Kingspan® GreenGuard® Insulation Board may be used as a WRB as prescribed in [IBC Section 1403.2](#)¹⁴ and [IBC Section 1402.5](#).¹⁵
- 5.2.2 Kingspan® GreenGuard® Building Wrap may be used as a WRB as prescribed in [IBC Section 1403.2](#).
- 5.2.3 Kingspan® GreenGuard® MAX™, RainDrop® 3D, C2000, VW, HPW™, and RainArmor™ building wraps have been tested in accordance with ASTM E1354 and ASTM E84 and meet the requirements of [IBC Section 1402.5](#),⁹ Exception 2, for use in Type I, II, III or IV construction that are greater than 40 feet (12,192 mm) in height above grade plane when the water-resistive barrier is the only combustible component without the need for NFPA 285 testing.

5.3 Air Barrier

- 5.3.1 Kingspan® GreenGuard® Insulation Board may be used as an air barrier material as prescribed in [IECC Section R402.4.1.1](#) and [IECC Section C402.5.1](#).
- 5.3.2 Kingspan® GreenGuard® MAX™, RainDrop® 3D, C2000, and HPW™ and Everbilt™ Premium Non-Woven Housewrap may be used as an air barrier material as prescribed in [IECC Section R402.4.1.1](#) and [IECC Section C402.5.1](#).

5.4 Thermal Resistance

- 5.4.1 Kingspan® GreenGuard® Insulation Board has the thermal resistance as shown in Table 2.

Table 2. Thermal Resistance of Insulation Boards

Product Name	Thickness (in)	R-Value (°F ft² h/Btu)
Kingspan® GreenGuard® XPS ¹	1/2	3
	3/4	3.8
	1	5
	1 1/2	7.5
	2	10
	3	15
	4	20
SI: 1 in = 25.4 mm 1. Tested in accordance with ASTM C518 at 75° mean temperature.		

5.5 Thermal Barrier

- 5.5.1 Industry testing on extruded polystyrene (XPS) insulation boards was evaluated in accordance with NFPA 286 for equivalence to the prescriptive ignition barriers in accordance with [IBC Section 2603.4.1.6](#). This testing met the acceptance criteria for use in attics and crawlspaces without a thermal barrier or ignition barrier.
- 5.5.2 In addition, engineering analysis was performed to compare Kingspan® GreenGuard® Insulation Board to the tested assembly with respect to its flammability characteristics.

¹⁴ [2015 IBC Section 1404.2](#)

¹⁵ [2015 IBC Section 1403.5](#)

- 5.5.3 Testing in accordance with the following test methods was compared to determine the similarities between the products.
- 5.5.3.1 ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials
 - 5.5.3.2 ASTM E1354: Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter
- 5.5.4 Based on the similar performance of GreenGuard® Insulation Boards and the tested XPS, Kingspan® GreenGuard® Insulation Board is approved for use without a thermal barrier or ignition barrier in attics and crawlspaces where entry is made only for the service of utilities in accordance with IBC Section 2603.4.1.6.
- 5.6 *Potential Heat*
- 5.6.1 Kingspan® GreenGuard® Insulation Board was tested to assess the potential heat generated by the FPIS in accordance with IBC Section 2603.5.3 and are shown in Table 3.

Table 3. Potential Heat of Insulation Boards

Product Name	Potential Heat (Btu/lb) ¹
Kingspan® GreenGuard® XPS ¹	17,495
1. Tested in accordance with NFPA 259.	

5.7 *Surface Burn Characteristics*

- 5.7.1 Flame spread and smoke developed indexes for Kingspan® GreenGuard® XPS are shown in Table 4.

Table 4. Fire Performance of Insulation Boards & Building Wraps

Product Name	Flame Spread	Smoke Developed
Kingspan® GreenGuard® XPS ¹	< 25	< 450
1. Foam core tested in accordance with ASTM E84.		

5.8 *Vertical and Lateral Fire Propagation*

- 5.8.1 Kingspan® GreenGuard® Insulation Boards and Kingspan® GreenGuard® Building Wraps were tested to assess their performance with regard to vertical and lateral fire propagation in accordance with NFPA 285 and IBC Section 2603.5.5.
- 5.8.1.1 Engineering analysis also was conducted to assess substitution of other products within the approved wall assemblies.
 - 5.8.1.2 The wall assemblies listed in Table 5 and Table 6 are approved for use in buildings of Type I-IV construction.

Table 5. Approved NFPA 285 Wall Assemblies with up to 3" Kingspan® GreenGuard® XPS Insulation¹

Wall Component	Materials
Base Wall System Use any of these options	1. Concrete Wall 2. Concrete Masonry Wall 3. 20-gauge (min.) 3 ⁵ / ₈ " depth (min.) steel studs spaced at a maximum of 16" o.c. with lateral bracing every 4' vertically. a. 1 layer – 5/ ₈ " thick Type X or 1/2" thick Type X gypsum wallboard on interior
Floorline Firestopping	1. 4 lb/cu ft mineral wool (i.e., Thermafiber®) in each stud cavity at each floor line – attached with Z-clips or equivalent
Cavity Insulation Use any of these options	1. None 2. Any noncombustible insulation per ASTM E136 3. Fiberglass (Batt type Class A ASTM E84 faced or unfaced)
Exterior Sheathing Use any of these options	1. None 2. Minimum 1/2" thick, exterior type gypsum sheathing 3. Minimum 5/ ₈ " thick, Type X, exterior type gypsum sheathing
Air Barrier or Weather-Resistive Barrier Applied to Exterior Sheathing Use any of these options	1. None 2. BASF Enershield® HP 3. BASF Enershield® 1 4. Carlisle CCW-705FR w/Primers 5. Carlisle Barritech™ VP 6. Carlisle Barritech™ NP 7. Carlisle Barrithane VP 8. Carlisle 705 VP 9. Cosella-Dörken Delta®-Foxy 10. Cosella-Dörken Delta®-Foxy Plus 11. Cosella-Dörken Delta®-Fassade S 12. Cosella-Dörken Delta®-Vent S/Plus 13. Cosella-Dörken Delta®-Maxx Plus 14. Dow Weathermate™ 15. Dow Weathermate™ Plus 16. Dryvit Backstop® NT 17. Dupont™ Tyvek® CommercialWrap® 18. Dupont™ Tyvek® CommercialWrap® D 19. Dupont™ Tyvek® ThermoWrap™ 20. Dupont™ Tyvek® Fluid Applied Weather Barrier-nominal 25 mill (wet) thickness 21. Henry Air-Bloc® 17MR 22. Henry Air-Bloc® 32MR 23. Henry Air-Bloc® 31MR 24. Henry Air-Bloc® 33MR 25. Henry BlueskinVP™ 160 26. Henry Air-Bloc® 21 FR 27. Henry Metal Clad™ 28. Henry Foilskin® 29. Hohmann & Barnard Enviro-Barrier™ 30. Hohmann & Barnard Enviro-Barrier™ VP 31. Momentive Performance Materials GE SEC2500 SilShield AWB 32. Momentive Performance Materials GE SEC2600 SilShield AWB 33. Momentive Performance Materials GE SEC2600-R SilShield AWB 34. Kingspan® GreenGuard® Max™ Building Wrap 35. Kingspan® GreenGuard® VW 36. Kingspan® GreenGuard® Classic Wrap 37. Kingspan® GreenGuard® RainDrop® 3D

Wall Component	Materials
	38. Kingspan® GreenGuard® C2000 39. Polyguard Airluk Flex® at 40 mils (wet) 40. Polyguard Airluk Flex® WG at 20 mils (wet) 41. Polyguard Airluk Flex® VP at 32 mils (wet) 42. Sto Corp Sto Gold Coat® with StoGuard Fabric 43. Sto Corp Sto Emerald Coat® with StoGuard Fabric 44. Sto Corp Sto ExtraSeal™ w/StoGuard Mesh 45. STS, Inc. Wall Guardian™ FW 100A 46. VaproShield WallShield® 47. VaproShield WrapShield® 48. VaproShield RevealShield™ 49. VaproShield RevealShield SA™ 50. W.R. Grace Perm-A-Barrier® Aluminum Wall Membrane 51. W.R. Grace Perm-A-Barrier® VPL 52. W.R. Grace Perm-A-Barrier® VPS 53. W.R. Grace Perm-A-Barrier® NPL 54. WR Meadows Air-Shield™ LMP (Gray) 55. WR Meadows Air-Shield™ LMP (Black) 56. WR Meadows Air-Shield™ TMP 57. WR Meadows Air-Shield™ LSR Note: All WRBs to be installed at the indicated or recommended application rates and per the manufacturer installation instructions.
Exterior Insulation	1. Kingspan® GreenGuard® XPS – 1/2" minimum and 3" maximum Seal all insulation joints with maximum 4" wide asphalt or Butyl based flashing tape.
WRB Over Exterior Insulation Use any option 1-13	1. None 2. Dow Weathermate™ 3. Dow Weathermate™ Plus 4. Dupont™ Tyvek® CommercialWrap® 5. Dupont™ Tyvek® CommercialWrap® D 6. Dupont™ Tyvek® ThermaWrap™ 7. Kingspan® GreenGuard® Max™ Building Wrap 8. Kingspan® GreenGuard® VW 9. Kingspan® GreenGuard® Classic Wrap 10. Kingspan® GreenGuard® RainDrop® 3D 11. Kingspan® GreenGuard® C2000 12. VaproShield RevealShield™ 13. VaproShield RevealShield SA™
Exterior Veneer Use any of these options	1. Brick <ul style="list-style-type: none"> a. Standard nominal 4" thick, clay brick b. Brick veneer anchors – standard types – installed maximum 24" o.c. vertically on each stud c. Maximum 2" air gap between exterior insulation and brick 2. Concrete <ul style="list-style-type: none"> a. Minimum 2" thick b. Maximum 2" air gap between exterior insulation and concrete 3. CMU-Concrete Masonry Units <ul style="list-style-type: none"> a. Minimum 4" thick b. Maximum 2" air gap between exterior insulation and CMU 4. Stone Veneer <ul style="list-style-type: none"> a. Minimum 2" thick limestone or natural stone veneer b. Minimum 1 1/2" thick cast artificial stone veneer c. Any standard non-open joint technique may be used (i.e., shiplap, etc.)

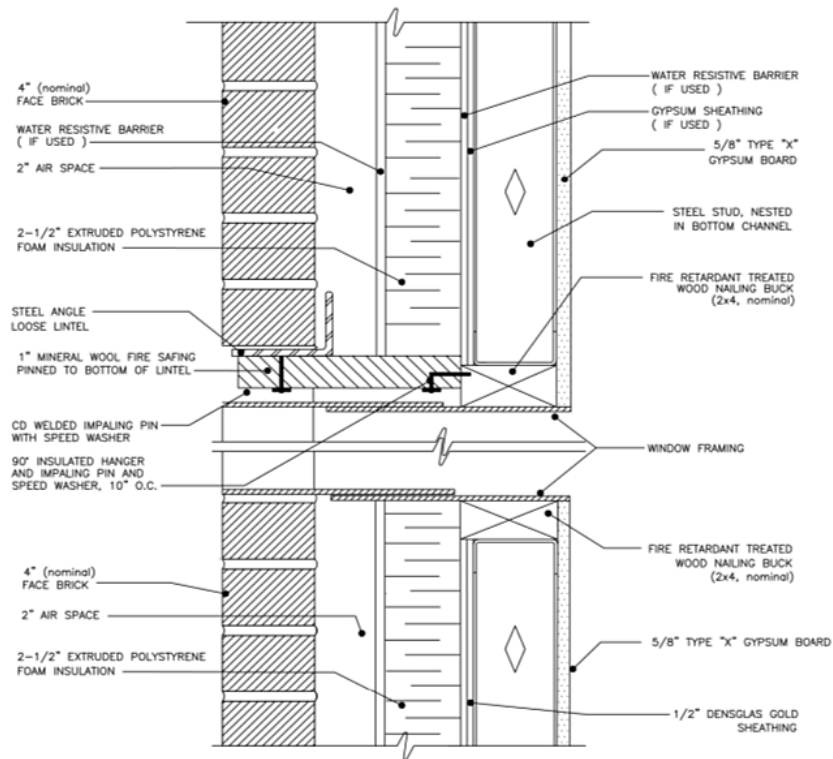
Wall Component	Materials
	<ol style="list-style-type: none"> 5. Terracotta cladding <ol style="list-style-type: none"> a. Minimum 1 1/4" thick b. Any standard non-open joint technique may be used (i.e., shiplap, etc.) 6. Portland cement-sand plaster (Stucco) over metal lath <ol style="list-style-type: none"> a. Minimum 3/4" thick b. 2- or 3-coat application c. No air gap between Stucco veneer and exterior insulation
SI: 1 in = 25.4 mm 1. See Header detail (Figure 2) for instructions on required treatment of window and door openings.	

Table 6. Approved NFPA 285 Wall Assembly with up to 4 Inches of GreenGuard® XPS Insulation¹

Wall Component	Materials
Base Wall System	<ol style="list-style-type: none"> 1. 18-gauge 3 5/8" depth (min.) galvanized steel studs spaced at a maximum 24" o.c. <ol style="list-style-type: none"> a. One (1) layer 5/8" thick gypsum wallboard on interior
Cavity Insulation	<ol style="list-style-type: none"> 1. Unfaced fiberglass batt insulation
Exterior Sheathing	<ol style="list-style-type: none"> 1. One (1) layer 1/2" thick exterior type gypsum
Air Barrier and Weather Resistive Barrier applied to exterior sheathing Use any of these options.	<ol style="list-style-type: none"> 1. Tremco® ExoAir® 230 fluid applied, synthetic air & vapor permeable membrane 2. 3M™ Self-Adhered Air and Vapor Barrier 3015 3. BASF Senershield-R 4. BASF Senershield-VB 5. Carlisle CCW-705FR w/ Primers 6. Carlisle Barritech™ VP 7. Carlisle Barritech™ NP 8. Carlisle Barrithane VP 9. Carlisle 705 VP 10. Dörken Systems Delta®-Foxy 11. Dörken Systems Delta®-Foxy Plus 12. Dörken Systems Delta®-Fassade S 13. Dörken Systems Delta®-Vent S/Plus 14. Dörken Systems Delta®-Maxx Plus 15. Dow Chemical WeatherMate™ 16. Dow Chemical WeatherMate™ Plus 17. Dow Corning® Defend Air 200 18. Dryvit Backstop® NT 19. DuPont™ Tyvek® CommercialWrap® 20. DuPont™ Tyvek® CommercialWrap® D 21. DuPont™ Tyvek® ThermaWrap™ 22. DuPont® Tyvek® Fluid Applied WB+ (nominal 25 wet mil thickness) 23. Henry Company Air-Bloc® 21 FR 24. Henry Company Air-Bloc® 31MR 25. Henry Company Air-Bloc® 33MR 26. Henry Company Blueskin VP™ 160 27. Henry Company Blueskin® Metal Clad® 28. Henry Company Foilskin® 29. Hohmann & Barnard Enviro-Barrier™ VP 30. Grace Construction Products Perm-A-Barrier® Aluminum Wall Membrane 31. Grace Construction Products Perm-A-Barrier® VPL 32. Grace Construction Products Perm-A-Barrier® VPL LT 33. Grace Construction Products Perm-A-Barrier® VPS

Wall Component	Materials
	34. JX Nippon ANCI, Inc. JX ALTA™ Commercial Wrap 35. JX Nippon ANCI, Inc. JX ALTA™ HP Wrap 36. JX Nippon ANCI, Inc. JX ALTA™ LP Wrap 37. Kingspan® GreenGuard® Max™ Building Wrap 38. Kingspan® GreenGuard® Classic Building Wrap 39. Kingspan® GreenGuard® C2000 Building Wrap 40. Kingspan® GreenGuard® Raindrop® 3D Building Wrap 41. Kingspan® GreenGuard® HPW™ Building Wrap 42. Kingspan® GreenGuard® RainArmor™ Building Wrap 43. Everbilt™ Premium Non-woven Housewrap 44. Momentive Performance Materials GE SEC2500 SilShield* AWB 45. Momentive Performance Materials GE SEC2600 SilShield* AWB 46. Momentive Performance Materials GE SEC2600-r SilShield* AWB 47. Polyguard Products Airlok Flex® (applied at a maximum 50 mils WFT) 48. Polyguard Products Airlok Flex® WG (applied at a maximum 20 mils WFT) 49. Polyguard Products Airlok Flex® VP (applied at a maximum 32 mils WFT) 50. Prosoco CAT 5 51. Prosoco CAT 5 Rainscreen 52. Soprema Sopraseal Stick VP 53. Sto Corp Sto Gold Coat® with StoGuard Fabric 54. Sto Corp Sto Emerald Coat® with StoGuard Fabric 55. Sto Corp Sto ExtraSeal™ with StoGuard Mesh 56. Sto Corp StoGuard® VaproShield™ 57. STS, Inc. Wall Guardian™ FW-100A 58. Tremco, Inc. ExoAir 430 59. VaproShield Wallshield® 60. VaproShield WrapShield® 61. VaproShield WrapShield® SA™ 62. VaproShield RevealShield™ 63. VaproShield RevealShield SA™ 64. W.R. Meadows Air-Shield™ LMP (Gray) 65. W.R. Meadows Air-Shield™ LMP (Black) 66. W.R. Meadows Air-Shield™ TMP 67. W.R. Meadows Air-Shield™ LSR
Exterior Insulation	1. Kingspan® GreenGuard® XPS Insulation Board – 4" thickness
WRB Over Exterior Insulation	1. 10mm Keene Building Products Driwall™ Rainscreen drainage mat
Exterior Veneer	1. Glen-Gery Thin Veneer Brick <ul style="list-style-type: none"> a. First a layer of 1/2" thick PermaBase® cement board b. Laticrete MVIS Thin Brick Mortar applied to full surface of PermaBase® c. Thin Veneer Brick applied with Glen-Gery Mortar Blend Portland cement-line mortar as grout
1. See Header detail (Figure 2) for instructions on required treatment of window and door openings.	

STEEL STUD/BRICK VENEER – WINDOW HEAD DETAIL



STEEL STUD/BRICK VENEER – WINDOW SILL & JAMB DETAIL

Figure 2. Header Detail for NFPA 285 Wall Assemblies (Brick Shown - Other Claddings Similar)

5.9 Ignition

5.9.1 Kingspan® GreenGuard® Insulation Boards were evaluated to assess performance with regard to ignition in accordance with [IBC Section 2603.5.7](#).

5.9.1.1 Kingspan® GreenGuard® Insulation Boards comply with this section when the exterior side of the sheathing is protected with one of the following materials:

- 5.9.1.1.1 A thermal barrier complying with [IBC Section 2603.4](#).
- 5.9.1.1.2 A minimum 1" (25 mm) thickness of concrete or masonry.
- 5.9.1.1.3 Glass-fiber-reinforced concrete panels of a minimum thickness of $\frac{3}{8}$ " (9.5 mm).
- 5.9.1.1.4 Metal-faced panels having a minimum 0.019" thick (0.48 mm) aluminum or 0.016" thick (0.41 mm) corrosion-resistant steel outer facings.
- 5.9.1.1.5 A minimum $\frac{7}{8}$ " (22.2 mm) thickness of stucco complying with [IBC Section 2510](#).
- 5.9.1.1.6 A minimum $\frac{1}{4}$ " (6.4 mm) thickness fiber-cement lap, panel or shingle siding complying with [IBC Section 1404.16](#).¹⁶

¹⁶ [2015 IBC Section 1405.16](#)

5.10 Fire Resistance

- 5.10.1 The exterior non-loading wall assembly described in Table 7 was tested and evaluated in accordance with ASTM E119 and was found to have a one-hour fire-resistance rating from either side.

Table 7. One-hour Fire Resistance Rated Wall Assembly^{1,2}

Wall Component	Material
Interior Cladding	One (1) layer of 5/8" thick gypsum wallboard
Framing	18-gauge 35/8" depth galvanized steel studs spaced at a maximum 24" o.c.
Cavity Insulation	Unfaced fiberglass batt insulation, Type I
Exterior Sheathing	One (1) layer of 1/2" thick exterior type gypsum
Water-Resistive Barrier	Tremco® ExoAir® 230 fluid applied, synthetic air & vapor permeable membrane
Exterior Insulation	Kingspan® GreenGuard® XPS insulation board – 4" thickness
WRB Over Insulation	10mm Keene Building Products Driwall™ Rainscreen drainage mat
Exterior Cladding	Glen-Gery Thin Veneer Brick 1. First a layer of 1/2" thick PermaBase® cement board 2. Laticrete MVIS Thin Brick Mortar applied to full surface of PermaBase® 3. Thin Veneer Brick applied with Glen-Gery Mortar Blend Portland cement-line mortar as grout
SI: 1 in = 25.4 mm 1. Tested in accordance with ASTM E119. One hour rating is achieved with the fire exposure from either side. 2. Wall components listed from interior to exterior.	

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

6 Installation

- 6.1 Installation shall comply with the approved construction documents, the manufacturer installation instructions, this TER and the applicable building code.
- 6.2 In the event of a conflict between the manufacturer installation instructions and this TER, the more restrictive shall govern.
- 6.3 *Installation Procedure*
- 6.3.1 For Kingspan® GreenGuard® Insulation Board [installation instructions](#), see DrJ Installation Instructions in [TER 1410-09](#).
- 6.3.2 For commercial building wrap applications, see the [Commercial Installation Guide for Kingspan GreenGuard® Building Wraps](#).
- 6.4 See Table 5 for NFPA 285-compliant wall assemblies using Kingspan® GreenGuard® Insulation Board and Kingspan® GreenGuard® Building Wraps with non-combustible veneers. See Figure 2 for the “Window/Door Opening Detail” required for these assemblies.

7 Substantiating Data

- 7.1 Testing has been performed under the supervision of a professional engineer and/or under the requirements of ISO/IEC 17025 as follows:
- 7.1.1 Flame spread and smoke developed rating testing in accordance with ASTM E84/UL 273
 - 7.1.2 Air barrier performance testing in accordance with ASTM E331
 - 7.1.3 Air permeance testing in accordance with ASTM E2178
 - 7.1.4 Water-resistance barrier performance testing in accordance with ASTM E2178
 - 7.1.5 Water-resistance barrier performance testing in accordance with ASTM E331
 - 7.1.6 Water resistance properties testing in accordance with AATCC 127
 - 7.1.7 Material properties testing in accordance with ASTM C578
 - 7.1.8 Vertical and lateral flame spread testing in accordance with NFPA 285
 - 7.1.9 Exclusion of thermal and ignition barriers in attics and crawlspaces testing in accordance with NFPA 286
 - 7.1.10 Fire resistance characteristics testing in accordance with ASTM E119
 - 7.1.11 Cone calorimeter testing in accordance with ASTM E1354
 - 7.1.12 Surface burning characteristics testing in accordance with ASTM E84
- 7.2 Information contained herein may include the result of testing and/or data analysis by sources that are approved agencies (i.e., ANAB accredited agencies), approved sources (i.e., RDPs), and/or professional engineering regulations. Accuracy of external test data and resulting analysis is relied upon.
- 7.3 Where pertinent, testing and/or engineering analysis is based upon provisions that have been codified into law through state or local adoption of codes and standards. The developers of these codes and standards are responsible for the reliability of published content. DrJ's engineering practice may use a code-adopted provision as the control sample. A control sample versus a test sample establishes a product as being equivalent to the code-adopted provision in terms of quality, strength, effectiveness, fire resistance, durability, and safety.
- 7.4 The accuracy of the provisions provided herein may be reliant upon the published properties of raw materials, which are defined by the grade mark, grade stamp, mill certificate, Listings, certified reports, duly authenticated reports from approved agencies, and research reports prepared by approved agencies and/or approved sources provided by the suppliers of products, materials, designs, assemblies and/or methods of construction. These are presumed to be minimum properties and relied upon to be accurate. The reliability of DrJ's engineering practice, as contained in this TER, may be dependent upon published design properties by others.
- 7.5 Testing and engineering analysis: The strength, rigidity and/or general performance of component parts and/or the integrated structure are determined by suitable tests that simulate the actual conditions of application that occur and/or by accepted engineering practice and experience.¹⁷
- 7.6 Where additional condition of use and/or code compliance information is required, please search for Kingspan® GreenGuard® Insulation Board Products and Kingspan® GreenGuard® Building Wrap Products on the DrJ Certification website.

¹⁷ See Code of Federal Regulations (CFR) Title 24 Subtitle B Chapter XX Part 3280 for definition.

8 Findings

- 8.1 As delineated in Section 3, Kingspan® GreenGuard® Insulation Board Products and Kingspan® GreenGuard® Building Wrap Products have performance characteristics that were tested and/or meet pertinent standards and is suitable for use pursuant to its specified purpose.
- 8.2 When used and installed in accordance with this TER and the manufacturer installation instructions, Kingspan® GreenGuard® Insulation Board Products and Kingspan® GreenGuard® Building Wrap Products shall be approved for the following applications:
 - 8.2.1 Kingspan® GreenGuard® Insulation Board Products and Kingspan® GreenGuard® Building Wrap Products are approved for use in exterior walls without a thermal barrier in accordance with [IBC Section 2603.4](#) and [IBC Section 2603.5.2](#).
 - 8.2.2 Kingspan® GreenGuard® Insulation Board Products and Kingspan® GreenGuard® Building Wrap Products are approved for use in exterior walls of buildings of Type I-IV construction in accordance with [IBC Section 2603.5](#).
 - 8.2.3 Kingspan® GreenGuard® Insulation Board Products and Kingspan® GreenGuard® Building Wrap Products are approved for use in wall assemblies meeting the requirements of NFPA 285 testing when constructed in accordance with Table 5.
 - 8.2.3.1 Kingspan® GreenGuard® MAX™, GreenGuard® RainDrop® 3D, GreenGuard® C2000, GreenGuard® VW, GreenGuard® HPW™, GreenGuard® RainArmor™, and Everbilt™ Premium Non-Woven Housewrap building wraps have been tested in accordance with ASTM E1354 and ASTM E84 and meet the requirements of [IBC Section 1402.5](#),¹⁸ Exception 2, for use in Type I, II, III or IV construction that are greater than 40 feet (12,192 mm). As such, where these Kingspan® building wraps are the only combustible products in the wall assembly, NFPA 285 testing is not required.
 - 8.2.4 Wall assemblies containing Kingspan® GreenGuard® Insulation Boards up to 4" in thickness are fire resistance rated for one hour when used as described in Table 6.
 - 8.2.5 Kingspan® GreenGuard® Insulation Boards and Kingspan® GreenGuard® Building Wraps described in this TER comply with or are a suitable alternative to the applicable sections of the codes listed in Section 2.
- 8.3 Unless exempt by state statute, when the Kingspan® GreenGuard® Insulation Board Products and Kingspan® GreenGuard® Building Wrap Products is 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.
- 8.4 Any application specific issues not addressed herein can be engineered by an RDP. Assistance with engineering is available from Kingspan® Insulation LLC.
- 8.5 [IBC Section 104.11](#) ([IRC Section R104.11](#) and [IFC Section 104.10](#)¹⁹ 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.

¹⁸ [2015 IBC Section 1403.5](#)

¹⁹ [2018 IFC Section 104.9](#)

- 8.6 **Approved:**²⁰ Building codes require that the building official shall accept duly authenticated reports²¹ or research reports²² from approved agencies and/or approved sources (i.e., licensed RDP) with respect to the quality and manner of use of new products, materials, designs, services, assemblies, or methods of construction.
- 8.6.1 Acceptance of an approved agency, by a building official, is performed by verifying that the agency is accredited by a recognized accreditation body of the International Accreditation Forum (IAF).
- 8.6.2 Acceptance of a licensed RDP, by a building official, is performed by verifying that the RDP and/or their business entity is listed by the licensing board of the relevant jurisdiction.
- 8.6.3 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, as denial without written reason deprives a protected right to free and fair competition in the marketplace.
- 8.7 DrJ is an engineering company, employs RDPs and is an ISO/IEC 17065 ANAB-Accredited Product Certification Body – Accreditation #1131.
- 8.8 Through ANAB accreditation and the IAF Multilateral Agreements, this TER can be used to obtain product approval in any jurisdiction or country that has IAF MLA Members & Signatories to meet the Purpose of the MLA – “*certified once, accepted everywhere.*” IAF specifically says, “*Once an accreditation body is a signatory of the IAF MLA, it is required to recognise certificates and validation and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA, with the appropriate scope.*”²³

9 Conditions of Use

- 9.1 Material properties shall not fall outside the boundaries defined in Section 3.
- 9.2 As defined in Section 3, where material and/or engineering mechanics properties are created for load resisting design purposes, the resistance to the applied load shall not exceed the ability of the defined properties to resist those loads using the principles of accepted engineering practice.
- 9.3 As listed herein, Kingspan® GreenGuard® Insulation Board Products and Kingspan® GreenGuard® Building Wrap Products shall not be used:
- 9.3.1 As a nailing base for claddings.
- 9.3.2 To resist lateral loads. Walls shall be braced by other materials in accordance with the applicable code, and the exterior wall covering shall be capable of resisting the full design wind pressure.
- 9.4 Design properties shall not exceed those described in Section 5.
- 9.5 When the insulation boards or building wraps are used on exterior walls of buildings of Type I, II, III or IV, construction must be as described in Table 3.
- 9.6 In areas where the probability of termite infestation is very heavy and the building is wood-framed construction, the product must not be placed on exterior walls located within 6" (152 mm) of the ground and shall meet the requirements of IBC Section 2603.8.
- 9.7 Kingspan® GreenGuard® Insulation Boards shall be separated from the interior of the building by an approved thermal barrier except as provided for in Section 5.5.
- 9.8 For applications outside the scope of this TER, an engineered design is required.

²⁰ 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.

²¹ <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1707.1>

²² <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1703.4.2>

²³ <https://iaf.nu/en/about-iaf-mla/#:~:text=required%20to%20recognise>



- 9.9 When used as part of a continuous air barrier, Kingspan® GreenGuard® Insulation Boards shall be a minimum 1" thickness and all sheathing panel edges at the top and bottom of the wall assemblies and all butted joints between sheathing panels shall be sealed with 1 7/8" GreenGuard® Seam Tape or equivalent.
- 9.10 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:
- 9.10.1 Any calculations incorporated into the construction documents shall conform to accepted engineering practice, and, when prepared by an approved source, shall be approved when signed and sealed.
- 9.10.2 This TER and the installation instructions shall be submitted at the time of permit application.
- 9.10.3 These innovative products have an internal quality control program and a third-party quality assurance program.
- 9.10.4 At a minimum, these innovative products shall be installed per Section 6 of this TER.
- 9.10.5 The review of this TER, by the AHJ, shall be in compliance with IBC Section 104 and IBC Section 105.4.
- 9.10.6 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.
- 9.10.7 The application of these innovative products in the context of this TER are 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.
- 9.11 The approval of this TER by the AHJ shall comply with IBC Section 1707.1, where legislation states in pertinent part, *"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 Section 104.11", all of IBC Section 104, and IBC Section 105.4.*
- 9.12 Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed and/or by the building designer (i.e., owner or RDP).
- 9.13 The actual design, suitability, and use of this TER, for any particular building, is the responsibility of the owner or the owner's authorized agent.

10 Identification

- 10.1 The innovative products listed in Section 1.1.1 and Section 1.1.3 are identified by a label on the board or packaging material bearing the manufacturer name, product name, TER number, and other information to confirm code compliance.
- 10.2 Additional technical information can be found at www.kingspan.com.

11 Review Schedule

- 11.1 This TER is subject to periodic review and revision. For the most recent version, visit drjcertification.org.
- 11.2 For information on the status of this TER, contact DrJ Certification.

12 Approved for Use Pursuant to US and International Legislation Defined in Appendix A

- 12.1 Kingspan® GreenGuard® Insulation Board Products and Kingspan® GreenGuard® Building Wrap Products are included in this TER 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, and whose TER Listing states either that the material, product, or service meets identified standards or has been tested and found suitable for a specified purpose. This TER 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, 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 Kingspan® GreenGuard® Insulation Board Products and Kingspan® GreenGuard® Building Wrap 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),²⁴ where providing test reports, engineering analysis and/or other related IP/TS is subject to prison of not more than 10 years²⁵ and/or a \$5,000,000 fine or 3 times the value of²⁶ 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 materials²⁷ that are not specifically provided for in any building code, 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.²⁸
 - 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 104.11.²⁹

²⁴ <http://www.drjengineering.org/AppendixC> and <https://www.drjcertification.org/cornell-2016-protection-trade-secrets>.

²⁵ <https://www.law.cornell.edu/uscode/text/18/1832#:~:text=imprisoned%20not%20more%20than%2010%20years>

²⁶ <https://www.law.cornell.edu/uscode/text/18/1832#:~:text=Any%20organization%20that,has%20thereby%20avoided>

²⁷ <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706.2>

²⁸ [IBC 2021, Section 1706.1 Conformance to Standards](#)

²⁹ [IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General](#)

- 1.3 **Approved³⁰ 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, which 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.³¹ The Superintendent of Building roster of approved testing agencies 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 CBI 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 1707.1.³²
- 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 NYC Building Code 2022 (NYCBC) states in pertinent part that an approved agency shall be deemed³³ 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 agreement³⁴ (i.e., ANAB, International Accreditation Forum (IAF), etc.).

³⁰ See Section 8 for the distilled building code definition of **Approved**

³¹ Los Angeles Municipal Code, SEC. 98.0503. TESTING AGENCIES

³² <https://up.codes/viewer/california/ca-building-code-2022/chapter/17/special-inspections-and-tests#1707.1>

³³ New York City, The Rules of the City of New York, § 101-07 Approved Agencies

³⁴ New York City, The Rules of the City of New York, § 101-07 Approved Agencies

- 1.6 **Approved by Florida:** Statewide approval of products, methods, or systems of construction shall be approved, without further evaluation, by 1) A certification mark or listing of an approved certification agency, 2) A test report from an approved testing laboratory, 3) A product evaluation report based upon testing or comparative or rational analysis, or a combination thereof, from an approved product evaluation entity; 4) A product evaluation report based upon testing or comparative or rational analysis, or a combination thereof, developed and signed and sealed by a professional engineer or architect, licensed in Florida. 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) A certification mark, listing, or label from a commission-approved certification agency indicating that the product complies with the code; 2) A test report from a commission-approved testing laboratory indicating that the product tested complies with the code; 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; 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; 5) A statewide product approval issued by the Florida Building Commission. 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 Building Code 2018 of New Jersey in IBC Section 1707.1 General,³⁵ 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)”.³⁶ Furthermore N.J.A.C 5:23-3.7 states: Municipal approvals of alternative materials, equipment, or methods of construction. **(a) 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. 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 (a) above. 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 (a) above. 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 2 given that the listed entities are no longer in existence and/or do not provide “reports of engineering findings”.

³⁵ https://up.codes/viewer/new_jersey/ibc-2018/chapter/17/special-inspections-and-tests#1707.1

³⁶ <https://www.nj.gov/dca/divisions/codes/codreg/ucc.html>

- 1.9 **Approved by the Code of Federal Regulations Manufactured Home Construction and Safety Standards:** Pursuant to Title 24, Subtitle B, Chapter XX, Part 3282.14³⁷ and Part 3280,³⁸ the Department encourages innovation and the use of new technology in manufactured homes. The design and construction of a manufactured home shall conform with the provisions of Part 3282 and Part 3280 where key approval provisions in mandatory language follow: 1) “All construction methods shall be in conformance with accepted engineering practices”; 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.”; and 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.³⁹
 - 1.10.2 For innovative alternative products, materials, designs, services and/or methods of construction, in the absence of approved rules or other approved standards...the building official shall accept duly authenticated reports (i.e., listing and/or research report) from approved agencies with respect to the quality and manner of use of new materials or assemblies.⁴⁰ A building official approved agency is deemed to be approved via certification from an accreditation body that is listed by the International Accreditation Forum⁴¹ or equivalent.
 - 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.⁴² An approved source is defined as a PE subject to professional engineering laws, where a research and/or a technical evaluation report certified by a PE, shall be approved.
- 1.11 **Approval by International Jurisdictions:** The USMCA and GATT agreements provide for approval of innovative materials, products, designs, services, assemblies and/or methods of construction through the Technical Barriers to Trade agreements and the International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA), where these agreements:
- 1.11.1 Permit participation of conformity assessment bodies located in the territories of other Members (defined as GATT Countries) under conditions no less favourable than those accorded to bodies located within their territory or the territory of any other country,
 - 1.11.2 State that conformity assessment procedures (i.e., ISO/IEC 17020, 17025, 17065, etc.) are prepared, adopted, and applied so as to grant access for suppliers of like products originating in the territories of other Members under conditions no less favourable than those accorded to suppliers of like products of national origin or originating in any other country, in a comparable situation.
 - 1.11.3 State that conformity assessment procedures are not prepared, adopted, or applied with a view to or with the effect of creating unnecessary obstacles to international trade. This means that conformity assessment procedures shall not be more strict or be applied more strictly than is necessary to give the importing Member adequate confidence that products conform to the applicable technical regulations or standards.

³⁷ <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3282/subpart-A/section-3282.14>

³⁸ <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280>

³⁹ IBC 2021, Section 1706 Design Strengths of Materials, 1706.2 New Materials. Adopted law pursuant to IBC model code language 1706.2.

⁴⁰ IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General. Adopted law pursuant to IBC model code language 1707.1.

⁴¹ Please see the ANAB directory for building official approved agencies.

⁴² IBC 2021, Section 1706 Design Strengths of Materials, Section 1706.1 Conformance to Standards Adopted law pursuant to IBC model code language 1706.1.



- 1.11.4 **Approved:** The purpose of the IAF 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, products, designs, services, assemblies and/or methods of construction. Accreditations granted by IAF MLA signatories are recognised worldwide based on their equivalent accreditation programs, therefore reducing costs and adding value to businesses and consumers.