Listing and Technical Evaluation Report™

A Duly Authenticated Report from an Approved Agency

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

Trade Secret Report Holder:

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CSI Designations:

DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION

Section: 07 21 00 - Thermal Insulation

Section: 07 21 13 - Foam Board Insulation

Section: 07 24 00 - Exterior Insulation and Finish Systems

Section: 07 26 00 - Vapor Retarders

Section: 07 27 00 - Air Barriers

1 Innovative Products Evaluated[1]

1.1 Kingspan Kooltherm Insulation Boards:

- 1.1.1 K8 Cavity Board
- 1.1.2 K9 Internal Insulation Board
- 1.1.3 K10 Soffit Board
- 1.1.4 K12 Framing Board
- 1.1.5 K15 Rainscreen Board
- 1.1.6 K20 Concrete Sandwich Board
- 1.1.7 K108 Cavity Board
- 1.1.8 K110CB Cavity Board
- 1.1.9 K110 Soffit Board and Continuous Insulation Board
- 1.1.1 K110 Framing Board
- 1.1.10 K110 Rainscreen Board
- 1.1.11 K120 Concrete Sandwich Board
- 1.1.12 K120 Internal Insulation Board
- 1.1.13 K122 Double Foil Face Board

2 Product Description and Materials

2.1 The innovative products evaluated in this report are shown in **Figure 1** and described in **Table 1**.

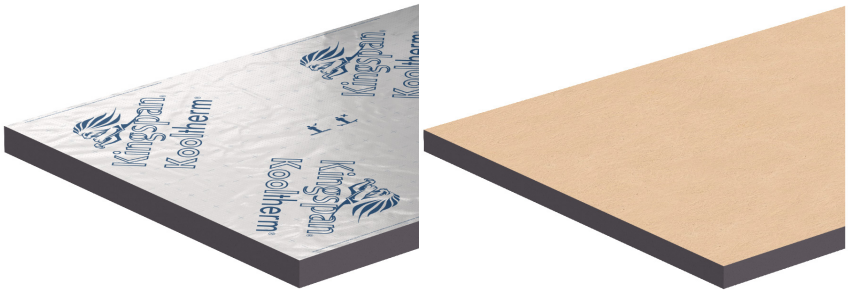

Figure 1. Kingspan Kooltherm Insulation Boards - Foil Facer (Left) and Glass Facer (Right)

2.2 Kingspan Kooltherm Insulation Boards consist of a fiber-free, thermoset phenolic core with facer materials bonded both sides, and are used for non-structural thermal insulation in all types of construction in accordance with the IBC and IRC.

Table 1. Kingspan Kooltherm Insulation Boards – Product Descriptions

Product	Facers	Standard Dimensions[1] (in)	Available Thicknesses[2] (mm)	Application
K8 Cavity Board	Low emissivity composite foil facing on both sides	Width: 47 1/4 Length: 16	20 – 120	Partially filled cavity wall
K9 Internal Insulation Board	Glass-tissue based facer on both sides	Width:[1] 47 1/4 Length:[1] 89 3/8	20 – 120	Interior exposed application on habitable space
K10 Soffit Board	Glass-tissue based facer on inside face; low emissivity composite foil on exposed face	Width: 47 1/4 Length: 89 3/8	25 – 120	Structural ceilings or floors (not below grade)
K12 Framing Board	Low emissivity composite foil facing on both sides	Width: 47 1/4 Length: 96	20 – 120	Wood frame walls or steel framing systems
K15 Rainscreen Board	Low emissivity composite foil facing on both sides	Width: 47 1/4 Length: 96	20 – 120	Behind rainscreen or masonry faced systems
K20 Concrete Sandwich Board	Glass-tissue based facer on both sides	Width:[1] 47 1/4 Length:[1] 89 3/8	20 – 120	Precast/concrete insulated sandwich wall systems
K110 Soffit Board	Glass-tissue based facer on inside face; low emissivity composite foil on exposed face	Width: 47 1/4 Length: 94 1/2	40 – 100	Structural ceilings or floors (not below grade)
K110 Framing Board				Wood and steel framing systems
K110 Rainscreen Board				Rainscreen cladding systems

Table 1. Kingspan Kooltherm Insulation Boards – Product Descriptions

Product	Facers	Standard Dimensions[1] (in)	Available Thicknesses[2] (mm)	Application
K110CB Cavity Board	Glass-tissue based facer on inside face; low emissivity composite foil on exposed face	Width: 47 1/4 Length: 16	40 – 100	Partially filled cavity wall
K120 Internal Insulation Board	Glass-tissue based facer on both sides	Width: 47 1/4 Length: 89 3/8	40 – 100	Habitable space, basement, crawl space, attic walls
K120 Concrete Sandwich Board				Precast/concrete insulated sandwich wall systems
K122 Double Foil Face Board	Low emissivity composite foil facing on both sides	Width: 47 1/4 Length: 96	40 – 100	Behind rainscreen or masonry faced systems

SI: 1 in = 25.4 mm
1. Custom widths and lengths may be available.
2. Other thicknesses may be available.

2.3 Kingspan Kooltherm Insulation Boards K8, K10, K12, K15, and K20 have a nominal core design of 2.0 pcf (32 kg/m^3).

2.4 Kingspan Kooltherm Insulation Boards K110, K110CB, K120, and K122 have a nominal core design of 2.4 pcf (38 kg/m^3).

2.5 As needed, review material properties for design in **Section 6** and the 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, or RDP) 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 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 *Regulations*

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

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

4.1.3 *IECC – 15, 18, 21: International Energy Conservation Code®*

4.2 *Standards*

4.2.1 *ASTM C209: Standard Test Methods for Cellulosic Fiber Insulating Board*

4.2.2 *ASTM D1621: Standard Test Method for Compressive Properties of Rigid Cellular Plastics*

4.2.3 *ASTM D1622: Standard Test Method for Apparent Density of Rigid Cellular Plastics*

4.2.4 *ASTM D1623: Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics*

4.2.5 *ASTM D2126: Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging*

4.2.6 *ASTM D6226: Standard Test Method for Open Cell Content of Rigid Cellular Plastics*

4.2.7 *ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials*

4.2.8 *ASTM E96: Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials*

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

4.2.10 *NFPA 285: Standard Fire Test Method for the Evaluation of Fire Propagation Characteristics of Exterior Non-load-bearing Wall Assemblies Containing Combustible Components*

4.2.11 *UL 723: Test for Surface Burning Characteristics of Building Materials*

5 Listed[20]

5.1 Equipment, materials, products, or services included in a List published by a nationally recognized testing laboratory (i.e., CBI), an approved agency (i.e., CBI and DrJ), and/or and 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*

6.1.1 Kingspan Kooltherm Insulation Boards are a rigid thermoset closed cell phenolic thermal insulation complying with IBC Section 2603 and IRC Section R316.

6.1.2 Kingspan Kooltherm Insulation Boards are permitted to be used in buildings of Type I-IV construction in accordance with IBC Section 2603.5.

6.1.3 Kingspan Kooltherm Insulation Boards are permitted to be used in in one- or two-family residential structures in accordance with the IRC.

6.2 *Water Vapor Permeance*

6.2.1 Kingspan Kooltherm Insulation Boards are classified as Class II and Class III vapor retarders in accordance with IBC Section 1404.3 and IRC Section R702.7.

6.2.2 Water vapor permeance values are listed in **Table 2**.

Table 2. Vapor Permeance[1,2]

Product	Water Vapor Permeance (perm)	Classification
Foil Facers (K8, K12, K15, and K108RF)	0.51	Class II
Glass Facers (K10)	0.48	Class II
Foil-Glass Facers (K20)	0.79	Class II
Foil-Glass Facers (K110, K110CB)	2.96	Class III
Glass Facers (K120)	0.80	Class II
Foil Facers (K122)	0.45	Class II

SI: 1 perm = 57.2 ng/(Pa·s·m^2)

1. Tested in accordance with ASTM E96 Desiccant Method.
2. Results for 1" thickness board.

6.3 *Air Barrier Material*

6.3.1 Kingspan Kooltherm Insulation Boards are an air-impermeable insulation and an air barrier material meeting the requirements of IRC Section N1101.10.5, IECC Section R303.1.5, and IECC Section C402.5.1.3[21] for use as part of an air barrier assembly when installed in accordance with the manufacturer installation instructions and this report.

6.3.1.1 All seams, including the top and bottom edges shall be taped.

6.3.2 Kingspan Kooltherm Insulation Boards K8, K10, K12, K15, and K20 were evaluated in accordance with ASTM E2178 at a thickness of 1" (25.4 mm).

6.3.3 Kingspan Kooltherm Insulation Boards K110, K110CB, K120, and K122 were evaluated in accordance with ASTM E2178 at a thickness of 1" (25.4 mm).

6.4 *Surface Burning Characteristics*

6.4.1 Kingspan Kooltherm Insulation Boards were evaluated for surface burning characteristics in accordance with ASTM E84 per IBC Section 2603.03, IBC Section 2603.5.4, and IRC Section R316.3.

6.4.2 Flame spread index and smoke developed index are shown in **Table 3**.

Table 3. Surface Burning Characteristics[1,2]

Product	Flame Spread Index	Smoke Developed Index	Classification
Kingspan Kooltherm Products, as listed in **Table 1**[3]	< 25	< 450	Class A

1. Tested in accordance with ASTM E84 (UL 723).
2. Flame spread and smoke-developed indexes are shown for comparison purposes only and are not intended to represent the performance under actual fire conditions.
3. For products with a different facing material one side, results are applicable with either facer (i.e. glass fiber tissue, or foil facing) exposed.

6.5 *Ignition*

6.5.1 Kingspan Kooltherm Insulation Boards were evaluated to assess performance with regard to ignition in accordance with IBC Section 2603.5.7.

6.5.2 Kingspan Kooltherm Insulation Boards comply with this section when the exterior side of the sheathing is protected with one of the following materials:

6.5.2.1 A thermal barrier complying with IBC Section 2603.4 and IRC Section R316.4.

6.5.2.2 A minimum 1" (25 mm) thickness of concrete or masonry.

6.5.2.3 Glass fiber-reinforced concrete panels of a minimum thickness of $^{3}/_{8}$" (9.5 mm).

6.5.2.4 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.

6.5.2.5 A minimum $^{7}/_{8}$" (22.2 mm) thickness of stucco complying with IBC Section 2510.

6.5.2.6 A minimum $^{1}/_{4}$" (6.4 mm) thickness fiber-cement lap, panel, or shingle siding complying with IBC Section 1404.16 and IBC Section 1404.16.1 (IRC Section R703.10.1), or IBC Section 1404.16.2 (IRC Section R703.10.2).

6.6 *Vertical and Lateral Fire Propagation*

6.6.1 Kingspan Kooltherm Insulation Boards 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.

6.6.1.1 Engineering analysis also was conducted to assess substitution of other products within the approved wall assemblies.

6.6.1.2 The wall assemblies listed in the following tables are approved for use in buildings of Type I-IV construction.

6.6.1.2.1 **Table 4** for Kingspan Kooltherm K15, K8, K10, K12 or K20 insulation – minimum 1" (25 mm) thick to a maximum of $4^{3}/_{4}$" (120 mm) thick.

6.6.1.2.2 **Table 5** for Kingspan Kooltherm K15, K8, K10, K12 or K20 insulation – minimum 1" (25 mm) thick to a maximum of 3" (75 mm) thick.

6.6.1.2.3 **Table 6** for Kingspan Kooltherm K110, K120, or K122 insulation – minimum 1" (25 mm) thick to a maximum of 3" (75 mm) thick.

Table 4. Approved NFPA 285 Wall Assemblies Containing Maximum 4 3/4" Thick Kooltherm K15, K8, K10, K12, or K20 Insulation[1]

Wall Component	Materials
Base Wall System Use 1, 2, or 3	1. Cast-concrete Wall 2. Concrete Masonry Wall 3. One layer 5/8" thick Type X gypsum wallboard on interior installed over steel studs: minimum 3 5/8" depth, minimum 20-gauge, spaced at a maximum of 24" o.c. with lateral bracing every 4' vertically.
Floorline Firestopping	1. 4 lb./cu ft. mineral wool in each stud cavity at each floor line, attached with Z-clips or equivalent.
Cavity Insulation Use either 1, 2, or 3	1. None 2. Fiberglass batt or mineral wool insulation (faced or unfaced) 3. Any noncombustible insulation (faced or unfaced)
Exterior Gypsum Sheathing Use either 1 or 2	1. None; when base wall systems #1 or #2 are used, sheathing is optional 2. Minimum 5/8" thick, Type X, exterior type gypsum sheathing
Water-Resistive Barrier Use either 1 or 2 Applied over exterior gypsum sheathing and underneath exterior insulation	1. None 2. Any Water-Resistive Barrier (WRB) material as indicated in **Table 7**.
Exterior Insulation	1. Kingspan Kooltherm K15, K8, K10, K12 or K20 insulation – minimum 1" (25 mm) thick to a maximum of 4 3/4" (120 mm) thick. Standard silver aluminum, black coated aluminum, white coated aluminum or glass tissue facers are all acceptable facing materials.
Sealing of Exterior Insulation	1. Optional: All exterior insulation joints and veneer tie penetrations sealed with acrylic, asphalt, or butyl-based sealing tape – maximum 4" width
Exterior Veneer Use any of these options	1. Brick 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 a. Minimum 2" thick b. Maximum 2" air gap between exterior insulation and concrete. c. Any standard non-open joint technique may be used. 3. Concrete Masonry Units (CMU) a. Minimum 4" thick b. Maximum 2" air gap between exterior insulation and CMU 4. Stone Veneer 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 (such as shiplap, etc.) 5. Stucco a. Minimum 3/4" thick 2 or 3-coat stucco installed over lath

Table 4. Approved NFPA 285 Wall Assemblies Containing Maximum 4 3/4" Thick Kooltherm K15, K8, K10, K12, or K20 Insulation[1]

Wall Component	Materials
Flashing of Window, Door and Other Exterior Wall Penetrations[1]	1. As an option, flash window, door and other exterior penetrations with limited amounts of acrylic, asphalt or butyl-based sealing tape, maximum 12" width. 2. As an option, Kooltherm® Cavity Closure can be used to close wall cavities at openings.
1. For more information regarding window detailing for NFPA 285 assemblies, please contact the manufacturer.	

Table 5. Approved NFPA 285 Wall Assemblies Containing Maximum 3" Thick Kooltherm K15, K8, K10, K12, or K20 Insulation[1]

Wall Component	Materials
Base Wall System Use 1, 2 or 3	1. Cast-concrete Wall 2. Concrete Masonry Wall 3. One layer 5/8" thick Type X gypsum wallboard on interior installed over steel studs: minimum 3 5/8" depth, minimum 20-gauge, spaced at a maximum of 24" o.c. with lateral bracing every 4' vertically.
Floorline Firestopping	1. 4 lb./cu ft. mineral wool in each stud cavity at each floor line, attached with Z-clips or equivalent.
Cavity Insulation Use either 1, 2, or 3	1. None 2. Fiberglass batt or mineral wool insulation (faced or unfaced) 3. Any noncombustible insulation (faced or unfaced)
Exterior Gypsum Sheathing Use either 1 or 2	1. None (only allowed when base wall systems #1 or #2 are used) 2. 1/2" or 5/8" thick, Type X, exterior type gypsum sheathing
Water-Resistive Barrier Use either 1 or 2 Applied over exterior gypsum sheathing and underneath exterior insulation	1. None 2. Any WRB material as indicated in **Table 7**.
Exterior Insulation	1. Kingspan Kooltherm K15, K8, K10, K12, or K20 insulation – minimum 1" (25 mm) thick to a maximum of 3" (75 mm) thick. Standard silver aluminum, black coated aluminum, white coated aluminum, or glass tissue facers are all acceptable facing materials.
Sealing of Exterior Insulation	1. Optional: All exterior insulation joints and veneer tie penetrations sealed with acrylic, asphalt or butyl-based sealing tape – maximum 4" width
Exterior Veneer Use any of these options	1. MCM Panel System a. Any metal composite material system that has been successfully tested by the panel manufacturer via the NFPA 285 test method. b. Acceptable NFPA 285 testing shall consist of successful NFPA 285 test results on wall assembly incorporating a comparable thickness of combustible foam insulation behind the MCM. c. MCM panels shall be maximum 4 mm thick.

Table 5. Approved NFPA 285 Wall Assemblies Containing Maximum 3" Thick Kooltherm K15, K8, K10, K12, or K20 Insulation[1]

Wall Component	Materials
	2. Steel, Aluminum, or Copper Metal Exterior Wall Cladding a. Aluminum cladding shall be minimum 0.080" thick b. Steel cladding shall be minimum 0.0149" thick c. Copper cladding shall be minimum 0.0216" thick d. Any standard installation technique may be used e. Also acceptable to install cladding using Knight Wall Rainscreen Attachment System 3. Fiber-Cement Siding (Noncombustible) a. Minimum 1/4" thick b. Any standard installation technique with noncombustible furring can be used c. A maximum 1 1/2" air gap allowed behind the fiber-cement siding 4. Swisspearl Carat Panels a. Minimum 0.315" (8 mm) thick with closed or open joints (maximum 1/2" joints when open) b. Any standard installation technique using noncombustible furring can be used c. A maximum 1 1/2" air gap allowed behind panels 5. Brick 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 6. Concrete a. Minimum 2" thick b. Maximum 2" air gap between exterior insulation and concrete c. Any standard non-open joint technique may be used 7. Concrete Masonry Units (CMU) a. Minimum 4" thick b. Maximum 2" air gap between exterior insulation and CMU 8. Stone Veneer 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 (such as shiplap, etc.) 9. Stucco a. Minimum 3/4" thick b. 2 or 3-coat stucco installed over lath 10. Terracotta Cladding a. Use any terracotta cladding system in which terracotta is minimum 1 1/4" thick b. Any standard joint installation technique such as shiplap, etc. may be used 11. EIFS a. Henkel Polybit Industries Limited Ceresit EIFS – EIFS system consisting of Ceresit-CT 85 adhesive mortar and basecoat, Ceresit-CT 16 primer, and Ceresit-CT 60 finish coat

Table 5. Approved NFPA 285 Wall Assemblies Containing Maximum 3" Thick Kooltherm K15, K8, K10, K12, or K20 Insulation[1]

Wall Component	Materials
	12. Thin Brick a. Minimum 3/4" thick clay brick fully adhered with cementitious mortar (standard or polymer modified) to minimum 1/2" thick cement backer board or gypsum sheathing b. A secondary water-resistive barrier can be installed between the board/sheathing and the brick c. The secondary water-resistive barrier shall not be full-coverage asphalt or butyl-based self-adhered membranes
Flashing of Window, Door and Other Exterior Wall Penetrations[1]	1. As an option, flash window, door and other exterior penetrations with limited amounts of acrylic, asphalt or butyl-based sealing tape, maximum 12" width 2. As an option, Kooltherm® Cavity Closure can be used to close wall cavities at openings
1. For more information regarding window detailing for NFPA 285 assemblies, please contact the manufacturer.	

Table 6. Approved NFPA 285 Wall Assemblies Containing Maximum 3" Thick Kooltherm K110, K110 CB, K120, or K122 Insulation[1]

Wall Component	Materials
Base Wall System Use 1, 2, or 3	1. One layer 5/8" thick Type X gypsum wallboard complying with ASTM C1396 on interior installed horizontally or perpendicular to framing, attached with Type S #6 x 1 1/4" screws at 8" o.c. on the perimeter and 12" o.c. in the field. Joists shall be taped and covered with joint compound; fastener heads shall be covered with joint compound. Framing shall be steel studs: minimum 3 5/8" depth, minimum 20-gauge, spaced at a maximum of 16" o.c. with lateral bracing every 4' vertically.
Floorline Firestopping	1. 4 lb./cu ft. mineral wool in each stud cavity at each floor line, attached with Z-clips or equivalent
Cavity Insulation Use either 1, 2, or 3	1. None 2. Fiberglass batt or mineral wool insulation (faced or unfaced) 3. Any noncombustible insulation (faced or unfaced)
Exterior Gypsum Sheathing	1. Minimum 5/8" thick, Type X, exterior type gypsum sheathing complying with ASTM C1177, installed horizontal or perpendicular to framing, attached with Type S #6 x 1 1/4" screws at 8" o.c. on the perimeter and 12" o.c. in the field
Water-Resistive Barrier Applied over exterior gypsum sheathing and underneath exterior insulation	1. Tremco EXO Air 110 AT, applied in accordance with the manufacturer instructions

Table 6. Approved NFPA 285 Wall Assemblies Containing Maximum 3" Thick Kooltherm K110, K110 CB, K120, or K122 Insulation[1]

Wall Component	Materials
Exterior Insulation	1. Kingspan Kooltherm K110, K110 CB, K120 or K122 – minimum 1" (25 mm) thick to a maximum of 3" (76 mm) thick shall be installed between Slotted-Z framing members and attached to framing with sufficient fasteners to hold the insulation boards in place ***Note:*** Thermally broken Slotted-Z by Cladiator framing members are attached horizontally to vertical framing members with 1 1/2" long Tek 5, 5/16" hex head stainless steel screws, one per stud. Maximum vertical spacing is 47 1/4". See **Figure 4** and **Figure 5**. A stack joint consisting of the 24-gauge galvanized steel angle (MK-03) with Slotted-Z framing above and below shall be located a maximum of 47 1/4" above openings. The stack joint shall extend a minimum of 43" on either side of the opening. The steel angle shall be attached to steel framing members with #8 x 1 1/4" wafer head screws. See **Figure 5**.
Sealing of Exterior Insulation	1. Kingspan Kooltherm K122 Insulation Boards shall be taped using Nashua 324A insulation tape
Exterior Veneer	1. Morin MX-8 Wall Cladding Panels shall be oriented vertically and shall be attached to the Slotted-Z framing members with Matrix Series galvanized clips, which use two #14 x 2 1/4" screws per clip. See **Figure 6**, **Figure 7**, and **Figure 8**.
Openings	1. Openings shall be framed with minimum 20-gauge steel. The header shall be two layers consisting of 20-gauge galvanized steel angle (MK-03) and 24-gauge Galvalume flashing (MK-02). Window sills shall be covered with 24-gauge Galvalume (MK-01). The MK-03 angel shall extend a minimum of 43" on either side of the opening. See **Figure 2** and **Figure 3** for component profiles and dimensions.
1. For more information regarding window detailing for NFPA 285 assemblies, please contact the manufacturer.	

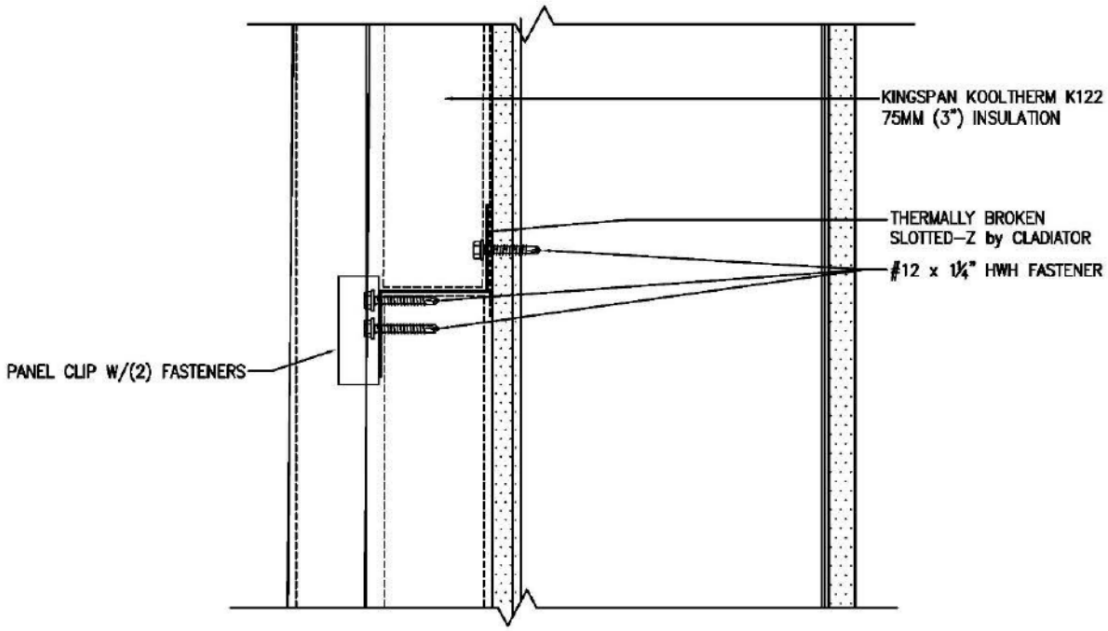

Figure 2. Typical Window Sill Detail

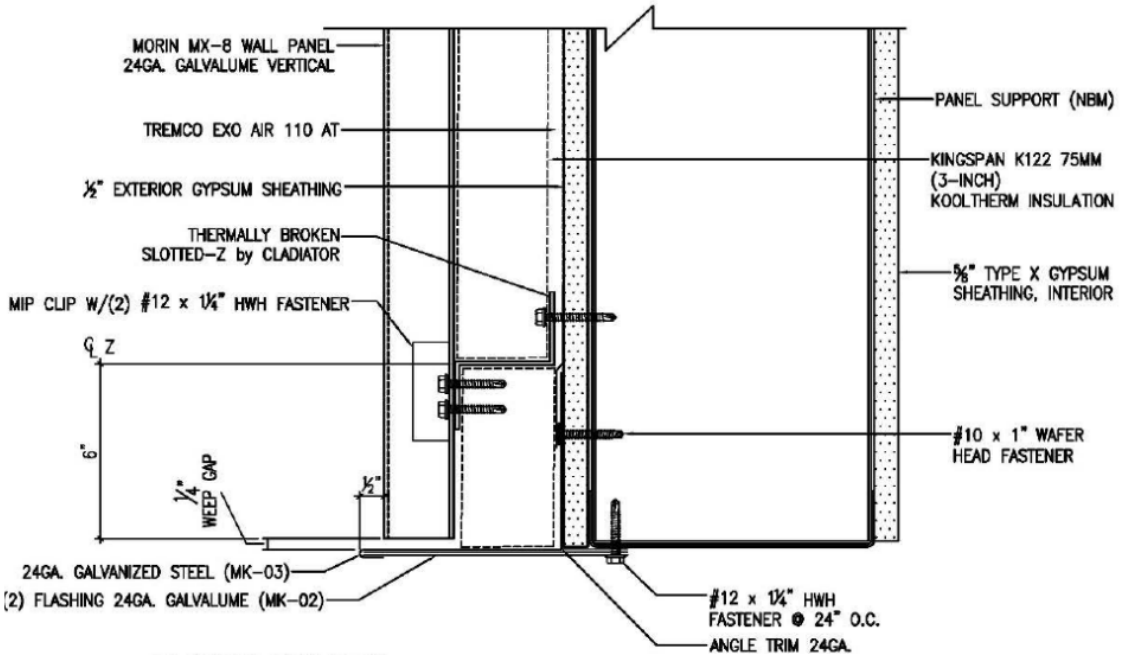

Figure 3. Typical Window Head Detail

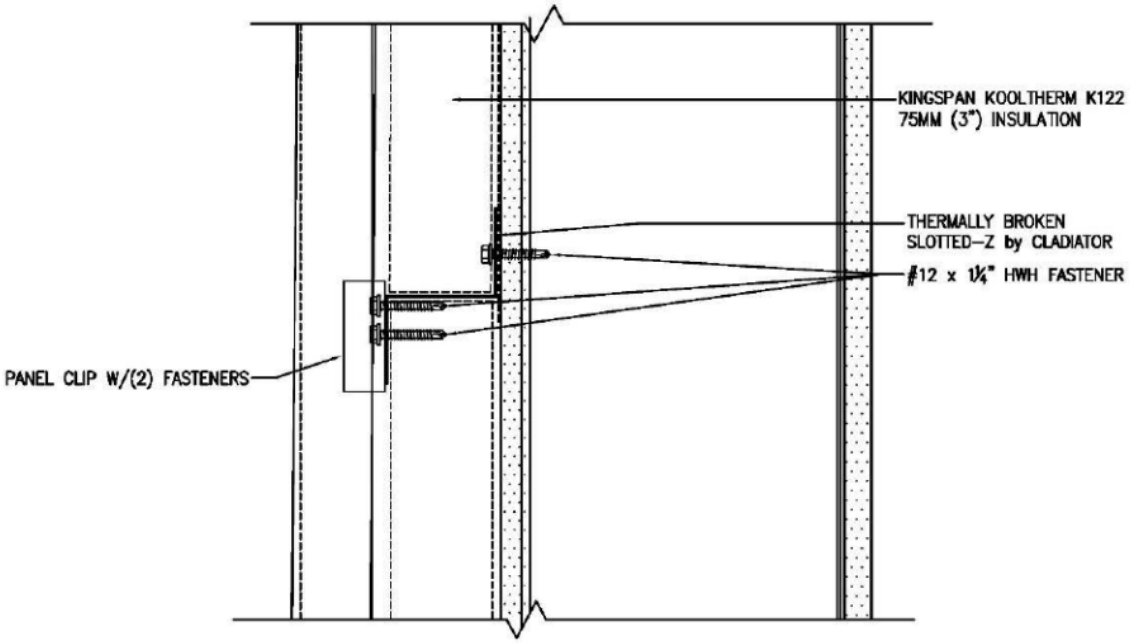

Figure 4. Typical Slotted-Z Detail

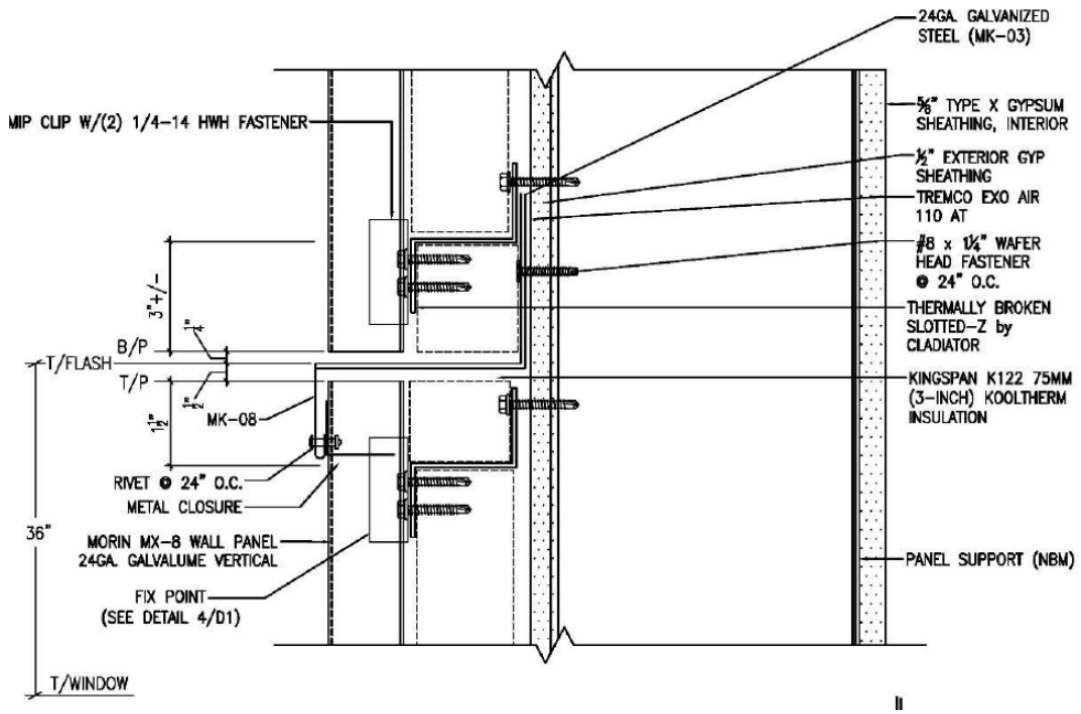

Figure 5. Typical Stack Joint Detail

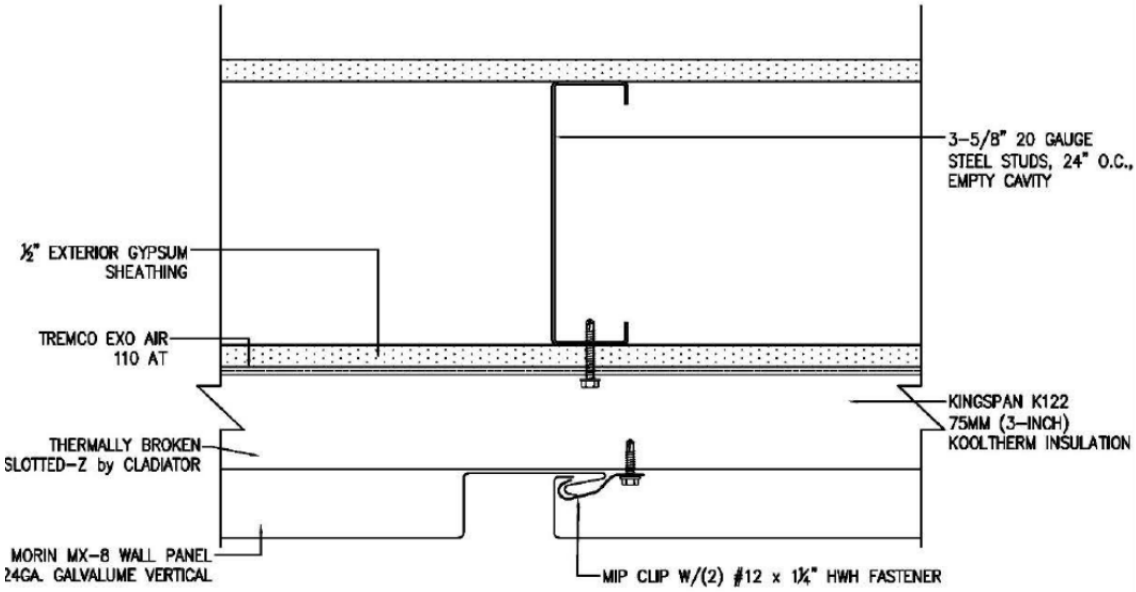

Figure 6. Typical Vertical Panel Joint Detail

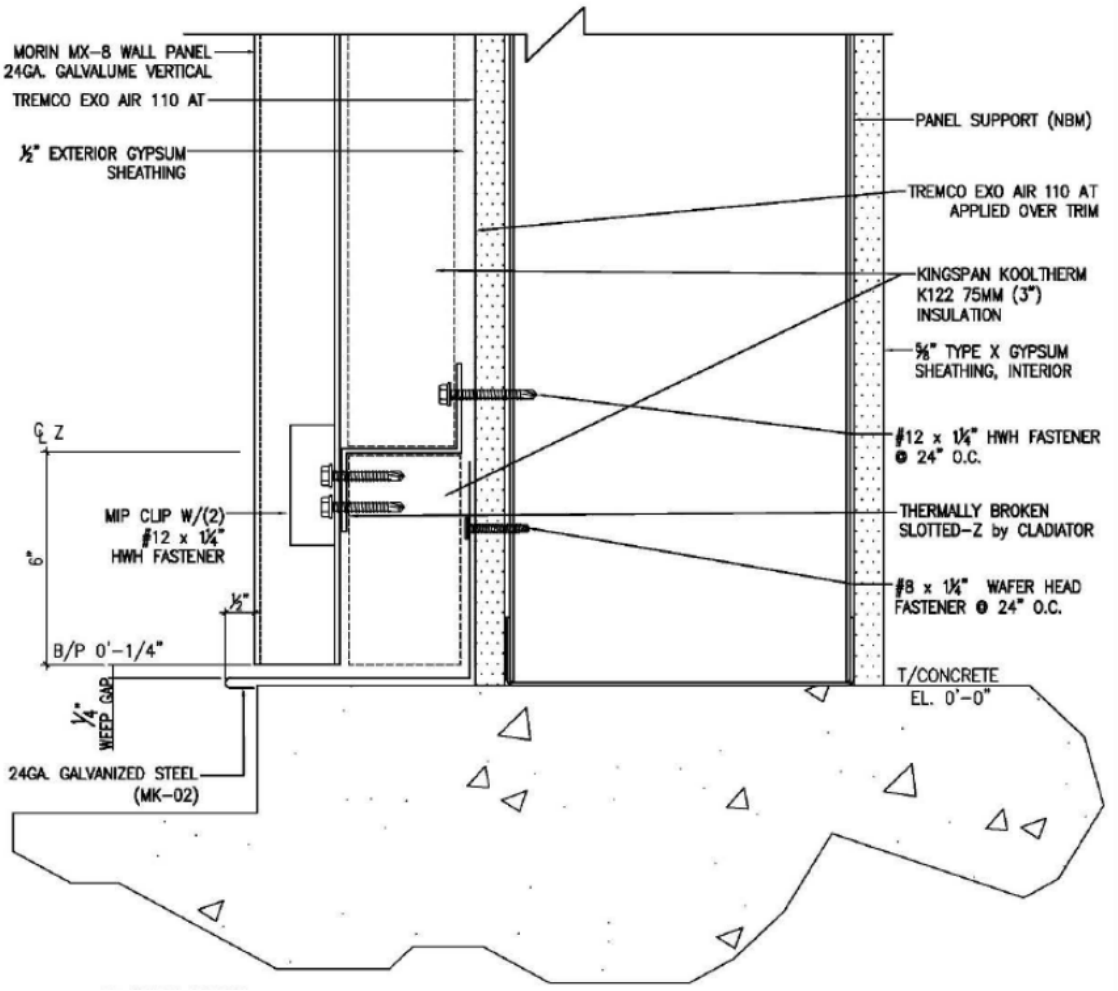

Figure 7. Typical Base Detail

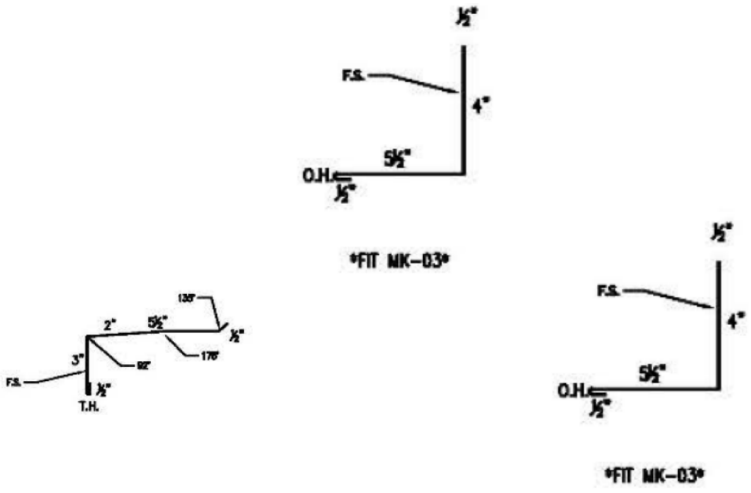

Figure 8. Flashing Profiles

6.6.1.3 The materials listed in **Table 7** are approved for use as WRB in buildings of Type I-IV construction.

Table 7. Approved WRB Materials for NFPA 285 Wall Assemblies

Manufacturer	Material[1]	For Use with Table 4	For Use with Table 5
3M™	3M™ Self-Adhered Air and Vapor Barrier 3015	X	X
BASF	MasterSeal AWB 660	X	X
	MasterSeal AWB 660I	X	X
Carlisle	CCW-705FR w/ Primers	X	X
	Barritech™ VP	X	X
	Barritech™ NP	X	X
Cosella-Dörken	DeltaR-Foxx	X	X
	DeltaR-Foxx Plus	X	X
	DeltaR-Fassade S	X	X
	DeltaR-Vent S/Plus	X	X
	DeltaR-Maxx Plus	X	X
Dow Chemical	WeatherMate™	X	X
	WeatherMate™ Plus	X	X
Dow Corning®	DefendAir 200	X	X
Dryvit	BackstopR NT	X	X
DuPont	DuPont™ Tyvek® CommercialWrap®	X	X
	DuPont™ Tyvek® CommercialWrap® D	X	X
	DuPont™ Tyvek® ThermaWrap™	X	X
	DuPont™ Tyvek® Fluid Applied WB+ (nominal 25 wet mil thickness)	X	X
Henry Company	Air-Bloc® 32MR	X	X
	Air-Bloc® 31MR	X	X
	Air-Bloc® 33MR	X	X
	Blueskin VP™ 160	X	X
	Air-Bloc® 21 FR	X	X
	Metal Clad™	X	X
	Foilskin®	X	X

Table 7. Approved WRB Materials for NFPA 285 Wall Assemblies

Manufacturer	Material[1]	For Use with Table 4	For Use with Table 5
Hohmann & Barnard	Enviro-Barrier™	X	X
	Enviro-Barrier™ VP	X	X
Grace Construction Products	Perm-A-Barrier® Aluminum Wall Membrane	X	X
	Perm-A-Barrier® VPL	X	X
	Perm-A-Barrier® VPL LT	X	X
	Perm-A-Barrier® VPS	X	X
	Perm-A-Barrier® NPL 10	X	X
JX Nippon ANCI, Inc.	JX ALTATM Commercial Wrap	X	X
	JX ALTATM HP Wrap	X	X
	JX ALTATM LP Wrap	X	X
Kingspan®	Kingspan® GreenGuard® Max™ Building Wrap	X	X
	Kingspan® GreenGuard® Classic Building Wrap	X	X
	Kingspan® GreenGuard® C2000 Building Wrap	X	X
	Kingspan® GreenGuard® Raindrop® 3D Building Wrap	X	X
	Kingspan® GreenGuard® HPW™ Building Wrap	X	X
	Everbilt™ Premium Non-woven Housewrap	X	X
Momentive Performance Materials	GE SEC2500 SilShield AWB	X	X
	GE SEC2600 SilShield AWB	X	X
	GE SEC2600-r SilShield AWB	X	X
PolyGuard Products	Airlok Flex® applied at a maximum 40 mils WFT	X	
	Airlok Flex® WG applied at a maximum 20 mils WFT	X	
	Airlok Flex® VP applied at a maximum 32 mils WFT	X	
Prosoco	CAT 5	X	
	CAT 5 Rainscreen	X	
Soprema	Sopraseal Stick 1100 TI	X	
	Sopraseal Stick VP	X	

Table 7. Approved WRB Materials for NFPA 285 Wall Assemblies

Manufacturer	Material[1]	For Use with Table 4	For Use with Table 5
Sto Corp	Sto Gold Coat® with StoGuard Fabric	X	X
	Sto Emerald Coat® with StoGuard Fabric	X	X
	Sto ExtraSeal™ with StoGuard Mesh	X	X
	StoGuard® VaproShield™	X	
STS, Inc.	Wall Guardian™ FW-100A	X	X
Tremco, Inc.	ExoAir 430	X	
VaproShield	WallShield	X	X
	WrapShield	X	X
	WrapShield SA™	X	
	RevealShield™	X	X
	RevealShield SA™	X	X
W.R. Meadows	Air-Shield™ LMP (Gray)	X	X
	Air-Shield™ LMP (Black)	X	X
	Air-Shield™ TMP	X	X
	Air-Shield™ LSR	X	X

1. Installation shall comply with the instructions in **Table 4** or **Table 5**, respectively. All WRB to be installed at the indicated or recommended application rates and per the manufacturer installation instructions.

6.7 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[22]

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.[23]

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.[24]

8 Regulatory Evaluation and Accepted Engineering Practice

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

8.1.1 Kingspan Kooltherm Insulation Boards were evaluated to determine the following:

8.1.1.1 Use as a vapor retarder in accordance with IBC Section 1404.3 and IRC Section R702.7.

8.1.1.2 Use as an air barrier material in accordance with IRC Section N1101.10.5, IECC Section R303.1.5, and IECC Section C402.5.1.3.[25]

8.1.1.3 Performance for use in buildings of Type I-IV construction of any height in accordance with IBC Section 2603.5.

8.1.1.3.1 Performance in accordance with ASTM E84/UL 723 for flame spread and smoke development ratings in accordance with IBC Section 2603.3, IBC Section 2603.5.4, IRC Section R302.10.1, and IRC Section R316.3.

8.1.1.3.2 Performance with regard to the potential heat generated by the Foam Plastic Insulating Sheathing (FPIS) in accordance with IBC Section 2603.5.3.

8.1.1.3.3 Performance with regard to vertical and lateral fire propagation in accordance with IBC Section 2603.5.5.

8.1.1.3.4 Performance for use in buildings of Type V construction.

8.1.1.3.5 Performance with regard to ignition in accordance with IBC Section 2603.5.7.

8.1.2 Use as part of an NFPA 285 wall assembly in accordance with IBC Section 2603.5.5, as detailed in **Table 4**, **Table 5**, and **Table 6**.

8.2 Wind pressure resistance is outside the scope of this report.

8.3 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[26] to practice product and regulatory compliance services within its scope of accreditation and engineering expertise, respectively.

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

8.5 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 See **Table 4**, **Table 5**, and **Table 6** for NFPA 285-compliant wall assemblies using Kingspan Kooltherm Insulation Boards.

9.4 See **Table 7** for NFPA 285-compliant WRBs for use with the assemblies in **Table 4** and **Table 5**.

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

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 Water absorption in accordance with ASTM C209

10.1.2 Compressive strength properties in accordance with ASTM D1621

10.1.3 Apparent core density properties in accordance with ASTM D1622

10.1.4 Tensile strength in accordance with ASTM D1622

10.1.5 Flame spread and smoke developed ratings in accordance with ASTM E84

10.1.6 Water vapor transmission and permeance properties in accordance with ASTM E96

10.1.7 Air barrier material performance in accordance with ASTM E2178

10.1.8 Vertical and lateral flame spread in accordance with NFPA 285

10.2 Engineering analysis supporting the following material properties

10.2.1 Extension of NFPA 285

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 an RDP. 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.[27]

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

11 Findings

11.1 As outlined in **Section 6**, Kingspan Kooltherm 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, Kingspan Kooltherm Insulation Boards shall be approved for the following applications:

11.2.1 Kingspan Kooltherm Insulation Boards are approved for use as Class II or Class III vapor retarder in accordance with IBC Section 1404.3 and IRC Section R702.7.

11.2.2 Kingspan Kooltherm Insulation Boards are approved for use as an air impermeable insulation (air barrier material) in accordance with IRC Section N1101.10.5, IECC Section R303.1.5, and IECC Section C402.5.1.3[28]

11.2.3 Kingspan Kooltherm Insulation Boards achieved ASTM E84 Class A.

11.2.4 Kingspan Kooltherm Insulation Boards are approved for use in exterior walls of buildings of Type I-IV construction in accordance with IBC Section 2603.5

11.2.5 Kingspan Kooltherm Insulation Boards are approved for use in wall assemblies meeting the requirements of NFPA 285 testing when constructed in accordance with **Table 4**, **Table 5**, and **Table 6**.

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

11.4 IBC Section 104.11 (IRC Section R104.11 and IFC Section 104.10[29] are similar) in pertinent part states:

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

11.5 **Approved**:[30] Building regulations require that the building official shall accept duly authenticated reports.[31]

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

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

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

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

11.7 Through the IAF Multilateral Agreements (MLA), this duly authenticated report can be used to obtain product approval in any jurisdiction or country because all ANAB ISO/IEC 17065 duly authenticated reports are equivalent.[32]

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, Kingspan Kooltherm Insulation Boards shall not be used:

12.3.1 As a nailing base for cladding

12.3.2 The insulation boards shall not be used to resist lateral loads

12.3.2.1 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.

12.4 In areas where the probability of termite infestation is very heavy and the building is wood-framed construction, Kingspan Kooltherm Insulation Boards 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.

12.5 Kingspan Kooltherm Insulation Boards shall be separated from the interior of the building by an approved thermal barrier. For use without an approved thermal barrier to the interior of the wall, see Report Number 1601-07.

12.6 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:

12.6.1 Any calculations incorporated into the construction documents shall conform to accepted engineering practice and, when prepared by an approved source, shall be approved when signed and sealed.

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

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

12.6.4 At a minimum, these innovative products shall be installed per **Section 9**.

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

12.6.6 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.

12.6.7 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.

12.7 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.

12.8 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).

12.9 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 Kingspan Kooltherm Insulation Boards, as 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.kingspaninsulation.us.

14 Review Schedule

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

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

Notes

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

2 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 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

21 2018 IECC Section C402.5.1.2.1

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

23 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

24 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

25 2018 IECC Section C402.5.1.2.1

26 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.

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

28 2018 IECC Section C402.5.1.2.1

29 2018 IFC Section 104.9

30 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.

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

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