

**Attachment of Exterior Wall Coverings
Through Kingspan Kooltherm® Insulation Boards to Wood
or Steel Wall Framing**

TER No. 1603-04

Kingspan Insulation LLC

2100 RiverEdge Parkway
Suite 175
Atlanta, GA 30328
kingspaninsulation.us

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DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION

Section: 07 21 00 – Thermal Insulation
Section: 07 40 00 – Roofing and Siding Panels
Section: 07 46 00 – Siding

1. Products Evaluated:

- 1.1. Kingspan Insulation LLC – Kingspan Kooltherm® Insulation Boards
 - 1.1.1. K3 Floorboard
 - 1.1.2. K5 External Wallboard
 - 1.1.3. K7 Pitched Roof Board
 - 1.1.4. K10 FM Soffit Board
 - 1.1.5. K12 Framing Board
 - 1.1.6. K15 Rainscreen Board
 - 1.1.7. K20 Concrete Sandwich Board
- 1.2. For the most recent version of this Technical Evaluation Report (TER), visit drjengineering.org. For more detailed state professional engineering and code compliance legal requirements and references, visit drjengineering.org/statelaw. DrJ is fully compliant with all state professional engineering and code compliance laws.
- 1.3. This TER can be used to obtain product approval in any country that is an IAF MLA Signatory (all countries found [here](#)) and covered by an [IAF MLA Evaluation](#) per the [Purpose of the MLA](#) (as an example, see [letter to ANSI](#) from the Standards Council of Canada). Manufacturers can go to jurisdictions in the U.S., Canada and other [IAF MLA Signatory Countries](#) and have their products readily approved by authorities having jurisdiction using [DrJ's ANSI accreditation](#).

DrJ is a Professional Engineering Approved Source

 **Learn more about DrJ's Accreditation**

- DrJ is an ISO/IEC 17065 accredited product certification body through ANSI Accreditation Services.
- DrJ provides certified evaluations that are signed and sealed by a P.E.
- DrJ's work is backed up by professional liability insurance.
- DrJ is fully compliant with IBC Section 1703.

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- 1.4. Building code regulations require that evaluation reports are provided by an approved agency meeting specific requirements, such as those found in [IBC Section 1703](#). Any agency accredited in accordance with ANSI ISO/IEC 17065 meets this requirement within ANSI's scope of accreditation. For a list of accredited agencies, visit ANSI's [website](#). For more information, see [drjcertification.org](#).
- 1.5. Requiring an evaluation report from a specific private company (i.e. ICC-ES, IAPMO, CCMC, DrJ, etc.) can be viewed as discriminatory and is a violation of international, federal, state, provincial and local anti-trust and free trade regulations.
- 1.6. DrJ's code compliance work:
 - 1.6.1. Conforms to code language adopted into law by individual states and any relevant consensus based standard such as an ANSI or ASTM standard.
 - 1.6.2. Complies with accepted engineering practice, all professional engineering laws and by providing an engineer's seal DrJ takes professional responsibility for its specified scope of work.

2. Applicable Codes and Standards:¹

- 2.1. *2012, 2015 and 2018 International Building Code (IBC)*
- 2.2. *2012, 2015 and 2018 International Residential Code (IRC)*
- 2.3. *2012, 2015 and 2018 International Energy Conservation Code (IECC)*
- 2.4. *AISI Standard S100 – North American Specification for the Design of Cold-Formed Steel Structural Members*
- 2.5. *ASCE 7 – Minimum Design Loads for Buildings and Other Structures*
- 2.6. *ASTM C1126 – Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation*
- 2.7. *ASTM C1513 – Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections*
- 2.8. *ASTM F1667 – Standard Specification for Driven Fasteners: Nails, Spikes, and Staples*
- 2.9. *ANSI/AWC NDS – National Design Specification for Wood Construction*
- 2.10. *ANSI/SBCA FS100 – Standard Requirements for Wind Pressure Resistance of Foam Plastic Insulating Sheathing Used in Exterior Wall Covering Assemblies*

3. Performance Evaluation:

- 3.1. This TER examines the attachment of exterior wall coverings through Kingspan Kooltherm[®] Insulation Boards, with thickness up to 4", to wood or cold-formed steel wall studs.
- 3.2. This TER also provides a step-by-step approach for the process of designing the attachment of exterior wall coverings through Kooltherm[®] Insulation Boards to wood or steel wall framing.
- 3.3. The evaluation and design methodology in this TER considers only the weight of the exterior covering on fasteners cantilevered through the sheathing and into the stud.
- 3.4. An evaluation of the wind pressure resistance of the exterior covering is outside the scope of this TER. Consult the exterior covering manufacturer's installation instructions for information regarding the allowable design wind pressure for a given product, in accordance with *ANSI/SBCA FS100*.
 - 3.4.1. The intent of this TER is not to reduce minimum fastener sizes, penetrations and spacings required to resist wind loads. Where fastener requirements for wind resistance or cladding weight are more stringent, they shall control the design.
- 3.5. Attachment of window flanges over Kooltherm[®] Insulation Boards is outside the scope of this TER.
- 3.6. Any code compliance issues not specifically addressed in this section are outside the scope of this TER.

¹ Unless otherwise noted, all references in this code compliant technical evaluation report (TER) are from the 2018 version of the codes and the standards referenced therein, including, but not limited to, *ASCE 7*, *SDPWS* and *WFCM*. This product also complies with the 2000-2015 versions of the *IBC* and *IRC* and the standards referenced therein. As required by law, where this TER is not approved, the building official shall respond in writing, stating the reasons this TER was not approved. For variations in state and local codes, if any see [Section 8](#).

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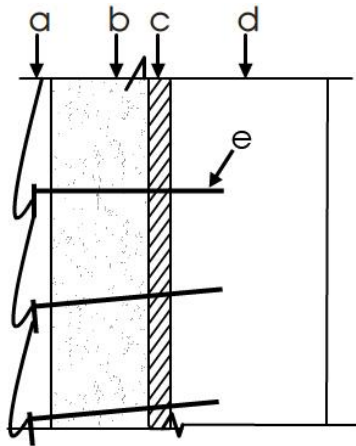
4. Product Description and Materials:

- 4.1. Kooltherm® Insulation Boards shall comply with the following material standards:
 - 4.1.1. Kooltherm® Insulation Boards shall be manufactured in compliance with *ASTM C1126*.
 - 4.1.2. Kooltherm® Insulation Boards shall have a minimum compressive strength of 18 psi.
 - 4.1.3. Where wind pressure resistance is required, Kooltherm® Insulation Boards shall comply with *ANSI/SBCA FS100*.
- 4.2. Kooltherm® Insulation Boards are proprietary fiber-free rigid thermoset phenolic Insulation Boards.
- 4.3. Kooltherm® Insulation Boards are available as follows:
 - 4.3.1. K3 Floorboard – glass facer on both sides
 - 4.3.2. K5 External Wallboard – glass facer on both sides
 - 4.3.3. K7 Pitched Roof Board – reinforced foil on both sides
 - 4.3.4. K10 FM Soffit Board – reinforced foil on one side and glass facer on the other
 - 4.3.5. K12 Framing Board – reinforced foil on both sides
 - 4.3.6. K15 Rainscreen Board – reinforced foil on both sides
 - 4.3.7. K20 Concrete Sandwich Board – glass facer on both sides
- 4.4. Material Availability
 - 4.4.1. Thickness: ¾" (20 mm) through 4 ¾" (120 mm)
 - 4.4.2. Standard product width: 48" (1,219 mm)
 - 4.4.3. Standard product length: 96" (2,438 mm) and 108" (2,743 mm)
 - 4.4.4. Consult the manufacturer for the availability of a given product with non-standard width or length.

5. Applications:

- 5.1. Structural Applications
 - 5.1.1. Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience and technical judgment.
- 5.2. Design Procedure
 - 5.2.1. Determine an appropriate cladding attachment requirement in accordance with [Section 5.2.2](#) through [5.4](#).
 - 5.2.2. Select one of the following methods of cladding attachment:
 - 5.2.2.1. Direct attachment of cladding through Kooltherm® Insulation Boards to wall framing, [Figure 1a](#).
 - 5.2.2.2. Furring attachment through Kooltherm® Insulation Boards to wall framing, [Figure 1b](#), whereby cladding is attached to furring in accordance with the applicable building code and the cladding manufacturer's installation instructions.

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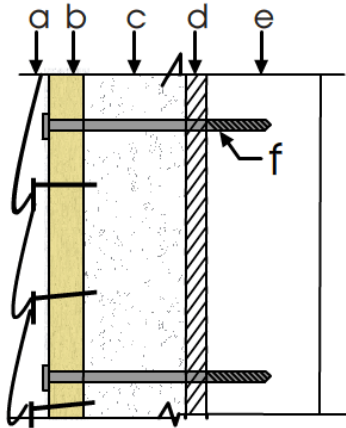


- a – Cladding material and fasteners
- b – Thickness of Kooltherm® Insulation Board, as required
- c – Wall sheathing, optional or as required by the applicable building code (e.g., gypsum sheathing, WSP or other)¹
- d – Wall framing per code (i.e., wood or cold-formed steel studs)
- e – Fastener per [Table 1a](#) or by design

Figure 1a: Exterior Wall Covering Assembly (direct attachment)

Note: Wall sheathing layer “c” is optional, unless required by the applicable building code

¹ For compliance with the 2015 IRC and IBC, where a separate structural sheathing layer is not provided to separately resist wind load, the Kooltherm must comply with ANSI/SBCA FS100.



- a – Cladding material and fasteners
- b – Minimum ¾"-thick (nominal 1x3 or larger) wood furring or minimum ¾" plywood (Exterior 1)¹
- c – Thickness of Kooltherm® Insulation Board, as required
- d – Optional wall sheathing or as required by the applicable building code (e.g., gypsum sheathing, WSP or other)²
- e – Wall framing per code (i.e., wood or cold-formed steel studs)
- f – Fastener per [Table 1b](#) or by design

Figure 1b: Exterior Wall Covering Assembly (through furring)

Note: Wall sheathing layer “d” is optional, unless required by the applicable building code

¹ Siding fastening into a suitable nail-base sheathing shall be permitted for claddings not weighing more than 3 psf and foam sheathing thicknesses not greater than 2"; refer to [2015 IRC Section R703](#) for requirements.

² Minimum required furring thickness may increase where cladding fastening requirements dictate more penetration depth in framing; alternatively, a compatible siding fastener with adequate withdrawal resistance shall be specified.

5.2.3. Determine the maximum allowable Kooltherm® Insulation Board thickness based on a selected minimum fastener size, maximum fastener spacing, and the cladding system weight, using [Table 1a](#) for the direct attachment method or [Table 1b](#) for the through-furring attachment method.

5.2.3.1. To determine cladding system weight, add the weight of all materials on the exterior side of the foam sheathing (‘a’ in [Figure 1a](#) and ‘a’ and ‘b’ in [Figure 1b](#)).

5.2.3.1.1. Use the actual weights of the materials installed. Actual cladding weights of materials can be obtained from the cladding manufacturer’s material specifications. Other typical weights of building materials can be found in the Commentary to *ASCE 7-10*.

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Cladding Fastener Through Kooltherm® Insulation Boards into:	Siding Fastener – Type & Minimum Size	Siding Fastener Vertical Spacing (in.)	Maximum Thickness of Kooltherm® Insulation Boards (in.)							
			16" o.c. Fastener Horizontal Spacing				24" o.c. Fastener Horizontal Spacing			
			Max. Cladding Weight:				Max. Cladding Weight:			
			3 psf	11 psf	18 psf	25 psf	3 psf	11 psf	18 psf	25 psf
Wood Framing (minimum 1 1/4" penetration)	0.113" diameter nail	6	2	1.45	0.75	DR	2	0.85	DR	DR
		8	2	1	DR	DR	2	0.55	DR	DR
		12	2	0.55	DR	DR	1.85	DR	DR	DR
	0.120" diameter nail	6	3	1.70	0.90	0.55	3	1.05	0.50	DR
		8	3	1.20	0.60	DR	3	0.70	DR	DR
		12	3	0.70	DR	DR	2.15	DR	DR	DR
	0.131" diameter nail	6	4	2.15	1.20	0.75	4	1.35	0.70	DR
		8	4	1.55	0.80	DR	4	0.90	DR	DR
		12	4	0.90	DR	DR	2.70	0.50	DR	DR
	0.162" diameter nail	6	4	3.55	2.05	1.40	4	2.25	1.25	0.80
		8	4	2.55	1.45	0.95	4	1.60	0.85	0.50
		12	4	1.60	0.85	0.50	4	0.95	DR	DR
Steel Framing (minimum penetration of steel thickness + 3 threads)	#8 screw into 33 mil steel or thicker	6	3	2.95	2.20	1.45	3	2.35	1.25	DR
		8	3	2.55	1.60	0.60	3	1.80	DR	DR
		12	3	1.80	DR	DR	3	0.65	DR	DR
	#10 screw into 33 mil steel	6	4	3.50	2.70	1.95	4	2.90	1.70	0.55
		8	4	3.10	2.05	1	4	2.25	0.70	DR
		12	4	2.25	0.70	DR	3.70	1.05	DR	DR
	#10 screw into 43 mil steel or thicker	6	4	4	4	3.60	4	4	3.45	2.70
		8	4	4	3.70	3	4	3.85	2.80	1.80
		12	4	3.85	2.80	1.80	4	3.05	1.50	DR

For SI: 1" = 25.4 mm; 1 pound per square foot [psf] = 0.0479 kPa

1. Tabulated requirements are based on wood framing of Spruce-Pine-Fir or any wood species with a specific gravity of 0.42 or greater in accordance with AFPA/NDIS and minimum 33 ksi steel for 33 mil and 43 mil steel and 50 ksi steel for 54 mil steel or thicker.
2. Cladding weight shall include all materials supported by the fasteners on the exterior side of the Kooltherm® Insulation Board (e.g., wood structural panel sheathing may be installed between the cladding material and the Kooltherm® Insulation Board). In such cases, both the cladding and the WSP sheathing weight must be included in the calculation for the cladding weight.
3. Examples of cladding included in each weight category: 3 psf – vinyl siding, 11 psf – fiber cement siding, 25 psf – masonry or cultured stone. Examples are not inclusive.
4. Nail fasteners shall comply with ASTM F1667, except nail length shall be permitted to exceed ASTM F1667 standard lengths. Screws shall comply with ASTM C1513.
5. Self-drilling tapping screw fasteners for connection of siding to steel framing shall comply with the requirements of AISI S200. Other approved fasteners of equivalent or greater diameter and bending strength shall be permitted.
6. For cladding system weights exceeding 25 psf with any thickness of Kooltherm® Insulation Boards, a design professional should be consulted.
7. Max. foam thickness of 2" for 0.113" and 0.120" diameter nails for 3 psf cladding weight due to limiting factor of nail length.
8. Kooltherm® Insulation Board shall have a minimum compressive strength of 25 psi in accordance with ASTM C578.
9. Metal lath shall be minimum 2.5 lbs./yd.² diamond mesh in accordance with ASTM C847. Metal lath lock washers on fasteners are highly recommended.
10. Vertical spacing of fasteners in metal lath shall not exceed 7" o.c., in accordance with ASTM C1063 and the Masonry Veneer Manufacturers Association (MVMA) Installation Guide
11. Where adhered masonry is used, it shall be installed in accordance with the MVMA Installation Guide.
12. Linear interpolation between cladding weight categories is not permitted.
13. DR = Design Required

Table 1a: Siding Minimum Fastening Requirements for Direct Cladding Attachment Over Foam Plastic Sheathing to Support Cladding System Weight

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Furring Material	Framing Member	Fastener Type & Min. Size	Min. Penetration into Wall Framing(in.)	Fastener Spacing in Furring(in.)	Max. Thickness of Kooltherm® Insulation Board (in.)								Allowable Wind Pressure Resistance of Furring Attachment (psf)	
					16" o.c. Furring				24" o.c. Furring					
					Siding Weight:				Siding Weight:					
					3 psf	11 psf	18 psf	25 psf	3 psf	11 psf	18 psf	25 psf	16" o.c.	24" o.c.
Min. 1x3 Wood Furring	Min. 2x Wood Stud	Nail (0.120" shank; 0.271" head)	1 1/4"	8	2	1.85	1.05	0.65	2	1.20	0.60	DR	42.6	28.4
				12	2	1.20	0.60	DR	2	0.70	DR	DR	28.4	18.9
				16	2	0.80	DR	DR	2	DR	DR	DR	21.3	14.2
		Nail (0.131" shank; 0.281" head)	1 1/4"	8	4	2.45	1.45	0.95	4	1.60	0.85	DR	46.5	31.0
				12	4	1.60	0.85	DR	4	0.95	DR	DR	31.0	20.7
				16	4	1.10	DR	DR	3.05	0.60	DR	DR	23.3	15.5
		0.162" diameter nail	1 1/4"	8	4	4	2.45	1.60	4	2.75	1.45	0.85	57.5	38.3
				12	4	2.75	1.45	0.85	4	1.65	0.75	DR	38.3	25.6
				16	4	1.90	0.95	DR	4	1.05	DR	DR	28.8	19.2
		#10 wood screw	1"	12	4	2.30	1.20	0.70	4	1.40	0.60	DR	107.3	71.6
				16	4	1.65	0.75	DR	4	0.90	DR	DR	79.0	52.7
				24	4	0.90	DR	DR	2.85	DR	DR	DR	35.1	23.4
1/4" lag screw	1 1/2"	12	4	2.65	1.50	0.90	4	1.65	0.80	DR	140.4	93.6		
		16	4	1.95	0.95	0.50	4	1.10	DR	DR	79.0	52.7		
		24	4	1.10	DR	DR	3.25	0.50	DR	DR	35.1	23.4		
Min. 33mil Steel Hat Channel or Min. 1x3 Wood Furring	33 mil Steel Stud	#8 screw (0.285" head)	Steel thickness +3 threads	12	3	1.80	DR	DR	3	0.65	DR	DR	52.9	35.3
				16	3	1	DR	DR	2.85	DR	DR	DR	39.7	26.5
				24	2.85	DR	DR	DR	2.20	DR	DR	DR	26.5	17.6
		#10 screw (0.333" head)	Steel thickness +3 threads	12	4	2.25	0.70	DR	3.70	1.05	DR	DR	62.9	41.9
				16	3.85	1.45	DR	DR	3.40	DR	DR	DR	47.1	31.4
				24	3.40	DR	DR	DR	2.70	DR	DR	DR	31.4	21.0
	43 mil or thicker Steel Stud	#8 screw (0.285" head)	Steel thickness +3 threads	12	3	1.80	DR	DR	3	0.65	DR	DR	69.0	46.0
				16	3	1	DR	DR	2.85	DR	DR	DR	51.8	34.5
				24	2.85	DR	DR	DR	2.20	DR	DR	DR	34.5	23.0
		#10 screw (0.333" head)	Steel thickness +3 threads	12	4	3.85	2.80	1.80	4	3.05	1.50	DR	81.9	54.6
				16	4	3.30	1.95	0.60	4	2.25	DR	DR	61.5	41.0
				24	4	2.25	DR	DR	4	0.65	DR	DR	35.1	23.4

For SI: 1" = 25.4 mm; 1 pound per square foot (psf) = 0.0479 kPa

- Table values are based on:
 - Minimum 3/4" (19.1 mm) thick wood furring and wood studs of Spruce-Pine-Fir or any softwood species with a specific gravity of 0.42 or greater per *AF&PA/ND*S.
 - Minimum 33 mil steel hat channel furring of 33 ksi steel. Steel hat channel shall have a minimum 7/8" (22.2 mm) depth.
 - Steel framing of indicated nominal steel thickness and minimum 33 ksi steel for 33 mil and 43 mil steel and 50 ksi steel for 54 mil steel or thicker.
- Self-drilling, self-tapping screw fasteners for connection of siding to steel framing shall comply with the requirements of *AISI S200*. Other approved fasteners of equivalent or greater diameter and bending strength shall be permitted.
- Nail fasteners shall comply with *ASTM F1667*, except nail length shall be permitted to exceed *ASTM F1667* standard lengths. Screws shall comply with *ASTM C1513*.
- Furring shall be spaced a maximum of 24" o.c. in a vertical or horizontal orientation.
 - In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing.
 - Where placed horizontally, wood furring shall be preservative treated wood in accordance with [IRC Section R317.1](#) or naturally durable wood and fasteners shall be corrosion resistant in accordance [IRC Section R317.3](#). Steel furring shall have a minimum G60 galvanized coating.
 - Furring strips installed in a horizontal direction shall be fastened at each stud with a number of fasteners equivalent to that required by the fastener spacing. If the required nail spacing is 12" o.c. and the studs are 24" o.c., then two (2) nails would be required at each stud (24/12=2). In no case shall fasteners be spaced more than 24" (0.6 m) apart.
- Lag screws shall be installed with a standard cut washer.
- Lag screws and wood screws shall be pre-drilled in accordance with *AF&PA/ND*S.
- Approved self-drilling screws of equal or greater shear and withdrawal strength shall be permitted without pre-drilling.
- A minimum 2x wood furring shall be used where the required siding fastener penetration into wood material exceeds 3/4" (19.1 mm) and is not more than 1 1/2" (38.1 mm), unless approved deformed shank siding nails or siding screws are used to provide equivalent withdrawal strength, allowing the siding connection to be made to a 1x wood furring.
- Examples of cladding included in each weight category: 3 psf – vinyl siding, 11 psf – fiber cement siding, 25 psf – masonry or cultured stone. Examples are not inclusive.
- Max. foam thickness of 2" for 0.120" diameter nails for 3 psf cladding weight due to limiting factor of nail length.
- For cladding system weights exceeding 25 psf with any thickness of Kooltherm® Insulation Board, a design professional should be consulted.
- Foam sheathing shall have a minimum compressive strength of 15 psi, in accordance with *ASTM C578* or *ASTM C1289*.
- Linear interpolation between cladding weight categories is not permissible.
- DR = Design Required

Table 1b: Furring Minimum Fastening Requirements for Application Over Foam Plastic Insulating Sheathing to Support Cladding System Weight & Resist Wind Pressure

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- 5.3. The minimum fastening requirement shall be the more stringent of that required by:
- 5.3.1. The fastening schedule determined in accordance with [Section 5.2](#) of this TER.
 - 5.3.2. The fastener type, head size, diameter, spacing, and penetration into framing required by the applicable building code for the specific cladding material and the cladding manufacturer's installation instructions.²
 - 5.3.2.1. Where the seismic provisions of [IRC Section R301.2.2](#) apply, the wall assembly shall not exceed the weight limits of [Section R301.2.2.1](#), unless an engineered design is provided in accordance with [Section R301.1.3](#).
 - 5.3.2.2. Where the seismic load provisions of [IBC Section 1613](#) apply, the cladding attachment shall be verified to provide resistance to meet or exceed minimum required earthquake loads.
- 5.4. Fastenings that are not at least equivalent to minimum required fastener characteristics described in [Section 5.3](#) shall be designed to provide adequate support of cladding weight, resistance to wind loading, and seismic loads as required by the applicable building code.
- 5.4.1. For furring connections in accordance with [Table 1b](#), allowable wind load resistance shall be verified to meet or exceed the minimum required wind load of the applicable code.
 - 5.4.1.1. Refer to [IRC Table R301.2\(2\)](#) for components and cladding wind loads for the applicable wall wind zone and for an effective wind area of 10 square feet.
 - 5.4.1.2. For IBC required wind loads, see [IBC Section 1609](#).

6. Installation:

- 6.1. Installation shall comply with the manufacturer's installation instructions and this TER. In the event of a conflict between the manufacturer's installation instructions and this TER, the more restrictive shall govern.
- 6.2. Verify that materials comply with the following provisions of this TER:
 - 6.2.1. Kooltherm® Insulation Boards shall comply with the requirements of [Section 4](#).
- 6.3. Wall framing materials shall comply with [Section 5](#), specifically the minimum wood and cold-formed steel framing member requirements in the footnotes to [Table 1a](#) and [Table 1b](#), as applicable.
- 6.4. Cladding or furring fastener type and size, including fastener length to obtain required penetration into or through framing members, complies with the solution determined in accordance with [Section 5.3](#).
 - 6.4.1. Where fasteners are permitted to penetrate into or fully through sheathing or nailable substrate without penetrating into framing, as specified by the manufacturer's instructions and supported by a test report, the end of the fastener shall extend a minimum of ¼" beyond the opposite face of the sheathing or nailable substrate in accordance with [IRC Section R703.11.1](#).
- 6.5. Fasteners shall be installed into framing members and driven flush and snug such that gaps between layers are removed, except where a gap under the cladding fastener head is required for attachment of vinyl siding.
- 6.6. Fasteners shall be installed in a professional manner and not over-driven. Over-driving fasteners can result in material damage or excessive distortion of cladding, furring, or Kooltherm® Insulation Board materials.
- 6.7. Ensure framing members or blocking are provided to allow for attachment of siding and trim materials at transitions such as corners and wall penetrations.
- 6.8. Ensure that a code compliant water-resistive barrier system and flashing are provided prior to or during the installation of cladding materials. Refer to [DRR No. 1205-05](#) for construction detailing concepts.
- 6.9. Where required by contract documents, the project owner or owner's agent, or good practice, construct a mock-up assembly to demonstrate constructability and a proper integration of components.

² An example of this would be lath attachments for stucco where a maximum of 7" o.c. spacing is required. [IRC Section R703.15.2](#) provides a prescriptive table for the attachment of furring to resist up to 30 psf design wind loading.

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7. Test and Engineering Substantiating:

- 7.1. *National Design Specification for Wood Construction* – 2012 Edition, American Wood Council.
- 7.2. *General Dowel Equations for Calculating Lateral Connection Values* (1999), TR-12, American Forest & Paper Association.
- 7.3. *North American Cold-Formed Steel Specification* – 2012 Edition, American Iron & Steel Institute (AISI S100 standard).
- 7.4. New York State Energy Research and Development Authority, *Fastening Systems for Continuous Insulation*, 2010.
- 7.5. The product(s) evaluated by this TER fall within the scope of one or more of the model, state or local building codes for building construction. The testing and/or substantiating data used in this TER is limited to buildings, structures, building elements, construction materials and civil engineering related specifically to buildings.
- 7.6. The provisions of model, state or local building codes for building construction do not intend to prevent the installation of any material or to prohibit any design or method of construction. Alternatives shall use consensus standards, performance-based design methods or other engineering mechanics based means of compliance. This TER assesses compliance with defined standards, accepted engineering analysis, performance-based design methods, etc. in the context of the pertinent building code requirements.
- 7.7. Some information contained herein is the result of testing and/or data analysis by other sources, which DrJ relies on to be accurate, as it undertakes its engineering analysis.
- 7.8. DrJ has reviewed and found the data provided by other professional sources are credible. The information in this TER conforms with DrJ's procedure for acceptance of data from approved sources.
- 7.9. DrJ's responsibility for data provided by approved sources conforms with [IBC Section 1703](#) and any relevant professional engineering law.
- 7.10. Where appropriate, DrJ relies on the derivation of design values, which have been codified into law through codes and standards (e.g., *IRC, WFCM, IBC, SDPWS, NDS, ACI, AISI, PS-20, PS-2*, etc.). This includes review of code provisions and any related test data that aids in comparative analysis or provides support for equivalency to an intended end-use application. Where the accuracy of design values provided herein is reliant upon the published properties of commodity materials (e.g. lumber, steel, concrete, etc), DrJ relies upon grade/properties provided by the raw material supplier to be accurate and conforming to the mechanical properties defined in the relevant material standard.

8. Findings:

- 8.1. The design procedure and installation requirements outlined in this TER may be used to attach exterior wall coverings through Kooltherm® Insulation Boards to wood or steel wall framing.
- 8.2. [IRC Sections R703.3](#) and [R703.15](#) through [R703.16](#) include provisions for the attachment of cladding and/or furring over Kooltherm® Insulation Boards to appropriately resist the required design wind loads.
- 8.3. [IBC Section 104.11](#) ([IRC Section R104.11](#) and [IFC Section 104.9](#) are similar) 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, provided that any such alternative has been *approved*. An alternative material, design or method of construction shall be *approved* where the *building official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in 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*.
- 8.4. This product has been evaluated with the codes listed in [Section 2](#), and is compliant with all known state and local building codes. Where there are known variations in state or local codes that are applicable to this evaluation, they are listed here:
 - 8.4.1. No known variations
- 8.5. This TER uses professional engineering law, the building code, ANSI/ASTM consensus standards and generally accepted engineering practice as its criteria for all testing and engineering analysis. DrJ's

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professional engineering work falls under the jurisdiction of each state Board of Professional Engineers, when signed and sealed.

9. Conditions of Use:

- 9.1. Where required by the authority having jurisdiction (AHJ) in which the project is to be constructed, this TER and the installation instructions shall be submitted at the time of permit application.
- 9.2. Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the code official for review and approval.
- 9.3. 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 (e.g., Owner, Registered Design Professional, etc.).
- 9.4. The attachment of cladding materials through the Kooltherm® Insulation Boards described in this TER comply with the 2015 and 2018 versions of the *IBC* and *IRC*, or are a code compliant alternative as specified in the codes listed in [Section 2](#) subject to the following conditions:
 - 9.4.1. Installation shall comply with the manufacturer's installation instructions and this TER. In the event of a conflict between the manufacturer's installation instructions and this TER, the more restrictive shall govern.
 - 9.4.2. Installation shall be on walls with code compliant wood framing or cold-formed steel framing meeting the minimum requirements as indicated in [Table 1a](#) and [Table 1b](#).
- 9.5. Design
 - 9.5.1. Building Designer Responsibility
 - 9.5.1.1. Unless the AHJ allows otherwise, the Construction Documents shall be prepared by a Building Designer for the Building and shall be in accordance with [IRC Section R106](#) and [IBC Section 107](#).
 - 9.5.1.2. The Construction Documents shall be accurate and reliable and shall provide the location, direction and magnitude of all applied loads and shall be in accordance with [IRC Section R301](#) and [IBC Section 1603](#).
 - 9.5.2. Construction Documents
 - 9.5.2.1. Construction documents shall be submitted to the building official for approval and shall contain the plans, specifications and details needed for the building official to approve such documents.
- 9.6. Responsibilities
 - 9.6.1. The information contained herein is a product, material, detail, design and/or application TER evaluated in accordance with the referenced building codes, testing and/or analysis through the use of accepted engineering practice, experience and technical judgment.
 - 9.6.2. DrJ TERs provide an assessment of only those attributes specifically addressed in the Products Evaluated or Code Compliance Process Evaluated sections.
 - 9.6.3. The engineering evaluation was performed on the dates provided in this TER, within DrJ's professional scope of work.
 - 9.6.4. This product is manufactured under a third-party quality control program in accordance with [IRC Section R104.4](#) and [R109.2](#) and [IBC Section 104.4](#) and [110.4](#).
 - 9.6.5. 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, and the TER shall be reviewed for code compliance by the Building Official.
 - 9.6.6. The use of this TER is dependent on the manufacturer's in-plant QC, the ISO/IEC 17020 third-party quality assurance program and procedures, proper installation per the manufacturer's instructions, the Building Official's inspection and any other code requirements that may apply to demonstrate and verify compliance with the applicable building code.

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10. Identification:

- 10.1.** The Kingspan Kooltherm® Insulation Board products described in this TER are identified by a label on the board or packaging material bearing the manufacturer's name, product name, TER number, and other information to confirm code compliance.
- 10.2.** Additional technical information can be found at kingspaninsulation.us.

11. Review Schedule:

- 11.1.** This TER is subject to periodic review and revision. For the most recent version of this TER, visit drjengineering.org.
- 11.2.** For information on the current status of this TER, contact [DrJ Engineering](#).



- [Mission and Professional Responsibilities](#)
- [Product Evaluation Policies](#)
- [Product Approval – Building Code, Administrative Law and P.E. Law](#)