Technical Evaluation Report

TER 1601-07

NFPA 286 Tested Wall Assemblies
Using Kingspan Kooltherm® Insulation Boards in Attics, Crawlsaces, Basements, and Other Interior Applications

Kingspan Insulation LLC

Product:
Kingspan Kooltherm® Insulation Boards

Issue Date:
April 12, 2017

Revision Date:
March 31, 2020

Subject to Renewal:
April 1, 2021
1 PRODUCTS EVALUATED

1.1 Kingspan Kooltherm® Insulation Boards
   1.1.1 K5 External Wallboard
   1.1.2 K8 Cavity Board
   1.1.3 K9 Internal Insulation 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

2 APPLICABLE CODES AND STANDARDS

2.1 Codes
   2.1.1 IBC—12, 15, 18: International Building Code®
   2.1.2 IRC—12, 15, 18: International Residential Code®
   2.1.3 IECC—12, 15, 18: International Energy Conservation Code®

1 Building codes require data from valid research reports be obtained from approved sources. Agencies who are accredited through ISO/IEC 17065 have met the code requirements for approval by the building official. DrJ is an ISO/IEC 17065 ANAB-Accredited Product Certification Body – Accreditation #1131.

Through ANAB accreditation and the IAF MLA, DrJ certification 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.”

Building official approval of a licensed registered design professional (RDP) is performed by verifying the RDP and/or their business entity complies with all professional engineering laws of the relevant jurisdiction. Therefore, the work of licensed RDPs is accepted by building officials, except when plan (i.e. peer) review finds an error with respect to a specific section of the code. Where this TER is not approved, the building official responds in writing stating the reasons for disapproval.

For more information on any of these topics or our mission, product evaluation policies, product approval process, and engineering law, visit drjcertification.org or call us at 608-310-6748.

2 Unless otherwise noted, all references in this TER are from the 2018 version of the codes and the standards referenced therein (e.g., ASCE 7, NDS, ASTM). This material, design, or method of construction also complies with the 2000-2015 versions of the referenced codes and the standards referenced therein.

3 All terms defined in the applicable building codes are italicized.
2.2 Standards and Referenced Documents

2.2.1 ANSI/AWC NDS: National Design Specification (NDS) for Wood Construction
2.2.2 ASTM C209: Standard Test Methods for Cellulosic Fiber Insulating Board
2.2.4 ASTM D1621: Standard Test Method for Compressive Properties of Rigid Cellular Plastics
2.2.5 ASTM D1622: Standard Test Method for Apparent Density of Rigid Cellular Plastics
2.2.6 ASTM D1623: Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
2.2.7 ASTM D2126: Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging
2.2.8 ASTM D6226: Standard Test Method for Open Cell Content of Rigid Cellular Plastics
2.2.9 ASTM E2178: Standard Test Method for Air Permeance of Building Materials
2.2.10 ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials
2.2.11 ASTM E96: Standard Test Methods for Water Vapor Transmission of Materials
2.2.12 NFPA 286: Standard Methods of Fire Test for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth
2.2.13 UL 723: Test for Surface Burning Characteristics of Building Materials

3 PERFORMANCE EVALUATION

3.1 Kingspan Kooltherm® Insulation Board products were evaluated to determine:

3.1.1 Material properties in accordance with ASTM C209
3.1.2 Thermal resistance properties in accordance with IECC Section C402
3.1.3 Use as an air barrier material in accordance with IECC Section C402.5.1.2
3.1.4 Performance for use in buildings of Type I-IV construction in accordance with IBC Section 2603.5
3.1.4.1 Performance in accordance with ASTM E84 / UL 723 for flame spread and smoke development ratings in accordance with IBC Section 2603.3 and Section 2603.5.4
3.1.4.2 Performance for use without a thermal barrier in accordance with IBC Section 2603.4 and 2603.5.2
3.1.4.3 Performance with regard to vertical and lateral fire propagation in accordance with IBC Section 2603.5.5
3.1.4.4 Performance with regard to ignition in accordance with IBC Section 2603.5.7
3.1.4.5 Use as part of an NFPA 286 wall assembly in accordance with IBC Section 2603.7

3.2 Wind pressure resistance is outside the scope of this TER.

3.3 Any code compliance issues not specifically addressed in this section are outside the scope of this TER.

3.4 Any engineering evaluation conducted for this TER was performed on the dates provided in this TER and within DrJ’s professional scope of work.

4 PRODUCT DESCRIPTION AND MATERIALS

4.1 Kingspan Kooltherm® Insulation Board is shown in Figure 1 and has the following properties:

4.1.1 Made from proprietary plastic foam made from rigid cellular phenol resin.
4.1.2 Used for non-structural thermal insulation in ceiling, wall and floor assemblies in all types of construction.

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4 2012 IBC Section 2603.8
4.1.3 Available with foil, foil-glass, and glass facers.

FIGURE 1. KINGSSPAN KOOLTHERM® INSULATION BOARD

4.2 Material Availability

4.2.1 Thickness: 20 mm (¾") through 120 mm (4¾")

4.2.2 Standard Product Width: 1,219 mm (48")

4.2.3 See Table 1 for list of products, facers, and sizes.

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Facers</th>
<th>Application</th>
<th>Thickness (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>K8</td>
<td>Reinforced Foil Facers Both Sides</td>
<td>Brick with Block Wall (16&quot; pre-cut)</td>
<td>20 120</td>
</tr>
<tr>
<td>K12</td>
<td></td>
<td>Wood or Steel Stud Framed Wall</td>
<td></td>
</tr>
<tr>
<td>K15</td>
<td></td>
<td>Rainscreen</td>
<td></td>
</tr>
<tr>
<td>K10</td>
<td>Reinforced Foil on One Side, Glass Facer on Other</td>
<td>Soffit and Exposed Applications (Not Below Grade)</td>
<td>25 120</td>
</tr>
<tr>
<td>K5</td>
<td>Glass Facer on Both Sides</td>
<td>EIFS Wall System</td>
<td>100</td>
</tr>
<tr>
<td>K20</td>
<td></td>
<td>Precast/Tilt-up Concrete</td>
<td>20 120</td>
</tr>
<tr>
<td>K9</td>
<td></td>
<td>Internal Insulation Board for Basement/Crawlspace Wall Applications</td>
<td>120</td>
</tr>
</tbody>
</table>

5 APPLICATIONS

5.1 Kingspan Kooltherm® Insulation Board is a rigid thermoset closed cell phenolic thermal insulation complying with IBC Section 2603.

5.2 Kingspan Kooltherm® Insulation Board is used in buildings of Type I-IV construction in accordance with IBC Section 2603.5.

5.3 Kingspan Kooltherm® Insulation Board is used in buildings of Type V construction in accordance with IBC Section 2603.4.1.4.
5.4 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.

5.5 Permeance

5.5.1 Per IBC Section 1404.3.2, Class III vapor retarders shall be used on the interior side of walls framed with insulation boards having <1 permeance installed on the exterior side of the framed wall.

5.5.2 Kingspan Kooltherm® Insulation Boards meet the IBC Section 1404.3.2 requirements for water vapor permeance as indicated in Table 2.

<table>
<thead>
<tr>
<th>TABLE 2. WATER VAPOR PERMEANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Foil Facers (K8, K12, K15)</td>
</tr>
<tr>
<td>Foil-Glass Facers (K10)</td>
</tr>
<tr>
<td>Glass Facers (K5, K20)</td>
</tr>
</tbody>
</table>

1. Tested in accordance with ASTM E96 A, Desiccant Method
2. Results for 25 mm (1”) thick board

5.6 Air Barrier

5.6.1 Kingspan Kooltherm® Insulation Board is an air barrier material and meets the requirements of IECC Section C402.5.1.2.1 for use as part of an air barrier assembly when installed in accordance with the manufacturer’s installation instructions and this TER and with all seams, including the top and bottom edges, taped.

5.7 Thermal Barrier

5.7.1 Kingspan Kooltherm® Insulation Boards shall be fully protected from the interior of the building by an approved thermal barrier or ignition barrier as required by IBC Section 2603.4 and IRC Section R316.4, except as follows:

5.7.1.1 Use without an Ignition Barrier:

5.7.1.1.1 The following Kingspan Kooltherm® Insulation Boards have been approved for use without an ignition barrier on walls and/or ceilings in attics and crawl spaces based on NFPA 286 testing in accordance with IBC Section 2603.9 and IRC Section 316.6. This includes, but is not limited to, knee and gable end walls.

5.7.1.1.1 Kingspan Kooltherm® K8, K10 (with foil facer exposed), K12, and K15 Insulation Boards up to 75 mm (3”) thick, walls only or ceiling only.

5.7.1.1.2 Kingspan Kooltherm® K5, K10 (with glass facer exposed), and K20 Insulation Boards up to 120 mm (4¾”) thick, walls and ceilings.

5.7.1.2 Use without an approved ignition barrier is limited to areas where:

5.7.1.2.1 Access to the space is required by IRC Section R807.1 or Section R408.4.

5.7.1.2.2 Entry is made only for the purposes of repairs or maintenance.

5.7.1.2.3 Combustion air is provided in accordance with IMC Section 701.
5.7.1.1.2.4 For vented attics, ventilation is provided when required by IBC Section 1202.2 or IRC Section R806.

5.7.1.1.2.5 For unvented attics, ventilation is not required where permitted in accordance with IRC Section R806.5.

5.7.1.1.2.6 For vented crawlspaces, ventilation is provided when required by IBC Section 1202.4 or IRC Section R408.1.

5.7.1.1.2.7 For unvented crawlspaces, ventilation is not required where permitted in accordance with IRC Section R408.3.

5.7.1.2 Use without a Thermal Barrier:

5.7.1.2.1 Kingspan Kooltherm® K20, K10, and K5 Insulation Boards, up to 75 mm (3") with glass tissue facer left exposed, have been tested to NFPA 286 for use on ceilings only or walls only in accordance with IBC Section 2603.9 and IRC Section 316.6 and is approved for use without a thermal barrier.

5.7.1.2.2 Kingspan Kooltherm® K15, K12, K10, and K8 Insulation Boards, up to 75 mm thick (3") with exterior foil facer left exposed, have been tested to NFPA 286 for use on ceilings only in accordance with IBC Section 2603.9 and IRC Section 316.6 and is approved for use without a thermal barrier.

5.8 Surface Burn Characteristics

5.8.1 The surface burn characteristics of Kingspan Kooltherm® Insulation are provided in Table 3.

<table>
<thead>
<tr>
<th>Product</th>
<th>Flame Spread Index</th>
<th>Smoke Developed Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kingspan Kooltherm® Insulation Board</td>
<td>&lt; 25</td>
<td>&lt; 450</td>
</tr>
</tbody>
</table>

1. Tested in accordance with UL 723 (ASTM E84)
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.

5.9 Ignition

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

5.9.1.1 Kingspan Kooltherm® 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 Thermal barrier complying with IBC Section 2603.4

5.9.1.1.2 Minimum 25 mm (1") thickness of concrete or masonry

5.9.1.1.3 Glass-fiber-reinforced concrete panels of a minimum thickness of 9.5 mm (3/8").

5.9.1.1.4 Metal-faced panels having a minimum 0.48 mm (0.019") thick aluminum or 0.41 mm (0.016") think corrosion-resistant steel outer facings.

5.9.1.1.5 Minimum 22 mm (7/8") thickness of stucco complying with IBC Section 2510

5.9.1.1.6 Minimum 6.4 mm (¼") thickness of fiber-cement lap, panel, or shingle siding complying with IBC Section 1404.16

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8 2015 IBC Section 1203.2  
9 2015 IBC Section 1203.4, 2012 IBC Section 1203.3  
10 2012 IBC Section 2603.10  
11 2012 IBC Section 2603.10  
12 2015 IBC Section 1405.16
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 For applications outside the scope of this TER, an engineered design is required.

7 TEST ENGINEERING SUBSTANTIATING DATA

7.1 Test reports and data supporting the following material properties and wall assembly performance:

7.1.1 Material properties in accordance with ASTM C209 by Intertek
7.1.2 Thermal resistance values in accordance with ASTM C518 by Intertek
7.1.3 Compressive strength properties in accordance with ASTM D1621 by Intertek
7.1.4 Apparent core density properties in accordance with ASTM D1622 by Intertek
7.1.5 Tensile strength in accordance with ASTM D1622 by Intertek
7.1.6 Flame spread and smoke developed ratings in accordance with ASTM E84/UL 723 by Underwriters Laboratories, Inc.
7.1.7 Water vapor transmission and permeance properties in accordance with ASTM E96 by Intertek
7.1.8 Air barrier material performance of Kingspan Kooltherm® Insulation Boards in accordance with ASTM E2178 by Intertek
7.1.9 NFPA 286 room corner testing performed by Underwriters Laboratories, Inc.
7.1.10 Exclusion of thermal and ignition barriers in attics and crawlspaces in accordance with NFPA 286 by Jensen Hughes

7.2 Engineering analysis supporting the following material properties:

7.2.1 Jensen Hughes, Analysis of Kingspan’s Kooltherm® Insulation Boards and Section 1403.5 of the IBC (2015 edition), Project No. 1JJB00153.006
7.2.2 FM Approvals, Approval Examination of Kingspan Kooltherm® K10 Soffit Board for Standard 4880, Project ID: 3044265

7.3 Manufacturer technical data sheets and installation instructions.

7.4 Test reports and data for determining comparative equivalency for use as an alternative material in accordance with IBC Section 104.11.

7.5 Some information contained herein is the result of testing and/or data analysis by other sources which conform to IBC Section 1703 and relevant professional engineering law. DrJ relies on accurate data from these sources to perform engineering analysis. DrJ has reviewed and found the data provided by other professional sources to be credible.

7.6 Where appropriate, DrJ’s analysis is based on design values that have been codified into law through codes and standards (e.g., IBC, IRC, NDS®, and SDPWS). 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, and concrete), DrJ relies upon the grade mark, stamp, and/or design values provided by raw material suppliers to be accurate and conforming to the mechanical properties defined in the relevant material standard.
8 FINDINGS

8.1 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.

8.2 Kingspan Kooltherm® K10 Insulation Boards are approved for use in attics and crawlspaces, walls and ceilings, without a thermal or ignition barrier when constructed in accordance with Section 5.7.

8.3 Kingspan Kooltherm® Insulation Boards described in this TER comply with, or are a suitable alternative to, the applicable sections of the codes listed in Section 2.

8.4 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.

8.5 This product has been evaluated in the context of the codes listed in Section 1.1.1 and is compliant with all known state and local building codes. Where there are known variations in state or local codes applicable to this evaluation, they are listed here.

8.5.1 No known variations

9 CONDITIONS OF USE

9.1 When the insulation boards are used on exterior walls of buildings of Type I, II, III, or IV, construction must be as described in Section 5.9.

9.2 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 152 mm (6") of the ground and shall meet the requirements of IBC Section 2603.8.

9.3 Kingspan Kooltherm® Insulation Boards shall be separated from the interior of the building by an approved thermal barrier except as provided for in Section 5.7.

9.4 This product shall not be used as a nailing base for claddings.

9.5 The insulation boards shall not be used 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.

9.6 Where required by the building official, also known as 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.

9.7 Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the AHJ for review and approval.

9.8 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 or registered design professional).

9.9 At a minimum, this product shall be installed per Section 5.6 of this TER.

9.10 This product is manufactured under a third-party quality control program in accordance with IBC Section 104.4 and 110.4 and IRC Section R104.4 and R109.2.

9.11 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. Therefore, the TER shall be reviewed for code compliance by the building official for acceptance.
9.12 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.

10 IDENTIFICATION

10.1 The product(s) listed in Section 1.1 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 www.kingspan.com.

11 REVIEW SCHEDULE

11.1 This TER is subject to periodic review and revision. For the most recent version of this TER, visit drjcertification.org.

11.2 For information on the current status of this TER, contact DrJ Certification.