WHY CONTINUOUS INSULATION?
Meeting Demanding Standards and Changing Codes

What is Continuous Insulation (CI)?
ASHRAE 90.1 defines continuous insulation as: "...insulation that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior, exterior, or is integral to any opaque surface of the building."

ASHRAE Standard 90.1 is one of two primary baseline building energy codes that may be adopted by states and local jurisdictions to regulate the design and construction of new buildings. ASHRAE 90.1 is limited to commercial buildings, while the International Energy Conservation Code® (IECC), addresses both residential and commercial buildings.

Energy efficiency codes are becoming more stringent. Note the changes in ASHRAE R-value requirements in recent years (red text denotes the changes).

Benefits of Continuous Insulation

• **Reduces thermal bridging and increases overall R-value.** Thermal bridging is a type of heat loss which occurs when heat flows through the building envelope via a continuous path, such as through wood or, more commonly, highly conductive steel framing members. Thermal bridging dramatically affects whole wall R-value. For instance, a steel stud wall assembly with batt insulation could lose up to 50% of its R-value through thermal bridging.

• **Creates barrier continuity.** Air and water barriers can be installed as a single material adjacent to wall sheathing, keeping barriers continuous.

• **Reduces moisture concerns.** CI reduces the possibility of condensation within the wall when warm, moist air is prevented from reaching a dew point temperature.

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
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<td>NA</td>
<td>NA</td>
</tr>
<tr>
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<td>13</td>
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<td>13+7.5</td>
<td>13+3.8</td>
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<tr>
<td>3</td>
<td>13+3.8</td>
<td>13+7.5</td>
<td>13+5</td>
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<td>4</td>
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<td>13+7.5</td>
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<td>13+7.5</td>
<td>13+7.5</td>
<td>13+10</td>
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<td>6</td>
<td>13+7.5</td>
<td>13+7.5</td>
<td>13+12.5</td>
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<tr>
<td>7</td>
<td>13+7.5</td>
<td>13+15.6</td>
<td>13+12.5</td>
</tr>
<tr>
<td>8</td>
<td>13+7.5</td>
<td>13+18.8</td>
<td>13+18.8</td>
</tr>
</tbody>
</table>

2 https://www.energycodes.gov/sites/default/files/fiec/bc/2012iecc_commercial_envelope_BECU.pdf
3 https://sustainabilityworkshop.autodesk.com/buildings/total-r-values-and-thermal-bridging
ENERGY EFFICIENCY
Contributing to sustainable buildings

The Evolution of Energy Efficiency
We have come a long way with the development of energy efficient buildings.

1900s
No Insulation
In the 1900’s an exterior wall would look pretty much like this: no insulation.

1940s–1970s
Limited Insulation
As we move into the 1940’s and especially during the energy crisis of the 70’s, designers and building owners start to recognize the need for more insulation, but it’s still used in a limited amount.

Today’s Integrated
Air/Water/Thermal Assembly
In today’s designed assemblies with the emphasis on energy reduction and sustainable construction we now see systems that incorporate air, water and thermal efficiency all in one assembly.

Paths to Code Compliance
There are three typical paths to compliance:

1. Prescriptive R-value
   • Considers R-value of insulation ONLY
   • Compliance is achieved by installing insulation with code-prescribed R-value

2. Performance (overall assembly)
   • Considers:
     - U-factors: U-value of assembly (above grade)
     - C-factors: Thermal conductance (below grade)
     - F-factors: Slab edge factors
   • Compliance is achieved when assembly meets minimum U-value
   • Requires calculations or testing to demonstrate compliance but offers greater flexibility in system options

3. Envelope tradeoff
   • Tightly defined
   • Allows for tradeoff between various parts of the building envelope
   • ASHRAE Standard 90.1-2007/2010 provides the basic rules
   • Tradeoff is implemented in the COMcheck™ software

Going Beyond Codes
Many owners, designers, and contractors feel that the insulation requirements set out in state-adopted codes are not robust enough to truly save energy and reduce greenhouse gas emissions. These owners, designers, and contractors look beyond code initiatives to USGBC’s LEED® rating system, ASHRAE Standard 189.1 or Architecture 2030.

Including increased insulation levels in the building envelope can help reach these advanced efficiency goals with a negative marginal cost, generating a positive economic return over the building’s lifecycle.

Non-combustible and Fire Resistant

**Standards and Testing**

Non-combustible material is defined as a material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion or release flammable vapors when subjected to fire or heat. Materials that are reported as passing ASTM E136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C, shall be considered non-combustible materials.¹

**ASTM E136**¹

- Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C

While it does not duplicate actual building fire exposure conditions, this test method assists in indicating those materials which do not act to aid combustion or add appreciable heat to an ambient fire.

**Mineral wool: Non-combustible continuous insulation**

Mineral wool products are non-combustible per ASTM E136. Mineral wool will resist flame propagation over the surface of the products.

As a non-combustible material, mineral wool insulation is ideal for assemblies with combustible claddings and/or water-resistant barriers (WRB). When used with other combustible products, mineral wool acts as an aid in passing NFPA 285.

**NFPA 285**²


NFPA 285 measures what happens during a fire when a non-combustible building is wrapped in combustible materials.

**The purpose of NFPA 285**

NFPA 285 is required in the International Building Code (IBC) in multiple situations. For example, it is required in many situations when combustible air barriers are used or when foam plastic insulation is used in the exterior walls of construction types I, II, III or IV. These construction types, by code definition, have exterior walls constructed of non-combustible materials. The NFPA 285 test is to determine that combustibles, when exposed to fire on the exterior face of the wall, do not spread flame over the surface or through the core of the otherwise non-combustible wall assembly.

The test standard NFPA 285 is referenced in many sections of the IBC including 1403.5 for water resistive barriers, and Section 2603.5.5 for foam plastic insulation. NFPA 285, or a variation of it, has been referenced in each edition of the IBC since its first edition in 2000, and since the 1980s in the three model codes that preceded it. The now defunct ICBO Uniform Building Code first included the concept in the 1988 edition, requiring testing in accordance with the UBC Standard 17-6, a predecessor of NFPA 285.


INTRODUCTION TO OWENS CORNING® THERMAFIBER® RAINBARRIER® CONTINUOUS INSULATION
Comfort, Safety and Sustainability

Thermafiber® RainBarrier® continuous insulation (ci) is designed to work with a diverse range of cavity wall or open-joint façade systems. Whatever the specifications of your next project, RainBarrier® mineral wool continuous insulation delivers benefits for:

- **Fire and smoke protection:** RainBarrier® continuous insulation can withstand temperatures over 2,000°F for more than five hours.
- **Sound control:** RainBarrier® continuous insulation cuts down on noise between floors, through walls, and from outdoors.
- **Thermal comfort:** RainBarrier® continuous insulation R-values contribute to the energy efficiency and won’t decrease as the insulation ages.
- **Installation:** RainBarrier® continuous insulation uses no CFCs or HCFCs and installers need minimal PPE during installation.
- **Sustainability:** Using RainBarrier® continuous insulation contributes to credits in several green building programs such as LEED® and Green Globes®.

**Standards, Codes Compliance — Thermafiber® RainBarrier® 45 and RainBarrier® HD continuous insulation**

<table>
<thead>
<tr>
<th>CODE/STANDARD</th>
<th>RAINBARRIER® 45</th>
<th>RAINBARRIER® HD</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM C 665</td>
<td>Non-corrosive Type I (unfaced material)</td>
<td>Non-corrosive</td>
</tr>
<tr>
<td>ASTM C 795</td>
<td>Pass</td>
<td>Pass</td>
</tr>
<tr>
<td>ASTM C 612</td>
<td>Rain Barrier® 45 Type IA, IB, IVA</td>
<td>Rain Barrier® HD Type IA, IB, II, III, IVA</td>
</tr>
<tr>
<td>ASMT E 136</td>
<td>Non-combustible as defined per NFPA Standard 220</td>
<td>Non-combustible as defined per NFPA Standard 220</td>
</tr>
<tr>
<td>CAN/ULC S114</td>
<td>Complies</td>
<td>Complies</td>
</tr>
<tr>
<td>ASMT E 96</td>
<td>Unfaced, 50 Perms as tested</td>
<td>Unfaced, 50 Perms as tested</td>
</tr>
<tr>
<td>ASMT E 84</td>
<td>Flame Spread 0, Smoke Developed 0</td>
<td>Flame Spread 0, Smoke Developed 0</td>
</tr>
<tr>
<td>CAN/ULC S102</td>
<td>Flame Spread 0, Smoke Developed 5</td>
<td>Flame Spread 0, Smoke Developed 5</td>
</tr>
<tr>
<td>ASTM C 1104</td>
<td>Absorbs 0.03% by volume</td>
<td>Absorbs 0.03% by volume</td>
</tr>
<tr>
<td>ASTM C 356</td>
<td>Linear Shrinkage &lt;2% 1200°F (650°C)</td>
<td>Linear Shrinkage &lt;2% 1200°F (650°C)</td>
</tr>
</tbody>
</table>

**PRODUCT OPTIONS**

Owens Corning® Thermafiber® RainBarrier® 45 and RainBarrier® HD

Recycled Content Option*:
- EPA Choice Fiber (US Government Buildings) – Minimum 75%
- Standard Fiber – Minimum 70%

*Recycled content verified by ICC-ES. †Recycled content options other than standard must be specified at a time of order.

**Technical Data**

<table>
<thead>
<tr>
<th>ACTUAL DENSITY</th>
<th>TESTED TO ASTM C 518</th>
<th>TESTED TO ASTM E 84 UNFACED</th>
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<tbody>
<tr>
<td></td>
<td>&quot;K&quot; @ 75° [24° C]</td>
<td>&quot;R&quot; VALUE PER INCH OF THICKNESS^</td>
</tr>
<tr>
<td></td>
<td>BTU. IN./HR. SQ. FT. °F</td>
<td>Flame Spread</td>
</tr>
<tr>
<td>Thermafiber® RainBarrier® 45</td>
<td>4.5 pcf</td>
<td>0.23</td>
</tr>
<tr>
<td>Thermafiber® RainBarrier® HD</td>
<td>6.0 pcf</td>
<td>0.23</td>
</tr>
</tbody>
</table>

^R=thickness divided by "k"
Acoustical Performance
Thermafiber® RainBarrier® 45

COEFFICIENTS AT FREQUENCIES PER ASTM C 423

<table>
<thead>
<tr>
<th>THICKNESS</th>
<th>125Hz</th>
<th>250Hz</th>
<th>500Hz</th>
<th>1000Hz</th>
<th>2000Hz</th>
<th>4000Hz</th>
<th>NRC</th>
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</thead>
<tbody>
<tr>
<td>1 1/4&quot;</td>
<td>0.22</td>
<td>0.44</td>
<td>0.96</td>
<td>1.06</td>
<td>1.05</td>
<td>1.05</td>
<td>0.90</td>
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<tr>
<td>2&quot;</td>
<td>0.30</td>
<td>0.69</td>
<td>1.08</td>
<td>1.01</td>
<td>1.00</td>
<td>1.03</td>
<td>0.95</td>
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<td>3&quot;</td>
<td>0.70</td>
<td>1.07</td>
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<td>1.15</td>
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<tr>
<td>4&quot;</td>
<td>1.03</td>
<td>1.25</td>
<td>1.20</td>
<td>1.05</td>
<td>1.05</td>
<td>1.08</td>
<td>1.15</td>
</tr>
</tbody>
</table>

Thermafiber® RainBarrier® HD

COEFFICIENTS AT FREQUENCIES PER ASTM C 423

<table>
<thead>
<tr>
<th>THICKNESS</th>
<th>125Hz</th>
<th>250Hz</th>
<th>500Hz</th>
<th>1000Hz</th>
<th>2000Hz</th>
<th>4000Hz</th>
<th>NRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot;</td>
<td>0.36</td>
<td>0.79</td>
<td>1.15</td>
<td>1.04</td>
<td>1.01</td>
<td>1.04</td>
<td>1.00</td>
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<tr>
<td>4&quot;</td>
<td>1.15</td>
<td>1.17</td>
<td>1.18</td>
<td>1.03</td>
<td>1.06</td>
<td>1.08</td>
<td>1.10</td>
</tr>
<tr>
<td>6&quot;</td>
<td>1.18</td>
<td>1.01</td>
<td>1.11</td>
<td>1.03</td>
<td>1.06</td>
<td>1.10</td>
<td>1.05</td>
</tr>
</tbody>
</table>

Availability
Both Thermafiber® RainBarrier® 45 and RainBarrier® HD are available in:

<table>
<thead>
<tr>
<th>THICKNESS*</th>
<th>WIDTHS**</th>
<th>LENGTHS**</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot;-7&quot;</td>
<td>16&quot;, 24&quot;, 36&quot;</td>
<td>48&quot;, 60&quot;</td>
</tr>
</tbody>
</table>

*Thicknesses are available in 1/2" increments. **Custom sizes are available upon request.

RAINBARRIER® INSTALLATION

CLADDING TYPES LEGEND

- Brick
- Stone
- Terra Cotta
- Architectural Panels
- Metal
  - ACM: Aluminum Composite
  - MCM: Metal Composite Material
- Masonry
- Concrete
- Concrete Panel
  - ACM: Aluminum Composite Materials
  - MCM: Metal Composite Materials
  - Phenolic Panels
  - HPL: High Pressure Laminate Panels

Impaling Pins

Standard Impaling Pins

RainBarrier® HD and RainBarrier® 45 can be installed without Z-furring using impaling pins. The following diagrams depict standard positioning of impaling pins, showing different numbers of pins used per panel.

Impaling pins may be installed prior to the air and water barrier, adhered to the air and water barrier (AWB), or screwed through the air and water barrier (AWB). Contact the air and water barrier manufacturer for acceptable installation methods.
RainBarrier® Insulation impaling pin

4-pin installation

RainBarrier® Insulation impaling pin

5-pin installation

RainBarrier® Insulation impaling pin

6-pin installation

---

**Z-Furring with Impaling Pins**

RainBarrier® Insulation can be secured into Z-furring channels with inexpensive and easy-to-use impaling pins on insulation panels of all sizes.

Impaling pins may be installed prior to the air and water barrier, adhered to the air and water barrier (AWB), or screwed through the air and water barrier (AWB). Contact the air and water barrier manufacturer for acceptable installation methods.

<table>
<thead>
<tr>
<th>IMPALING PINS/INSULATION PANEL</th>
<th>THICKNESS</th>
<th>PANEL WIDTH</th>
<th>PANEL LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>1&quot; to 4&quot;</td>
<td>16’</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>1&quot; to 3&quot;</td>
<td>24’</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>4”</td>
<td>24’</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>1&quot; to 4&quot;</td>
<td>36’</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>THICKNESS (IN)</th>
<th>PANEL WIDTH</th>
<th>PANEL LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot; to 3&quot;</td>
<td>16’</td>
<td>48”</td>
</tr>
<tr>
<td>1&quot; to 2&quot;</td>
<td>24’</td>
<td>48”</td>
</tr>
<tr>
<td>1&quot;</td>
<td>36’</td>
<td>48’ or 60’</td>
</tr>
</tbody>
</table>
Z-Furring with Impaling Pins

<table>
<thead>
<tr>
<th>THICKNESS (IN)</th>
<th>PANEL WIDTH</th>
<th>PANEL LENGTH</th>
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</thead>
<tbody>
<tr>
<td>3(\frac{1}{2}) to 4(&quot;)</td>
<td>16(&quot;)</td>
<td>48(&quot;)</td>
</tr>
<tr>
<td>3&quot; to 4&quot;</td>
<td>24&quot;</td>
<td>48&quot;</td>
</tr>
<tr>
<td>1(\frac{1}{2}) to 4&quot;</td>
<td>36&quot;</td>
<td>48&quot; or 60&quot;</td>
</tr>
</tbody>
</table>

2 Pins per Insulation Panel – Vertical Installation

Z-Furring Channel

Insulation Impaling Pins

Vertical Z-Furring (2 pin)

2 Pins per Insulation Panel – Horizontal Installation

Z-Furring Channel

Insulation Impaling Pins

Horizontal Z-Furring (2 pin)

3 Pins per Insulation Panel – Vertical Installation

Z-Furring Channel

Insulation Impaling Pins

Vertical Z-Furring (3 pin)
Impasse® Hangers

Impasse® Hangers provide a precise, faster and safer installation of RainBarrier® insulation without the need to penetrate the Air and Water Barrier (AWB). Impasse® Hangers facilitate a logical order of installation, installation efficiency, and allow for positive mechanical attachment directly to the channels.

Impasse® Hanger

Locking Washer

Custom Impasse® ci Hanger

Z-Furring with Impasse® Hanger

The Impasse® insulation system holds the insulation securely in place during the event of a fire. Installation of RainBarrier® HD and RainBarrier® 45 insulation using Impasse® Hangers with Z-furring typically requires only two hangers per insulation panel.

<table>
<thead>
<tr>
<th>THICKNESS (IN)</th>
<th>PANEL WIDTH</th>
<th>PANEL LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1” to 4”</td>
<td>16”, 24” and 36”</td>
<td>36”, 48” and 60”</td>
</tr>
</tbody>
</table>

*Standard measurements. Custom sizes are available.*
Clip & Rail Systems

Thermafiber, Inc. is a leader in continuous insulation design by providing installation compatibility with a wide range of RainBarrier® hanging options designed to work with virtually any cladding system in the industry, and accommodate both imaginative designs and demanding specifications.
Clip & Rail

These thermally isolated clips reduce thermal bridging between the cladding and the wall, improving the effective R value of the insulation.
This insulated composite clip and rail system is composed of bioresin and recycled fiberglass.
Reinforcement and Attachment Methods

Wire Ties of Flat Anchors

RainBarrier® HD and RainBarrier® 45 insulation can either be impaled onto shelf-type wall ties or installed so wall ties occur at insulation seams. When fit between wall ties, the insulation is secured to the wall tie with Thermafiber® RainBarrier® clips.

Note that galvanized steel retaining clips are recommended for systems requiring fire performance characteristics.
Owens Corning® RainBarrier® HD and RainBarrier® 45 insulation can be attached to CMU walls with brick tie wall single barrel brick anchors with 2” washer anchors. Secure insulation by screwing anchor screw with minimum 1½” diameter washer head to the CMU anchor.
PROJECT SPOTLIGHT
Owens Corning® Thermafiber® RainBarrier®

Owens Corning® Thermafiber® RainBarrier® continuous insulation can be found in some of the most advanced buildings being constructed today. Here are just a few projects that showcase the comfort, safety and sustainability of RainBarrier® mineral wool insulation.

Commercial Buildings

San Francisco Museum of Modern Art (SF Moma) Expansion
San Francisco, California
For a building as striking as the art it houses, the design team turned to Thermafiber® RainBarrier® 45 for continuous insulation. The installation of Thermafiber® products, which have a minimum of 70% recycled content¹, helped the building earn LEED® Gold pre-certification.

Occupancy: Museum

Museum of the Moving Image
New York City, New York
This building, featuring Thermafiber® RainBarrier®, carries a LEED® Silver certification and has been honored with the Red Dot Design Award for Architecture + Urban Design (2013) and the Excellence in Design Award from the Public Design Commission of the City of New York (2011).

Occupancy: Museum

Bullitt Center
Seattle, Washington
This six-story building, featuring RainBarrier® Continuous Insulation, is currently the greenest commercial building in the world. The Bullitt Center is Certified Living by the International Living Future Institute’s Living Building Challenge.¹

Occupancy: Office

¹https://living-future.org/lbc/case-studies/bullitt-center/
Institutions

**Discovery Hall, University of Washington, Bothell**
Bothell, Washington
This 74,000 square-foot building features Thermafiber® RainBarrier® 45 Continuous Insulation. The recycled content in Thermafiber® products helped earn this building LEED® Gold Certification.²

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**Munger Graduate Residences, University of Michigan**
Ann Arbor, Michigan
Home to more than 600 graduate students, this building features a number of sustainability features, including Thermafiber® RainBarrier® Continuous Insulation. The building is the first residence hall at the University of Michigan to earn LEED® Gold Certification.³

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Healthcare Facilities

**Sydney & Lois Eskenazi Hospital**
Indianapolis, Indiana
Completed in 2013, Eskenazi Hospital was designed with patient wellness at its center, and features a unique, contemporary façade that combines pre-fabricated concrete, glass and metal. Use of Thermafiber® RainBarrier® contributed to the building’s LEED® Gold Certification.

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**Promedica Health and Wellness Center**
Toledo, Ohio
This $67M health and wellness center consolidates a full spectrum of medical services and offices under one roof. The Center features a terra cotta cladding, and the design team selected Thermafiber® RainBarrier® 45 to help the building meet NFPA 285 requirements.

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¹ Recycled content certified by ICC-ES.
²“Happy Earth Day: LEED Gold for Discovery Hall” [https://uwb.edu/news/April-2016/leed].
³“Munger is first university residence hall to be LEED Gold certified” [https://record.umich.edu/articles/munger-first-university-residence-hall-be-leed-gold-certified].
OWENS CORNING® THERMAFIBER®
The Name In Mineral Wool®

Owens Corning® Thermafiber® mineral wool insulation has brought fire protection, safety and thermal comfort since 1934. Thermafiber, Inc. was acquired by Owens Corning, a leading supplier of building products you can trust.

10 reasons to choose Thermafiber® mineral wool

1. Made from inorganic, non-combustible material per ASTM E136
2. Minimum 70% recycled content
3. Resists temperatures of over 2,000°F per ASTM E119
4. Does not require a thermal barrier
5. Flame Spread and Smoke Developed ratings of 0 per ASTM E84
6. Allows vapor transmission providing flexibility in vapor barrier placement
7. Consistent R-values per any thickness regardless of installation temperatures
8. Can be installed at any temperature or weather condition
9. Requires minimal Personal Protective Equipment (PPE) to install
10. Provides excellent thermal, acoustical and fire-resistive properties in one product

Recycled content verified by ICC-ES.


To learn more about Owens Corning® Thermafiber® RainBarrier® Continuous Insulation, visit www.owenscorning.com.

Thermafiber Inc.
One Owens Corning Parkway
Toledo, OH 43659
888-TFIBER1 [834-2371]
www.thermafiber.com

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