RAINBARRIER® CONTINUOUS INSULATION

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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 or 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).²

Benefits of Continuous Insulation

- Reduces thermal bridging and increases overall R-value. Thermal bridging is a type of heat loss that 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.³
- 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.

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 1900s, an exterior wall would look pretty much like this: no insulation.

1940s–1970s
Limited Insulation

As we move into the 1940s and especially during the energy crisis of the 70s, 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

---

Prescriptive R (Minimum) Requirements for Steel-Framed Walls, Above Grade

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<th>ZONE</th>
<th>NON-R</th>
<th>R</th>
<th>NON-R</th>
<th>R</th>
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ASHRAE 90.1

2004

2007 & 2010

2013

2012 & 2015

2016

2018

ZONE NON-R R NON-R R NON-R WR NON-R R NON-R R NON-R R NON-R R

FOOTNOTES
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 system¹, ASHRAE Standard 189.1², or Architecture 2030.³ 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-COMBUSTIBILITY**

**Non-Combustible and Fire-Resistant**

**Standards and Testing**

A non-combustible 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**: 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 that do not act to aid combustion or add appreciable heat to an ambient fire.


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

The Purpose of NFPA 285 Testing:

NFPA 285 is required in the International Building Code (IBC) in multiple situations. Some examples may include 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 NFPA 285 standard test is referenced in many sections of the IBC, including Section 1404.5 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.

**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.
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 energy efficiency and won’t decrease as the insulation ages.

### RainBarrier® Product Comparison

<table>
<thead>
<tr>
<th>PROPERTIES</th>
<th>TEST METHOD</th>
<th>RAINBARRIER® 45</th>
<th>RAINBARRIER® HD</th>
<th>RAINBARRIER® HC (80)</th>
<th>RAINBARRIER® HC PLUS (110)</th>
<th>RAINBARRIER® HC MAX</th>
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<tr>
<td>Mineral Wool Standard</td>
<td>ASTM C612</td>
<td>Types IA, IB, IVA</td>
<td>Types IA, IB, II, IVA, IVB</td>
<td>Types IA, IB, II, IVA, IVB</td>
<td>Types IA, IB, II, IVA, IVB</td>
<td>Types IA, IB, II, IVA, IVB</td>
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<td>Corrosion of Steel, Aluminum, and Copper</td>
<td>ASTM C665</td>
<td>Non-corrosive, Type I (unfaced material)</td>
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<td>Non-Combustibility</td>
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<td>Non-Combustibility</td>
<td>CAN/ULC S114</td>
<td>Non-combustible</td>
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<td>Water Vapor Permeance</td>
<td>ASTM E96</td>
<td>50 perms, unfaced</td>
<td>50 perms, unfaced</td>
<td>24 perm</td>
<td>46 perm</td>
<td>57 perm</td>
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<td>Surface Burning Characteristics</td>
<td>ASTM E84</td>
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<td>Flame spread 0</td>
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<td>Surface Burning Characteristics</td>
<td>CAN/ULC S102</td>
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<td>Smoke developed 0</td>
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<td>Water Vapor Sorption</td>
<td>ASTM C1104</td>
<td>Absorbs 0.03% by volume</td>
<td>Absorbs 0.03% by volume</td>
<td>Absorbs &lt;1% by volume</td>
<td>Absorbs &lt;0.5% by volume</td>
<td>Absorbs &lt;0.5% by volume</td>
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<td>Linear Shrinkage</td>
<td>ASTM C356</td>
<td>&lt;2% @ 1200°F (650°C)</td>
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</table>

### ATTACHMENT METHODS

- **Cladding Attachment Around Insulation**:
  - Brick Ties
  - Girts (metal or thermally short)
  - Channels
  - Clips & Rails (metal or thermally short) Preferred when ASTM C612 Type I VB is required
- **Cladding Attachment Outboard of Insulation (i.e., throughfastener, nails, screws)**
  - Preferred when using light-weight cladding
  - Preferred when using medium-weight cladding
  - Preferred when using heavy-weight cladding
<table>
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<tr>
<th>Product</th>
<th>Actual Density</th>
<th>Compression Strength</th>
<th>&quot;K&quot; @ 75° [24° C] BTU. IN./HR. SQ. FT. °F</th>
<th>&quot;R&quot; Value per Inch of Thickness*</th>
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<tr>
<td>RainBarrier® 45</td>
<td>4.5 pcf</td>
<td>N/A</td>
<td>0.23</td>
<td>4.3</td>
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<td>RainBarrier® HD</td>
<td>6.0 pcf</td>
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<td>0.23</td>
<td>4.3</td>
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<td>RainBarrier® HC 80</td>
<td>N/A</td>
<td>475 lbs/ft² @ 10% deformation</td>
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<td>4.2</td>
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<td>RainBarrier® HC Plus 110</td>
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<td>720 lbs/ft² @ 10% deformation</td>
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<td>RainBarrier® HC Max</td>
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<td>1296 lbs/ft² @ 10% deformation</td>
<td>0.24</td>
<td>4.2</td>
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*R=thickness divided by "k"
RAINBARRIER® INSTALLATION

CLADDING TYPES LEGEND

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<tr>
<th>Material Type</th>
<th>Legend</th>
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<td>Stone</td>
<td>![Stone Icon]</td>
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<td>Terra Cotta</td>
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<td>Metal</td>
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<tr>
<td>Masonry</td>
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<tr>
<td>Concrete/Concrete Panel</td>
<td>![Concrete/Concrete Panel Icon]</td>
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</tbody>
</table>

- ACM: Aluminum Composite
- MCM: Metal Composite Material
- Phenolic Panels
- HPL: High Pressure Laminate Panels

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.

<table>
<thead>
<tr>
<th>Panel Width</th>
<th>Panel Length</th>
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<tr>
<td>1&quot; to 4&quot;</td>
<td>16&quot;</td>
</tr>
<tr>
<td>1&quot; to 3&quot;</td>
<td>24&quot;</td>
</tr>
<tr>
<td>4&quot;</td>
<td>48&quot; or 60&quot;</td>
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</tbody>
</table>

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.

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## Z-Furring with Impaling Pins

<table>
<thead>
<tr>
<th>Thickness (in)</th>
<th>Panel Width</th>
<th>Panel Length</th>
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<tr>
<td>1&quot; to 3&quot;</td>
<td>16'</td>
<td>48&quot;</td>
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<tr>
<td>1&quot; to 2&quot;</td>
<td>24'</td>
<td>48&quot;</td>
</tr>
<tr>
<td>1&quot;</td>
<td>36'</td>
<td>48&quot; or 60&quot;</td>
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### 2 Pins per Insulation Panel – Vertical Installation

*Vertical Z-Furring (2 pins)*

### 2 Pins per Insulation Panel – Horizontal Installation

*Horizontal Z-Furring (2 pins)*
Z-Furring with Impaling Pins

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

3 Pins per Insulation Panel – Vertical Installation

Vertical Z-Furring (3 pins)

3 Pins per Insulation Panel – Horizontal Installation

Horizontal Z-Furring (3 pins)
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 and installation efficiency, and allow for positive mechanical attachment directly to the channels.

Z-Furring with Impasse® Hangers
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>
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</thead>
<tbody>
<tr>
<td>1&quot; to 4&quot;</td>
<td>16&quot;, 24&quot;, and 36&quot;</td>
<td>36&quot;, 48&quot;, and 60&quot;</td>
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*Standard measurements. Custom sizes are available.

Vertical Installation

Horizontal Installation
Clip and 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.

Glass Fiber Reinforced Clips

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 or 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.
When installing masonry veneers, Owens Corning® RainBarrier® 45 and RainBarrier® HD continuous insulation can be attached using the single-barrel masonry anchors with 2-inch or greater washers. Secure by screwing the appropriate type of anchor (for wood, steel, or concrete/masonry) through the insulation as recommended by the anchor manufacturer.
Direct Attachment Method

**Screws or Nails**

By utilizing the high compressive strength of rigid mineral wool continuous insulation board, only long screws penetrate the continuous insulation to secure the cladding attachment system (such as girts or channels) to the stud framing below the CI. This reduces the thermal bridging through the assembly.

Typically, cladding is attached to 16-, 18-, or 20-gauge channels, girts, or dimensional wood furring. This particular rigid board CI to be used is dependent upon the cladding weight and attachment system. Contact the cladding attachment manufacturer for recommendations.

When installing over wood framing, fasteners may be secured into studs below the CI or into properly designed wood sheathing. When installing over steel framing, fasteners must be secured directly into stud framing. When installing over concrete or masonry structures, anchors or masonry fasteners are required. Always verify correct fastening methods with cladding attachment manufacturers. This type of installation greatly reduces thermal bridging versus traditional attachment methods. (See chart below.)

**THERMAL BRIDGING IN CI**

Typical Effectiveness of CI with Various Attachment Methods

- Continuous Vertical Z-Girt
- Continuous Horizontal Z-Girt
- Aluminum T-Clip
- Galvanized Steel Clip
- Stainless Steel Clip
- Isolated Galvanized Clip
- Fiberglass Clip Galv. Screws
- Galvanized Steel Screws
- Fiberglass Clip Stain. Screws
- Stainless Steel Screws
- FG Clip No Through Screws

![Thermal Bridging Chart](chart.png)
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