



RAINBARRIER® CONTINUOUS INSULATION GUIDE

**STANDARDS AND CODE COMPLIANCE
INSTALLATION | ATTACHMENT**

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:¹ "...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).²

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.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.

Steel Stud Framing

Zone	2007 & 2010		2013		2016	
	Non-res	Res	Non-res	Res	Non-res	Res
0	NA	NA	NA	NA	13	13
1	13	13	13	13	13	13
2	13	13+7.5	13+3.8	13+7.5	13+3.8	13+7.5
3	13+3.8	13+7.5	13+5.0	13+7.5	13+5.0	13+7.5
4	13+7.5	13+7.5	13+7.5	13+7.5	13+7.5	13+7.5
5	13+7.5	13+7.5	13+10.0	13+10.0	13+10.0	13+10.0
6	13+7.5	13+7.5	13+12.5	13+12.5	13+12.5	13+12.5
7	13+7.5	13+15.6	13+12.5	13+15.6	13+12.5	13+15.6
8	13+7.5	13+18.8	13+18.8	13+18.8	13+18.8	13+18.8

¹ ANSI/ASHRAE/IES Standard 90.1-2016 -- Energy Standard for Buildings Except Low-Rise Residential Buildings. American Society of Heating, Refrigerating and Air-Conditioning Engineers. <https://www.ashrae.org/resources--publications/bookstore/standard-90-1>.

² https://www.energycodes.gov/sites/default/files/becu/2012iecc_commercial_envelope_BECU.pdf

³ <https://sustainabilityworkshop.autodesk.com/buildings/total-r-values-and-thermal-bridging>

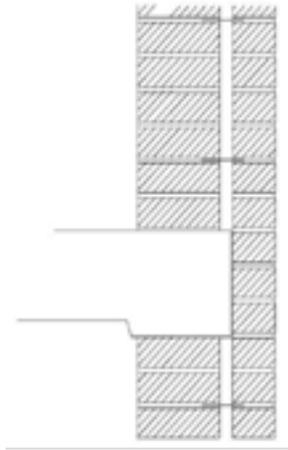


ENERGY EFFICIENCY

Contributing to sustainable buildings

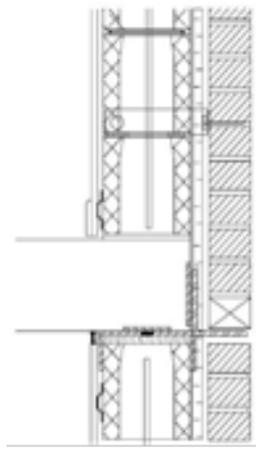
The Evolution of Energy Efficiency

We have come a long way with the development of energy efficient buildings.



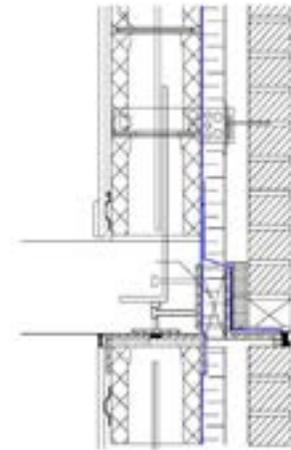
1900s No Insulation

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 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.

¹ U.S. Green Building Council. <https://new.usgbc.org/leed>.

² ANSI/ASHRAE/IES/USGBC Standard 189.1-2014, Standard for the Design of High-Performance Green Buildings. American Society of Heating, Refrigerating and Air-Conditioning Engineers. <https://www.ashrae.org/resources-publications/bookstore/standard-189-1>.

³ Architecture 2030. <http://architecture2030.org/>.

NON-COMBUSTIBILITY

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 E136¹

- 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 285²

- Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

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.

¹ ASTM International. ASTM 136-16a. Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C. <https://www.astm.org/Standards/E136.htm>.

² National Fire Protection Association. Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components. <http://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=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

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

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

	ACTUAL DENSITY	TESTED TO ASTM C 518		TESTED TO ASTM E 84 UNFACED	
		"K" @ 75° [24° C] BTU. IN./HR. SQ. FT. °F	"R" VALUE PER INCH OF THICKNESS^	Flame Spread	SMOKE DEVELOPED
Thermafiber® RainBarrier® 45	4.5 pcf	0.23	4.3	0	0
Thermafiber® RainBarrier® HD	6.0 pcf	0.23	4.3	0	0

^R=thickness divided by "k"

Acoustical Performance

Thermafiber® RainBarrier® 45

COEFFICIENCIES AT FREQUENCIES PER ASTM C 423

THICKNESS	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	NRC
1 1/2"	0.22	0.44	0.96	1.06	1.05	1.05	0.90
2"	0.30	0.69	1.08	1.01	1.00	1.03	0.95
3"	0.70	1.07	1.24	1.13	1.07	1.08	1.15
4"	1.03	1.25	1.20	1.05	1.05	1.08	1.15

Thermafiber® RainBarrier® HD

COEFFICIENCIES AT FREQUENCIES PER ASTM C 423

THICKNESS	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	NRC
2"	0.36	0.79	1.15	1.04	1.01	1.04	1.00
4"	1.15	1.17	1.18	1.03	1.06	1.08	1.10
6"	1.18	1.01	1.11	1.03	1.06	1.10	1.05

Availability

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

THICKNESS*	WIDTHS**	LENGTHS**
1"-7"	16", 24", 36"	48", 60"

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

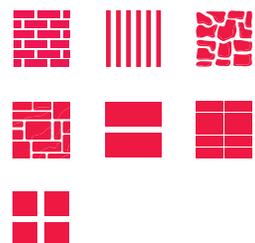
RAINBARRIER® INSTALLATION

CLADDING TYPES LEGEND

 Brick	 Stone	 Terra Cotta	 Architectural Panels <ul style="list-style-type: none"> • ACM: Aluminum Composite Materials • MCM: Metal Composite Materials • Phenolic Panels • HPL: High Pressure Laminate Panels
 Metal <ul style="list-style-type: none"> • ACM: Aluminum Composite • MCM: Metal Composite Material 	 Masonry	 Concrete Concrete Panel	

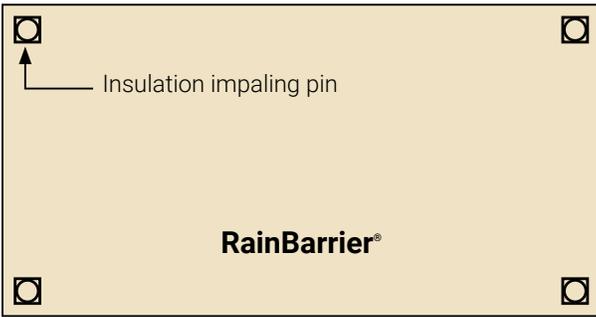
Impaling Pins

Standard Impaling Pins

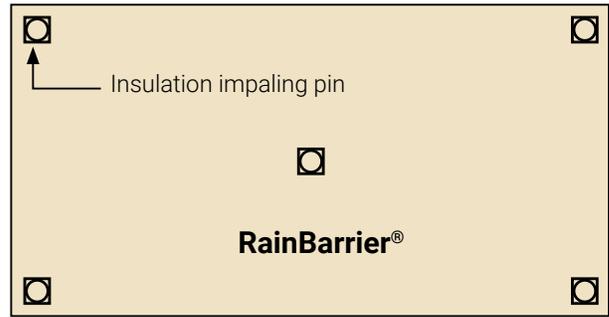


RainBarrier® HD and RainBarrier® 45 can be installed without Z-furring using impaling pins. The following diagrams depict standard positioning of impaling pins, showing different numbers of pins used per panel.

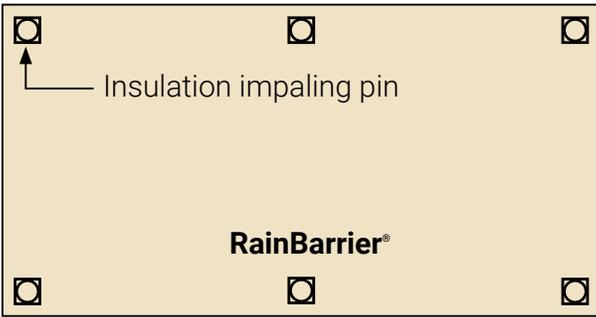
Impaling pins may be installed prior to the air and water barrier, adhered to the air and water barrier (AWB), or screwed through the air and water barrier (AWB). Contact the air and water barrier manufacturer for acceptable installation methods.



4-pin installation



5-pin installation



6-pin installation

IMPALING PINS/INSULATION PANEL	THICKNESS	PANEL WIDTH	PANEL LENGTH
4	1" to 4"	16"	48"
4	1" to 3"	24"	48"
5	4"	24"	48"
6	1" to 4"	36"	48" or 60"

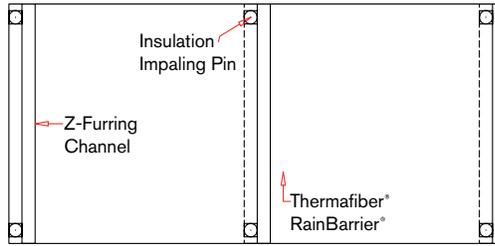
Z-Furring with Impaling Pins

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

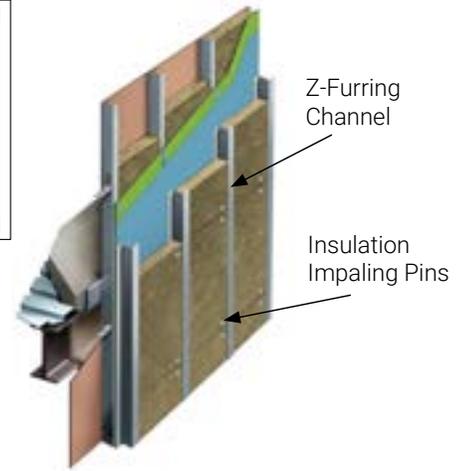
Impaling pins may be installed prior to the air and water barrier, adhered to the air and water barrier (AWB), or screwed through the air and water barrier (AWB). Contact the air and water barrier manufacturer for acceptable installation methods.

THICKNESS (IN)	PANEL WIDTH	PANEL LENGTH
1" to 3"	16"	48"
1" to 2"	24"	48"
1"	36"	48" or 60"

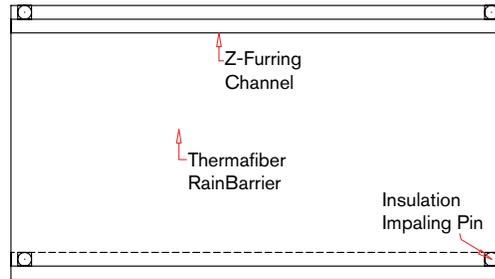
2 Pins per Insulation Panel – Vertical Installation



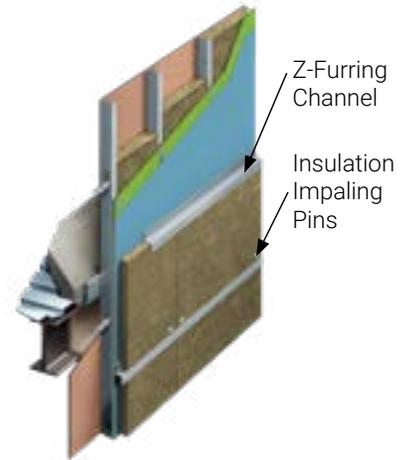
Vertical Z-Furring (2 pin)



2 Pins per Insulation Panel – Horizontal Installation



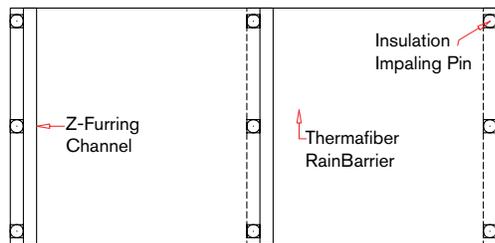
Horizontal Z-Furring (2 pin)



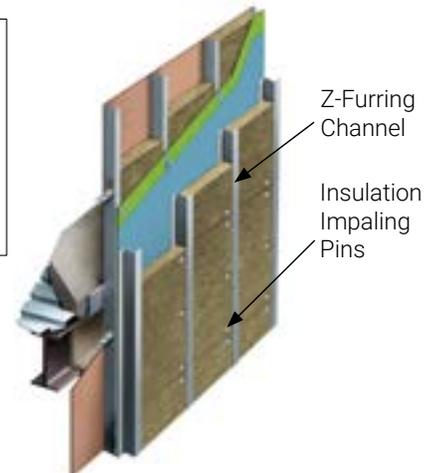
Z-Furring with Impaling Pins

THICKNESS (IN)	PANEL WIDTH	PANEL LENGTH
3 1/2" to 4"	16"	48"
3" to 4"	24"	48"
1 1/2" to 4"	36"	48" or 60"

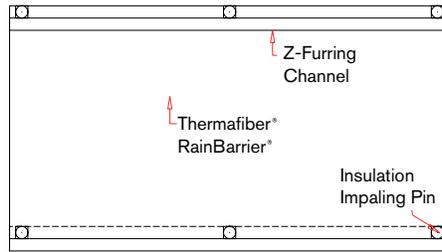
3 Pins per Insulation Panel – Vertical Installation



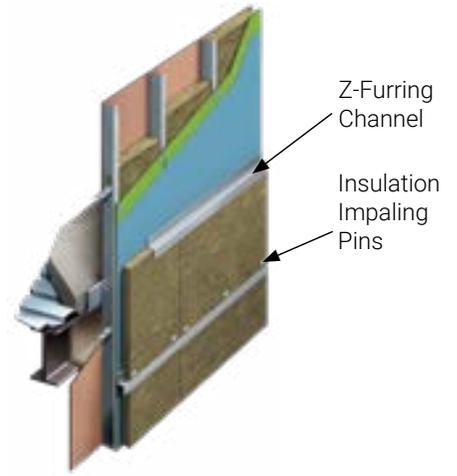
Vertical Z-Furring (3 pin)



3 Pins per Insulation Panel – Horizontal Installation



Horizontal Z-Furring (3 pin)



Impasse® Hangers

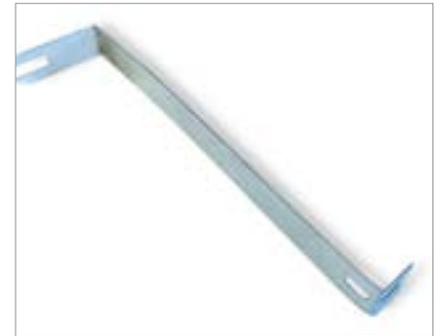
Impasse® Hangers provide a precise, faster and safer installation of RainBarrier® insulation without the the need to penetrate the Air and Water Barrier (AWB). Impasse® Hangers facilitate a logical order of installation, installation efficiency, and allow for positive mechanical attachment directly to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



Impasse® Hanger



Locking Washer



Custom Impasse® ci Hanger

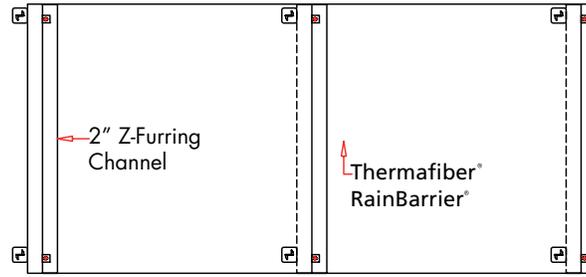
Z-Furring with Impasse® Hanger

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.

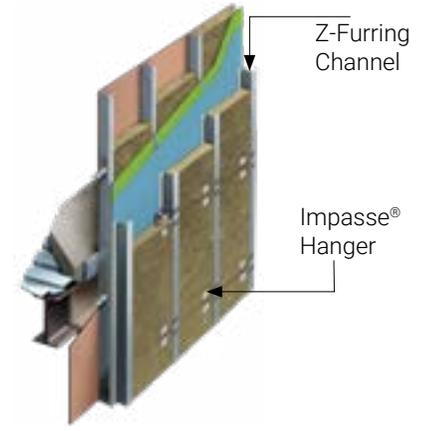
THICKNESS (IN)	PANEL WIDTH	PANEL LENGTH
1" to 4"	16", 24" and 36"	36", 48" and 60"

*Standard measurements. Custom sizes are available.

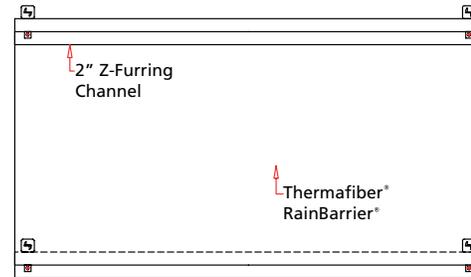
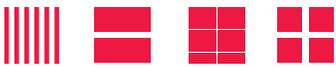
Vertical Installation



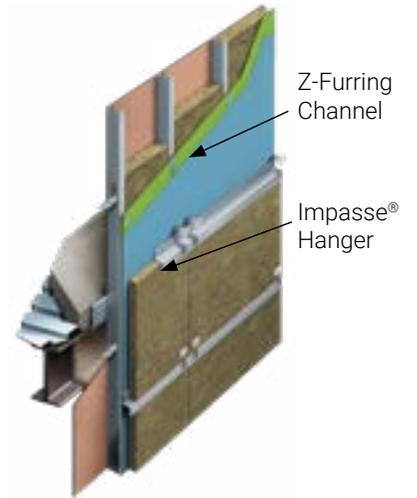
Vertical Z-Furring



Horizontal Installation



Horizontal Z-Furring

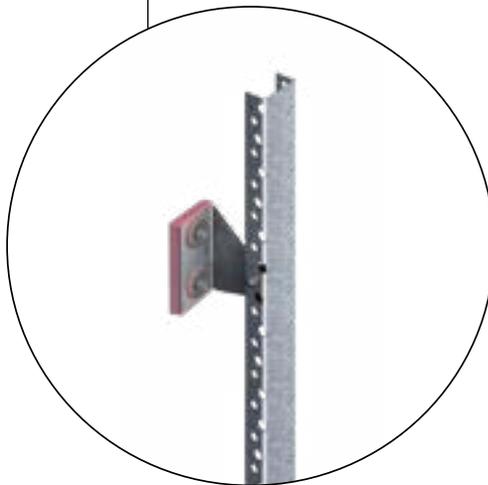
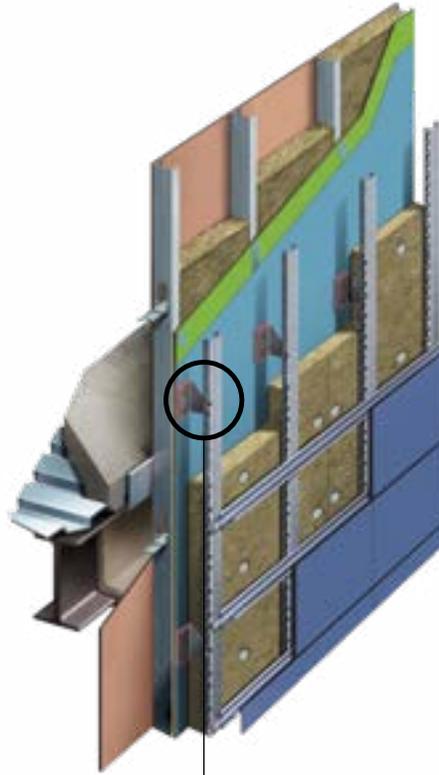


Clip & Rail Systems

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

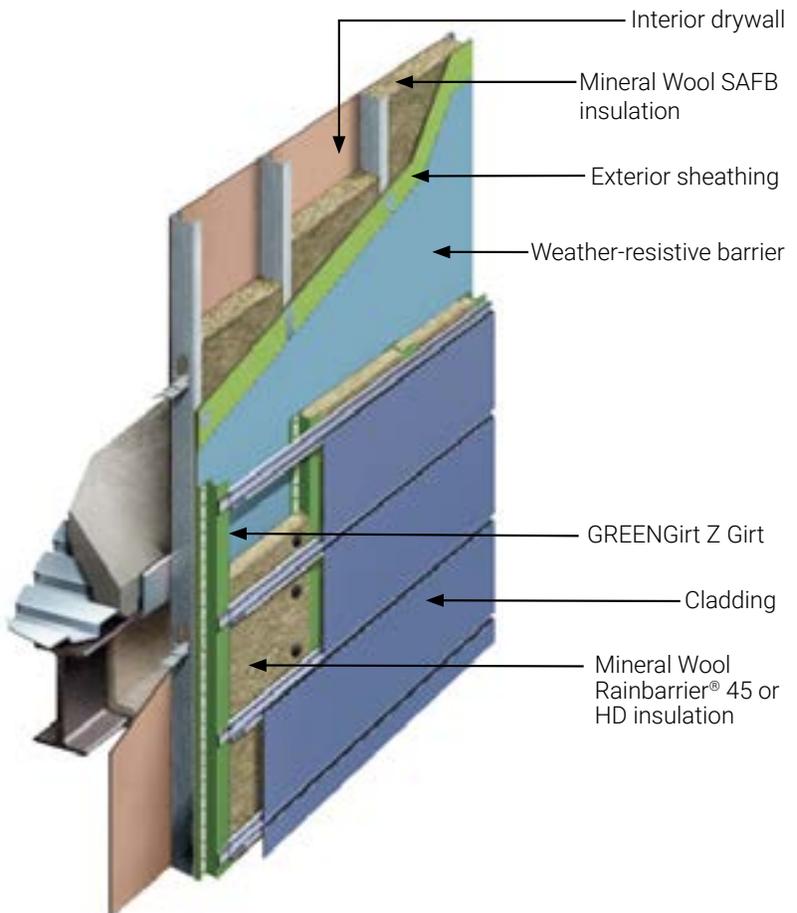
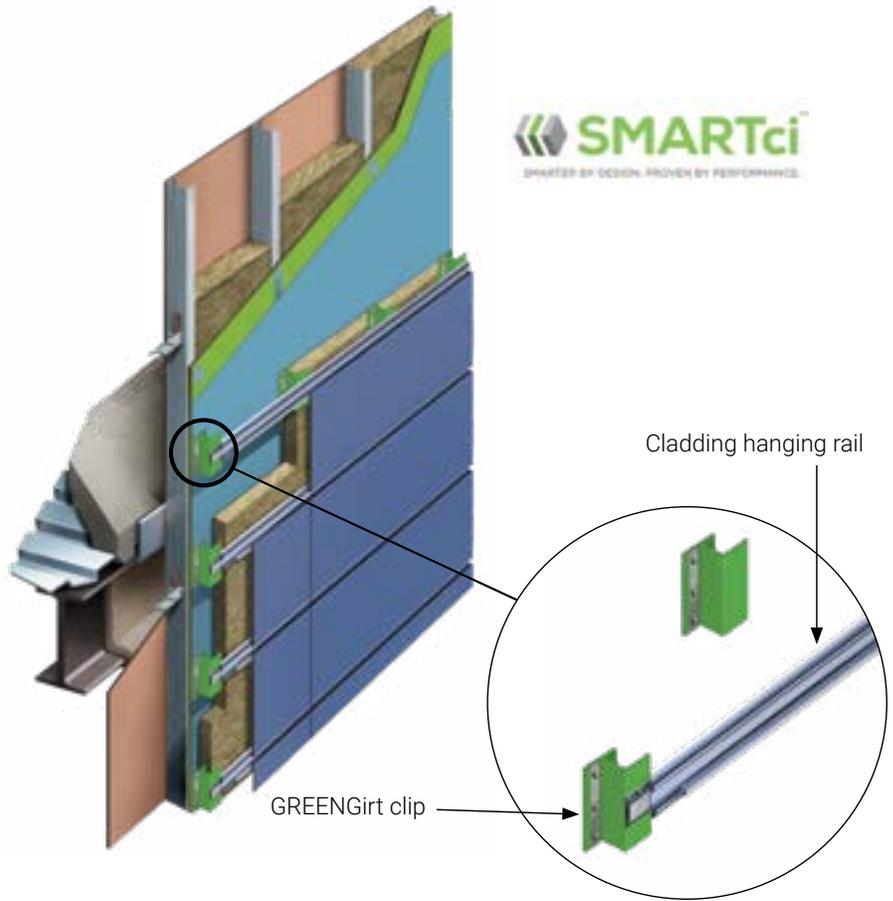
These thermally isolated clips reduce thermal bridging between the cladding and the wall, improving the effective R value of the insulation.



**Glass Fiber
Reinforced Clips**



This insulated composite clip and rail system is composed of bioresin and recycled fiberglass.

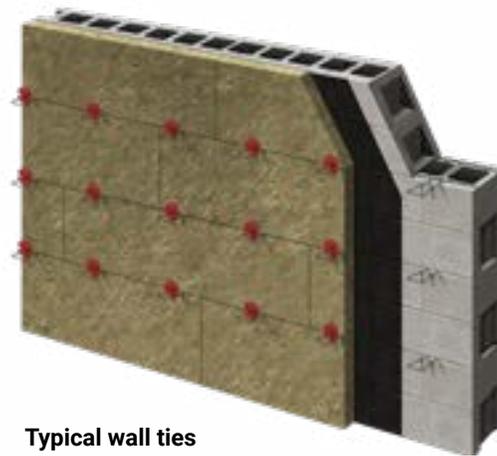
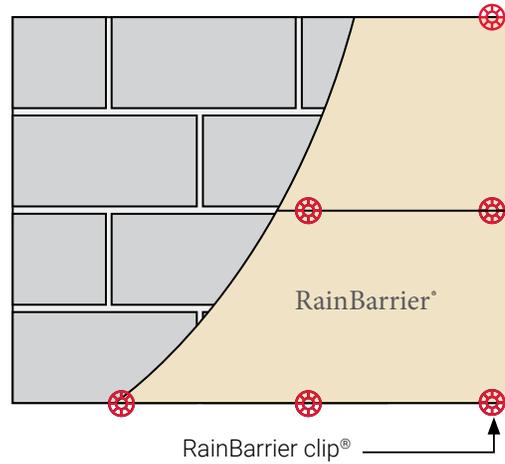


Reinforcement and Attachment Methods

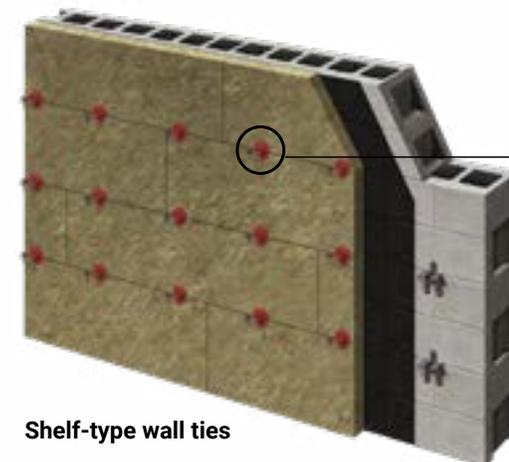
Wire Ties of Flat Anchors



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.



Typical wall ties



Shelf-type wall ties



Note that galvanized steel retaining clips are recommended for systems requiring fire performance characteristics.

Barrel-Style Anchors

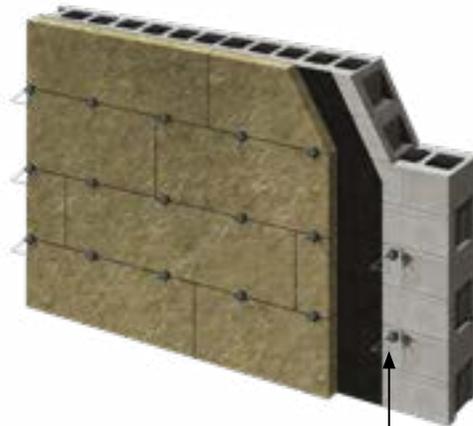
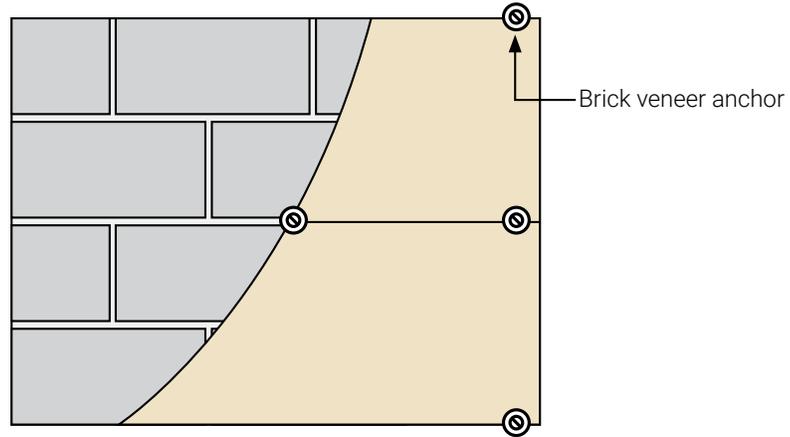
Brick Veneer Anchor Wall



Brick and Mortar with Barrel Ties



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.



Brick veneer 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

¹<https://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



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

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.



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.

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>>.

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The Name In Mineral Wool®

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¹ Recycled content verified by ICC-ES.

* Source: Dodge Data & Analytics - Construction.com Spec Rate Report - September 2017.



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