THERMAFIBER® RAINBARRIER® CI HIGH COMPRESSIVE

CLADDING ATTACHMENT GUIDE | CANADA EDITION

A guide for selecting a direct strapping attachment solution for your project

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A SOLUTION FOR IMPROVING THERMAL PERFORMANCE

As demand increases for more energy-efficient and low-carbon buildings, building codes and design professionals are responding by adopting methods that improve the thermal performance of the building enclosure. One way to improve a building's thermal performance and minimize thermal bridging is to add exterior continuous insulation with an appropriate cladding attachment. Exterior insulation can be used when the stud cavities of standard framed walls are already filled with insulation or the backup walls are solid, like CMU and concrete.

Continuous insulation reduces thermal bridging caused by wall framing, and in turn reduces a building's energy demand required for heating and cooling. Placing continuous insulation outboard of the building structure has additional advantages, such as minimizing condensation risk within a wall assembly and improving occupant thermal comfort.

Mineral wool insulation, such as Owens Corning® Thermafiber® RainBarrier® Continuous Insulation, offers these and many other benefits when used as the exterior insulation for above-grade wall assemblies.

Thermafiber® RainBarrier® Continuous Insulation products are designed to work with a diverse range of exterior wall cladding systems, backup wall types, and attachment methods. This guide can help you select a direct strapping attachment (i.e., long screws through vertical strapping) solution to use with these products (see **Figure 1**). Alternate cladding attachment methods are also discussed throughout this guide.

When designing and installing exterior continuous insulation, you face many important design considerations, including (but not limited to) thermal performance, air and water control layer placement, cladding attachment, fire resistance, acoustics, and sustainability targets. This guide discusses many of these considerations and provides a step-by-step design path toward a cladding attachment solution best suited for your project.

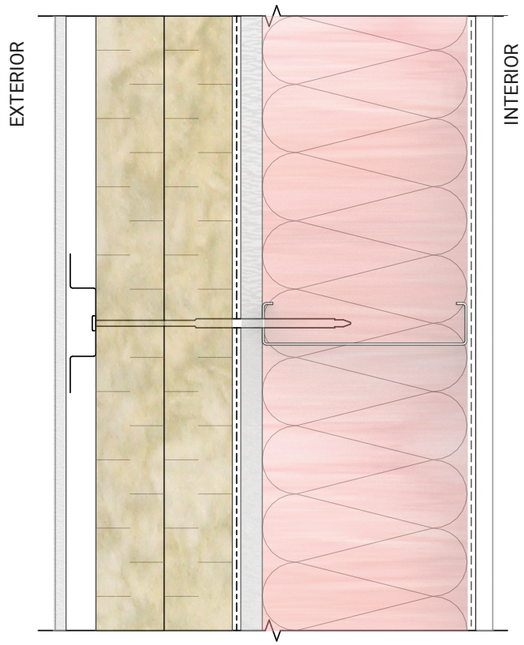


Figure 1. Plan view of a steel-stud framed wall assembly with Thermafiber® RainBarrier® ci High Compressive (HC) exterior insulation and a direct strapping attachment solution. Cladding is supported by vertical strapping attached back to the steel-stud framed wall assembly using long screws. PINK NEXT GEN® FIBERGLAS® or mineral wool batt insulate the framed wall cavity.

The direct strapping attachment solution, as referenced in this guide, uses long screws through vertical strapping and exterior continuous insulation to provide a substrate for cladding attachment.

The Benefits of Thermafiber® RainBarrier® Continuous Insulation

Water Resistance
RainBarrier® is engineered to repel and drain water.

Thermal Comfort
RainBarrier® R-values contribute to energy efficiency and will not decrease as the insulation ages.

Noncombustibility
RainBarrier® is noncombustible per S114.

Installation
RainBarrier® is a forgiving insulation that speeds installation and uses no blowing agents, requiring minimal PPE during installation.

Sound Control
RainBarrier® helps control noise between floors, through walls, and from outdoors.

Sustainability
RainBarrier® is produced with a minimum 70% recycled content and contributes to credits in several green building programs, such as LEED® and Green Globes®. RainBarrier® products also have a certified Declare Label.

Water Vapour Permeance
RainBarrier® provides a high level of vapour permeance and helps manage vapour flow, which keeps moisture from collecting on cooler surfaces.

Continuous Insulation Design Path

A suitable cladding attachment method for use with exterior continuous insulation can be determined by following the continuous insulation design path outlined in **Figure 2**. This step-by-step process can guide you toward the project-specific selection of a Thermafiber® RainBarrier® Continuous Insulation product and attachment method. These selections should then be verified by a licensed design professional before their installation on-site.

This process begins in **Step 1** with identifying the project-specific requirements that may influence or govern cladding attachment. Based on these requirements, **Step 2** guides your selection of an insulation product and attachment method. **Step 3** provides additional design guidance for a direct strapping attachment method. **Step 4** outlines additional considerations you may wish to address for the exterior wall design and installation process. Finally, **Step 5** offers general installation guidance.

Each step of the continuous insulation design path is described in this guide and includes discussion, resources, and reference tables to lead you to the cladding attachment solution suitable for your project.

Figure 2. Steps in the continuous insulation design path.

1 IDENTIFY PROJECT REQUIREMENTS

In **Step 1**, you will collect the building-specific information to influence your cladding attachment selection process. Exterior insulation is most often installed to minimize heat transfer through the building enclosure, but the exterior insulation may also support cladding, attachment, and insulation dead loads in addition to transferring loads from wind and seismic forces.

As a first step, identify the project requirements that will influence the selection of a cladding attachment solution for your project. To complete **Step 1**, do the following:

- Determine the cladding dead loads. Identify the project cladding type(s), associated cladding weights, and locations where these cladding types occur on the building. Consider any additional elements such as flashings, trim, or adornments that might contribute to the cladding dead loads.
- Determine the cladding weight classification. Use **Figure 3** to make this determination.
- Make note of the following:
  - → The corresponding backup wall structure at the clad wall area (e.g., steel-stud framed, wood frame, concrete block, etc.).
  - → Structural loads, including seismic, wind, and any other anticipated loads that may act on the cladding.
  - → Preferred cladding attachment methods, if any, which might be dictated by early-stage cost analysis, product availability limitations, or other factors.
  - → Required thermal and acoustic performance of the wall with exterior insulation. For a list of resources that can help you select the right insulation thickness for your project, turn to page 6.

The following Owens Corning library resources are available to assist you when determining the right insulation thickness for your project:

- **Owens Corning® Enclosure Solutions – Above Grade Steel Stud Wall Assemblies.** Thermal solutions that meet energy code requirements, reduce material and labour costs, and enhance acoustical performance.
- **Enclosure Solutions Thermal Bridging Guide.** Information and guidance for determining the thermal transmittance of commercial, institutional, and multi-unit residential construction using Owens Corning products and systems.
- **Thermal Bridging Playbook.** A playbook highlighting how insulation can be used more effectively on projects with a focus on achieving high levels of thermal performance while balancing a multitude of objectives.
- **Steel-Frame Clear Wall Thermal Analysis.** A discussion on the thermal analysis and modeled results of 10 common wall assembly solutions that use Thermafiber® RainBarrier® insulation.

Visit **www.owenscorninglibrary.ca** to access these resources or contact a technical representative at www.owenscorning.ca/contacttech.

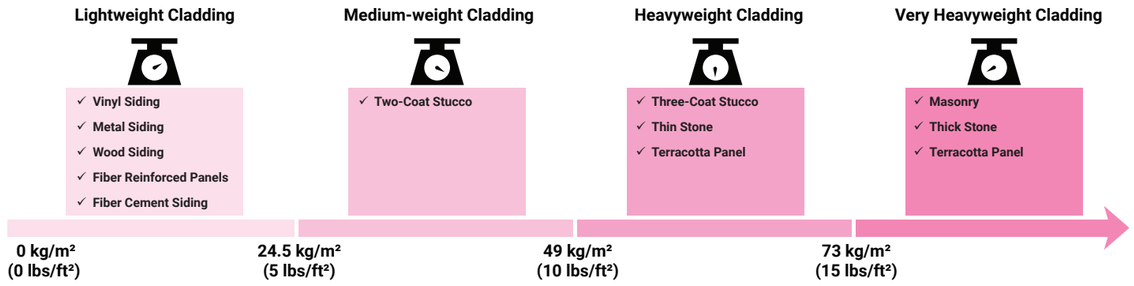


Figure 3. Cladding weight classifications. Example cladding types are listed for each classification; use the project-specific cladding weight to determine the weight classification for each cladding type.

2 SELECT INSULATION PRODUCT AND ATTACHMENT METHOD

Step 2 is when you select the insulation product based on the preferred cladding attachment methods and other physical and aesthetic properties that the building-specific design might require. This step also provides reference information on mineral wool insulation types and cladding attachment options if you need more information.

Consider consulting an Owens Corning technical representative or experienced contractor to optimize the wall assembly for cost and performance when choosing between either long screws through strapping attachment or alternate cladding attachment methods.

In this step, you will select the project-specific insulation product and attachment method. To complete **Step 2**, do the following:

- Based on the cladding weight classification you determined in **Step 1** and the products summarized in **Table 1**, select a high compressive Thermafiber® RainBarrier® HC 80/110/Max (140) mineral wool insulation.
- Based on the product(s) you identified, further refine your selection by reviewing the *physical properties* data listed in **Table 1** and retain only the product options that meet your performance requirements.
  - → Make note of the Thermafiber® RainBarrier® product(s) identified.
- To confirm the product-specific insulation thickness needed for your project, refer to the R-values in **Table 3**.
  - → Based on the exterior insulation RSI- or R-value identified in **Step 1**, identify the corresponding insulation thickness needed for your project; round up when the RSI- or R-value falls between two thicknesses.

Mineral Wool Continuous Insulation Types

This guide identifies two Thermafiber® RainBarrier® mineral wool insulation types: high compressive and semi-rigid.

Rigid Board Insulation

Thermafiber® RainBarrier® ci High Compressive rigid mineral wool insulation products (see **Figure 4**) are designed for performance in rainscreen applications. These products provide thermal performance, fire-resistive characteristics, and acoustical control while allowing moisture to drain from a wall cavity system. Compressive strength is a key physical property when specifying exterior insulation for a direct strapping attachment solution (i.e., long screws through strapping and insulation) as described in the next section. These products are designed to be used behind most cladding types—including combustible and open-joint assemblies.

Semi-Rigid Board Insulation

Thermafiber® RainBarrier®, a semi-rigid continuous insulation provides similar performance characteristics as the rigid Thermafiber® RainBarrier® ci High Compressive products but differ in their physical properties, primarily compressive strength.

Thermafiber® RainBarrier® is a nominal 6.0 pcf (lb/ft³) (96 kg/m³) density product with a monolithic density throughout the entire thickness of the product. This product is designed for use with alternate cladding attachment systems but is not suitable for direct strapping attachment solutions.

Thermafiber® RainBarrier® is also available with a black facer (see Thermafiber® RainBarrier® Dark™ in **Figure 6**) for aesthetic concealment. Thermafiber® RainBarrier® Dark™ is intended for open-joint and perforated façade systems or any application where visible masking of the insulation layer is desired.

Figure 4. RainBarrier® ci High Compressive mineral wool insulation.

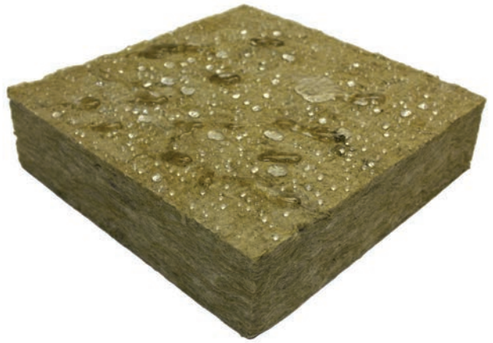


Figure 5. RainBarrier® mineral wool insulation.

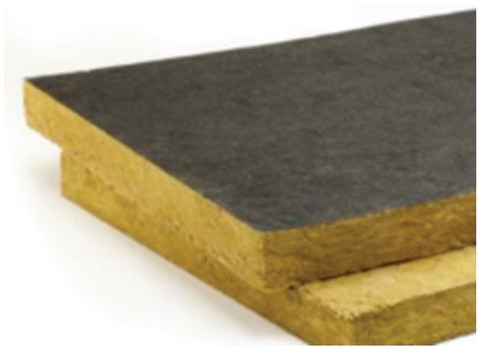


Figure 6. RainBarrier® Dark™ mineral wool insulation.

Table 1. Thermafiber® RainBarrier® product selection table.

		Thermafiber® RainBarrier® HC products for use with a direct strapping attachment method				
		RAINBARRIER® HC (80)	RAINBARRIER® HC PLUS (110)	RAINBARRIER® HC MAX (140)	RAINBARRIER®	RAINBARRIER® DARK™
		Rigid Board	Rigid Board	Rigid Board	Semi-Rigid Board	Semi-Rigid Board with Facer
					For alternate cladding attachment guidance, contact an Owens Corning technical representitive.	
DIRECT STRAPPING ATTACHMENT METHOD (see page 10)						
CLADDING WEIGHTS	0–24.5 kg/m² (0–5 lbs/ft²)	✓	✓	✓	–	
	24.5–49 kg/m² (5–10 lbs/ft²)	–	✓	✓	–	
	49–73 kg/m² (10–15 lbs/ft²)	–	✓	✓	–	
	73+ kg/m² (15+ lbs/ft²)	–	–	✓	–	
ALTERNATE CLADDING ATTACHMENT METHODS (see page 11)						
Continuous framing		–	–	–	✓ *RainBarrier® installed between framing*	
Intermittent clips and rail		–	–	–	✓ *RainBarrier® installed between clips*	
Engineered ties and anchors		–	–	–	✓ *RainBarrier® installed between ties and anchors*	
PHYSICAL PROPERTIES						
Nominal density		N/A	N/A	N/A	96 kg/m³ (6.0 lb/ft³)	
Compressive strength ASTM C165		22.7 kPa (475 lb/ft²) @ 10% deformation	34.5 kPa (720 lb/ft²) @ 10% deformation	62.1 kPa (1296 lb/ft²) @ 10% deformation	–	
RSI/25.4 mm @ 24°C (R-value/inch @ 75°F) ASTM C518*		0.74 m²•K/W (4.2 hr•ft²•°F/Btu)	0.73 m²•K/W (4.1 hr•ft²•°F/Btu)	0.71 m²•K/W (4.0 hr•ft²•°F/Btu)	0.74 m²•K/W (4.2 hr•ft²•°F/Btu)	
Mineral wool classification ASTM C612		Types IA, IB, II, III, IVA, IVB	Types IA, IB, II, III, IVA, IVB	Types IA, IB, II, III, IVA, IVB	Types IA, IB, II, III, IVA, IVB	
Corrosion (steel, aluminum, copper) ASTM C665		Pass			Pass	
Corrosion (austenitic steel) ASTM C795		Pass			Pass	
Combustibility CAN/ULC S114 ASTM E136		Noncombustible			Noncombustible	
Water vapour permeance ASTM E96		(1373 ng/Pa•s•m²) 24 perm	(2631 ng/Pa•s•m²) 46 perm	(3261 ng/Pa•s•m²) 57 perm	1432 ng/Pa.s.m² - 2850 ng/Pa.s.m² (25 perm - 50 perm)	
Flame spread/smoke developed CAN/ULC S102 ASTM E84		FS = 0 | SD = 5 FS = 0 | SD = 0	FS = 0 | SD = 5 FS = 0 | SD = 0	FS = 0 | SD = 5 FS = 0 | SD = 0	FS = 0 | SD = 5 FS = 0 | SD = 0	FS = 20 SD = 5 FS = 20 | SD = 20
Water vapour sorption ASTM C1104		Absorbs < 0.5% by volume	Absorbs < 0.5% by volume	Absorbs < 0.5% by volume	Absorbs 0.03% by volume	Absorbs 0.06% by volume
Linear shrinkage ASTM C356		< 2% @ 1200°F (650°C)			< 2% @ 1200°F (650°C)	
		FS = flame spread; SD = smoke developed				

*Values based on CAN/ULC-S702. Visit **www.owenscorninglibrary.ca** for the product data sheet.

Cladding Attachment Methods

Numerous cladding attachment methods are compatible with continuous exterior insulation, and each method consists of a unique combination of different materials and components. This guide focuses specifically on a direct strapping attachment method when using Thermafiber® RainBarrier® ci High Compressive rigid mineral wool insulation products; however, alternate cladding attachment solutions are available and include:

- Continuous framing
- Intermittent clip and rail
- Engineered ties and anchors

Table 2 summarizes these cladding attachment methods. **Step 3** of this guide provides more detailed design information for the long screws through vertical strapping attachment method. Contact an Owens Corning technical representative for more information on using Rainbarrier® with alternate cladding attachment methods.

Table 2. Summary of cladding attachment methods.

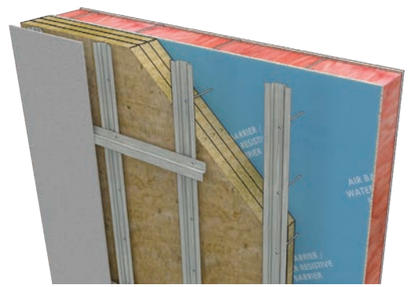
Direct Strapping Attachment	
This method uses screws that connect girts or strapping on the exterior of rigid insulation directly into the backup wall structure. The combination of the continuous girt/strapping, screws, and compression of the rigid insulation creates a truss system that supports the cladding; thus, a key physical property of the exterior insulation is compressive strength (rather than density, as commonly referenced by some in the industry). This cladding attachment method is most appropriate for light- to medium-weight cladding. The main thermal bridge in this system is via the long screws, which create a relatively small thermal bridge compared to a larger clip or girt. The effects of this thermal bridge can be minimized further by using a lower-conductivity metal such as stainless steel. The thermal performance for this cladding attachment method is generally efficient and effective, depending on the backup wall structure and screw spacing. However, there are special considerations when using a long-screw system. Any screws that miss the backup wall structure framing can impact the structural integrity of the system. Screws that miss the backup wall structure and are removed will also produce holes in the underlying air and water resistive barrier layer. Thus, it is recommended to not remove these screws and to confirm whether additional fasteners may be required to satisfy structural requirements.	

Table 2. (continued) Summary of cladding attachment methods.

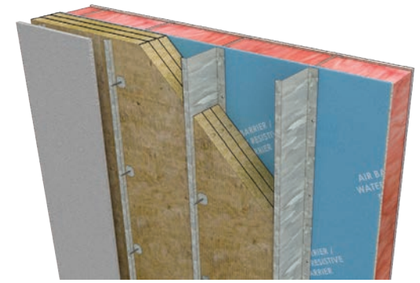
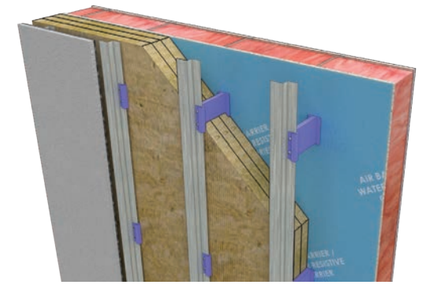
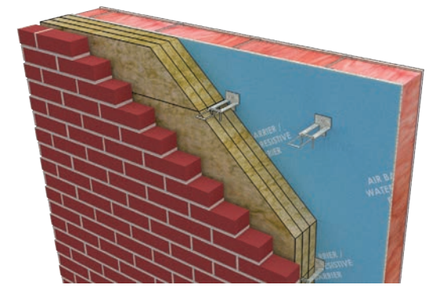
Continuous Framing	
Continuous framing uses a cladding attachment system consisting of a continuous Z-girt framing member installed horizontally, vertically, or as a dual "crossing" Z-girt system. This system bridges the full depth of the exterior insulation. If the system is vertical, the Z-girt is installed to be aligned with each wall stud. If it is horizontal, the Z-girts are typically spaced every 24 inches (610 mm) to 48 inches (1220 mm). Continuous framing cladding attachment methods are considered more easily constructable, but they do not perform well thermally unless constructed of fiberglass. The method of using metal continuous framing for cladding attachment has largely been replaced by fiberglass framing and the intermittent clip and rail method described below.	
Intermittent Clip and Rail	
Clip and rail systems are more thermally efficient than continuous metal framing and can support all types of cladding. Clip and rail systems consist of vertical and/or horizontal girts attached to/through intermittent clips that are then attached to the structure through the exterior insulation. The ideal strategy with a clip and rail system is to use as few clips as possible while meeting the building's structural requirements. Clip and rail systems can consist of aluminum clips, galvanized or stainless-steel clips, thermally isolated clips, or fiberglass clips.	
Engineered Ties and Anchors	
Anchored masonry veneer cladding systems are supported by gravity-bearing supports such as shelf angles or corbels at the bottom and intermittent masonry ties for lateral support in the field of the wall assembly. Masonry ties bridge the exterior insulation like long screws, but the system does not apply pressure or compress the exterior insulation. Masonry ties like long screws are also thermal bridges but can be thermally efficient based on the conductivity of the metal, the number of ties, and the type of tie selected. Stainless steel is typically the optimal material for masonry ties due to its low thermal conductivity and high degree of corrosion resistance. In addition, some anchor or clip systems are specially designed for use with specific cladding materials and types. For example, stone veneer systems use heavy steel gauge clips to support the heavy cladding. These larger and thicker attachment clips typically result in larger thermal bridges. These systems are usually proprietary and designed with a specific project, cladding type, or brand in mind. Other engineered anchors can use fiberglass, aluminum, or plastic clips while minimizing thermal bridging. Due to the specialized nature of some engineered anchor systems, the remainder of this guide largely focusses on masonry tie systems.	

Table 3. RainBarrier® Continuous Insulation R-value by total insulation thickness. Multiple layers of insulation may be required to achieve the total thickness listed.

Thermafiber® RainBarrier® ci HC (80)

RSI /25.4 mm @ 24 °C•m²•K/W	0.74
R-value /inch @ 75°F hr•ft²•F/Btu	4.2

TOTAL INSULATION THICKNESS		RSI-VALUE	R-VALUE
(mm)	(in.)		
38	1.5	1.11	6.3
51	2	1.48	8.4
64	2.5	1.85	10.5
76	3	2.22	12.6
89	3.5	2.59	14.7
102	4	2.96	16.8
114	4.5	3.33	18.9
127	5	3.70	21.0
140	5.5	4.07	23.1
152	6	4.44	25.2
165	6.5	4.81	27.3
178	7	5.18	29.4
191	7.5	5.55	31.5
203	8	5.92	33.6
216	8.5	6.29	35.7
229	9	6.66	37.8
241	9.5	7.03	39.9
254	10	7.40	42.0
267	10.5	7.77	44.1
279	11	8.14	46.2
292	11.5	8.51	48.3
305	12	8.88	50.4

Thermafiber® RainBarrier® ci HC Plus (110)

RSI /25.4 mm @ 24 °C•m²•K/W	0.73
R-value /inch @ 75°F hr•ft²•F/Btu	4.1

TOTAL INSULATION THICKNESS		RSI-VALUE	R-VALUE
(mm)	(in.)		
32	1.25	0.91	5.1
38	1.5	1.10	6.2
51	2	1.46	8.2
64	2.5	1.83	10.3
76	3	2.19	12.3
89	3.5	2.56	14.4
102	4	2.92	16.4
114	4.5	3.29	18.5
127	5	3.65	20.5
140	5.5	4.02	22.6
152	6	4.38	24.6
165	6.5	4.75	26.7
178	7	5.11	28.7
191	7.5	5.48	30.8
203	8	5.84	32.8
216	8.5	6.21	34.9
229	9	6.57	36.9
241	9.5	6.94	39.0
254	10	7.30	41.0
267	10.5	7.67	43.1
279	11	8.03	45.1
292	11.5	8.40	47.2
305	12	8.76	49.2

Table 3. (continued) RainBarrier® Continuous Insulation R-value by total insulation thickness. Multiple layers of insulation may be required to achieve the total thickness listed.

Thermafiber® RainBarrier® ci HC Max (140)

RSI /25.4 mm @ 24 °C•m²•K/W	0.71
R-value /inch @ 75°F hr•ft²•F/Btu	4.0

TOTAL INSULATION THICKNESS		RSI-VALUE	R-VALUE
(mm)	(in.)		
25	1	0.71	4.0
38	1.5	1.07	6.0
51	2	1.42	8.0
64	2.5	1.78	10.0
76	3	2.13	12.0
89	3.5	2.49	14.0
102	4	2.84	16.0
114	4.5	3.20	18.0
127	5	3.55	20.0
140	5.5	3.91	22.0
152	6	4.26	24.0
165	6.5	4.62	26.0
178	7	4.97	28.0
191	7.5	5.33	30.0
203	8	5.68	32.0
216	8.5	6.04	34.0
229	9	6.39	36.0
241	9.5	6.75	38.0
254	10	7.10	40.0
267	10.5	7.46	42.0
279	11	7.81	44.0
292	11.5	8.17	46.0
305	12	8.52	48.0

Thermafiber® RainBarrier® and RainBarrier® Dark™

RSI /25.4 mm @ 24 °C•m²•K/W	0.74
R-value /inch @ 75°F hr•ft²•F/Btu	4.2

TOTAL INSULATION THICKNESS		RSI-VALUE	R-VALUE
(mm)	(in.)		
25	1	0.74	4.2
38	1.5	1.11	6.3
51	2	1.48	8.4
64	2.5	1.85	10.5
76	3	2.22	12.6
89	3.5	2.59	14.7
102	4	2.96	16.8
114	4.5	3.33	18.9
127	5	3.70	21.0
140	5.5	4.07	23.1
152	6	4.44	25.2
165	6.5	4.81	27.3
178	7	5.18	29.4
191	7.5	5.55	31.5
203	8	5.92	33.6
216	8.5	6.29	35.7
229	9	6.66	37.8
241	9.5	7.03	39.9
254	10	7.40	42.0
267	10.5	7.77	44.1
279	11	8.14	46.2
292	11.5	8.51	48.3
305	12	8.88	50.4

Product is used for alternate attachment methods. For alternate cladding attachment guidance, contact an Owens Corning technical representitive.

3 ESTIMATE DIRECT STRAPPING ATTACHMENT

Step 3 further refines the attachment method that uses long screws through vertical strapping.

This method includes continuous vertical straps that are secured with long screws through exterior RainBarrier® ci HC insulation and into the backup wall structure. Additional horizontal cross straps over the vertical strapping may also be added to accommodate different cladding-specific attachment needs and layouts.

In this step, you will estimate the direct strapping attachment design. To complete **Step 3**, do the following:

- Based on the backup wall structure identified in **Step 1**, refer to **Table 4** for wood-framed backup walls and **Table 5** for steel-stud framed backup walls.
- Using the tables, the cladding weight classification (from **Step 1**), and the minimum continuous exterior insulation thickness (based on RSI-value or R-value) in **Step 2**, identify and make note of the following:
  - → Maximum vertical screw spacing
  - → Minimum screw diameter
  - → Minimum screw embedment
  - → Minimum strapping size
- Make note of the fastener table assumptions described in this step and at the foot of each table.
- Identify the strapping spacing and multilayer insulation staggering dimensions described in this step.
- Verify the vertical strapping attachment design with a licensed design professional for approval prior to installing.

Refer to the additional information in this step and **Appendix A** to aid in the design of this system.

Screw Spacing and Selection

When using a direct strapping attachment method, you will need to consider many variables to determine a project-specific attachment design solution. These variables include but aren't limited to:

- Cladding and insulation weight (see **Appendix B**);
- Strapping type, size, shape, gauge (where applicable), and spacing;
- Backup wall sheathing and framing spacing; and
- Screw type, size, spacing, embedment depth (see **Table 6**), and installation torque.

The direct strapping attachment method needs to be designed to withstand all combined applied loads, including but not limited to wind loads, seismic loads, and dead loads (insulation, screws, and all cladding and cladding support materials).

Use the information in **Table 4** for wood-framed and **Table 5** for steel-stud framed backup walls to estimate a starting point for a permanent attachment solution. The information in these tables identify solutions that support both the exterior insulation and the cladding when using long screws through vertical strapping and Owens Corning® Thermafiber® RainBarrier® ci HC 80, ci HC Plus 110, and ci HC Max exterior insulation.

The information in **Table 4** and **Table 5** is based on laboratory testing commissioned by Owens Corning to demonstrate the relationship between cladding gravity loads and strapping deflection under short-term cladding weights. The engineering calculations used to formulate fastener guidance in these tables are based on many variables, but they generally represent attachment for typical low- to mid-rise buildings built using typical wood and steel-stud framing techniques. These values are provided as estimates and require project-specific verification by a licensed design professional, especially where higher wind loads are expected on taller buildings.

To access the Thermafiber® RainBarrier® product information, visit

www.owenscorninglibrary.ca.

The direct strapping attachment method requires that a qualified design professional determine the project-specific design requirements of the system. **Step 3** includes information that can inform the general design before that review and approval process takes place.

When selecting a screw option, consider that:

- Strapping locations need to align with the backup wall framing members; thus, the spacing of strapping is the same as the stud spacing of the backup wall framing.
- In wood-frame construction, there may be an option for screws to be secured to ¾-inch thick Douglas Fir plywood sheathing in lieu of into wood sheathing and studs, depending on the structural design. In this option, the long screws are embedded into the sheathing, independent of the stud spacing. This attachment option requires project-specific verification by a licensed design professional.
- By selecting the largest screw spacing that can meet project requirements, you will limit unnecessary thermal bridging through the insulation and reduce the number of penetrations through the air barrier and water-resistive barrier membrane (when located at the wall sheathing face).

Table 4. Thermafiber® RainBarrier® ci High Compressive fastener tables for direct strapping attachment into wood framing.*

Wood Framing

RAINBARRIER CI HIGH COMPRESSIVE

EXTERIOR INSULATION THICKNESS	MAXIMUM VERTICAL SCREW SPACING	MINIMUM SCREW DIAMETER	MINIMUM SCREW EMBEDMENT	MINIMUM VERTICAL STRAPPING SIZE
16" o.c. WOOD-FRAME WALL ASSEMBLIES				
Lightweight Cladding < 24.5 kg/m² (5 lbs/ft²)				
up to 3"	24"	#10	1-1/2"	3/4" x 2-1/2"
>3" to 6"	16"			
>6" to 9"	10"	#12		
Medium-weight Cladding 24.5 kg/m² to < 49 kg/m² (5 lbs/ft² to < 10 lbs/ft²)				
up to 3"	12"	#12	1-1/2"	3/4" x 3"
>3" to 6"	10"			
>6" to 9"	8"	#14		
Heavyweight Cladding 49 kg/m² to < 73 kg/m² (10 lbs/ft² to < 15 lbs/ft²)				
up to 3"	10"	#14	1-1/2"	3/4" x 3-1/2"
>3" to 6"	8"			
>6" to 9"	6"	5/16"		

EXTERIOR INSULATION THICKNESS	MAXIMUM VERTICAL SCREW SPACING	MINIMUM SCREW DIAMETER	MINIMUM SCREW EMBEDMENT	MINIMUM VERTICAL STRAPPING SIZE
24" o.c. WOOD-FRAME WALL ASSEMBLIES				
Lightweight Cladding < 24.5 kg/m² (5 lbs/ft²)				
up to 3"	16"	#10	1-1/2"	3/4" x 2-1/2"
>3" to 6"	12"			
>6" to 9"	8"	#12		
Medium-weight Cladding 24.5 kg/m² to < 49 kg/m² (5 lbs/ft² to < 10 lbs/ft²)				
up to 3"	8"	#12	1-1/2"	3/4" x 3"
>3" to 6"	6"			
>6" to 9"	5"	#14		
Heavyweight Cladding 49 kg/m² to < 73 kg/m² (10 lbs/ft² to < 15 lbs/ft²)				
up to 3"	6"	#14	1-1/2"	3/4" x 3-1/2"
>3" to 6"	5"			
>6" to 9"	4"	5/16"		

o.c. = on center

*Values listed in this table generally represent attachment for low- to mid-rise buildings built using typical wood-stud framing techniques. A minimum insulation compressive strength of 475 psf (22.7 kPa) at 10% per ASTM C165 testing is assumed. Fasteners are assumed to be torqued such that they remain under tension throughout the lifespan of the building and when subjected to environmental loading. These values are provided as estimates and require project-specific verification by a licensed design professional.

In wood-frame construction, screws may also be secured to ¾-inch thick plywood sheathing in lieu of into wood sheathing and studs, depending on the structural design.

Table 5. Thermafiber® RainBarrier® ci High Compressive fastener tables for direct strapping attachment into steel-stud framing.*

Steel-Stud Framing

RAINBARRIER CI HIGH COMPRESSIVE

EXTERIOR INSULATION THICKNESS	MAXIMUM VERTICAL SCREW SPACING	MINIMUM SCREW DIAMETER	MINIMUM SCREW EMBEDMENT	MINIMUM VERTICAL STRAPPING SIZE
16" o.c. STEEL STUD WALL ASSEMBLIES				
Lightweight Cladding < 24.5 kg/m² (5 lbs/ft²)				
up to 3"	16"	#12	through stud flange	7/8" x 1-1/4" 20ga hat track
>3" to 6"	12"			
>6" to 9"	10"			
Medium-weight Cladding 24.5 kg/m² to < 49 kg/m² (5 lbs/ft² to < 10 lbs/ft²)				
up to 3"	12"	#12	through stud flange	7/8" x 1-1/4" 20ga hat track
>3" to 6"	10"			
>6" to 9"	8"			
Heavyweight Cladding 49 kg/m² to < 73 kg/m² (10 lbs/ft² to < 15 lbs/ft²)				
up to 3"	10"	#14	through stud flange	7/8" x 1-1/4" 20ga hat track
>3" to 6"	8"			
>6" to 9"	6"			

EXTERIOR INSULATION THICKNESS	MAXIMUM VERTICAL SCREW SPACING	MINIMUM SCREW DIAMETER	MINIMUM SCREW EMBEDMENT	MINIMUM VERTICAL STRAPPING SIZE
24" o.c. STEEL STUD WALL ASSEMBLIES				
Lightweight Cladding < 24.5 kg/m² (5 lbs/ft²)				
up to 3"	12"	#12	through stud flange	7/8" x 1-1/4" 20ga hat track
>3" to 6"	10"			
>6" to 9"	8"			
Medium-weight Cladding 24.5 kg/m² to < 49 kg/m² (5 lbs/ft² to < 10 lbs/ft²)				
up to 3"	8"	#12	through stud flange	7/8" x 1-1/4" 20ga hat track
>3" to 6"	6"			
>6" to 9"	5"			
Heavyweight Cladding 49 kg/m² to < 73 kg/m² (10 lbs/ft² to < 15 lbs/ft²)				
up to 3"	6"	#14	through stud flange	7/8" x 1-1/4" 20ga hat track
>3" to 6"	5"			
>6" to 9"	4"			

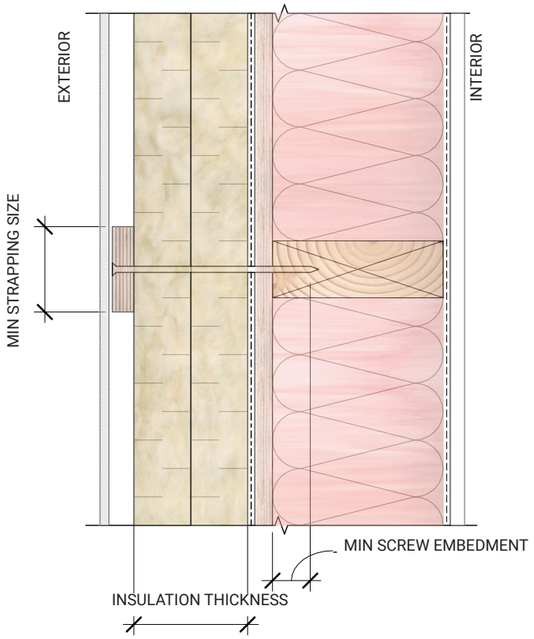
o.c. = on center

*Values listed in this table generally represent attachment for low- to mid-rise buildings built using typical steel-stud framing techniques. A minimum insulation compressive strength of 475 psf (22.7 kPa) at 10% per ASTM C165 testing is assumed. Fasteners are assumed to be torqued such that they remain under tension throughout the lifespan of the building and when subjected to environmental loading. These values are provided as estimates and require project-specific verification by a licensed design professional.

The direct strapping attachment method needs to be designed to withstand all combined applied loads, including but not limited to wind loads and dead loads (insulation, screws, and all cladding and cladding support materials).

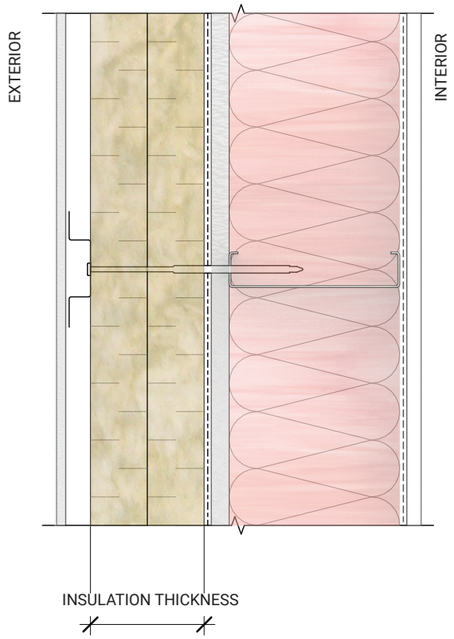
Table 6. Minimum screw embedment.

Wood-Framed Walls (Plan View)



Embedment depth excludes the tapered tip of the screw and sheathing thickness and is typically a minimum of 1.5 inches (38 mm).

Steel-Stud Framed Walls (Plan View)



Embedment into steel-stud walls requires fastening through the stud flange with a minimum of three screw thread lengths past the back of the flange.

*Cladding attachment to strapping not shown for clarity.

CONTINUOUS INSULATION SCREWS

In strapping applications, long screws function to keep insulation flush with the wall substrate in a continuous fashion for the intended life of the structure. Screw specifications depend on the backup wall material and the load capacity required for attachment as well as other factors like required corrosion resistance, product availability, etc.

The corrosion resistance of fasteners will impact the long-term durability of the wall assembly and cladding attachment system. Owens Corning recommends that the corrosion resistance of screws used for cladding attachment systems are appropriately selected for the project-specific conditions, including the building and fastener exposure and expected cladding lifespan. Stainless-steel screws or fasteners with a minimum 2000-hour salt spray resistance are generally recommended. For more discussion on corrosion resistance and material compatibility, refer to **Step 4**.

The use of adhesive-based attachments, such as those used with impaling pin types, are not reliable as permanent attachment methods unless appropriately engineered and quality controlled on-site during installation. However, these attachments can be suitable to temporarily hold boards in place while permanent attachments are being installed. When adhesive-based attachment methods that impale or attach to the air barrier and/or water-resistive barrier membrane are used, confirm the compatibility and detailing requirements of the attachment with the membrane manufacturer to avoid damage to the membrane.

To learn more about fastener types and product options, refer to Appendix A of this guide.

Vertical Strapping Spacing

Strapping members are installed vertically outboard of the insulation and attached through the insulation to the backup wall framing. The strapping then compresses the insulation in place as the strapping is attached. As previously noted, the spacing of strapping typically corresponds with the stud spacing of the backup wall framing (e.g., it will commonly varry from 16 inches (406 mm) on-centre to 24 inches (610 mm) on-centre). Additional horizontal strapping can be added over the vertical strapping to accommodate different cladding arrangements and attachment needs.

The following are best practice guidelines for spacing the straps:

- When strapping is used to retain two or more layers of insulation, stagger each layer of insulation (i.e., offset) a minimum of 16 inches (406 mm) from the insulation boards beneath. See **Figure 7**.
- Locate strapping a minimum of 8 inches (200 mm) from the insulation board edge when measured perpendicular to the strapping. This applies to all layers of insulation. See **Figure 7**.

Additional Retainment

Based on the insulation layout and backup wall framing availability, additional insulation fasteners may be required (in addition to those used to attach the vertical strapping). These additional fasteners are used to retain the insulation boards tight together and tight to the backup wall. The additional attachment is important for the long-term securement of the boards; it reduces the risk that boards may move within the cavity due to wind pressures and long-term creep, and it holds the boards tight to the substrate, which reduces gaps and improves the effective thermal performance of the exterior insulation.

Additional retainment requires the selection of appropriate fasteners that are part of the engineered cladding attachment solution. The specific fastener spacing and fastener selection will depend on project-specific applications. Attachment options may include nails, screws with washers, plastic washer-style fasteners, and impaling pins. Refer to **Appendix A** of this guide to learn more about these options and recommendations for their use.

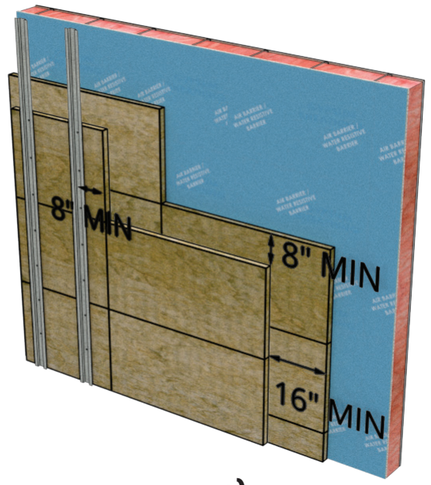


Figure 7. Multi-layer insulation application for a) two layers of insulation, and b) three layers of Thermafiber® RainBarrier® ci High Compressive exterior insulation.

4 ADDRESS ADDITIONAL DESIGN CONSIDERATIONS

Step 4 summarizes many of the design considerations for exterior-insulated wall assemblies that require a designer's attention and have not yet been specifically addressed in **Steps 1** through **3**.

These considerations are specific to the insulation material selection and attachment of the insulation and cladding products, and when appropriately applied can support the long-term durability of the wall assembly.

In this step, you will address additional design considerations when designing with RainBarrier® mineral wool exterior insulation for wall assemblies. Note that additional design considerations can vary significantly by project. **Step 4** discusses the general considerations listed below.

- Weather exposure
- Assembly moisture balance
- Corrosion resistance
- Material compatibility
- Thermal performance
- Fire and smoke performance
- Acoustic performance

Weather Exposure

Owens Corning® Thermafiber® RainBarrier® mineral wool insulation products are designed to handle construction-phase environmental conditions. During construction and before the cladding, flashings, and finishes are completed, the Thermafiber® RainBarrier® insulation will likely be exposed to normal environmental elements such as ultraviolet (UV) light, heat, and moisture in the form of rainwater and snow.

When exposed to normal weather, Thermafiber® RainBarrier® insulation products are expected to remain undamaged and secured to the building when a properly engineered attachment is used. However, exterior insulation should not be exposed to extreme weather conditions such as natural disasters, wildfires, flooding, hurricanes, tornadoes, high winds, torrential downpours, and blizzard conditions. Additionally, Thermafiber® insulation should not be left exposed to rushing or running water, such as the water from a roof with an incomplete gutter or soffit system.

If Owens Corning® Thermafiber® RainBarrier® exterior insulation remains in place and is not dislodged, removed, or mechanically damaged, and the proper drainage requirements are met, the insulation can remain uncovered for 90 days with unfaced products and 30 days with faced products prior to covering with a cladding system. To use Thermafiber® RainBarrier® products beyond these durations, consult with an Owens Corning technical representative for guidance.

Owens Corning® Thermafiber® RainBarrier® insulation products are vapour-permeable and water resistant; thus, they are appropriate for use within rainscreen cavity spaces and outboard of water barrier membranes.

Assembly Moisture Balance

Because Owens Corning® Thermafiber® RainBarrier® is a vapour-permeable insulation product, other wall assembly layers may be required for appropriate water vapour control across the assembly. The use and material selection of a vapour control membrane, such as a vapour retarder/barrier membrane or low-permeance air barrier and water-resistive barriers, will depend on the project-specific exterior climate and the interior space use of the building. The use of vapour control layers and other low-permeance building materials within the wall assembly requires careful consideration by a qualified design professional to limit the risk of moisture accumulation within the wall assembly.

Corrosion Resistance

Corrosion under insulation (CUI) is a long-term durability design consideration with respect to building materials. This type of corrosion occurs when metal hidden behind insulation has prolonged contact with water and any resulting corrosion cannot be seen. The material properties of mineral wool insulation can reduce corrosion risk. Owens Corning® Thermafiber® RainBarrier® is water-resistant and allows water vapour to diffuse through it, which encourages drying of the underlying materials and can reduce CUI concerns.

Corrosion resistance isn't only an insulation material consideration. As previously discussed in this guide, the corrosion resistance of exterior fasteners, clips, and continuous framing should also be considered for long-term durability. Owens Corning recommends that exterior fasteners like long screws be either stainless steel or galvanized steel and have a minimum 2,000-hour salt spray resistance. Continuous framing, like metal Z-girts, for cladding attachment are typically 16-gauge sheet steel with a minimum G90 galvanized coating thickness, AZ150 Galvalume coating, stainless steel, or possibly fiberglass. Additional corrosion resistance, like G185 galvanic coatings, may be necessary in corrosive environments, such as marine climates that experience salt exposure. Corrosion risk can also be limited by using best practice design approaches that effectively manage and limit water exposure behind the cladding system.

Material Compatibility

Cladding attachment systems, including screws, strapping, insulation, and cladding, need to be compatible materials.

Pressure-treated wood or plywood is commonly used for vertical strapping with long-screw cladding attachment systems. Some common pressure-treated wood preservatives available for commercial use contain large amounts of copper and increase the risk of galvanic corrosion with other metals.

When pressure-treated wood preservatives are used, careful attention is needed to select metal-based components, including fasteners, that will avoid premature corrosion of the metal components and ensure long-term performance and load capacity. Exercise caution when using aluminum-based materials in conjunction with copper-based wood treatments such as ACQ. Additionally, many metal cladding materials may require a physical separation between the wood strapping and cladding products.

Thermal Performance

As discussed previously in this guide, continuous exterior insulation reduces the effects of thermal bridging caused by wall framing and reduces heating and cooling loads; however, it does not eliminate thermal bridging. Cladding and insulation attachment systems also cause thermal bridges through continuous exterior insulation. Regardless of the cladding or insulation attachment method used, each attachment method will have different thermal performance characteristics and may require thermal modelling to determine the effective thermal performance of the wall assembly.

The following resources available at **www.owenscorninglibrary.ca** can assist your design team in determining the appropriate insulation approaches and evaluating cladding attachment options.

- **Enclosure Solutions Thermal Bridging Guide**
- **Thermal Bridging Playbook**
- **Steel-Frame Clear Wall Thermal Analysis**
- **Owens Corning® Enclosure Solutions – Above Grade Steel Stud Wall Assemblies**

Additionally, when you are using a proprietary cladding attachment method like intermittent clips and rails, consult the system manufacturer's literature for information on the system's structural uses and limitations as well as its effective thermal performance.

In addition to the design approach selected for thermal insulation, installation practices can impact long-term in-service performance. Dislodged boards and gaps between insulation layers or cladding attachments can negatively impact the insulation's effective thermal performance. Therefore, specify appropriate installation methods and attachment as recommended by Owens Corning.

Refer to the architectural specifications at **www.owenscorninglibrary.ca** for more information and contact your local technical representative for more guidance.

Noncombustibility

A noncombustible 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 vapours when subjected to fire or heat. Materials that pass CAN/ULC-S114, "Test for Determination of Non-Combustibility in Building Materials," are considered noncombustible materials in Canadian jurisdictions. Thermafiber® RainBarrier® products are considered noncombustible per the CAN/ULC S114 standard.

As a noncombustible material, mineral wool insulation is ideal for assemblies with combustible claddings and/or water-resistive barriers. When used with other combustible products, mineral wool contributes to meeting the criteria of CAN/ULC-S134, "Fire Test of Exterior Wall Assemblies," since the mineral wool does not ignite or combust. It also reduces fire spread through cavities, and it protects materials over which it is installed. CAN/ULC-S134 measures fire spread over and within an exterior wall assembly and heat flow from the fire on the exterior surface of the wall. CAN/ULC-S134 is referenced in the National Building Code of Canada (NBC) and other provincial codes when combustible materials are proposed as part of the exterior wall assembly, including cladding, in a building required to be constructed of noncombustible materials.

Consult an Owens Corning technical representatives or refer to the Canadian RainBarrier® Insulation Guide at **www.owenscorninglibrary.ca** for more information.

Acoustic Performance

The material properties of Thermafiber® RainBarrier® mineral wool insulation naturally improve acoustic performance, especially when paired in exterior wall assemblies using Owens Corning batt insulation products. While Thermafiber® RainBarrier® is not specifically designed to provide acoustic control, the additional layer of continuous mineral wool insulation on the exterior face of the wall assembly improves the acoustic performance of the wall.

5 CONSIDER INSULATION INSTALLATION GUIDANCE

Step 5 outlines common installation considerations and recommendations when preparing for and installing Thermafiber® RainBarrier® exterior insulation and cladding attachment systems. Although the installation of materials isn't typically on the "design" path, designers and contractors who consider installation guidance during the design process can better specify and support the use of exterior insulation systems on their projects.

In this step, you will consider the installation guidance and recommendations to prepare for and install Thermafiber® RainBarrier® exterior insulation when used with various cladding attachment systems. To complete **Step 5**, do the following:

- Confirm that the final cladding attachment system for insulation board fasteners (either mechanically or adhesively attached) for your project are verified and approved by a qualified design professional.
- Consider that materials behind the exterior insulation will be concealed once the installation is complete. Specify the completion of all wall penetrations and air and water barrier membranes prior to insulation installation.
- Recognize that installation of long screws through vertical strapping and insulation require blind attachment fastening conditions. Consider whether the installer is appropriately trained to execute this installation or if additional training may be required to follow Owens Corning best practices.
- Assess the need to provide intermediate structural support, especially for backup walls that use gypsum sheathing over steel-stud framing and around building corners, penetrations, and windows. If intermediate support is needed, it as a part of the cladding attachment system and will need to be verified and approved by a qualified design professional.
- If adhesives will be used, check the adhesive's compatibility with the intended substrate and insulation boards by contacting the adhesive manufacturer or referencing the manufacturer's documentation on material compatibility. Also specify the required substrate surface conditions (e.g., wetness, dirtiness, surface temperature), quality assurance requirements, and compliance with the adhesive manufacturer's instructions to promote a long-term bond/attachment.

Refer to the reference information in this step to aid you in your design process.

Project-Specific Design

Cladding attachment systems for any project require a project-specific design that clearly specifies all materials and attachment requirements. Key considerations include the dead, wind, and seismic loads (at a minimum) in addition to appropriate safety factors. Other factors may also affect the attachment design such as corrosion resistance, compatibility of materials, and thermal cycling/wetting of the backup wall structure prior to installation of the insulation.

Blind Fastening Procedures for Long-Screw Attachments

Blind fastening conditions are common in applications where the cladding and cladding attachment are fastened outboard of the mineral wool insulation, like the direct strapping attachment method, or when using screw-type masonry ties. These situations are "blind" because the backup wall stud or other structure intended to receive the cladding attachment is not directly visible. Although there are many applications that require blind fastening, Owens Corning has identified the following best practices to assist installers with performing a plumb attachment penetration that will minimize accidental penetration of other building components:

- A laser line can be used to identify the line of each stud and to mark the stud line on the exterior insulation. This line will help to facilitate through-screw applications. This method can cause some issues because the exterior insulation boards need to be attached to the backup wall before the vertical strapping is installed.
- A drill guide may be useful for installing long screws to assist with accurate placement of the screws, which will help to meet project-specific fastening requirements and ensure penetration through multiple layers of exterior insulation.
- When installing wood strapping for long-screw attachment, installation challenges can be alleviated by pre-drilling the strapping and using countersunk fasteners.
- In steel frame construction, careful alignment is required because self-tapping metal screws can move across the surface of the steel stud before penetrating it. This movement could damage the backup wall membrane and gypsum sheathing.
- It is important to install screws in conformance with the designed minimum screw torque. In steel frame construction, do not over-torque the screw, which could strip the steel stud.
- If the receiving stud is missed and there is concern about penetrating the continuity of any concealed air barrier and water-resistive barrier membrane, industry best practice is to leave the missed screw in place. If damage to the membrane(s) is suspected, repair the membrane per the manufacturer's guidance.

Adhesives

Adhesives may sometimes be used during the installation of exterior insulation, either as backing on impaling pins or temporarily to attach insulation boards during the installation of permanent attachments.

When using adhesives, consider the adhesive's compatibility with the substrate and/or Thermafiber® RainBarrier®. Some adhesives will not stick to certain substrates and/or could result in damage to the substrate. To check an adhesive's compatibility with the substrate and insulation boards, contact the adhesive manufacturer or reference the manufacturer's material compatibility documentation.

Another general concern with adhesives is the substrate surface conditions. Conditions such as surface wetness or contamination and the substrate surface temperature can affect the bond and longevity of the adhesive used. It is best practice to follow the adhesive manufacturer's installation instructions and recommendations; these instructions usually include installation requirements like minimum and maximum air temperature, minimum and maximum surface temperature, the pressure required for pressure-activated adhesives (e.g., adhesive-backed impaling pins), and other substrate preparation requirements.

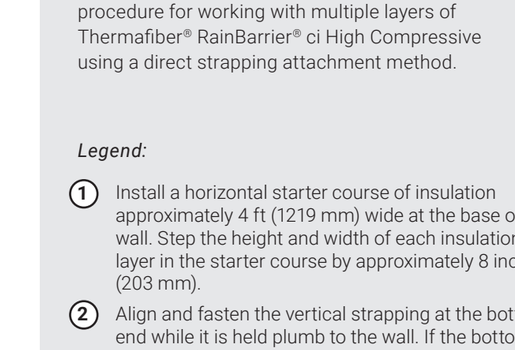
Adhesives applied directly to Thermafiber® RainBarrier® for insulation attachment or adhesive-backed impaling pins should be limited to temporary insulation attachment only unless directed by a qualified design professional.

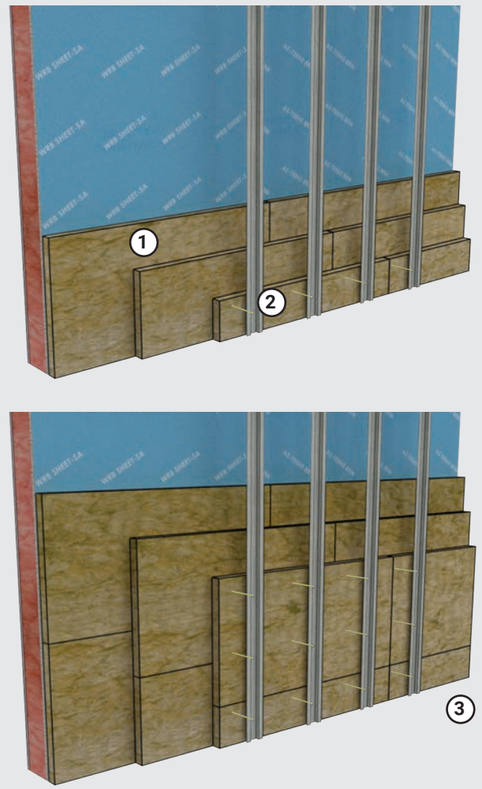
Multi-Layer Installation

Figure 8 outlines a recommended installation procedure for working with multiple layers of Thermafiber® RainBarrier® ci High Compressive using a direct strapping attachment method.

Legend:

1. Install a horizontal starter course of insulation approximately 4 ft (1219 mm) wide at the base of wall. Step the height and width of each insulation layer in the starter course by approximately 8 inches (203 mm).
2. Align and fasten the vertical strapping at the bottom end while it is held plumb to the wall. If the bottom screw in the strapping contacts the backup wall studs and the backup wall studs are plumb, the fasteners installed further up on the strapping should also contact the backup wall stud.
3. Slide the next course of insulation behind the strapping and stack it on the starter course. Install screws up the strapping through the insulation boards based on the long-screw fastening pattern approved for the project. Continue to stagger insulation layers as recommended by Owens Corning.
4. Continue to work up and across the wall following the method in **Step 1** and staggering insulation layers butt tight to the first starter course.





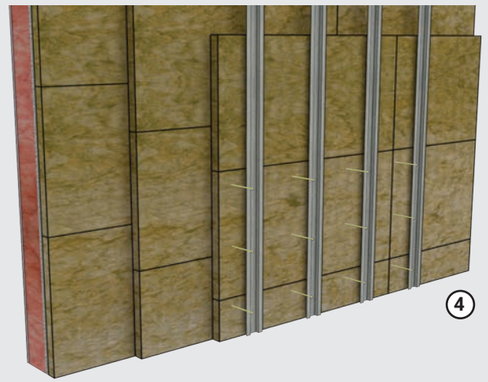


Figure 8. Thermafiber® RainBarrier® ci High Compressive installation sequence for three layers of insulation using the direct strapping attachment.

REFERENCES

Visit the Owens Corning Library at **www.owenscorninglibrary.ca** to access these helpful resources.

General Resources

Owens Corning® Enclosure Solutions – Above Grade Steel Stud Wall Assemblies (Pub # 501152)

Steel-Frame Clear Wall Thermal Analysis (Pub #600222)

Thermal Bridging Playbook (Pub # 501388)

Enclosure Solutions Thermal Bridging Guide (Pub # 501023)

Enclosure Solutions: NFPA 285 Accepted Complete Walls published by Owens Corning® (Pub # 10020919)

Canadian RainBarrier® Insulation Guide (Pub # 600060)

Product Data Sheets

Thermafiber® RainBarrier® Mineral Wool Continuous Insulations (Pub # 600000)

Thermafiber® RainBarrier Dark Mineral Wool Insulation (Pub # 600092)

Thermafiber® RainBarrier® CI High Compressive (80) Mineral Wool Insulation (Pub # 600062)

Thermafiber® RainBarrier® CI High Compressive Plus (110) Mineral Wool Insulation (Pub # 600064)

Thermafiber® RainBarrier® CI High Compressive Max Mineral Wool Insulation (Pub # 600066)

Thermafiber® SAFB™ Mineral Wool Acoustic Batt Insulation (Pub # 600008)

Thermafiber® Performance Criteria Summary Sheet published by Owens Corning (Pub # 600018)

APPENDIX A: INSULATION ATTACHMENT PRODUCTS

This appendix summarizes common attachment products that can be used when temporarily and permanently attaching Theramfiber® RainBarrier® Continuous Insulation to various backup wall substrates.

As recommended throughout this guide, the project-specific requirements and conditions should determine the selection of appropriate fasteners. In addition, the acceptable uses/applications and corrosion resistance of fasteners needs to be confirmed with the design team and manufacturer before use.

Long Screws

Long screws refer to the screws used to secure vertical strapping through exterior insulation for the direct strapping attachment method. The exact screw type, head, and specifications depend on the backup wall material receiving the attachment, the insulation thickness, and other project-specific design conditions. The type of screw head depends on the material the screws are to be used with and whether the fastener head will interfere with the wall assembly cladding. Specialized masonry or concrete fasteners are required for concrete or concrete block backup structures. Refer to **Table A1** for example long-screw products that may be available within your region.

Self-drilling screws eliminate the need to pre-drill pilot holes. All self-drilling screws are inherently self-taping, but not all self-taping screws are self-drilling.

Metal Screws

Metal screws are designed for use with steel-stud framed construction. These screws have a higher thread count than wood screws and need to be self-drilling for vertical strapping cladding attachment. This is necessary so the screws can drill directly through the metal stud framing without the need to pre-drill pilot holes. Metal screws often have a pan or hexagon washer head so they can be fastened tight to the metal strapping; however, consider that fastener heads that project out from the strapping can collide with future cladding installation.

Wood Screws, Concrete Screws, and Concrete Nails

Wood screws that are intended to secure wood strapping should generally have countersunk heads so they will not interfere with the installation and seating of the cladding. However, pan head screws can also be used to secure wood strapping if the pan head does not interfere with the cladding system (i.e., stucco).

Dual-Thread Screws

Dual-thread screws have two sets of threads: one near the tip and one near the head of the screw. Dual-thread screws are recommended for use with softer, less dense insulation to maintain the strapping position in relation to the backup wall.

Table A1. Example long-screw products.

SUBSTRATE	PRODUCT NAME	MANUFACTURER	AVAILABLE LENGTH (mm)	MATERIAL / COATING
Wood	HECO-TOPIX-plus	HECO-Schrauben GmbH & Co. KG	10–600	Stainless steel
	HBS EVO	Rothoblaas	80–320	Carbon steel with C4 EVO coating
	R4 Multi-Purpose Screw	GRK Fasteners™	40–300	Carbon steel with Climatek Coating
	Universal Screw	U2 Fasteners™	32–102	316 stainless steel
	#14 HD Roofing Fastener	TRUFAST®	32–305	SAE C1022, heat treated with Tru-Kote™ Epoxy E-Coat
	Deckfast Stainless 316	Starborn®	42–89	Stainless steel 316
	Master Deckers	LELAND Industries Inc.	25–152	300 series stainless steel
Metal	#14 HD Roofing Fastener	TRUFAST®	32–305	SAE C1022, heat treated with Tru-Kote™ Epoxy E-Coat
	Master Grippers MDP®	LELAND Industries Inc.	19–203	Case-hardened carbon steel with DT2000 or powder-coated

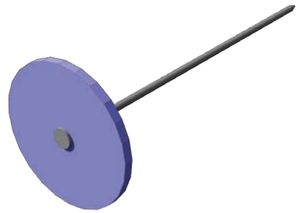
Notes:
1. Verify the availability of long-screw products in your region before specifying and consider acceptable alternatives if necessary.
2. Not all fasteners listed in Table A1 have 2,000-hour salt spray resistance. Select fasteners based on the project-specific requirements and conditions. Confirm the acceptable uses/applications and corrosion resistance of fasteners with the design team and manufacturer before use.

Additional Retainment

Insulation retainment functions to keep insulation boards continuous and flush with the backup wall substrate for the intended service life of the structure but are not tasked with supporting or transferring the load of the cladding. The exact insulation retainment depends on the backup wall material that is receiving the attachment, the insulation thickness, and other project-specific design conditions. The type of attachment, method, locations, and spacing are to be determined by a qualified design professional for the project-specific design conditions. Mechanical insulation attachments are recommended for long-term performance of insulation and to mitigate the risk of adhesive-based failure; however, adhesive-based attachments may retain insulation when appropriately designed and installed.

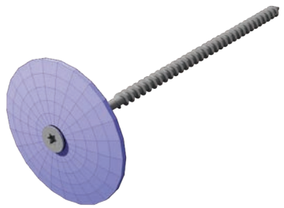
Some common insulation attachment examples and recommendations are described on the following page.

Plastic Cap Nails



Nails with plastic caps are installed from the exterior with the insulation already in place. In general, plastic cap nails are appropriate for securing insulation to wood and wood-based substrates. Some plastic washer head nails are available for concrete or masonry substrates but may not be appropriate for use with mineral wool exterior insulation.

Screws and Washers

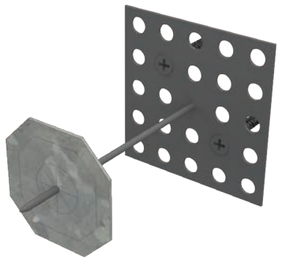


Long screws with large washers are installed from the exterior with the insulation already in place. It is generally recommended to use a minimum 2-inch (51-mm) washer and ensure the screw penetrate into the receiving stud or structural material as determined by the project design team. Assuming the appropriate type of screw is used, screws and washers can be used with concrete, concrete block, masonry, wood-framed, or steel-stud backup wall assemblies.

Insulation Fasteners

Insulation fasteners are proprietary insulation attachments that typically have a plastic washer head and metal pin. These fasteners are installed from the exterior with the insulation already in place. They usually require the use of a specialized powder-actuated tool to install the fastener and fire the pin through the insulation into the backup wall structure. Insulation fasteners can be used with concrete, concrete block, masonry, wood-framed, or steel-stud backup wall assemblies.

Impaling Pins and Metal Plates



Impaling pins typically use a fastened (i.e., mechanically attached) or self-adhered base plate on the backup wall substrate, and the insulation boards are seated over them and pushed in place until the pin sticks out. The insulation is then secured to the pin with a washer. In general, impaling pins can be used with concrete, concrete block, masonry, wood-framed, or steel-stud backup wall assemblies.

APPENDIX B: INSULATION PRODUCT WEIGHT

Table B1 shows the approximate product weight for the listed thicknesses of Thermafiber® RainBarrier® Continuous Insulation products. Insulation may be layered to achieve the listed thickness.

Table B1. Thermafiber® RainBarrier® Continuous Insulation approximate product weight by total insulation thickness per unit of area.

TOTAL INSULATION THICKNESS		RAINBARRIER® HC (80)		RAINBARRIER® HC PLUS (110)		RAINBARRIER® HC MAX (140)		RAINBARRIER®		RAINBARRIER® DARK™	
mm	inches	kg/m²	lbs/ft²	kg/m²	lbs/ft²	kg/m²	lbs/ft²	kg/m²	lbs/ft²	kg/m²	lbs/ft²
25	1	NA	NA	NA	NA	4.48	0.92	1.83	0.38	1.83	0.38
32	1.25	NA	NA	4.07	0.83	NA	NA	NA	NA	NA	NA
38	1.5	4.27	0.88	4.88	1.00	6.71	1.38	2.75	0.56	2.75	0.56
51	2	5.70	1.17	6.51	1.33	8.95	1.83	3.66	0.75	4.88	1.00
64	2.5	7.12	1.46	8.14	1.67	11.2	2.29	4.58	0.94	4.58	0.94
76	3	8.54	1.75	9.76	2.00	13.4	2.75	5.49	1.13	5.49	1.13
89	3.5	9.97	2.04	11.4	2.33	15.7	3.21	6.41	1.31	6.41	1.31
102	4	11.4	2.33	13.0	2.67	17.9	3.67	7.32	1.50	7.32	1.50
114	4.5	12.8	2.63	14.6	3.00	20.1	4.13	8.24	1.69	8.24	1.69
127	5	14.2	2.92	16.3	3.33	22.4	4.58	9.15	1.88	9.15	1.88
140	5.5	15.7	3.21	17.9	3.67	24.6	5.04	10.1	2.06	10.1	2.06
152	6	17.1	3.50	19.5	4.00	26.9	5.50	11.0	2.25	11.0	2.25
165	6.5	18.5	3.79	21.2	4.33	29.1	5.96	11.9	2.44	11.9	2.44
178	7	19.9	4.08	22.8	4.67	31.3	6.42	12.8	2.63	12.8	2.63
191	7.5	21.4	4.38	24.4	5.00	33.6	6.88	13.7	2.81	13.7	2.81
203	8	22.8	4.67	26.0	5.33	35.8	7.33	14.6	3.00	14.6	3.00

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