

Below-Grade Insulation Application Guide

Stone Wool Insulation Solutions for Below-Grade Wall
and Slab-on-Grade Assemblies



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This is an Interactive Guide

This guide is designed to enhance your reading experience and provide you with seamless navigation. Here's how to make the most of it:

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Insulation for Below-Grade Wall and Slab-on-Grade Systems

Below-grade exterior assemblies, particularly the insulation within these assemblies, can have a critical impact on the durability and comfort of basements and other below-grade spaces. Below-grade exterior assemblies are any walls and slabs in contact with or extending below the ground surface, such as basement walls and slabs, where they are subject to various structural and environmental loads. Not all insulation products perform equally in these conditions.

ROCKWOOL stone wool insulation products can reduce energy usage, improve occupant comfort, and mitigate condensation risk in properly designed below-grade basement wall and slab-on-grade applications. ROCKWOOL stone wool products are sustainable because they do not contain greenhouse gases or ozone-depleting gases, and they can be infinitely recycled.

ROCKWOOL developed this technical application guide to help you select below-grade insulation products that offer durable, high-performance solutions for many building types, including single-family residential, multi-family residential, and non-residential buildings. In this guide, you will learn how the characteristics of stone wool board and batt insulation can be used as part of a below-grade wall and/or slab-on-grade system that meets your building performance targets. You will also find recommendations for integrating stone wool insulation into your below-grade assemblies as well as design and installation guidance, tips, and additional resources.





Below-Grade Assembly Overview



Below-Grade Assembly Overview

Whether your below-grade project is part of a new build or an existing building remodel, rehabilitation, or retrofit, you can begin maximizing your project’s long-term durability and environmental impact as early as the design phase (see Figure 1). Access to below-grade wall and slab-on-grade assemblies for modification or repair can be limited after construction, so material selection during the design phase is particularly important for long-term performance.

ROCKWOOL has a selection of stone wool insulation products that provide options for effective moisture control, reliable long-term R-value, and resistance to slumping, flattening, or shrinking over time for consistent performance. The moisture-tolerant properties of stone wool allow it to be used for the long term, which is critical in below-grade applications.

ROCKWOOL offers product solutions for below-grade walls and slabs-on-grade in both new construction and renovation projects:

- **New construction:** Stone wool insulation can be used on the interior and/or exterior sides of below-grade walls and slabs for improved thermal performance. ROCKWOOL offers both rigid board insulation and semi-rigid batt insulation products that can meet the thermal, moisture, and durability needs of below-grade assemblies. Stone wool insulation solutions for new construction projects are discussed in greater detail on **pages 50 and 56**.
- **Basement remodels and renovation:** In existing basements and below-grade spaces, access to the exterior of the wall is not available. ROCKWOOL offers stone wool solutions that can improve the thermal performance of existing below-grade walls and slabs and be installed entirely from the interior. In a properly designed assembly, stone wool’s excellent vapor permeability and resistance to moisture can help mitigate the moisture-related challenges that can arise with interior-insulated below-grade walls and slabs. ROCKWOOL solutions for basement remodel and renovation projects are discussed in greater detail on **pages 54 and 56**.



Did You Know?

ROCKWOOL stone wool insulation products have been tested to many performance standards to ensure long-term below-grade performance in any climate. Jump to **page 23** to learn more.

A - Below-grade wall assembly (split-insulated)

1. Free-draining backfill
2. Fastener
3. Protection board
4. Drainage mat
5. ROCKWOOL Comfortboard
6. Dampproofing/waterproofing
7. Foundation wall
8. Stud wall with ROCKWOOL Comfortbatt
9. Vapor retarder (when applicable)*
10. Interior finishes

Slab-on-grade assembly

11. Slab-on-grade
12. Vapor retarder (when applicable)*
13. ROCKWOOL Comfortboard
14. Capillary break layer (crushed rock or similar)

B - Below-grade wall assembly (interior-insulated)

1. Foundation wall**
2. ROCKWOOL Comfortboard
3. Stud wall with ROCKWOOL Comfortbatt
4. Vapor retarder (when applicable)*
5. Interior finishes

Slab-on-grade assembly

6. Slab-on-grade
7. Vapor retarder
8. ROCKWOOL Comfortboard
9. Capillary break layer (crushed rock or similar)

*A vapor retarder/barrier may be required in the wall assembly depending on the project-specific location and use.

**Dampproofing/waterproofing, drainage mat, and backfill not shown.



Figure 1. Examples of below-grade assemblies: A) typical split-insulated below-grade wall and exterior-insulated slab-on-grade, viewed from exterior, and B) typical interior-insulated below-grade wall and exterior-insulated slab-on-grade, viewed from interior.



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Managing Enclosure Loads

Building enclosures are subject to multiple simultaneous structural and environmental loads. Below-grade walls and slabs-on-grade will be exposed to groundwater, soil gas and contaminants, variations in temperature and relative humidity, and/or air pressures.

In both new construction and retrofit projects, the process of finishing and conditioning a basement introduces thermal and moisture loads into the space and lowers tolerance for moisture-related issues, such as condensation, within these assemblies.

Many aspects of the building contribute to how effectively these building loads are managed, including the building's exterior climate, the soil composition, the building form (depth of foundations and exposure level), how the occupants use and condition the interior spaces, and the materials and components of each building assembly.



Did You Know?

ROCKWOOL products are moisture resistant, inorganic, and will not promote fungal growth in the event of a leak through a below-grade assembly. Water from below-grade leaks can carry organic materials into the assembly or interact with organic materials already present inside the assembly. These organic materials, in the presence of water, can promote fungal growth and deterioration of the assembly components. Prior to insulating a below-grade assembly, any water leaks through the assembly should be identified and repaired.

Structural Loads

Below-grade wall and slab-on-grade assemblies support various short- and long-term structural loads (see **Figure 2**). These loads include the weight of the structure above, their own self-weight, finishes, occupant live loads, and lateral soil pressures.

Insulation materials used on the exterior of below-grade walls or within a slab assembly must resist these short- and long-term loads without significant compression or deformation. Compression and deformation can lead to a reduction in thermal performance and settlement, which has the potential to damage the building's structure.

ROCKWOOL Comfortboard products have high compressive strength, which allows them to withstand these loads without significant short-term deformation or long-term deformation, also known as creep.

To learn more about the compressive strength of Comfortboard, jump to **page 30**.

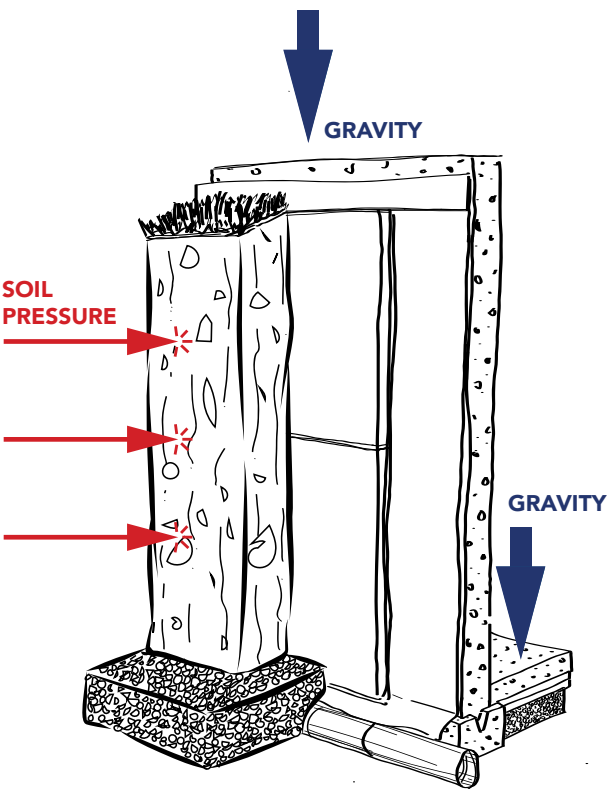


Figure 2. Schematic showing various short- and long-term structural loads that can act on below-grade wall and slab-on-grade assemblies

Need Support?

The ROCKWOOL Building Science (RBS) team provides services and resources for architects, designers, builders, and specifiers to assist in optimizing the thermal efficiency and durability of building designs that reach far beyond insulation.

Get in touch with the team of experts at rockwool.com/building-science-support.



Environmental Loads

The materials and components within a below-grade wall or slab-on-grade assembly form a series of layers intentionally designed and installed to resist water, air, thermal, and water vapor loads on the wall or floor.

Some materials within the assembly contribute to managing these loads directly or indirectly. ROCKWOOL stone wool insulation products contribute to managing many loads, not just thermal loads. Continue reading to learn how below-grade assemblies can be designed to appropriately manage these loads.



Water Control

Below-grade walls and slabs-on-grade are exposed to water loads like rain, snowmelt, and groundwater (see **Figure 3**). This guide focuses specifically on below-grade wall and slab-on-grade assemblies above the groundwater table. These below-grade wall and slab-on-grade assemblies are not subject to constant saturated soil conditions, and liquid water is drained away from the below-grade enclosure systems.

In below-grade applications, water control is accomplished through waterproof or dampproof membranes, drainage mediums, flashings, and sealants. ROCKWOOL stone wool insulation board products are moisture resistant, porous, and non-absorbent. They will not increase water loads on the assembly, making them an ideal choice for use in conjunction with these materials to mitigate water loads on the below-grade assemblies.

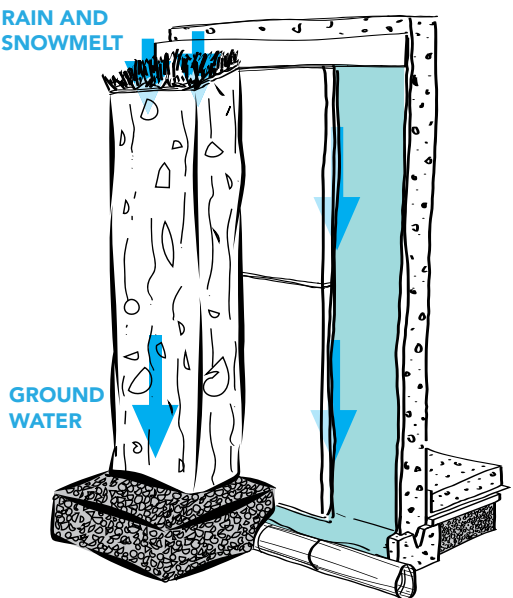


Figure 3. Typical exterior water loads on below-grade walls

Did You Know?

In below-grade applications, building codes will often require waterproofing or dampproofing at foundation walls and slabs. Waterproofing is typically used in hydrostatic conditions, defined as assemblies extending below the groundwater table, or at below-grade areas sensitive to moisture ingress. Dampproofing is typically used in non-hydrostatic conditions, such as below-grade areas that do not extend below the groundwater table.

Refer to **page 29** to learn more about the moisture-resistant properties of ROCKWOOL stone wool products.



Air Control

Below-grade walls and slabs-on-grade are exposed to air loads created by air pressure differences between interior and exterior environments or by wind loads on the above-grade enclosure systems.

In below-grade wall and slab-on-grade assemblies, air control is most commonly achieved by combinations of the foundation structure (typically concrete or masonry) and treatment of joints, penetrations within, and transitions at the perimeter of the below-grade systems. ROCKWOOL stone wool products will not negatively impact the air control performance of a properly designed below-grade enclosure. **Figure 4** and **Figure 5** show examples of air barrier continuity at the transition from stone wool insulated below- and above-grade assemblies.

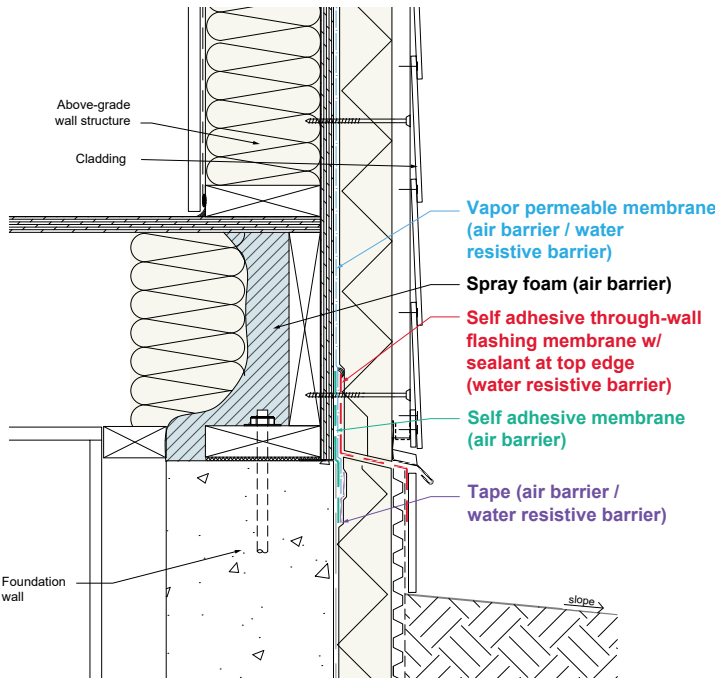


Figure 4. Example of air barrier continuity at a transition between below-grade and above-grade wall assemblies

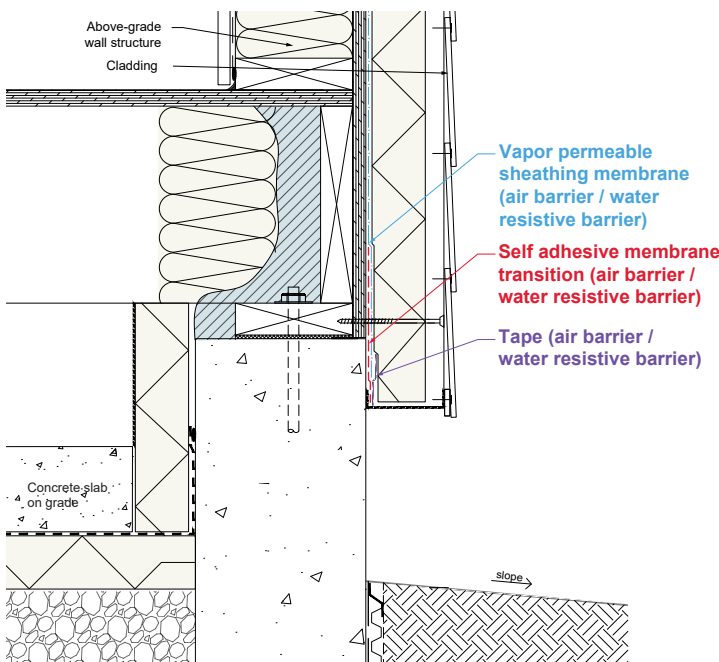


Figure 5. Example of air barrier continuity at a transition between the foundation and above-grade wall assembly

Soil Gas and Contaminant Resistance

Below-grade walls and slabs-on-grade are exposed to gasses and other contaminants present in the soil such as chlorides, sulfides, radon, and methane. Comfortboard is inorganic, chemically inert, and corrosion resistant, and it is not negatively impacted by most common soil contaminants. Comfortboard is not intended to control or restrict the transmission of these contaminants through the building enclosure, so contaminants should be evaluated by a building science professional to determine the need for appropriate contaminant control measures within the assembly.



Thermal Control

Below-grade walls and slabs-on-grade are exposed to thermal loads resulting from conductive heat flow across the building enclosure (see **Figure 6**). Thermal control in below-grade wall and slab-on-grade assemblies is provided by thermal insulation. Thermal insulation is most effective in these systems when thermal bridging is minimized via insulation continuity.

Below-grade wall assemblies can be insulated with three main approaches: exterior-insulated, split-insulated, or interior-insulated (see **Table 1, p. 18**). Slabs-on-grade can be exterior- or interior-insulated (see **Table 2, p. 20**).

ROCKWOOL Comfortboard® and ROCKWOOL Comfortbatt® stone wool insulation products provide thermal control solutions to reduce thermal transmission and improve occupant comfort. Comfortboard and Comfortbatt are dimensionally stable to resist slumping over time, preserving long-term thermal performance. These products are intended for the following uses:

- **Comfortboard:** A rigid stone wool board insulation intended for use at the exterior or interior sides of below-grade walls and slabs-on-grade. The high compressive strength of Comfortboard® minimizes compression in below-grade applications, which leads to reliable, long-term thermal performance.
- **Comfortbatt:** A semi-rigid stone wool batt insulation intended only for use within interior stud cavities of below-grade walls or raised basement floors. Comfortbatt is designed to conform to stud cavities and the obstructions within them to provide optimal thermal performance.

Need Support?

To learn more about evaluations of stone wool's long-term thermal performance, contact us at techservice@rockwool.com.

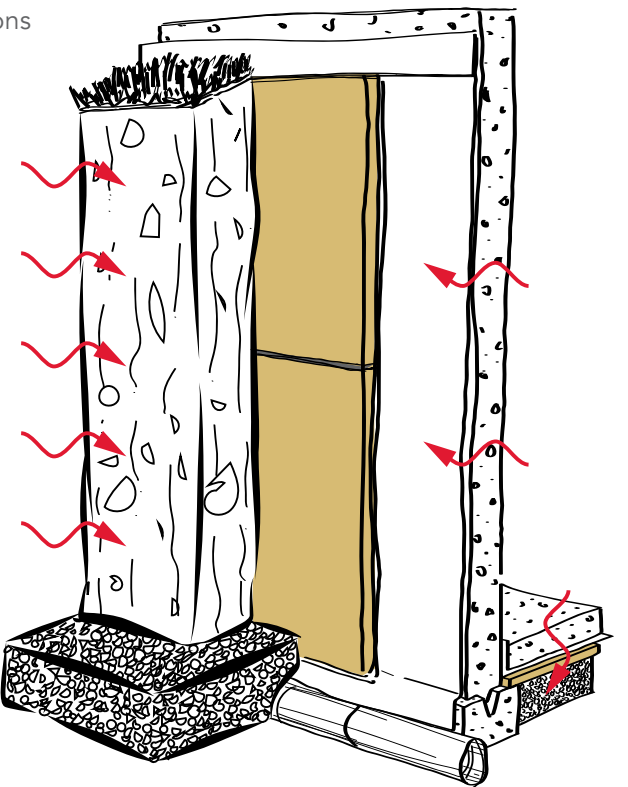


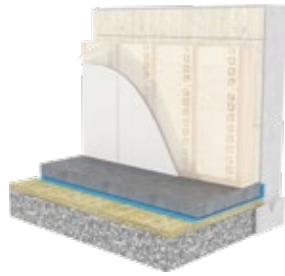
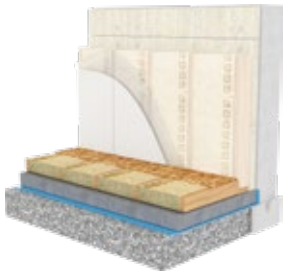

Figure 6. Example locations of the thermal control layer in a below-grade assembly

Table 1. Below-Grade Wall Insulation Approaches

Exterior-Insulated		Split-Insulated	
			
Application		Insulation placed only on the exterior of the foundation wall	
		Insulation placed on the exterior of the foundation wall, and insulation placed within stud cavities	
Continuous Insulation Considerations		Continuous Exterior Insulation <ul style="list-style-type: none">• Bypasses studs, building structure, services within cavities, and other systems that can interrupt insulation continuity and degrade the thermal performance of the insulation• Can reduce condensation risk within the assembly by keeping the foundation wall warmer and eliminate the need for an interior vapor retarder• Protects the below-grade waterproofing or dampproofing membrane from damage when these layers are installed behind the continuous exterior insulation	
Stud Cavity Insulation Considerations		<ul style="list-style-type: none">• Most effective when used with low-conductivity framing methods like wood framing• Installation is performed from the building interior, providing more optimal installation access for basement improvements and retrofits• A vapor control layer on the interior side might be necessary	
Learn More		<ul style="list-style-type: none">• Continue to page 27 to learn more about the benefits of continuous exterior insulation from a whole-building perspective and minimizing thermal bridging in below-grade assemblies• Reference these assemblies in the Mid-Rise Wood Construction Solutions Guide[®] 	

Interior-Insulated		
Interior/Stud Cavity Insulated	Interior Continuous and Stud Cavity Insulated	Interior Continuous Insulated
		
Insulation placed within the stud cavity only	Insulation placed continuously on the interior of the foundation wall and placed within stud cavities	Insulation placed continuously only on the interior of the foundation wall
Continuous Interior Insulation <ul style="list-style-type: none">• Bypasses studs to provide greater continuity of the insulation layer, but consideration of thermal bridging at wall-to-floor transitions and services through the wall should still be considered• A vapor control layer on the interior side may be necessary to limit moisture related risks within the wall assembly” to the interior Comfortboard options in continuous insulation section		
<ul style="list-style-type: none">• Most effective when used with low-conductivity framing methods like wood framing• Installation is performed from the building interior, providing optimal installation access for basement improvements and retrofits• A vapor control layer on the interior side might be necessary		
<ul style="list-style-type: none">• For guidance on installation of Comfortboard and Comfortbatt insulation, jump to page 60• Reference these assemblies in the Mid-Rise Wood Construction Solutions Guide[®] 		

Table 2. Slab-on-Grade Insulation Approaches

	Exterior-Insulated	Interior-Insulated
		
Application	Insulation loose laid on sub-grade below slab-on-grade	Insulation placed on top of an interior slab surface between floor framing members
Common Project Types	New construction projects	Retrofit and improvement projects
Insulation Considerations	<p>Continuous Exterior Insulation</p> <ul style="list-style-type: none">• Bypasses studs, building structure, services within cavities, and other systems that can interrupt insulation continuity and degrade the thermal performance of the insulation• Can reduce condensation risk within the assembly by keeping the slab warmer.• Keeps liquid water away from the slab <p>Placement and selection of appropriate insulation products must be coordinated with load-bearing foundation elements</p>	<p>Floor Cavity Insulation</p> <ul style="list-style-type: none">• Most effective when used with low-conductivity framing methods like wood framing• Installation is performed from the building interior, providing better access for installation, particularly in basement improvements and retrofits• Consider impacts to ceiling heights related to added insulation in retrofit projects
Learn More	<ul style="list-style-type: none">• Reference these assemblies in the Mid-Rise Wood Construction Solutions Guide[®] 	<ul style="list-style-type: none">• For guidance on installation of Comfortboard and Comfortbatt insulation, jump to page 60

Managing Moisture-Related Risks

When interior insulating below-grade wall and slab-on-grade assemblies, consider the following:

- Interior insulation will typically keep the foundation wall or slab interior surface colder than the interior air. These assemblies should be evaluated for condensation risk and incorporate an interior vapor retarder where deemed appropriate by a building science professional.
- The use of a smart vapor retarder detailed for air control on the interior side of the assembly can reduce air and water vapor flow into the insulated wall space during colder/drier months and allow inward-bound water vapor flow to escape through the smart vapor retarder in warmer months.



Water Vapor Control

Below-grade wall and slab-on-grade assemblies are subject to water vapor loads from both the exterior and interior environments. When this load is properly managed, moisture-related risks, such as organic growth on and/or deterioration of assembly components, is reduced.

A dedicated vapor control layer is not always necessary in below-grade systems. The need for and appropriate placement of a vapor control layer are based on multiple factors: the site’s climate, the below-grade structure, soil and groundwater conditions, below-grade space use and conditioning, interior finishes of the below-grade space, and the ratio of exterior to interior insulation. Local code requirements will also govern the appropriate placement of low-permeance or other vapor-retarding materials.

When vapor control is needed, the materials commonly used to control the diffusion of water vapor across below-grade assemblies include low-permeance exterior dampproofing or waterproofing, or interior vapor retarders or vapor barriers. The selection and placement of a vapor control layer, in addition to other materials like insulation, should consider the need to both limit water vapor diffusion into the assembly and allow for drying.

Comfortboard and Comfortbatt stone wool insulation products are vapor permeable, porous, non-absorbent, and moisture resistant. These products can also help support water vapor control when used as part of an appropriately design below-grade wall or slab assembly (see **Figure 7**).

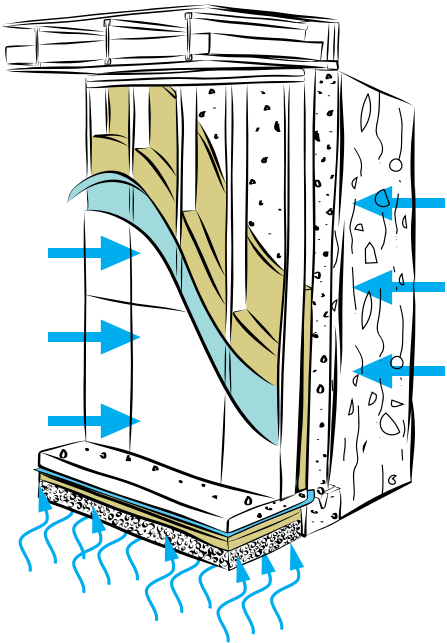


Figure 7. Typical water vapor loads on below-grade walls and slabs-on-grade



Need Help Completing an Analysis of Potential Moisture Risk?

The ROCKWOOL Building Science team offers complimentary consultation and modeling services. Contact our team of experts at [rockwool.com/building-science-support[®]](https://rockwool.com/building-science-support).

Organic Growth

Exposing some components of the below-grade wall and slab-on-grade assemblies to long-term accumulation or repeated exposure to moisture can lead to organic growth, including various species of mold and fungus. Organic growth can lead to deterioration of moisture-sensitive finishes and structural components, and poor indoor air quality. Because ROCKWOOL insulation products are inorganic, they do not support organic growth.

Stone wool insulation’s porosity and permeability can allow any moisture within the assembly to drain and dry out. Additionally, ROCKWOOL products can be used to separate moisture-sensitive structural components and interior finishes from potential condensation surfaces.

To learn more about how stone wool products are tested to demonstrate resistance to organic growth, refer to **page 29**.



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Meeting and Exceeding Performance Targets

To design a durable and energy-efficient below-grade assembly, you may need to consider a variety of potential products and combinations to find a successful project solution. The project team’s most basic goal is to ensure the solution is safe, meets building code requirements, and provides value to the owner.

Below-grade wall and slab-on-grade assemblies need to provide long-term performance. In addition to meeting structural requirements, below-grade walls and slabs-on-grade need to resist moisture, air, temperature variation, mold growth, and soil contaminants.



Which ROCKWOOL Product Can Help You Meet Your Project Goals?

ROCKWOOL stone wool products have been tested to many standards to ensure long-term below-grade performance in any climate. Several long-term research studies have validated stone wool product performance. Comfortboard products have been evaluated by the International Code Council for use in “exterior perimeter insulation around concrete slab edges on foundation walls, or under flat concrete slab-on-grade construction.” They have also been evaluated by the National Research Council Canada for use against the outside of the foundation wall.

For further information, refer to **ICC-ESR Report #3773[®]** and **CCMC Report #12718-R[®]**.

Thermal and Energy Performance

Below-grade enclosure systems are becoming an increasingly important element of the building enclosure for improving building thermal performance.

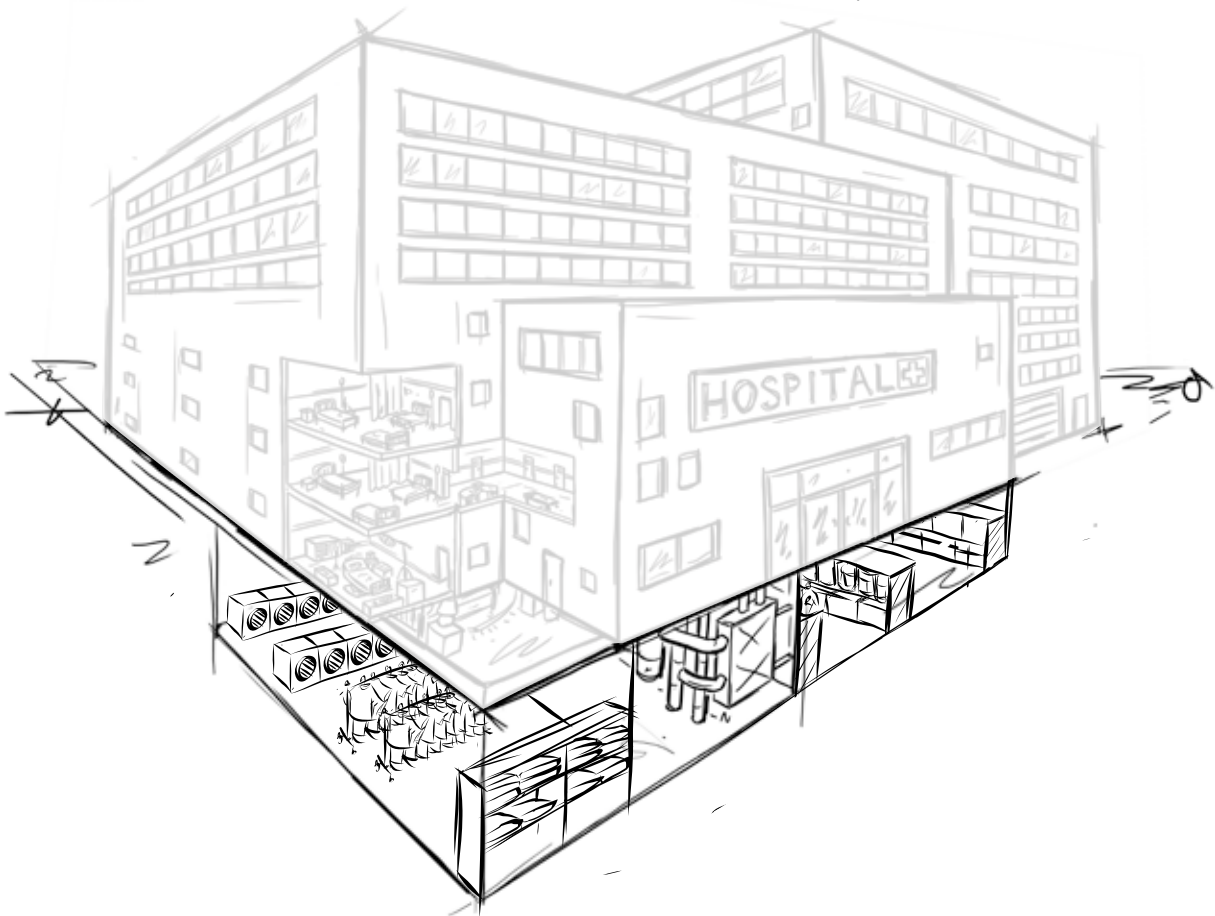
Compliance with new building standards and codes increasingly requires insulation for below-grade walls and slabs-on-grade. In the U.S. and Canada, many single-family residential, multi-family residential, and non-residential buildings are governed by the energy requirements of the local codes derived from the following model codes and standards:

- **International Residential Code (IRC) in the U.S.**
- **International Energy Conservation Code (IECC) in the U.S.**
- **National Energy Code for Buildings (NECB) in Canada**
- **ASHRAE Standard 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings** (referenced by building and energy codes in most U.S. states)

Different jurisdictions adopt different versions of these codes and standards, but energy code compliance can generally be achieved with these approaches:

- **Prescriptive compliance approaches**, such as the R-value method, U-factor method, and component performance alternative method.
- **Performance-based approaches**, which include whole-building energy modeling using building simulation software to demonstrate anticipated building performance against a defined target performance.

The degree of accuracy to which wall assemblies and their interfaces are evaluated (e.g., modeled, calculated, or estimated by reference tables) for their energy code conformance varies with different jurisdictional requirements.



Continuous Exterior Insulation Overview

Continuous exterior insulation is typically more thermally efficient than insulation placed between studs or inboard of the structural system. Continuous exterior insulation is also effective in reducing thermal bridging — a significant source of heat transfer in the built environment. Thermal bridges are penetrations in a building's insulation layer that allow heat (energy) to transfer through the enclosure more readily. Refer to **Figure 8** for typical locations of thermal bridges through the below-grade building enclosure.

In below-grade applications, continuous exterior insulation is most effective when thermal bridges such as footings and slab edges are adequately insulated. Stone wool continuous exterior insulation can be used to insulate these components to reduce thermal bridging and improve thermal performance. **Figure 9 (p. 28)** shows how ROCKWOOL stone wool can be used to mitigate common below-grade thermal bridges.

Wood Stud vs. Steel Stud Construction

When a basement or other below-grade space is finished, stud wall construction is often used on the interior side of the foundation walls to support the interior finishes and insulation. Stud-framed walls are commonly constructed of either wood studs or steel studs. Wood-framed stud walls are common in single-family residential, multi-family residential, and other low-rise to mid-rise construction. Steel-framed walls are common in commercial, institutional, and other mid-rise to high-rise construction. The use of steel or wood studs in a project can be driven by a number of factors, including occupancy type, fire rating requirements, structural requirements, or cost.

Below-grade walls are commonly insulated with batt insulation between the studs, continuous insulation installed on the exterior side of the foundation wall, or continuous insulation between the foundation wall and stud wall. The thermal performance of wood-framed and steel-framed walls can differ. Steel is significantly more thermally conductive than wood, resulting in more thermal bridging across the stud cavity compared to a similar wood-framed wall, making the batt insulation less effective. Steel studs can also be at higher risk for condensation due to thermal bridging in colder climates. As a result, a steel-framed wall typically needs continuous insulation installed on the exterior or interior side of the foundation wall to mitigate thermal bridging, manage condensation risk, and achieve equivalent thermal performance.

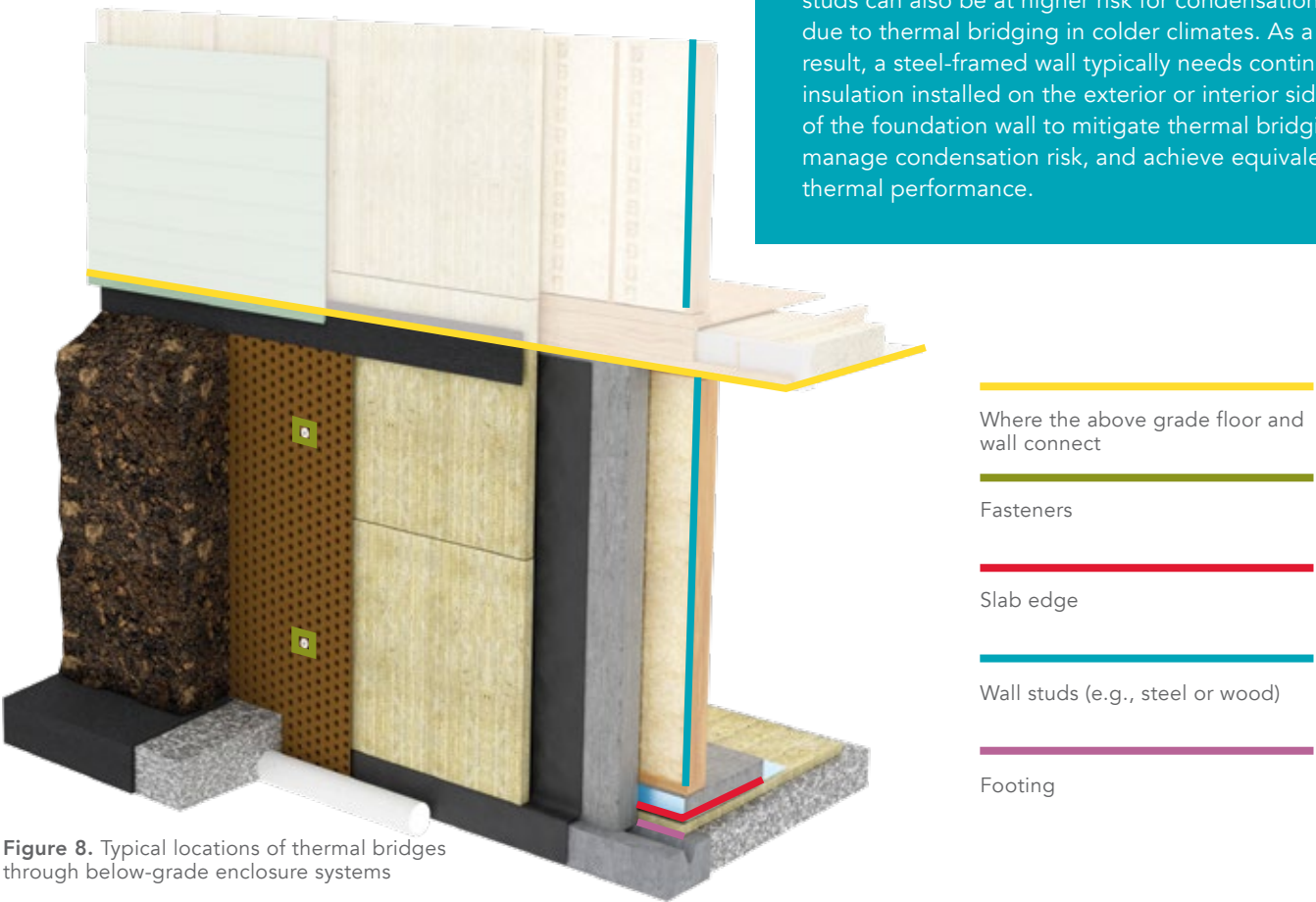


Figure 8. Typical locations of thermal bridges through below-grade enclosure systems

Long-Term Thermal Performance of Stone Wool

When evaluating the thermal performance of insulation, particularly in below-grade applications where access to replace the insulation may not be available in the future, the insulation must retain its insulative ability over the long term — often for decades. Stone wool products have been investigated in several long-term research studies to evaluate their long-term thermal performance.

- **U.S. Army Corp of Engineers Study:** This study presents research results and guidance on the successful use of stone wool insulation in below-grade foundation wall and slab assemblies in cold-climate Scandinavian countries over several decades. The study documents the evolution of Scandinavian foundation design regulations and several foundation designs utilizing stone wool insulation to improve thermal performance and occupant comfort, and to reduce the risk of long-term soil frost damage to foundations.¹

- **National Research Council Canada (NRC) Study:** This study monitored the insulating ability of stone wool insulation over multiple years in foundation walls exposed to water and freezing temperatures. It demonstrated that groundwater from the soil drained along the outer fibers of the stone wool and did not absorb into the insulation, so the water had no impact on thermal performance over time.²

For further information on stone wool's long-term thermal performance, refer to the U.S. Army Corp of Engineers report "European Foundation Designs for Seasonally Frozen Ground", and the NRC article "Performance of Thermal Insulation on the Exterior of Basement Walls".

Need Help Evaluating the Thermal Performance of Your Assembly?

ROCKWOOL Building Science Support Services include R-value calculations and thermal bridging analysis. Contact us at rockwool.com/building-science-support.

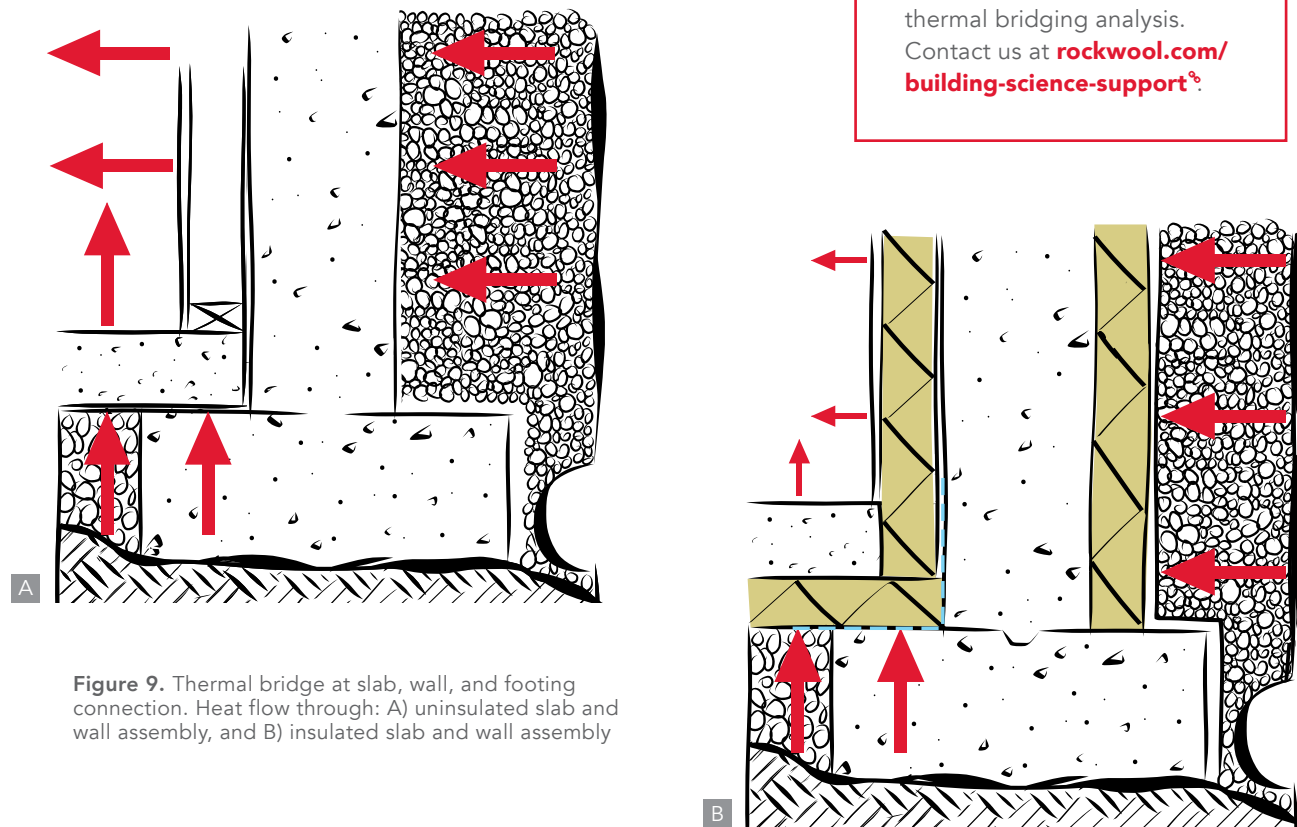


Figure 9. Thermal bridge at slab, wall, and footing connection. Heat flow through: A) uninsulated slab and wall assembly, and B) insulated slab and wall assembly

Water Control and Vapor Control Performance

Below-grade walls and slabs-on-grade must effectively manage rain, snowmelt, and groundwater. Poor management of these loads can lead to deterioration of finishes and structural components, resulting in costly repairs. Many building codes and standards include requirements for drainage and waterproofing or dampproofing provisions around building foundations.

In below-grade applications, codes generally require foundation walls to include a waterproof or dampproof treatment of below-grade walls and a drainage medium to drain water away from the building. Selection and installation of exterior below-grade insulation products should account for maintaining drainage around the foundation.

ROCKWOOL Comfortboard has been tested to evaluate reaction moisture by these independent evaluation services:

- **International Code Council Evaluation Services Reports (ICC-ESR) Program – ESR-3773³**
- **Canadian Construction Materials Centre (CCMC) – CCMC 12718-R³**

As part of these evaluations, the material's reaction to water vapor and liquid water is measured. The testing conducted in these evaluations shows that Comfortboard products are vapor permeable and non-absorbent, and they will not trap water against below-grade walls. Additionally, a research study conducted by the Danish Technological Institute determined that ROCKWOOL stone wool insulation continued to maintain its drainage and drying ability on an existing building for over 30 years in service and counting.³

For further information on stone wool's reaction to moisture and long-term drying performance, refer to the Danish Technological Institute report "External Thermal and Moisture Insulation of Outer Basement Wall".

Organic Growth Resistance

Moisture in below-grade assemblies can lead to organic growth on moisture-sensitive assembly components. Comfortboard has been tested to ASTM C1338 – Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings, which exposes specimens to a prolonged period of high humidity and an initial fungi sample. When tested to ASTM C1338, Comfortboard products showed no fungal growth.

¹Army Corp of Engineers: European Foundation Designs for Seasonally Frozen Ground, March 1992

²National Research Council Canada: Performance of Thermal Insulation on the Exterior of Basement Walls, December 1999

³Danish Technological Institute: External thermal and moisture insulation of outer basement wall, 27 March 2009

Compressive Strength

Below-grade wall assemblies, and any exterior insulation used in the assembly, must resist lateral soil pressures. In slab-on-grade assemblies, exterior insulation must resist the weight of the slab and applied loads from above. Insulation must also resist slumping over time to maintain the thermal performance of the assembly and limit movement of the building structure.

ROCKWOOL Comfortboard products have been tested in accordance with ASTM C165 – Standard Test Method for Measuring Compressive Properties of Thermal Insulations as shown in **Figure 10**. The compressive strength results demonstrate that Comfortboard products can withstand sustained lateral soil loads and slab pressures without significant deformation or compromised performance.

As noted in the Danish Technological Institute report “External Thermal and Moisture Insulation of Outer Basement Wall,” ROCKWOOL stone wool showed no noticeable permanent compression even after 30 years installed below grade.⁴ Additionally, Comfortboard products have been evaluated for use under concrete slab applications, under various loads, and for slabs up to 10” thick with minimal compression under the loads.

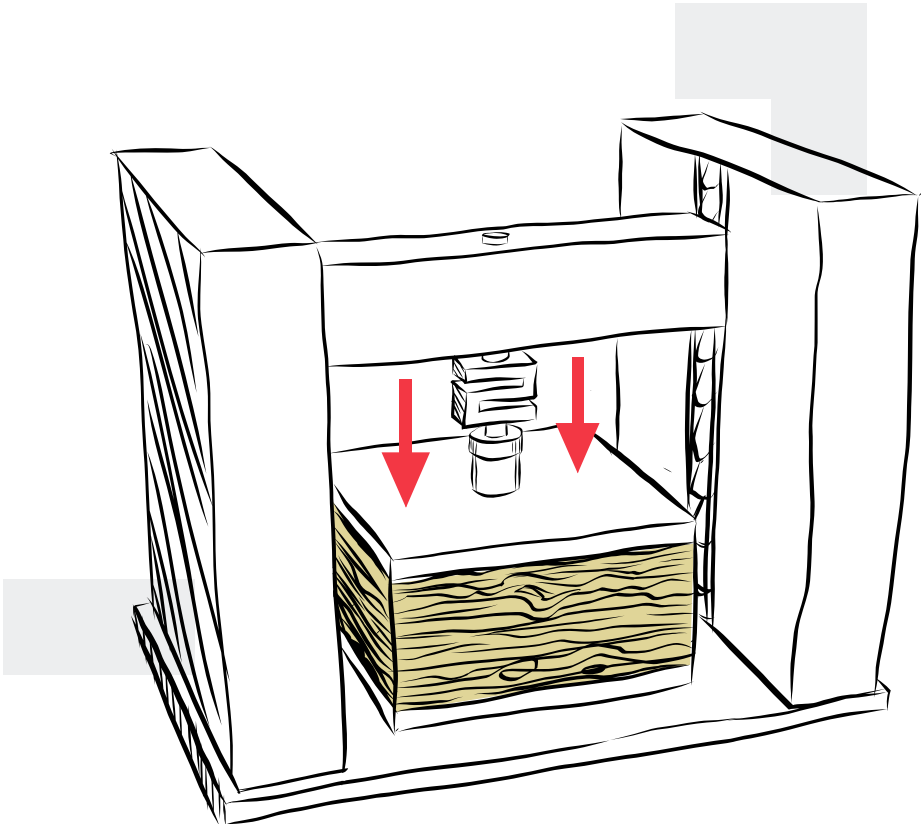


Figure 10. Comfortboard under compressive load testing

⁴Danish Technological Institute: External thermal and moisture insulation of outer basement wall, 27 March 2009

Termite Resistance

In many regions, termites can cause extensive damage to buildings, particularly at the transition of below-grade assemblies and above-grade construction. A map of termite hazard probability regions across the U.S. is shown in **Figure 11**.

To prevent termite damage, below-grade assemblies in vulnerable regions are designed to resist termite damage. Some building codes even restrict the use of foam plastic insulation on the exterior of below-grade assemblies in heavy termite hazard locations. Test standards used to evaluate termite resistance of building materials include:

- **ASTM D3345-74** – Standard Test Method for Laboratory Evaluation of Wood and Other Cellulosic Materials for Resistance to Termites
- **American Wood Protection Association (AWPA) E1 – 09** - Standard Test Method for Laboratory Evaluation to Determine Resistance to Subterranean Termites

ROCKWOOL conducted a study to evaluate Comfortboard for termite resistance under these standards. In this study researchers exposed material samples to 400 Formosan subterranean termites for a 28-day period, then measured the weight loss of the

material, assessed termite mortality rates, and visually evaluated damage to the samples on a 0 to 10 scale. This scale is based on the standards specified in AWPA E1-09 and ASTM D3345-74, where a rating of 10 is sound and 0 is total failure of the sample. The results were compared with a control sample of untreated Southern yellow pine and a sample of Southern yellow pine treated for termite resistance with ACQ Type D preservative exposed to identical termite conditions.

Over the 28-day test period, the untreated pine samples were severely attacked by termites. The treated pine samples showed minor evidence of termite attack. Meanwhile, the stone wool insulation samples showed no significant damage from termites, with a mean visual rating of 9.6 and an adjusted mean weight loss of 1.22%, exceeding the rating of the preservative-treated wood and untreated wood samples (see **Table 3**).

For further information on the termite resistance of stone wool products, refer to the **Resistance of ROCKWOOL Stone Wool Insulation to Termites[®]** technical bulletin.

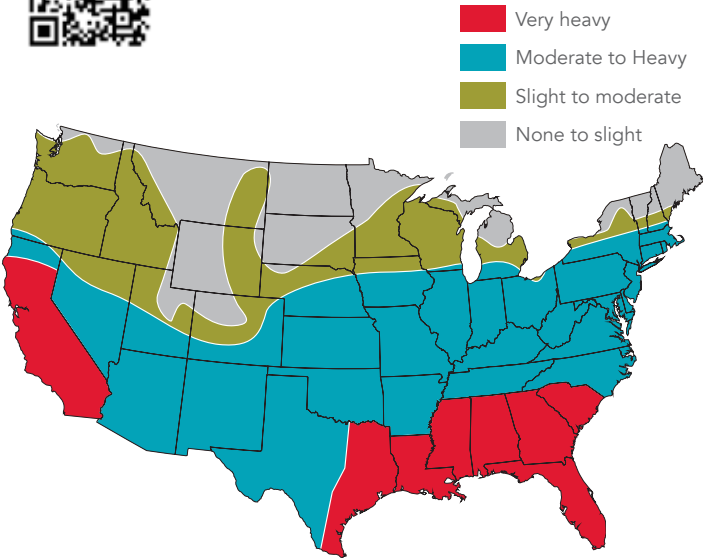


Figure 11. Map of U.S. termite hazard probability from IBC 2021

Table 3. Test Results from Test Report No. RAD-5860 “Termite Resistance Test on Mineral Fiber Insulation”

Test Samples	Adjusted Mean Weight Loss %	Termite	Man Visual Rating (Scale 1-10)
Stone Wool Wafer	1.22 %	27.40 %	9.6
Treated Pine Wafer	4.85 %	38.60 %	8.6
Untreated Pine Wafer	50.92 %	2.00 %	2.4

High-Performance Sustainable Design Strategies

Whereas regulations set minimum performance requirements, you can use voluntary frameworks, standards, and design methods to establish project-specific performance expectations that go above and beyond.

LEED

The LEED Green Building Rating System includes performance criteria for certifying the design and construction of commercial, institutional, and residential buildings. LEED works for all buildings anywhere, regardless of where they are in their life cycle. The process is designed to inspire innovative solutions that support healthy, highly efficient, and cost-saving green buildings during the design, construction, operation, and maintenance of these high-performance structures.

As **Table 4** shows, stone wool insulation products can help a project achieve critical points required for LEED certification. ROCKWOOL Comfortboard and Comfortbatt below-grade insulation products can contribute to LEED prerequisites and credits for the Energy and Atmosphere (EA), Materials and Resources (MR), and Indoor Environmental Quality (EQ) categories.



To generate a LEED letter specific to your project, visit rockwool.com/leedcalculator.

Table 4. ROCKWOOL Products for LEED v4 and v4.1

	Energy and Atmosphere (EA)		Materials & Resources (MR)				Indoor Environmental Quality (EQ)			
	Minimum Energy Performance	Optimize Energy Performance	Building Life-Cycle Impact Reduction	Building Product Disclosure and Optimization - Environmental Product Declarations	Building Product Disclosure and Optimization - Sourcing of Raw Materials	Building Product Disclosure and Optimization - Material Ingredients	Minimum Acoustical Performance	Low-Emitting Materials	Thermal Comfort	Acoustic Performance
Interior Walls										
Comfortboard® 110	x	x	x	x	x	Declare	x	x	x	x
Comfortboard® 80	x	x	x	x	x	Declare	x	x	x	x
Comfortbatt®	x	x	x	x	x	Declare	x	x	x	x

WELL

The WELL standard was created by both medical doctors and building practitioners to inspire the global community to apply the principles of health to their building designs. Projects designed to the WELL building standard support health for building occupants by meeting its requirements for indoor air quality, thermal and acoustic indoor comfort, and material transparency — all requirements that ROCKWOOL products are naturally suited to meet.

Refer to the **ROCKWOOL Sustainable Project Solutions Guide** for more information on how stone wool insulation products help meet the requirements for LEED and WELL certification.



Net-Zero Energy Building

Net-zero energy building is a method of design and construction that aims to achieve an energy-efficient building able to generate energy from renewable sources to compensate for its own energy demand. As a result, these types of buildings boast a net-zero energy consumption: the total energy used by the building on an annualized basis is roughly equal to the amount of renewable energy created on the site or at a nearby location.

Below-grade walls and slabs with continuous exterior insulation can aid in achieving net zero by providing a continuous thermal barrier to reduce thermal bridging, thereby reducing energy losses.

Did You Know?

The ROCKWOOL Environmental Product Declaration (EPD) is another element of our commitment to provide sustainable solutions. Download our EPD at rockwool.com/epd.



Passive House

Passive House is a standard for buildings whose primary goals are to achieve superior energy efficiency and occupant comfort. This enclosure-first, “passive” approach encompasses all aspects of high-energy performance, sustainability, and resiliency that can be applied to all types of buildings, in all types of climates.

ROCKWOOL has wood-framed and mass wall assemblies that have been designed and modeled to meet Passive House building enclosure recommendations, similar to the wall and slab-on-grade assemblies shown in **Figure 12**. The full list of assemblies is outlined in the **Passive House Solutions Guide[®]**.

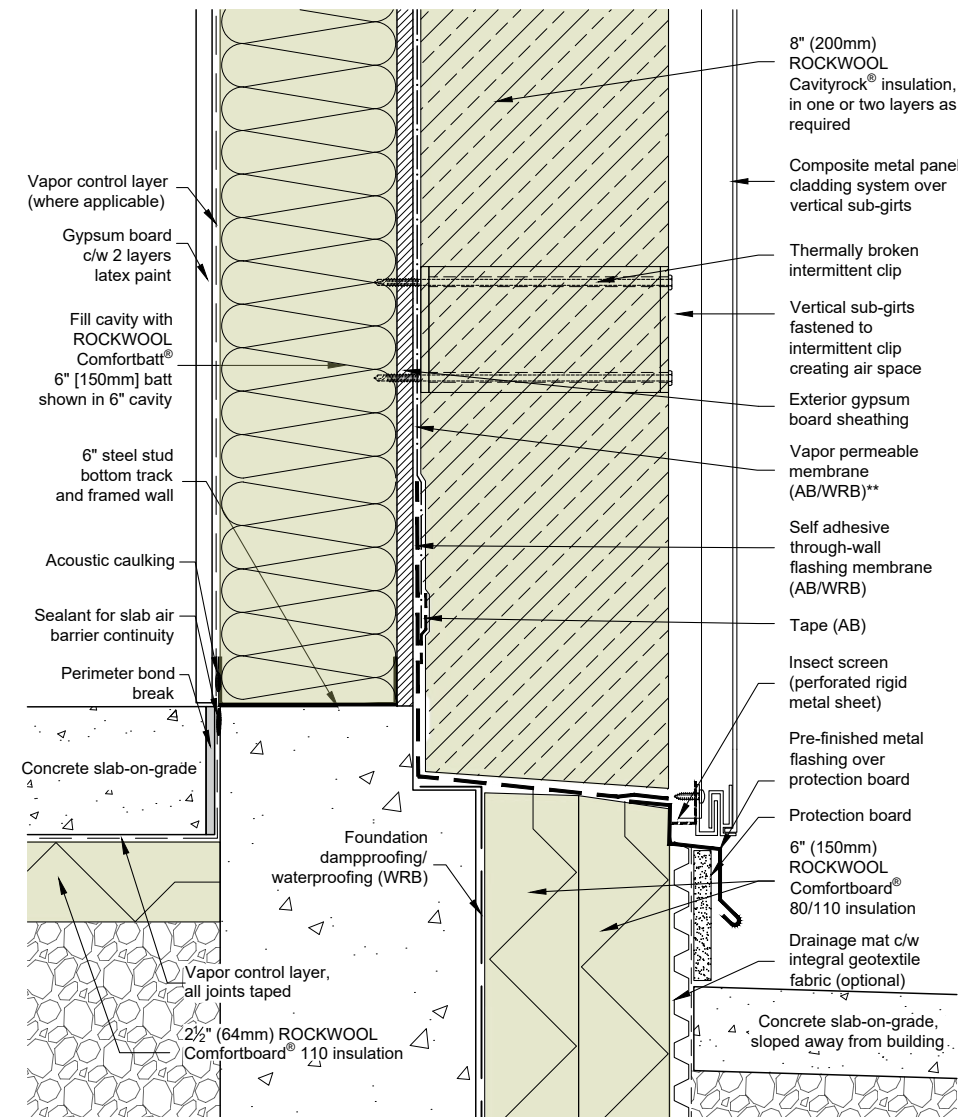


Figure 12. ROCKWOOL slab-to-wall detail





Fire safe, moisture resistant, breathable, sound absorbent, durable, and circular — these are the inherent properties found in all ROCKWOOL stone wool insulation.

In its manufactured state, stone wool delivers unique benefits as an insulation solution. Our products contribute to addressing many of society's biggest climate change challenges, creating new opportunities to enrich modern living and build safer, healthier, and more climate-resilient communities.

Not all building materials are created equal.
Ours are inspired by nature.



INSPIRED BY NATURE.

FIRE SAFE

Like the basalt rock it is made from, **ROCKWOOL stone wool insulation is fire resilient by nature with no added chemical flame retardants. Capable of withstanding temperatures of over 2150°F (1177°C), a melting point that exceeds the temperatures of most commercial and residential building fires, it works to contain fire and prevent its spread. The noncombustible characteristics of stone wool insulation mean that it will not develop toxic smoke or promote flame spread, even when directly exposed to fire. It provides passive fire protection and is a complement to active systems such as sprinklers.**

The fire safe performance benefits achieved with stone wool insulation for below-grade assemblies include:

- Will not develop smoke or promote flame spread - when tested to ASTM E84, stone wool achieves a Flame Spread Index and Smoke Developed Index as 0 and 0, respectively. Combustible extruded polystyrene (XPS), by comparison, often achieves up to 175 on the smoke developed index and can contribute to the spread of fire.
- Opportunity to be used as a thermal barrier over foam plastic insulation in floor joist construction at the transition between below-grade and above-grade walls in many jurisdictions.

MOISTURE RESISTANT

ROCKWOOL stone wool is water repellent by nature. During wet and rainy weather, stone wool insulation keeps buildings warm and dry without a reduction in thermal performance over time. It also resists moisture in humid climates, protecting the long-term health of buildings and the people within them.

The moisture-resistant properties achieved with stone wool insulation for below-grade assemblies include:

- Resists absorption of water. ROCKWOOL stone wool insulation can be used to separate below-grade walls and slabs from the soil to reduce water loads on the structure and to separate interior stud framing in a basement wall from condensation on concrete wall surfaces.
- Provides consistent thermal performance, even in the presence of rainwater, snowmelt, or freezing conditions. ROCKWOOL stone wool insulation will quickly dry out to become fully restored and retain its original characteristics.

To learn more about how stone wool insulation supports the need to effectively manage water loads on the below-grade enclosure, jump to **page 21**.

BREATHABLE

The vapor-permeable nature of ROCKWOOL stone wool insulation allows water vapor to diffuse through without becoming trapped. Other building materials, including some insulation types, can work as vapor retarders or barriers and can greatly reduce the drying potential of many typical building assemblies. When used appropriately along with other wall assembly layers and materials, stone wool insulation becomes part of an assembly that holds minimal risk of decay, mold, and mildew. This contributes to securing healthy, comfortable indoor environments.

The vapor permeability benefits of stone wool insulation for below-grade assemblies include:

- Vapor permeable and tested per ASTM E96. As a result, any moisture within a below-grade basement wall is able to dry to the interior through the insulation.
- When installed below a slab-on-grade, stone wool will not trap moisture against the slab. Any moisture that bypasses the insulation (contacting the vapor barrier) can drain and dry out of the assembly because the insulation is highly vapor permeable.

To learn more about how stone wool insulation manages vapor loads through drying, jump to **page 21**.

SOUND ABSORBENT

ROCKWOOL stone wool insulation has an open, porous structure, which makes it highly efficient at absorbing sound by nature. This, in addition to its resistance to airflow, significantly reduces the ability of noise to travel through the building enclosure. Stone wool contributes to human health and well-being by providing quiet spaces to recover and recuperate in homes and hospitals and to avoid health issues associated with noise pollution, such as diabetes and increased blood pressure. Stone wool insulation also contributes to reduced noise in the workplace and educational institutions, which can result in more efficient and pleasant work and learning environments for building occupants.

The sound absorbent aspects achieved with stone wool insulation for below-grade assemblies include:

- Improved low-frequency sound absorption for both normal and random incidents of noise.
- Enhanced acoustic dampening for a quieter environment.

Visit our **Commercial Resource Library**[®] to access all of our documentation referenced throughout this section.



DURABLE

Just like stone, ROCKWOOL stone wool insulation is durable by nature and keeps its shape and insulation properties over time. Its insulation performance is unaffected by humidity and temperature changes. And when it is appropriately installed, stone wool insulation requires no technical supervision or maintenance throughout the building's lifetime. Sample testing from existing buildings shows that ROCKWOOL stone wool retains its performance for 65 years — and counting!

The durability benefits achieved with stone wool insulation for below-grade assemblies include:

- Resistance to soil and structural loads. ROCKWOOL stone wool insulation maintains its structural integrity in backfilled applications and below concrete slabs.
- Dimensional stability and resistance to slumping. ROCKWOOL stone wool insulation maintains its shape in below-grade walls, even if it gets wet, avoiding formation of cold spots and condensation points in below-grade walls and reduction of thermal performance.
- Chemically inert and inorganic. ROCKWOOL stone wool insulation will not support mold growth, termites, rot, corrode, or deteriorate over time, even in buried applications.

To learn more about the durability of stone wool, jump to the Meeting and Exceeding Performance Targets section on **page 23**.

CIRCULAR

Based on one of Earth's most abundant raw materials, stone wool is circular by nature — and for long-term sustainability, a “circular economy” is the answer. The building sector produces one-third of all waste, much of which ends up in landfills today. However, stone wool can be recycled again and again without ever losing performance. The technology at ROCKWOOL allows the use of waste from other industries as alternative raw material. Overall, ROCKWOOL upcycles waste materials, recycles its own waste in closed loops, and designs products for long life and indefinite recycling.

The circular aspects of stone wool insulation for below-grade assemblies include:

- Maintains its performance over the lifespan of the building, which is valuable when exterior below-grade insulation is typically not accessible after construction.
- Can be reused in future renovations on the interior of basements, provided that it was not exposed to any contaminants and is not physically damaged.

THERMAL RESISTANCE

As the building industry seeks new and innovative solutions that are truly energy efficient, ROCKWOOL leads the way in developing insulation products with excellent long-term thermal performance. The R-value of ROCKWOOL insulation does not change over time because stone wool is not produced with blowing agents, which off-gas and result in lower thermal performance.

The thermal performance benefits of stone wool insulation for below-grade assemblies include:

- Ease of installation, cutting, and compression to fit snugly in spaces to maximize thermal benefit.
- Long-term thermal performance that is not affected by water or soil exposure, as demonstrated in multiple studies of stone wool in service.

For additional insight on the long-term thermal performance of stone wool, see the Meeting and Exceeding Performance Targets section on **page 26**.

Made for the Future

Climate change is not a future phenomenon — its impacts are evident today, and in many cases, devastating to the environment and societies around the world. According to the latest Intergovernmental Panel on Climate Change (IPCC) report, it is unequivocal that rising global temperatures and increasing frequency of extreme weather, flooding, and catastrophic wildfire events will have an unprecedented impact over many centuries to come.⁵

There is an urgent need to adapt and mitigate climate change impacts and foster climate resilience. This can be done, in part, by constructing sustainable and resilient buildings with materials that support a circular economy approach.

As **Figure 13** shows, stone wool is a versatile material with multiple benefits, such as being inherently circular and fire resilient, that makes it ideal for applications in below-grade wall and slab-on-grade applications.

The durability of ROCKWOOL stone wool insulation means that its incorporation in new and existing buildings today can contribute to future proofing them for the evolving building codes of tomorrow.

ROCKWOOL pursues a fact-based, auditable approach backed by third-party references and methodologies to document progress in maximizing our products’ positive impact. Our products are designed and positioned to be used in high-performance wall assemblies with high R-values, making them ideal for projects as building codes, building owners, and developers continue to require higher thermal performance and lower building energy demands.

Visit rockwool.com/sustainability to download our Sustainability Report.

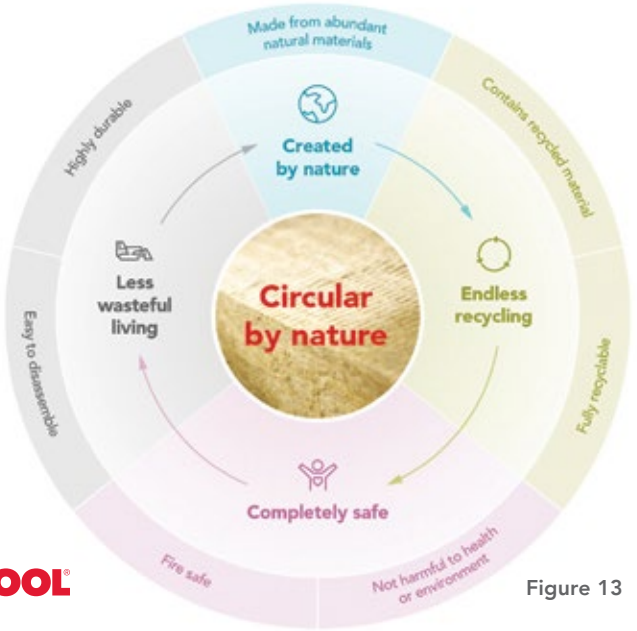


Figure 13

Did You Know?

Reducing operational carbon is a critical component of the total decarbonization effort — and adequately insulating buildings can play a significant role by increasing energy efficiency and reducing energy demand, thereby lowering greenhouse gas (GHG) emissions. Therefore, insulation is a primary building material that can directly reduce the operational carbon of a building over its lifetime.

⁵IPCC, Climate Change 2021: The Physical Science Basis, 2021, Sixth Assessment Report (ipcc.ch)



Cost-Conscious Systems

Talk to your local ROCKWOOL representative for support in designing cost-effective systems that can help you meet (or come in under) your budget goals, refer to rockwool.com/salesreplocator.





Stone Wool Insulation for Below-Grade Assemblies

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Stone Wool Insulation for Below-Grade Assemblies

ROCKWOOL offers two products — Comfortboard and Comfortbatt — that can be used in below-grade wall and slab-on-grade applications. Comfortboard can be used in interior and exterior applications, while Comfortbatt can be used in interior applications only within a stud cavity.



Comfortboard vs. Comfortbatt

To learn more about each product and its unique features, see **Table 5 (p. 49)**.

Which Product is Right for Your Project?

Whether you are working on a new construction project or existing basement renovation, ROCKWOOL has a product that can suit your needs. The key to achieving the greatest performance benefit of insulation in below-grade applications is selecting the right product for your project. The right insulation product can help you create below-grade spaces that are durable, comfortable, and sustainable.

All ROCKWOOL below-grade insulation products explored in this guide are:

- Vapor permeable and moisture resistant
- Dimensionally stable and durable
- Noncombustible and fire resistant


To learn more about each product and its unique features, see **Table 5** (p. 49).



Not all building materials are created equal. ROCKWOOL products are created by nature. See how stone wool insulation helps build safer, healthier, and more climate resilient communities on **pages 38 through 41**.

ROCKWOOL Stone Wool Below-Grade Insulation Products

Table 5. Product Summary Table

			
	Comfortboard® 80 & Comfortboard® 110	Comfortbatt®	
Application	Continuous exterior or interior insulation	Interior insulation within below-grade wall and floor stud cavities	
Insulation Type	Rigid board	Semi-rigid batt	
Description	A noncombustible rigid stone wool board product designed for continuous insulation assemblies, such as exterior- and interior-insulated below-grade walls, under slabs, and at slab edges	A noncombustible, semi-rigid stone wool batt insulation for wood and steel stud assemblies, including in below-grade applications	
Key Features	<ul style="list-style-type: none">• High compressive resistance suitable for installation below slabs-on-grade or on the exterior side of below-grade walls• Long-term thermal performance• Moisture resistant, non-absorbent, and porous to allow drainage of water	<ul style="list-style-type: none">• A unique, flexible edge designed to compress and spring back as the batt is inserted between studs to completely fill the cavity• Flexible design ensures the expected R-value is achieved and maintained• GREENGUARD Gold Certified and contributes to a healthier indoor environment	
Insulation Attachment Options	Below-grade walls <ul style="list-style-type: none">• Mechanically fastened• Temporary construction adhesive prior to backfill Slabs-on-grade <ul style="list-style-type: none">• Loose laid	Stud walls <ul style="list-style-type: none">• Friction fit Slabs-on-grade <ul style="list-style-type: none">• Friction fit in raised floor framing cavities	
Installation Considerations	<ul style="list-style-type: none">• If using adhesive or waterproofing membrane to permanently attach insulation boards where they will not be permanently back-filled or supported by other means, validate with the adhesive or waterproofing membrane manufacturer• Do not use below load-bearing elements or foundation elements such as footings• Do not use in exterior conditions below the groundwater table• Use of insulation below slabs should be based on evaluation of project-specific slab loads, floor finishes, and live loads by a design professional• Evaluate selection of Comfortboard 80 or 110 below slabs or on the exterior of below-grade walls based on project-specific expected slab or soil pressures with a design professional	<ul style="list-style-type: none">• For split-insulated and interior insulated walls and slabs, evaluate condensation risk and combine with interior vapor retarder as necessary	
Additional Product Information	rockwool.com/comfortboard80 ®	rockwool.com/comfortboard110 ®	rockwool.com/comfortbatt ®



Typical Below-Grade Wall Applications

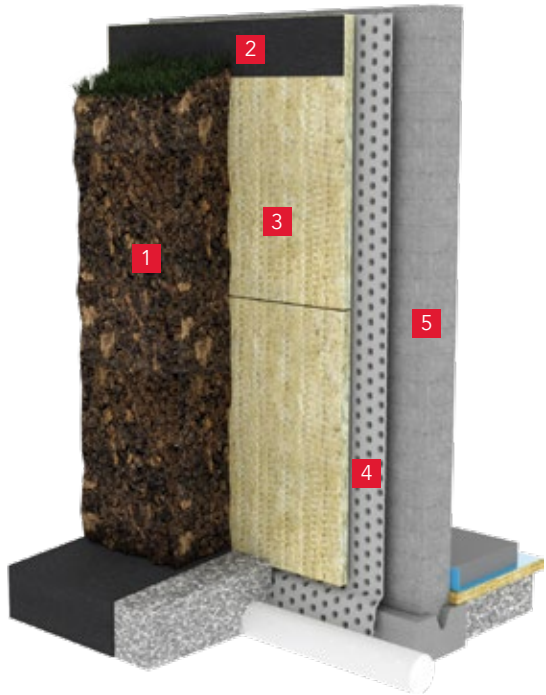
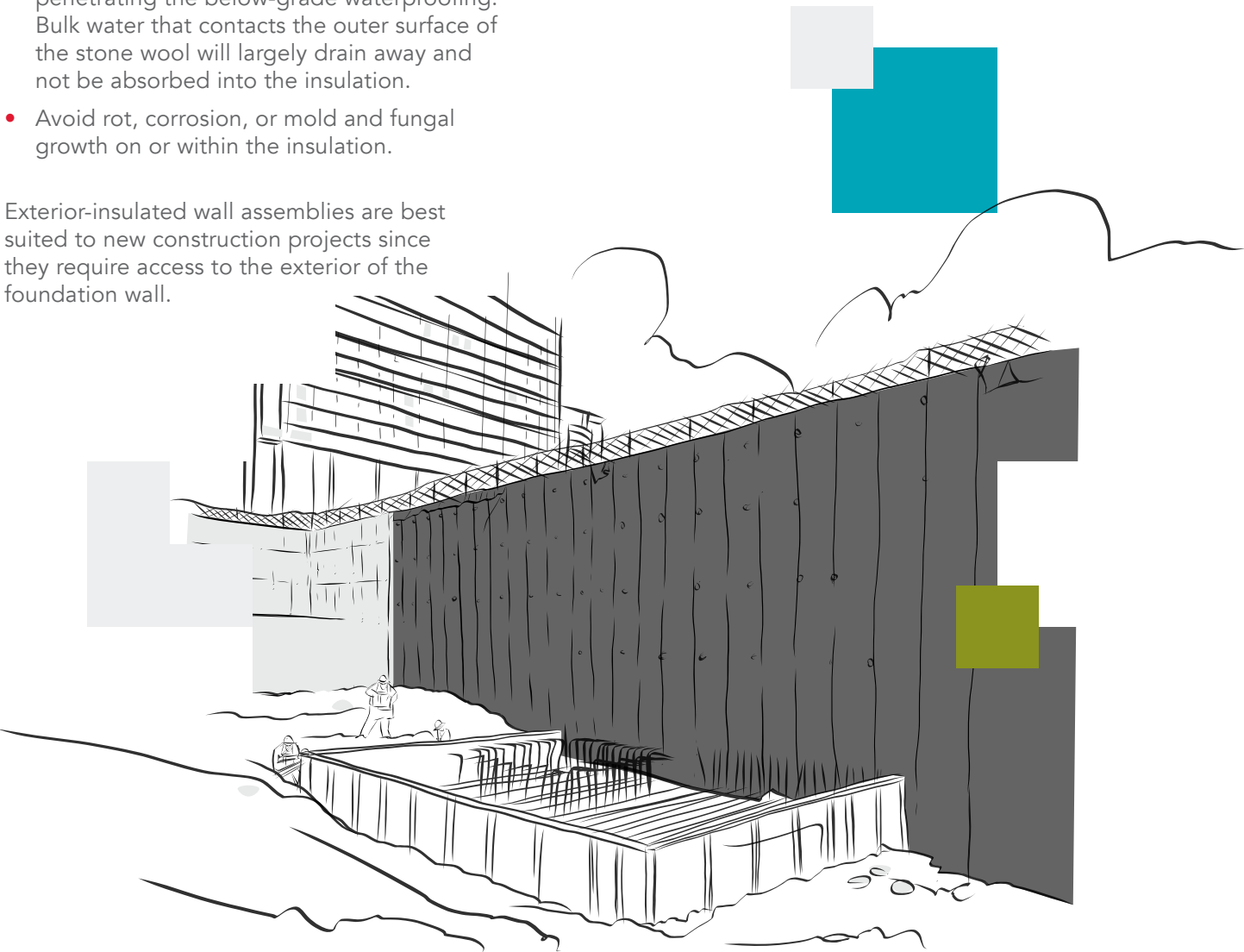
ROCKWOOL stone wool insulation can be used in several different below-grade wall types. These include exterior-insulated, split-insulated, and interior-insulated wall assemblies.

Exterior-Insulated Wall Assembly

An exterior-insulated wall assembly is simple, robust, and has limited inherent risks. It uses Comfortboard as the continuous exterior insulation to:

- Maintain consistent thermal resistance, even when exposed to moisture — an important consideration for exposed below-grade insulation.
- Resist water absorption when the insulation is installed on the exterior of the waterproofing or dampproofing membrane, which reduces the risk of moisture penetrating the below-grade waterproofing. Bulk water that contacts the outer surface of the stone wool will largely drain away and not be absorbed into the insulation.
- Avoid rot, corrosion, or mold and fungal growth on or within the insulation.

Exterior-insulated wall assemblies are best suited to new construction projects since they require access to the exterior of the foundation wall.



Exterior-Insulated – Waterproofing/ Dampproofing Membrane on Wall

(shown from exterior to interior)

1. Free-draining backfill
2. At-grade protection board
3. ROCKWOOL Comfortboard stone wool insulation
4. Drainage mat
5. Foundation wall



Exterior-Insulated – Dimpled Dampproofing Outboard of Insulation

(shown from exterior to interior)

1. Free-draining backfill
2. At-grade protection board
3. Drainage mat*
4. ROCKWOOL Comfortboard stone wool insulation
5. Dampproofing/waterproofing
6. Foundation wall

*The selection of membrane type and placement within an assembly should be evaluated based on project-specific conditions and use, and consider the requirements of local building codes.

Split-Insulated Wall Assembly

A split-insulated wall assembly provides stone wool insulation on both the interior and exterior of the below-grade foundation wall. This assembly:

- Optimizes performance, cost, and overall wall thickness.
- Improves thermal performance, reduces thermal bridging, and reduces condensation risks via placement of continuous Comfortboard insulation on the exterior of the wall.
- Balances thermal benefit and assembly thickness by utilizing Comfortbatt insulation in the stud framing on the interior of the wall.

Split-insulated wall assemblies are best-suited to new construction projects since they require access to the exterior of the wall. This type of assembly can also be an effective strategy for improving the thermal performance of existing exterior-insulated walls by providing additional thermal insulation on the interior.

Split-Insulated – Dimpled Dampproofing Outboard of Insulation

1. Free-draining backfill
2. Protection board
3. Drainage mat*
4. ROCKWOOL Comfortboard stone wool insulation
5. Dampproofing/waterproofing
6. Foundation wall
7. Stud wall with ROCKWOOL Comfortbatt stone wool insulation
8. Vapor retarder/barrier**
9. Interior finishes



*The selection of membrane type and placement within an assembly should be evaluated based on project-specific conditions and use, and consider the requirements of local building codes.
**A vapor retarder/barrier may be required in the wall assembly depending on the project-specific location and use.

Exploring Different Below-Grade Waterproofing and Dampproofing Membranes

There are many different types of below-grade waterproofing and dampproofing membranes. They can be fluid-applied to the foundation via roller, brush, or spray; self-adhered in sheets; or mechanically fastened to the structure. Some membranes are “post-installed” onto the exterior side of the foundation after the foundation is constructed, while others are “pre-installed” onto shoring or another temporary substrate prior to construction of the foundation. Depending on the project-specific design, local jurisdictional codes, and manufacturer requirements, the membranes may be installed in direct contact with the foundation wall, or between the exterior insulation and the backfill.

When waterproofing or dampproofing a below-grade foundation wall, it is important to do the following:

- Select an appropriate membrane product that has been evaluated to meet local jurisdictional requirements for use as a waterproofing or dampproofing membrane.
- Position the product in the assembly to meet the project-specific design application and local code requirements.

ROCKWOOL recommends reviewing appropriate selection and position of below-grade waterproofing and dampproofing membranes with a design professional.

Using ROCKWOOL Products as a Thermal Barrier at Rim Joists

At the transition from below-grade walls to the above-grade walls, the rim joist construction at the floor can be prone to air leakage and condensation risk in certain assemblies and climates. It is common to mitigate air leakage and condensation risk at the rim joist using spray foam insulation. When utilizing this type of detail, many model codes such as the International Building Code, International Residential Code, and National Building Code of Canada require foam plastic insulation to be separated from the interior with an approved thermal barrier. A thermal barrier is a material applied between foamed plastics and interior spaces designed to:

- Delay the ignition of the foamed plastic insulation in a fire.
- Delay or prevent the involvement of the foamed plastic in the fire.

ROCKWOOL Comfortboard 80 is tested in accordance with NFPA 275 – Standard Method of Fire Tests for the Evaluation of Thermal Barriers Used over Foam Plastic Insulation. It also meets the requirements of a thermal barrier in the International Building Code and International Residential Code when installed to the correct thickness.

Comfortboard 80 and Comfortbatt are tested in accordance with CAN/ULC-S124 – Test for the Evaluation of Protective Coverings for Foamed Plastic. These products meet the requirements of a thermal barrier in the National Building Code of Canada when installed to the correct thickness.

An example of stone wool insulation used as a thermal barrier is shown in **Figure 14**. For further information on stone wool as a thermal barrier, refer to the **Use of ROCKWOOL Stone Wool as a Thermal and Ignition Barrier**® technical bulletin.

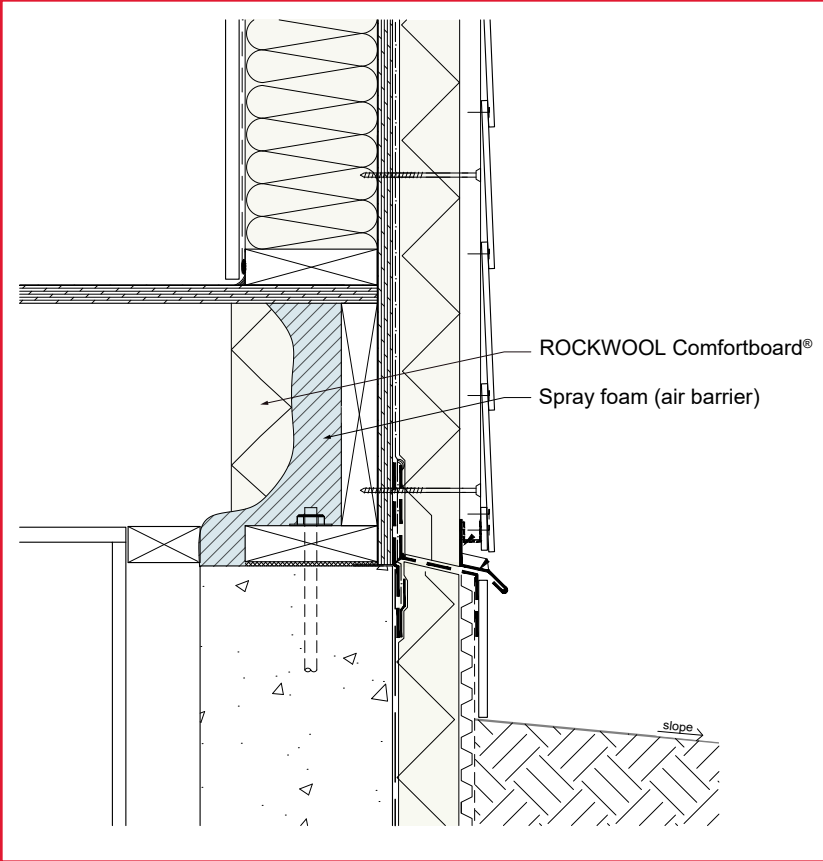


Figure 14. Comfortboard installed as a thermal barrier at the rim joist



Interior-Insulated Wall Assembly

Interior-insulated below-grade wall assemblies provide thermal insulation on the interior side of the below-grade foundation wall, eliminating the need to access the exterior of the wall to improve thermal performance. This assembly:

- Can reduce thermal bridging by utilizing a continuous layer of insulation between the foundation wall and interior studs.
- Can balance assembly thickness and performance by utilizing insulation directly within a planned new construction or existing interior stud cavity.
- Can be installed from the interior without accessing the exterior side of the foundation wall.

Interior-insulated wall assemblies are often the optimal solution for existing basement finishing, renovation, and retrofit projects.



**Interior Continuous Insulated –
Comfortboard and Comfortbatt**

1. Foundation wall
2. ROCKWOOL Comfortboard stone wool insulation
3. Stud wall with ROCKWOOL Comfortbatt stone wool insulation
4. Vapor retarder/barrier*
5. Interior finishes

*A vapor retarder/barrier may be required in the wall, depending on the project-specific location and use.



**Interior Continuous Insulated –
Comfortboard only**

1. Foundation wall
2. ROCKWOOL Comfortboard stone wool insulation
3. Stud wall
4. Vapor retarder/barrier*
5. Interior finishes

*A vapor retarder/barrier may be required in the wall assembly, depending on the project-specific location and use.



**Interior Stud Cavity Insulated –
Comfortbatt only**

1. Foundation wall
2. Stud wall with ROCKWOOL Comfortbatt stone wool insulation
3. Vapor retarder/barrier*
4. Interior finishes

*A vapor retarder/barrier may be required in the wall assembly, depending on the project-specific location and use.

Typical Slab-on-Grade Applications

ROCKWOOL insulation can be used in two different slab assemblies: exterior-insulated and interior-insulated slab assemblies. Insulated slab-on-grade assemblies can improve the thermal performance of the enclosure and improve occupant comfort by keeping the floor surface warmer. They can also be paired with a variety of heated flooring systems to improve energy efficiency and reduce the sizing of heated flooring systems.

Exterior-Insulated Slab Assembly

An exterior-insulated slab assembly provides a continuous layer of insulation underneath the slab, which keeps the slab warmer and minimizes condensation risk. In this assembly, Comfortboard stone wool insulation will:

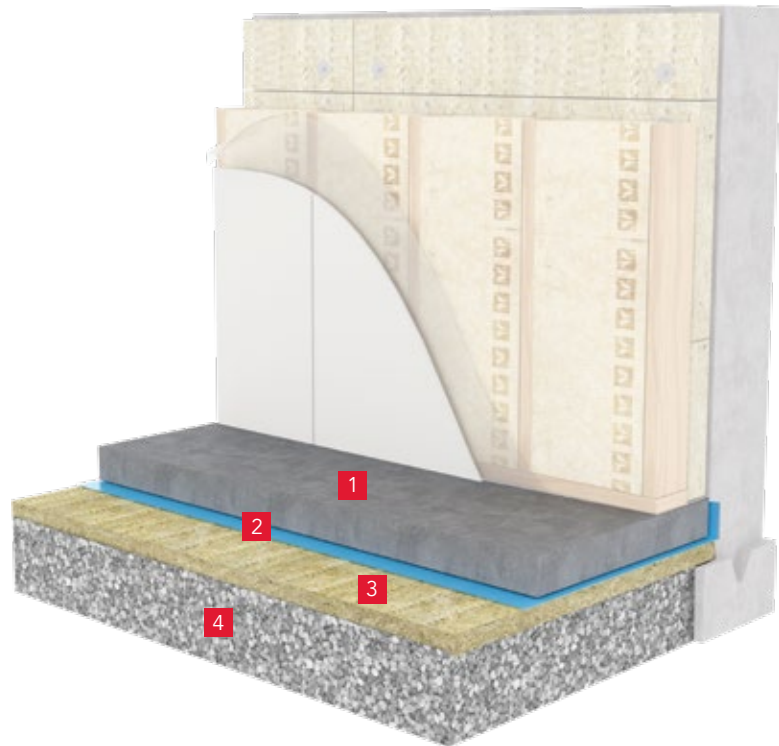
- Allow the floor slab to remain at a more consistent temperature, improving the thermal comfort of building occupants.
- Resist water absorption when exposed to ground moisture and allow any moisture that bypasses the insulation to drain and dry out of the assembly, reducing the risk of moisture damage occurring within the building basement.
- Not rot, corrode, or support mold or fungal growth when wetted.

Exterior-insulated slab assemblies are best suited to new construction projects since they require access to install the insulation prior to slab construction.

Exterior-Insulated Slab Assembly

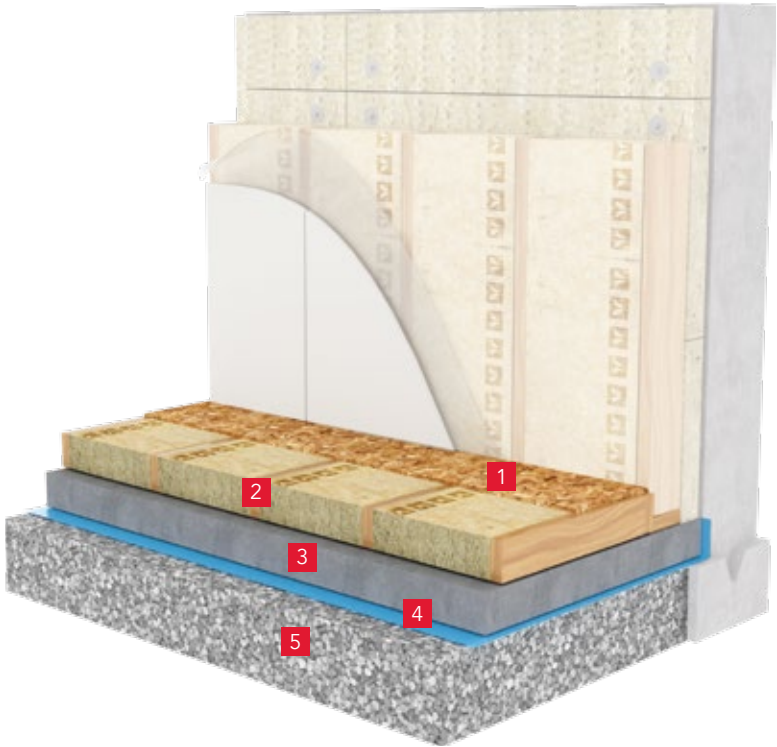
(shown from interior to exterior)

1. Slab-on-grade
2. Vapor retarder/barrier
3. ROCKWOOL Comfortboard stone wool insulation
4. Capillary break layer (crushed rock or similar) on soil



Interior-Insulated Slab Assembly

Interior-insulated slab assemblies provide thermal control via insulation between or below the framing members of a raised floor on the slab. This assembly is a good option for existing basement finishing, renovation, and retrofit projects since the insulation can be installed from the interior. These types of assemblies should be coordinated with interior ceiling heights.



*The placement and need for vapor control layer(s) will vary by project. Consult with a qualified building science professional to determine project-specific materials and placement to appropriately manage water vapor loads.

Interior-Insulated Slab Assembly

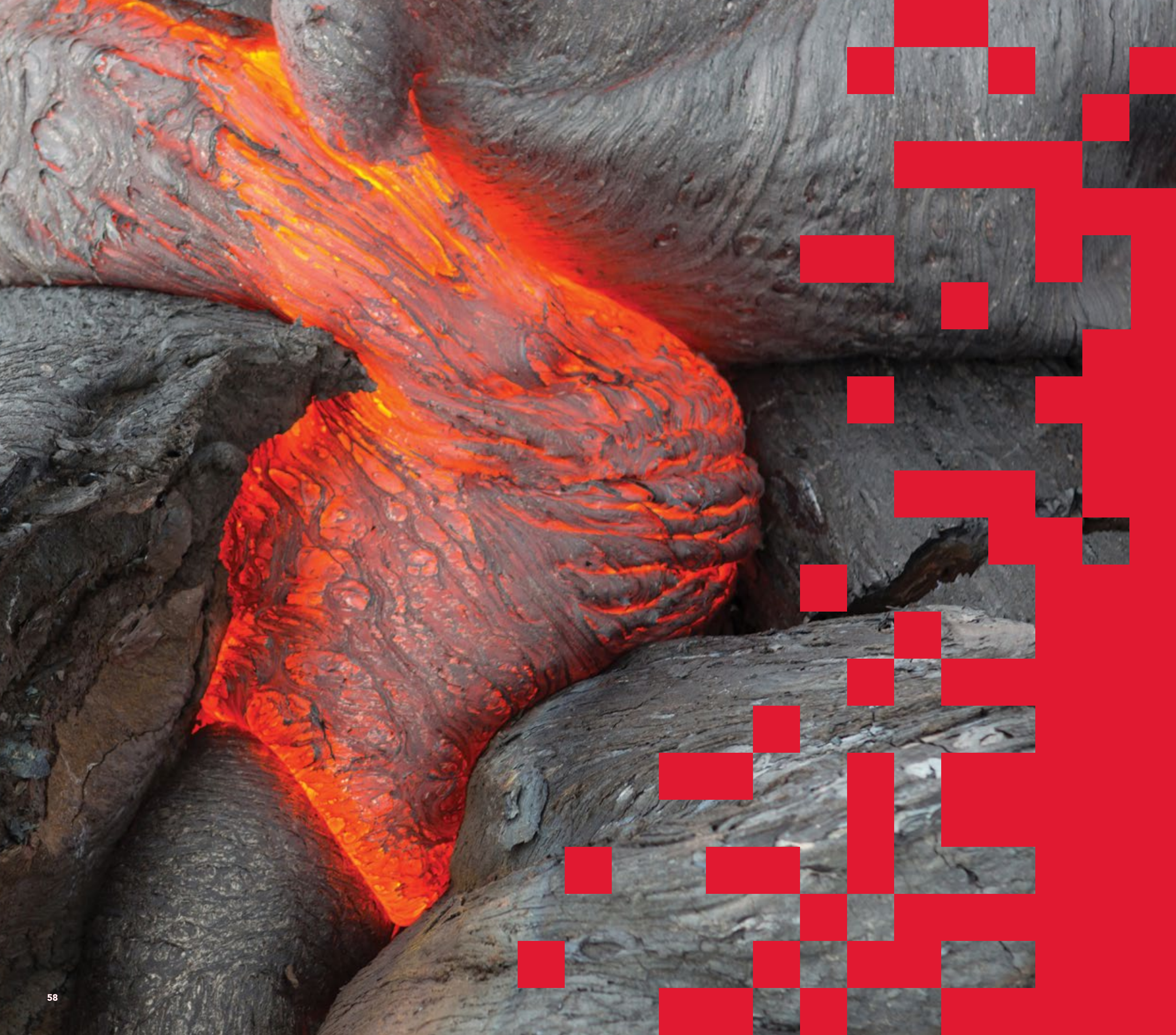
(shown from interior to exterior)

1. Interior finishes
2. Raised floor framing* with ROCKWOOL Comfortbatt stone wool insulation
3. Slab-on-grade
4. Vapor retarder/barrier*
5. Capillary break layer (crushed rock or similar) on soil

Below-Grade System with Stone Wool Insulation

ROCKWOOL stone wool insulation products have been successfully used in below-grade systems in conjunction with different waterproofing membranes, vapor barriers, drainage composites, and sealants. For more information on below-grade system details with stone wool insulation, refer to the [ROCKWOOL Below-Grade application page](#).





Installation Considerations

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Installation Considerations

ROCKWOOL stone wool insulation products can be installed, attached, or secured in a variety of ways. Depending on the insulation product and whether the insulation is installed on the exterior or interior of the structure, it may be mechanically fastened, pinned, temporarily adhered and backfilled, friction fit, or loose laid. Because below-grade insulation is often difficult or impossible to access after installation, it is important to select a durable installation method appropriate for the application.

Continue reading to learn more about appropriate installation practices, including attachment requirements.



Safety Precautions
When handling and installing stone wool products, use proper safety precautions and equipment. For more information, refer to the ROCKWOOL **Safe Use Instruction Sheet**®.



Below-Grade Wall Assemblies — Comfortboard

Comfortboard stone wool insulation can be installed on both the exterior and/or interior sides of below-grade wall assemblies, depending on the type of project and assembly (see **Figure 15** and **Figure 16**). When installing Comfortboard in exterior and/or interior wall applications, boards can be attached using mechanical fasteners or temporary adhesives.

General installation guidelines include:

- For permanent mechanical attachment of Comfortboard to the interior or exterior of a concrete foundation wall, ROCKWOOL recommends using fasteners or impaling pins with minimum 2" diameter washers.
- Refer to **Figure 17 (p. 63)** for recommended fastening patterns according to board size and thickness. Mechanical attachment embedment depth and adhesive suitability should be evaluated for the project-specific application, structure, and material compatibility.
- A construction-grade adhesive can be considered for the temporary attachment of Comfortboard until another permanent restraint, such as interior stud framing or exterior backfill, is installed to hold the insulation in place.
- When using construction-grade adhesives, confirm the adhesive is compatible with stone wool and the intended substrate (e.g., dampproofing or waterproofing) so that the adhesive does not damage the substrate or negatively affect its performance.



Figure 15. Comfortboard mechanically fastened to the exterior face of a basement wall prior to installation of backfill

Specific to exterior insulation applications:

- Where mechanical attachments are needed, consider attachments that are adhered (e.g., stick pins) to the wall structure to avoid fastening to the wall where waterproofing or dampproofing membranes occur.
- Comfortboard insulation installed on the exterior of foundation walls should be protected from damage at the transition to above-grade walls. For more information, refer to ROCKWOOL technical bulletin **Protection of Stone Wool Insulation for Foundation at Grade[®]**.



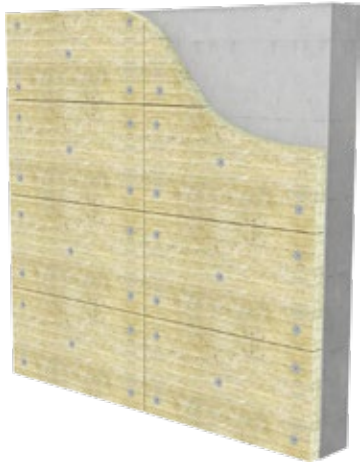
For further information on Comfortboard attachment, refer to the **ROCKWOOL Board Insulation Attachment Guide[®]**.



Figure 16. Comfortboard mechanically fastened to the interior face of a basement wall

Minimum 5 attachments required for solid and framed walls with the following board sizes:

Thickness	Width	Length
1" to 6"	16"	48"
1" to 6"	24"x48"	48"



Fastening pattern over a solid surface with 5 attachments (24"x48" ROCKWOOL insulation board over a concrete wall shown)

Minimum 8 attachments required for solid and framed walls with the following board sizes:

Thickness	Width	Length
1" to 3"	48"	72"
1" to 3"	48"	96"



Fastening pattern over a solid surface with 8 attachments (48"x72" ROCKWOOL insulation board over a concrete wall shown)

Figure 17. Comfortboard fastening requirements for concrete foundation walls

Waterproofing and Dampproofing Membrane Protection

During construction and backfill activities, foundation wall waterproofing and dampproofing membranes can be damaged by tools, debris, traffic, and ultraviolet light exposure. Damage to these membranes can lead to future water ingress that can be difficult to access and repair.

Comfortboard products are durable and UV resistant, and can provide an effective protection layer over waterproofing and dampproofing membranes to reduce the risk of damage. When tested under accelerated UV exposure simulating several years of in-situ UV exposure, ROCKWOOL stone

wool products exhibited no significant change in compressive strength, water absorption, or thermal resistance.

For further information on the UV resistance of stone wool products, refer to the **Resistance of ROCKWOOL Exterior Insulation to Ultraviolet Light[®]** technical bulletin.



Below-Grade Wall Assemblies — Comfortbatt

The rigidity and flexible edge of Comfortbatt stone wool insulation makes it easy to friction fit into below-grade stud cavities (see **Figure 18**). Semi-rigid stone wool batt products can be installed within a wood or steel stud framed wall cavity using an “insert, compress, release” method.

The flexibility of the batt allows for insertion into the stud cavity, while the rigidity and recovery of the product contributes toward a tight fit between the framing members. Minimizing gaps to fill the cavity space provides optimal, long-term performance of the wall assembly.

Comfortbatt can be easily cut with a serrated knife for optimal fit around pipes, electrical boxes, wiring, ductwork, and between studs and joists that are less than a standard width, as demonstrated in **Figure 19**.



Figure 18. Comfortbatt installation within a stud cavity



Figure 19. Comfortbatt cut to fit around an obstruction

Need Support?

The ROCKWOOL Technical Services team is available to help you establish informed, project-specific design goals and determine the right products and assemblies for your next project.

Contact us at techservice@rockwool.com.

Slab-on-Grade Assemblies – Comfortboard

Comfortboard stone wool insulation can be installed on both the exterior and interior sides of slab-on-grade assemblies, depending on the type of project and assembly.

Exterior Insulation

Comfortboard may be loose laid below slabs-on-grade and between slab edges and foundation walls to reduce thermal bridging. To ensure structural integrity, select the appropriate Comfortboard product for your project's slab thickness and associated weight, and the live loads expected on the slab. ROCKWOOL recommends that the use of insulation below slabs, and selection of Comfortboard 80 and 110, be based on an evaluation of the project-specific slab loads, floor finishes, and live loads with a design professional.

To install Comfortboard below slabs-on-grade and at slab edges:

- Loosely lay the insulation over a firm, level subgrade. When using multiple layers of Comfortboard, the board joints should be overlapped for added strength as shown in **Figure 20**.
- Ensure the slab design accounts for some compression of the insulation due to induced loads from the slab.
- Install Comfortboard under the entire floor area of a concrete floor slab, or coordinate special details by the designer at the boundary where the concrete floor slab does not have under-slab insulation.
- Install Comfortboard prior to the under-slab vapor retarder/barrier.
- Do not use Comfortboard under footings or load-bearing walls.
- Avoid installing on buildings that may have moving loads (i.e., forklifts, vehicles, etc.) and live loads with variable pattern loading without specialized concrete reinforcement design.

Interior Insulation

Comfortboard may be loose-laid below raised floor framing on the interior side of the slab-on-grade. ROCKWOOL recommends that the use of Comfortboard insulation on the interior surface of slabs, and selection of Comfortboard 80 and 110; be based on an evaluation of project-specific floor finishes, live loads, and raised floor framing design with a design professional.

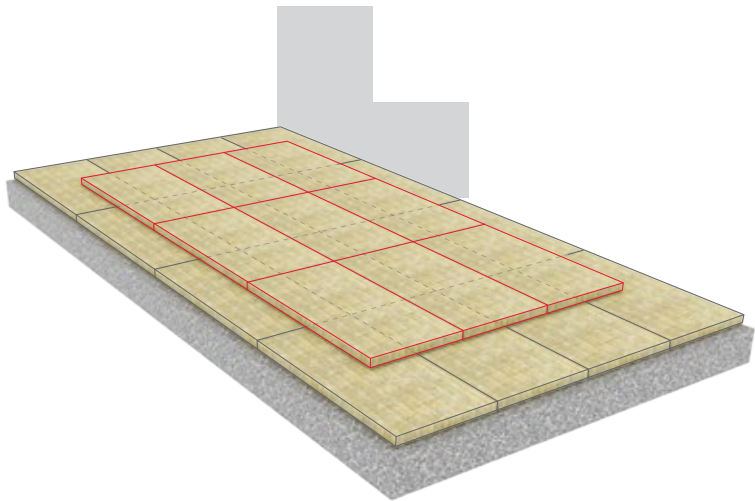


Figure 20. Schematic showing Comfortboard jointing below a slab-on-grade assembly

Need Support?

To learn more about the compressive test data for Comfortboard insulation products, contact us at techservice@rockwool.com.

ROCKWOOL Product and Application Documentation

Technical Data Sheets

- ROCKWOOL Comfortbatt® (CA)™
- ROCKWOOL Comfortbatt® (US)™
- ROCKWOOL Comfortboard® 80™
- ROCKWOOL Comfortboard® 110™

Technical Bulletins

- Exposure to the Elements™
- Resistance of ROCKWOOL Exterior Insulation to Ultraviolet Light™ (p. 63)
- Resistance of ROCKWOOL Stone Wool Insulation to Termites™ (p. 31)
- Storage of Stone Wool Insulation™
- Use of ROCKWOOL Stone Wool as a Thermal and Ignition Barrier™ (p. 53)
- Protection of Stone Wool Insulation for Foundation at Grade™ (p. 62)

Technical Guide

- ROCKWOOL Board Insulation Attachment Guide™ (p. 62)

Installation Guide

- ROCKWOOL Comfortboard 80 Installation Guide™

Additional Documentation

- Durability and Stone Wool Insulation Fact Sheet™
- Environmental Product Declaration (EPD)™ (pp. 33, 41)
- LEED Submittal Guide™ (p. 41)
- ROCKWOOL Mid-Rise Wood Construction Solutions Guide™ (pp. 19, 20)
- ROCKWOOL Passive House Solutions Guide™ (p. 34)
- ROCKWOOL Sustainable Project Solutions Guide™ (p. 33)
- Sustainability Report™ (p. 42)
- Safe Use Instruction Sheet (SUIS)™ (p. 61)

ROCKWOOL Sales and Support

ROCKWOOL is committed to assisting you in achieving your project’s highest performance by offering building science expertise and technical support services.

Complimentary services provided by ROCKWOOL Building Science experts:



Building Science Support

- Building science expertise and resources
- Educational seminars and architectural/site visits
- Envelope detailing and material specifications



Thermal Calculations

- Codes and standards compliance evaluations
- Effective thermal performance calculations
- 2D and 3D thermal modeling (THERM/HEAT3)
- Overall U-factor/effective R-value analysis
- Insulation detail review



Heat, Air, and Moisture Transfer Modeling

- 1D transient hygrothermal analysis (WUFI)
- Dew-point calculations



Acoustic Modeling

- Insulation detail review
- Sound transmission class (STC) calculations

Questions? Contact Us

ROCKWOOL is a partner with the technical know-how to support inquiries from your team. If you have technical questions about our products or need support for your project, our technical experts are here to help you.

Technical Services and Product Inquiries

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techservice@rockwool.com™

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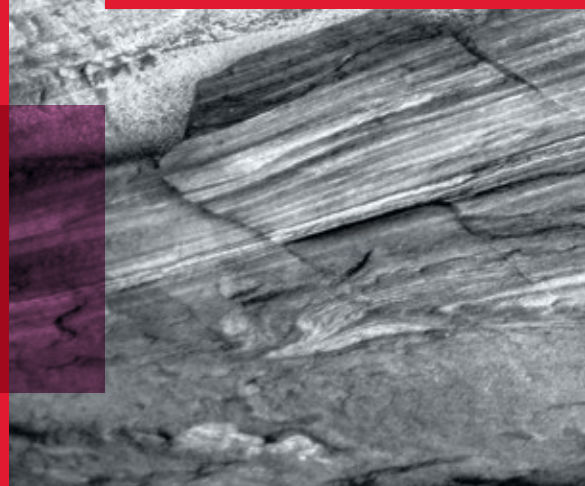
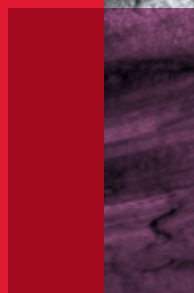
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ROCKWOOL Group is the world leader in stone wool products, from building insulation to acoustic ceilings, external cladding systems to horticultural solutions, engineered fibers for industrial use to insulation for the process industry and marine & offshore. We are committed to enriching the lives of everyone who experiences our products and services, and to helping customers and communities tackle many of today's biggest sustainability and development challenges including energy consumption, noise pollution, fire resilience, water scarcity, urban flooding, and more.

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