

# Perimeter Fire Containment System Technical Guide

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Curtain wall systems

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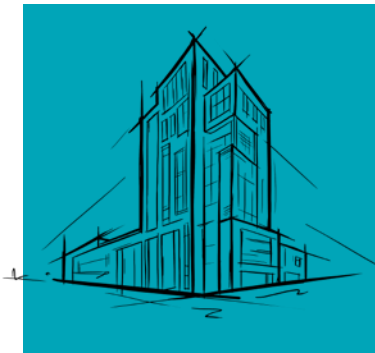
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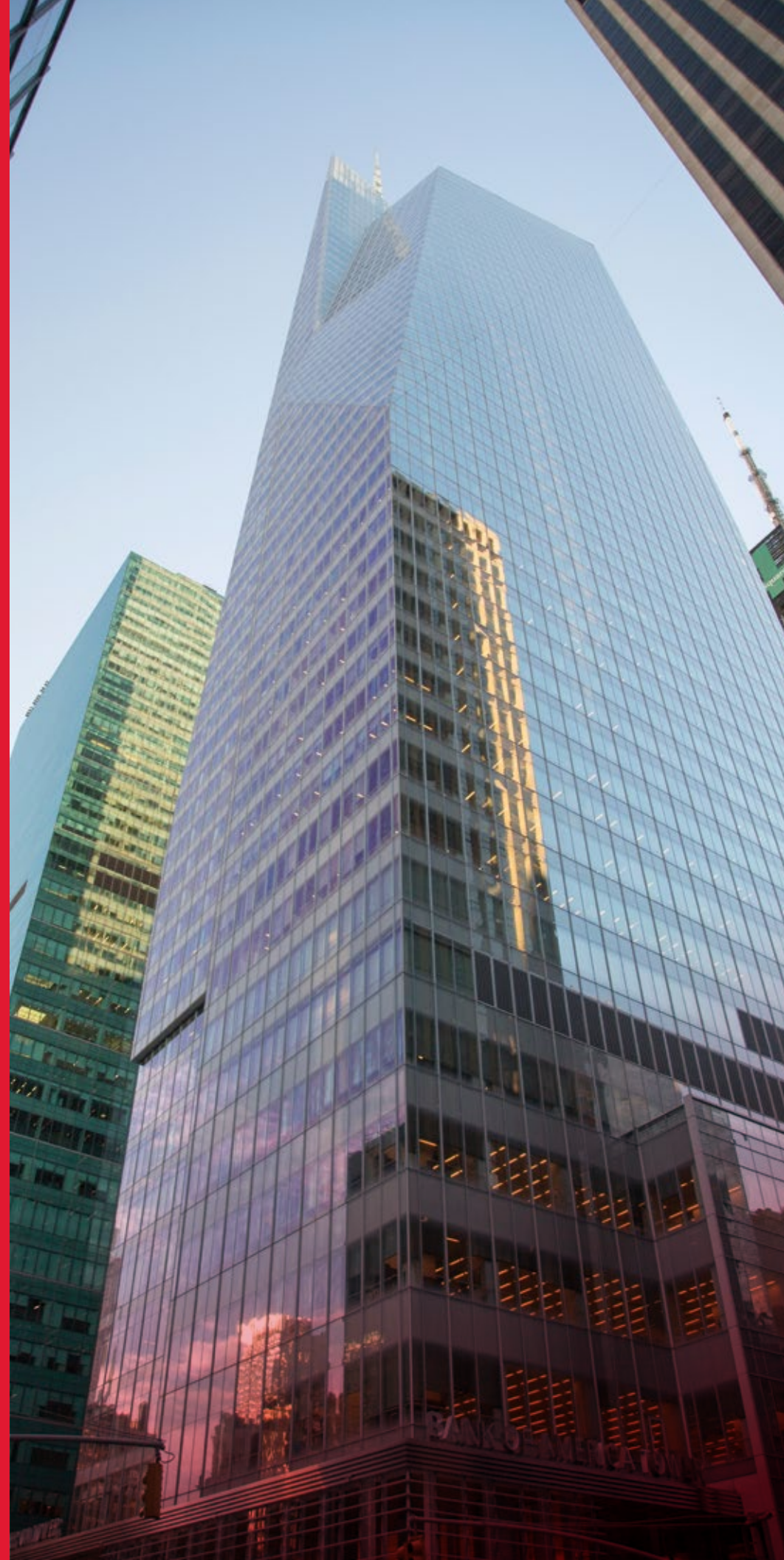
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## A commitment to life safety set in stone

Founded as a family business in 1937, today ROCKWOOL™ is the world's leading manufacturer of stone wool insulation. By using stone, one of the planet's most abundant natural resources, ROCKWOOL can offer a full range of high-performing and sustainable insulation products for the construction industry.

Life safety begins with creating safer environments designed to prevent fires and minimize risks. Firestopping, for both penetrations and joints, is no different. Even simple-looking applications have detailed listings that must be assembled and installed in accordance with the manufacturer's and/or third-party listing instructions.

Noncombustible insulation materials — such as ROCKWOOL stone wool insulation — play a crucial role in improving the fire resistance of buildings by helping to limit the spread of fire and assisting in the health and safety for all occupants.

ROCKWOOL has developed this technical guide to provide a better understanding of perimeter fire containment systems for curtain wall construction, along with the ROCKWOOL insulation products and system solutions that meet requirements within the building code. Throughout the guide, you will also find installation tips and recommendations to help better inform the fire safety decisions of your next project.







# Curtain walls and perimeter fire containment systems

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Cladding systems: how curtain walls differ from traditional window walls

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Types of curtain wall systems: unitized vs. stick-built

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Components of perimeter fire containment systems





From commercial multistory buildings to mid- and high-rise residential construction, many modern structures use curtain wall cladding systems, wherein the exterior walls are not part of the load-bearing structure.

The curtain wall facade does not carry or support any weight from the building other than its own dead load. And because of its nonstructural design, curtain walls can be manufactured from lightweight materials to reduce construction costs.

These structures can be elegant and functional solutions, but if a fire strikes in a high-rise building, the consequences can be serious. Because curtain walls are not fire rated, the risk of fire propagation is found at the perimeter void — the space between the edge of the floor slab and the exterior curtain wall.

Generally hidden from view after construction, when such openings are left unprotected, they provide a path

for fire and smoke to spread vertically from floor to floor within the building. This scenario is prevented by proper compartmentation with passive fire protection systems, which means containing the fire to the room of origin — allowing occupants to safely evacuate the building and fire personnel to safely enter the building to extinguish the fire.

Compartmentation is critical for ensuring life safety, meeting codes standards and providing structural integrity through protection of exterior wall components of the building in the event of a fire. This is where installation of perimeter fire containment systems featuring ROCKWOOL stone wool insulation can meet code requirements as well as contribute to life safety.

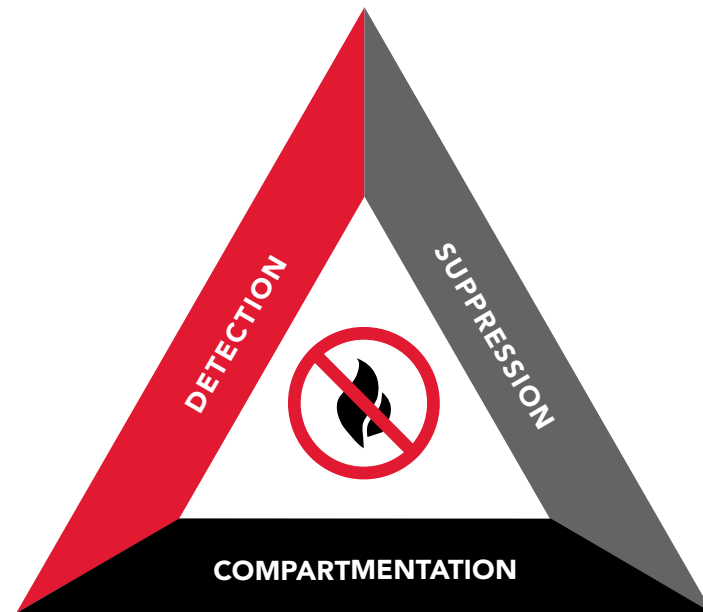
Three pillars of fire protection

These features contribute to a comprehensive approach to protecting people and property.

**Detection:** Installed systems that provide advance warning of fire. These can range from basic smoke detectors to complex fire alarm systems.

**Suppression:** On-site equipment that extinguishes fire, including fire extinguishers, sprinkler systems and fire hoses. This group of systems is often referred to as active fire protection, meaning each require a form of activation to turn on and work as intended.

**Compartmentation:** Structural elements created to separate human occupants from fire and smoke, including fire-resilient insulation, fire doors, dampers, and fire walls and flooring — all of which help to contain the fire to its location of origin. This group of systems is often referred to as passive fire protection and once installed do not require activation for operation.



“Even a well-maintained, complete, appropriate sprinkler system is not a magic wand. It requires the support of a well-considered integrated design for all the other elements of the building’s fire protection.”

– National Fire Protection Association

Cladding systems: how curtain walls differ from traditional window walls

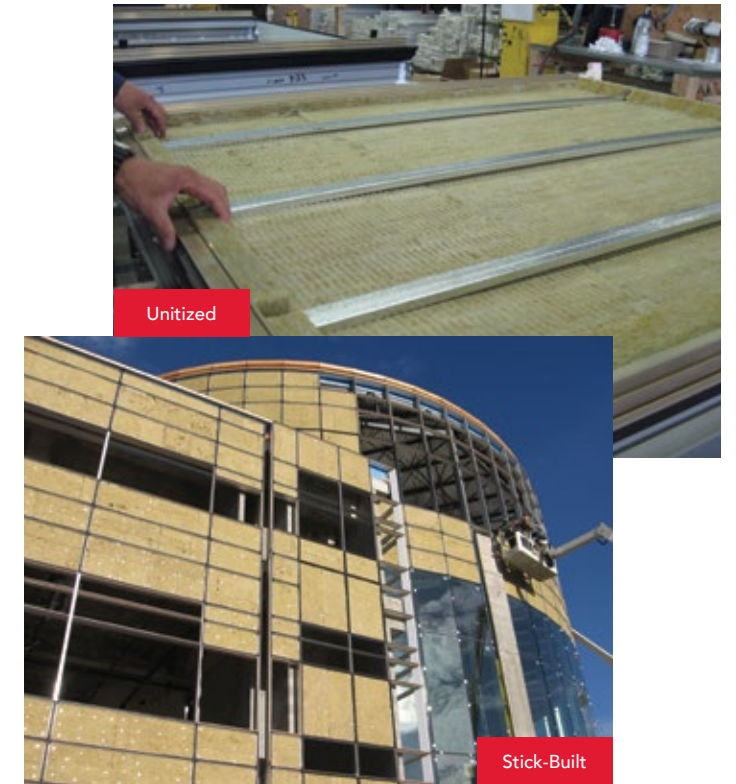
While window wall and curtain wall systems are often used interchangeably, there is a clear difference between the two cladding systems. Window walls structurally span from slab to slab between floors and can be installed from the building’s interior, while curtain wall systems are suspended externally over the building’s structural elements to create the look of top-to-bottom glass. Due to the window wall’s placement between the floor slabs, firestopping may or may not be required (refer to the listing for details).

Types of curtain wall systems: unitized vs. stick-built

There are two primary types of curtain wall system construction — unitized and stick-built, in addition to some hybrid construction projects. Though the end result is aesthetically similar, the two systems are manufactured differently and are chosen based on specific requirements of the project identified during design and construction.

Unitized curtain wall systems

Unitized curtain wall systems are assembled and glazed at an off-site manufacturing facility and shipped to the project location for installation on the structure to form the building enclosure. Once the finished units are on site, they can be hoisted onto anchors and connected to the building. Most unitized curtain wall systems are installed in a sequential manner around each floor level, moving upward from the bottom to the top of the building.



Stick-built curtain wall systems

Stick-built curtain wall systems are shipped to the job site in pieces, where they are assembled, glazed and installed piece by piece on the structure of the building. Long pieces of aluminum (the “stick”) are inserted between floors vertically and horizontally between vertical members to support and transfer the load of the glass back to the structure. This type of curtain wall assembly construction allows for a higher degree of on-site adjustments and customization allows for a higher degree of on-site adjustments and customization.

VARIABLES THAT MAY CONTRIBUTE TOWARD DETERMINING UNITIZED VS. STICK-BUILT CONSTRUCTION

	Stick-Built	Unitized
Project Size	Small	Large
Wall Configuration	Complex	Monolithic
Joint Pattern	Random	Uniform horizontal sill line
Glazing	Field	Factory
Inter-Story Movements	Very limited	Interlocking frames accommodate movements
Quality Control	Subject to site variables	Controlled factory conditions
Modifications	Can be cut to fit in the field	Preengineered
Sealing	Subject to site variables	Minimal field sealing
Field Labor Duration	Slow	Fast

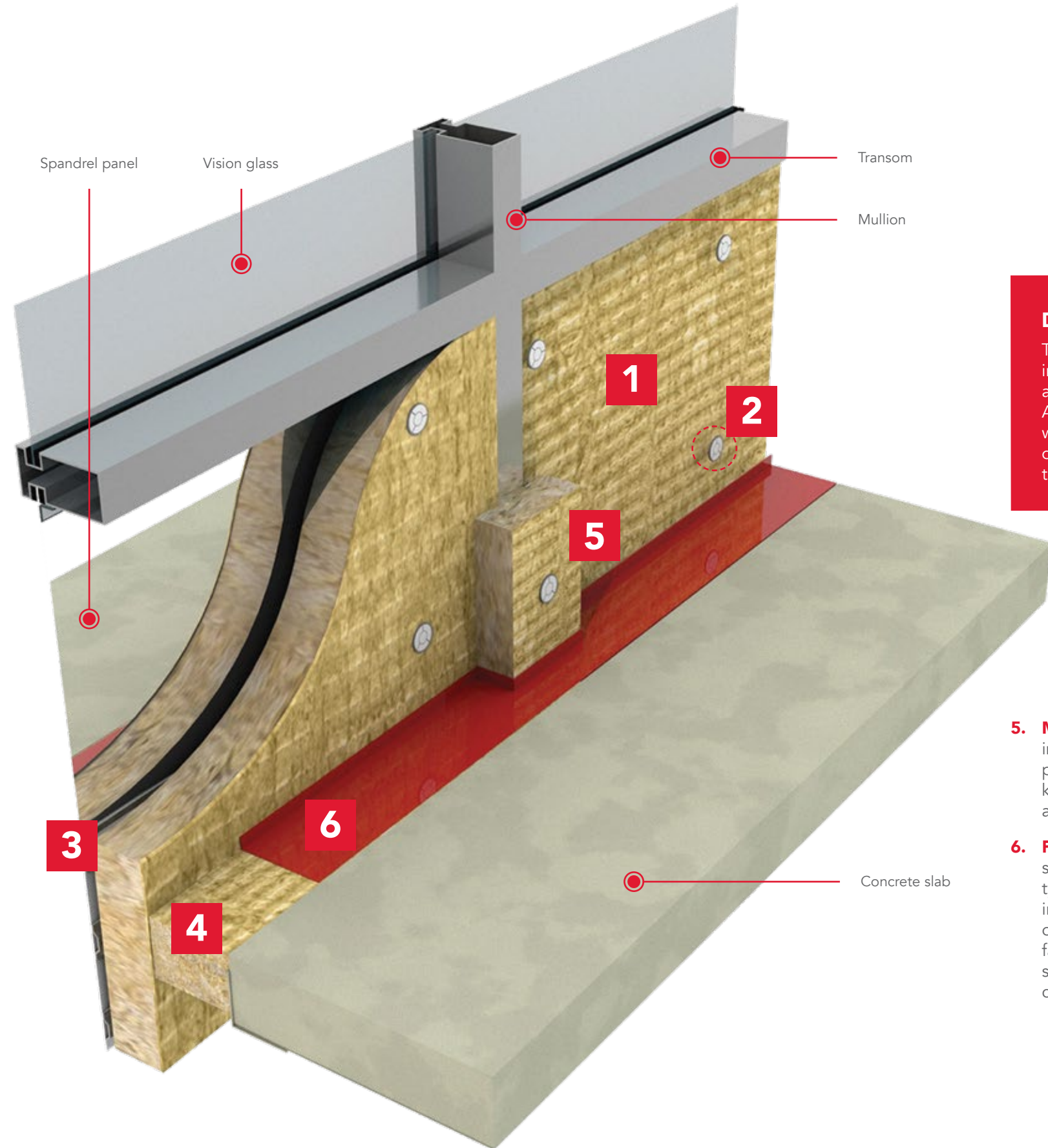


## Components of perimeter fire containment systems

At the forefront of any fire containment system strategy is the use of stone wool insulation or slag wool insulation — both commonly referred to as mineral wool insulation — the only material tested to stay in place when exposed to fire. In fact, mineral wool has a melting point greater than 2,000 degrees Fahrenheit.

For a perimeter fire containment system to meet building code requirements and provide passive fire protection as intended, the following six critical design elements must be considered. The complete system must be tested and approved in UL™ or Intertek® listings per ASTM E2307.

- 1. Spandrel insulation** is mechanically attached within the spandrel/curtain wall components of the assembly — whether a backpan, aluminum-framed, or other type of curtain wall design.
- 2. Fastening/insulation securement** is required to prevent the curtain wall spandrel insulation from becoming dislodged, which would allow fire to propagate to the next floor.
- 3. Stiffener/backer reinforcement** is a lightweight steel-angle, T-bar or hat channel placed behind the curtain wall insulation to help prevent the spandrel insulation from bowing due to the compression force at the safing joint. (Reference tested and listed systems requirements to ensure the proper reinforcement at the safing line is provided during assembly construction)
- 4. Safing insulation** is compression fit during installation within the void between the floor assembly and the exterior curtain wall insulation to provide a tight seal against the passage of flames through the joint. (Reference tested and listed systems for requirements on compression and orientation of the safing insulation)



### Did you know?

Temperatures reach 1220°F 9 minutes into the test when aluminum framing and curtain wall anchors begin to melt. A successful perimeter fire barrier test will compensate for the deflection and deformation of the wall system during the test.

- 5. Mullion covers** that use approved mineral wool insulation outlined in the tested and listed system protect exposed vertical aluminum mullions to help keep the spandrel insulation in place, while also adding moisture and thermal protection.
- 6. Firestop sealant/smoke barrier** is used to impede smoke from passing through the slab edge. It is typically spray-applied to the top of the safing insulation (non-fire-exposure side) with a 1-inch overlap extending onto the floor slab and interior face of the curtain wall. Materials used for smoke sealants include latex sprays, hybrid polymer coatings and fire barrier tape products.





# Perimeter fire containment system testing and standards

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Fire propagation in mid- to high-rise buildings

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Fire testing standards

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International Building Code

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National Building Code of Canada



A structure's fire resistance is a critical consideration for everyone involved in the design and construction of a building project. Codes, testing and standards exist to ensure that approved perimeter fire containment systems have the best chance of resisting the propagation of flame and smoke in order to keep a building's occupants as safe as possible in the case of a fire.

Since first appearing in the 2006 edition of the International Building Code®, ASTM E2307 has represented the definitive testing method for evaluating the performance of perimeter fire containment assemblies in curtain wall systems.

The end point of the fire resistance test is the period of time elapsing before the fire barrier fails or when the targeted period of time is reached. During such a test, flame penetration through the perimeter joint protection or around its boundaries would result in a failure.

Understanding rating definitions

- F-Rating: The time period that a passive firestop system can withstand the spread of fire through the penetration to the non-fire-exposed side. The rating is determined as the time at which one of the following conditions first occurs: flame penetration through the perimeter joint protection or around its boundaries, or the passage of flames or hot gases sufficient to ignite the cotton pad.
- T-Rating: The time period that a penetrating item takes to increase in temperature to 325 °F (181 °C) above ambient based on the temperature rise of any of the unexposed surface thermocouples on the unexposed face of the perimeter fire barrier.
- L-Rating: The air leakage, stated in cubic feet per minute of airflow through the assembly, per square foot of opening area — simulating smoke movement.

The case of Parque Central in Caracas, Venezuela

In 2004, a fire began on the 34th floor of the Parque Central's East Tower in downtown Caracas. Over the next 17 hours, the blaze spread upward through more than 20 floors, eventually reaching the roof before being contained by water dropped from military helicopters. The fire's rapid and destructive path was found to be the result of a lack of compartmentalization due to the building's improperly maintained fire alarm and sprinkler systems — demonstrating the importance of a comprehensive approach for designing a building's fire protection, which includes a complete perimeter fire containment system.



Fire propagation in mid- to high-rise buildings

To understand how an ASTM E2307 test can measure a perimeter fire containment system's ability to maintain a barrier, it is useful to understand how a fire can propagate in mid- to high-rise building structures.

After fire reaches the flashover point, the only way to keep it from engulfing much larger areas of the building from the inside is to ensure that the fire compartment (the walls, ceilings, floors and doors) can withstand being exposed to a fully developed fire on one side while not transporting heat, flames or toxic gases to the other side.

There are two main paths for fire and smoke to spread to adjacent floor levels at the exterior wall when the fire compartmentation fails to control propagation:

- Chimney effect is attributed to the spread of fire upward through the available void spaces created between the rated floor slab assemblies and the non-fire-rated curtain wall.
- Leapfrog effect is experienced in fires when the flames break out through perimeter vision glass on the building's floor where the fire originated, allowing flames and hot gases to escape to the outside of the building. The fire then leaps up through the windows in the floor above and enters that interior space — continuing to spread vertically through the same process floor by floor.

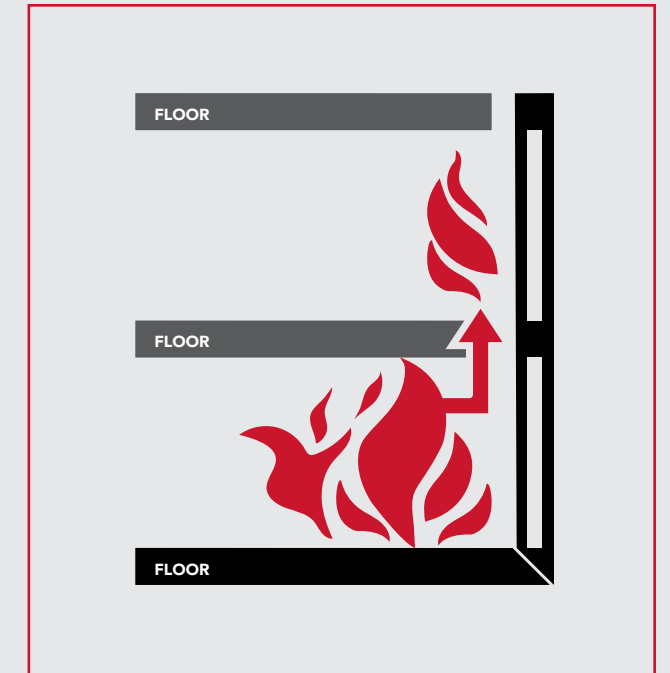
A perimeter fire containment system is engineered to counteract and contain these methods of fire propagation in commercial buildings that use a curtain wall. As a key component within these passive firestopping systems, ROCKWOOL stone wool insulation provides a critical line of defense that has been UL, ULC or Intertek tested and approved for perimeter fire containment systems.

Did you know?

70% of all fire-related deaths are due to smoke and toxic gases.

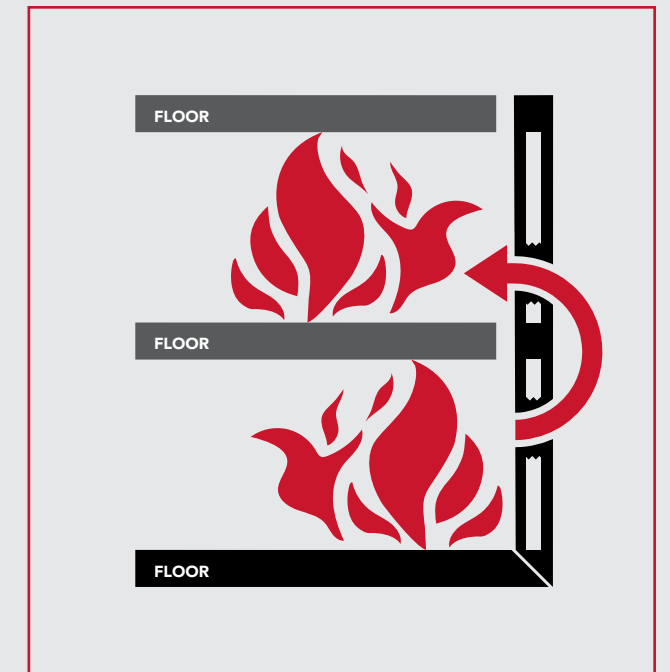
CHIMNEY EFFECT

ASTM E2307



LEAPFROG EFFECT

ASTM E2874







### Fire testing standards

There are two important fire testing standards for perimeter fire containment systems:

- **ASTM E2307:** Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Test Apparatus
- **ASTM E119:** Standard Test Methods for Fire Tests of Building Construction and Materials

Performed at independent and accredited laboratories, ASTM E2307 testing exposes a wall to fire on both sides at the same time for a specific time period (between one and four hours) and measures the performance of the perimeter fire barrier's ability to maintain a seal to prevent fire spread through the exterior wall and floor intersections (the chimney effect).

The curtain wall and joint are also burned from below and from the exterior to simulate how high-rise fires behave when the fire plume exits the room of origin through a window (the leapfrog effect).

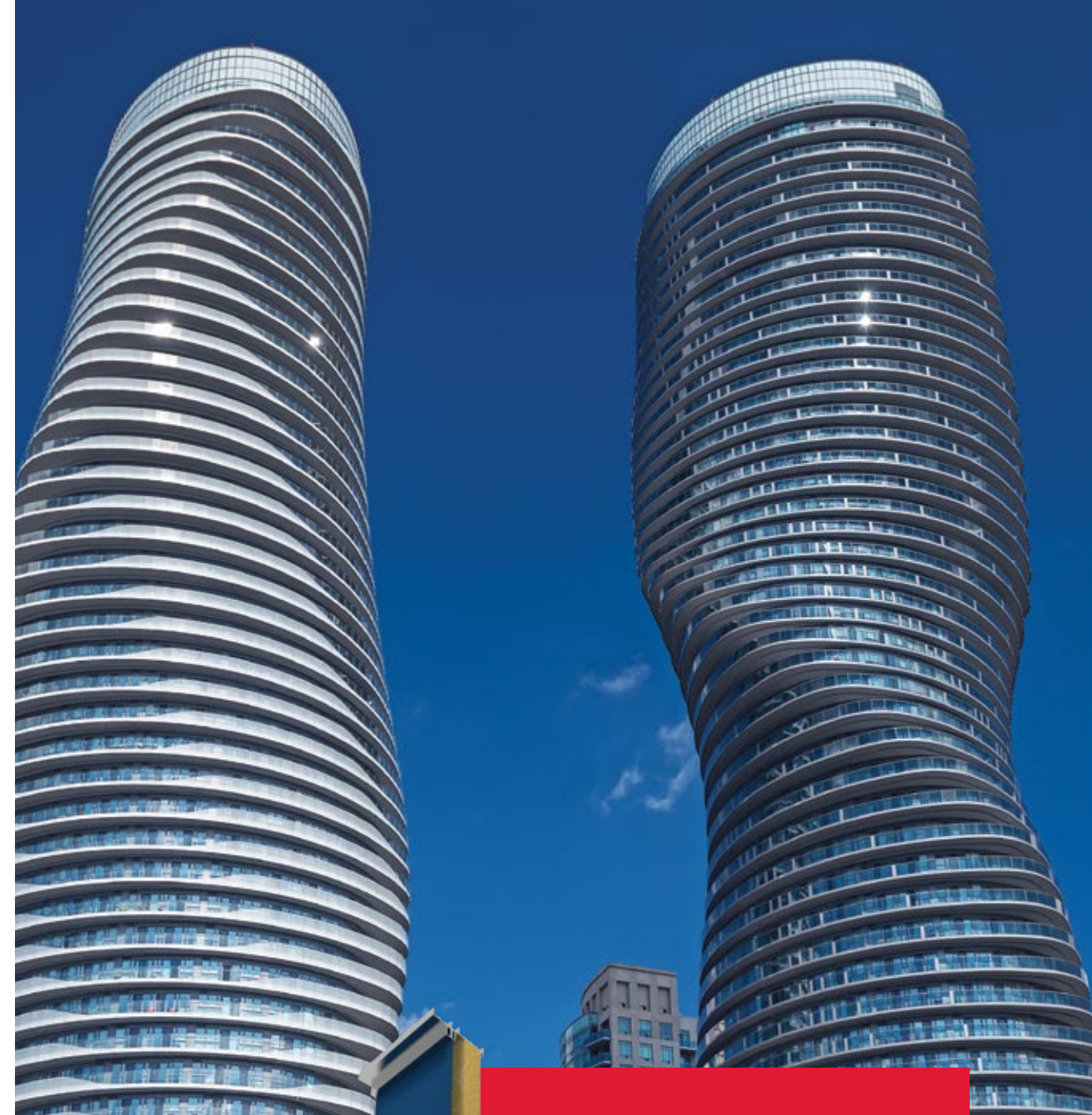
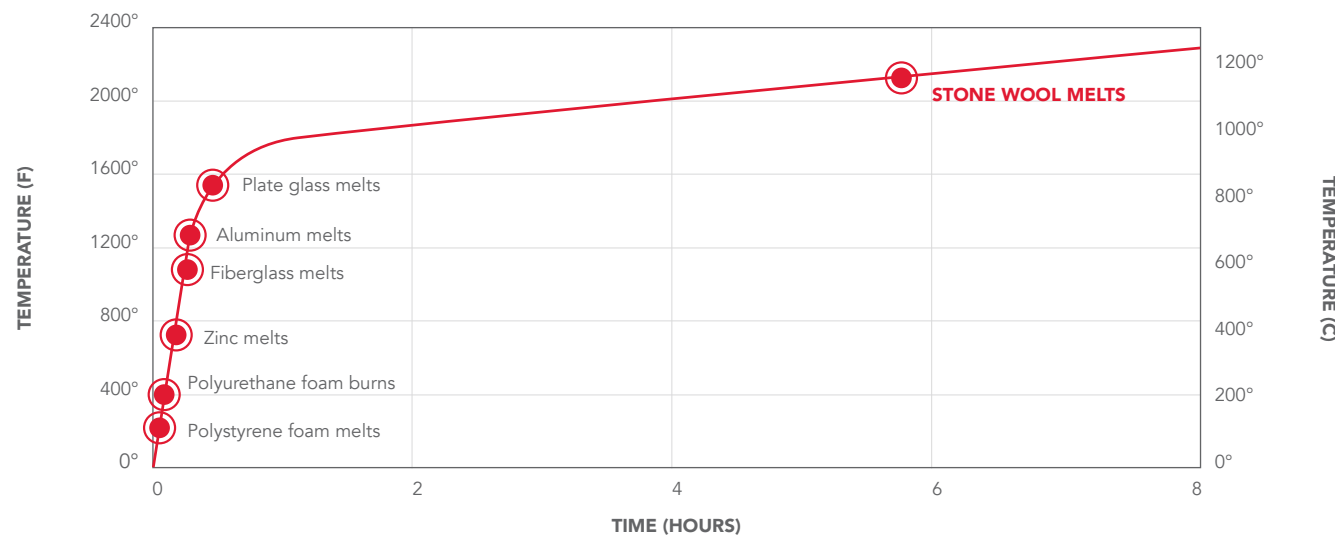
After 30 minutes of the test have elapsed, the ASTM E2307 essentially parallels the ASTM E119 time-temperature curve in the test room for the remainder of the testing window.

ASTM E119 is critical in testing building assemblies and is used to determine the fire resistance rating of materials and structures. The ASTM E119 test provides a time-temperature curve that details when the material in a curtain wall system will fail.

Testing shows that the aluminum framing starts to melt after approximately nine minutes as key components of the curtain wall system fail under extreme fire exposure. A successful perimeter fire barrier system design will compensate for the deflection and deformation of the wall system during the test. Perimeter fire containment systems must be compliant to ASTM E2307 to effectively provide a proven barrier to flame and hot gases at the perimeter joint. ROCKWOOL stone wool is noncombustible and able to withstand temperatures of up to 2150 °F (1177 °C) without burning or melting. This makes it an excellent barrier for preventing fire spread and allows it to provide or contribute to the fire resistance of building elements and assemblies.

**REMINDER:** Always follow the specifications of a tested and approved ASTM E2307 listing when designing and constructing a perimeter fire containment system.

E119 TIME TEMPERATURE CURVE



For the full case study, visit: [rockwool.com/absolute-world-case-study](https://rockwool.com/absolute-world-case-study)

### Case Study

The award-winning Absolute World residential towers in Ontario, Canada

Standing at 50 and 56 stories, respectively, both buildings' curtain wall systems incorporate ROCKWOOL's Curtainrock® 80 and ROXUL Safe® insulation as part of their fire perimeter containment system.







## International Building Code

To ensure the structural integrity and life safety of curtain wall systems in the US, the International Building Code outlines very specific firestopping requirements. The IBC® is revised over a three-year cycle — most recently in 2015 and 2018 — and the 2021 version includes modifications to firestopping requirements.

### Section 705.8.5 Vertical Separation of Openings

- Openings in exterior walls in adjacent stories shall be separated vertically to protect against fire spread on the exterior of the buildings where the openings are within 5 feet (1,524 mm) of each other horizontally and the opening in the lower story is not a protected opening with a fire-protection rating of not less than 45 minutes. Such openings shall be separated vertically not less than 3 feet (914 mm) by spandrel girders, exterior walls or other similar assemblies that have a fire resistance rating of not less than one hour, rated for exposure to fire from both sides, or by flame barriers that extend horizontally not less than 30 inches (762 mm) beyond the exterior wall. Flame barriers shall have a fire resistance rating of not less than one hour. The unexposed surface temperature limitations specified in ASTM E119 or UL 263 shall not apply to the flame barriers unless otherwise required by the provisions of this code.

#### Exceptions

- This section shall not apply to buildings that are three stories or less above grade plane.
- This section shall not apply to buildings equipped throughout with an automatic sprinkler system in accordance with section 903.3.1.1 or 903.3.1.2.
- Open parking garages.

There are also some significant changes in the 2021 edition to the IBC requirements, including the introduction of the terminology “perimeter fire containment system.” This provides significant clarity from 2015 and 2018, when the IBC simply stated an “approved” system as the requirement for the firestop between a rated floor assembly and a nonrated curtain wall.

The IBC now defines a perimeter fire containment system as “an assemblage of specific materials or products that is designed to resist for a prescribed period of time the passage of fire through voids created at the intersection of exterior curtain wall assemblies and fire-resistance-rated floor or floor/ceiling assemblies.”

The 2021 edition of the IBC also now includes reference to ASTM E2307 in subsection 715.4.1.

### Section 715.4 Exterior Curtain Wall/Fire-Resistance-Rated Floor Intersections

Voids created at the intersection of exterior curtain wall assemblies and fire-resistance-rated floor or floor/ceiling assemblies shall be protected with an approved perimeter fire containment system to prevent the interior spread of fire. Such systems shall provide an F rating for a time period not less than the fire resistance rating of the floor or floor/ceiling assembly.

#### Section 715.4.1 Fire Test Criteria

Perimeter fire containment systems shall be tested in accordance with the requirements of ASTM E2307.

#### Exception

- Voids created at the intersection of the exterior curtain wall assemblies and floor assemblies where the vision glass extends to the finished floor level shall be permitted to be protected with an approved material to prevent the interior spread of fire. Such material shall be securely installed and capable of preventing the passage of flame spread and hot gases sufficient to ignite cotton waste where subjected to ASTM E119 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch (0.254 mm) of water column (2.5 Pa) for the time period not less than the fire resistance rating of the floor assembly.

### Section 715.5 Exterior Curtain Wall/Non-Fire-Resistance-Rated Floor Assembly Intersections

Voids created at the intersection of exterior curtain wall assemblies and non-fire-resistance-rated floor or floor/ceiling assemblies shall be filled with an approved material or system to retard the interior spread of fire and hot gases between stories.

### Section 715.6 Exterior Curtain Wall/Vertical Fire Barrier Intersections

Voids created at the intersection of non-fire-resistance-rated exterior curtain wall assemblies and vertical fire barriers shall be filled with an approved material or system to retard the interior spread of fire and hot gases.

### Section 715.7 Curtain Wall Spandrels

Height and fire resistance requirements for curtain wall spandrels shall comply with Section 705.8.5. Where Section 705.8.5 does not require fire-resistance-rated curtain wall spandrels, the requirements of Sections 715.4 and 715.5 shall still apply to the intersection between the curtain wall spandrels and the floor.

### Section 715.8 Joints & Voids in Smoke Barriers

Fire-resistant joint systems protecting joints in smoke barriers, and perimeter fire containment systems protecting voids at the intersection of a horizontal smoke barrier and an exterior curtain wall, shall be tested in accordance with the requirements of UL 2079 for air leakage. The L rating of the joint system shall not exceed 5 cubic feet per minute per linear foot (0.00775 m³/s m) of joint at 0.30 inch (74.7 Pa) of water for both the ambient temperature and elevated temperature tests.



## What is movement cycling?

Identified as the expected movement between the exterior wall and the floor slab during normal building use, such movement is caused by thermal expansion/contraction (e.g., winter to summer and summer to winter).

### ■ Case Study

## The Living Shangri-La

Designed by James K.M. Cheng Architects Inc., the visually stunning Living Shangri-La tower, located on the Vancouver waterfront, was built using ROCKWOOL Curtainrock and ROXUL Safe products as its specified insulation.





### ■ Case Study

#### 5-star luxury meets the 7 Strengths of Stone

Located in the heart of downtown Toronto, The Ritz-Carlton hotel and condominium's 53-floor curtain wall system was built using ROCKWOOL Curtainrock 80 and ROXUL Safe as part of the building's perimeter fire containment system.

## National Building Code of Canada

Previously, there were challenges on how to address the gap created with the intersection of a rated floor assembly and a nonrated exterior wall assembly. Until recently, firestopping at slab edges was treated as joints per CAN/ULC S115; however, changes to the code clarify that perimeter joint firestop systems must be tested to ASTM E2307, in alignment with the requirements under the International Building Code.

With CAN/ULC S115 now referencing the ASTM E2307 Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Test Apparatus, there is clarity on the requirement for continuity of the fire resistance rating of a rated floor and an unrated exterior wall.

### 9 Perimeter Joint Firestop Systems

#### 9.1 General

Section 9.1.1 Perimeter Joint Firestop Systems shall be tested in accordance with the requirements in ASTM E2307, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Apparatus.

#### 9.2 Construction of Fire Test Specimen

Section 9.2.1 The test specimen shall be constructed and conditioned for the fire test as described in ASTM E2307, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Test Apparatus.

Section 9.2.2 The perimeter joint firestop systems shall be tested in accordance with the movement cycling requirements in the standard ASTM E2307, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Test Apparatus, and with the minimum cycle and cycling rate specified in ASTM E2307.

#### 9.3 Test Equipment and Apparatus

Section 9.3.1 The test equipment and apparatus shall be in accordance with the requirements in the standard ASTM E2307, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Test Apparatus.

New Canadian requirements for Perimeter Fire Barrier Systems in the 2018 CAN/ULC S115 code:

#### 9.4 Conduct of Fire Test

##### 9.4.1 General

Section 9.4.1.1 In addition to the requirements of Section 7, Protection and Conditioning, the test specimen shall be tested in accordance with the fire resistance test procedure in ASTM E2307, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Test Apparatus.

##### 9.4.2 Furnace Temperatures

Section 9.4.2.1 The fire exposure conditions used for the first 30

### Did you know?

The void created between a rated floor and the nonrated curtain wall can range anywhere from 1 to 12 inches (25 to 305 mm) or more. This joint requires proper sealing to prevent the spread of flames between adjacent stories.

minutes shall conform to the exposure described in ASTM E2307, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Test Apparatus, and then conform to the fire exposure requirements in CAN/ULC-S101, Standard Methods of Fire Endurance Tests of Building Construction and Materials, for the remainder of the test.

#### 9.4.3 Differential Pressures

Section 9.4.3.1 In addition to the requirements for differential pressures in ASTM E2307, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Test Apparatus, the furnace pressure differential shall be in accordance with Clause 5.5.5.

#### 9.4.4 Unexposed Surface Temperatures

Section 9.4.4.1 The placement and measurement of unexposed surface temperatures shall be in accordance with the requirements in ASTM E2307, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Test Apparatus.

### Need support?

ROCKWOOL's Technical Services team is available to help you interpret building code requirements for your jurisdiction, as well as determining the right products and assemblies for your next project. Contact us at [techservice@rockwool.com](mailto:techservice@rockwool.com).





## The superior performance of stone wool insulation

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The stone wool difference

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The 7 strengths of stone

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Curtainrock® 40/80

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ROXUL Safe®



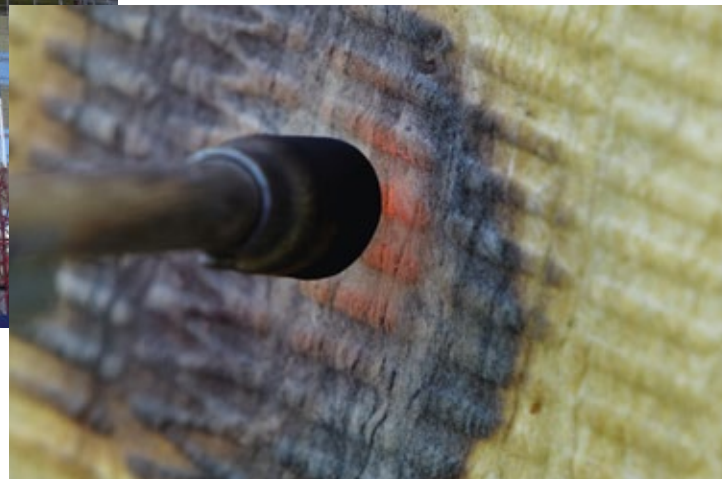


### The stone wool difference

In its manufactured state, stone wool delivers unique benefits as an insulation solution. In part due to its nondirectional fiber orientation and high percentage of natural stone, stone wool also exhibits unique benefits over competing insulation materials, specifically slag wool.

The results of structural integrity testing prove that ROCKWOOL stone wool materials are more durable, are easier to install and have less material degradation and better resilience to weathering. What does this mean for you? You'll have an improved installation experience, fewer callbacks and better long-term performance of the product once installed. When it comes to life safety, leave nothing to chance.

- **Fire resistant** for occupant safety: ROCKWOOL stone wool can withstand temperatures greater than 2,150 °F (1,177 °C) and does not contribute to the development and spread of fire or the release of toxic gases.
- **Sound absorbent** for acoustic comfort: The nondirectional fiber orientation of ROCKWOOL stone wool insulation helps to absorb acoustic waves and can reduce the intensity and propagation of noise, creating a more comfortable environment for occupants.
- **Water repellent** to resist absorption and moisture effects: ROCKWOOL stone wool is water repellent yet vapor permeable. Our insulation materials offer inherent drying potential, which means that should they get wet and are allowed to dry, the insulation will retain its stated performance, provided the materials



are not damaged. Stone wool is also resistant to rot, mold and mildew growth — contributing to a safer indoor environment.

- **Dimensional stability** to maintain performance: Stone wool retains its characteristics over time, which means reduced maintenance requirements over the life of a building. ROCKWOOL products have a small coefficient of linear expansion, meaning that even with changes in temperature and/or humidity over long periods of time, the product supports a reliable installation to avoid gaps.
- **Thermal resistance:** The R-value of stone wool insulation will not decrease over time because stone wool is not produced with blowing agents. The consistent long-term thermal performance helps create a more comfortable environment for building occupants and provide reliable energy efficiency.

**REMINDER:** When evaluating your project needs, it is important to keep in mind that the insulation used in perimeter fire containment systems is not generic. Manufacturers, including ROCKWOOL, have uniquely engineered products for the application they are intended to serve in perimeter fire protection. Products that are suitable for thermal/acoustical applications may not be suitable for fire containment assemblies.

Please follow the guidance on approved insulation products within an ASTM E2307 tested and listed system.

## The 7 Strengths of Stone

The 7 strengths of stone — fire resilience, thermal properties, acoustic capabilities, water repellency, aesthetics, durability and circularity — highlight the versatile properties of ROCKWOOL stone wool insulation.



### Fire resilience

- Provides an excellent fire barrier for enhanced safety and protection
- Will not burn, develop smoke toxicity or promote the spread of flames
- Withstands temperatures above 2,150 °F /1,177 °C



### Aesthetics

- Can be cut, bent or compressed without being damaged
- Is designed for individual applications to ensure the best performance



### Thermal properties

- Engineered to provide an optimal indoor climate and to reduce airflow and heat flow
- Results in heating and cooling savings



### Durability

- Lasts more than 50 years
- Has no loss of performance over time
- Resists mold and mildew



### Acoustic capabilities

- Helps absorb sound and reduces noise transmission
- Enables increased productivity in the workplace



### Circularity

- Is 100% recyclable
- Contains up to 50% recycled content
- Can be manufactured from secondary materials



### Water repellency

- Does not absorb moisture
- Repels water and allows vapor to pass through
- Performs at its best even with moisture present

### Did you know?

ROCKWOOL insulation is both water repellent and vapor permeable. When exposed to moisture, before or during installation, it should be allowed to completely dry — after which it will retain its stated performance, provided there is no physical damage or contamination.





### ROCKWOOL Curtainrock® 40/80

These stone wool insulation products meet a wide variety of curtain wall specifications. ROCKWOOL Curtainrock 40 and Curtainrock 80 are noncombustible and fire resistant, and will not develop smoke or promote flame spread when exposed to fire. ROCKWOOL Curtainrock products are available unfaced or with a reinforced vapor-retarding foil facing.

#### Properties

- Has a low moisture sorption rate; effectively drains water away from exterior walls
- Delivers higher R-values for lasting thermal protection
- Is a noncombustive product with a melting point of approximately 2150 °F (1177 °C)
- Is sound absorbent
- Is chemically inert and noncorrosive
- Repels water; does not rot or promote growth of mildew, fungi or bacteria

### ROCKWOOL ROXUL Safe®

ROXUL Safe is a lightweight, semirigid stone wool insulation that provides firestopping and acoustical properties. It is designed to fill perimeter gaps between concrete floor slabs and exterior wall systems, between firewalls and ceiling slabs, through penetrations, and around conduit pipes and duct openings through walls and floor slabs.

It is noncombustible and fire resistant and will not develop toxic smoke or promote flame spread, even when exposed directly to a fire. ROXUL Safe is always used in conjunction with a fire sealant to prevent passage of fire and smoke from one floor to the next.

Similar to ROCKWOOL Curtainrock 40 and Curtainrock 80 products, ROXUL Safe can also help to earn LEED points via ROCKWOOL contributions.

#### Properties

- Consists of noncombustible stone wool insulation with a melting point of approximately 2150 °F (1177 °C)
- Does not promote smoke or flame spread when exposed to flame
- Experiences minimal shrinkage to maintain critical line of defense against fire
- Has low thermal conductivity
- Is water and moisture resistant; does not absorb moisture to maintain insulating value
- Does not rot or promote the growth of mildew, fungi or bacteria

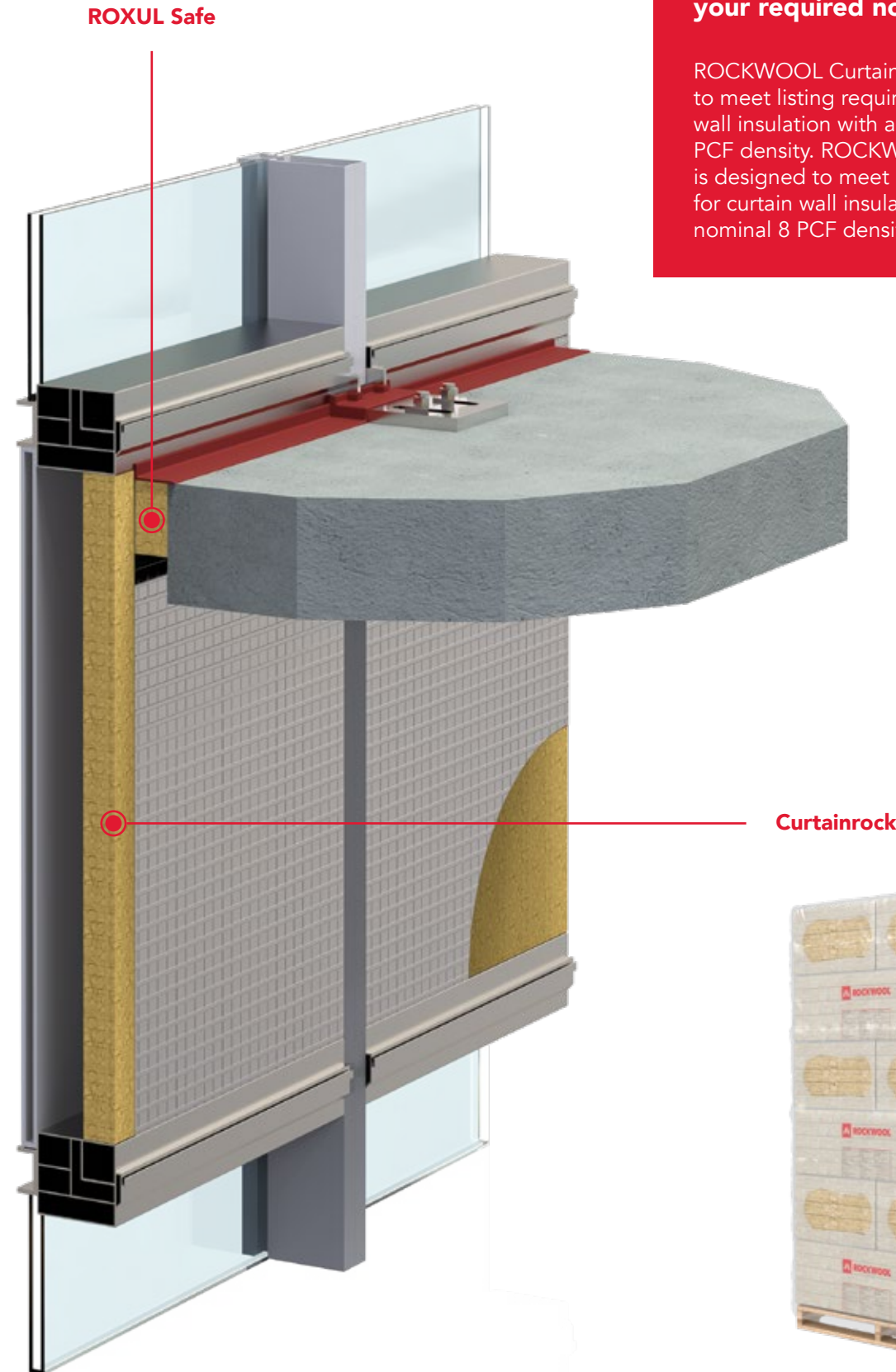
### What is the role of reinforced foil facing on mineral wool insulation?

A foil facing is laminated to the insulation in a spandrel or curtain wall application to provide air and vapor control within the assembly. More commonly associated with aluminum-framed designs, the foil facing is a critical component for this type of assembly.

Due to the lack of interior air adjacent to opaque curtain wall areas, these sections are subject to wide swings in temperature and humidity and require careful detailing of insulation and air and vapor control layers to control the risk for condensation. Maintaining the integrity — and continuity — of these control layers is of the utmost importance, and the contractor installing the material should be sure to repair any punctures or tears in the facing by taping with a pressure-sensitive foil tape. In

contrast, backpan systems typically use unfaced insulation, given that they are attached and sealed to the curtain wall framing around the perimeter and behind opaque areas of a curtain wall. The backpan is the air and vapor control layers of the assembly.

Note that some tested and listed systems provide the option of using unfaced or foil-faced insulation. The need for and placement of a vapor retarder in commercial construction depends on many factors. The architect or specifier should evaluate the requirements of each project. Foil-faced insulation is available directly through ROCKWOOL with the vapor permeance developed from testing conducted to ASTM E96.



### Curtain wall insulation: What is your required nominal density?

ROCKWOOL Curtainrock 40 is designed to meet listing requirements for curtain wall insulation with a minimum nominal 4 PCF density. ROCKWOOL Curtainrock 80 is designed to meet listing requirements for curtain wall insulation with a minimum nominal 8 PCF density.





## Perimeter fire containment system assemblies

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Curtain wall assembly options

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Assembly and international building code requirements

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Engineering judgements

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Assembly components



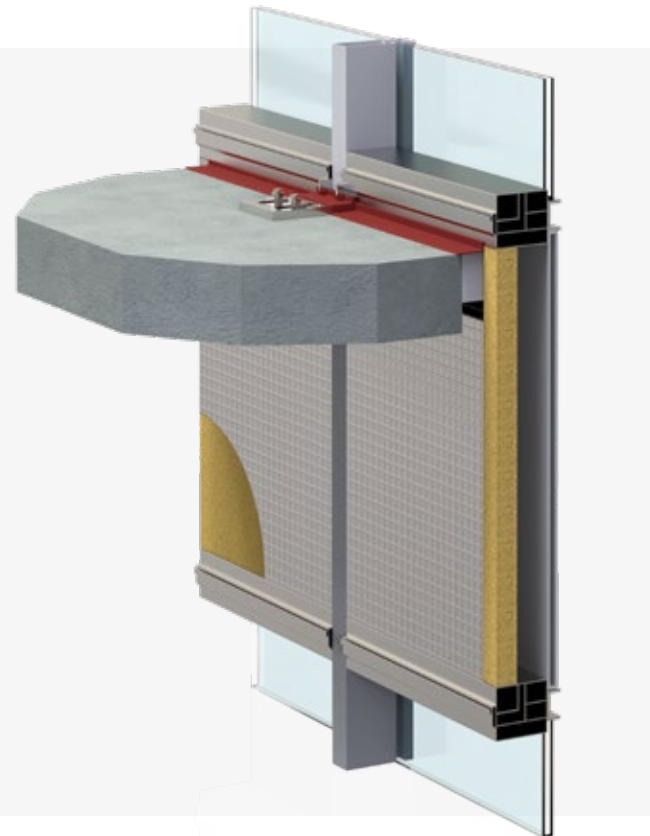
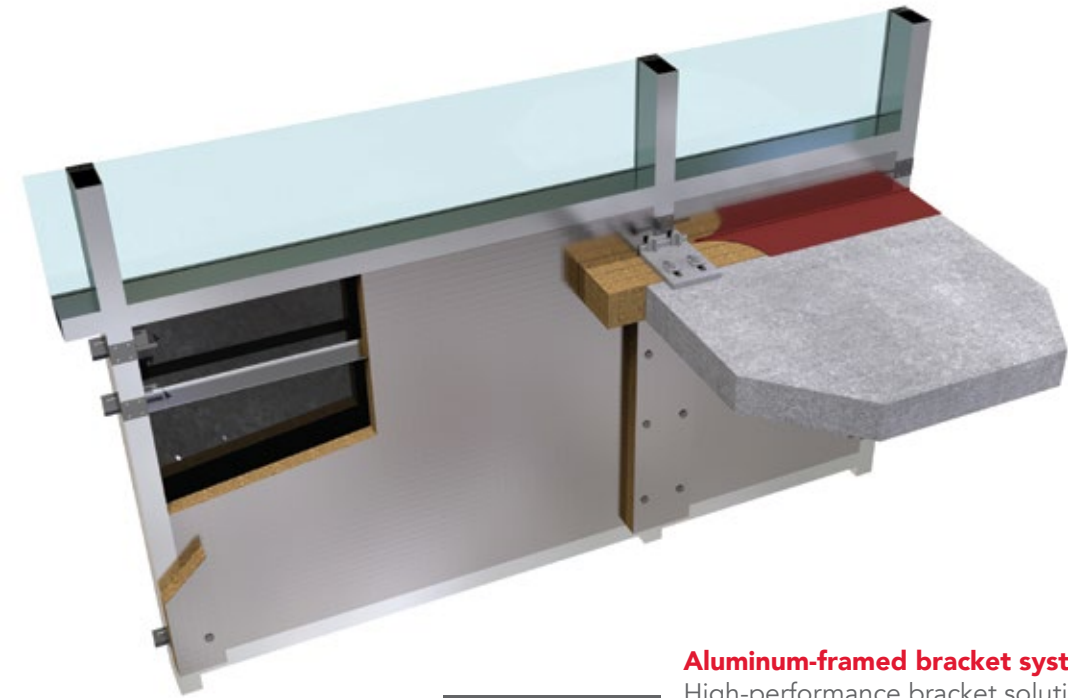


## Curtain walls and perimeter fire containment systems

As outlined previously, perimeter fire containment systems are mandated under the building code. Through partnerships with firestop manufacturers in the North American market, ROCKWOOL offers an extensive breadth of tested systems (listed to the right) that incorporate ROCKWOOL stone wool insulation and that are approved under ASTM E2307.

- Steel-framed walls with gypsum sheathing, with finishes such as EIFS, stucco, brick or metal siding
- Glass fiber reinforced concrete panels

- Galvanized steel backpan and curtain walls
- Aluminum-framed walls with glass, aluminum or stone spandrels
- Precast concrete panels



### Curtain wall assembly options

#### Aluminum-framed backpans

When used in conjunction with curtain wall systems, insulated backpans are designed to minimize field installation time and can be fastened to the curtain wall, steel substrate or block substrate behind the opaque sections of the glazed assembly. Backpan assemblies have become increasingly popular, particularly within the unitized construction market where glaziers and fabricators are able to benefit from economies of scale during the production process by preinsulating the glazed units. Backpans help to minimize the field installation time and can be fastened to curtain walls, steel substrates or block substrates.

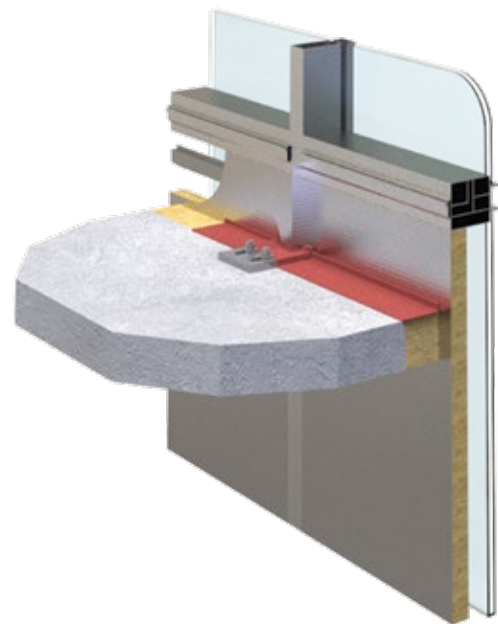
ROCKWOOL has testing that includes flush sill designs, multiple spandrel types such as transparent or opaque glass panels, aluminum panels and stone panels, aluminum composite panels, and metal composite panels.

#### Aluminum-framed bracket systems

High-performance bracket solutions are also available to provide a faster method of installing perimeter fire containment systems, thereby reducing labor requirements as well as the number of screws required to penetrate the curtain wall framing, depending on the condition and the tested system.

#### Did you know?

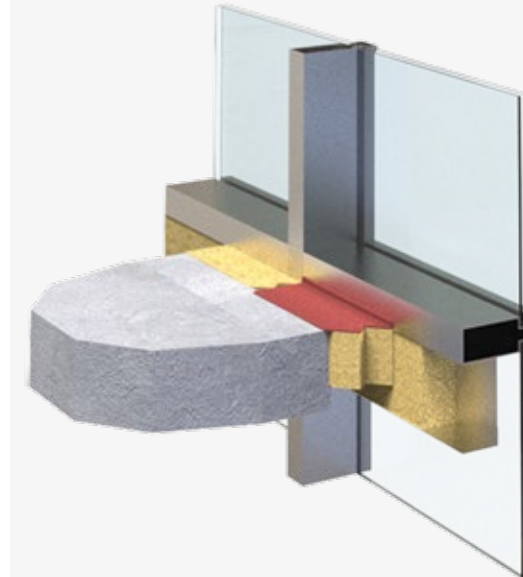
ROCKWOOL Intertek and UL Listings for Curtainrock 40, Curtainrock 80 and ROXUL Safe can be found at [rockwool.com/north-america/resources-and-tools/tools/ul-listings](http://rockwool.com/north-america/resources-and-tools/tools/ul-listings).



#### Aluminum-framed systems

Nonbackpan aluminum-framed systems provide an alternative installation to backpan assembly construction. Our testing includes options with lower sill heights and shorter spandrel panels, as well as flush-sill-tested systems that allow for more vision glass. ROCKWOOL testing covers a variety of system types, such as the following:

- Continuous angles
- Hat channels
- Insulation hangers and steel pins
- Mull framing
- All-vision glass



#### All-vision glass

All-vision glass curtain wall assemblies provide a modern design concept focused on maximizing the vision glass area for building occupants. Firestopping these assemblies can be difficult because there is a limited area to properly install the firestop system in a smaller daylight opening (DLO) without it being visible from the exterior of the building. To circumvent this issue, there are system designs that use a sheet metal pan attached to the upper transom and vertical mullions that hide the firestopping system at the floor line. The pans can be painted or finished with a look that will be visibly pleasing from the exterior of the building while occupying only a small area of the vision glass.





### Assembly and International Building Code requirements

Section 1705 of the International Building Code requires special inspection of firestop systems, fire-resistant joint systems and perimeter fire containment systems. The code stipulates that this is mandatory in high-rise buildings or buildings assigned to Risk Category III or IV.

#### Insulation-related checkpoints

1. The depth and width of materials have been measured as indicated in the details of the ASTM E2307 listing and/or engineering documents provided by the listing holder (including verifying the orientation and compression of the insulation within the safing slot/slab edge condition).
2. Fasteners or weld pins are not too long and will not come in contact with gaskets or glass. The types of fasteners cannot be mixed and matched from one tested listed system to another system. Follow the fastener type and installation requirements specific to the tested and listed system being used on the project.

3. Insulation is cut and installed tight to the upper and lower horizontals, flush with the interior face of the framing in aluminum-framed systems. In backpan systems, insulation should fit snug into the pan to avoid gaps.
4. Mullion covers are the proper width and are installed tight to the top and bottom where required.
5. For systems using foil-faced insulation, FSK/aluminum foil tape is sealed to the facing of the insulation to provide a continuous vapor barrier, and foil backing is free from holes/damage.

Installation of the ROXUL Safe insulation should be done by compression fit. This forms a tight seal between the floor line and the exterior curtain wall assembly so that flame and hot gases cannot pass through the joint. It is important that the insulation be installed at the proper compression as specified in the tested listing, which will provide direction on the amount of compression and in which direction the ROXUL Safe insulation should be installed. Please see below for a summary of joint widths and compression requirements.

UNCOMPRESSED WIDTH OF STONE WOOL IN SLAB EDGE JOINTS

Joint Width (in.)	% Insulation Compression Required									
	10%	15%	20%	25%	30%	33%	35%	40%	45%	50%
1.0	1.11	1.18	1.25	1.33	1.43	1.49	1.54	1.67	1.82	2.00
1.5	1.67	1.76	1.88	2.00	2.14	2.24	2.31	2.50	2.73	3.00
2.0	2.22	2.35	2.50	2.67	2.86	2.99	3.08	3.33	3.64	4.00
2.5	2.78	2.94	3.13	3.33	3.57	3.73	3.85	4.17	4.55	5.00
3.0	3.33	3.53	3.75	4.00	4.29	4.48	4.62	5.00	5.45	6.00
3.5	3.89	4.12	4.38	4.67	5.00	5.22	5.38	5.83	6.36	7.00
4.0	4.44	4.71	5.00	5.33	5.71	5.97	6.15	6.67	7.27	8.00
4.5	5.00	5.29	5.63	6.00	6.43	6.72	6.92	7.50	8.18	9.00
5.0	5.56	5.88	6.25	6.67	7.14	7.46	7.69	8.33	9.09	10.00
5.5	6.11	6.47	6.88	7.33	7.86	8.21	8.46	9.17	10.00	11.00
6.0	6.67	7.06	7.50	8.00	8.57	8.96	9.23	10.00	10.91	12.00
6.5	7.22	7.65	8.13	8.67	9.29	9.70	10.00	10.83	11.82	13.00
7.0	7.78	8.24	8.75	9.33	10.00	10.45	10.77	11.67	12.73	14.00
7.5	8.33	8.82	9.38	10.00	10.71	11.19	11.54	12.50	13.64	15.00
8.0	8.89	9.41	10.00	10.67	11.43	11.94	12.31	13.33	14.55	16.00

### Engineering judgments

Engineering judgments are an alternative means to assembly-test for achieving third-party ASTM E2307 certification. Typically, an engineering judgment will be used when minor modifications or material substitutes to existing ASTM E2307 listings are requested. Engineering judgments are never 100% guaranteed, however, and rely on several factors when being evaluated. They can be completed by UL, Intertek, most firestop manufacturers or any third-party, licensed, professional engineering consultant.

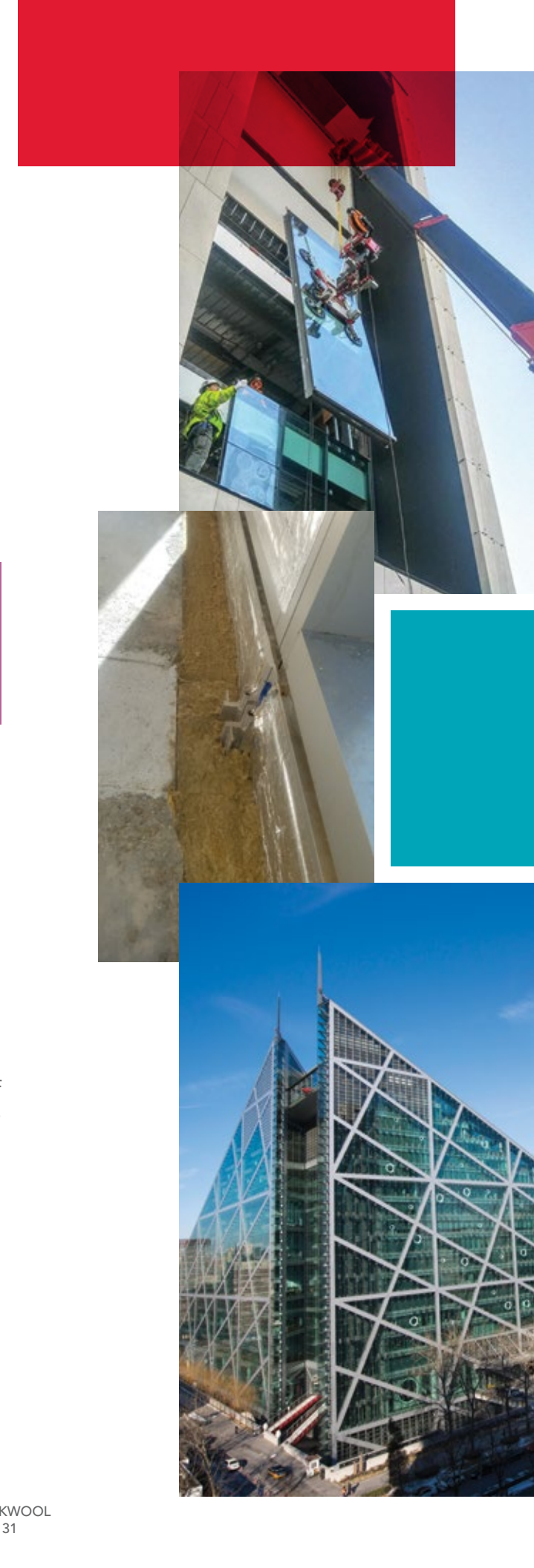
Engineering judgments should be closely reviewed to ensure that the listed manufacturer has tested assemblies, and the requirements of those systems must be incorporated into the judgment.

For support with engineering judgments on your next project, please reach out to ROCKWOOL directly through our Technical Support channel at [techservice@rockwool.com](mailto:techservice@rockwool.com).

Note that ROCKWOOL is not authorized to complete engineering judgments; however, we can assist by working closely with our firestop partners. Our team will provide a recommendation on how best to service an engineering judgment request.

Here are some tips to keep in mind when working on these requests to help prevent delays and meet inspection timelines on a project:

- Provide complete and accurate information, including access to the system, application and test standard.
- Share contact details for the person with knowledge of the application — someone who can answer questions to clarify the condition and provide additional details the engineer will need to complete the request.
- Supply photos and drawings when available. Details such as penetration sizes, annular space and insulation type/thicknesses are just a few of the components that are difficult to accurately determine from a photo alone.
- Provide AutoCAD files when available for curtain walls. Allow the drafting team at firestop manufacturers to show the specific building features and accurately detail the firestop materials usage condition.







### Assembly components

Because each building's facade is distinctive and due to the rigorous testing process associated with ASTM E2307, the required practice is to defer to the listing. This section provides a summary of other components included within a typical perimeter fire containment system assembly.

#### Shadow boxes

The shadow box is a design feature to help maintain the visual continuity of the curtain wall system as it crosses from vision glass to spandrel areas. Shadow boxes can also give the spandrels visual depth, allowing light to penetrate into the facade. This look is often achieved using clear vision glass with aluminum or painted shadow boxes behind the glass. As opposed to using opaque or tinted spandrel glass, this approach allows continued use of the same glazing throughout the exterior and provides a more uniform appearance to the curtain wall.

#### Brackets

The type of brackets and spacing between them is dependent on the allowable vertical and horizontal load distribution, bracket geometry and bolt position. Curtain wall anchor systems must carry the dead-load weight of the curtain wall, transferred from horizontal framing members to vertical mullions and down to anchor points, where it is transferred to the building structure. Anchoring systems may be installed top of slab, face of slab, bottom of slab or a hybrid design, depending on what is included in the ASTM E2307 listing. Backpan systems are frequently installed with top-of-slab anchoring because connected to the mullion is the fist/slider, which has a hook on it that locks into the top-of-slab plate.

#### Mullion covers

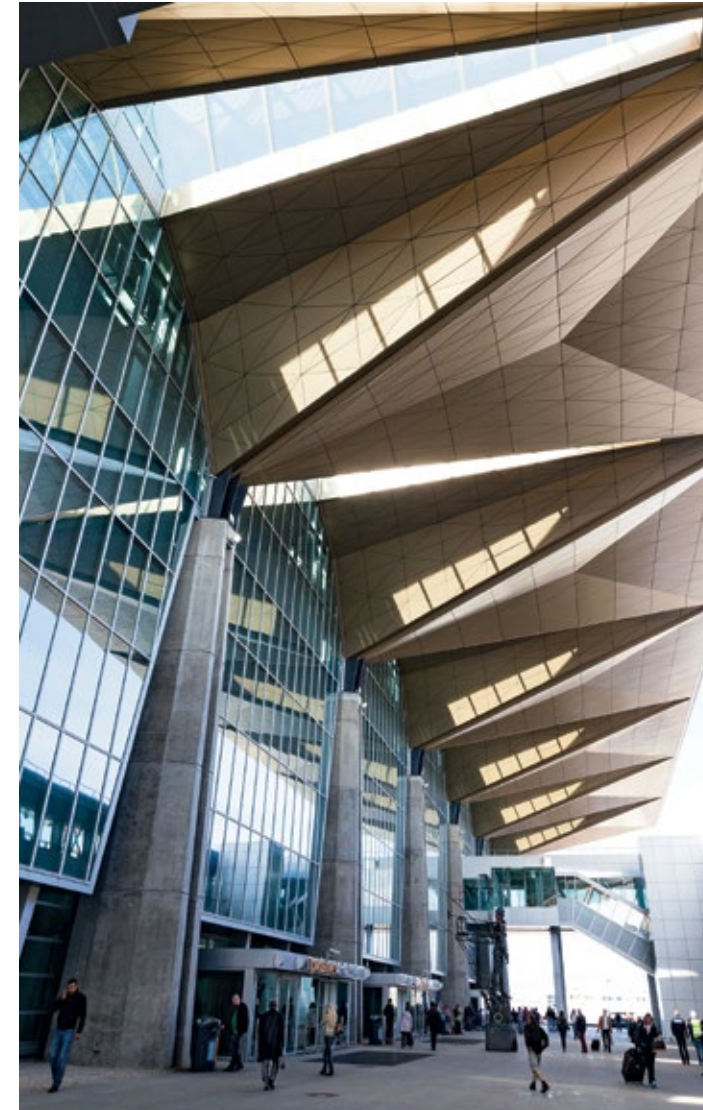
Traditionally, mullion covers have been used to provide a bridge or separation between the spandrel insulation over the exposed vertical mullions. The majority of UL- and Intertek-listed aluminum-framed curtain wall systems require the vertical mullions to be protected with approved mineral wool insulation (per ASTM E2307 listing and/or engineering judgment). These components are attached with screws to metal framing, or hat channels used to impale the spandrel insulation, or may be attached to spandrel insulation with spiral anchors. Noncombustible insulation helps extend the life of the mullions in the event of a fire. Mullion covers may also be added to provide additional thermal requirements by stopping the transmission of heat through the mullion to the knee wall.

#### Foil tapes

Aluminum foil and FSK (foil/scrim/kraft) tapes are engineered to complete a proper vapor barrier seal between the spandrel insulation and vertical mullions of the curtain wall. These tape products are generally coated with a cold-weather, acrylic, pressure-sensitive adhesive system that allows the tapes to work effectively at low temperatures. Tapes may also be used within the spandrel cavity when seams are permitted and/or required based on size of the area below the daylight opening within the ASTM E2307-listed system.

### Cutting tips

ROCKWOOL stone wool insulation products are easy to cut. A serrated knife is our recommended tool to use. We advise not to use utility knives as they will dull too quickly and end up tearing the product, but a serrated knife or bread knife works extremely well with our products.







## 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.

The ROCKWOOL Building Science team was established to provide architects, designers and specifiers with the tools and services to unlock the energy-saving potential of your building design, reaching far beyond insulation.

Our North American Building Science team is part of a larger global network, allowing us to utilize international best practice, innovation and design solutions. We combine this knowledge with local expertise to offer high-quality tools, training and tailored advisory services relevant to the North American market.

### Complimentary services provided by our building science experts:

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Building science resources and technical support

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Educational seminars and architectural/site visits

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Envelope detailing and material specifications

#### R-Value calculations

- Codes and standards compliance evaluations
- Effective thermal performance calculations
- Heat transfer modeling

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#### Thermal bridging modeling

- 2D and 3D thermal modeling (THERM/HEAT3)
- Overall U-value analysis
- Insulation detail review

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#### Heat, air and moisture transfer modeling

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

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#### Acoustic modeling

- Insulation detail review



### Questions? Contact us.

ROCKWOOL is a partner with the technical know-how to support inquiries from your team on perimeter fire containment and other firestopping requirements, along with a broader set of application areas for our stone wool insulation products.

If you have technical questions about our products or need support for your project, our technical experts are here to help you.

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#### Technical support and product inquiries

+ 1.877.823.9790 (direct)  
+ techservice@rockwool.com

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#### Project support

[rockwool.com/north-america/resources-and-tools/building-science-support](https://rockwool.com/north-america/resources-and-tools/building-science-support)

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At the ROCKWOOL Group, we are committed to enriching the lives of everyone who comes into contact with our solutions. Our expertise is perfectly suited to tackle many of today's smallest sustainability and development challenges, from energy consumption and noise pollution to fire resilience, water scarcity and flooding. Our range of products reflects the diversity of the world's needs, while supporting our stakeholders in reducing their own carbon footprint.

Stone wool is a versatile material and forms the basis of all our businesses. With more than 11,000 employees in 39 countries, we are the world leader in stone wool solutions, from building insulation to acoustic ceilings, external cladding systems to horticultural solutions, engineered fibres for industrial use to insulation for the process industry and marine and offshore.

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Publication date - edition: 08/2022



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