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Designing Resilient Data Centers with Stone Wool Insulation

Given the rapid expansion of cloud computing, artificial intelligence and data-intensive applications, data centers have become core infrastructure, driving a global construction boom in large, often campus-scale facilities that operate continuously. Because these mission-critical assets are highly exposed and any service interruption can produce substantial operational and financial loss, resilience, particularly fire safety, are central to their design. Non-combustible stone wool insulation can contribute to that objective: specified and installed as part of tested, passive fire protection systems, it helps limit fire propagation, protect critical IT assets and support operational continuity. With downtime costs estimated at up to $9,000 per minute[1], protecting data centers from service outages is an essential requirement for both businesses and consumers.

When incorporated into fire-rated assemblies suitable for data center applications, such as walls, roofs, and through penetration firestop systems, stone wool insulation can also provide, among other benefits, improved acoustic attenuation, long-term durability, and enhanced thermal performance. Realizing these benefits, however, depends on adequate time, coordination, and verified installation, all of which can be compromised by compressed schedules and supply chain pressures. Accelerated timelines often drive material, system, and enclosure choices with insufficient attention to site specific exposure, testing requirements, and installation sequencing, thereby risking degradation of tested assembly performance.

This bulletin examines the technical role of stone wool in tested assemblies and provides practical guidance for specifying and procuring solutions that reconcile accelerated delivery schedules with verifiable assembly-level resilience. It also includes a concise review of sustainability considerations, including operational carbon, material sourcing and mass timber strategies, and explains how stone wool insulation can support energy efficiency and lifecycle objectives.

Fire Risk, Vulnerabilities, and the Role of Passive Measures in Data Centers

Although data center fires are uncommon, largely due to comprehensive prevention and protection systems such as pre action sprinkler networks and advanced detection, when they do occur the consequences can be severe[2] (the OVHcloud Strasbourg fire, 2021, remains the largest recorded data center loss, Figure 2 on page 2).

Comprehensive incident data are rarely public, and organizations often withhold details under nondisclosure agreements or to protect their reputation. Unless events are reported to authorities, covered by the press, or cause significant customer outages, tracing occurrences and deriving operational lessons is difficult. This opacity inhibits industry wide learning and the refinement of resilience measures.

Figure 1: Interior of a modern data center with rows of high-density server racks.

Typical ignition sources in data centers include electrical failures (short circuits, overloads), equipment overheating, lithium-ion battery malfunctions, and human error. The scale, dense equipment layouts and complex service

[1] Factory Mutual Insurance Company, Downtime doesn't compute at AI data centers, October 23, 2025
[2] DataCenter Knowledge, How to Prevent Data Center Fires: Lessons from the Biggest Incidents, October 8, 2024

routing of modern facilities complicate mitigation of fire, and can amplify consequences when an incident occurs. Rising power density and hot-aisle containment concentrate heat within racks and plenums, increasing thermal stress on components and raising the likelihood that combustible items—cable jackets, filter media, packaging and other in-room materials, will reach ignition thresholds. Consequently, rigorous thermal management, strict control of combustible loads and effective compartmentation are essential elements of fire-risk mitigation.

Figure 2: OVHcloud Strasbourg fire, 2021 — a major incident that severely damaged critical infrastructure, caused extensive data loss and led to prolonged business disruption.

Active detection and suppression systems are indispensable, but they are not sufficient on their own. Robust passive measures are required to prevent an internal ignition from escalating into a structural fire and to reduce the risk of catastrophic outcomes, including extensive asset damage and write-offs, prolonged service outages, permanent or hard-to-recover data loss, regulatory penalties, and severe reputational and commercial harm.

Fire performance obligations encompass both the building enclosure, including exterior walls, roof and perimeter fire barriers, and critical internal partitions such as fire walls and fire stopping at service penetrations. Continuous passive protection of these elements is required to maintain compartmentation and prevent fire spread to structural components.

Fire Safety in Data Centers: IBC Occupancies, Rated Assemblies, and Insurer-Approved Solutions

Given the potentially severe operational, financial and reputational consequences of a data center fire, clear regulatory and industry requirements for fire protection are essential to provide consistent, verifiable resilience.

In addition to the model building and fire codes, NFPA 75 (Standard for the Fire Protection of Information Technology Equipment) and NFPA 76 (Standard for the Fire Protection of Telecommunications Facilities), both published by the National Fire Protection Association, are widely referenced in practice by owners and insurers. However, NFPA 75 is not incorporated by reference in the 2024 International Building Code (IBC), the 2024 International Fire Code (IFC), or the 2024 NFPA 101 Life Safety Code. Accordingly, compliance must be demonstrated first and foremost against the codes and standards adopted in the jurisdiction, with NFPA guidance used as supplemental best practice where accepted by the authority having jurisdiction or required by insurer criteria.

IBC Occupancy Classification and Fire-Resistance Requirements for Data Centers

Under the IBC, data centers are most often classified as Group F-1 occupancies, with Group S-1 used in some cases. The IBC also distinguishes between Data Centers[3] and Information Technology Equipment Facilities[4]. For clarity, this section summarizes selected fire-resistance rating requirements applicable to Group F-1 occupancies, noting that similar provisions may apply to Group S-1. In the IBC, Group F-1 denotes Moderate-Hazard Factory Industrial buildings.

Three IBC tables are central to applying fire-resistance provisions to F-1 data center projects:

- Table 508.4 specifies the required fire-resistance separation (in hours) between F-1 occupancies and other occupancies, for example where office space is located within the same building as a data hall.
- Table 601 establishes fire-resistance requirements for building elements (in hours) by Type of Construction; data centers are commonly designed as Type I or Type II, which in turn dictates ratings for primary structural frame, bearing walls, floor assemblies and roof assemblies.

[3] At the time of writing this bulletin, a code change proposal to the 2024 IBC defines Data Center as a room or building, or portions thereof, used primarily to house information technology equipment (ITE) and serving a total ITE load greater than 10 kW and 20 W/ft^2 (215 W/m^2) of conditioned floor area.

[4] At the time of writing this bulletin, a code change proposal to the 2024 IBC defines Information Technology Equipment Facilities (ITEF) as data centers and computer rooms used primarily to house information technology equipment.

- Table 705.5 establishes the required fire-resistance ratings of exterior walls as a function of the fire separation distance, defined as the distance from the exterior wall to the property line. Most new data centers are sited with setbacks of approximately 10 feet (3048 mm) to 30 feet (9144 mm); smaller separations, more common in urban contexts, may require higher exterior wall ratings and more stringent detailing.

Within industry practice, energy storage systems that use lithium batteries are also typically separated from data halls and accessory office spaces by 2-hour fire-resistance-rated construction, even where the building is fully sprinklered in accordance with NFPA 13 (Standard for the Installation of Sprinkler Systems).

In practical terms, the IBC makes fire-resistance ratings, expressed in hours, a core design obligation for floor assemblies, interior walls, exterior walls and roof assemblies, with specific requirements determined by occupancy classification, type of construction and fire separation distance. For data centers, which are commonly classified as Group F-1 or S-1 and typically designed as Type I or Type II, these requirements should be translated early into project specific, tested assemblies for data halls, energy storage rooms and ancillary office areas, with penetrations and joints detailed to maintain continuity of the rated assembly.

A Brief Overview of NFPA 75

Originally developed in the 1960s, NFPA 75 establishes minimum requirements to protect IT equipment and the spaces that house it from fire and its associated effects, smoke, heat, and water. The standard explicitly addresses data center construction techniques and therefore directly informs passive fire-protection measures: minimum construction and compartmentation criteria, continuity of fire-resistant elements, and prescribed joint and penetration treatments that limit fire spread and safeguard sensitive equipment.

Compliance with NFPA 75 is commonly enforced by reference in local building and fire codes; authorities having jurisdiction (and, in some cases, insurers) are typically responsible for verification and acceptance of the applied measures.

Key passive fire-protection provisions include the following examples:

- Fire resistant construction and compartmentation of IT equipment areas (minimum 1 hour rated separations), extending from the structural floor to the structural floor above or the roof.
- Non combustible raised floor materials, and restrictions on combustible storage.
- Openings and service penetrations must be firestopped to the rating of the barrier and air transfer openings fitted with automatic dampers.

FM Grade Building Enclosure Protection

Many owners and insurers supplement NFPA guidance with insurer-led engineering standards to raise loss-prevention and continuity expectations for mission-critical facilities; FM Global's Property Loss Prevention Data Sheet 5-32, "Data Centers and Related Facilities," is a widely used reference that routinely imposes underwriting requirements above minimum code.

FM Global's guidance for enclosure fire protection typically requires construction and materials that preserve envelope[5] fire resistance integrity. In practice, this includes:

- Fire-rated walls and partitions with protected openings.
- Non-combustible building enclosure and interior finishes, with only FM approved or class tested plastics permitted.
- Limited glazing and fire-rated doors.
- Class I[6] or otherwise approved ceiling materials.
- Non-combustible floors and raised floor systems.
- Non-combustible or FM approved insulation.
- Listed fire stopping for pipe, duct and cable penetrations to maintain continuity of the fire-rated envelope.

These prescriptive requirements are intended to minimize ignition sources, limit fire growth and preserve suppression effectiveness and business continuity. Accordingly, where Data Sheet 5-32 is adopted as a design basis, designers, developers, and builders are advised to integrate its requirements early in the design, commissioning, and insurer-engagement processes.

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[5] In the context of this document, the terms "envelope" and "enclosure" are used interchangeably. Both refer to the physical components of a building that separate the interior from the exterior and function as an environmental separator.

[6] As per FM Approval Standard 4882, Class 1 Interior Wall and Ceiling Materials or Systems for Smoke Sensitive Occupancies

Interior Walls and Partition Design

Whether fire-rated or not, non-combustible stone wool insulation measurably improves interior wall performance: it is easy to cut and install for accurate, rapid fit in stud cavities; it offers long-term dimensional stability and resistance to moisture; and it provides strong sound-attenuation that improves STC and reduces equipment and plant noise transmission. Additionally, its non-combustible nature supports passive-fire objectives when incorporated into tested, assembly-level designs.

Fire-rated Interior Wall Systems

Fire resistance of interior partitions is a fundamental component of passive protection in data center facilities. Hourly ratings—commonly 1, 2 and, in select locations, 3 hours—are assigned to complete, tested wall assemblies rather than to individual products; the assembly build-up and joint detailing ultimately determine the certified rating.

Assemblies are evaluated to standardized time–temperature tests (ASTM E119 / UL 263 in the U.S. and CAN/ULC S101 in Canada), which are intended to determine the duration for which building elements can contain a fire, retain structural integrity, or both, under a specified furnace exposure. Designers must therefore specify a classified (UL/ULC) assembly and ensure installation strictly follows the tested details to achieve the published rating in practice.

Metal-stud gypsum partitions and shaft walls are the predominant fire-rated interior partitions used in data center environments. These assemblies may use ROCKWOOL AFB®[7] or, more generally, batt insulation products bearing the UL classification mark or classified under UL categories BZJZ or BKNV; certain tested assemblies also prescribe a minimum insulation density as specified in the applicable UL/ULC design.

Because fire performance is established at the assembly level, designers should always reference the complete UL/ULC classified wall design (including material types, board layers, stud gauge, and spacing) rather than specifying individual components alone.

Gypsum/steel stud assemblies with 1, 2, 3, and 4 hour ratings are typically found in the U300, U400, V400, and W400 series of the UL Directory[8]. Representative UL designs, provided for illustration rather than as an exhaustive list, are presented in Table 1.

Table 1: Representative UL classified hourly rated wall assemblies and corresponding Sound Transmission Class (STC) ratings

UL Design No.	AFB® Insulation Thickness	Interior Finish 1	Interior Finish 2	Stud Size/ Gauge	STC rating			
					W/O Resilient Channels		With Resilient Channels	
					16″ o.c.	24″ o.c.	16″ o.c.	24″ o.c.
1-Hour Fire Resistance Rating								
V489, V438, U419, U448, U465, V417	3.5"	5/8″ gyp.	5/8″ gyp.	3-5/8″/25Ga	**45** Assembly ISS07+	**50** Assembly ISS19+	**53** Assembly ISS27+	**55** Assembly ISS31+
V489, V438, U419, U448, U465, V417	6.0"	5/8″ gyp.	5/8″ gyp.	6.0″/25Ga	**52** Assembly ISS25+	**55** Assembly ISS33+	**56** Assembly ISS37+	**56** Assembly ISS36+
V438, U419, U448	2.5"	1/2″ gyp.	1/2″ gyp.	2-1/2″/25Ga	**38***	**44** Assembly ISS06+	**39***	**39***
U419	1.5"	3/4″ gyp.	3/4″ gyp.	1-5/8″/25Ga	**38***	**38***	**45***	**45***
W469 (load bearing)	3.5"	5/8″ gyp.	5/8″ gyp.	3-5/8″/20Ga	**43***	**47***	**51***	**51***
W469† (load bearing)	3.5"	2 x 1/2″ gyp.	2 x 1/2″ gyp.	3-5/8″/20Ga	**51***	**53***	**59***	**59***
U433	3.5"	5/8″ gyp.	5/8″ gyp.	3-5/8″/20Ga	**43***	N/A	N/A	N/A
U433	6.0"	5/8″ gyp.	5/8″ gyp.	6.0″/20Ga	**50***	N/A	N/A	N/A
U415	2.5"	1.0″ shaftliner	5/8″ gyp.	2-1/2″ C-H/ 20Ga	**38***	**44***	N/A	N/A

[7] ROCKWOOL AFB® is a stone wool batt for steel stud partitions that provides fire resistance, strong acoustic attenuation and long-term dimensional stability. It is non-combustible per ASTM E136 and CAN/ULC-S114 and registers zero flame-spread and smoke-developed indices (or rating and classification, as applicable) under ASTM E84 and CAN/ULC-S102. Composed of stone-wool fibers derived from volcanic rock, it can withstand temperatures in excess of 2,000 °F (>1,000 °C).

[8] UL Product iQ® directory

Table 1 (Continued): Representative UL classified hourly rated wall assemblies and corresponding Sound Transmission Class (STC) ratings

UL Design No.	AFB® Insulation Thickness	Interior Finish 1	Interior Finish 2	Stud Size/ Gauge	STC rating			
					W/O Resilient Channels		With Resilient Channels	
					16" o.c.	24" o.c.	16" o.c.	24" o.c.
2-Hour Fire Resistance Rating								
V489, V438, U419, U412, V418, V419	3.5"	2 x 5/8" gyp.	2 x 5/8" gyp.	3-5/8"/25Ga	**54***	**57** Assembly ISS39+	**57***	**58***
V489, V438, U419, U412, V418, V419	6.0"	2 x 5/8" gyp.	2 x 5/8" gyp.	6.0"/25Ga	**58***	**59***	**61***	**62***
V438, U419	2.5"	2 x 1/2" gyp.	2 x 1/2" gyp.	2-1/2"/25Ga	**46***	**53** Assembly ISS28+	**55***	**56***
W469 (load bearing)	3.5"	2 x 5/8" gyp.	2 x 5/8" gyp.	3-5/8"/20Ga	**52***	**54***	**57***	**58***
W469 (load bearing)	3.5"	3x 1/2" gyp.	3 x 1/2" gyp.	3-5/8"/20Ga	**55***	**56***	**60***	**61***
U412, V418	1.5"	2 x 1/2" gyp.	2 x 1/2" gyp.	1-5/8"/25Ga	**39***	**41***	**44***	**43***
U415	2.5"	1.0" shaftliner	2 x 5/8" gyp.	2-1/2" C-H/ 20Ga	**43***	**48***	N/A	N/A
3-Hour Fire Resistance Rating								
V489, V438, U419	3.5"	3 x 5/8" gyp.	3 x 5/8" gyp.	3-5/8"/25Ga	**56***	**57***	**62***	**63***
V489, V438, U419	6.0"	3 x 5/8" gyp.	3 x 5/8" gyp.	6.0"/25Ga	**59***	**61***	**62***	**63***
W455	3.5"	2 x 3/4" gyp.	2 x 3/4" gyp.	3-5/8"/25Ga	**49***	**51***	N/A	N/A
W455	6.0"	2 x 3/4" gyp.	2 x 3/4" gyp.	6.0"/25Ga	**53***	**54***	N/A	N/A
V438, U419	2.5"	3 x 1/2" gyp.	3 x 1/2" gyp.	2-1/2"/25Ga	**55***	**57***	**59***	**61***
W469 (load bearing)	3.5"	3 x 5/8" gyp.	3 x 5/8" gyp.	3-5/8"/20Ga	**53***	**55***	**62***	**63***
W469 (load bearing) U426	3.5"	4 x 1/2" gyp.	4 x 1/2" gyp.	3-5/8"/20Ga	**57***	**59***	**62***	**63***
U426	3.5"	4 x 5/8" gyp.	4 x 5/8" gyp.	3-5/8"/20Ga	**54***	**55***	**65***	**66***
U415	2.5"	1.0" shaftliner	3 x 5/8" gyp.	2-1/2" C-H/ 20Ga	**47***	**50***	N/A	N/A
4-Hour Fire Resistance Rating								
V489, V438, U419	3.5"	4 x 5/8" gyp.	4 x 5/8" gyp.	3-5/8"/25Ga	**58***	**60***	**65***	**66***
V489, V438, U419	6.0"	4 x 5/8" gyp.	4 x 5/8" gyp.	6.0"/25Ga	**61***	**62***	**67***	**68***
V438, U419	2.5"	4 x 1/2" gyp.	4 x 1/2" gyp.	2-1/2"/25Ga	**57***	**58***	**62***	**63***
U415	2.5"	1.0" shaftliner	4 x 5/8" gyp.	2-1/2" C-H/ 20Ga	**47***	**52***	N/A	N/A

† 1.5-hour fire-resistance rating.
+ ISS (Interior Steel Stud) refers to the assembly numbers found in the ROCKWOOL Acoustic Wall Assemblies Catalog.
* STC ratings were estimated using INSUL prediction software version 10.0.3, simulations are generally within +/- 3 STC points.

Sound Control in Steel-Stud Partitions

Noise levels inside data centers commonly range from 85 to 96 dB(A), driven by cooling plant, server fans, generators and ancillary equipment, and therefore pose occupational health risks. These levels meet or exceed the 85 dB(A) action level, per OSHA and many jurisdictions, which triggers a hearing conservation program, and frequently approach or exceed the 90 dB(A) permissible exposure limit for an 8-hour time weighted average, necessitating engineering, administrative or personal protective controls.

Partition design is a primary means of controlling noise within the data center. Increasing partition mass, decoupling layers, incorporating damping materials, maintaining airtight continuity and eliminating flanking paths at penetrations directly reduce airborne sound transmission and limit structure borne vibration between data halls and adjacent occupancies. Consequently, incorporating stone wool cavity insulation such as ROCKWOOL AFB® in steel stud fire-rated partitions can further decrease airborne transmission through partition walls by dissipating acoustic energy within the cavity.

To quantify performance, laboratories measure frequency dependent transmission loss in accordance with ASTM E90 to determine the sound energy transmitted through an assembly from one space to an adjacent space when flanking paths are absent. These results are commonly summarized as a single number Sound Transmission Class (STC) by reference to the ASTM E413 contour at 500 Hz; STC rates perceived transmission of typical interior sources such as speech, radio and television and was developed for interior partitions.

Experience shows that stone wool generally provides equal or greater transmission loss and STC performance than glass fiber batts when the stone wool has at least the same density as the fiberglass it replaces and is at least 85% of the fiberglass thickness. Minor differences may be observed in simple assemblies (for example heavy gauge metal studs without resilient attachment), and individual tests can occasionally favor fiberglass.

Refer to ROCKWOOL's **Catalog of Acoustical Wall Assemblies** for a comprehensive resource, detailing a variety of wall assemblies with AFB® that have been rigorously tested for acoustical performances.

Beyond material selection, effective acoustic performance also depends on rigorous airtight detailing. Unsealed penetrations such as cable trays, ducts, and ladder supports create flanking paths that significantly reduce acoustic separation. Sealing these openings and, when required, applying listed through-penetration firestop systems is essential to restore acoustic integrity while preserving necessary air management for cooling.

Through Penetrations and Firestopping

From a safety standpoint, the through penetrations described in the last section are among the most critical vulnerability points in fire-rated assemblies in data center environments. Mechanical, electrical and data services, including cables, conduits, cable trays and ladders, pipework, ducts and HVAC penetrations, together with access ports and service sleeves are required to be detailed and protected so that the certified hourly rating of the assembly is preserved.

Wherever penetrations occur, listed through penetration firestop systems tested to ASTM E814 / UL 1479 (U.S.) or CAN/ULC S115 (Canada) are to be applied. The exact listed system corresponding to the penetrant, the host assembly and the required rating is required to be used; field improvisation or unapproved modification is not acceptable without a manufacturer's Engineering Judgment.

Figure 3: A mineral wool forming material is commonly installed within penetration openings and then sealed with a compatible fire-stop caulk.

A mineral wool forming material such as ROCKWOOL ROXUL Safe®[9] is commonly installed within penetration openings or cavity voids and then sealed with a compatible fire-stop sealant or caulk. As a non-combustible backing and forming medium, mineral wool is appropriate for irregular cable bundles and complex service configurations when used in strict accordance with the applicable listed fire-stop design.

For high-density cable applications, modular or proprietary solutions may be employed to simplify installation and improve maintainability. Examples include STI Firestop's EZ-Path® series[10] and other specialized data-center penetration products. These systems are intended to provide repeatable field performance; applicable listing numbers and installation guidelines should be confirmed with the manufacturer.

Exterior Walls Under Schedule Pressure: Trade-offs and Insulation Implications

Capacity shortfalls driven by rising computational demand are accelerating data center construction timelines. Consequently, early selection of the enclosure system becomes critical, as it has a direct impact on schedule, performance, and future flexibility. Therefore, as exterior system preferences evolve, specifications and insulation needs are also transitioning.

Common enclosure strategies for data centers include site-cast tilt-up concrete panels, insulated precast concrete sandwich panels, and insulated metal panels. Each strategy delivers distinct performance, schedule, and procurement trade-offs. Mass timber as an enclosure strategy is gaining popularity more recently for its sustainability benefits, as discussed later in this bulletin.

Concrete wall systems

Tilt-up concrete panels (Figure 4) remain a prevalent enclosure strategy for data center construction, combining structural robustness, inherent fire resistance, and favorable acoustic performance. Cast horizontally on site and lifted into position, tilt-up panels typically reduce enclosure erection time relative to conventional cast-in-place methods. However, tilt-up construction requires heavy-lifting equipment, precise joint and connection design, and affords limited late-stage flexibility for modifications.

Building on the enclosure benefits outlined above, tilt-up concrete panels nonetheless present specific thermal and hygrothermal challenges. The concrete substrate provides little inherent insulation, and conventional interior cavity solutions that rely on light-gauge steel studs with low-density batt insulation are often ineffective. Thermal bridging through the studs can substantially reduce the assembly's effective R-value, while convective loops within discontinuous or poorly fitted cavity insulation increase the risk of interstitial condensation.

Figure 4: Tilt-up panel erection: site-cast concrete wall panels cast horizontally, lifted into position to form the building enclosure.

[9] ROCKWOOL ROXUL Safe®: insulation for perimeter gaps, service penetrations and voids. It is non-combustible per ASTM E136 and CAN/ULC-S114 and register zero flame-spread and smoke-developed indices (or rating and classification, as applicable) under ASTM E84 and CAN/ULC-S102. Composed of stone-wool fibers derived from volcanic rock, it can withstand temperatures in excess of 2,000 °F (>1,000 °C).

[10] Specified Technologies Inc. EZ-Path

ROCKWOOL Smartrock® addresses these issues. It is a medium-density non-combustible (as per ASTM E136) stone wool board with an integrated humidity-dependent ("smart") vapor retarder (i.e., responsive vapor retarder as denoted in IBC 2024, Chapter 14), designed to provide continuous interior insulation of mass walls, such as concrete panels. Its conformable profile minimizes voids; the integrated smart vapor retarder both controls vapor diffusion and, when joints are taped and sealed, provides airtightness, functioning as a secondary air barrier. When installed as a continuous, sealed system, Smartrock® improves effective thermal performance and reduces the risk of interstitial condensation in tilt-up enclosures (Figure 5).

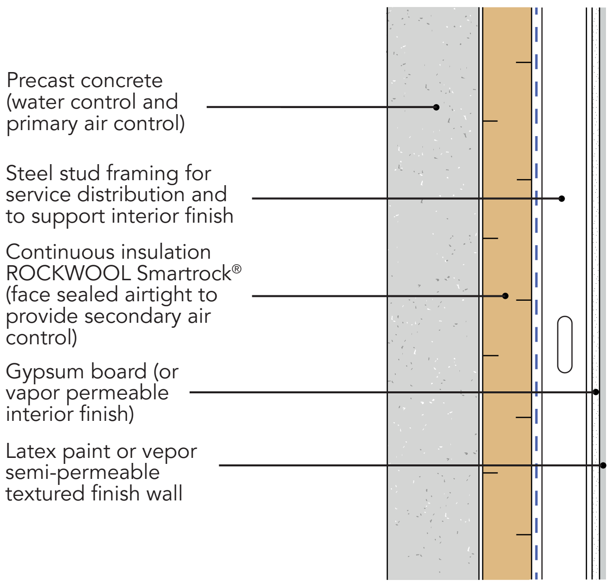


Figure 5: ROCKWOOL Smartrock® insulation controls internal air convection; continuity of the secondary air control layer is achieved by taping and sealing the facer joints, seams, terminations, and penetrations.

Insulated precast concrete sandwich panels provide an intermediate enclosure strategy between site cast tilt up and factory prefabricated insulated metal panels. Fabricated under controlled factory conditions, precast concrete sandwich panels combine the durability of concrete, fire resistance and acoustic performance with the predictable thermal behavior of factory installed continuous insulation. Although it is less common in North America and more prevalent in the European Union, particularly the Nordic countries, a noncombustible stone wool core[11] can be specified where enhanced passive fire performance is required.

Moisture performance is governed primarily by joint and wythe detailing while the outer precast wythe manages bulk water. The two stage (drained) joint is designed to drain water ingress at joints.

Stone wool cores are non-wicking. Moisture that enters the panel is more likely to evaporate or diffuse into adjacent materials than to move as bulk water. Nevertheless, it remains essential to protect joints and edges from standing water to prevent localized saturation and maintain long-term durability. Common protections include locating the primary water and air seal within the outer wythe or applying perimeter coatings at core interfaces (Figure 6).

In data center practice, horizontal joints are typically absent (panels are often full height from foundation to parapet, up to ~40 ft), so detailing emphasis shifts to vertical joints (typically every 8–12 ft) and the roof parapet interface (addressing thermal bridging and potential water penetration); foundation connections may be less hygrothermally critical but warrant consideration for continuous detailing.

Careful two stage joint design, defined drainage paths, perimeter protection, and rigorous factory quality control are therefore essential to achieve acceptable hygrothermal performance and long-term durability with stone wool cores.

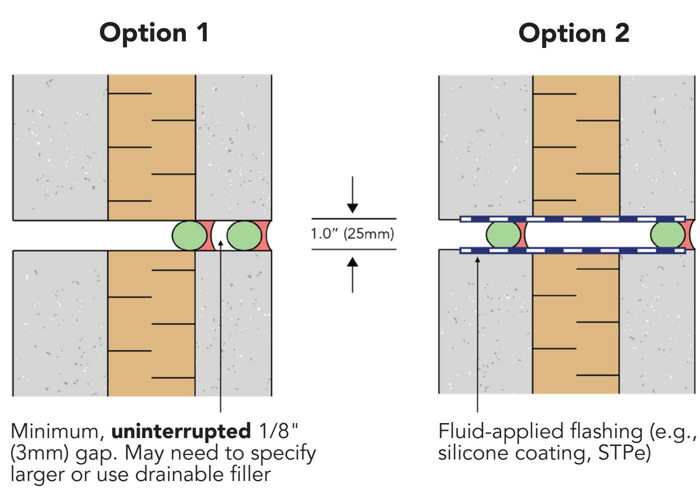


Figure 6: Plan views of two conceptual options for a two-stage (drained) joint between adjacent precast concrete panels with a stone wool insulation core, illustrating the inner wythe, continuous interior air barrier/ vapor retarder seal, drained cavity, and drained exterior weather seal.

[11] Stone Wool Core for Industrial Manufacturers

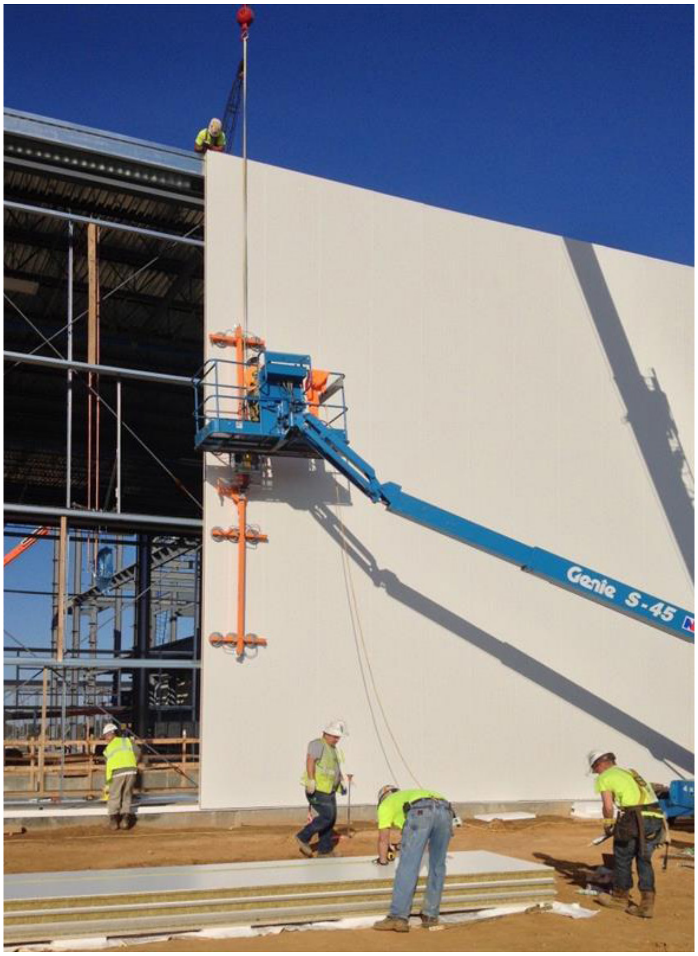


Figure 7: Installation of insulated metal panels (IMPs) with a non-combustible stone-wool core: factory-fabricated panels provide integrated air, vapor, water, and thermal barriers, enabling rapid on-site erection while enhancing passive fire resistance.

Insulated metal panels

With accelerating schedule demands, many data center developers are evaluating alternative enclosure systems, such as insulated metal panels (IMPs) (Figure 7). IMPs offer factory-controlled quality and can reduce certain supply chain and on-site delivery risks when schedule is paramount. Their rapid, factory-controlled fabrication and simplified installation make them well suited to fast-track projects.

IMPs are valued for rapid on-site erection because integrated air, water, vapor, and thermal control functions are provided in a single factory fabricated assembly, reducing on site labor, shortening schedules, and limiting opportunities for installation errors.

To support robust long-term performance, designers may supplement IMPs with a secondary backup wall or an independent continuous air and water barrier so that enclosure functions are not solely dependent on panel seams or factory joints. In some cases, IMPs are also used as a backup substrate in combination with exterior furring and rainscreen cladding, providing an additional pathway to enhance overall enclosure performance.

Where enhanced fire performance is required, IMPs with a **non-combustible stone wool core** are available and—when tested as complete assemblies in accordance with ASTM E119 or ULCS101—can achieve up to a 3-hour fire-resistance rating for wall constructions and roof/ceiling assemblies[12].

Pre-Engineered Metal Buildings (PEMBs)

PEMBs present an effective alternative to cast in place concrete and conventional steel construction for data center projects by addressing long lead times, high capital costs and limited adaptability.

Factory fabricated, pre cut components permit rapid, reproducible on site erection with reduced labor and material waste. Clear span frames and modular bay construction accommodate high rack densities, heavy floor loads and intricate MEP distribution, and enable incremental expansion without disruptive retrofit. Steel framing also facilitates support of rooftop equipment and extensive ductwork and permits integration of high performance exterior enclosure for thermal management and energy efficiency.

While well-suited to both hyperscale and edge/micro deployments, PEMB envelopes must be specified, tested, and coordinated to satisfy operational, structural, and passive fire protection requirements. ROCKWOOL stone wool insulation is ideal for PEMBs, offering enhanced thermal performance, contributing to reduced energy consumption, and exceptional fire resistance.

ROCKWOOL Plus™ MB is designed to provide thermal resistance in exterior wall assemblies that do not require a fire-resistance rating. In contrast, ROXUL Safe® 55 and ROXUL Safe® 65 are designed for interior or exterior non-load-bearing metal panel wall assemblies (Figure 8 on page 10).

[12] Metl-Span ThermalSafe® Fire Resistant Panel, Kingspan K-Roc™ HF, Norbec Noroc®

These products are ideally suited for zero lot line applications, where buildings are in close proximity and a fire-resistance rating is required:

- ROXUL Safe® 65 is used in exterior wall assemblies requiring a 1-hour fire-resistance rating,
- ROXUL Safe® 55 is used in exterior wall assemblies requiring a 2-hour fire-resistance rating.

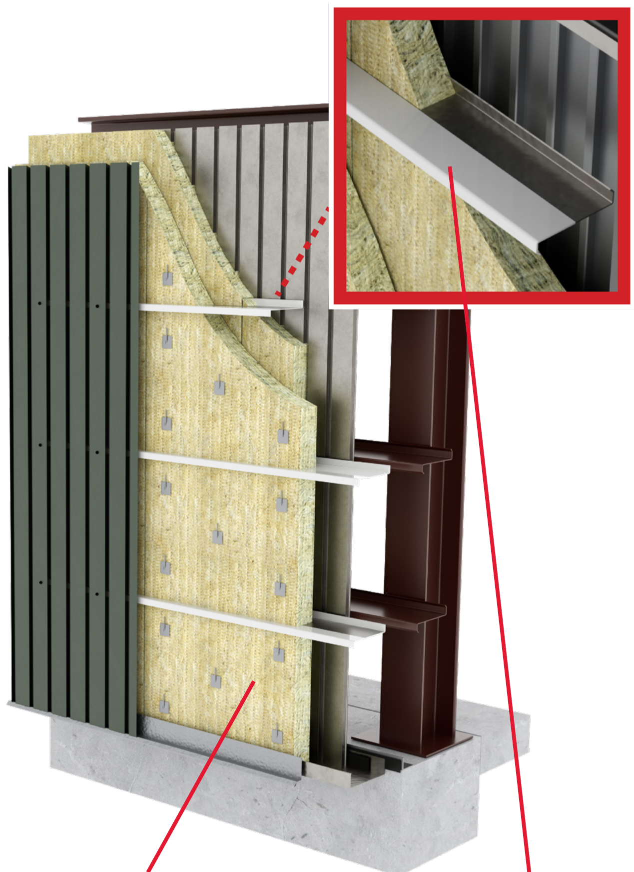


Figure 8: Exterior wall with a 1- or 2-hour fire rating requirement. Note the ceramic fiber blanket on the front of the horizontal girts

For more information about stone wool insulation strategies for pre-engineered metal buildings, including water, air, and vapor control, ROCKWOOL product selection, fire-rated assemblies, and typical U-factors, refer to the technical bulletin **"Exterior Stone Wool Wall Insulation for Pre-Engineered Metal Buildings."**

It should be noted that a high level of airtightness is critical for this type of enclosure and can be difficult to achieve in practice, particularly at interior liners and joints; similar challenges arise when poly scrim liners are used in place of metal liners. Consequently, pre-engineered metal building structures are frequently combined with alternative enclosure strategies rather than relying solely on traditional PEMB envelope systems. Traditional PEMB wall solutions may still be appropriate for certain portions of data center projects, such as offices or ancillary separations, but are not necessarily suited to data hall enclosures, where more stringent airtightness and performance criteria typically apply because of the potentially high differential pressures across the walls.

The Roof Imperative: Operational Criteria and Roofing Choices

For data centers, the roof is integral to operational resilience and must execute a coordinated set of protective functions for IT equipment, including:

- Shield the facility from external loads such as rain, hail, and snow to prevent moisture ingress that can cause equipment corrosion, electrical failures and broader operational disruption.
- Manage drainage to eliminate ponding and consequent membrane deterioration.
- Limit solar heat gain to reduce cooling demand and improve energy efficiency.
- Provide structural capacity for heavy rooftop equipment and create usable space for HVAC and generator equipment.
- Enable safe access for inspection and maintenance.
- Contribute to fire performance and acoustic control.

Because these objectives can conflict and materially affect capital and operating costs as well as resilience to extreme weather, roof systems, material selection, and detailing must be determined in accordance with each facility's operational requirements, risk profile, and maintenance strategy.

Conventional Low-Slope Roofing Systems

Low-slope roofing systems are widely specified for data centers because their flat profile and layered construction are well-suited to accommodate rooftop equipment, provided the structural deck and roofing assembly are designed to carry the imposed loads and to integrate curbs and penetrations. They also provide safe, unobstructed access for maintenance and permit installation of continuous high-performance insulation to improve energy efficiency.

Figure 9: Aerial view of data centers in Ashburn, Virginia

Building on these advantages, typical assemblies place continuous insulation above the structural deck to create an uninterrupted thermal barrier that reduces heat transfer, stabilizes interior temperatures, and preserves long-term performance. A primary roofing membrane is then installed over the insulation. Common options include single ply polymeric membranes with factory assembled reinforcements (e.g., TPO, PVC, EPDM), bituminous systems (built up or modified bitumen) and multi ply hybrid roofs that combine polymeric and bituminous layers (Figure 10). Membranes may be fully adhered, mechanically fastened or ballasted. Selection should consider wind uplift resistance, roof slope, compatibility with the insulation, and robust detailing at edges, curbs, and penetrations.

Figure 10: Installation of a PVC KEE single ply roofing membrane over ROCKWOOL Toprock® DD stone wool insulation.

To guide system selection, FM Approved roof assemblies provide a rigorously tested basis that consolidates performance criteria for wind uplift, fire exposure and hail impact across defined deck types, membranes and insulations. Designers can use FM Approvals' online database RoofNav to filter by site conditions such as wind speed, hail zone and occupancy risk class, translating FM test data into resilient, insurer-accepted solutions with clear installation requirements.

Within this framework, roof fire performance warrants particular attention for data centers. Roofs are primary exposure surfaces and often support heat generating or combustible equipment, including HVAC, photovoltaic and battery systems. Without appropriate design and detailing, roofs can permit ignition and vertical fire spread. Specifying complete, tested assemblies helps control these risks.

Fire performance is evaluated using established test methods:

- External fire exposure: ASTM E108 and UL 790 evaluate roof coverings under simulated exterior fire and wind, including potential propagation from the exterior to the underside of the deck.
- Underside exposure and assembly performance: UL 1256, FM 4450 and NFPA 276 assess the behavior of complete roof assemblies with insulated steel decks when exposed to fire from below. Compliance with these tests is used to qualify FM Global Class 1 roof assemblies.
- Time and temperature fire-resistance: ASTM E119 and CAN/ULC S101 determine how long roof ceiling assemblies contain fire and maintain structural integrity. While not used for FM Class 1 qualification, these methods apply where a rated roof ceiling assembly is required.

It should be noted that a Class A roof assembly classification under standardized exterior tests indicates limited flame spread but does not establish non-combustibility or assure acceptable performance in other fire scenarios. Consequently, membrane chemistry warrants rigorous evaluation, since single ply membranes including TPO, EPDM, PVC and KEE exhibit distinct fire behaviors such as softening, melting or dripping, and self-extinguishing. Designers should not rely solely on a Class A designation; rather, they should verify complete assembly performance, pair membranes with non-combustible components such as stone wool insulation and gypsum-based cover boards to limit heat transfer and reduce ignition potential, and ensure robust detailing at penetrations, curbs, edges and equipment supports to disrupt pathways for vertical fire spread.

Long-term performance considerations must also be addressed by selecting stabilized membrane formulations and confirming current test data that accounts for aging, ultraviolet exposure and thermal cycling. Material selection should be guided by membrane chemistry, applicable exterior and full assembly test data, and the specific risk profile of the project, including the presence of photovoltaic or battery installations.

Within complete, tested roof systems, ROCKWOOL Toprock® DD[13] (or Toprock® DD Plus), a rigid stone wool insulation board, contributes to passive fire performance through its non-combustible composition and supports durable thermal performance over the service life of the roof. In practice, Toprock® DD and Toprock® DD Plus are incorporated into many FM Approved Class 1 roof assemblies.

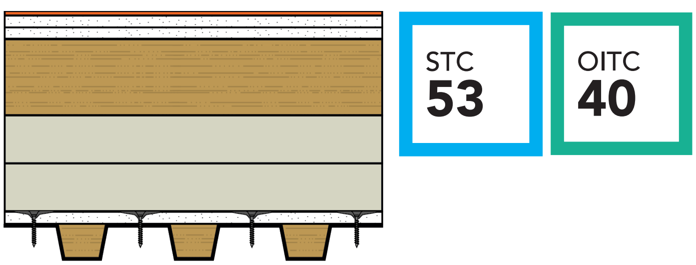
Table 2: Examples of FM approved designs with various hail ratings including ROCKWOOL stone wool insulation products

FM Assembly No.	Deck Type	Insulation Board	Coverboard	Membrane Type	Cover Securement	Fire Rating (Internal/ External)	Wind Uplift (psf)	Hail Rating	Partners
219560-0-0	Steel	Toprock® DD	Toprock® DD	PVC	Mech. Attached	1/A	90	SH	Tremco, SOPREMA, Johns Manville
535070-0-0	Steel	Polyiso	Toprock® DD	TPO	Adhered	1/A	90	VSH	GAF
433807-0-0	Concrete	Toprock® DD	Toprock® DD	PVC	Mech. Attached	1/A	90	SH	Sika
281148-48574-0	Steel	Polyiso	Toprock® DD Plus	ModBit/SBS	Adhered	1/A	90	SH	JM, Tremco
282113-50227-0	Steel	Polyiso	Toprock® DD Plus	ModBit/SBS	Adhered	1/A	90	SH	Tremco
546322-546290-0	Concrete	Polyiso	Toprock® DD	ModBit/SBS	Adhered	Noncomb./A	90	VSH	Tremco
108288-0-0	Steel	Toprock® DD	Toprock® DD	PVC	Mech. Attached	1/A	120	SH	Sika
257379-0-0	Steel	Toprock® DD	Toprock® DD	EPDM	Mech. Attached	1/A	120	SH	Firestone
207177-0-0	Steel	Toprock® DD	Toprock® DD	PVC	Mech. Attached	1/A	120	SH	Tremco, SOPREMA, Johns Manville
108891-0-0	Steel	Toprock® DD	Toprock® DD	PVC	Mech. Attached	1/A	135	SH	Sika
338065-0-0	Steel	Toprock® DD	Toprock® DD	TPO	Mech. Attached	1/A	150	SH	GenFlex Roofing Systems
196886-0-0	Steel	Toprock® DD	Toprock® DD	TPO	Mech. Attached	1/A	165	SH	GenFlex Roofing Systems
284973-0-0	Steel	Polyiso	Toprock® DD	PVC	Mech. Attached	1/A	180	SH	Sika
258241-0-0	Steel	Toprock® DD	Toprock® DD	TPO	Mech. Attached	1/A	210	SH	GenFlex Roofing Systems

[13] ROCKWOOL Toprock® DD is non-combustible per ASTM E136 and CAN/ULC-S114 and register zero flame-spread and smoke-developed indices (or rating and classification, as applicable) under ASTM E84 and CAN/ULC-S102. Composed of stone-wool fibers derived from volcanic rock, it can withstand temperatures in excess of 2,000 °F (>1,000 °C).

Additionally, Toprock® DD and Toprock® DD Plus can contribute to superior performance in the following areas:

- Hail resilience: increasing hail frequency in North America necessitates assemblies qualified under FM Standard 4470. Toprock® DD contributes to absorbing impact energy and limiting damage and is incorporated into many FM Approved Very Severe Hail (VSH) designs.
- Long-term thermal performance and durability: a stable R value and low coefficient of thermal expansion maintain thermal continuity, reduce membrane stress and lower energy demand, while stone wool's dimensional stability supports long service life without routine replacement.
- Acoustic containment: inherent sound attenuation in stone wool reduces airborne transmission of data center equipment and plant noise through the roof assembly to the surrounding environment (Figure 11).



Assembly Components	
Roofing Membrane:	Any adhered roofing membrane
Coverboard:	2 layers of 5/8" (16mm) gypsum roof board, adhered
Insulation (Top):	3.0" (76mm) Toprock® DD, adhered
Insulation (Bottom):	2 layers of 2.0" (51mm) polyisocyanurate, adhered
Air/vap. control layer:	Recommended (not included in the test)
Coverboard:	5/8" (16mm) gypsum roof board, fastened
Roof deck:	1.5" (38mm) type B metal deck, gauge 20
Flute fillers:	Toprock® Flute Filler
Other Characteristics	
System area weight:	13.7 lb/ft^2 (66.8 kg/m^2)
Total insul. R-value:	R-34.2 ft^2.°F.hr/BTU (RSI-6.02 m^2.K/W)
Test Report Numbers	
STC/OITC:	Intertek E7692.01-113-11-R1
Rainfall:	None

Figure 11: Example of a robust hybrid roof assembly for high acoustic performance, combining continuous stone wool insulation and mass layers.

For tested acoustic performance of additional assemblies using Toprock DD and Toprock DD Plus, refer to ROCKWOOL's **Catalog of Acoustical Roofing Assemblies.**

Standing Seam Metal Roofs

Although the initial installation cost of standing seam metal roofs is higher than that of conventional membrane systems, they typically yield lower life-cycle cost owing to service lives of 50 to 60 years and minimal maintenance. Their continuously interlocked seams and concealed fasteners reduce leak potential and enhance long-term watertightness, while appropriate panel gauge and finishes can provide high solar reflectance and accommodate photovoltaic integration. When the structural deck and supporting framing are engineered to resist imposed loads and attachment forces, standing seam roofs can safely support heavy rooftop equipment.

Durable, ROCKWOOL insulation products are well matched to the long service life of metal roofs, enhancing overall roof system longevity, thermal continuity and operational resilience, attributes particularly important for mission critical data center applications (Figure 12).

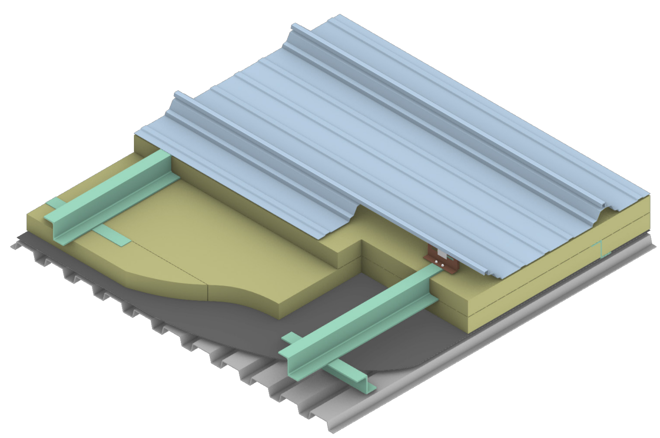


Figure 12: Example of structural metal roof panel system over ROCKWOOL Cavityrock® insulation fitted between thermally broken framing, over steel decking.

Refer to the ROCKWOOL technical bulletin **"Enhancing Metal Roofing Systems with Stone Wool Insulation"** for guidance on the application of ROCKWOOL products in both structural and architectural metal roofing systems and the building science that supports their use.

Insulated Metal Panels

As noted earlier, insulated metal panels offer factory-controlled quality, rapid installation, and integrated air, water, vapor, and thermal control, and they can also be applied to data center roofs:

- On sloped roofs, IMPs can serve as the insulated roof deck and primary water control layer, providing continuous thermal performance with coordinated air and water management.
- On low slope roofs, they are more commonly used as an insulated structural substrate beneath a separate roofing membrane, which enhances waterproofing and detailing flexibility and reduces reliance on panel seams and factory joints for long-term performance.

Thermal expansion and contraction of the exterior metal sheet is an additional design consideration, particularly as building widths increase, and more panel end laps are introduced. In these cases, an insulated membrane overlay can help moderate temperature swings in the exterior sheet and thereby reduce associated thermal stresses. Construction sequencing must be managed carefully so that temporary exposure conditions and movements are understood and controlled before the overlay is installed.

Designing Under-Slab Insulation for High-Load Data-Center Floors

Even though slab edge perimeter insulation in Climate Zones 4 and above is typically sufficient to meet code, insulation beneath the concrete slab can be a critical design element for data center floors. Under slab insulation helps stabilize slab temperature, reduce peak HVAC loads, and mitigate slab surface condensation that can jeopardize sensitive equipment. It also protects buried services and equipment pads from frost and ground induced movement, limits heat loss at the slab edge when tied into continuous perimeter insulation, and contributes to the long-term dimensional stability of the floor assembly, all of which directly support operational continuity and energy resilience.

Selection must be driven by the slab's structural and environmental demands. Commonly used materials include XPS and EPS boards; their suitability for below grade service depends on demonstrated long-term compressive strength and resistance to groundwater uptake. Because under slab insulation is impractical to replace, durability under sustained loads and moisture exposure is essential. Accordingly, where compressive resistance is verified for the project conditions (functional design and structural design), ROCKWOOL stone wool insulation is an appropriate option.

Data-center floor live loads are routinely owner-specified and commonly exceed typical code values. Some data hall design live loads used in practice include 210 psf (10.0 kPa), 250 psf (12.0 kPa), 275 psf (13.2 kPa) and 440 psf (21.0 kPa); mechanical and electrical equipment rooms typically specify 150–200 psf (7.2–9.6 kPa).

Under these conditions, the use of stone-wool beneath a slab-on-grade, specifically ROCKWOOL Toprock® DD, is feasible but requires engineered verification and precise detailing to accommodate elevated design loads, expected slab deformation and construction sequencing. Equivalent design verification and detailing are likewise required for any alternative under-slab insulation material.

Some key considerations include:

- Slab edges must be detailed and construction sequencing considered to account for initial slab deformation due to the concrete self-weight and the additional deformation under the design floor load.
- The designer and contractor need to recognize that initial deformation may be less than the final deformation once equipment is installed.
- Because slab design loads often include contingency for future technology changes, day-one equipment loads may be substantially lower than the slab design load, which further complicates how floor deformation is addressed and detailed.

Table 3: Deformation of ROCKWOOL Toprock® DD due to Compression Load

Board Thickness	Compression Load				
	83 psf (4 kPa)	125 psf (6 kPa)	167 psf (8 kPa)	209 psf (10 kPa)	251 psf (12 kPa)
2.0" (51mm)	0.018" (0.45mm)	0.025" (0.63mm)	0.031" (0.78mm)	0.036" (0.92mm)	0.041" (1.04mm)
4.0" (102mm)	0.016" (0.41mm)	0.023" (0.58mm)	0.029" (0.72mm)	0.034" (0.86mm)	0.039" (0.99mm)

Interior Floor–Ceiling Assemblies and Vibration Isolation

Building on the guidance for partitions, interior floor/ceiling assemblies must likewise control both airborne sound transmission and structure borne vibration between data hall levels and adjacent occupancies. The same principles apply: specify tested assemblies, maintain continuous airtightness, and implement disciplined detailing at penetrations. Acoustical ceiling systems can reduce interior noise levels and improve overall acoustic comfort in data centers.

Rockfon[14] offers a range of ceiling tiles, compatible with most common structural grid systems and engineered for data center environments (Figure 13). These systems are designed to be highly modular, allowing panels to be installed, demounted, and reconfigured easily to accommodate frequent layout and equipment changes.

Acoustic ceiling absorption performance is commonly expressed by the Noise Reduction Coefficient (NRC), a 0 to 1 index measured in accordance with ASTM C423 that quantifies average sound absorption in a reverberant room. NRC is valuable for controlling reverberation and reducing room noise, but it is not a direct measure of source level attenuation or sound transmission between spaces. Rockfon data center ceiling panels achieve high NRC values, typically between 0.85 and 0.95.

Figure 13: Data hall with an interior suspended ceiling and acoustic ceiling tiles.

Where additional low frequency absorption is required, stone wool batts such as ROCKWOOL AFB® may be installed above acoustical ceiling tiles to extend absorption into lower frequency bands. Subject to ceiling system capacity, plenum clearances and applicable fire code requirements, these batts can also damp plenum noise and reflections and enhance overall acoustic control.

Moving Toward Greater Sustainability

Many of the largest corporations[15] that own and operate data centers have set public decarbonization commitments and targets, underscoring the rapid growth in energy consumption and associated emissions from digital infrastructure.

Facility operational carbon emissions are most often mitigated by decarbonizing the electricity supply, either directly through on-site renewable energy generation and storage or virtually by means of power purchase agreements.

To complement and reduce risk in supply side strategies, demand side passive energy efficiency measures led by the use of stone wool as continuous exterior insulation in wall and roof assemblies can reduce thermal bridging, lower peak loads, and increase flexibility to deploy low-carbon electricity strategies. Adopting a low-carbon enclosure first approach addresses embodied carbon at the outset and subsequently reduces operational emissions over the building's service life.

Additionally, a holistic approach to material selection helps strengthen both environmental performance and transparency across both embodied and operational carbon impacts by favoring products with third party verified Environmental Product Declarations (EPDs) prepared in accordance with the relevant product category rules and supported by clear life cycle reporting. Prioritizing manufacturers with established circularity programs further strengthens long-term sustainability performance, particularly where those programs are designed to reduce waste and pollution, keep materials at their highest possible value, and minimize or eliminate production waste.

For example, ROCKWOOL's sustainability strategy is aligned with the United Nations Sustainable Development Goals[16] and the Science Based Targets initiative[17], with decarbonization efforts focused on energy efficiency, technology innovation and circularity.

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[14] Rockfon® solutions for data centers

[15] Meta pilots mass timber for more sustainable data center construction & Microsoft builds first datacenters with wood to slash carbon emissions

[16] The UN SDGs drive our sustainability work

[16] ROCKWOOL Group Annual Report 2024

ROCKWOOL stone wool insulation is supported by third party verified EPDs[18] prepared to industry standards and by circular practices such as documented recycled content and take back initiatives, strengthening both embodied and operational carbon outcomes over the facility life cycle.

Decarbonizing with Mass Timber

Mass timber, including engineered products such as cross laminated timber (CLT), is increasingly considered for data center applications because it can advance embodied carbon reduction strategies.

- Substituting mass timber for steel and concrete lowers upfront embodied carbon; when sustainably sourced and evaluated using accepted biogenic carbon life cycle methods, long-term carbon storage in timber can offset a portion of those emissions.
- The lower structural weight reduces foundation demands, enabling more efficient foundation designs and reduced material use.
- Factory prefabrication and faster on-site erection shorten schedules and can lower construction phase costs and associated emissions.

The net climate benefit of biogenic carbon storage depends on the permanence of that storage over the building's life and on end-of-life outcomes, including whether timber elements remain in service, are reused or sequestered long-term, or are released through combustion or degradation at disposal.

As in earlier sections of this document, fire-resistance remains paramount for mass timber applications. Although timber provides inherent resistance through charring, codes typically require additional noncombustible encapsulation to meet fire-resistance ratings. Under the 2021/2024 IBC for Types IV-A, IV-B, and IV-C, Section 602.4 prescribes levels of noncombustible protection; Section 703.2 requires ratings determined per ASTM E119; and Section 703.6 requires testing of protective materials. Stone wool encapsulation helps limit heat and flame penetration; ROCKWOOL Comfortboard® 80 has been tested to provide 40 minutes at 1.5 in and 80 minutes at 3.0 in when applied to walls and directly beneath floors/ceilings.

From an acoustic control standpoint, high density, continuous stone wool insulation boards (for example, Comfortboard® 80) can be attached directly to CLT or mass plywood panel elements, either above or below the floor finish where traditional framing cavities are absent and where structural capacity permits. The random fiber orientation of stone wool increases broadband sound absorption and reduces both airborne and impact noise transmission. Laboratory tested CLT floor assemblies incorporating Comfortboard 80 have demonstrated measurable improvements in STC, IIC and HIIC performance.

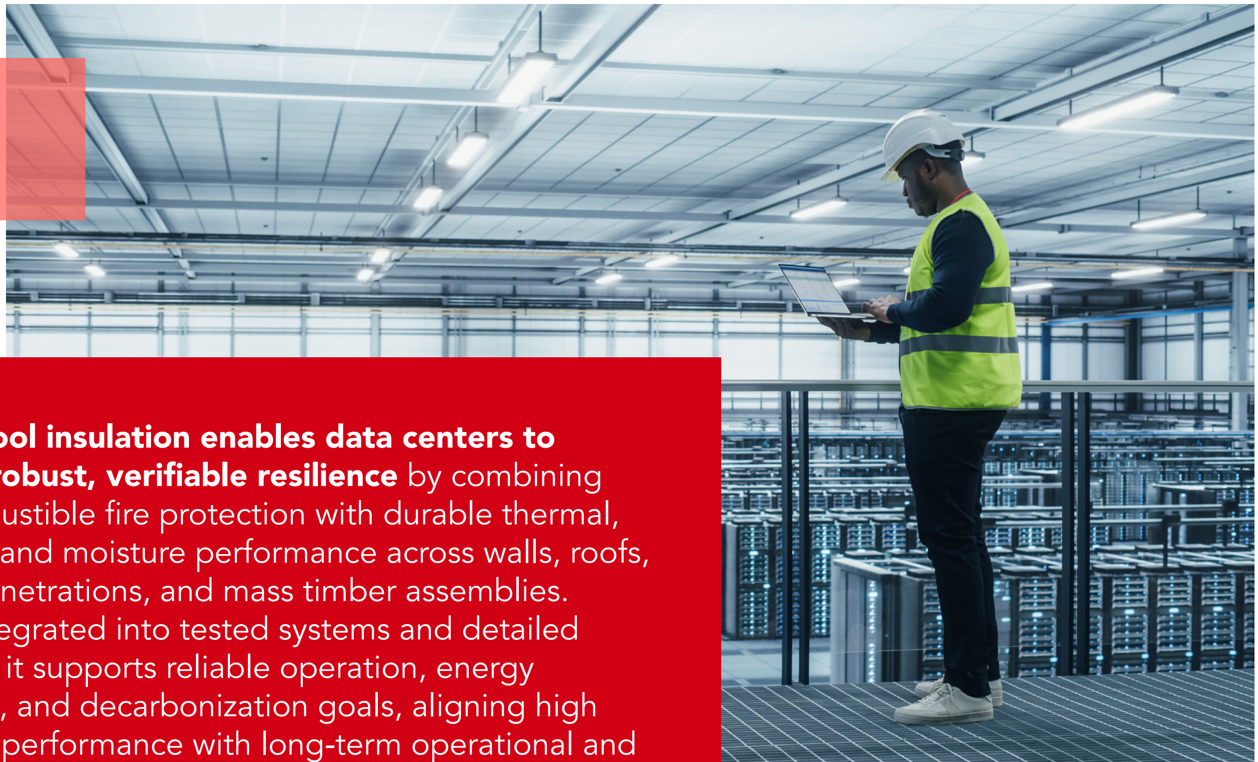
Stone wool insulation is vapor permeable and inherently hydrophobic, enabling drying and limiting interstitial condensation when integrated with properly detailed water resistive barriers, flashing, appropriate vapor control, and ventilated cavities. When used as continuous exterior insulation in rainscreen assemblies over mass timber, stone wool products such as ROCKWOOL Cavityrock® help limit moisture accumulation and reduce long-term moisture risk across a wide range of climates, particularly Climate Zones 4 through 8.

Refer to the technical bulletin, **"Enhancing Mass Timber with Stone Wool Insulation for Fire Safety and Acoustics"** for guidance on fire-rated assemblies, NFPA 285 compliant walls, managing fire risks in concealed spaces, acoustic CLT floor assemblies, and moisture management and durability.

Table 4: Comparison of Noncombustible Covering Materials for the Protection of Mass Timber Building Elements, as Tested per ASTM E119

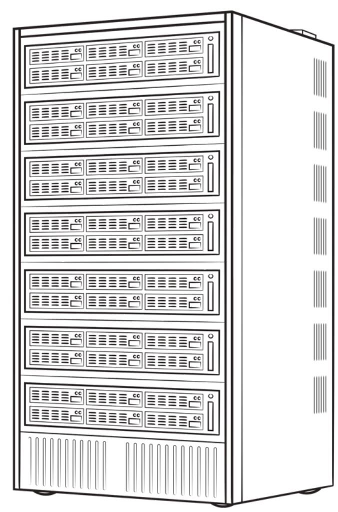
Noncombustible Protection	Duration of Protection	Source
1/2" type X gypsum board	25 minutes	IBC 2021 Table 722.7.1(2)
5/8" type X gypsum board	40 minutes	
1.5" ROCKWOOL Comfortboard® 80	40 minutes	QAI Design Listings: B1067-1jl & B1067-1kl
3.0" ROCKWOOL Comfortboard® 80	80 minutes	

[18] ROCKWOOL has a product-specific Type III EPD, third-party developed and verified by UL in accordance with ISO 14025 for North America



Stone wool insulation enables data centers to achieve robust, verifiable resilience by combining noncombustible fire protection with durable thermal, acoustic, and moisture performance across walls, roofs, floors, penetrations, and mass timber assemblies. When integrated into tested systems and detailed correctly, it supports reliable operation, energy efficiency, and decarbonization goals, aligning high technical performance with long-term operational and sustainability objectives.

Beyond the assemblies discussed in this bulletin, ROCKWOOL also offers complementary stone wool solutions for data center enclosures and infrastructure, including products such as Cavityrock for exterior walls, as well as OEM options for air handling unit systems and sound barriers. Taken together, these systems provide a practical, code aligned pathway to deliver data centers that are safer, more efficient, and better prepared for the demands of a rapidly expanding digital infrastructure.



For additional technical resources, visit the **"ROCKWOOL Building Science and Technical Services"** web page.

To get in touch with the ROCKWOOL Technical Services team, visit **rockwool.com/north-america/contact/**

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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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