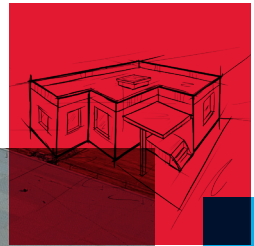




Acoustical Roofing Assembly Catalog

Enhancing Roof Acoustics with
ROCKWOOL Stone Wool Insulation



In the realm of architectural acoustics, low-slope and standing seam metal roofs play an important role in attenuating and damping noise transmitting into the building from the exterior. This aspect is particularly critical when addressing the challenge of mitigating noise originating from overhead sources, such as air traffic, rooftop HVAC systems, and weather-related disturbances like thunder. Additionally, the sound of rain or hail impacting metal roofs is a noteworthy concern that can affect the ambiance within the building. This guide aims to explore these acoustical considerations, offering insights and solutions to mitigate noise in buildings.

Designing low-slope roof assemblies demands careful attention to acoustic performance, particularly in environments within airport flight paths, as well as in structures where sound control is paramount, such as sound stages, educational facilities, healthcare institutions, hotels, residential areas, and senior care facilities. In densely populated urban areas, where commercial and residential spaces frequently overlap, managing sound within commercial premises becomes crucial. For these applications, selecting the right materials is key.

Stone wool insulation, especially ROCKWOOL Toprock® and ROCKWOOL Toprock® DD Plus, specifically engineered for low-slope roofing systems, serve as effective sound attenuation layers within the roof assembly. Some noise reflects off the roof due

to the outer roofing layer, but a significant portion still passes into the roof assembly. ROCKWOOL insulation are fibrous and porous so they convert the sound energy into heat through friction between the moving air molecules and fiber surfaces. ROCKWOOL's complex fiber structure, density and airflow resistivity have been engineered to maximize this noise attenuation process. Both airborne noise such as airplane flyovers and impact noise from rain are controlled. Without this layer, the noise passing through the roof and into the building would be louder and more problematic.

Quantitative Assessment of Roof Acoustical Performance Using Transmission Loss Data

The acoustical performance of a roof, colloquially referred to as its sound blockage ability, is quantitatively assessed



in a laboratory setting. This evaluation involves measuring the transmission loss of sound, which varies by frequency, as it travels from one space, through the roofing assembly, to an adjacent space, assuming no flanking paths (i.e., sound is transmitted only through the assembly). This measurement adheres to the ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements, resulting in a series of transmission loss data across various frequencies.

To facilitate the comparison of acoustical performance across different assemblies, two single-number ratings have been developed. The Sound Transmission Class (STC) is calculated by comparing the measured sound transmission loss to a reference contour curve at 500 Hz, following the ASTM E413 Classification for Rating Sound Insulation. Additionally, the Outdoor-Indoor Transmission Class (OITC) is computed in accordance with ASTM E1332 Standard Classification for Rating Outdoor-Indoor Sound Attenuation. These ratings help in simplifying the assessment and enable straightforward comparisons between different systems.

Addressing Sound Transmission in Roofing: STC vs. OITC Ratings

According to ASTM E413, the primary purpose of the Sound Transmission Class (STC) rating

is to rate the perceived level of sound transmission from typical indoor sound sources, such as speech, radio, and television, within office or building interiors. Although STC ratings are commonly applied to evaluate roofing assemblies, the standard was originally developed to assess interior partitions. As a result, STC ratings may not be well-suited for characterizing sound insulation performance against external sources, particularly those dominated by low-frequency noise.

Given these limitations, it is preferred and recommended to use the OITC when evaluating roofing systems. Unlike STC, OITC is a single-number rating calculated by subtracting the logarithmic summation of transmission loss values from the logarithmic summation of an A-weighted transportation noise spectrum. This spectrum, outlined in ASTM E1332, consolidates noise data from common transport sources such as aircraft takeoffs, roadway traffic, and diesel locomotive pass-by. With a frequency range from 80 to 4000 hertz considered, the OITC offers a more comprehensive assessment of a roof's capability to mitigate outdoor noise.

Mitigating Rain Impact Noise

Impact noise from rainfall is a critical factor in roof design due to its potential to substantially elevate indoor noise levels. Metal roofing, while durable



and aesthetically pleasing, can exacerbate this issue due to its hard and rigid surface which often amplifies the sound of rain impact. Conversely, the design of roofing materials such as the inherently flexible single-ply membranes plays a pivotal role in acoustical performance. When combined with effective insulation, these systems can dramatically enhance sound damping compared to more rigid metal composite roofing systems. However, advancements in metal roofing technology, including structural adaptations and the incorporation of sound-damping insulation materials, have been developed to address these acoustical challenges.

The specific procedures for assessing the impact of rain noise on a particular roofing construction, including metal roofs, are defined in the British Standard BS EN ISO 140-18: 2006, ensuring standardized

testing and reliable results. This comprehensive approach helps in optimizing roof designs to reduce indoor noise pollution effectively.

Utilizing the Acoustical Roofing Assembly Catalog

This guide serves as a comprehensive resource, detailing a variety of roof assemblies that have been rigorously tested for acoustical performance. It includes essential data such as Sound Transmission Class (STC), Outdoor-Indoor Transmission Class (OITC), thermal resistance (R-value), and rainfall impact sound levels (if available). Additionally, each listed assembly is accompanied by a unique ROCKWOOL number and specifies the ROCKWOOL products incorporated within the assembly, facilitating easy reference and selection.

The assemblies featured in this catalog are a selection from the extensive range of low-slope roof assemblies tested.

For comprehensive details or to request the full test report, please reach out to the ROCKWOOL Technical Services team at **rockwool.com/north-america/contact** or call **1-877-823-9790**.



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ROCKWOOL Products

Toprock® DD

Unfaced rigid stone wool roof board

rockwool.com/toprock-dd

Roof Membrane Attachment Options*



Mechanically
Fastened



Cold
Adhered**



Toprock® DD plus

Bitumen-coated rigid stone wool roof board

rockwool.com/toprock-dd-plus

Roof Membrane Attachment Options*



Mechanically
Fastened



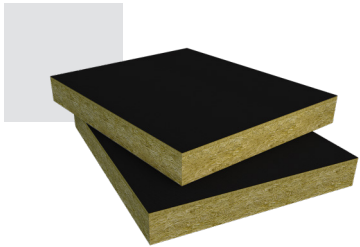
Torched



Cold
Adhered**



Hot Asphalt
Mopped



* Some roof membrane types, membrane and insulation attachment methods, and/or project-specific loads may require a coverboard between the insulation and roof membrane for adequate long-term support and durability. A qualified design professional can help you determine whether the use of a coverboard is needed for your project.

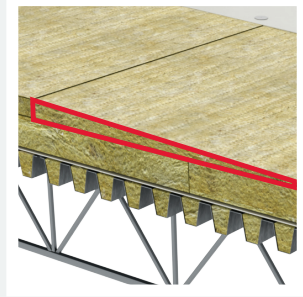
**Applicable to certain applications. Consult ROCKWOOL Technical Services.

Tapered, Flute Filler, and Cant Strip Fabricated Components

ROCKWOOL has a range of fabricated roof products available to provide a complete roof insulation assembly and to create a customized, high-performing roofing system.

ROCKWOOL Toprock Tapered and Tapered Plus

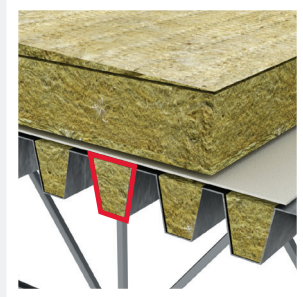
Toprock Tapered boards are available as both unfaced and bitumen-coated options for use with torch-applied or hot asphalt-applied membrane systems. Available in 1/8-inch, 1/4-inch, and 1/2-inch slope.



ROCKWOOL Toprock Flute Filler

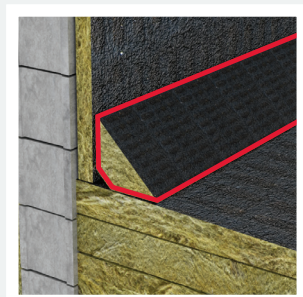
Toprock Flute Filler inserts into the void in standard N-Deck and B-Deck profiles.

Designed to absorb exterior noise and incidental sound that would otherwise be reflected back into the space below.



ROCKWOOL Toprock Cant Strips

Fabricated bitumen-coated stone wool insulation components designed to provide an additional 45° for transitions at parapet walls, mechanical units, and other roof penetrations.



This catalog provides a comprehensive overview of a range of tested acoustical roof assemblies. For each assembly, the catalog includes the corresponding STC and OITC ratings, as well as rainfall impact sound levels where available. It also provides a breakdown of all assembly components, system area weight, total insulation R-value, and the corresponding test report numbers.

Note: Several assemblies in this catalog were originally tested with the coverboard positioned mid-assembly, a configuration that does not reflect standard construction practice. To align with industry norms, ROCKWOOL engaged Stewart Acoustical Consultants to conduct a third-party engineering analysis, which concluded that relocating the coverboard to the top of these assemblies does not adversely affect STC or OITC ratings. Assemblies revised in this manner are marked with “**”.

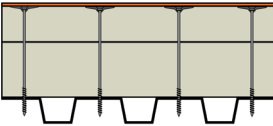
Additional modifications—such as incorporating adhesives between layers and revising roofing membrane specifications—were also made based on the same engineering judgment to enhance constructability, and were found to have a negligible or minor positive effect.

Please note that the corresponding test reports remain applicable, but may differ slightly from the revised assembly details.

Conventional Roof Assemblies

RW-CR26

STC 26	OITC 21	Rainfall 54.4 dB
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Assembly Components

Roofing Membrane:	48mil (1.2mm) PVC membrane, welded
Coverboard:	None
Insulation (Top):	1.75" (44.5mm) polyisocyanurate, fastened
Insulation (Bottom):	2.75" (70mm) polyisocyanurate, fastened
Air/vap. control layer	Recommended (not included in the test)
Coverboard:	None
Roof deck:	1.5" (38mm) type B metal deck, gauge 22
Flute fillers:	None

Other Characteristics

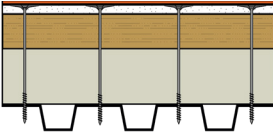
System area weight	2.88lb/ft ² (14.06 kg/m ²)
Total insul. R-value:	R-26.2 ft ² ·°F·hr/BTU (RSI-4.61 m ² ·K/W)

Test Report Numbers

STC/OITC:	Intertek G3302.05-113-11-R2
Rainfall:	Intertek G3302.15-113-11-R0

RW-CR35*

STC 35	OITC 25	Rainfall -
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Assembly Components

Roofing Membrane:	48mil (1.2mm) PVC membrane, welded
Coverboard:	5/8" (16mm) gypsum roof board, fastened
Insulation (Top):	2.0" (51mm) Toprock® DD, fastened
Insulation (Bottom):	2.75" (70mm) polyisocyanurate, fastened
Air/vap. control layer:	Recommended (not included in the test)
Coverboard:	None
Roof deck:	1.5" (38mm) type B metal deck, gauge 22
Flute fillers:	None

Other Characteristics

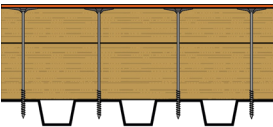
System area weight:	7.8 lb/ft² (37.9 kg/m²)
Total R-value:	R-23.8 ft². °F.hr/BTU (RSI-4.19 m².K/W)

Test Report Numbers

STC/OITC:	Intertek G3302.03-113-11-R2
Rainfall:	None

RW-CR36

STC 36	OITC 28	Rainfall -
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Assembly Components

Roofing Membrane:	48mil (1.2mm) PVC membrane, welded
Coverboard:	None
Insulation (Top):	2.0" (51mm) Toprock® DD, fastened
Insulation (Bottom):	3.0" (76mm) Toprock® DD, fastened
Air/vap. control layer	Recommended (not included in the test)
Coverboard:	None
Roof deck:	1.5" (38mm) type B metal deck, gauge 22
Flute fillers:	None

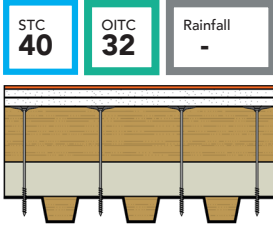
Other Characteristics

System area weight	7.0 lb/ft² (34.3 kg/m²)
Total insul. R-value:	R-19.0 ft². °F.hr/BTU (RSI-3.35 m².K/W)

Test Report Numbers

STC/OITC:	Intertek G3302.01-113-11-R2
Rainfall:	None

RW-CR40



Assembly Components

Roofing Membrane:	48mil (1.2mm) PVC membrane, welded
Coverboard :	2 layers of 5/8" (16mm) gypsum roof board, adhered,
Insulation (Top):	3.0" (76mm) Toprock® DD, fastened
Insulation (Bottom):	2.0" (51mm) polyisocyanurate, fastened
Air/vap. control layer:	Recommended (not included in the test)
Coverboard:	None
Roof deck:	1.5" (38mm) type B metal deck, gauge 20
Flute fillers:	Toprock® Flute Filler

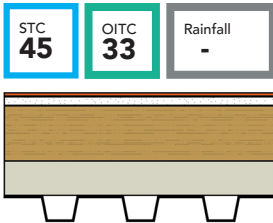
Other Characteristics

System area weight:	10.7 lb/ft ² (52.0 kg/m ²)
Total R-value:	R-22.8 ft ² .°F.hr/BTU (RSI-4.01 m ² .K/W)

Test Report Numbers

STC/OITC:	Intertek E7692.26-113-11-R0
Rainfall:	None

RW-CR45



Assembly Components

Roofing Membrane:	Any adhered roofing membrane
Coverboard:	5/8" (16mm) gypsum roof board, adhered
Insulation (Top):	3.0" (76mm) Toprock® DD, adhered
Insulation (Bottom):	2.0" (51mm) polyisocyanurate, adhered
Air/vap. control layer:	Recommended (not included in the test)
Coverboard:	None
Roof deck:	1.5" (38mm) type B metal deck, gauge 20
Flute fillers:	None

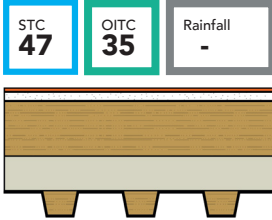
Other Characteristics

System area weight:	7.6 lb/ft ² (37.0 kg/m ²)
Total insul. R-value:	R-22.8 ft ² .°F.hr/BTU (RSI-4.01 m ² .K/W)

Test Report Numbers

STC/OITC:	Intertek E7692.15-113-11-R0
Rainfall:	None

RW-CR47a



Assembly Components

Roofing Membrane:	Any adhered roofing membrane
Coverboard:	5/8" (16mm) gypsum roof board, adhered
Insulation (Top):	3.0" (76mm) Toprock® DD, adhered
Insulation (Bottom):	2.0" (51mm) polyisocyanurate, adhered
Air/vap. control layer:	Recommended (not included in the test)
Coverboard:	None
Roof deck:	1.5" (38mm) type B metal deck, gauge 20
Flute fillers:	Toprock® Flute Filler

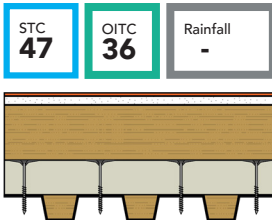
Other Characteristics

System area weight:	8.1 lb/ft² (39.7 kg/m²)
Total R-value:	R-22.8 ft²·°F·hr/BTU (RSI-4.01 m²·K/W)

Test Report Numbers

STC/OITC:	Intertek E7692.14-113-11-R0
Rainfall:	None

RW-CR47b



Assembly Components

Roofing Membrane:	Any adhered roofing membrane
Coverboard:	5/8" (16mm) gypsum roof board, adhered
Insulation (Top):	3.0" (76mm) Toprock® DD, adhered
Insulation (Bottom):	2.0" (51mm) polyisocyanurate, fastened
Air/vap. control layer:	Recommended (not included in the test)
Coverboard:	None
Roof deck:	1.5" (38mm) type B metal deck, gauge 20
Flute fillers:	Toprock® Flute Filler

Other Characteristics

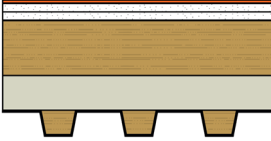
System area weight:	8.0 lb/ft² (39.2 kg/m²)
Total insul. R-value:	R-22.8 ft²·°F·hr/BTU (RSI-4.01 m²·K/W)

Test Report Numbers

STC/OITC:	Intertek E7692.28-113-11-R0
Rainfall:	None

RW-CR49

STC 49	OITC 38	Rainfall -
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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):	2.0" (51mm) polyisocyanurate, adhered
Air/vap. control layer:	Recommended (not included in the test)
Coverboard:	None
Roof deck:	1.5" (38mm) type B metal deck, gauge 20
Flute fillers:	Toprock® Flute Filler

Other Characteristics

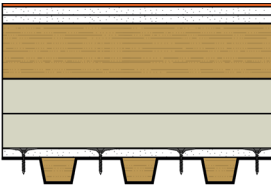
System area weight:	10.7 lb/ft² (52.0 kg/m²)
Total R-value:	R-22.8 ft²·°F·hr/BTU (RSI-4.01 m²·K/W)

Test Report Numbers

STC/OITC:	Intertek E7692.22-113-11-R0
Rainfall:	None

RW-CR53

STC 53	OITC 40	Rainfall -
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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/ft² (66.8 kg/m²)
Total insul. R-value:	R-34.2 ft²·°F·hr/BTU (RSI-6.02 m²·K/W)

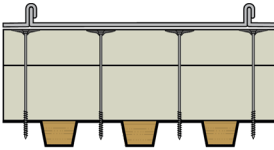
Test Report Numbers

STC/OITC:	Intertek E7692.01-113-11-R1
Rainfall:	None

Metal Roof Assemblies

RW-MR29

STC 29	OITC 23	Rainfall 55.7 dB
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Assembly Components

Roofing Membrane:	24Ga. standing seam metal roof, fastened
Underlayment:	Recommended (not included in the test)
Coverboard:	None
Insulation (Top):	1.75" (44.5mm) polyisocyanurate, fastened
Insulation (Bottom):	2.75" (70mm) polyisocyanurate, fastened
Air/vap. control layer:	Recommended (not included in the test)
Coverboard:	None
Roof deck:	1.5" (38mm) type B metal deck, gauge 22
Flute fillers:	Toprock® Flute Filler

Other Characteristics

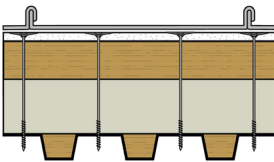
System area weight:	4.2 lb/ft ² (20.6 kg/m ²)
Total insul. R-value:	R-26.2 ft ² .°F.hr/BTU (RSI-4.61 m ² .K/W)

Test Report Numbers

STC/OITC:	Intertek G3302.10-113-11-R2
Rainfall:	Intertek G3302.20-113-11-R0

RW-MR36*

STC 36	OITC 27	Rainfall -
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Assembly Components

Roofing Membrane:	24Ga. standing seam metal roof, fastened
Underlayment:	Recommended (not included in the test)
Coverboard:	5/8" (16mm) gypsum roof board, fastened
Insulation (Top):	2.0" (51mm) Toprock® DD, fastened
Insulation (Bottom):	2.75" (70mm) polyisocyanurate, fastened
Air/vap. control layer:	Recommended (not included in the test)
Coverboard:	None
Roof deck:	1.5" (38mm) type B metal deck, gauge 22
Flute fillers:	Toprock® Flute Filler

Other Characteristics

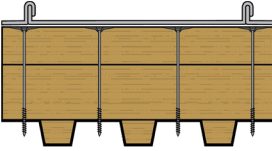
System area weight:	9.1 lb/ft ² (44.5 kg/m ²)
Total R-value:	R-23.8 ft ² .°F.hr/BTU (RSI-4.19 m ² .K/W)

Test Report Numbers

STC/OITC:	Intertek G3302.08-113-11-R2
Rainfall:	None

RW-MR37

STC 37	OITC 29	Rainfall 48.3 dB
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Assembly Components

Roofing Membrane:	24Ga. standing seam metal roof, fastened
Underlayment:	Recommended (not included in the test)
Coverboard:	None
Insulation (Top):	2.0" (51mm) Toprock® DD, fastened
Insulation (Bottom):	3.0" (76mm) Toprock® DD, fastened
Air/vap. control layer:	Recommended (not included in the test)
Coverboard:	None
Roof deck:	1.5" (38mm) type B metal deck, gauge 22
Flute fillers:	Toprock® Flute Filler

Other Characteristics

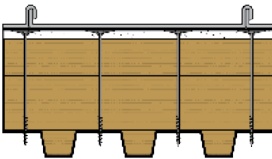
System area weight	8.9 lb/ft ² (43.6 kg/m ²)
Total insul. R-value:	R-19.0 ft ² .°F.hr/BTU (RSI-3.35 m ² .K/W)

Test Report Numbers

STC/OITC:	Intertek G3302.06-113-11-R2
Rainfall:	Intertek G3302.16-113-11-R0

RW-MR38*

STC 38	OITC 30	Rainfall -
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Assembly Components

Roofing Membrane:	24Ga. standing seam metal roof, fastened
Underlayment:	Recommended (not included in the test)
Coverboard:	5/8" (16mm) gypsum roof board, fastened
Insulation (Top):	2.0" (51mm) Toprock® DD, fastened
Insulation (Bottom):	3.0" (76mm) Toprock® DD, fastened
Air/vap. control layer:	Recommended (not included in the test)
Coverboard:	None
Roof deck:	1.5" (38mm) type B metal deck, gauge 22
Flute fillers:	Toprock® Flute Filler

Other Characteristics

System area weight:	11.5 lb/ft ² (56.0 kg/m ²)
Total R-value:	R-19.0 ft ² .°F.hr/BTU (RSI-3.35 m ² .K/W)

Test Report Numbers

STC/OITC:	Intertek G3302.07-113-11-R2
Rainfall:	None

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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