ROCKWOOL™

ENRICHING MODERN LIVING

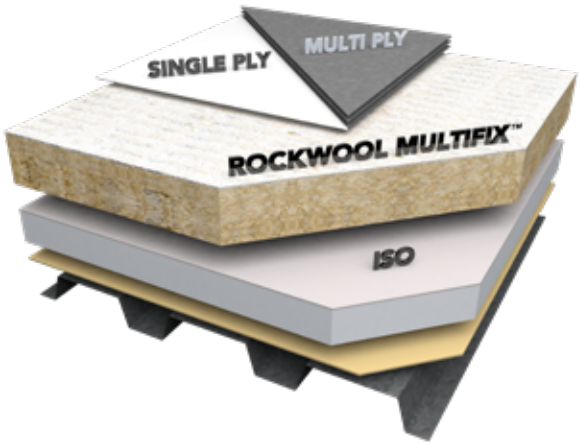
Low Slope Roofing

Improving Value with Stone Wool Roof Systems

The Value in Stone Wool Roofing Insulation

Our stone wool roof boards provide increased value to low-slope roofing projects due to the inherent benefits offered by stone wool insulation. By utilizing a layer of stone wool above the rest of the thermal insulation in a hybrid system, the stone wool provides added resilience and energy efficiency to improve the overall system. The positive effects of the hybrid solution can begin with as little as 2" of stone wool insulation added and based on energy modeling can be incremental up to 50% of the required R-value before showing decreasing effects in performance benefits.

This layer acts as a thermal buffer between the extreme temperature of the exterior and the thermal insulation, as well as providing added mass for acoustics, increased dimensional stability, fire resistance and impact resistance that can lengthen the life of the roof assembly.



Thermal resistance of stone wool increases at colder temperatures and does not decrease over time, allowing for more predictable, longer-lasting energy performance that provides increased ROI. Read more pg. 7

Why it matters:
More predictable energy performance allows for properly designed mechanical equipment and longer-lasting performance means saving money.

TOPROCK® DD has a high-density upper layer and a lower-density bottom layer. The high-density upper layer allows for increased compressive strength while the lower-density bottom layer allows for loads to be shared across the entire board. Read more pg. 10

Why it matters:
Point load resistance is key on flat roofs during construction and maintenance work where occasional foot traffic impacts the boards. The TOPROCK® DD boards also return to their original state once the load is removed.

Made from basalt rock and steel slag, stone wool products are naturally fire resistant, meet the FM 4470 NCC rating requirements and have 0/0 flame and smoke spread ratings. Read more pg. 10

Why it matters:
Increased fire resistance reduces the risk of a fire event causing damages, loss of business or increased insurance costs. Toxic smoke can cause additional environmental and health concerns.

Non-directional fiber structure and increased mass lead to improved acoustic performance over traditional foam plastic insulations. Read more pg. 9

Why it matters:
When used in combination with other mass layers, such as gypsum, high sound reduction can be achieved, critical for areas subject to increased noise pollution.

Lower co-efficient of expansion means increased dimensional stability over temperature changes and less gapping between boards. Read more pg. 8

Why it matters:
Over time, gaps between other insulation products become large and decrease effective thermal resistance.

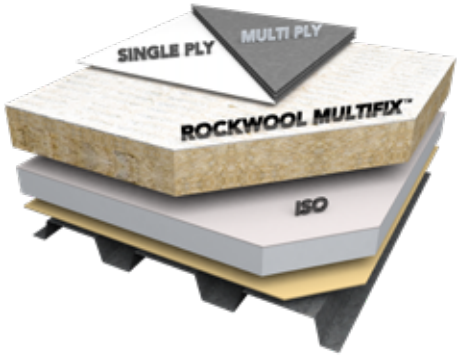
ROCKWOOL MULTIFIX™

ROCKWOOL MULTIFIX™ is a dual-density, rigid roofing insulation faced with a high-performance mineral coated glass fiber layer.

ROCKWOOL MULTIFIX™ has all the product qualities of our TOPROCK® DD product:

- Insulation and coverboard in one
- Suitable for new building, re-roofing and re-covering applications
- Fire, impact and hail resistant

The glass fiber coating allows the product to be used with a number of different bonding methods for conventional roofing systems.



Bonding Method	TOPROCK® DD	TOPROCK® DD Plus	ROCKWOOL MULTIFIX™
Mechanically Fastened	•		•
Torch Applied Membranes		•	•
Hot Mopped Membranes		•	•
Cold Applied Membranes		Some applications, consult ROCKWOOL	•
Self-Adhered/Peel and Stick Membranes			•

Better Adhesion, Better Performance

ROCKWOOL MULTIFIX™ has been tested for compliance with a number of membrane systems in order to prove the performance of this mineral-coated product.

ROCKWOOL MULTIFIX™ has received approval from a number of membrane manufacturers for use in their systems. Better adhesion between the insulation or coverboard and membrane can improve performance in high-wind areas and reduce potential for leaks and moisture in a system.

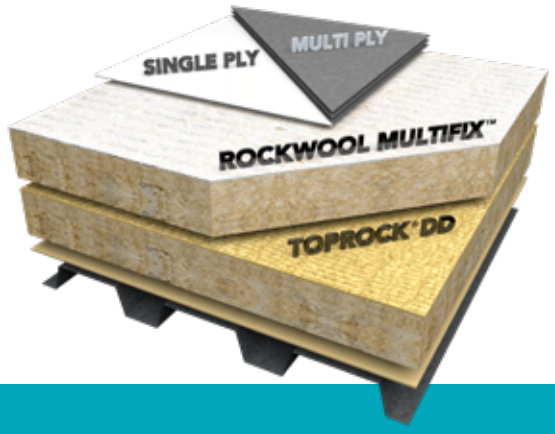
Roofing Products

TOPROCK® DD

Thermal Roofing Insulation and Coverboard

TOPROCK® DD is a dual-density rigid stone wool roof board available unfaced or with facing for improved adhesion. TOPROCK® DD Plus has a bitumen coating for hot adhered systems. ROCKWOOL MULTIFIX™ has a mineral coated fiber glass facer that is approved for use with hot and cold adhered systems.

- Insulation and coverboard in one
- Suitable for new building, re-roofing and re-covering applications
- Also used in tapered systems for positive drainage
- Standard thicknesses: 2 – 6", .5" increments
- R-value of 3.8 per inch as tested at 75°F per ASTM C518 standard



TOPROCK® DD products are available with two different facing options: bitumen or mineralcoated fiberglass. The bitumen-coated TOPROCK® DD Plus products are used in hot adhered applications such as torch or hot-mopped asphalt. The mineral-coated fiberglass facing used on ROCKWOOL MULTIFIX™ can be used with both hot and cold adhesives.

Building Better With Building Science

Building science research is continuously being conducted to improve the performance of the buildings in order to achieve more effective performance in the building enclosure. The performance of the roof enclosure can have a significant effect on the overall building, especially on large one-story buildings.

Building science research allows for increased building modeling to better reflect the performance of the building once it is in use. For walls, research has shown that the nominal R-value of the insulation is not what you should expect due to the effects of thermal drift, thermal bridging and other factors, and exterior walls have begun to move to an "effective R-value" for the wall rather than nominal. For low-slope roofs, energy codes still rely on nominal R-values; however, better performance can be achieved by looking at the effective performance of the roof system.

More than Just R-value

Modeling the system components together allows additional factors to be considered in the performance of the roof system such as temperature changes, thermal drift, thermal bridging and gaps occurring.

While it never guarantees results, it can allow the owner to better understand the expected performance of their building and not experience sticker shock once the energy bills start to add up.

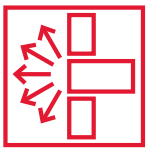
ROCKWOOL BUILDING SCIENCE (RBS)

We offer building science resources for architects, designers, specifiers, consultants and owners who are looking for information on how to efficiently design or improve their building enclosure systems, including their low-slope roof systems. These knowledgeable building science specialists can review building assemblies and provide quantitative feedback and recommendations that can be implemented into your project.

RBS Team work is completed on an individual project basis and will include good, better and best recommendations that can provide assistance to make informed, educated decisions to increase the overall performance of the building.

Building Science

R-Value Calculations



Thermal Bridging Modeling

Hygrothermal Modeling

Full Building Modeling

Our Solutions

Hybrid Insulation System

A hybrid insulation system utilizes the benefits of two different insulating materials to achieve increased performance. Polyisocyanurate insulation is the most widely used insulation in the low-slope roofing industry due to its high published R-value per inch and its lightweight boards. Using a layer of stone wool insulation as a coverboard on top of the polyiso allows the roof system performance to improve. The stone wool layer moderates the temperature the polyiso is subject to and provides increased dimensional stability for the membrane.

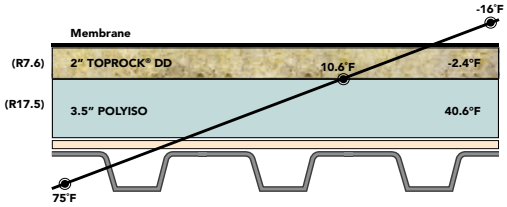
The hybrid system also reduces the need for hard-to use coverboard materials and the number of fasteners or amount of adhesive required in certain systems in order to reduce the installed cost. When exposed to colder temperatures, such as during the winter in northern climates or during the night, the stone wool layer moderates the temperature, keeping it nears its optimum temperature range.

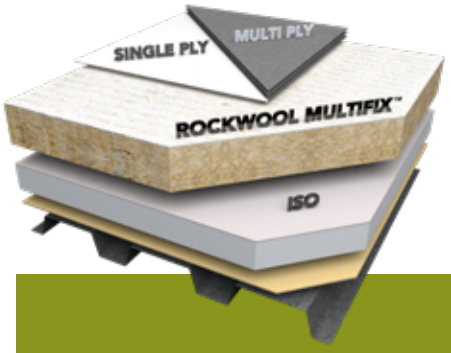
In the system shown before, the polyiso is subjected to a 40°F temperature average and a 10°F temperature at the top of the layer. Increasing the thickness of the stone wool increases both the average temperature and the temperature at the face of the polyiso layer.

Stone Wool System

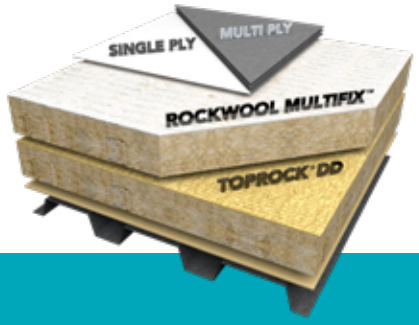
Utilizing a full height stone wool system can increase the overall thickness of the roof system, due to the lower R-value per inch, but it can also provide additional benefits over a hybrid system. By utilizing non-combustible materials in the roof system, the risk of a fire event is reduced and insurance premiums may be decreased.

In addition, the stone wool roof system has increased acoustic properties due to the fibers and mass of the stone wool roof boards. Finally, a smart membrane layer on the bottom of the roof system can be used to allow vapor to diffuse through the roof system, allowing the roof to dry any trapped moisture in the roof enclosure.





Polyisocyanurate provides an increased R-value per inch, allowing for decreased thickness of the roof system, which can affect the total cost and effective performance of the system.



Stone wool roof boards provide added fireresistance and dimensional stability to the roof system for added resiliency and longevity. The mass of the boards also moderate the temperature of the roof and do not decrease in thermal resistance over time.

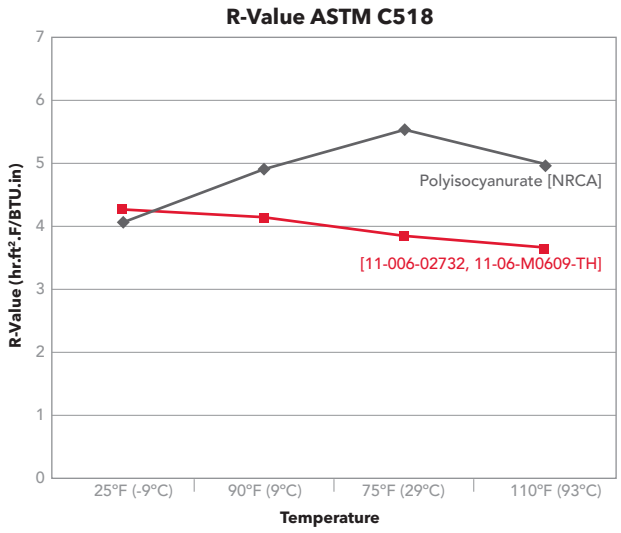
Thermal Insulation That Won't Degrade

Thermal Resistance Across Temperatures

The ASTM C518 (C177) standard is conducted at mean temperatures of 25°F (-4°C), 40°F (4°C) , 75°F (24°C) and 110°F (43°C), but most R-values are published based on 75°F (24°C). Our roof boards provide increased performance at cold temperatures and drop slightly at warmer temperatures.

The graph below shows the values of an average polyisocyanurate board from testing conducted by the National Roofing Contractors Association (NRCA) and TOPROCK® DD from a third party test.

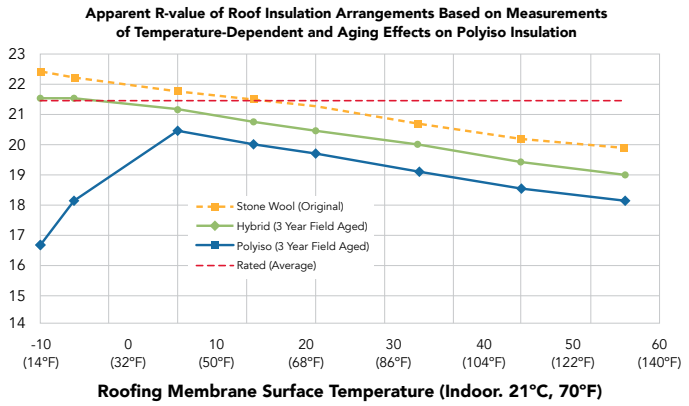
At colder temperatures, the polyisocyanurate boards perform worse, reducing the overall effectiveness of their thermal resistance. This is most prevalent in cold climates, but can also be seen at night in all climates as the temperature drops. The NRCA has recommended that a design R-value of R5.0/in be used for polyiso in all climates based on theirtesting published in early 2016.



Effects of Aging

In a third party in-situ test conducted by RDH Building Science, polyisocyanurate lost 10% of its nominal R-value at mean 75°F and showed decreases of up to 20% after being aged in the field for three years. The stone wool system showed no decrease in overall thermal performance over the three-year period in the RDH study. As the product is exposed to air, the blowing agents are replaced with the higher conductive air, reducing overall thermal performance of the boards. The rate of expansion depends on many factors of the roof board but has shown to happen rapidly in the first five years of use of the board before finding an equilibrium level. Polyiso products typically report their R-value as an LTTR value, which is a timeweighted average meant to emulate the 180-day R-value of other foam plastic products. However, this means that they will be deficient after that point and they will continue to drop until they reach an equilibrium point.

Our stone wool and other inorganic products do not use blowing agents, so there is no change in the composition of the product over time due to offgassing and stone wool shows no drop in R-value performance. We even provide a Limited 100% Thermal Warranty on our products, guaranteeing that they will not drop in thermal resistance over time.

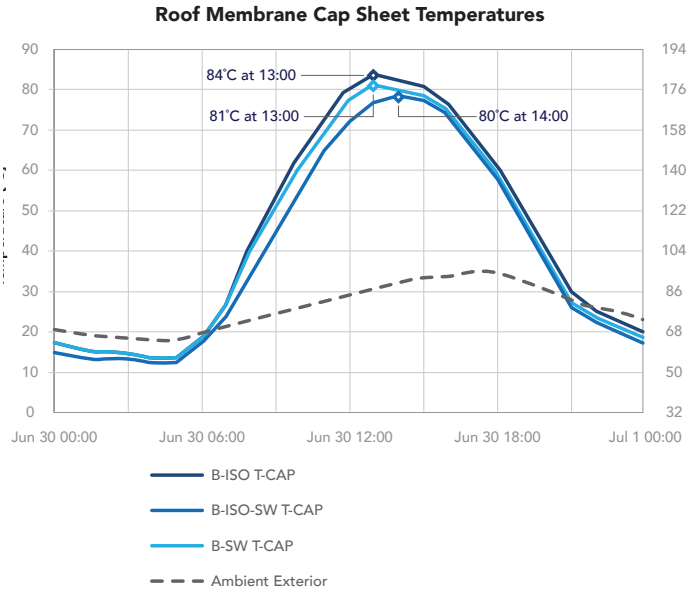


Dimensionally Stable Year after Year

Our stone wool is inherently dimensionally stable, as its co-efficient of linear expansion is small compared to other materials like foam plastics. The larger the co-efficient the more products will expand and contract.

Over time and temperature cycling, some insulating materials never return to their original size, causing gaps to form between the boards. These gaps can significantly affect the thermal performance of roof systems. Oakridge National Laboratory found that 1" gaps between boards (½" gaps from each board) caused a 10-15% drop in thermal performance even when two layers of insulation were used.1

This drop in thermal performance is in addition to the drop expected from the temperature and the effects of aging of the roof boards, therefore the effective performance differs from expected performance based on the design R-value.



[1]Reference: Oakridge National Laboratory. "Effects of Mechanical Fasteners and Gaps between Insulation Boards on Thermal Performance of Low-Slope Roofs"

Dimensional Stability and Membranes

As the roof boards expand and contract, membranes that are secured directly to those boards move along with them, putting additional stresses on the membrane. Climates that experience great variance in temperatures seen throughout the day and night, as well as seasonally, are at greater risk of seeing membranes fail prematurely due to unnecessary stress caused by the roof boards.

Stone wool roof boards not only have superior dimensional stability to foam plastic insulations, they also increase the thermal capacity of the roof system. This reduces the peaks and valleys that the second thermal insulation layer is exposed to. It also moderates the temperature of the membrane layer, helping to provide additional relief to the stresses membranes are exposed to.

In a third-party study by RDH Building Science, three systems were tested in-situ in Chilliwack, BC to monitor their performance over time. This graph, taken in the first year of the study, highlights the thermal capacity of the stone wool and hybrid systems. In the hybrid system, the peak temperature of the membrane cap sheet is reduced by 3°C and in the stone wool system, the peak is reduced by 4°C and pushed an hour later. This snapshot taken of one day is representative of the moderating effects stone wool can have over time to improve the performance of the roof membrane and help extend the service life of the roof.

For more information on this study, visit **rockwool.com** or **rdh.com**

Sound Absorbent to Improve Comfort

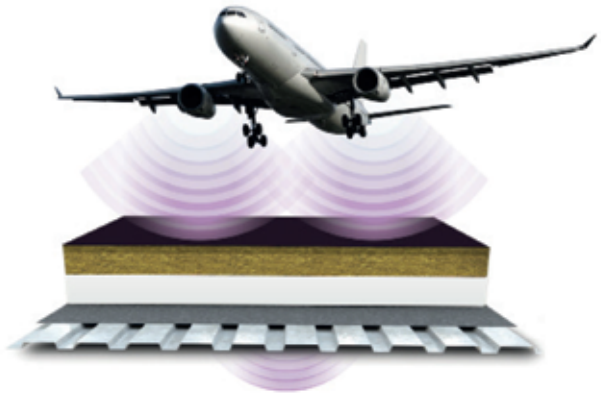
Sound Absorbency Reduces Distractions and Can Improve Health

TOPROCK® DD roof boards are able to provide sound attenuation benefits to low-slope roof systems. TOPROCK® DD roof boards are dual-density, providing increased mass, and their non-directional fibers allow for improved sound-absorbent properties.

Sound absorbency is a key attribute for a number of low-slope roof assemblies. Certain buildings, such as hospitals or schools, request additional sound absorption in order to protect the health of the occupants. Others, such as offices or buildings near airports or other noise polluters, desire additional sound properties in order to limit distractions or interruptions during the course of the day.

TOPROCK® DD products can provide additional sound reduction in combination with the other components of the roof system and work well to provide additional benefits for STC, OITC and other sound reduction ratings for low-slope roofing applications.

TOPROCK® DD products also work well in metal roofing systems where rain driven and impact noise are a large concern.

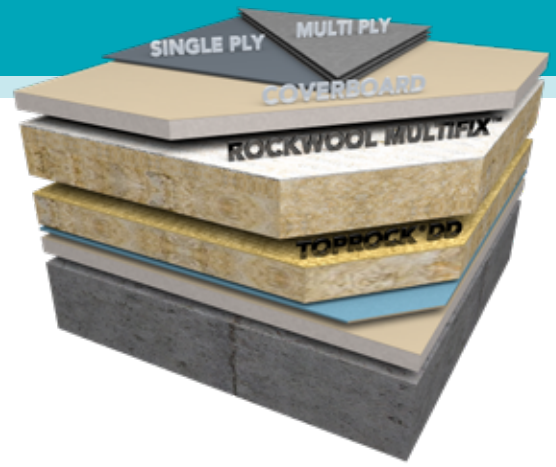


High-performance Roof Enclosures

To meet performance requirements of clients and owners, high-performance roof enclosures require additional layers and resilience. Utilizing alternating layers of gypsum and stone wool creates additional benefits in the roof enclosures. The gypsum coverboards provide reflectance of sound while the fibrous nature of the stone wool provides sound absorbency, allowing for high STC or OITC requirements to be met.

In addition, these systems provide added resiliency by creating redundancy in the roof system to limit damage in the case of roof leaks, a fire event or hail storms. Resilient designs seek to provide more than the minimum to help owners feel comfortable that their roof enclosure will withstand external forces out of their control.

We have tested acoustic assemblies to meet a variety of performance criteria. For information on acoustic designs, contact your local ROCKWOOL roofing or specifications representative or contact our Technical Innovations team via phone at 1-877-823-9790 or by email at **contactus@rockwool.com**



Fire Resistant Insulation

Our stone wool insulation has a melting point that exceeds the temperatures of most commercial fires, stone wool roofing insulation is non-combustible and will not develop toxic smoke or promote flame spread, even when directly exposed to fire. It meets the requirements for FM 4470 NCC (Non-Combustible Core) rating. Therefore it will not add fuel to an existing fire, making it ideal for high occupancy buildings or those with particular fire concerns. Manufacturing facilities and critical facilities that cannot be disrupted may also desire added fire protection.

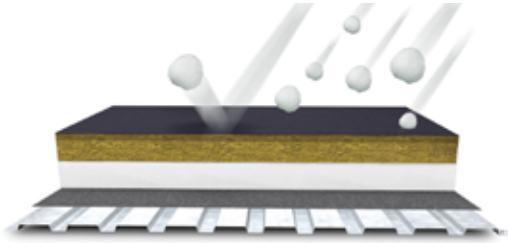
Stone wool provides passive fire protection – a strong complement to active systems such as sprinklers. This is important while a building is operational and just as important in the construction and maintenance stages.

Learn More:
Search "Comparative Roof Insulation Fire Test with Tony Crimi" online or go to rockwool.com to see a comparison of common flat roof insulation types with the ASTM E119 fire test.

Impact and Hail Resistant

TOPROCK® DD roof boards have two different densities built into the product. This allows the product to withstand both loads asserted onto the product as well as impact loads (such as hail or foot traffic).

The upper layer of the TOPROCK® DD products is a higher-density, allowing it to deal with heavy loads, and the lower-density layer allows the loads to be spread out across the rest of the board with foot traffic. In addition, the lower-density layer allows the board to return toits original form over time after a load is removed for temporary loading such as construction materials or foot traffic. For areas of heavy traffic or constant loading such as paving stones, an additional coverboard layer is recommended based on good roofing practice.



For more information on the impact resistance of our TOPROCK® products, search for our technical bulletinon the subject or contact our Technical Innovations:

Phone: 1-877-823-9790
Email: contactus@rockwool.com

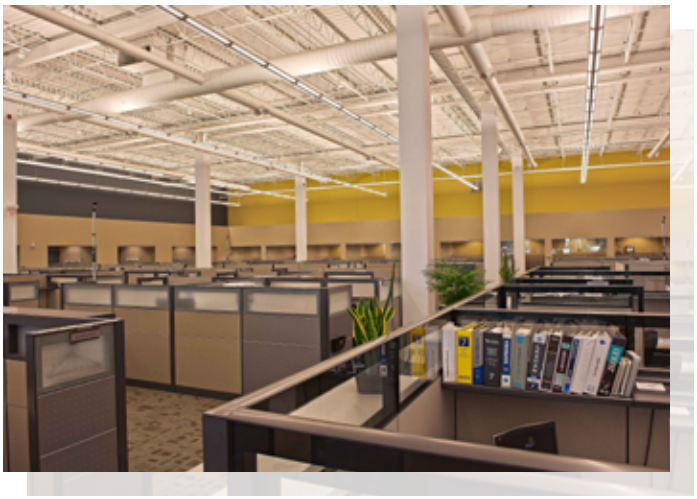
Roofing Projects

Wayne State University – Detroit, MI

In order to meet the energy demands of a growing campus, Wayne State University wanted to reduce the energy usage of their existing buildings by improving their roof systems. They utilized TOPROCK® DD Plus on top of the existing systems or in combination with other insulations to meet their energy requirements.

Flynn Canada Office Building – Toronto, ON

This office building was located near Toronto Pearson International Airport in Toronto, ON. To improve the comfort of their office staff, Flynn Canada decided to improve their roof enclosure with TOPROCK® DD. The new roof system reduced the sound transfer between the nearby air traffic and the interior space, allowing for improved occupant comfort.



Distribution Warehouse – Quebec City, QC

This warehouse chose to perform a re-cover of their existing roof in order to improve the overall energy efficiency of their building. In order to do so they added 2" of ROCKWOOL MULTIFIX™ to the existing roof system and installed a new membrane over top. This re-cover of their existing roof allows them to increase performance and extend the life of the roof system without tearing off the existing roof or disturbing the use of the building.

GW Williams Secondary School – Aurora, ON

This high school in Aurora, ON was part of a school board initiative to reduce the energy usage of their buildings. 2In order to do so, they chose to use TOPROCK® DD Plus as part of a hybrid roof system in combination with polyisocyanurate. The polyiso has a high initial R-value that decreases over time which is offset by TOPROCK® DD Plus, providing added dimensional stability and increased thermal capacity.

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 biggest 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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