

ROXUL[®]

MINERAL WOOL INSULATION
PERFORMANCE AND PROPERTIES



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ROXUL uses the latest European technology developed by the Rockwool International Group, the largest manufacturer of mineral wool products in the world.

ROXUL mineral wool is made from volcanic rock and recycled steel slag. The rock and slag are melted in large cupola furnaces at a temperature of about 1500°C (2700°F).

The molten rock is directed into a series of fast rotating wheels spinning it into rock fibres with an average diameter of about 0.005 mm (2/100 inch). A binding agent is added and, for impregnated products, an additional agent is introduced to coat the fibres with a water repellent film. The wool is then cured in special curing ovens transforming the binder into bakelite. The basic material for all ROXUL products is now created.



ROXUL Inc. Milton, Ontario plant

Who is ROXUL?

ROXUL INC. is a subsidiary of the Rockwool International A/S Group of companies. The Group is Danish and comprises subsidiaries in Denmark, Great Britain, Holland, Germany, France, Switzerland, Norway, Poland and Canada.

The basis of all the Rockwool Group products is mineral wool — a high-quality product for insulation purposes.

Quality is the key word which also applies to the service we give our customers.

ROXUL mineral wool is used

- for thermal insulation of apartments, single and multi-family residences
 - factories, public institutions and offices
 - for thermal insulation of district heating pipes
 - for heat and fire insulation of boilers and tanks
 - for heat, sound and fire insulation in ships and offshore constructions
 - for pulp and paper mills and petro-chemical plants
 - for sound insulation of indoor swimming pools, industrial premises, offices and hospitals
- ROXUL mineral wool plays a major role in insulating the structures of today and the future.

Thermal insulation

How does it work?

The high insulation value of ROXUL products is the result of entrapping air within a matrix of rock fibre, preventing air circulation and convection. ROXUL building products are light in weight consisting of 99% air and 1% fibres. The quantity of fibre in heavier insulation materials may be as high as 6%.

Between the interconnected strands of ROXUL fibres a constant void volume is maintained, resulting in consistent insulation performance.



A magnified view of ROXUL mineral wool shows its interlocking structure and the water repellent coating. These fibres are approximately 1/15th the size of a human hair.

What is 'U' value?

The insulation ability of a structure - e.g. an outer wall, a roof, etc. - is expressed in terms of its 'U' value, also called its transmission value. It represents the amount of heat transmitted through 1m² (1 ft²) in one hour for a temperature difference between inside and outside of 1°C (1°F). The lower the 'U' value the better the insulation property of the structure.

What is 'K' value?

'K' value is the thermal conductivity of a single element and indicates the amount of heat conducted through 1m (1 ft²) for a temperature difference of 1°C (1°F) between the opposite faces of the element. The lower the 'K' value the better the insulation property of the element.

What is 'R' value?

'R' value is the thermal resistance of a structure to heat flow and is the converse expression of a 'U' value. The higher the 'R' value the better the insulation ability of the structure, or element. The performance of typical residential insulation currently available can be assessed by 'R' value per inch.

	Design		Installed
Glass mineral wool	R 20.0	6" 5 1/2"	Less Than R 19.5
ROXUL mineral wool	R 21.5	5 1/2" 5 1/2"	R 21.5

The structure of the wool

The random orientation of ROXUL mineral wool creates a non-directional structure which ensures high rigidity of the material. When compressed ROXUL recovers to its full design depth.



Fibre structure of ROXUL mineral wool.



Fibre structure of glass mineral wool.

Other products with directional fibre structures may lose intended insulation value when compressed out of shape.

ROXUL's special fibre structure provides good transverse elasticity, allowing the material to fit tightly when installed.

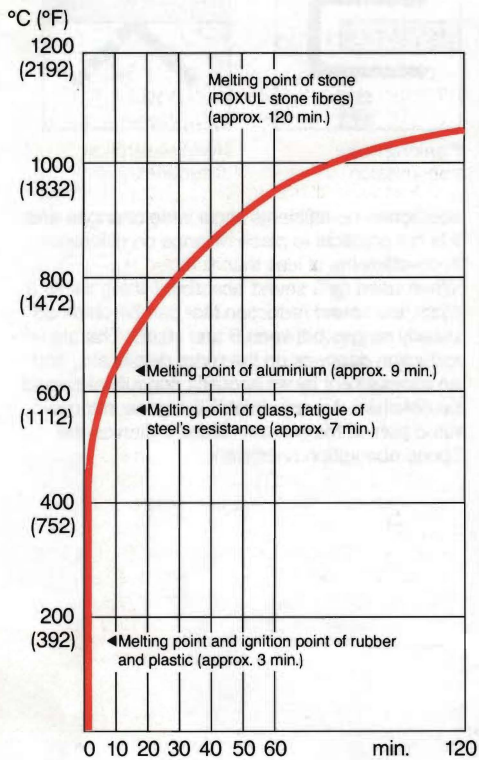
ROXUL mineral wool batts will not "curve up" because of excess width or slight inaccuracies of cutting, eliminating cold bridges which are generally difficult to see.

To facilitate handling and storage, the products are compressed in packages, but the structure of ROXUL fibres ensures recovery to full nominal thickness when unpacked and installed.

Fire insulation

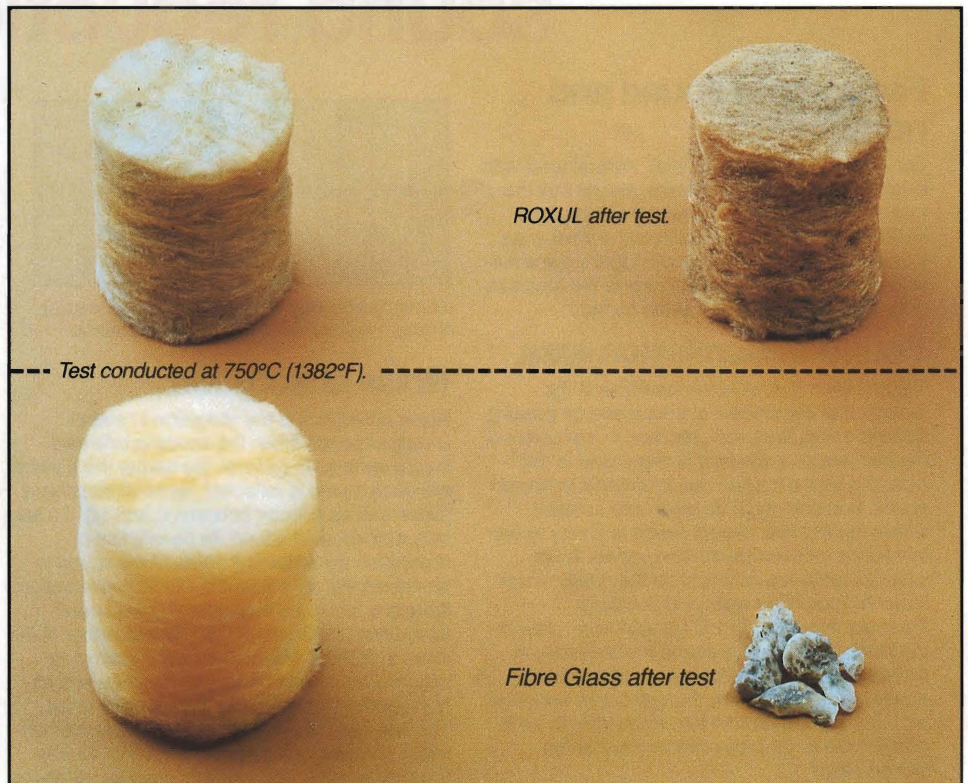
Important aspects of fire insulation.

Very few insulating materials have a high resistance to fire. ROXUL mineral wool does.



The fibres of ROXUL mineral wool are highly resistant to fire, because they can withstand temperatures exceeding 1000°C (1832°F) without melting. As the products are heated the resin binder evaporates; this only occurs in the hot outer layer at temperatures in excess of 250°C (482°F).

When the temperature rises above 250°C, the binder will evaporate in the zone which is exposed to 250°C or more.



Even without this binder the rock fibres remain intact protecting the rest of the material. This is a very important quality under fire conditions. ROXUL mineral wool therefore acts as a shield against fire when it is incorporated in the structural members of the building, provided that it is installed in such a way that mechanical stress will not alter its shape when the binder evaporates.

Non-combustibility.

An insulating material classified as "non-combustible" is not inevitably a material which is "highly fire resistant".

The test illustrated above clearly demonstrates

the difference between two insulating materials which are both classified as non-combustible: rock fibre mineral wool and fibre glass mineral wool.

Fire resistance.

A non-combustible insulating material with a high melting point is appropriate for fire-resisting and fire-retardant constructions:

- it will not contribute to the fire
- it will preserve its insulating ability under fire conditions
- it will not liberate offensive gases

The fire-resisting value of ROXUL mineral wool varies with its thickness.

Resistance to water and moisture

Water resistance.

It is well-known that moisture in an insulating material reduces the insulation value of the material.

Impregnated ROXUL mineral wool is a water-repellent yet porous material; nevertheless it absorbs water only when it is pressed or forced into the material. When the pressure is relieved, the water will evaporate, and the material will become dry again and restored to its original insulation value.

When tested, ROXUL mineral wool will absorb approximately 1.0 volume per cent moisture,

whereas fibre glass will absorb 10 - 30 volume percent moisture.

ROXUL mineral wool repels water due to the presence of water repellent additives. Moisture condensing from the air within ROXUL is less than 0.02% by volume at 95% relative humidity.

Vapour diffusion.

The open character of ROXUL mineral wool lends itself to diffusion. This means that water vapour can pass through the layer of insulation and cool without undergoing interstitial condensation.

Capillary suction.

The capillaries of insulating materials must be unable to draw up water into the bulk of the material. In the ROXUL mineral wool products the fibre coating together with their random orientation repels water and permits the use of the products as a barrier to water penetration.

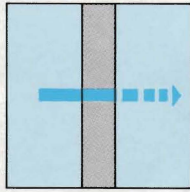
Acoustic control and sound reduction

Facts about sound and noise.

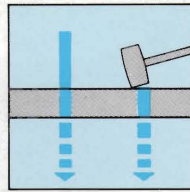
The fibrous structure of ROXUL mineral wool with its airfilled interconnected voids means that the material has good noise absorbing qualities. ROXUL mineral wool works in two distinct ways to reduce noise, either by impeding the transmission of sound through an element of the structure or by absorption of sound at the surface.

Sound transmission loss.

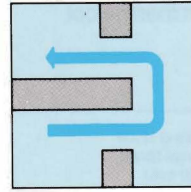
Transmission loss or noise insulation is the reduction of the amount of sound energy passing through a wall, floor, roof, etc., and is a property of the element as a whole. It is expressed in decibels (dB). Noise may be due to airborne or impact sound, and both must be taken into account where appropriate. Impact sound is a very important factor, for example in intermediate floors, while airborne sound would be the predominant factor in separating walls and partitions. Particular attention should be paid when designing elements to reduce sound transmission, to the ways in which sound may penetrate at the edges of the element, or through doors, windows, etc. This 'flanking sound transmission' can be a problem if it is not taken into account at the design stage.



Transmission loss through wall element



Airborne and impact noise transmission



Flanking noise transmission



Noise absorption at surfaces

Noise absorption.

Noise absorption is the reduction in sound energy obtained when the sound is reflected from a surface. In general, the harder the surface, the more sound is reflected. Noise absorption is expressed as a factor between 0 and 1.0. If a surface absorbed no sound, its co-efficient of absorption would be 0. If 100% of the sound is absorbed, the co-efficient is 1.0. 50% absorption, therefore, would be expressed by the sound absorption coefficient of 0.50. The structure of the fibres in ROXUL makes it an ideal product for use as a sound-absorber, with characteristically high coefficients over a wide frequency range. The test used is the reverberation room method which gives a good rating assessment. Due to room differences and inherent material variations,

absorption co-efficients show wide changes and it is not practical to place reliance on differences in co-efficients of less than 0.15.

When used as a sound absorbent lining within a room, the sound reduction that can be obtained usually ranges between 5 and 10 dB. The actual reduction depends on the room details etc., and an assessment by an acoustic consultant should be obtained. An appreciable airspace incorporated behind the acoustic slabs improves the sound absorption coefficient.

Other properties

HI-PERFORMANCE INSULATION

WORKING

ROXUL is light and easy to handle. It is easily cut to shape or size with a sharp knife.

CHEMICAL

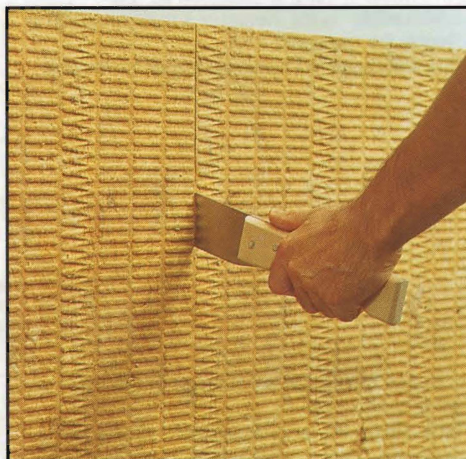
ROXUL material is chemically inert. An aqueous extract of the slabs is neutral (pH7) or slightly alkaline.

BIOLOGICAL

ROXUL does not encourage the growth of fungi, moulds or bacteria and does not rot or sustain vermin.

CORROSION

ROXUL products have a very low content of water leachable chloride, approximately 4 p.p.m. ROXUL insulation therefore will not promote corrosion and can safely be applied to austenitic stainless steel.



ROXUL INC. is a subsidiary of ROCKWOOL INTERNATIONAL the world's largest manufacturer of mineral wool products.