

Therma[®]roof



Protected membrane roofing insulation system

Superior insulation and weather protection



RMAX
Rigid Cellular Plastics

A division of Huntsman Chemical Company
Australia Pty. Limited ABN 48 004 146 338

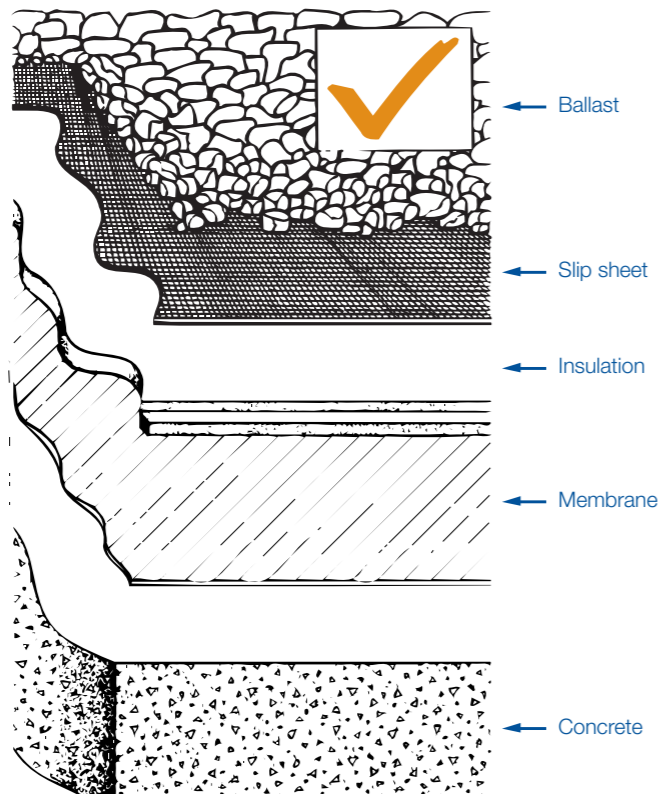
Introduction

RMAX Thermarroof® is a flame retarded expanded polystyrene (EPS) sheet roofing insulation system that offers superior environmental protection for concrete slab roofs.

Employed for over 40 years in the USA, Europe, Japan, the Middle East, Australia and New Zealand the Thermarroof® system insulates and protects roofs and roofing membranes from the effects of temperature cycling, UV radiation and mechanical stresses.

An investment in a Thermarroof® system can be an investment in years of trouble-free and water-tight roof performance.

Roof membranes are subject to daily temperature cycling that prematurely ages the membrane and affects its ability to repel water. High UV radiation environment provides added stress to the roof membranes. This causes them to become brittle and more susceptible to fracture. As a result mechanical damage can occur through accidental impact or roof traffic.



Reduction in heat loss & gain

By using Thermarroof®, the consequent reduction in heating and cooling loads on air-conditioning equipment produce capital savings on the equipment, in addition to savings on annual operating costs.

Potential problems “without” Thermarroof® protection

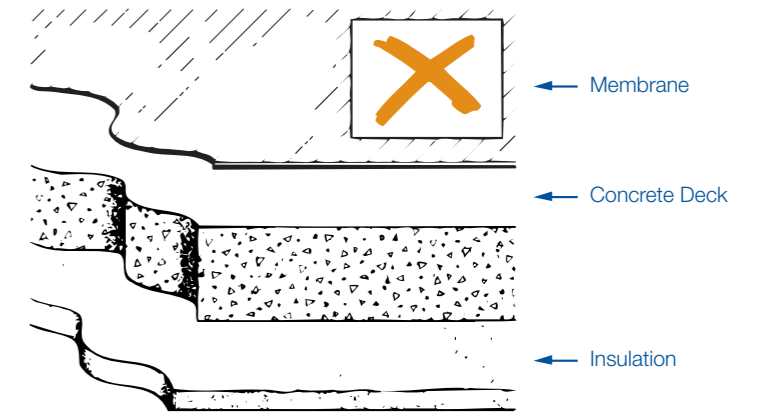
In these situations, a number of problems can occur:

- roof membranes are subject to daily temperature cycling, which prematurely ages the membrane and affects its ability to stop the penetration of water through to the concrete deck
- long term exposure of the roof membrane to Australia’s particularly strong UV radiation may cause the membrane to become brittle and be more susceptible to fracture resulting from the stresses of thermal cycling or from mechanical damage. Building movement, impact damage and roof traffic are all sources of mechanical stress which can contribute to the failure of the roofing membrane.

In Installation A where the roof membrane is a concrete roof’s only protection, then the roof itself is highly susceptible to damage.

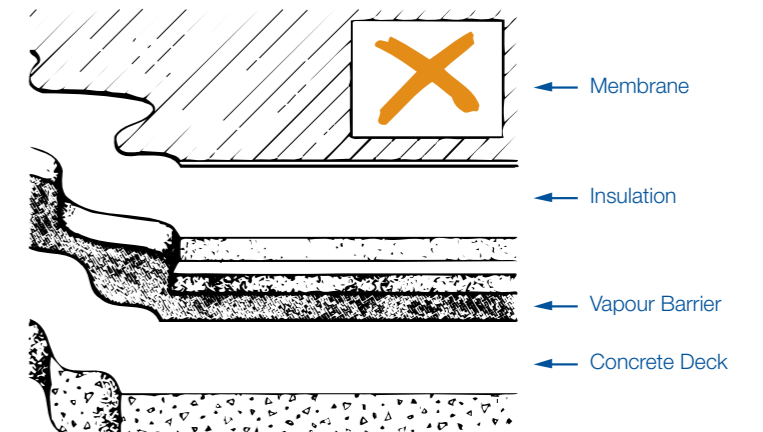
The roof is subject to thermal cycling, with constant expansion and contraction. This has the potential to cause significant structural damage.

With insulation below the roof slab, the concrete deck acts as a sink/heat radiator, with higher air-conditioning operating costs and greater air-conditioning capital expenses (due to the requirement for larger units), when the building is constructed.



Installation A

- in the Installation A, the roofing membrane is placed on the concrete deck with insulation below the deck.
- in the Installation B, insulation is first placed upon the roof deck, and the membrane is placed above.



Installation B

A larger number of control joints in the roof deck need to be built to facilitate expansion and contraction. As a consequence, a larger number of concrete pours also have to be made according to the number of control joints installed.

In Installation B, where the membrane is separated from the concrete deck by the insulation, the membrane is probably at greater risk, as it has been isolated from the buffering thermal mass of the concrete. In this circumstance the membrane has a wider daily temperature cycle than if no insulation had been used at all.



Thermarroof® system at work

The Thermarroof® system involves placing insulation above the roofing membrane rather than below it.

Once the roofing membrane is laid across the concrete roof deck the Thermarroof® EPS sheets are then laid over the membrane and with the aid of an effective shiplap joint designed into the sheet, are easily locked together.

The lightweight EPS sheets which make the Thermarroof® system, are quick and easy to install requiring minimal labour. Sheets can be cut to shape where necessary with a knife or hand saw thus ensuring a tight-fitting layer which covers the entire roof thus minimising heat loss.



The Thermarroof® system also offers superior drainage protection. The underside of each sheet incorporates a grid of small channels and positive location lugs providing a continuity of drainage channels sheet to sheet.

Once installed, ballast is required for several reasons - to hold the insulation in place and to prevent ultra violet degradation of the insulation, as well as providing a Class A fire resistant roof.

River stones are recommended. The stones should be smooth and range in size from 15mm to 35mm. As wind loadings are stronger at roof edges and parapets, ballast needs to be increased. In these same locations paving blocks may also be used as an alternative and they have the added advantage of providing a suitable surface to support roof maintenance traffic.

Thermarroof® is quick and easy to install

After adhering the membrane to the roof deck the Thermarroof® insulating panels (which measure 600mm x 1200mm) are laid over the membrane.

Once the panels are in place a slip sheet is then laid over them to prevent movement caused by water and to minimise the ingress of fines from the stone ballast.

The ballast is then applied over the surface of the roof to a depth suitable to allow for peak wind conditions.

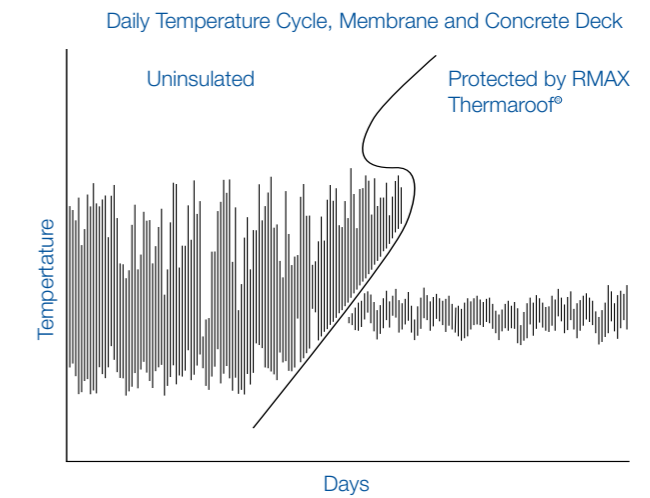
The RMAX Thermarroof® system is supplied in four grades of thermal resistance to suit all environmental conditions.

With Thermarroof® the structural roof slab is given significant protection from the effects of temperature cycling.

The application of R1.75 Thermarroof® can be expected to maintain deck temperatures in the range of 10°C to 30°C for most Australian applications. Daily temperature cycles are a quarter of the amplitude of non-insulated systems.

This reduction in the expansion and contraction of the base slab can lead to greater distances between the control joints, with consequently larger concrete pours and reduced costs.

It is also possible for reduced concrete thicknesses to be employed.



Thermarroof® why is it the best insulating system

Long term insulation value

The thermal resistance (R value) of Thermarroof® insulation is permanent because the cellular structure of Thermarroof® contains only stabilised air. Ageing has no effect on the performance of Thermarroof®.

Cost efficiency

Thermarroof® provides high R values per dollar and allows for very cost effective design.



Moisture resistance

The effect of moisture on an insulating material is only important in so far as that moisture adversely affects the physical and thermal properties of the insulation.

It is the change in physical and thermal properties that has to be measured, not the amount of water absorbed.

Thermarroof® has excellent resistance to moisture absorption in water. Moisture gain in Thermarroof® is either surface or interstitial due to Thermarroof®'s closed cell structure of hydrophobic polymer and its integrally moulded skin - thus moisture gain has limited effect on thermal resistance values. Thermarroof® also offers a high degree of dimensional stability in wet conditions.

Retained thermal resistance with moisture

For R1.25 H grade Thermarroof®, submersion tests to ASTM C-272 (30mm head of water) for 25 days produce a maximum uptake of 6% moisture vol/vol. Tests carried out by the Cold Regions Research and Engineering Laboratory of the U.S Army Corps of Engineers show a 90% retention of dry R value at a 6% vol/vol moisture content.

As R1.25 H grade is the thinnest Thermarroof® product on offer, performance figures from other Thermarroof® panels will be improved on those shown in this test.

Superior drainage

The 8mm x 4mm channels moulded as a grid pattern into the underside of the Thermarroof® panels allow easy drainage across the top of the membrane.

This unique product feature coupled with adequate roof design will prevent prolonged water/insulation contact.

Positive location lugs moulded into the ship-lap edges ensure continuity of the drainage channels board to board.

In extraordinary circumstance where water ponded to a height of 30mm above the insulation for periods in excess of 25 days, there would only be a possible 10% reduction of the insulation's R value.

Temperature cycling resistance

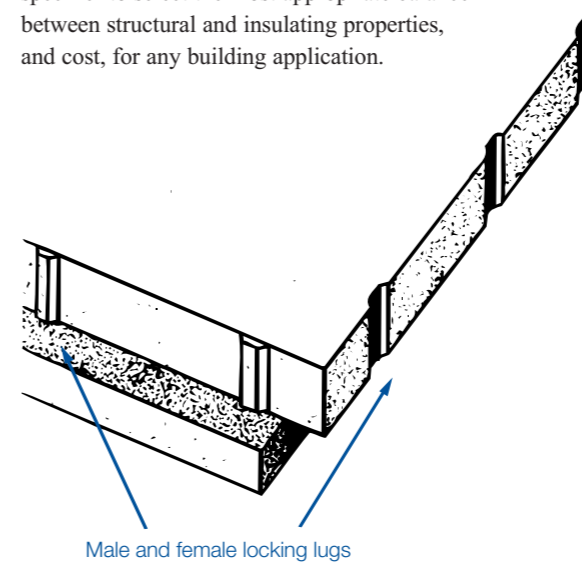
Thermarroof® is able to withstand the abuse of temperature cycling, assuring long term performance without loss of structural integrity or physical properties.

Strength characteristics

The correct grade of Thermarroof® can be selected by the designer to withstand the loads of ballast, foot traffic and equipment that will be on the roof.

Thermarroof® exhibits excellent compressive and flexural strength and dimensional stability characteristics at a high strength to weight ratio.

The range of classes available enables the specifier to select the most appropriate balance between structural and insulating properties, and cost, for any building application.



Breatheability

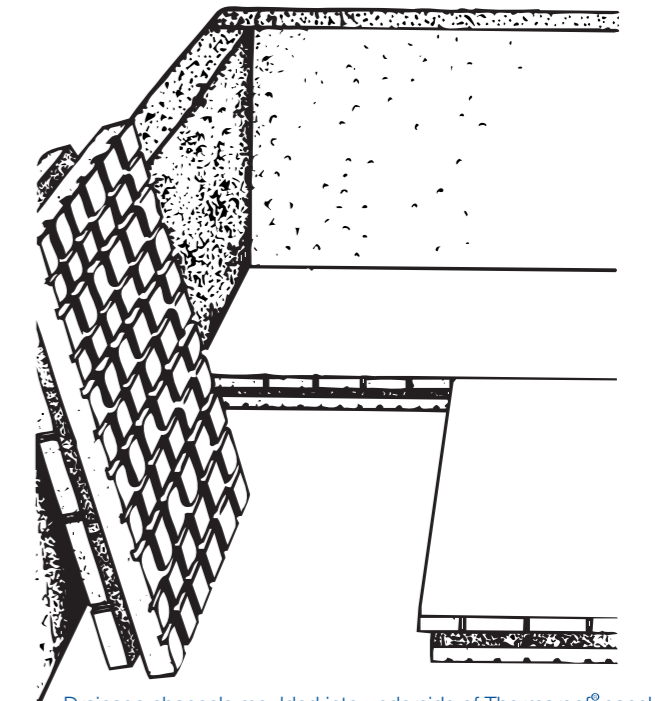
Although Thermarroof® has a low water vapour transmission, it is not a vapour barrier; instead it "breathes". Because it does not trap moisture, Thermarroof® does not need costly venting as do certain other relatively impermeable insulation materials.

Performance

Thermarroof® insulation, being made from expanded polystyrene (EPS), is an inert, organic material. It provides no nutritive value to plants, animals or micro organisms. It will not rot and is highly resistant to mildew.

Fabrication and installation ease

Thermarroof® insulation can be installed quickly and easily, requiring limited labour. It can be cut to shape with knife or saw to assure a tight fit and eliminate heat loss channels. Its light weight allows ease in handling and storage.



Thermarroof® range and properties

Thermarroof® is available in four grades of thermal resistance. Each grade offers two classes of compressive strength and associated physical properties

R value R 1.25 Approx thickness	42mm
R value R 1.5 Approx thickness	51mm
R value R 1.75 Approx thickness	59mm
R value R 2.00 Approx thickness	67mm
All available in Class H or Class X	

Additional information

Flame resistance. Like many construction materials, Thermarroof® must be considered combustible and constitutes a fire hazard if improperly used or installed. The material contains a flame retardant additive to inhibit accidental ignition from small fire sources.

Solvent attack. Thermarroof® is subject to attack by petroleum based solvents and coal tar products. Care should be taken to prevent contact between Thermarroof® and these materials and their vapours.

Membrane compatibility. Membrane compatibility with RMAX Thermarroof® should always be checked. Some membranes contain components or solvents which may attack the insulation. When a PVC membrane is used, a slip sheet is required to eliminate the migration of the PVC plasticizer out of the membrane into the EPS. Acrylic paint on the EPS may replace the slip sheet.

Ultra violet degradation. Prolonged exposure to sunlight will cause a slight discolouration and surface dusting of Thermarroof® insulation, although the insulating properties will not be significantly affected unless exposure is so excessive that thickness is lost. Thermarroof® should be covered to prevent ultra violet degradation if it is to be stored in the open for extended periods.

Temperature resistance. Thermarroof® will be affected by high temperatures, and contact with high temperature equipment or processes must be avoided. Maximum long-term service temperature is 80°C.

CFC free. As with all RMAX polystyrene products, Thermarroof® does not contain CFC's. Material safety data sheet. Adchem material safety data sheet is available for Thermarroof® MSDS No.19507

Physical properties of Thermarroof® expanded polystyrene

Physical Property	Unit	Class		Test Method
		H	X	
Compressive strength min. at 10% deformation	kpa	135	210	AS 2498 method 3
Cross breaking strength min.	kpa	260	405	AS 2498 method 4
Rate of water vapour transmission; max: (measured parallel to rise 23°C)	µg/m².s	460	365	AS 2498 method 5
Thermal conductivity; max: (at a mean temperature of 25°C)	W/mK	.033	.033	AS 2464 method 6
Capillarity		none	none	
Water absorption % by volume 7 days 50mm immersion		3%	3%	AS TM C272
Maximum service temperature	°C	80	80	
Early fire hazard properties tested as AS 1530 Part 3	Ignitibility Index (0-20)		12	
	Speed of Flame Index (0-10)		0	
	Heat evolved Index (0-10)		3	
	Smoke Developed Index (0-10)		5	

Thermarroof® installation

Insulation

After adhering the membrane to the roof deck, RMAX Thermarroof® four sided ship lapped insulating panels are laid in one of the four R grade levels in either class of material.

Slip sheet

A water permeable, ultra violet light and weather resistant material is required to prevent movement of the insulation by water and to minimise the ingress of fines from the stone ballast.

Ballast

River stones are recommend as a suitable ballast to hold the insulation in place against the forces of wind and water, to prevent ultra violet degradation of the insulation and to provide a Class A fire resistant roof cover.

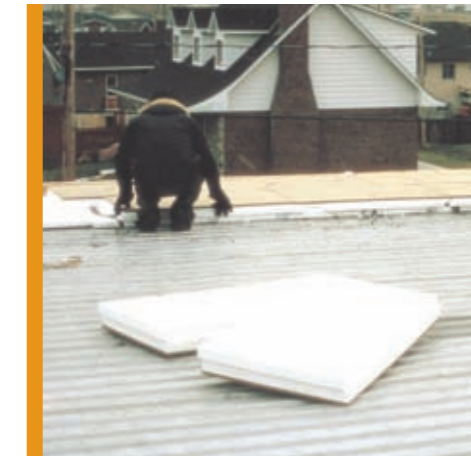
The stones should be smooth, free from grit and dirt, and in the size range 15mm to 35mm. Most stones should be 20mm to 30mm size.

Ballast weight

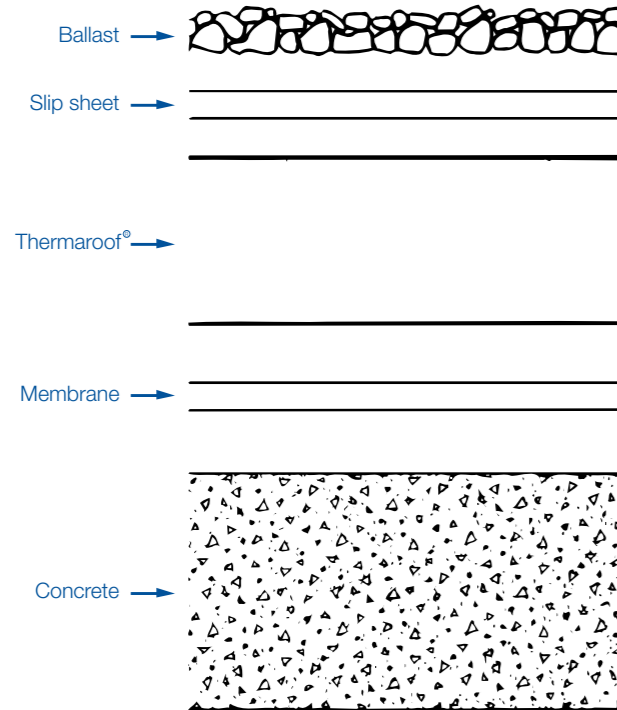
Ballast is required to secure the insulation system from wind and potential buoyancy loadings. As wind loadings are stronger at edges and parapets, perimeter ballast is increased.

RMAX Thermarroof® Grade	Across Roof Space	For 1200mm Width at Perimeter
R 1.25	60 kg/m2	60 kg/m2
R 1.5	60 kg/m2	65 kg/m2
R 1.75	60 kg/m2	70 kg/m2
R 2.00	65 kg/m2	75 kg/m2

As an alternative paving blocks may be used around the perimeter. They are also suitable for roof maintenance traffic.



Sample specification



Insulation

Insulation shall be individually moulded boards of expanded polystyrene brand named Thermarroof® as manufactured by RMAX.

The boards shall be 600mm x 1200mm with a shiplap on all four edges and drainage channels integrally moulded into the underside. Positive location lugs will ensure the continuity of the drainage channels board to board.

- R value shall be 1.25/1.5/1.75/2.00
- Class shall be H/X
- Compression strength at 10% deformation shall be 135/210 kPa

How RMAX is expanding your future



EPS shape moulded products

These include Voidforms®, packaging for aquaculture, produce, white goods and other manufactured articles. Automotive and other engineered components, drop test approved packaging for the computer industry, and bicycle helmets are just a small cross-section of the shape moulding range.



The manufacturing process of EPS

Expandable polystyrene (EPS) is supplied as plastic beads in which an expanding agent, usually pentane, has been dissolved. In the presence of steam the thermoplastic polystyrene softens and the increasing vapour pressure of the expanding agent causes the beads to expand up to 50 times their original volume. During this stage the degree of expansion is controlled to achieve the desired density.

Isolite® block products

Manufactured primarily for the building industry and used in coolrooms, lightweight panels, voids, building facades, wall, roof and floor insulation. It is also used in architectural design projects, marinas, pipe insulation, road construction and many other customer specified requirements.

Recycling

RMAX EPS can be recycled. Recycled EPS can be granulated for use in e.g: construction applications or further processed to make a range of plastic products in everyday use. RMAX is a member of PACIA (Plastics and Chemicals Industries Association) playing a major role in the industry through the EPS Division and REPSA (Recycling Expanded Polystyrene Australia).

Expanded polystyrene does not contain any ozone depleting substances and none is used in its manufacture.

RMAX pursues a policy of continuous improvement in the design and performance of its products. The right is therefore reserved to vary specifications without notice.

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