pro clima®

In Depth

pro clima technical articles

What is TEEE?

Australia & New Zealand

Thermoplastic Elastomer Ether Esters: What are they, how do they work?

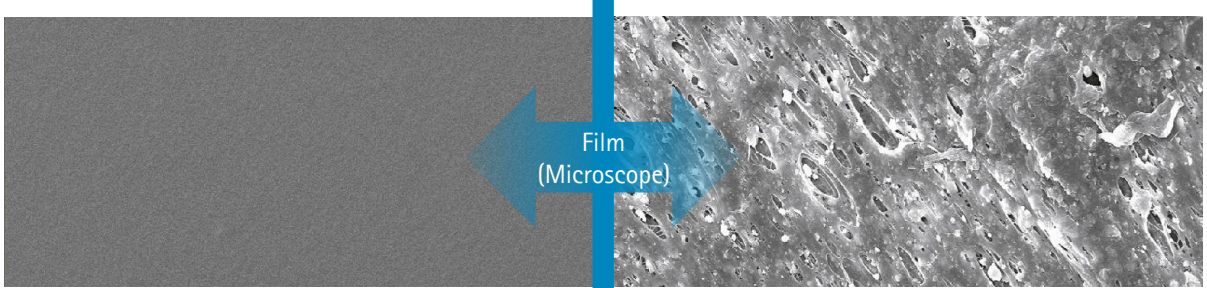
Exterior membranes for roofs and walls by pro clima incorporate a monolithic Thermoplastic Elastomer Ether Ester (TEEE) film. The TEEE forms a state-of-the-art Weather Resistive Barrier (WRB) and when combined with TESCON EXTORA® forms the SOLITEX system. The membrane, unlike conventional vapour permeable membranes, has no pores and is completely waterproof and wind/airtight. The membrane actively transports water vapour through molecular diffusion across the thickness of the TEEE film – an engineered property of this functional film.

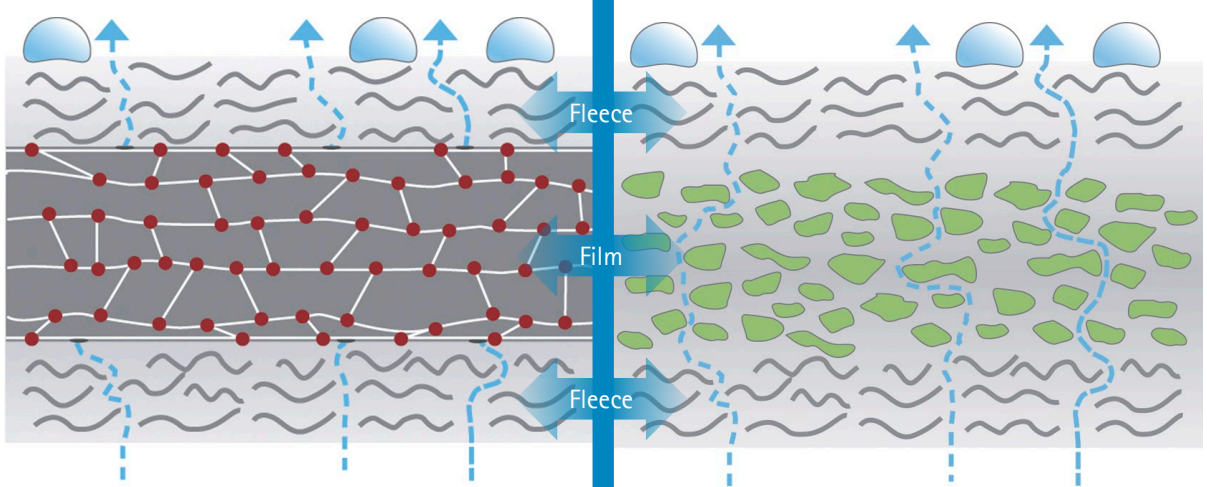
Non-porous membrane

SOLITEX range has the non-porous TEEE molecular diffuse film (bottom) and microscopic image of TEEE membrane (top)

Micro-porous membrane

Conventional WRB with micro-porous film (convection driven) and microscopic image of micro-porous membrane (top)





Vapour diffusion

Vapour convection

Aren't all vapour permeable membranes the same?

If vapour/water is present on the surface of the membrane, even the slightest differential in vapour pressure across the membrane (inside to outside) will promote vapour movement from one side to the other and dry out the moisture. Consequently, the membrane is very vapour open (0.4 MNs/g, 2.5 µg/Ns) in every condition. Conventional vapour permeable sarking membranes and underlays depend on creating a micro-porosity in a normally vapor closed material (PE or PP). In the production process these materials are made vapor open by either spun bonding them into a PE mesh, puncturing the PP or stretching the PP with calcium carbonate $CaCO_3$ additives in production. These micro-pores then allow gaseous water vapor molecules to be moved through the water-resistant layer by convection (leaking through the micro-pores).

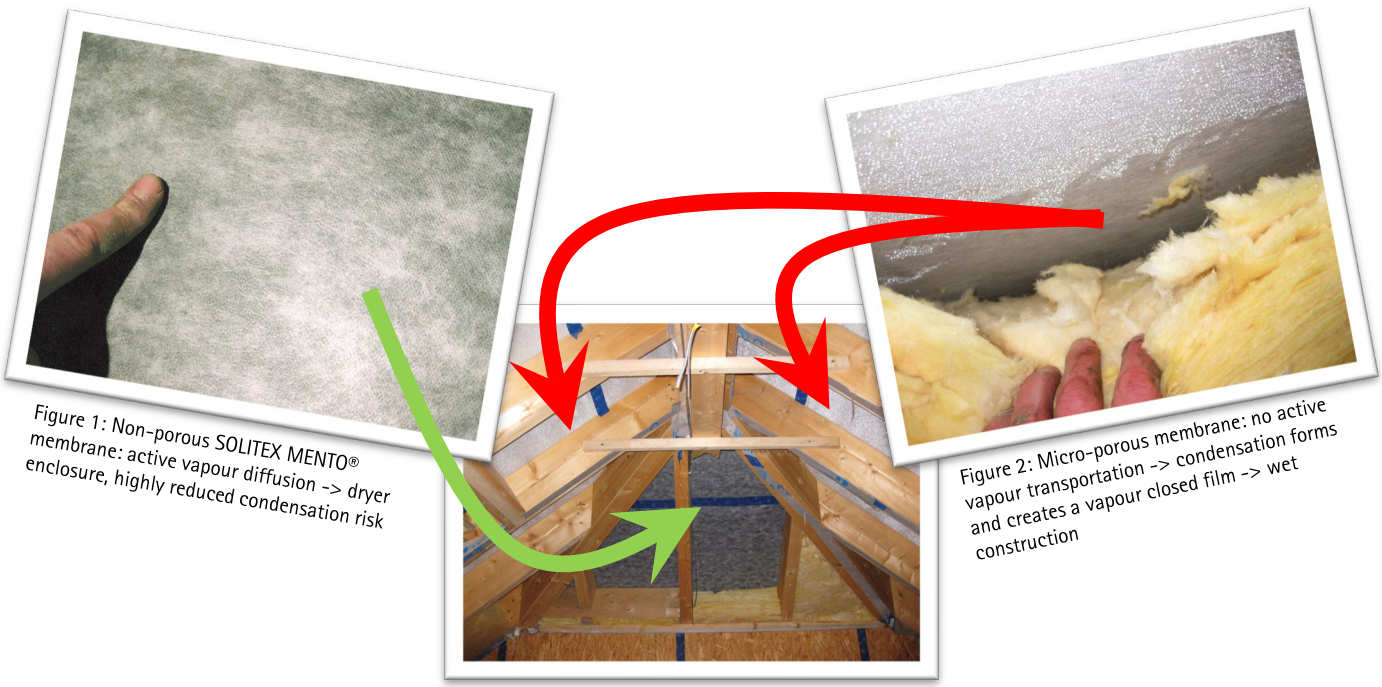


Figure 1: Non-porous SOLITEX MENTO® membrane: active vapour diffusion -> dryer enclosure, highly reduced condensation risk

Figure 2: Micro-porous membrane: no active vapour transportation -> condensation forms and creates a vapour closed film -> wet construction

Figure 3: One roof, similar exposure, dramatically different results: non-porous SOLTEX MENTO® membrane straight ahead, on left/right faces a micro-porous membrane.

By being porous, perforated or stretched, these materials are not 100% airtight. They are therefore vapour open because air and water-vapour molecules, driven by convection, leak through the micro-pores. Since the pores are quite small - nanometre scale - a relatively high vapor pressure differential is required for vapor to actually dry outwards through the pores. This is true even if the actual vapour permeance (per ASTM E96B) is high, which could be the case because the pores are big or perforated. If you can easily blow through the membrane when placing it over your mouth, the pores are probably large - very vapor open, and not very airtight, and possibly not even watertight under driving rain conditions.

Through active vapour diffusion, pro clima SOLITEX MENTO® membrane remains dry (Figure 1). In the same roof, the microporous membrane causes condensation to form, because passive vapour openness is not sufficient for outward drying (Figure 2).

The example above shows that actively vapour open SOLITEX MENTO® membranes remain dry even when large amounts of humidity enter a roof enclosure with compromised interior airtightness. However, the conventional passively vapour open membrane in the same building is showing condensation - because water vapor wasn't transported fast enough, causing a layer of condensate to build up. It looks like the membrane leaks, but the moisture is actually just interior humidity.

How is a vapour permeable membrane waterproof?

A micro-porous or perforated membrane is "waterproof" because the surface tension in liquid water holds the drops together and prevents water beads from passing through the membrane. But if that tension is broken by surfactants such as oils, wood preservatives, wood tannins, soap or contaminants, the waterproofing becomes compromised.

By contrast, the monolithic film in the pro clima SOLITEX product range is completely waterproof. In the lab tests depicted below, to the left you can see the effect of applying oil to membranes before testing the water column (DIN EN 20811) of each membrane (Figure 4 & 6). The conventional membrane leaks at low water pressures (Figure 5), while SOLITEX MENTO® membrane stays dry at a much higher column (notice the difference in bulge in Figure 7). This demonstrates that the waterproof qualities of the TEEE work even when exposed to surfactants such as oil.

SOLITEX range uses a monolithic membrane and is waterproof (DIN EN 20811) up to lab test limitation of 10 meters head of water. Half of each membrane sample is coated with oil without any effect on waterproofness as seen in Figure 7. Surfactant contamination on construction sites will have no effect on the water resistance of SOLITEX products.

Micro-porous membrane

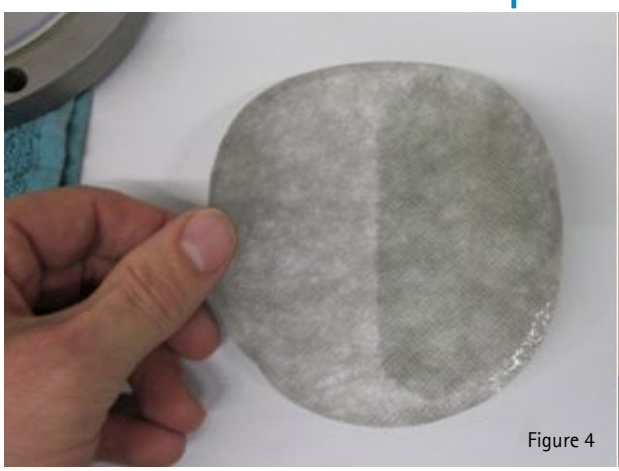


Figure 4

Figure 5

Lab test water column (DIN EN 20811) on conventional WRB. The right half was treated with oil, rendering it leaky. The Australian and New Zealand building codes use a similar test method (AS 4201.4) which requires significantly lower test pressures (0.1m vs EN > 1m) and over different time cycles (24 hours vs EN 2 hours).

Non-porous membrane


Figure 6

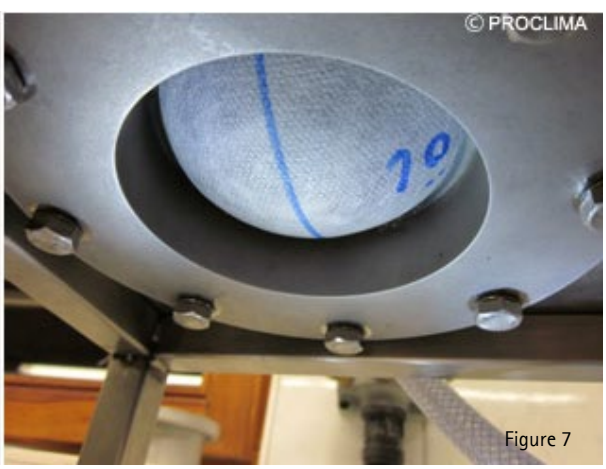


Figure 7

SOLITEX range uses a monolithic membrane and is waterproof (DIN EN 20811) up to lab test limitation of 10 meters head of water. Right side is coated with oil without effect on waterproofness.

Preventing wind washing

The pro clima SOLITEX range with a monolithic membrane is also absolutely wind & airtight. ASTM E2173 test result show that the material is so airtight that it exceeds the capabilities of the lab calibration - and goes above and beyond the Air Barrier Association of America (ABAA) requirements and certainly well above the thresholds specified in AS/NZS 4200.1 or NZS 2295 measured using ISO 5636-5 (AUS) & BS 6538.3 (NZ).

The pro clima WRB roof & wall systems offer the ultimate protection against wind-washing of insulation when taped with TESCON tapes and following the other instructions found on SOLITEX MENTO® and SOLITEX EXTASANA® product webpages.

pro clima full scale weather testing in NATA and IANZ accredited laboratories has demonstrated world class weather tightness with the SOLITEX EXTASANA® flexible membrane system and rainscreen cladding.

Three layers – each with its own function

All pro clima WRB membrane systems are multi-layered products, with each layer having specific properties to assure the product offers first class performance during installation and the life of the building. The top layer serves as a protective cover made with a PP microfiber fleece. This offers the external exposure resistance needed for both roofs and walls.

When SOLITEX MENTO® is used as a roof underlay, the top layer offers slip resistance, while also protecting the TEEE layer below.

The TEEE functional layer is located in the middle of each product, providing active vapour permeability and waterproofing properties of the material. The SOLITEX product range allows exposure prior to cladding of:

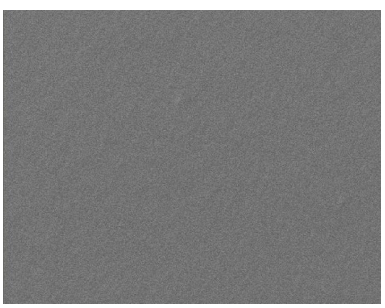
- **MENTO® 1000:** 30 days
- **MENTO® 3000:** 90 days
- **MENTO® 5000:** 180 days
- **MENTO® PLUS:** 180 days
- **MENTO® ULTRA:** 180 days
- **EXTASANA® (NZ):** 180 days
- **EXTASANA® (AUS):** 180 days
- **EXTASANA ADHERO® (NZ):** 180 days
- **EXTASANA ADHERO® (AUS):** 180 days

SOLITEX MENTO® 1000 & 3000 available in NZ.
SOLITEX MENTO® 5000, PLUS & ULTRA available in AUS.

With up to 180 days UV exposure prior to cladding and more than 100°C continuous operating temperature SOLITEX products are built to last in the harshest summer conditions.

Showing the 3 layer build up of SOLITEX MENTO® (via BLDGTYP.com)

The **top fleece** protects the TEEE film from direct UV exposure during installation. Polymers are engineered for enhanced UV tolerance. Heavier duty fleeces provide more protection and allow for longer UV exposure prior to cladding.



TEEE: Thermoplastic Elastomer Ethyl Ester – is a material that combines the flexibility of rubber with the strength of a membrane, resisting tears, abrasion and corrosion. It also has good resistance to surfactants.

The **bottom microfiber fleece** protects the TEEE layer above from damage during construction.

The TEEE functional layer also has the added benefit that it holds the product together, acting as a bonding agent. Applied in a high temperature process, it eliminates any need for hot melt adhesives giving SOLITEX MENTO® and SOLITEX EXTASANA® ultimate temperature resistance behind hot cladding materials.

SOLITEX products without reinforcement scrim have shown no heat shrinkage up to 100°C in accordance with Australian and New Zealand Standard AS/NZS 4200.1. This elevated test temperature is 30°C above the requirement.

The heat shrinkage @ 70°C in accordance with AS 4200.1 and ADTM D 1204:

- **SOLITEX MENTO® 1000, 3000, 5000, ULTRA:** 0.0% shrinkage
- **SOLITEX MENTO® PLUS:** 0.4% shrinkage
- **SOLITEX EXTASANA®:** 0.0% shrinkage
- **SOLITEX EXTASANA ADHERO®:** 0.0% shrinkage

Adapted from an article published on: https://foursevenfive.com/blog/the-pro-clima-solitex-mento-difference/

Pro Clima New Zealand Ltd
PO Box 925
Wellington

welcome@proclima.co.nz
0800 PRO CLIMA (776 254)
www.proclima.co.nz

Pro Clima Australia Pty Ltd
PO Box 924
Gosford, NSW 2250

welcome@proclima.com.au
1800 PRO CLIMA (776 254)
www.proclima.com.au