

## TECHNICAL BULLETIN

# NOT ALL WATERPROOF MEMBRANES ARE MADE THE SAME

### INTRODUCTION & SCOPE

A question frequently posed is, what ceramic tile adhesive or smoothing cement (in certain special applications) can we use over the waterproof membrane? The answer to this question lies partly in the type of membrane, and partly in the adhesive characteristics. There are a number of different types of membranes which have very different chemical and physical properties, and as a result, tile adhesives have varying performance on these materials.

In this advice we will have a general overview of membrane types and general recommendations for tile adhesives.

### ACRYLIC MEMBRANES

These membranes are the most common type and are water based. The polymer base is a modified acrylic material and can be one or two part. One part materials are premixed and applied direct from the container. For two part systems, the liquid part normally contains the polymer dispersion and the powder contains cement and other additives. These membranes are flexible, have low odour and are water clean up.

The Dunlop range has two membranes in this category, Dunlop Undertile Waterproofing and Dunlop Express Waterproofing.

These membranes are normally compatible with tile adhesives based on cement, which dry by hydration of the cement. The use of premixed adhesives which dry by evaporation is not recommended since the water cannot escape, especially where non porous tiles are used. The adhesive remains soft and tiles may come loose.

### POLYURETHANE MEMBRANES

#### TYPES

There are three basic types of polyurethane membranes and these can be rigid or elastomeric (flexible). The rigid types are not normally encountered in tiling situations and the elastomeric variety is the one we shall look at further.

Polyurethanes are a reaction polymer system where a highly reactive organic molecule based on the isocyanate group reacts to form a continuous cross linked membrane.

The original type of polyurethane is the two pack system which relies upon the reaction of the isocyanate with a polyol. These materials are packed separately after dispersion in flammable solvents such as Xylene or alcohols. The materials are mixed and then applied to the surface to form the membrane.

The second type of polyurethane is a one pack system called moisture cure, and these membranes rely on the reaction of the isocyanate with moisture in the atmosphere. This type is also solvent borne and is not recommended for tiling over.

The two pack and moisture cure polyurethanes can be either aromatic or aliphatic and this describes the shape of the polymer molecules. These polymer shapes can also alter the membrane properties, and aliphatic membranes tend to be more U.V. resistant.

The third type of 'polyurethane' is a water based system where pre-reacted polyurethane polymer is suspended in water and is typically added to an acrylic based emulsion. Dunlop Express Waterproofing belongs to this class of membrane.

### PROPERTIES

#### *Two pack and Moisture Cure*

Polyurethanes are noted for their chemical resistance and inertness. The surface of the two pack and moisture cure membranes are typically very smooth, and very inert. This means that adhesion by normal tile adhesives are problematic, since the adhesive cannot easily form a mechanical bond, and does not form any sort of chemical bond.

Depending on the formulation, testing by Ardex has shown that whilst an initial bond can be formed to these membranes, the tensile bonds achieved by the adhesive (pull off strength) is often a marginal pass in terms of compliance with the Australian Standard. This testing gives an indication of performance for the system when new, and so the long term performance cannot be guaranteed. Dunlop has also found that were the membrane has been sand blinded, in an attempt to provide an adhesive key, the adhesive may in fact pull the sand out of the flexible surface thus negating the purpose of the sand.

Dunlop does not recommend the use of its adhesives over other two pack and moisture cure polyurethanes, and users of these membranes are advised to consult the manufacturer for their recommendations.

#### *Water based dispersions*

The water borne polyurethanes retain the good performance of the type in general, but provide a surface which is compatible with cement based tile adhesives. Dunlop has however observed some compatibility issues in terms of bonding, with third party water based polyurethane membranes. Depending on the formulation, the han-

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ding and application is typically similar to the acrylic membranes.

### EPOXY MEMBRANES

#### TYPES

The epoxy membranes fall into three general types, 100% solids pure epoxies, water dispersed epoxy and flexible epoxies. These are all two part systems that rely on the reaction between epoxide resins and a reactive hardener such as an amine, and form a thermosetting polymer.

The 100% solids resins are not commonly used, but water based epoxies are quite common and a number of flexible systems are available. These membranes have good chemical resistance, and are quite inert when cured. The non-flexible membranes are very rigid after full curing and require special bond breaker systems according to AS3740-2010 clause 3.13.7.

#### PROPERTIES

##### *Water based emulsions*

The water based types are used for stopping rising damp in masonry, pool or pond liner membrane bases and sealing early age screeds. These types are compatible with cement based adhesives, though it is best to tile on them within a few days of installation as the polymer continues to cure and develops a hard surface after around 7 days.

##### *Flexible epoxies*

These are solvent less two part systems which when cured are not rigid. The bond of adhesives onto these types varies.

##### *100% Solids Solvent Free*

These are not commonly used as membranes, are chemically inert, and tend to dry with shiny hard surfaces. Adhesion is dependent on abrading the surface to a rough finish which may compromise the membrane qualities, or broadcasting sand

onto the surface when still sticky to provide a bond surface. Ardex does not recommend application of its adhesives over this type of membrane. In some circumstances smoothing cements can be applied over sand blinded epoxies of this type.

### POLYESTER MEMBRANES

These membranes are a rigid type using polyester resin and fibreglass mesh as the reinforcement. The polyester is a two part system based on a resin formed from an acid anhydride and a polyol, dissolved in styrene (which gives it the distinctive smell), and with a peroxide catalyst to cause the resin to harden. This is the same resin used for fibreglass pools and car parts.

Polyester forms a hard and impermeable surface which is fairly chemically inert, and can be difficult to get an adequate mechanical bond to. It may be necessary to roughen the surface to achieve a bond, but in the process this can compromise the membrane. Due to these issues Dunlop does not recommend the direct application of tile adhesives to these membranes.

### BITUMINOUS MEMBRANES

There are a number of varieties of these membranes based on bituminous fractions, including modified membranes such as SBS or APP Modified Sheet, PU Modified Liquid Applied and Acrylic Modified Liquid Applied. They are commonly used on the roofs of commercial and institutional buildings, but also apartment blocks, and around foundations, planter boxes and retaining walls

Dunlop does not recommend the application of its tile adhesives over these membranes.

Issues with these membranes can include the bleeding of light hydrocarbon fractions

over time resulting discolouration of grouts and possible degradation of the adhesives.

### SYNTHETIC RUBBER SHEET MEMBRANES

There are a number of synthetic rubber membranes available which have been used in wet areas, but predominantly these membranes are used externally on verandahs, decks and roofs. They are fabricated from EPDM or SBR and are very durable and inert.

DUNLOP BUTYNOL sheet membrane falls into this class of membranes. Normally these rubber surfaces have limited adhesion capability to carry tile adhesives and DUNLOP **only** recommends the use of DUNLOP TILE ALL when tiling is being considered on BUTYNOL. Contact Dunlop on the technical hotline for more details.

### POLYOLEFINS

A new type of sheet membrane based on polyolefin sheeting has been introduced to the Australian market. This product is intended mainly for roofing applications. The surface of this material is not suitable for bonding of tiles and the best approach is to apply a self supporting screed and tile onto these sheet membranes if required.

### CONCLUSIONS

For tiling applications over acrylic and water borne polyurethane or epoxy membranes such as

The choice of adhesive then depends on the substrate type, kind of tile, wall or floor installation, and internal or external situation. As noted on page 1, premixed adhesives are not recommended on membranes due to extended drying times.

For the other kinds of membranes, the following options are possible solutions –  
Remove the membrane and use one

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compatible with the tile adhesives.

Place a self supporting sand cement screed over the membrane and tile over that instead.

**Always remember, Dunlop membranes and tile adhesives are tested to work together as a system. Where a non Dunlop membrane is in place, regardless of type, Dunlop cannot guarantee the performance of its adhesives over that membrane, except where specifically tested by Dunlop and found to conform to the relevant Australian Standard, and Dunlop's performance criteria.**

Always refer to the product data sheets for specific usage details.

The information contained herein is to the best of our knowledge true and accurate.

No warranty is implied or given as to its completeness or accuracy in describing the performance or suitability of the product application.

Users are asked to check that the literature in their possession is the latest issue.

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### GLOSSARY

**Acrylic**—Acrylic resins are a group of related thermoplastic or thermosetting plastic substances derived from acrylic acid, methacrylic acid or other related compounds. When used in membranes these polymers are used as water borne emulsions.

**APP Modified Sheet**—Atatic Polypropylene modified sheet is a type of bituminous sheet membrane. Atatic means that the polymer molecule has random attachments along its chain. Dunlop's parent company Ardex Australia supplies a number of these products, for example Ardex WM180, 185 and 186.

**Bituminous**—This is a black petroleum tar material which has been refined and blended with other polymer materials to be formable into waterproofing sheets. Bitumen can 'bleed' some components in warm weather leading brownish stains appearing, typically on grout lines.

**Emulsion**—An emulsion is a mixture of two or more liquids that are normally immiscible (unmixable or unblendable), and is made either by special chemical stabilisers or high speed mixing.

**EPDM**—Ethylene Propylene Diene monomer (M-class) rubber, is a type of synthetic rubber, not natural latex rubber from Rubber Trees.

**Liquid applied**—The membrane is supplied as a thick liquid or paste and brushed, rolled or sprayed on.

**One pack**— A single component product.

**Polyolefin**— A type of plastic sheeting made from polymers such as polyethylene or polypropylene. Dunlop's parent company Ardex Australia supplies one of these products—Ardex WPM615 (TPO).

**Premixed adhesives**— these are supplied as a paste in a bucket. The adhesive is

scooped out and applied with a notch trowel. These are called D class or Dispersion adhesives.

**Reaction polymer**—Two component resins where the components chemically react to form the final hardened resin.

**SBR**—Styrene Butadiene Rubber which is a type of synthetic rubber, not natural latex rubber from Rubber Trees.

**SBS Modified Sheet**—Styrene Butadiene Styrene Modified Sheet is a type of bituminous sheet membrane. It contains SBS polymer to alter the bitumen properties.

**Sheet membrane**—The membrane is supplied in rolled sheets and is either glued or heat welded to the surface to be waterproofed.

**Solvent**—A liquid used to dissolve a solid substance. Can be water or an organic liquid such as 'paint thinners'.

**Solvent free**—The polymer liquid contains no or very little solvent in the composition. Also called '100% solids' resins which is a misnomer as they are not solid, but means the polymer is effectively entirely the reactive resins.

**Thermosetting polymer**—A thermosetting polymer (or plastic), also known as a thermoset, is a pre-polymer material that cures irreversibly. The cure may be induced by heat, generally above 200 °C (392 °F), through a chemical reaction, or suitable irradiation. Once hardened a thermoset resin cannot be reheated and melted to be shaped differently.

**Two pack**—The product is supplied in two parts and mixed.

**Xylene**—Also called Xylol is an organic solvent which is flammable and has a penetrating smell. Correct name is Dimethyl Benzene CAS 1330-20-7.

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