

# Membranes

**Purpose:** This document is intended to identify and define the different membranes that can be associated or incorporated into a ceramic tile installation.

## Types of Membranes:

### Cleavage Membranes:

Cleavage membranes are incorporated into a ceramic tile installation when the backing surface can be damaged by water, is not continuous, is cracked or is dimensionally unstable. The cleavage membrane is designed to separate the backing surface from the mortar setting bed and tile allowing the setting bed to be unbonded and free floating; thereby not subject to the instability of the backing surface. When a cleavage membrane is incorporated, the setting bed is required to be reinforced with lath.

Cleavage membranes can be roofing felt, reinforced asphalt paper, polyethylene sheeting, chlorinated polyethylene sheeting, polyvinyl chloride membrane or high solids, cold liquid applied membrane. ANSI A-2.1.8 shows the specific requirements for these various materials.

### Crack Isolation Membranes:

Crack isolation membranes for thin-set ceramic tile and dimension stone installations act to isolate the tile or stone from minor, in-plane substrate cracking. These membranes may be bonded to a variety of substrates approved by the manufacturer. They may be applied only in the vicinity of existing cracks or throughout the installation to protect the installation from existing cracks as well as any future cracks that may develop. The contractor should check with the manufacturer to determine the limitations of crack movement the specific material will tolerate. There are two basic types of crack isolation membranes; sheet applied and trowel or liquid applied.

**Sheet Applied Membranes** are usually provided in rolls consisting of a flexible material with some amount of elasticity which allows the material to elongate while remaining bonded to the substrate. Some of these sheet applied membranes have reinforcing fabrics adhered to the surface of the membrane to enhance the tensile strength of the material as well as provide a better bonding surface for thin-set mortars.

**Liquid Applied Membranes** may be single or multi component membranes applied in a liquid or paste form. Some are trowel applied; some may be applied with a paint roller or even spray applied. Some liquid applied membranes require embedding a polyester fabric into the membrane to increase tensile strength. These membranes cure into a continuous crack isolation membrane which allows direct bonding of ceramic tile, usually with latex Portland cement mortar. Some liquid applied crack isolation membranes can be used as the setting material for the tile creating a single step operation.

ANSI Specifications governing Crack Isolation Membranes are currently under development and should be in print in 2004.

### Waterproof Membranes:

Waterproof membranes for thin-set ceramic tile and dimension stone installations function as barriers to positive liquid water migration. In architectural circles, when a membrane is subjected to a perm rating test, it is considered to be waterproof if it results in a perm rating of 1 or less. Waterproof membranes are not considered vapor barriers. They will stop liquid water penetration from entering the substrate. However, most waterproof membranes do allow some penetration of moisture vapor through the membrane. In addition to built-up membranes, non-metallic, lead or copper waterproofing, normally applied by the plumbing trade, there are also waterproof membranes available for use in both thick-bed and thin-set installations on vertical or horizontal applications which can be applied by the ceramic tile contractor. Among these are sheet applied membranes and liquid applied membranes which can be bonded to a variety of manufacturer approved substrates.

**Sheet applied membranes** are usually provided in rolls consisting of a waterproof, flexible material that is to be adhered to the substrate. Some of these sheet applied membranes have reinforcing fabrics adhered to the surface of the membrane to enhance the tensile strength of the material as well as provide a better bonding surface for thin-set mortars.

**Liquid applied membranes** may be single or multi component membranes applied in a liquid or paste form. Some are trowel applied; some may be applied with a paint roller or even spray applied. Some liquid applied membranes require embedding a polyester fabric into the membrane to increase tensile strength. These membranes cure into a continuous waterproof membrane which allows direct bonding of ceramic tile, usually with latex Portland cement mortar.

ANSI Specifications governing Waterproof Membranes are found in ANSI A118.10.

### **Moisture Barriers:**

Moisture barriers are designed to substantially reduce or eliminate moisture migration from the substrate (normally concrete) into the flooring adhesive, setting material or the flooring material itself. These membranes are normally associated with the resilient flooring industry (sheet vinyl, VCT, carpet and wood) which set limitations on the amount of moisture flow allowable prior to the installation of resilient products. These limitations are set because excessive moisture may cause warping of wood products, mildew growth under sheet vinyl or VCT or even deterioration of adhesives normally associated with these products. When tested for moisture migration with a standardized calcium chloride test, many manufacturers of resilient materials require the moisture flow to be less than 5 pounds per 1000 square feet in 24 hours and some require less than 3 pounds. Moisture barriers can reduce excessive moisture flows to within the allowable limits.

Most moisture barriers are liquid applied. Some are applied as a topical membrane forming a continuous membrane on the surface of the substrate and some are applied as a penetrating material which fills the pores and capillaries of the concrete thereby reducing the avenues available to moisture flow. Other materials used as moisture barriers penetrate and use some of the constituents of concrete to induce crystalline growth; thereby increasing the density of the concrete itself and reducing moisture flow. Moisture flow under 12 pounds per 1000 square feet is normally not considered detrimental to a ceramic tile installation installed with standard dry-set mortar. Tile set

with latex Portland cement mortars need not be concerned unless the moisture flow is above 10 pounds per 1000 square feet. This is because ceramic tile installations set with Portland cement based products can “breathe” allowing the moisture to escape without doing damage to the installation. There should be concern when moisture flows in excess of 12 pounds per 1000 square feet are encountered. Many times this is an indication of hydrostatic pressure. If the tile is being set with adhesive or epoxy products, check with the manufacturer for their limitations on moisture flow.

## **Uncoupling Systems and Anti-Fracture Membranes**

Uncoupling Systems and Anti-Fracture Membranes separate the finished surface from the substrate to allow the independent movement between the two and prevent the transfer of stresses to the tiled surface. The relief of stresses incurred by deflection, crack movement, thermal expansion or contraction or moisture expansion occurs in one of two ways. *Some sheet applied systems incorporate air cavities into the membrane. These air cavities remain empty as the material is bonded to the substrate on the bottom and the ceramic tile setting material is applied to the surface of the membrane. These air cavities absorb the differential movement between the substrate and the ceramic tile and setting material.* Liquid applied materials and flat sheet applied materials relieve stresses as a result of the membrane material being elastomeric. This elasticity allows the membrane to stretch within itself to relieve differential movement stresses. In both systems, when the stresses decrease, as with thermal expansion and contraction, the membranes return to their original configuration without loss of bond to the substrate or the tile. Some liquid applied Anti-Fracture Membranes can actually be used as the setting material for the tile creating a single step operation.

## **Vapor Barrier Membranes**

Vapor Barrier Membranes are sheet membranes that have a perm rating close enough to zero that they are considered vapor barriers. These membranes do not allow the penetration of normal vapor gasses much less liquid moisture. Waterproof membranes are normally not considered vapor barriers. They will let moisture in a vapor form penetrate the membrane. Vapor barriers will not.

Since Vapor Barriers will not allow the penetration of moisture, even in a gaseous vapor form, careful consideration should be given when incorporating a vapor barrier into a ceramic tile installation. Improper placement of a vapor barrier may result in moisture condensation within the wall cavity creating deterioration of building materials.