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SUBJECT: FLOOR CRACK ISOLATION MEMBRANES

In the building industry, a membrane usually refers to an underlayment that is a thin product providing separation or transition from one concrete material or application to another. In the ceramic floor tile industry, a membrane refers to an underlayment that is applied between the substrate and the flooring tile or tile assembly. Membranes are used for a variety of reasons so there are many types that are designed for specific functions. The purpose of this report is to identify and define crack isolation membranes and their intended use. Crack protection is limited to minor horizontal planar movement of the substrate (shrinkage cracks). Unless otherwise noted, the membranes covered in this report meet the industry standards covered in ANSI A118.12 for crack isolation material and ANSI A108.17 for installation. Other membranes that may also meet these standards are referred to by their manufactures as, anti-fracture, fracture free, crack suppression, joint relocation, etc. When in doubt, check with the membrane's manufacturer for its intended use and their warranty.

I - MEMBRANE CATEGORIES

LOAD BEARING, BONDED, CRACK ISOLATION MEMBRANES: (ANSI A118.12)

For individual crack isolation, membrane strips are bonded to the substrate and are specifically designed to cover existing in-plane cracks in the substrate per TCA F125-07 for 'Partial Coverage.'

The membrane strips must cover three times the width of the floor tile used, with a minimum width of 6-inches and one or two soft joints may be required. Check with the membrane manufacturer for the maximum crack width that is covered by their membrane warranty and any limitations. These types of membranes can also be used as a full coverage membrane to manage any future movement cracks in the substrate as per F125A-07 for 'Full Coverage.' When used as a full coverage membrane, it also provides some protection against shrinkage, thermal and moisture expansion/contraction of the substrate.

CLEAVAGE MEMBRANES: (ANSI 3.8)

This is a full floor coverage membrane that not bonded to the substrate with the purpose of separating the entire tile assembly from the substrate. This isolates both the wire-reinforced mortar-bed and the tile installation from any instability in the wood or concrete substrate.

LOAD BEARING, BONDED, UNCOUPLING MEMBRANES:

Although not specifically part of ANSI A118.12, this full coverage membrane differs from other 'direct bond' crack isolation membranes because it is a thicker material with air cavities pressed into its surface. These membranes are designed to 'keylock' the thin-set into its upper surface, while the open air cavities underneath allow for some lateral movement without losing bond per TCA F128-07 over concrete floors, F147-07 and F148-07 over wood floors.

LOAD BEARING, BONDED, CRACK ISOLATION MEMBRANES

This type of membrane is not covered in this Field Report. If you require a waterproof membrane, please refer to CTIOA Field Report 82-1-3 (R-2002 'Waterproof Membranes & Underlayments') available on our Web site at www.ctioa.org.

II - TYPES OF INDIVIDUAL MEMBRANES

- 1- Sheet membranes bonded to the substrate with some available in a 'peel & stick' type of material.
- 2- Rolled liquid or trowel applied membranes that are bonded to the substrate with or without fabric. Some require fabric embedded over the entire substrate while others only require it over backer-board joints and at all change un plane. When cured, tiles are typically thin-set directly onto the membrane.
Always refer to manufacturers' instructions for performance levels and limitations, and be sure to follow written instructions accurately to avoid problems.
- 3- Some trowel applied membranes can be used as a bonding agent for tiles as long as the tile are applied before the membranes sets.
- 4- TCA F135-07 'Cork underlayment on Concrete' specifically refers to ½-inch thick cork used for sound control. Most cork manufacturers also offer thinner sound control sheets and also 'Crack Suppression Membranes.' Refer to each manufacturers' instructions for performance levels and limitations, and be sure to follow written installation instructions accurately to avoid problems.

NOTE: TCA states in F135-07 to use a Type 1 organic adhesive to bond cork underlayment to sub floors. CTIOA warns regarding concrete slabs on grade, "Organic adhesives should never be used to bond sheet type membranes due to potential for moisture problems."

CLEAVAGE MEMBRANES:

- 1- Cleavage membranes are designed to separate the tile assembly's mortar-bed from the surface of the substrate.
- 2- The mortar-bed is required to be reinforced and to be of a uniform thickness – 1-¼" minimum to 2" maximum (TCA). Mortar-beds (reinforced) in excess of 2-inches thick shall be detailed by the architect. For reference details, refer to TCA F111-07, F114-07 over concrete floors, TCA141-07 over wood floors.
- 3- Membrane sheets approved as cleavage membranes should never be used, nor are they ever recommended by their manufacturers to be used, as a load bearing, bonded, crack isolation membrane.

LOAD BEARING, BONDED, UNCOUPLING MEMBRANES:

- 1- Uncoupling membranes are used on problematic substrates to prevent any existing or potential cracks and stresses from transferring to the finished tile assembly. Where there are height limitations, the uncoupling membrane is an alternative to using a reinforced mortar-bed over a cleavage membrane. For quick reference details see TCA F128-07 over concrete floors, F147-07 and F148-07 over wood floors.
- 2- This membrane is a full coverage 'load bearing, bonded, crack isolation' membrane.
- 3- The material that forms this membrane is thicker than other membranes and with air cavities pressed into its surface, the thinnest will be 1/8-inch thick.
- 4- This single sheet membrane is available with a number of different patterns pressed into it. The intended use of the membrane will determine which pattern should be used. The recessed patterns are designed to 'keylock' the thin-set into the membrane's top surface while providing mesh protected air cavities underneath to allow some lateral movement without losing bond.

MOISTURE AND VAPOR MEMBRANE BARRIERS:

Not all crack isolation membranes are suitable as vapor barriers and should be used only as per the manufacturer's instructions. Floor membranes are usually classified as either a moisture barrier or a vapor barrier. A **MOISTURE BARRIER** is designed to substantially reduce or eliminate moisture in a liquid state from passing through it, but it is breathable and does allow moisture in a vapor state to pass through it, to some degree. A **VAPOR BARRIER** does not allow moisture in either a liquid or vapor state to pass through it, thus it is not breathable. In cases where the substrate's moisture vapor transmission exceeds 3 lbs. per 1,000 square feet in 24 hours, consult with the membrane manufacturer for its suitability for use. The Marble Institute of America (MIA) recommends that all on-grade applications have a moisture barrier to protect the natural stone against potential moisture problems.

Carefully consider all options, as improper use of a vapor/moisture barrier membrane may entrap moisture condensation.

SLIP-SHEETS:

'Slip-sheet' is an incorrect term used to describe all of the above membranes. In the past, the term 'slip-sheet' was synonymous with cleavage membranes. Today 'slip-sheet' is a term used by the Ceramic Tile Institute of America (CTIOA) to describe materials such as 15 lb. Building paper, scribing felt or Kraft paper. These products have been misused as load bearing, bonded, crack isolation membranes in order for contractors to reduce material costs. 'Slip-sheets' are not recognized by the CTIOA or their manufacturers as an acceptable alternative or replacement for industry approved load bearing, bonded, crack isolation membranes. This is due to their initial low tensile (shear bond) values and their rapid deterioration when exposed to moisture condensation with high alkalinity that are common with concrete slab on-grade tile applications.

CONCLUSION:

There have been many tragic failures when the wrong membranes have been used or where the membranes and/or the bonding mortars are not compatible, resulting in loss of bond. The reason

for most failures where membranes are involved is that an inappropriate or unapproved membrane was used, or it was improperly installed for the kind of application it was being used. An important requirement to remember when selecting the correct membrane to use, all the manufacturers' instructions must be followed and limitations considered when membranes are installed.

ADDITIONAL SOURCES OF INFORMATION

For additional information on membranes and related subjects, see the following CTIOA publications.

1-Field Report 82-1-3 ®-2002 – ‘Waterproof Membranes and Underlayments’ (ANSI A118.10)

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