What are crack isolation membranes and how are they used?

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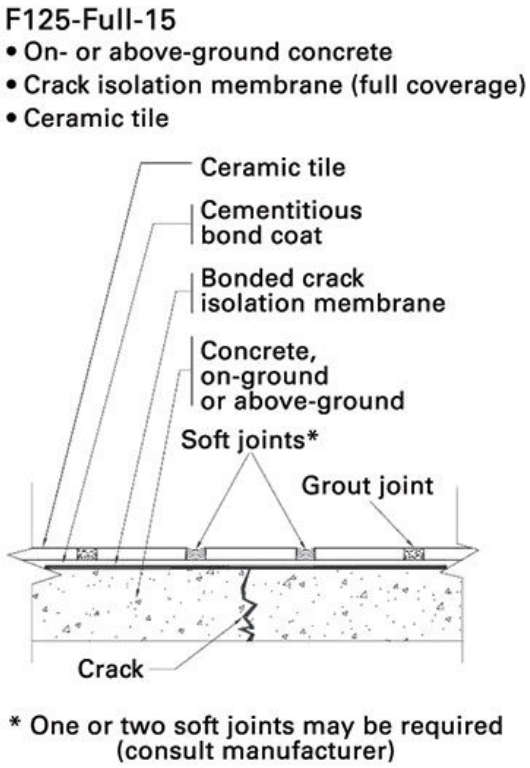
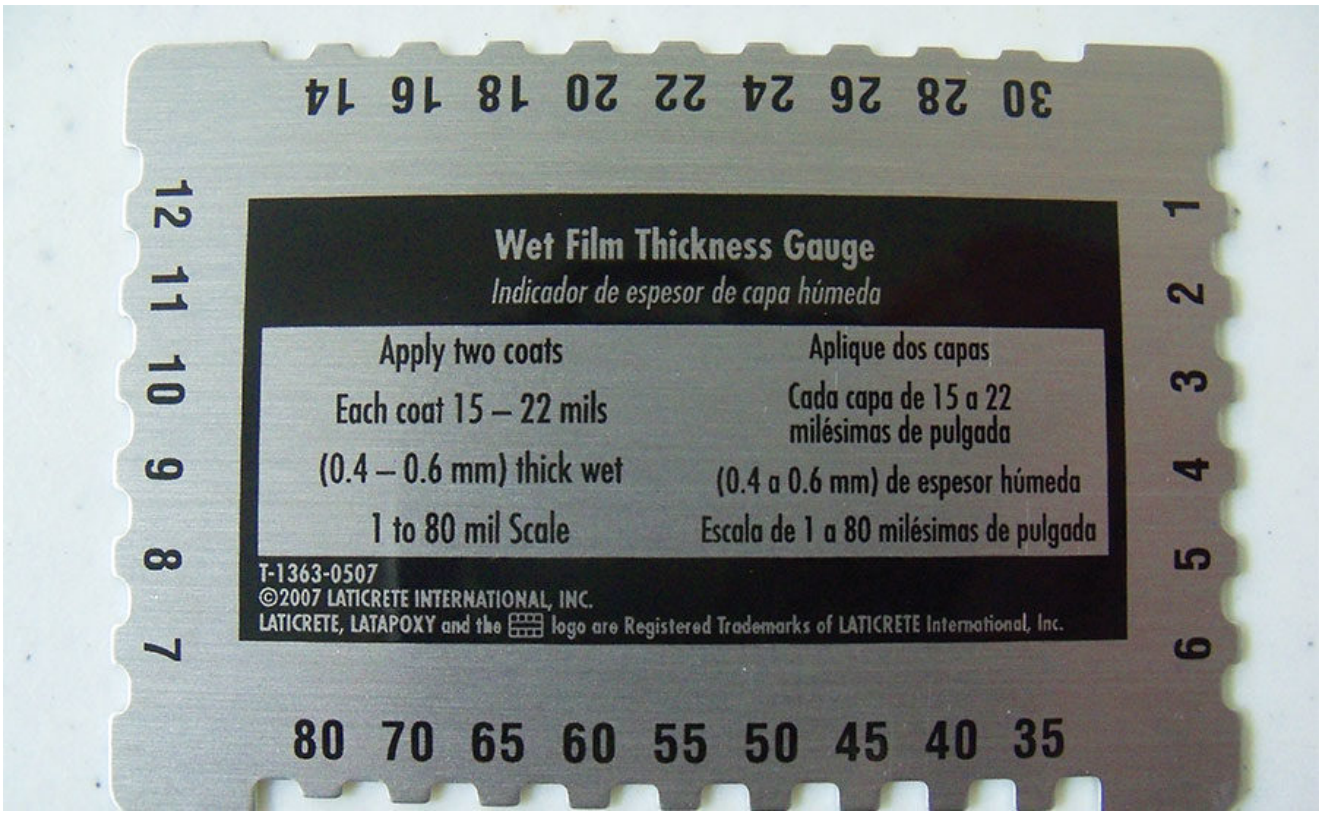
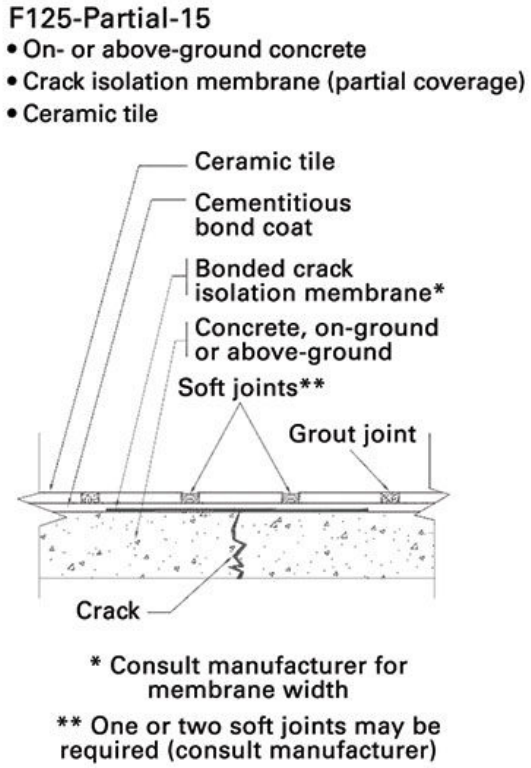


Crack isolation membranes are utilized in one of two ways — Partial or Full — as detailed in the TCNA detail F125. In the partial method, the membrane is applied only over the cracks, also known as crack chasing.



Crack isolation products are available in sheet, liquid and Portland cement-based materials. Liquid-applied products may be applied with a brush, roller or notched trowel. Once applied, the thickness of the liquid normally must be measured by using a wet film thickness gauge.



Under F125 Full, the membrane is applied over the entire surface of the floor to guard against existing cracks as well as others that may occur over the life of the floor.

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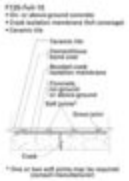

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Crack isolation membranes can many times eliminate the problem of a questionable substrate if they are used correctly. However, the incorrect use of these products can yield some unsavory results. We will look at them on a question-and-answer basis to help demonstrate proper selection and installation.

What is a crack isolation membrane?

On concrete floors, crack isolation membranes, also known as crack I products, are designed to absorb the stresses produced by movement in the concrete. These stresses normally are in-and-out motions similar to an accordion being played or shifting back and forth. The purpose of the membrane is to stretch with the movement of the concrete, but not allow this movement to telegraph to the face of the tile or grout joint. Conversely, crack isolation membranes are not recommended over structural movement. This movement occurs when a fault or deficiency below the concrete shifts, causing an up-and-down motion. No manufacturer will warrant its products over this type of movement. An architect or engineer should be consulted to recommend corrective measures.

What does ANSI say?

The scope of the American National Standards Institute (ANSI) specification for crack isolation membranes defines it in this way: “This specification describes the test methods and minimum requirements for crack isolation membranes for thin-set ceramic tile and dimension stone installation. Cracking is limited to horizontal planar movement of the substrate. It should be noted that while crack isolation membranes are intended to minimize the potential of crack propagation from the substrate through the finished tile or stone installation, they may not always be 100% effective in preventing all defects in the finished tile. It is particularly important when dealing with a cracked substrate that expansion joints are properly located and filled with a suitable sealant or prefabricated expansion joint. Movement joints in the substrate shall be carried through the tile installation. The individual manufacturers, project engineers and architects should be consulted, per Tile Council of North America (TCNA), regarding their requirements for expansion and control joint material and placement.”

What does the Tile Council tell us?

According to the TCNA Handbook, “Crack isolation membranes (ANSI A118.12) for thin-bed ceramic, glass and stone installations act to isolate the tile from minor in-plane substrate cracking. Membranes covered by this definition are bonded to a variety of manufacturer-approved substrates covered by ANSI specifications. In some cases, the trowel-applied products can be used as the adhesive for the tile. Other products within the scope of this category are allowed to cure or are applied as sheet goods and are then used as the substrate for the tile. Membranes may be sensitive to naturally occurring moisture and alkalinity when used over cement- and gypsum-based substrates. Consult the manufacturer for acceptable limits of moisture and alkalinity.”

Where may crack isolation membranes be used?

Depending on the manufacturer’s recommendations, crack isolation membranes — generally speaking — may be used under the tile or stone over properly prepared surfaces both interiorly and exteriorly. Some manufacturers may require that a primer be applied to the substrate and allowed to dry prior to the installation of the membrane. As with all products, always read and follow the manufacturer’s recommendations.

In what form are these products manufactured?

Crack isolation products are available in sheet, liquid and Portland cement-based materials. The sheet membranes may be dry-backed or self-adhesive. The dry-backed products are usually installed using an adhesive or thinset mortar. The sheet materials may also be a peel-and-stick, meaning that the adhesive is already applied to the back of the membrane and covered with a temporary protective paper. When properly aligned, the paper is removed allowing the adhesive to bond to the substrate.

Liquid-applied products may be applied with a brush, roller or notched trowel. The thickness of the liquid, once applied, normally must be measured by using a wet film thickness gauge, as shown in Photo 1. The manufacturer may require that two or three coats be applied to reach the minimum thickness requirement.

Portland cement-based materials are trowel-applied and designed to bond to the substrate and the tile while allowing movement to be absorbed within its body.

How are crack I products used?

As concrete cures, the moisture escapes through the top surface into the usually drier air while the underside remains wet. This moisture differential causes the concrete to shrink and curl, producing cracks. Many times, the concrete surface is cut to provide a stress relief in the surface, known as contraction or control joints. These cuts may be tooled into the wet concrete as it is being finished or saw cut within 24 hours.

In order to mitigate these cracks and allow for the tile pattern to continue uninterrupted over the control joints, crack isolation membranes are used in one of two ways. The TCNA detail F125 includes these two options: Partial (seen in Photo 2) and Full (seen in Photo 3). In the partial method, the membrane is applied only over the cracks, also known as crack chasing. Depending on the manufacturer's recommendations, the membrane is applied over the crack at three times the width of the tile. For example, if the tile is a 12- x 12-inch format, the membrane would be 36 inches wide. Additionally, a soft joint consisting of the appropriate sealant would be placed close to the original joint or crack. Some manufacturers require a soft joint on each side of the joint or crack, so always consult written instructions for guidance.

Under F125 Full, the membrane is applied over the entire surface of the floor to guard against existing cracks as well as others that may occur over the life of the floor. Here, too, soft joints must be placed as directed by the membrane manufacturer per the detail.

The function of these two methods can solve a number of substrate issues. However, expansion joints in the concrete must always be honored and carried up through the tile surface with the proper sealant being applied or manufactured expansion joint product being installed.

Can other materials be used as crack isolation?

An unfortunately popular and completely misguided substitute is being used in some parts of the country. The use of roofing felt, scribing felt or upside-down floor covering is completely inappropriate. These products were not designed to function in this capacity and are at best a temporary fix. Generally, they will not provide the necessary bond strength to the floor, resulting in loose and/or hollow-sounding tile. Additionally, they are not able to withstand the underlying moisture and may disintegrate causing the potential of fungal growth.

As previously mentioned, all expansion joints must be honored and installed in the tile assembly. It is a complete misconception that crack isolation membranes eliminate the necessity for these joints. The TCNA detail EJ171 provides guidelines for the architect or design professional to incorporate expansion joints into the tilework. Exposure to heated floors, sunlight and moisture require even more stringent adherence to these guidelines.

As always, the inclusion of the Ceramic Tile Education Foundation's (CTEF) Certified Tile Installers or IUBAC journeyman, as listed in the qualified labor section of the TCNA Handbook, will help ensure that the installation of these products will be completed properly the first time and yield another functional and long-lasting tile project.

Recent Articles by Scott Carothers

Scott Carothers is the Director of Certification and Training for the Ceramic Tile Education Foundation headquartered in Pendleton, SC, and is responsible for the creation of the

Certified Tile Installer (CTI) program, is involved in the creation of the new Advanced Certifications for Tile Installers (ACT) program as well as providing training to others in the tile industry. He has been involved in the ceramic tile industry for over 33 years and was the owner of a successful retail firm prior to coming to CTEF. He has served as President of the NTCA, Chairman of the NTCA Technical Committee and named the NTCA Tile Person of the Year in 2005. He is a voting member of the ANSI and the TCNA Handbook committees. He may be contacted at 864-222-2131 or scott@tilecareer.com.
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