Ceramic tile installation over young concrete with uncoupling membranes

By Sean Gerolimatos, technical services manager
Schluter Systems L.P.

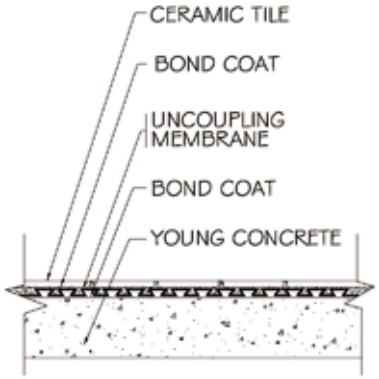
Tile industry standards have always dictated that concrete to receive tile must be cured a minimum of 28 days. However, fast-track construction and renovation projects can place scheduling demands on contractors to install tile earlier. This article will highlight the use of uncoupling membranes over young concrete (cured less than 28 days) and address some frequently asked questions regarding such applications.

Uncoupling membranes provide a reliable installation system for ceramic tile over young concrete. These membranes are configured to be flexible in the shear plane and prevent movement in the concrete substrate from causing stress in the tile covering. Method F128 in the *TCA Handbook for Ceramic Tile Installation* provides specification guidelines for these applications.

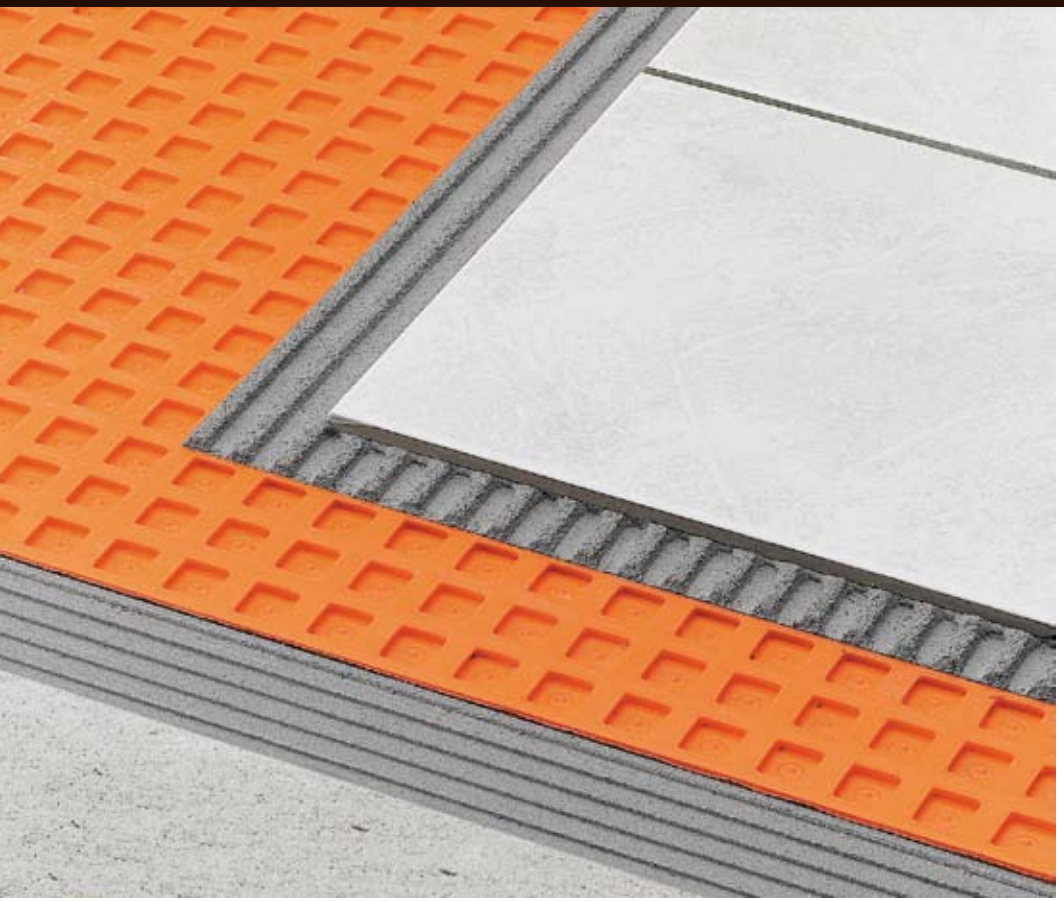
Trapped moisture

Is it okay to trap moisture in the concrete with an uncoupling membrane? There is a common misperception that concrete gains strength by drying. Portland cement concrete has three primary ingredients: coarse and fine aggregates (stone and sand), Portland cement, and water. The cement and water react chemically to bind the aggregate in a hardened matrix. This chemical reaction is called hydration. Water is the "fuel" that produces the chemical reaction and allows the concrete to gain strength.

Good practice is to cure concrete in moist conditions. Keeping the original mix water in the concrete longer or providing additional water after the concrete sets ensures that there is fuel on hand for cement hydration. As hydration continues the concrete



becomes denser, harder, and stronger. Another point to consider is that concrete shrinks as it dries. Shrinkage produces tensile stresses that can result in cracking, particularly at early ages when the concrete is weakest.



Schluter®-DITRA uncoupling membrane

Less drying means less shrinkage and reduced potential for cracking.

Another issue that can result from drying is curling. If the concrete is placed on a vapor retarder, steel pan system, or other base that prevents drying from below, then it can only dry from the top down. Under these conditions, the top of the concrete will shrink at a greater rate than the bottom, producing tensile stresses at the surface that can cause the slab to curl. Again, keeping the water in the concrete will mitigate the potential for this problem.

Thus, installing an uncoupling membrane and tile over young concrete can have some benefits for the concrete itself.

Moisture and mold growth

Will the trapped moisture result in mold growth? Various conditions must be present for mold growth to occur, including organic matter for food, water, and moderate temperatures. Molds also tend to favor neutral to acidic environments. The pH of fresh concrete is typically around 13, which is very alkaline. Uncoupling membranes are installed using cementitious thin-set mortars (Schluter®-Systems recommends unmodified thin-set mortar to install Schluter®-DITRA over young concrete) that are alkaline as well. Also, the uncoupling membrane will prevent the infiltration of organic material. Thus, the environment created below the membrane is not suitable for mold growth.

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Slab moisture and wall cavity damage

Will the moisture in the slab cause damage to moisture-sensitive materials at the wall cavities?

For some there is the impression that covering a concrete slab with a membrane will result in moisture being forced out of the slab at the perimeter at greatly increased rates, bringing with it the potential for mold growth in and damage to the surrounding wall cavities.

There is no history of the use of membrane systems leading to moisture problems in wall cavities.

Various membrane systems have been used over concrete slabs for many years. For example, curing compounds are routinely applied over young concrete to trap mixing water in the slab and promote proper hydration of the Portland cement as per the discussion above. Moisture control systems are also commonly used over concrete slabs subject to moisture migration (i.e., vapor emissions from the soil beneath the slab). These moisture-control systems are designed to reduce vapor emissions to prepare the slab to accept moisture-sensitive floor coverings. They may be applied in the field as coatings (e.g., epoxy systems) or as discrete sheet membranes, some of which are configured to provide air space above the slab.

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Vapor emissions from concrete floors are driven by differences in relative humidity above and below the slabs. The vapor gently diffuses through the concrete, rather than being forced up by high levels of pressure. Covering one area of a slab with a membrane does not produce significant increases to the vapor drive in other areas such as wall cavities.

Uncoupling membranes are configured to provide air channels between the substrate and the membrane. As vapor moves from the concrete into the channels, the relative humidity in the channels will increase. This reduces the vapor drive to the point where equilibrium can be reached and the vapor emissions stop. Thus, the vapor emissions under the membrane are not driven to the wall cavities in a manner that could cause moisture damage.

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Sean Gerolimatos is the technical services manager for Schluter Systems L.P., USA and has been with the company since 2003. He has served as a member of the TCNA Handbook Membrane Subcommittee, written articles for trade publications, and presented seminars at tile industry events, including Qualicer and Surfaces. His academic background is in civil engineering, earning a Bachelor of Science from Clarkson University and a Master of Science from Cornell University.