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Conspectus's Tech Tips received the national Communications Award from the Construction Specifications Institute.

**ABSTRACT:**

Moisture Vapor Transmission (MVT) through substrates can cause tremendous problems in some types of terrazzo and other impermeable floor systems. This article discusses the problems and the design steps to take that will ensure a lasting flooring installation.

**FILING:**

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**KEYWORDS:**

Fluid applied flooring, terrazzo, epoxy flooring, concrete slab preparation, moisture testing.

**REFERENCES:**

ASTM F 710-08 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.  
ASTM D 4263-83(2005) Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.  
ASTM F 1869-04 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.  
ASTM F 2170-02 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in-situ Probes.

## Terazzo

By David Stutzman, Jay Bethel, CSI, CDT, SCIP

Moisture Vapor Transmission (MVT) through concrete floor slabs-on-grade can cause serious damage to impermeable floor finishes.

Terrazzo floors are reported to have been invented by the Venetians in the 1500s, with cement based terrazzo being one of the oldest known decorative flooring systems. Made with chips of stone, glass, or other materials suspended in a cement binder, it is prized for durability and beauty.

A newer type of terrazzo, sometimes referred to as "thin-set" terrazzo, uses a polymer or epoxy binder instead of cement. Epoxy terrazzo is of a thinner depth and provides other benefits. Epoxy terrazzo is 100% solids and releases no VOC during and after installation. Epoxy binders also provide an opportunity to add vibrant color and intricate patterns to the flooring.

Floor systems made with polymer binders typically use marble, recycled glass, or other aggregate materials to achieve creative aesthetics. With a substantially long life cycle, terrazzo is considered an extremely durable and sustainable flooring system. Epoxy terrazzo systems are subject to some potential problems that might have little or no effect on a cementitious system. These problems can also affect other impermeable flooring systems as well, such as sheet vinyl flooring and fluid applied resinous flooring.

### Potential Problems

Cement terrazzo has MVT properties similar to the concrete substrate.

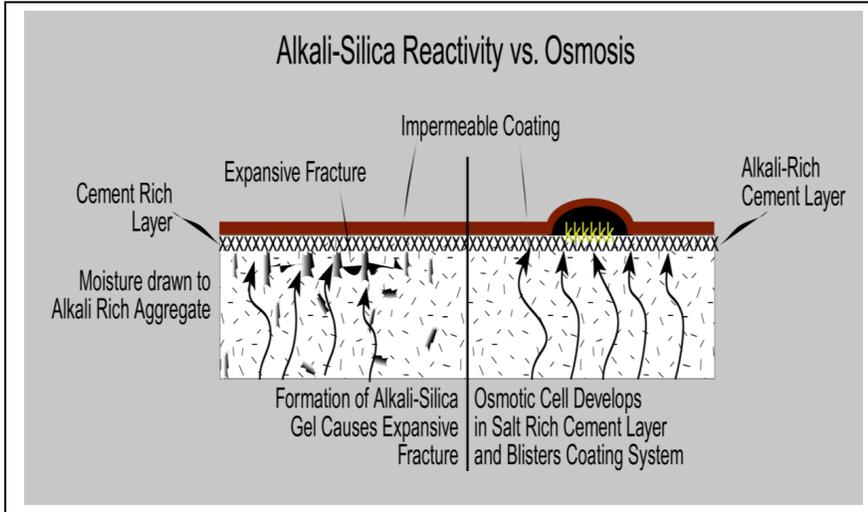
Concrete and cement terrazzo allow moisture vapor to pass through. Epoxy terrazzo, being virtually impermeable, does not. A concrete substrate that has excessive moisture will not provide a suitable substrate for an epoxy terrazzo floor system. Excessive MVT can result in adhesive failure of an epoxy terrazzo floor system. Very simply, the moisture vapor migrating upward through the slab meets the underside of the impermeable floor system, resulting in accumulation of moisture that promote chemical reactions under the floor finish.

Two typical chemical reactions result from MVT:

1. Alkali-Silica Reactivity is the result of alkali rich aggregate used in the concrete. Accumulated moisture reacts with the aggregate causing expansive fractures at or near the flooring system.
2. Osmotic Blistering is the most common defect. As moisture accumulates at the alkali-rich cement layer near the top of the slab, the resultant chemical reaction and vapor pressure weakens the epoxy and forms pockets of moisture and chemicals. For more on osmotic blistering see <http://bit.ly/obLis>. These conditions are depicted in the illustration provided by the Key Resin Company on page 2.

### Moisture Sources

MVT that can cause floor system damage is generally the result of moisture within or beneath the



concrete substrate. This condition can be caused by:

- High water tables combined with ineffective waterproofing
- A damaged or missing vapor retarder under the substrate
- An elevated substrate exposed to moist environment
- Absorption of moisture by lightweight concrete
- Substrate defects that channel moisture toward the floor system
- Insufficiently cured concrete

Any or all of the above conditions can result in the failure of an epoxy terrazzo floor system. During construction avoid problems by the proper installation and use of vapor retarders, waterproofing, defect management, and proper curing of concrete substrates.

In retrofit situations with existing substrates, a careful study of the substrate must be undertaken to determine the MVT potential and identify possible moisture sources.

## Testing

Testing the substrate for MVT is essential to ensure the proper performance of a terrazzo floor

system as well as many other floor finishes. (See Tech Tips A4090 <http://bit.ly/TT4090>) There are three different tests all prescribed by ASTM standards:

ASTM D4263 involves a timed application of plastic sheeting to the concrete, after which the amount of moisture collected on the plastic is observed. If moisture is present, the substrate may not be acceptable.

ASTM F-1869 consists of a chemical surface test in which a quantitative value is determined for the amount of moisture emitted from the substrate at that particular time. The test result exceeds 3 pounds of moisture per 1,000 sf per 24 hours, the substrate is not acceptable.

ASTM F-2170 consists of drilling holes in the substrate and installing electronic probes that measure the relative humidity within the substrate. The probes are precision instruments that provide real-time quantitative data. If the RH exceeds 80%, the substrate is not acceptable.

## Remedial Steps

The best method of controlling MVT is

to install a proper vapor retarder beneath the substrate. Barring that, there are other remedial steps that may mitigate potential failures:

- "Reservoir" MVT coating: A trowel-applied material that reduces MVT.
- Low Permeability Epoxy Primers that seal the surface of the substrate.

## Summary

Quality controlled construction and proper testing of substrates is essential to the successful installation of an epoxy terrazzo floor system. Work with the system manufacturer to ensure the most appropriate materials and installation techniques are used. The website of the National Terrazzo & Mosaic Association, Inc. is a good resource for system selection and system details: [www.ntma.com](http://www.ntma.com)

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