The Vapor Trail

Meet moisture vapor transmission problems head-on in the specifications.

By Rick Gregory

It was your dream, to design and build a facility like this. Two years courting the owners. A year in preliminary planning. Another year on the boards. Six months in permits and approvals. Nine months in construction. Occupancy just six weeks away.... Over five years of your life invested in this project, and the flooring contractor calls, saying *you* have a moisture problem and he won't install the floorcovering until you tell him how to treat the slab to bring it within the tolerances allowed by the manufacturer.

Sadly, this scenario is not at all far-fetched. Moisture-sensitive floorcoverings are failing—and exposing design firms to significant liability. The problem is still so new that even flooring experts are baffled in some situations.

Condensation

Often referred to (incorrectly) as hydrostatic pressure, moisture vapor transmission (the correct term) is the movement of water vapor from below the slab to the surface. This is a natural and regular phenomenon in which severity is affected primarily by environmental temperature, humidity, and the quality of the concrete slab. Where there is a non-breathable flooring material on the surface of a slab, the moisture vapor gets trapped beneath the flooring. When dew point is reached, the vapor condenses and begins to re-emulsify the adhesive, causing the flooring material to debond from the surface of the concrete.

The problem stems primarily from material and adhesive changes due to asbestos and VOC reduction and regulation.

Once common, vinyl asbestos tile (VAT) was a breathable product that allowed moisture vapor to escape. VAT floors rarely experienced emission-related failure. Today's vinyl composition tile (VCT) has no asbestos and so is safer, theoretically, but it doesn't breathe. With nowhere to go, the moisture vapor moving up through the slab condenses and collects. Sometimes this condensate becomes extremely alkaline—and very caustic. In effect, the concrete produces its own adhesive remover.

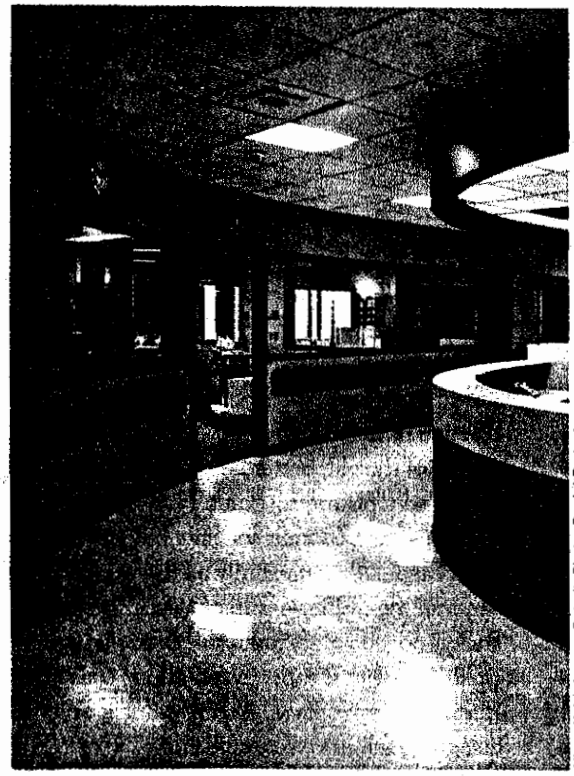
Most of the old, better adhesives were solvent based and moisture resistant. Now that the new adhesives can't contain solvents but still need a liquid carrier, they must rely on the world's most common emulsifier—water. Water keeps the "sticky" portion of the adhesive fluid enough for application, but it must evaporate or "flash" for adhesion to take place. And if water is reintroduced, the adhesive re-emulsifies.

The net result is that a non-breathable floor, highly susceptible to condensation underneath, is "adhered" to the floor by a material that may liquefy when moisture is reintroduced. In other words, materials and adhesives have been regulated into non-performance.

Slab Specification

Is there a solution? Yes. To begin with, in the Concrete section of your specifications, specify a water/cement ratio of 0.45 to 0.49 and require a minimum strength of 28 000 kPa (4,000 psi). This water/cement ratio, lower than the one commonly used for floor slabs, creates a denser slab and reduces available "space" for moisture vapor movement. Further, more complete and effective hydration and chemical reaction of the cement decreases vapor drive. Calcium chloride admixtures should never be used to speed setting and finishing of the slab.

Specify and require a minimum of seven days wet cure with no curing compounds, which cannot ensure optimum hydration and may leave surface residues that are incompatible with flooring materials. Further, specify that calcium chloride dome tests be conducted early in the project to determine moisture vapor emission levels. Testing early keeps the project from being held up at inopportune times (such as move-in).



Albert Kahn Assoc., Detroit. Photo: Daniel Bartush

Vinyl composition tile prevents moisture moving up through the slab from escaping.

Finally, have a contingency remediation process specified, budgeted, and scheduled for initiation if the slab is still out of tolerance. Even if all the contingency items are necessary, additional cost shouldn't exceed $11 to $32 per square meter ($1 to $3 per square foot). Compared to typical remediation costs, which can be ten times higher, implementing a contingency plan is relatively inexpensive.

Treating Slabs

Three materials are recommended for treating vapor emissions before flooring application: penetrating primers, cementitious underlayments, and fiberglass matting. The primer should be a clear, penetrating, non-toxic, non-silicone, non-acrylic, water-based potassium silicate, which can be used alone or in conjunction with underlayments or matting. A polymer-modified portland cement-based underlayment is best. Application should consist of two 3 mm (⅛ in.) coats applied with a trowel or squeegee.

Fiberglass mat systems consist of an acrylic emulsion base coat with a finish coat conforming in quantity and profile to the manufacturer's instructions. Four to six hours should elapse between coats. The membrane can receive traffic in eight hours.

There is no known equal to fiberglass matting. ◆

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