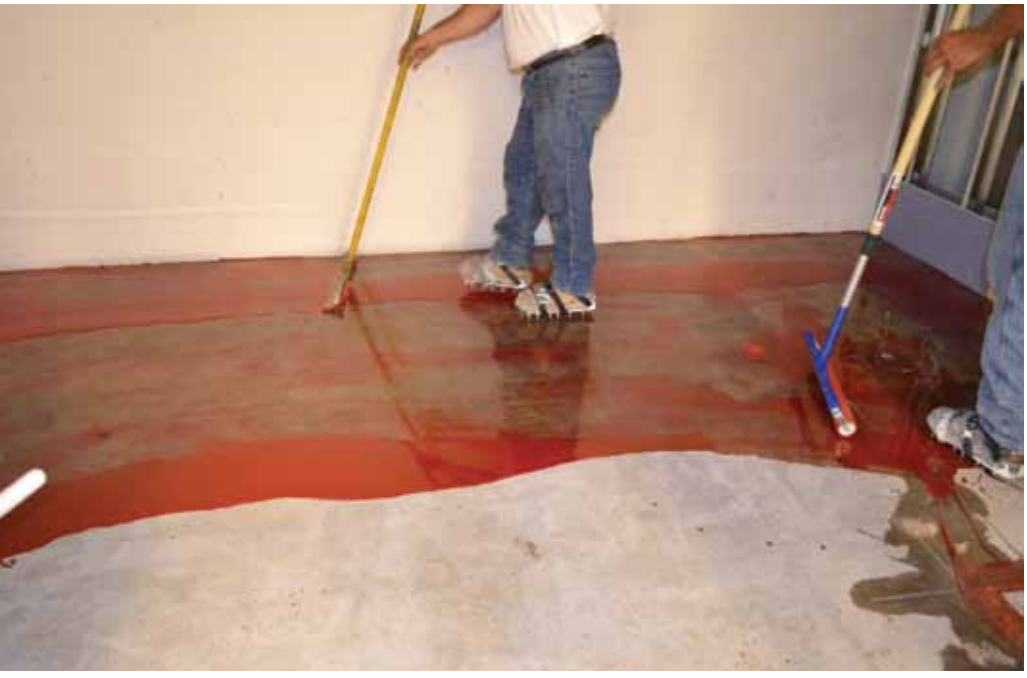
Floor Covering Distress: The Pros and Cons of Current Repair Strategies

By Martin R. Maingot, P.E., S.E.

Placing floor coverings over concrete slabs is not a new concept. Low-permeability floor coverings have been installed over concrete slabs for more than a century. However, advancements in concrete construction and floor covering technology over the past 25 years have caused flooring performance problems to reach critical levels. "Fast-track" scheduling (overlap of construction and design phases) tends to worsen the problem with significantly less concrete drying time; value engineering that eliminates vapor retarders; and a growing number of low VOC adhesives with considerably greater moisture sensitivity than in the past. While some problems can result from flooring not being installed in accordance with manufacturer's recommendations, more floor covering problems are now related to excessive moisture within the concrete slab and moisture migration through it.

THE OPTIONS

There are a number of options available to repair flooring distress caused by moisture vapor. The following repair outlines represent the most current mitigation strategies and provide valuable insight as to the associated advantages and disadvantages for each option.



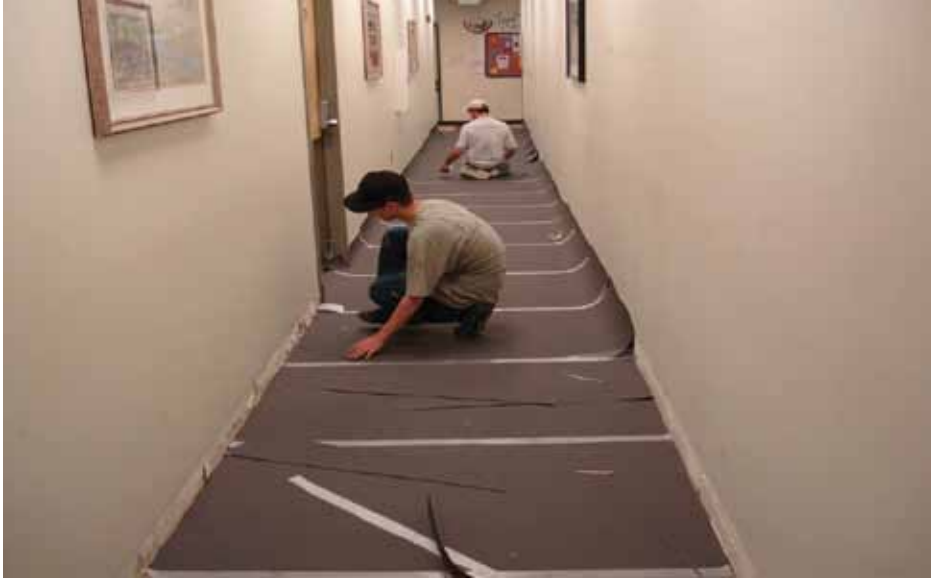
Option 1 – Liquid-Applied Moisture Suppression Systems

Pros: Odds of effectiveness – *High*
Destructive to existing structure – *Low to Medium*

Cons: Cost – *Medium*
Disruption to tenant - *Low to Medium*

Concrete slabs with excessive moisture content must have the moisture isolated from the adhesive and resilient floor covering. Currently the most effective solution is to 1) remove the existing flooring, 2) shotblast the concrete surface, 3) install a liquid-applied moisture suppression membrane topped with a skim coat of cementitious underlayment, and 4) reinstall the original or new floor covering. This option can provide a long-term solution that would permit installation of future floor coverings without having to renew the moisture suppression coating each time. It has been found through testing that "water-based," "water-borne," or "water-reducible" coatings are not as effective in moisture suppression as epoxies with 100 percent solids. It has also been found that solutions of alkali silicates are essentially ineffective for this purpose.

While the 100 percent solid epoxy coatings cannot be applied under existing interior walls, experience has shown that moisture vapor movement does not increase through uncoated adjacent areas of the slab (i.e., under existing interior



WHILE SOME PROBLEMS CAN RESULT FROM FLOORING NOT BEING INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, MORE FLOOR COVERING PROBLEMS ARE NOW RELATED TO EXCESSIVE MOISTURE WITHIN THE CONCRETE SLAB AND MOISTURE MIGRATION THROUGH IT.

walls) because the existing moisture condition throughout the slab will remain unchanged.

It should be noted that there are a number of products that recently introduced rapid, one-coat systems that can be installed in a much shorter time period than previous systems.

Option 2 – Pre-Formed Moisture Retarder Sheet Underlayment

Pros: Odds of effectiveness – *High*
Cost - *Low to Medium*
Disruption to tenant – *Low*
Destruction to existing structure – *Low*

Cons: Not a permanent solution; underlayment must be replaced each time the floor covering is replaced.

Not appropriate for concrete slabs with a relative humidity of more than 95%. Accurate relative humidity measurements are required prior to selecting this as a repair option.

Vinyl-backed modular carpet or vinyl composition tile (VCT) can be installed over a preformed moisture retarder sheet. Existing vinyl tiles should be removed first and the underlying concrete surface should be prepared flat and smooth to avoid damage to the underlayment and to avoid reflection of imperfections through reinstalled tile. Like the 100 percent solid epoxy coatings, this option cannot be installed under existing interior walls; however, it will not increase moisture vapor movement through untreated areas for the same reasons as with Option 1.

Option 3 – Remove and Replace (Slab on Grade only)

Pros: Odds of effectiveness – *High*

Cons: Cost – *Very High*
Disruption to tenant – *Very High*
Destruction to existing structure – *Very High*

The concrete floor slab can be sawcut and removed in sections, followed by preparation of an adequate subbase, installation of a vapor retarder directly below the new slab to preclude additional ingress of subslab moisture, and construction of a new floor slab. The freshly placed concrete will require several months to sufficiently dry before reinstallation of a floor tile system. The process of demolition and construction will be noisy, produce vibrations, and will require isolating areas with temporary walls or barriers to prevent airborne dust and contaminants from entering other areas. To shorten the overall construction schedule, the concrete could be sealed with a moisture suppression system (MSS) after it has cured and dried for approximately one month.

Option 4 – Thin Bonded Concrete Floor Slab Overlay

Pros: Odds of effectiveness - *High (if properly designed and installed)*
Cost – *Medium*

Cons: Odds of effectiveness – *Low (if not properly designed and installed)*;
Disruption to tenant – *High*
Destruction to existing structure – *High*

Instead of replacing the entire existing concrete floor slab in the distressed areas, another option is to remove the existing floor tile, and adhesive, abrasively remove a sufficient amount of the concrete slab surface to prepare a clean surface, install a liquid-applied vapor retarder (damp proofing membrane) on the surface of the old, clean floor slab, and then place a thin bonded concrete overlay.

The concrete mix for this new topping must be carefully designed and the system specified in detail to produce a floor that will dry quickly with minimal cracks and acceptable flatness. Thin *unbonded* overlays (2 inch or less thickness) are not acceptable because of the potential for shrinkage, cracking, and curling. This method requires that the existing slab not have any significant amounts of reactive aggregates or other expansive particles.

Option 5 – Raised Access Floor System

Pros: Odds of effectiveness – *High*
Cost – *Medium*
Disruption to tenant – *Low*
Destruction to existing structure – *Low*

Cons: This is not a permanent solution. Raises floor approx. 2" which may present grade issues for the tenant.

Raised access floors may not be appropriate for all tenant uses.

A modular raised access floor system can be installed over an appropriate vapor retarder placed on top of the existing floor system. This proposed method does not require demolition and removal of the existing concrete floor slab and can be installed more quickly and with least operations disruption.

This proposed method "covers up" the existing distressed floor. By using low height pedestals (approximately 2 inch), ramps may be required at transitions in and out of some areas, at floor drains, at doors and wherever access to the space is required from the existing floor elevation. The vapor retarder on top of the existing floor slab is necessary to inhibit moisture ingress underneath the raised access floor system and prevent microbial growths and corrosion of the raised access floor system.

THE RIGHT OPTION FOR YOUR INSTITUTION

Taking into account existing tenants' use and likely intolerance for disruption, it is suggested to consider Options 1 or 2. While all of the repair options cause disruption, Options 1 and 2 will have the least impact on existing tenants and are likely to be effective if installed properly. The main differences between these repair strategies are, besides cost, Option 1 is more permanent and takes slightly longer to install, while Option 2 must be reinstalled each time new flooring is installed but has a quicker installation time.

For any of these systems, it is imperative to contact the various manufacturers' directly for details and closely examine installation requirements, warranty provisions, and references for performance history. It is also equally important that approved installers be specified since some moisture suppression vendors offer different coverage in their warranties depending on the level of expertise and training of their installers.

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