

# Plant Services

PERFORMANCE | RELIABILITY | EFFICIENCY | ASSET MANAGEMENT

MOISTURE PLUS  
PH CAN ADD UP  
TO FLOORING  
FAILURE

## CAUSTIC COMMENTS

BY BILL IMHOFF

**A**

Colorado facility faced a dilemma that is increasingly common. The moisture content of a new concrete slab met the flooring manufacturer's recommendations. However, it showed a pH of 10 to 11. The result: The manufacturer wouldn't warranty the finish flooring and construction ground to a halt.

In Austin, Texas, a manufacturing facility struggled for 15 years with tile failures from moisture and high pH. It spent \$250,000 to remove failed floor tile and encapsulate the slab with a moisture barrier to install a warrantable floor covering that provides 2,000-psi strength for the massive machinery that moves across this floor (Figure 1).

### Behind the moisture-pH dilemma

Balancing slab pH and moisture level can be challenging and costly. Concrete has a naturally high pH. But, many flooring manufacturers won't warranty installations if the pH is at natural levels, even though moisture is low (Figure 2). Nationwide, moisture and pH-related flooring problems have reached the billion-dollar level annually, according to independent concrete flooring expert Scott M. Tarr, principal engineer at CTL Group, Skokie, Ill. Factors driving these problems include:

- Eliminating asbestos in resilient flooring
- Banning solvents from adhesive and coating systems
- Raising concrete water content to allow easier placement
- Absorptive aggregate in lightweight concrete
- Fast-track construction schedules
- Admixtures that cause adverse reactions in the concrete
- Constructing on fill material in less-than-prime areas

"New innovative products, installation methods/materials and environmental regulations have produced a more complex environment in which floor covering products are installed," notes the World Floor Covering Association (WFCA, [www.wfca.org](http://www.wfca.org)) in a recent study on flooring installation issues. Industrial facility managers have several options for dealing with moisture- and pH-related flooring problems.

### Conduct independent testing

The WFCA study recommends using an independent specialist to test

the installation. Consider only experts having in-depth understanding of the project, soil and underslab conditions, surrounding environment and the concrete. Expect the testing to include checking the chemical composition of the concrete, the environmental requirements and the formulation technologies of the concrete and adhesives.

Test results are tough to analyze because the industry relies on an analog test for calcium chloride that has helped to develop data for acceptable moisture and pH levels. Testing must be monitored to ensure an objective testing environment. It must be done in the finished floor's operating environment to provide good information about any reaction to that environment. Humidity probes provide more objective data, but there's some debate about interpretation.

The pH level is tested by placing distilled water on the surface and using a device to measure the activity of the hydronium ion. Because there's been no testing of ion activity levels on a dry surface, there's no definitive evidence that pH would be a concern in the absence of moisture.

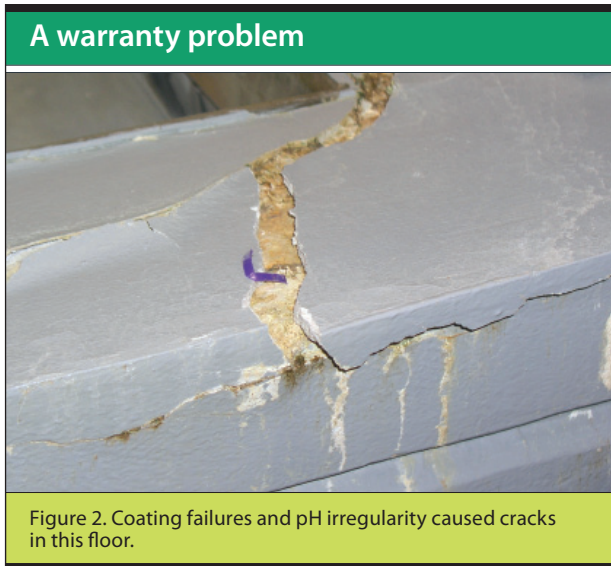
Some floor finishes perform well with as much as double the maximum allowable moisture readings, while others suffer chronically with readings at the maximum. Determining the right moisture/pH balance isn't an exact science. Balance the criteria for proper building technique and

### Wouldn't stay down



Figure 1. Moisture and pH problems led to strip failure, stressed vinyl composition tile and efflorescence in the seams.

## PERFORMANCE Flooring



quality products with project economics. Base any decisions on how crucial the loss of an area would be to the operation should the flooring fail and a warranty claim arise. In general, your flooring installer should follow manufacturer guidelines.

### Choose not to test

An alternative is simply not test. The installer bears the burden if the flooring fails unless the owner, contractor and architect sign a waiver. There are two scenarios in which a flooring installer might choose not to test:

- Costs involved in honoring the floor warranty don't outweigh the risks of not testing. The costs might include demolition, replacement, customer relations, resource utilization and lost-use revenue.
- The installer desires to be forced out of business because of the enormity of the loss with no possibility to recover.

### Ignore the standards and proceed

The installer and manufacturer might elect to exceed standards and proceed with the installation. A manufacturer might adjust the standard for the particular project and issue a modified warranty with stricter exclusions and exceptions. Proceeding without a warranty means your installer must assume liability should the flooring fail, unless a waiver has been signed.

But, don't be fooled by bogus warranties. Almost every warranty has a direct or implied exception or exclusion section that is a direct indicator of a deficiency in performance previously demonstrated by the product being considered. Carefully review any warranty and understand exactly what it covers.

### Fix the problem

Any moisture or pH problem can be fixed at a price. At the Austin high-tech facility, the fix involved removing the flooring and preparing, sealing and cementing the original concrete. This encapsulated the high humidity in the floor. The facility spent hundreds of thousands of

dollars to fix the problem, but it was critical that the flooring be able to bear the weight of large, heavy equipment without buckling.

Another installation required a jack hammer to get to the bare slab and sanding to expose a clean, bare concrete surface. A barrier to seal off the slab moisture was applied, which was covered by a heat-welded, self-curing sheet vinyl. This repair involved many thousands of dollars in testing to arrive at the ultimate solution.

When flooring in two clean rooms at another Texas facility failed, the general contractor was notified and the warranty was invoked. After five weeks of retrofitting the 1,250-sq. ft. space, the costs totaled \$1.1 million:

- Demolition, preparation, moisture sealer, cementitious underlayment and floor finish - \$40,000
- General contractor oversight, negative air pressure system, wall isolation and coordination - \$120,000
- Estimated downtime and lost revenue - \$850,000

### Select a reputable contractor

Fixing a floor means delays, downtime and cost. "Selecting a flooring contractor with extensive product knowledge, field experience and good business ethics is critical in today's market of tight margins and short timelines," says John Sutton, president of the Austin Chapter of the Building Owners and Managers Association. Choose a contractor trained in the relationship between pH and adhesive curing. Ask what steps the company will take if moisture or pH issues arise.

In the Colorado facility, even though moisture readings were within the maximum limit, the pH was unusually high. The pH was tested without any initial cleaning of the substrate surface. The issue faced by floor installation team and the flooring manufacturer was how hard to hold the line and where to seek the best advice for proceeding. They had to consider several questions:

- Moisture readings were usually at the maximum acceptable level. What if there's enough moisture to dampen the area under the floor and raise the pH? Will the floor adhesive suffer?
- Will the floor last beyond the warranty period?
- If not, what responsibilities does the installer bear afterward?

Most pH problems are caused by active vapor transmission bringing calcium hydroxide to the surface. Over time, the moisture evaporates, leaving behind higher-pH solid materials. In extreme cases, an efflorescence bloom can occur.

### Changing how we do business

In the end, you must weigh the risks and costs of each option. Taking the time to correct a problem – or prevent one from occurring – likely will mean a project delay or downtime for your facility. Proceeding with an installation outside guidelines speeds completion, but risks retrofit costs.

The solution is for manufacturers to recognize the reality of high-pH, low-moisture combinations. Products have changed. Knowledgeable flooring contractors have changed installation techniques. It's important that manufacturers likewise change their warranty policies to address market needs. ☺

Bill Imhoff is founder and president/CEO of Intertech Flooring in Austin, Texas. Contact him at [wei@intertechflooring.com](mailto:wei@intertechflooring.com) or (512) 385-4574.

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**Intertech Flooring**

[www.intertechflooring.com](http://www.intertechflooring.com)

**Austin:** 1106 Smith Road, Suite 100, Austin, TX 78721 • 512.385.4574

**San Antonio:** 4710 Perrin Creek, Suite 380, San Antonio, TX 78217 • 210.650.9670

**Rio Grande Valley:** 1301 Business Park Drive, Suite D, Mission, TX 78572 • 956.584.3592