

## High Moisture and High PH

High moisture and PH levels can interfere with the performance of all adhesive-dependent finished flooring products. In these environmentally-conscious times, manufacturers have reduced the Volatile Organic Compounds (VOCs) in their products. The drawback is that adhesives are much more sensitive to moisture and PH than in years past. To avoid moisture-plagued flooring installation, it is paramount that installers accurately measure the moisture and PH levels in concrete slabs.

Moisture is part of the original concrete mix. This moisture dissipates and evaporates through the surface as the slab cures. Moisture movement is an interactive process. As it evaporates from the surface, more internal moisture moves towards the surface. Under ideal conditions, the operating "rule-of-thumb" is to allow approximately 30 days of drying time for each inch of concrete thickness. The slab then reaches a moisture level at which installers can apply some floor coverings and adhesives.

Unfortunately, concrete procurement is seldom ideal. The conditions within and surrounding the slab are too variable to validate a generic rule-of-thumb. When the amount of slab surface moisture is lower than that of its ambient air, concrete can absorb moisture into the surface, slowing the drying process considerably. Ground water sources, surface additives, temperature variations and poor drainage can all sabotage the natural time-frame for concrete equilibration. Add project fast-tracking, or delays by other trades that further compact construction schedules, and we begin to see how flooring challenges are anything but ideal.

Catch-22, indeed: if moisture levels are in a state of perpetual flux, how can we safely install floor coverings?



How can the general contractor and specifier help the flooring installer prevent future problems?

### The Proactive Approach

- When pouring new concrete, make sure drainage runs away from the slab and that the grade is adequate for local conditions.
- Specify a true vapor barrier membrane under the slab to prevent moisture coming up through the ground.
- Use a concrete mixture with a lower water-to-cement ratio. Various admixtures may provide adequate workability while minimizing the initial moisture content.
- Allow the slab to dry naturally at service conditions. Protect it from the elements, and avoid maintenance or cleaning processes that will wet the slab.
- Verify (ie. test) the slab's moisture content reliably before installing the floor covering.

Various moisture content tests are available, but not all satisfy ATSM International's flooring installation requirements.

Considered the industry standard, relative humidity (RH) testing measures the concrete's relative humidity by installing a probe or sensor within the slab to a specified depth. Forty percent of the slab thickness has been found to best indicate the final RH conditions if the concrete were sealed (i.e. finished flooring installed) at that stage. ASTM standard F2170 covers the requirements for RH testing before installing the flooring over a concrete slab.

Another test method, the anhydrous calcium chloride test (ASTM F1869), uses a measured amount of a salt compound sealed under a glass dome to determine the moisture vapor emission rate (MVER) in a concrete slab. Weight is used to calculate the amount of moisture absorbed over a 60-72 hour period. Once frequently endorsed by manufacturers, ASTM recently disallowed calcium chloride testing of all lightweight aggregate concrete. By its nature, the MVER test produces results which are limited to surface conditions. Calcium chloride does not predict sub-slab moisture content.

Moisture meters use electromagnetic signal resistance (or impedance) to indicate slab moisture conditions. These meters may not read for depth, but they can provide comparative readings across the concrete slab. Therefore, moisture meters can be useful in determining where to place RH probes. Pin-style meters may help to determine moisture content, but those are considered unreliable for overall concrete assessments.

A mat test measures the reliability of an adhesive at the concrete's current moisture conditions. Assessors adhere a vinyl flooring product to the concrete and seals the edges. Because mat tests rely solely on a visual inspection after 72 hours, they are not considered a reliable indicator of the moisture conditions within the slab. A mat test can produce false negative results.

The polyethylene sheet test (ASTM D4263) simply produces a qualitative result. In this test, a square plastic sheet is taped to the concrete and left in place for a number of hours. The presence of condensation under the sheet is considered a positive indication that excess moisture is likely present. However, it is not certain that moisture conditions are acceptable throughout the slab.

#### The Reactive Approach

If it's too late for prevention, then the options become much more problematic. Warranty claims typically require that



contractors remove flooring and adhesive to allow the concrete slab to cure more thoroughly. If the moisture conditions cannot be naturally remediated, installers may need to try decorative concrete, less moisture-sensitive floor coverings, breathable floor coatings, or topical moisture vapor suppression systems. If moisture has caused severe damage, the whole floor (concrete and covering) may need to be reinstalled.

The best way to avoid issues is to accurately measure concrete slab conditions before installing a quality floor on an concrete slab. This is intended to ensure that the concrete slab falls within the appropriate parameters prior to flooring installation. Once concrete is poured, installers need to await service conditions (or as close as they will get) before testing concrete moisture levels. The most accurate tests should be conducted at various locations throughout the slab, because levels may vary. Most adhesive manufacturers include maximum moisture values for the warranty-approved use of their products. There is no need to put your job on shaky footing, because measurement is worth the cure of a concrete job.