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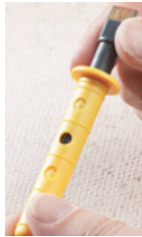


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ASTM F2170-02: A Concrete Moisture Testing Method for the 21st Century

by Christopher Capobianco
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The plastic sleeve inserted into the slab seals the hole except for the specific depth at which moisture will be measured.



In two of my previous columns, I discussed the false assumptions made every day about concrete substrates (January 2004 *NFT*) and the importance of correctly performing the ASTM F1869 Calcium Chloride Moisture Test (March 2004 *NFT*). This month, I'll further the discussion by detailing a "new" method of moisture testing that many feel is the best way to accurately predict the potential for moisture problems after the floor is installed.

The relative humidity probe method, also known as the RH test or the "in situ" test, has been in use in Europe for more than 20 years but is relatively new to the United States. ASTM F2170-02, *Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In Situ Probes*, which was published as an ASTM Standard in 2002, involves drilling approximately 2-inch-deep holes in the concrete to measure the humidity inside.

Scientific testing has shown that the calcium chloride test only measures vapor emissions from the top 1 inch or so of the concrete slab. Because most concrete slabs dry from the top down, the calcium chloride test may miss moisture deep inside the concrete that is likely to rise to the surface after a floor covering is installed. For this reason, many now consider the RH test a better predictor of future moisture problems.



By drilling a hole in the concrete, the F2170 method can measure moisture deep inside the slab.

Another advantage of the F2170 RH test is that it is easier to repeat. The first test using either method takes about the same amount of time. An F1869 Calcium Chloride test takes four days (grind the slab, wait a day, place the kit, and wait three days), after which a Moisture Vapor Emission Rate (MVER) is calculated. The MVER is stated in pounds per 1,000 square feet per 24 hours -- or "pounds," with 3 or 5 being the limit.



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The first F2170 test takes three days (drill the hole, place and cap the sleeve that lines the hole, wait three days), after which the Relative Humidity (RH) is read using a meter. The RH is stated as a percentage RH, with 75 to 80 percent the acceptable limit.

However, each subsequent test is much easier with the F2170 method. A second F1869 test requires another three day wait, while the F2170 test can be repeated without any waiting time because the hole can be reused over and over again. If the initial reading is too high for a floor covering installation, you can come back later, unseal the hole, and quickly read the RH again. There is no three-day waiting period once the hole is drilled and the sleeve is placed and capped.



Howard Kanare of Skokie, Ill.-based Construction Technology Laboratories (one of the premier concrete testing laboratories in the world) believes the RH method is better than the calcium chloride test. "Calcium chloride tests only tell us about the moisture situation in the upper region of the concrete," he explains. "RH probes can be placed at a specific depth in the concrete to indicate the actual moisture condition deeper in the concrete -- even below the floor slab where moisture originates -- and can monitor trends and indicate the rate of drying, allowing us to predict when a floor will be dry enough for installation"

Thus, a slab that is considered "dry" according to the calcium chloride test can wind up "wet" after the flooring is installed, because the dampness in the lower part of the slab has migrated up to the surface.

Because there is somewhat of a comfort level in the industry with the calcium chloride test, I inquired as to whether a correlation exists between the two methods. "No, they measure different properties of the concrete," Kanare answered. "F1869 determines a portion of free moisture near the surface that can be pulled out of the concrete over a short time period. F2170 measures the existing relative humidity within the slab at a specific depth."



A relative humidity meter connected to the probe yields an internal moisture reading. Relative humidity testing represents advanced concrete moisture testing for the 21st century.

So then, if one performed both tests and recorded a low MVER but a high RH, would it be safe to install the floor? Absolutely not, Kanare says.

"Many factors can produce a low MVER -- such as a sealer or curing compound on the surface of the concrete, a dense hard-troweled finish, very dry atmosphere over the floor, or cooler-than-normal temperature," he explains. "The floor may appear dry at the surface but high moisture conditions are lurking deeper down."

How about vice versa? "High MVER and low RH," Kanare continues, "may indicate the [F1869] test was performed improperly, or that the floor was recently exposed to moisture on the surface, such as a water leak, rain or excessive cleaning solutions. If the floor is adequately dry deeper down, you might simply need to let the surface dry some more before installation."

The F2170 test is the most up-to-date method for testing concrete floor slabs. A plastic sheet taped to the floor is no longer an acceptable method, and even a moisture meter test is not recognized by flooring manufacturers. Few could argue against the comprehensive data the F2170 test yields.

"We have used F2170 RH probes to monitor drying of wet floors and to predict many weeks ahead when a floor would be acceptable for installation," Kanare notes. "RH probes can be wired into a 'smart building' that monitors itself and alerts the facility

manager if a moisture problem is developing.”

We’ve come a long way from taping a piece of plastic to the floor to see if there is moisture. Hopefully, as more independent testing agencies and flooring dealers and contractors perform more testing, moisture-related failures will be less common. That would be good news for everyone in our industry -- and our customers as well.

Editor’s note: Flooring professionals interested in performing the in situ moisture test can obtain a copy of the ASTM F2170 method by accessing the organization’s Web site at www.astm.org. Be sure to check with the product manufacturer to ascertain the maximum allowable RH results for the floor covering you plan to install. Photographs of the F2170 test method accompanying this story were furnished courtesy of Sean Fallon of Tramex and Chris Ranwell of GE Protimeter.

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Christopher Capobianco is a fourth-generation floor covering veteran who has worked as a retailer, a commercial sales manager and a manufacturer’s technical support manager. He is an active member of ASTM Committee F.06 on Resilient Flooring and serves on the board of directors of the Floor Covering Contractors Association (FCICA). He recently returned to work for East Northport, N.Y.-based Fred’s Carpet, the company his grandfather founded in 1959.

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