

SUBJECT: WATER VAPOR TRANSMISSION TESTING

The Portland Cement Association publication states "It can take several months of air drying *in consistently dry weather* before new concrete can reach a level of 80% relative humidity, or less, which will not affect the application of flooring materials", *Design and Control of Concrete Mixtures*, Chap. 14, pg. 172, Moisture Content. Hydration in concrete stops when the internal relative humidity reaches 80%. Until concrete reaches an internal relative humidity below this percentage the outflow of water from hydration will cause coatings, coverings, paint and flooring materials to fail.

The Portland Cement Association recommends the ASTM D4263 Indication of Moisture Content of Concrete by the Plastic Sheet Method in their publication "Design and Control of Concrete Mixtures", Chap. 14, pg. 172, Moisture Content. Additionally, an article, published in the April/May '96 issue of *CONCRETE REPAIR*, addresses THE CRITICAL NATURE of water vapor transmission, and the proper testing prior to, the application of carbon fiber reinforcement for concrete beams. The recommended test: ASTM D4263.

The Carpet and Rug Institute recommends a modified version of the ASTM D4263, as one of the acceptable tests, which substitutes a sheet of plexiglas adhered to the surface by plumbers putty, as a test procedure for the measurement of water vapor transmission.

Armstrong World Industries recommends their version of the ASTM D4263 mat test which is to place 3' by 3' panels of the actual flooring and adhesive to be used, to the floor, every 50', and left in place for 72 hours. If after 72 hours it requires unusual force to lift the panels from the floor the surface is dry and will result in a satisfactory installation of the resilient flooring. Tarkett also recommends a bond and moisture test as THE test if there is any question whatsoever about the moisture content of the substrate.

The calcium chloride test is not the only acceptable test in the flooring industry. The Resilient Floor Covering Institute Specification lists the mat test, ASTM D4263, as one of *SEVERAL TESTS* available to determine water vapor migration. *ADDRESSING MOISTURE RELATED PROBLEMS RELEVANT TO RESILIENT FLOOR COVERINGS INSTALLED OVER CONCRETE*, MRP - RFCI, NOV., 1995, Sec III, TESTING FOR MOISTURE IN CONCRETE SLABS (New or Existing), pg. 6, par. 1.

This specification also lists the ASTM E96, Test Method for Water Vapor Transmission of Materials, which is another recommended test, and is the *TRUE STANDARD* for water vapor migration testing. Other recommended tests are ASTM D5084 Permeability of Concrete using a Flexible Wall Permeameter or the mat test with the use of a dew point hygrometer, for quantitative results. Any other ASTM, AASHTO, ACI, concrete institution or concrete association approved test is also applicable where MOXIE 1800 SUPER-ADMIX have been used.

MOXIE 1800 SUPER-ADMIX initially converts the free mix water and the calcium hydroxides into a colloidal gel state. In the interim period the colloidal gels by their chemical nature do not allow any ion exchange and prevent water vapor transmission. The chemical process of this colloidal gel, when complete, converts the water and soluble calcium hydroxides into permanent, insoluble, calcium silicates. *MOXIE International, TECHNICAL BULLETIN 1223 - CHEMICAL PROPERTIES*.

Calcium chloride will remove the water from approximately the top 1" of the colloidal gel structure, making that layer void of approximately fifty percent of the water necessary for the chemical process of MOXIE 1800 SUPER-ADMIX. The only valid water vapor transmission tests which are acceptable and applicable are the same which are approved by ACI, ASTM, PCA, AASHTO or concrete associations and institutions, exclusive of the calcium chloride test.

The calcium chloride test is simply not valid in the early stages of the chemical process where MOXIE 1800 SUPER-ADMIX has been used. This test measures water only and can not differentiate between hydrating free mix water in new slab construction, residual water from adhesives, from recently removed flooring, or water vapor migration. Although irrelevant for flooring installations this test cannot determine whether water is being absorbed from the initial chemical colloidal gel process of MOXIE 1800 SUPER-ADMIX and will result in erroneous water vapor transmission rates.

All factors such as water to cement ratio, age of the slab, weather exposure conditions, temperature and humidity, are directly related to the results of a calcium chloride test and must be considered and accounted for prior to testing. The calcium chloride test is a desiccant, and by its very chemical nature can have a coefficient of variation ranging from 40%, in laboratory conditions, to as much as 140%, in field conditions.