

## **ASTM F1869 Moisture Testing Protocol: Abstract**

### Significance and Use:

Use this test method to obtain a quantitative value indicating the rate of moisture vapor emission from a concrete floor and whether or not that floor is acceptable to receive resilient floor covering. The moisture vapor emission rate only reflects the condition of the concrete floor at the time of the test. All concrete subfloors emit some amount of moisture in vapor form. Concrete moisture emission is a natural process driven by environmental conditions. All floor coverings are susceptible to failure from excessive moisture vapor emissions. The moisture vapor emitted from a concrete slab is measured in pounds. This measurement is the equivalent weight of water evaporating from 1000 ft<sup>2</sup> of concrete surface in a 24-h period. The calcium chloride moisture test has been the industry standard for making this determination and is a practical, well-established and accepted test of dynamic moisture. It will produce quantified results directly applicable to flooring manufacturer' specifications. The results obtained reflect only the condition of the concrete floor at that time.

### 1. Scope:

1.1 This test method covers the quantitative determination of the rate of moisture vapor emitted from below-grade, on-grade, and above-grade (suspended) concrete floors.

1.2 This quantity of moisture shall be expressed as the rate of moisture vapor emission, measured in pounds of moisture over a 1000 ft<sup>2</sup> area during a 24-h period.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices, and determine the applicability of regulatory limitations prior to use.

### 2. Referenced Documents

[C670](#) Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials

[F141](#) Terminology Relating to Resilient Floor Coverings

Mil Spec B-131H Type 1, Class III

### Recommended Work Practices

Index Terms: Anhydrous calcium chloride; moisture vapor emission rate; quantitative calcium chloride; resilient flooring; RMA referee test; ICS Number Code 91.100.30

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### **ASTM F1869; Calcium Chloride Testing:**

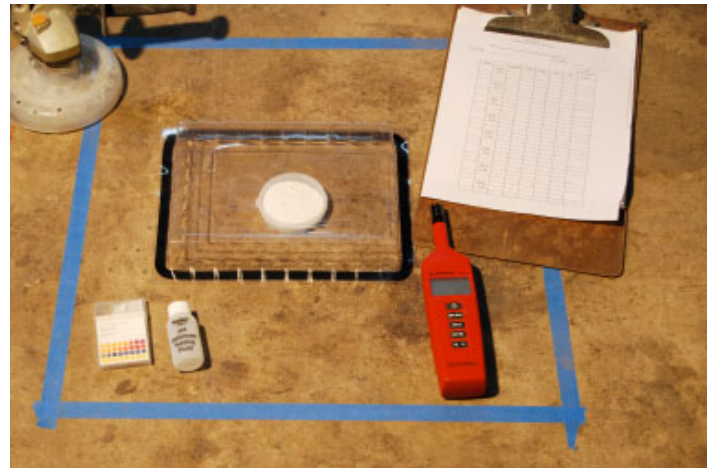
Concrete floor installers began using the Calcium Chloride moisture test back in the early 1940s to conclude when a new concrete slab was fit for floor coverings such as rubber

which saw an industry increase in the post WWII years. Promulgated by the Rubber Manufacturer's Association, the test became known as the RMA test (for Rubber Manufacturer's Assoc.). Over the ensuing decades, the RMA or Calcium Chloride test gained industry acceptance as a practical standard for testing moisture in concrete substrates. Although flooring contractors continue to use the Calcium Chloride moisture test, post-installation moisture problems are causing it to be questioned as to its validity as an accurate test method for today's high tech flooring systems.

The Calcium Chloride moisture test produced data based on MVER, the quantitative indication of how many pounds of slab moisture evaporated from 1000 square feet of concrete over a 24-hour period. The applicable industry standard for this test, ASTM F1869 defined the scope of Calcium Chloride testing: "*This test method covers the quantitative determination of the rate of moisture vapor emitted from below-grade, on-grade, and above-grade (suspended) bare concrete floors.*"

Although ASTM F1869 states that Calcium Chloride does not address all concrete safety concerns, manufacturers and installers declared that an industry-standard MVER of three pounds satisfied ASTM F 1869. At that point, it was safe to install floor covering over a concrete substrate.

Getting ready to perform the ASTM F1869 moisture test. Be sure to follow all procedures as outlined in the ASTM standard and as put forth by ICRI<sup>1</sup>.



If quantitative assessment indicates moisture vapor emissions, building trades experienced decades of qualitative difficulties with the Calcium Chloride moisture test. In fact, moisture-plagued concrete slabs certified by ASTM F1869 protocol proved to be a patterned and persistent challenge to the concrete flooring industry – so much so that industry professionals began to investigate the scientific integrity of the Calcium Chloride moisture test and came up with the following three problems:

1. **Surface Measurement:** Calcium Chloride measured only the top one-half to three-quarters-inch of the slab.
2. **Distorted Readings:** Calcium Chloride tended to *underestimate* the true moisture conditions at the high end of the moisture spectrum, while it tended

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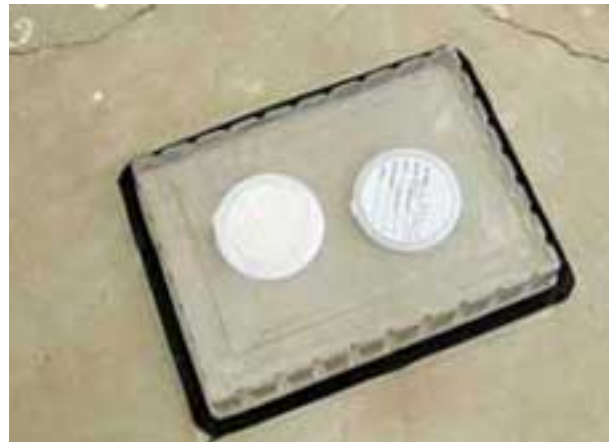
<sup>1</sup> ICRI, (International Concrete Repair Institute), [www.icri.org](http://www.icri.org)

to *overestimate* the moisture conditions of older slabs. Builders, then, made threshold floor covering decisions based on errant readings.

3. **Scope of Assessment:** Calcium Chloride failed to methodologically account for the fact that concentrated concrete moisture resides at greater depth than ever measured by the test. This led to continued moisture problems when that moisture eventually reached a covered concrete surface where they could no longer evaporate.

In light of this (and other) research, the ASTM made two changes to moisture measurement industry standards. First, it amended ASTM F1869 to remove the Calcium Chloride moisture test as a means of measuring lightweight concrete moisture. Second, ASTM created the F2170 standard that recognized in-situ relative humidity testing as an alternative integral assessment method.

The Calcium Chloride moisture test is a testing practice with a long lineage. It remains rooted in ASTM standard F1869 as the source of many tests tried. But due to a new era of technology in both testing and in flooring manufacture and challenges of moisture emissions-based testing the choice is becoming increasingly clear.



### **ASTM F1869 Recap:**

- Measured in pounds, water emitted from the slab in 1000 ft<sup>2</sup> over 24 hrs.
- Requirement: 1 test per 1000 ft<sup>2</sup> with a minimum of 3 tests.
- Space is climate controlled at the time of the testing.
- Test Area Surface should be ground clean and remain open for 24 hours prior to placement of the test.