

Precision & Bias Doesn't Exist for Concrete Moisture Testing?

What ASTM and your moisture consultant won't tell you about F2170 and F1869.

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What is Precision?

Precision is the closeness of agreement among test results obtained under set or prescribed conditions. Typically a discussion of precision is presented as a precision statement. The precision statement allows users of the test to assess the usefulness of the test in a proposed application. The statement offers guidelines pertaining to the degree of variability that can be expected among different test samples.

Two types of measurements are used to detail precision for a given test method.; commonly referred to as “repeatability” and “reproducibility”. These two criteria provide the boundaries for what is to be considered precise. “Repeatability” refers to the variance between test results gathered from a single lab or technician. “Reproducibility” addresses the variance that occurs from a single test results gathered from different labs or technicians.

What is Bias?

Bias is the systematic error that contributes to the difference between an average of test results and the generally “accepted reference” (i.e., correct) value. When bias is provided it's usually given as a correction factor such as a limitation of the equipment or offset to the known correct result. It's important to note that if a correct or “accepted references” value is not available or can not be established then bias cannot be established.

The Ruggedness Test

Knowing the variables associated with the results of a test is necessary in order to appreciate the accuracy of the test. Why do the test at all if you don't know if the results have any meaning. In order to determine these variables a ruggedness test is designed to highlight differences so improvements can be made toward accuracy. If an ASTM test has never been screened for ruggedness then technicians may never know the reliability for the result. Basically, you can not be completely certain or confident that your measurement was collected properly or that the ultimate value or answer has any meaning.

Why does it matter

Well, here is the problem with ASTM F1869 and ASTM F2170... precision and bias have NEVER been established. If you understand the above definitions for precision and for bias then you understand that it would be impossible to conduct a ruggedness test. Here is why, every concrete slab is different. In fact from point to point within a concrete slab the composition of that slab can change. No reference material, means no reference value, means no bias. At best, if the subject material has a high degree of variability then the test method used will also contain a high degree of variability.

Does this mean that moisture testing is a waste of time? Well, it certainly calls into question the level of confidence that a “decision maker” should apply to the results. How about manufacturers who tie their mitigation system or adhesive performance to moisture testing values? I've seen plenty of claims that our sprayable adhesive can handle 92% or 95% (depending on the salesman). Understand this isn't a measure of the glue but a measure of the moisture, as a gas, at a 40% depth of slab, with a test having no precision or bias established. Sounds like the definition of BS to me. How many claims of flooring failure have been supported using ASTM F2170/F1869? Millions of dollars have been risked and lost using ASTM tests as the sole foundation for determining the degree of mitigation (or mitigation at all). While ASTM has promoted these tests for their accuracy; a cottage industry (more like an army) of consultants has grown from the necessity for risk avoidance. All the while, the industry has quietly swept under the rug the fact that ASTM has no idea if the tests themselves possess any reasonable level of reliability.

ASTM F2170/F1869 should only be used as a conformational tool for the presence of elevated moisture in a more or less pass/fail assessment. That's much better then reading tea leaves but applying statistical data and then subsequently mapping “probable failure” as hot spots is completely worthless. In fact it's worse, you will only magnify the inherent lack of accuracy through the statistical exercise. Never rely on moisture data completely. Include historical performance of previous installations or in new slabs less than 6mos old expect to mitigate which can include any number of solutions best determined by budget and time constraints.