



CERAMIC TILE INSTITUTE OF AMERICA, INC.

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CTIOA REPORT 2006-3-30

SUBJECT: MOISTURE METER TESTING METHODS

By: CTIOA Moisture Meter Testing Committee

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Objective: To substantiate that the electronic moisture meters are a legitimate tool for detecting potential moisture problems.

Investigation:

1. List Brand Names of common moisture meters with manufacturer's contact information.

- a. Delmhorst Instrument Co.: www.delmhorst.com
- b. GE Measurement & Sensing Technologies: www.Protimeter.com
- c. Wagner Electronics: www.moisturemeters.com
- d. Tramex Ltd.: www.tramexltd.com

2. Types of Moisture Meters:

- a. Pinless – non-intrusive measuring.
- b. Pin – penetrates into softer material or only contacts surface.
- c. Hygrometer Probe – thermo-hygrometer attachment for intrusive testing of ERH (equilibrium relative humidity in material) and can also measure RH (relative humidity in air) of the local atmosphere.
- d. Wood Scale- calibrated for wood.
- e. Reference Scale – a general relative calibration.
- f. Gypsum Scale – calibrated for gypsum.
- g. Concrete Scale – calibrated for concrete, and reasonably accurate within a certain range on some meters. It can also be used to measure relative readings through brick, plaster, masonry, ceramic tile, and stone.
- h. Relative Humidity (RH) test method ASTM F-2170-02 - measures RH, temperature, and

dew point (recommendation 75% and 85% depending on permeability of product being installed) using hygrometry instrument to store data and download to computer for evaluation and charting.

i. Data-logging with computer interface.

3. Manufacturer's recommendations for use of the moisture meter relative to ceramic tile, stone and concrete.

- a. Delmhorst recommends the Accuscan Pinless electrical resistance meter to measure moisture in concrete and tile floors with $\frac{3}{4}$ " penetration.
- b. GE recommends the 3-in-1 Protimeter, using pinless radio frequency, to measure to $\frac{3}{4}$ " below the surface of concrete and ceramic tile.
- c. Tramex pinless Moisture Encounter Plus signal penetrates up to 1" into materials being tested for most coverings such as ceramic tile and concrete. The Tramex pin type Concrete Moisture Encounter measures electronic impedance to a depth of $\frac{1}{2}$ inch through parallel low frequency signals and is designed and calibrated for concrete. This meter will measure moisture content to over 6% for concrete.
- d. Wagner pin-free "Concrete Analog" Proline C575, uses Advanced electromagnetic wave technology for measuring moisture $\frac{3}{4}$ " down into concrete and ceramic tile.

4. List ways tool can be used for troubleshooting.

- a. **Quantitative vs. Qualitative** – Quantitative measurement is a precise unit of measure, such as pounds per thousand square feet, as in the Calcium Chloride Dome test, or the percent absorption, as in the ASTM C97 stone test, or the percent water absorption, as in the ASTM C-373 test for ceramic tile. Some moisture meters are calibrated to give an actual moisture content reading for materials such as wood or the material's wood moisture equivalent (WME) value. Qualitative measurement is a measurement using relative values that don't represent any particular unit of measure. For instance, the Protimeter measures up to 1000 units, and the Manufacturer claims that a reading over 200 is considered on the high side of moisture. The Tramex Concrete Moisture Encounter has a scale that measures a relative reading from 0 to 100. Since the values are relative readings, take a reading on an area that is known to be dry and then measure other suspect areas looking for the exceptionally high readings which would suggest an area of potential moisture migration.
- b. **Mapping** – Assuming there is a problem area, perform a moisture survey by taking methodical moisture readings throughout that area and non-destructively mark the readings on the area's surface. This can be accomplished by various methods such as placing a piece of blue masking tape on any area that has relatively higher moisture readings. Observe the marked survey area and look for a trend that may lead to or indicate the moisture migration source. This will be the spot to consider for intrusive testing. Photograph the area for documentation purposes.

5. Limitations of Moisture Meters

- a. **Point-in-time reading**. The moisture meter is only showing the relative moisture reading at a given point in time (real time field readings) relative to the various conditions (i.e. relative

humidity; temperature) at the point in time when the readings were taken. Actual readings may change as the climatic conditions change or the moisture source content changes.

- b. **Cannot measure non-conductive materials or metals.** Avoid measuring near metal corner beads and metal studs, which can affect the readings.
- c. **Cannot measure vapor transmission.** This measurement is not a substitute for a quantitative measurement, such as the Calcium Chloride (CaCl) Dome test.

6. Substantiate **how the Moisture Meter can be used** to demonstrate degree of relative moisture.

- 1. Using certain types of moisture meters allows for non-destructive (non-intrusive) testing and mapping (or moisture surveying) of a suspect area in order to determine the area's relative moisture condition. This is a relatively quick process and gives the Inspector a tool to evaluate and identify probable moisture sources and problem areas without intrusive testing. Using the moisture meter will assist the Inspector to determine the various areas of high moisture concentrations and determine the best areas to perform intrusive testing for substantiating problems and their source of moisture.

The preceding article was researched and written by CTIOA Inc. Moisture Meter Testing Committee.