

RAPIDRH^{4.0}EX

Fast, Accurate Moisture Test for Concrete Floors



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The Rapid RH[®] moisture testing system should be used on any project where moisture-sensitive floor coverings or coatings are to be applied over concrete slabs. Owners, general contractors, flooring contractors/installers, and testing companies need to be sure the tests they perform are accurate, repeatable, and available to all who need to know the current moisture condition of concrete slabs.

Rapid RH[®] significantly improves your project team's ability to instantly test and/or monitor the drying progress of a concrete slab without adding substantial cost to the project. The Rapid RH[®] enables you to take fast, accurate periodic readings that fully comply with industry standards. The Rapid RH[®] Smart Sensors are factory-calibrated and use CMOSens[®] technology to ensure the sensor's accuracy and fast equilibration.

Step 1: Drill the Hole

Correct hole depth and hole diameter are important in complying with the ASTM F2170 standard (see RH Testing Best Practices on page 11). For easy installation of a Smart Sensor, a uniformly round hole is also important. Drill a hole in the concrete slab to the required depth using a rotary hammer drill and a $\frac{3}{4}$ "-diameter masonry drill bit. Per the ASTM F2170 standard, drill the hole to a depth equaling 40% of the slab's thickness for slabs that are drying from one side, or 20% depth for a slab drying from two sides. For proper Rapid RH[®] 4.0 EX installation, be sure to position the drill perpendicular (90°) to the surface being tested.

TIP: If you do not have a depth gauge for your drill, mark or tape-off your drill bit to the correct depth setting.



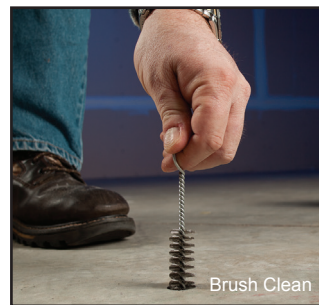
Step 2: Clean the Hole

Attach the vacuum attachment to the straight extension of a shop vacuum cleaner hose* and thoroughly vacuum up the dust in and around the hole.

Next, insert the wire bristle brush into the hole. Turn the brush several times to loosen pulverized concrete from the walls of the hole. Vacuum again. Repeat this step twice to ensure no loose concrete particles remain in the hole.

IMPORTANT: Correct Diameter and Hole Uniformity: Use the $\frac{3}{4}$ "-diameter section of the black insertion tool as a diameter and uniformity gauge to ensure a correct and uniformly round hole. If the $\frac{3}{4}$ "-diameter section of the tool will not go easily into the hole, the drill bit may be out-of-spec (worn out, etc.) or the hole may not have a uniform diameter from top to bottom. Not performing this step may cause damage to a Smart Sensor when attempting insertion.

**The vacuum attachment may require an adapter depending on vacuum model.*



Step 3: Insert the Smart Sensor



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Directly out of the package, the Smart Sensor is 1.6" in length or 40% of a 4" thick slab. ASTM F2170, Section 10.2 states: "Slab drying from top only (example: slab on ground with vapor retarder below, or slab on metal deck): 40% depth. Slab drying from top and bottom (example: elevated structural slab not in metal deck): 20% depth)." Each Smart Sensor pack includes a number of short (0.4") extensions that can be inserted into the Smart Sensor barrel to enable use in thicker slabs. Adding one insert extends the Smart Sensor barrel length to 2" for testing 5"-thick slabs to the 40% depth. Keep any unused extensions for future jobs. If needed, you can use additional extensions to increase the length of the sensor barrel for thicker slab applications.

In summary, add one extension insert to a Smart Sensor barrel for every 1" increase in slab thickness over 4" to meet the 40% depth requirement. The extension inserts make the Smart Sensor's usage flexible for varying thicknesses of concrete.

Now, for all installations, take the Smart Sensor directly out of the package, and with no extensions installed, insert the Smart Sensor into the hole using the insertion tool with orange cap placed atop for ease in pushing down on the insertion tool. Push down on the insertion tool with cap to insert the Smart Sensor down inside the hole, "seating" it

at the bottom (**review the IMPORTANT hole diameter and uniformity comment under Step 2**). Under no circumstances should you tap or hammer the insertion tool to attempt to insert the sensor. Doing so may cause damage to the Smart Sensor and will void any warranty. At this point, for 1.6" depth holes (40% of 4"), insert a protective cap into the top of the Smart Sensor base sleeve, and push down to the concrete surface. Or, if testing in thicker slabs, assemble the proper number of extensions, and with the protective cap inserted into the topmost extension, push down the extensions and cap into the hole to the concrete surface, until fully seated on the Smart Sensor, completing the installation.

Remember: Correct depth of hole is critical to adhere to the ASTM F2170 test method. See RH Testing Best Practices section on page 11.

Caution: NEVER use your reader device (either the Smart Reader or the Easy Reader) to install the Smart Sensor.

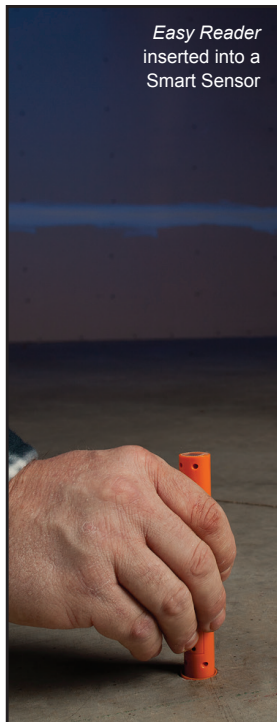


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Step 4: Take Readings

When ready to take readings, remove the orange protective cap from the Smart Sensor, and ensure no dust or debris are inside. Insert the Rapid RH[®] *Easy Reader* firmly until it comes fully into contact with the bottom of the Smart Sensor. Hold the *Easy Reader* in place until the first relative humidity reading appears on the screen (about three seconds), then immediately remove the *Easy Reader*. The display will toggle back and forth between the relative humidity value (when the cursor is next to the %RH symbol) and the temperature value (when the cursor is next to the °F or °C symbol*). Once the *Easy Reader* is removed from the Smart Sensor, the readings from that Smart Sensor will continue to display for approximately 5 minutes or until the *Easy Reader* is reinserted into another Smart Sensor. After removal, wait at least 5 seconds before inserting the *Easy Reader* into another Smart Sensor. Replace the *Easy Reader*'s plastic end caps when not in use.

In most cases, one hour after installation, the Smart Sensor will generally give a reading within 3-5% RH of the reading you would see after the ASTM-required 24-hour mark. Just remember to follow the ASTM F2170 procedures pertaining to equilibration time.

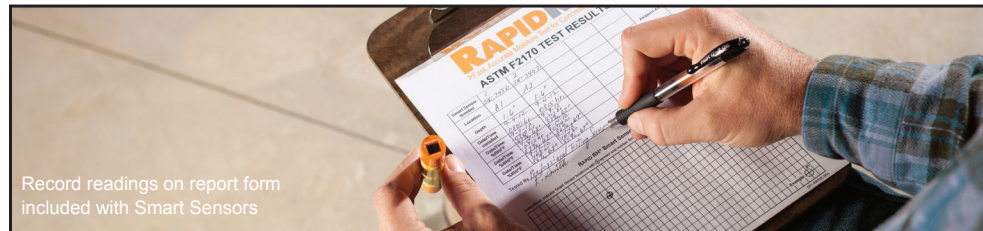


Easy Reader
inserted into a
Smart Sensor

After the initial equilibration has been reached per ASTM F2170 requirements, subsequent readings can be taken instantly (see ASTM F2170 Best Practices section at the end of this manual). If future testing is needed, replace the protective cap by snapping it back into the Smart Sensor.

Record readings on the enclosed report form in the spaces provided for information required by ASTM F2170, including the date, time, %RH and temperature. The grid at the bottom of the report form can be used to record test-hole locations. Each Smart Sensor is serialized on the outside of the Smart Sensor. Extra copies of the report form and an ASTM F2170 checklist can be downloaded at www.rapidrh.com. You can also visit www.rhspec.com to visit links to various finished flooring manufacturers' installation guides and their RH thresholds. **For any additional questions related to what RH levels are appropriate, please contact the manufacturer of the product to be applied to the concrete slab.**

**Rapid RH[®] Easy Readers that display temperature in Celsius can be identified by their blue labels and blue plastic protective caps.*



Record readings on report form
included with Smart Sensors

Step 5: Encapsulate Smart Sensor

If future readings are no longer needed (for example, when ready to apply a floor covering or coating), place the stainless steel metal disk over the Smart Sensor and skim-coat the hole with a cementitious patching compound compatible with the flooring manufacturer's installation instructions.



Troubleshooting

Easy Reader LCD display shows “ER”: The Rapid RH® *Easy Reader* may not be properly communicating with the Smart Sensor for the following reasons: (1) The *Easy Reader* was not in contact with the Smart Sensor long enough. Hold the *Easy Reader* in the Smart Sensor until the first relative humidity reading appears on the screen, then remove. (2) Debris is blocking proper contact. Check the Smart Sensor housing for any debris.

Replace the batteries: The *Easy Reader* comes with two AAAA alkaline batteries. To replace the batteries, open up the battery cover by removing the one battery cover screw with a jeweler's Phillips screwdriver. **DO NOT OPEN UP THE FULL BODY OF THE EASY READER AT ANY TIME.**

Use Conditions

The Rapid RH® 4.0 EX is intended for interior use only. It is imperative that the interior application area be protected from weather elements such as rain and snow to prevent water intrusion. The Rapid RH® 4.0 EX is not to be used in concrete less than 28 days old (see RH Testing Best Practices section on page 11). **Follow ASTM F2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs using in situ Probes¹.**

NIST² traceable accuracy:

Readings at +/- 1.8% RH from 10% to 90%

Avoid severe cold or hot storage environments (i.e. vehicles)

¹Available from ASTM International, P.O. Box C700, West Conshohocken, PA 19428-2959, www.astm.org

²National Institute of Standards and Technology

RH Testing **Best Practices**



New concrete slabs should be allowed to cure and dry as long as possible before performing any type of moisture testing. Even though some methods state to wait at least 28 days after a concrete pour before setting up test instruments, it is often prudent to wait much longer*. Minimizing the amount of time between initiating any moisture testing on a slab and obtaining the final results per testing standards increases the chance that the test results will more accurately indicate the condition of the concrete around the test location.

On all slabs (new and old), it is recommended to do test sampling, prior to complete testing, according to the ASTM F2170 standard's requirement, in regards to the number of test sites. It is good practice to initially only setup a portion of the test locations ultimately required and use those few locations as a means to indicate when the rest of the tests should be performed. If extended periods of time have

elapsed between initially setting up test locations and obtaining the final results per testing standards, then it is good practice to set a few new tests to confirm and validate what the older test locations are currently indicating.

Additionally, it is good practice to let the sensors lay on the slab for about 10 minutes or so prior to installation, until they reach temperature equilibrium with the slab to prevent any dew point issues that might cause condensation on or around the sensor (NOTE: Wagner has not heard of any reports where this has actually been an issue, but it is still a best use practice).

For more information on relative humidity in concrete floors and moisture testing, go to www.cement.org to order the book "Concrete Floors and Moisture" by Howard Kanare.

**The drying rate of standard Portland cement-based concrete slabs has been studied extensively. For slabs drying from one side, a very 'general' rule-of-thumb as a drying rate is approximately 30 days of drying time for each inch thickness of the slab for the relative humidity level to reach somewhere in the 85%-90% range. This is only a very rough approximate guideline, and drying times can, and often are, much longer if good drying conditions (closed-in space, environmental controls on, etc) are not present. Additionally, other factors such as the densifying of a slab surface from heavy power-troweling, additional water added to the concrete at time of pour, rain or construction water sitting on a slab, etc, can drastically affect the drying time of a concrete slab.*

Service Temperature **Adjustment Tool**

The ASTM F2170 standard mandates measuring RH at service conditions. But your project's timeline may be such that you'd like to be able to estimate RH before reaching service conditions.

Wagner Meters offers a simple-to-use, science-based RH estimator tool that adjusts for service temperature. The easiest way to use this handy tool is with the Rapid RH® DataMaster™ app, available for both iOS and Android devices. The estimator tool is also available online at www.wagnermeters.com/rhtemp where you can also watch a short introductory video for more information.

Simply obtain the RH and temperature readings of your concrete slab with your Rapid RH®, then use the DataMaster™ app, the online estimator tool, or download the service temperature adjustment table to get an estimated RH value at service conditions.

Note: *The service temperature adjustment tool was developed by CTLGroup, a wholly-owned subsidiary of the Portland Cement Association.*

Wagner Meters Limited **Warranty**

Wagner Meters warrants the Rapid RH® 4.0 EX Smart Sensor and Rapid RH® *Easy Reader* products against defects in material and workmanship for one (1) year from the date of purchase, subject to the following terms and conditions:

Wagner Meters' liability under this warranty shall be limited, at Wagner Meters' option, to the repair or replacement of products or any part thereof, which are demonstrated to be defective. To exercise this warranty, customer must send product back with a copy of the proof of purchase date, the reason for return and, if Wagner determines it is under warranty, Wagner will replace the customer's product. This limited warranty does not apply if the product has been damaged by accident, negligent handling, misuse, alteration, damage during shipment, or improper service. Wagner Meters shall in no event be liable for any breach of warranty or defect in this product, which exceeds the amount of purchase price of the product.

Relative humidity is one of many factors necessary for construction decisions. Wagner Meters does not assume responsibility for any particular construction decision based on the readings of this instrument and does not guarantee any specific construction results.

The method of use of this instrument and the interpretation of the readings are beyond the control of the manufacturer. Wagner Meters cannot accept responsibility for any loss, consequential or otherwise, resulting from the use of the Rapid RH® 4.0 EX and its accessories.

The Rapid RH® 4.0 EX Smart Sensor should be used before the specified expiration date included in the certificate of calibration. If the Smart Reader/*Easy Reader* does not appear to function properly for any reason, contact Wagner Meters for remedy.

This warranty is in lieu of all other warranties, whether oral or written, express or implied. Any implied warranties, including implied warranties of merchantability and fitness for a particular purpose, are excluded. If this product is not in good working order as warranted above, the customer's sole remedy shall be repair or replacement as provided above.

This warranty is personal to the customer purchasing the product from Wagner Meters or from its authorized distributors and is not transferable.

The agents and employees of Wagner Meters are not authorized to make modifications of this warranty or additional warranties binding on Wagner Meters. Accordingly, additional statements, whether oral or written, except written statements from an officer of Wagner Meters, do not constitute warranties and should not be relied upon by the customer.



WAGNER[®]
METERS
Unleash Your Expertise

**For more information on relative humidity testing
and to order online go to**

www.RapidRH.com

Wagner Meters

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Rogue River, OR 97537

Worldwide Toll-Free: (844) 786-8642

The RAPID RH⁺ 4.0 EX is registered under U.S. Patent 7231815, 8047056 & 9032791.

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