

# Moisture Testing in Concrete Using in-situ Probes

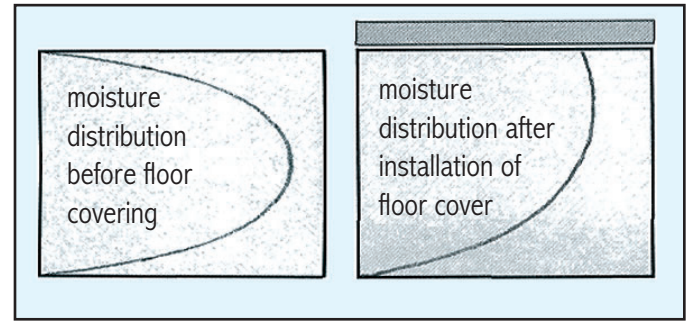


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# Using the RH BluePeg System to avoid Floor Covering Failure

The RH BluePeg is a relative humidity and temperature probe, designed to be placed inside a hole liner (sleeve), which has been inserted into a predrilled hole in the concrete test area. The cap is used to seal the sleeve to allow acclimation to the moisture released by the concrete inside the hole. To conform to the latest ASTM F2170 standard, the sleeve should be in the concrete and sealed from the outside atmosphere for 24 hrs before taking readings. Lignomat's RH BluePeg probe and the sleeves comply with the latest ASTM F 2170 standard.

So far, the Calcium Chloride test has been commonly used to determine concrete moisture. It has been proven, found the in-situ probe test is more reliable. One reason is that the Calcium Chloride test is mostly a surface test and not a core test, and in some cases moisture will remain undetected in the core. Another reason is the dependability of the Calcium Chloride test on ambient conditions. A floor will evaporate more moisture and give higher results on a dry day than on a humid day.



It has been a common practice to use pin or pinless meters to measure the moisture in concrete slabs. The NWFA recommends any of the pin or pinless meters only as qualitative testing tools. The in-situ probe method or the Calcium Chloride test are recommended, in order to determine if a concrete slab is dry enough to put a wood floor down. When selecting a test method, follow the installation guide lines of the floor manufacturer.

## Preparations

**Test Site Conditions before Test starts:** To obtain relevant test results the concrete floor slab should be at service temperature and the air space above the floor should be at service temperature and at service relative humidity for at least 48 hrs before drilling the holes.

**Number of Tests per locations:** Recommended are 3 tests for the first 1000 ft<sup>2</sup> (100m<sup>2</sup>) and at least one additional test for each additional 1000 ft<sup>2</sup> (100m<sup>2</sup>). Choose test areas where high moisture levels are suspected. The non-invasive scanning meters Ligno-DuoTec BW or the Ligno-VersaTec can also be useful to detect high and low moisture areas.

**Measuring Depth:** The standard sleeve from Lignomat is designed for 4-5" thick slabs drying from the top only. Measuring depth does not need to exceed 40% of the slab thickness. For 4-5" thick slabs drying from both sides, the required measuring depth does not need to exceed 20% of the slab thickness. The standard sleeve can be shortened accordingly and RH top extenders are available to cover RH probes extending above the sleeve. For thicker slabs 3" sleeves are available with RH depth adapter for easy cable connections. Contact Customer Service at 1-800-227-2105, if you have any questions.

**Preparing Test Hole, Placing Sleeve and Cap:** Once the location has been determined, drill one hole for the first sleeve with a carbide drill bit 5/8" (16mm) in diameter using a rotary hammer drill (observe all safety precautions as outlined by the manufacturer). To accommodate the sleeve, the hole should be 1 15/16" (50mm) deep. Take extra care in drilling straight down.

Clean the area around the hole with a vacuum cleaner and vacuum the dust out of the hole. Next, use a brush to remove loose particles in the hole and vacuum the hole clean. Repeat brushing and cleaning two more time, with vacuuming being the last step before inserting the sleeve. Immediately after cleaning, insert the sleeve. To protect the outer ring, put the cap on the sleeve before using a piece of wood, mallet or hammer to push the sleeve into the hole. Make sure the outer ring of the sleeve is flush with the floor and the cap is covering the sleeve. **After all steps are finished**, drill the next hole for another sleeve. If there is time to do a pretest, only drill the holes necessary for the pretest.

## Measurements

The RH in-situ probe measurement is regulated by the ASTM F2170 standard guidelines. Following the ASTM F2170 guidelines, the sleeves have to be in the concrete for 24 hrs and the RH probes have to be acclimated before test results are valid and can be documented. If waiting times are cut short the resulting measurements could be too high or too low.

### Test Procedure

The ASTM F2170 standard requires the sleeves to be set in the concrete slab and capped off for 24 hrs before recording final readings. If the sensors are inserted after 24 hrs, they still need sufficient acclimatization time to show true readings. If the acclimatization time is cut short, readings could be too low. In your report note: times when the sleeves are placed, the sensors are inserted and the readings are taken. If not enough sensors are on hand, the sensors can be leap-frogged and used to measure the remaining holes, an advantage of removable sensors.

Make sure that the temperature in the testing area is stable and does not drop at night to avoid condensation in the test hole.

To avoid waiting periods beyond the 24 hrs required by ASTM F2170, \*\* you can insert the RH Probes within 1 hour after the sleeves have been set, to allow the heat from the drilling to dissipate. Wait 24 hrs before taking the final measurements and documenting the readings. Drill only as many holes as are necessary for one test series. After the initial 24 hours the probes can be leapfrogged to the remaining holes. The leap frogged RH probes also need to be acclimated for several hours to show true readings.

Measurements taken 1 hour after insertion of probes are a good indication of the moisture condition. If the measurements after 1 hour are already above the acceptable RH range, the slab has failed.

The same probe within a test series can be measured several times. Make sure the hole is closed with the cap and the RH Probe is not removed from the hole inbetween readings.

We recommend using a different RH probe to measure ambient conditions.

\*\* The manufacturer of the sensing element recommends not to expose the sensors over an extended period of time to high relative humidity (over 95%). Please check if those high humidity conditions exist inside the sleeves and make sure the sensors are not left for hours in these conditions.

## Obtaining Measurements

- Connect RH BluePeg Probe to meter via RH cable or RH Adaptor.  
(RH meters: Ligno-Tec RH, Ligno-DuoTec BW or Ligno-VersaTec)
- Press the READ button. RH, Temp, DewT, GPP and the RH probe number appear on the left side of the display. The corresponding measured value appears on the right side of the display.
- Press up or down keys to toggle between RH, T, GPP, DP.

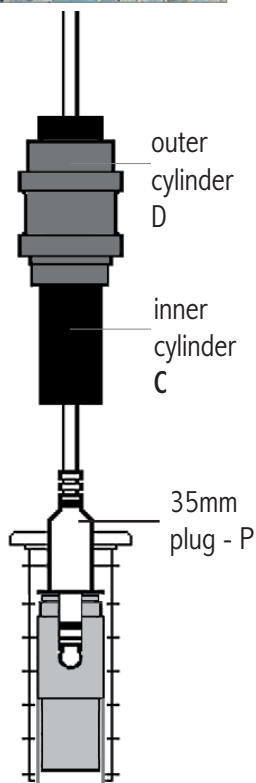
### 1. Set RH Probe

Remove blue cap and drop RH BluePeg into the sleeve. Tab on top of the probe to make sure the probe is situated correctly at the bottom. Use red cap to mark sleeve with RH BluePeg probe inside.



### 2. Connect Cable to RH Probe for Measurements

Remove red cap. Pull cable-end-cover back and connect 3.5mm plug (P) to probe (see drawing). Do not remove the RH probe from the sleeve, this disturbs the acclimation of the sensing element and the climate in the hole. -- Push outer cylinder (D) into the lip of the sleeve and push inner cylinder (C) down towards the probe. If the inner cylinder already touches the top of the probe, the cylinder will not move down any further. Connect cable to meter and take a reading.



### 3. Remove Cable

Hold both cylinders in place with one hand and pull the end of the cable about 1" towards you. This disconnects the cable from the probe. Now you can remove the cable-end-cover and the RH BluePeg probe will stay in the sleeve.



### 4. Remove RH Probe from Sleeve

After removing the cable as described above, simply connect the cable again and pull the RH probe out of the sleeve.



After a test series is finished, all RH BluePeg probes should be removed. The sleeves are unusable after the test. The fins which seal the sleeve are rubbed off, if you manage to remove a sleeve. Remove the lip of the sleeve and close the hole with a cementitious patching compound to produce a smooth surface.

Once a test series is finished, the same holes should not be used for another test series at a later time.



**Maintenance:** After testing is completed, the RH BluePeg probes should be stored in the original packaging and kept in a dry location. We recommend 20% to 60% relative humidity and 50°F to 120°F (10°C to 50°C). Visible dust should be removed.

## Specifications and Calibrations of RH BluePeg Probes

Range **RH:** 0% to 99.9% Range **T:** 5°F to 160°F (-15°C to 70°C)

Accuracy Relative Humidity:  $\pm 2\%$  for 10% to 90%, up to  $\pm 3\%$  below 10% and above 90%.

Accuracy Temperature:  $\pm 0.5^\circ\text{F}$  for  $32^\circ\text{C}$  to  $120^\circ\text{F}$ ,  $\pm 1^\circ\text{F}$  for  $5^\circ\text{F}$  to  $32^\circ\text{F}$  and  $120^\circ\text{F}$  to  $160^\circ\text{F}$   
 $\pm 0.3^\circ\text{C}$  for  $0^\circ\text{C}$  to  $50^\circ\text{C}$ ,  $\pm 0.5^\circ\text{C}$  for  $-15^\circ\text{C}$  to  $0^\circ\text{C}$  and  $50^\circ\text{C}$  to  $70^\circ\text{C}$ .

The RH Blue Peg uses a single microchip calibrated to NIST standards. The microchip manufacturer assures long term calibration stability.

According to ASTM F2170 probes should be checked within 30 days before use. Salt solution for 75% is allowed to be used during the test procedure. Furthermore, the RH probes should also be returned to the manufacturer once a year for calibration checking. During the one-year warranty period, Lignomat offers to check the calibration free of charge three times.

## Accessories



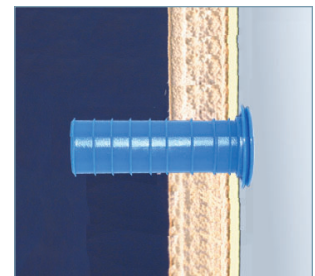
RH Adapter. Connects RH Probe directly to RH meter. Use as T-Hygrometer.



Standard sleeves 1.8" long with caps for in-situ probe testing.



Sleeves 3" long with caps for in-situ probe testing.



Sleeve with RH probe to measure moisture in wall cavities with or without insulation.



RH BluePeg probes for concrete test and relative humidity of air.



RH-CC cable with sleeve-seal-plug to connect RH probe in sleeve to RH meter.



RH Top-Extenders. Covers Probe when sleeves are cut shorter than 1.5".



RH Depth-Adapter plugs into RH probe for easy cable connection in sleeves over 2.4" long.



Vacuum attachment to remove dust from freshly drilled holes before inserting sleeves.



Brush to clean 5/8" holes after drilling.



Calibration check salt solution for 75% RH. Complies with ASTM F2170 standard.



**3 RH Meters from Lignomat:**

Ligno-Tec RH: RH only  
 Ligno-DuoTec BW: RH - pinless  
 Ligno-Versatec: RH - pin - pinless

## Readers for Lignomat RH BluePeg Sensor

- Ligno-Tec RH: A, B
- Ligno-DuoTec BW: A, B, C, D
- Ligno-VersaTec: A, B, D, C, D plus Pin Mode



**A** Measurement of relative humidity, temperature and dewpoint, GPP of air.



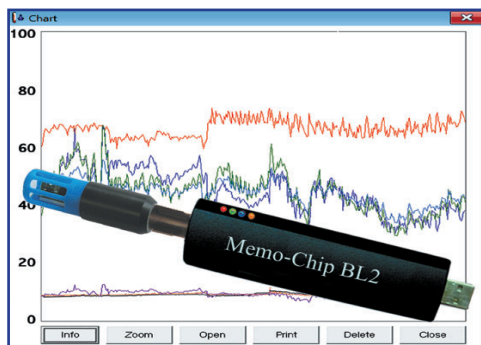
**B** In-situ concrete test with RH BluePeg probe and Ligno-Tec RH meter.



**C** non-invasive meter for concrete



**D** non-invasive meter for wood



BL2 is a data logger for Lignomats RH Probe. The data logger can be used to keep track of ambient conditions in the test location. Or, can be connected to the RH probe in the sleeve to record humidity changes and acclimation.