Guidance Note on Moisture Measurement – In-Situ Probe Method

Summary

Recommended changes to guidance on the in-situ probe method included in Annex A of BS8201; BS8203 & BS5325.

Acceptable upper limit

Current guidance states 75% as an acceptable upper limit for slabs and screeds to accept a floor covering, following guidance for the surface humidity box method.
New guidance states 85% as the upper limit and demonstrates that readings taken using the in-situ method should be approx. 10% higher than readings taken with surface humidity box method.

Time required to perform the test

Current guidance states 72 hours are required to achieve equilibrium and therefore record the correct reading.
New guidance states 24 hours is sufficient to achieve equilibrium, based on evidence of testing performed by ASTM in 2014 with the intention of reducing this same time period in ASTM F2170.

Minimum thickness of screed

Current guidance makes no mention of a minimum thickness.
New guidance states a minimum screed thickness of 10cm should be required to perform this test and recommends using surface humidity box method for screeds thinner than 10cm.

Knowledge of screed thickness

Current guidance states that the in-situ probe sleeve should be placed at precisely 40% of the overall thickness of the slab or screed to achieve accurate results (or 20% of overall thickness when slab is drying from both sides. i.e upper level).
New guidance elaborates further in this regard and states that if the precise depth of slab or screed is unknown then this test method should not be used and surface hygrometer box method should be used instead.

Overview

The in-situ probe method of testing the ERH% (Equilibrium Relative Humidity) within a slab or screed was introduced to British Standards in 2011 with the update of BS 8201 – Code of practice for installation of flooring of wood and wood based panels.

The test originated in Scandinavia circa 1996 and was adopted in the USA circa 2002, after which it was adopted by many more countries who follow ASTM Standards.

The growing popularity of the test worldwide seems to have been the main reason for adoption into the BS Standards. However, understanding around the procedure for use, which was described in BS 8201 (and

subsequently transferred to BS 8203 & BS 5325) has evolved and this note is intended to provide further guidance.

At the same time, recent changes in standards in the USA and in Germany have highlighted the need to look at two more recommendations to the procedure for in-situ RH measurement:

1. *The time period between drilling of the hole and taking the final result is currently recommended as 72 Hours while ASTM F2170 has reduced the time to 24 hours based on significant testing.*
2. *DIN EN 17668 originating from Germany, released in 2021, specifies that the in-situ method should only be used for screeds with a minimum thickness of 10cm due to the difficulty of performing the test at levels just below the surface.*

Difference in reading the surface RH vs RH at depth

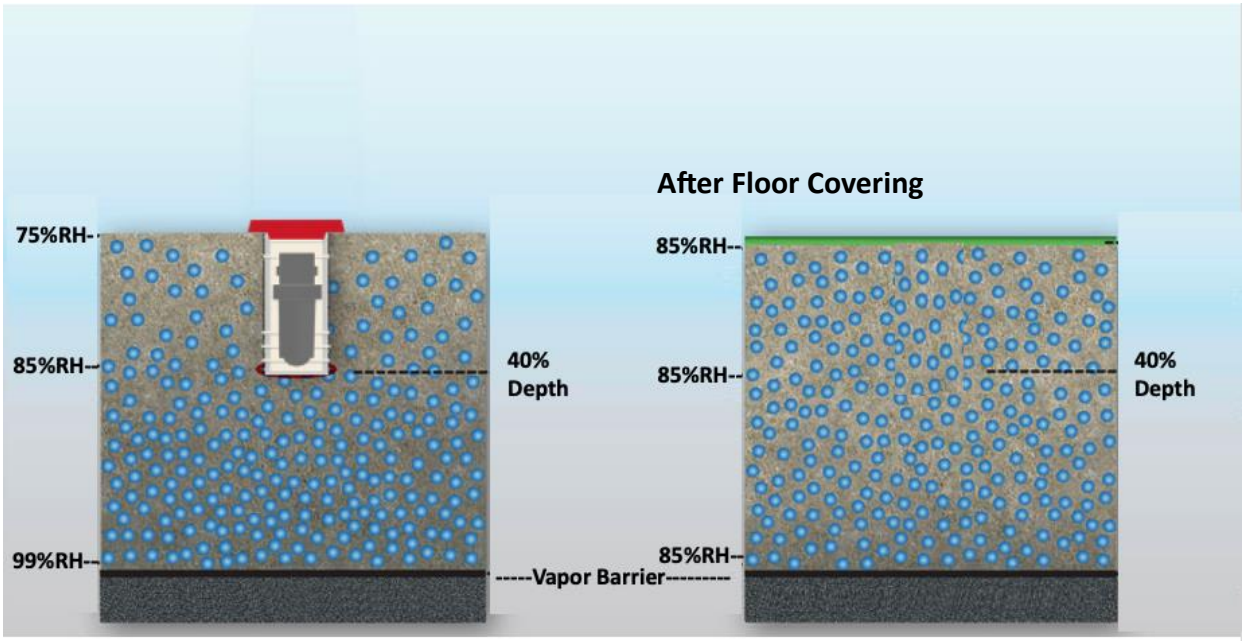
Annex A of BS 8201 states that:

"*Experimental evidence has shown that when the measured relative humidity falls to 80% RH, the water has evaporated from the coarse pores and the screed is sufficiently dry to allow installation of resilient floor coverings. If some allowance is made for errors in determining the relative humidity, the concrete should be considered dry when the relative humidity falls to 75% or less. For these reasons, the hygrometer probe or sleeve method for dampness measurement are recommended over and above other methods*."

This figure of 75% is carried over from the original version of the standard, which described only the Hygrometer Box method and the figure of 75%. Originally established as the ideal moisture condition of the surface of the slab or screed to ensure a good installation of most floor coverings. However, the recommendation does not take into account the fact that the two test methods (Hygrometer Box & Hygrometer Sleeve) are testing two different sections of the slab or screed, i.e. the Hygrometer Box tests the surface condition while the Sleeve Method tests the condition within the slab/screed, and it follows that two different measurement results will be expected when testing in the same location at the same time:

When 75% is achieved at the surface, then 85% is expected within the slab/screed.

To illustrate this point it is useful to understand the purpose of the Sleeve Method and what it is telling us about the condition of the Slab/Screed. When testing a ground floor slab/screed, the sleeve should be placed at a depth of 40% of the overall thickness, while on an upper floor the depth is 20% of the overall thickness.



The reason for these particular depths is that these have been found to be the precise locations which will show us what the moisture condition of the entire slab/screed will look like after a floor covering has been installed and the moisture has equalised throughout.

If a measurement is taken from a sleeve which is placed deeper or less deep into the overall thickness, then the reading will be higher or lower respectively and will give false results, therefore it is very important to know the overall thickness of the slab/screed to ensure this test method provides accurate measurements.

Note 1: Due to the important difference of depth of measurement between slab drying from one side only vs drying from both sides (i.e. 40% or 20% of the overall thickness) it is vital to know whether the slab or screed has the ability to dry from only one side or from both sides.

Note 2: If the exact thickness of the base is in doubt and not possible to establish, a surface hygrometer moisture test should be conducted as statute and any results obtained from in-depth test equipment should be completely ignored.

In other regions of the world, where the sleeve method is in use, such as the USA, readings of 85% are the standard upper limit for flooring products which do not have a high moisture tolerance. Swedish standard RBK-auktoriserad fuktkontrollant states: "*The RH in concrete is often in the range of 85 - 95% when a surface layer can be applied*." And expresses the need for a difference as: *"During the drying of newly cast concrete, the surface quickly reaches the same RH as the surrounding air. Further into the material, the RH is higher. The RH thus varies over the cross-section of the concrete.",* while Norwegian Standard NS 3511:2014 provides critical moisture thresholds of 85%-90% for most floor coverings.

<u>72hrs vs 24hrs</u>

At the time of the update of BS8201:2011 the other standards, in Scandinavia and the USA, all specified 72hrs as the required length of time to wait before placing the RH probe into the RH sleeve, after drilling the hole.

Since then ASTM have performed considerable precision and bias testing which demonstrates that readings taken after 24hrs are the same as those taken after 72hrs and therefore the time period can be reduced.

The waiting time is intended to allow sufficient time for heat from the drill to dissipate. This has been found to be within 24hrs.

<u>Minimum thickness of 10cm</u>

The recent publication of DIN EN17668 includes the recommendation: "*The hygrometer sleeve method is restricted to be used for mineral substrates with a minimum thickness of 10cm only*". This is also recommended by this Guidance Note as a suitable restriction.

<u>Conclusion / Summary</u>

The evidence and results from extensive testing demonstrate that when a reading of 75% RH is achieved at the surface of a slab or screed (deeming the substrate to be in a suitable condition to lay for most floor coverings) a reading taken at 40% of the depth of a slab/screed, using a sleeve and probe method, can be expected to give a reading of 85% RH. This will again deem the slab/screed to be in a satisfactory moisture condition to install most textile, resilient or timber floorcoverings. Min slab thickness to which the test can be applied is 10cm only.

Manufacturers recommendations should also be considered.

REFERRAL SECTION:

ASTM F2170-18 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes1.

BS 8201:2011 Code of practice for installation of flooring of wood and wood-based panels.

BS 8203:2017 Code of Practice for the Installation of Resilient Floor coverings.

BS 8204-1:2003 Screeds, bases and in situ floorings. Concrete bases and cementitious levelling screeds to receive floorings - Code of practice (+A1:2009).

DIN EN-17668:2022 Test methods for the determination of corresponding humidity of mineral substrates.

NS 3511:2014 Måling av relativ fuktighet (RF) i betong.

RBK-auktoriserad fuktkontrollant - https://www.rbk.nu/ladda-ned/fuktmatningsmanual__36