

Introduction

GE Protimeter depth-selectable *humidity sleeves* are designed for use with the GE Protimeter *Hygrostick* humidity probe. The *Hygrostick* probe may be used with the GE Protimeter *Hygromaster* or *MMS* instrument and the GE Protimeter *Humilog* monitoring system. Humidity sleeves improve and simplify the process of measuring the moisture level of solid walls, floors and structures in terms of *equilibrium relative humidity (ERH)*. The sleeves are placed into pre-drilled clearance holes in the material under investigation.

Note: *This method can be used to carry out the ASTM F2170 Standard test method for determining relative humidity in floor slabs using in situ probes.*

Humidity Sleeve Features and Components

The *humidity sleeve* (bottom item in photo at right) is an impervious plastic tube of 0.469 in. (12 mm) nominal diameter and 2.75 in. (70 mm) length, with a flange and sealing cap at one end. The tube is divided into four sections that are separated by sealing rings. Each section has two recessed areas that can be “knocked out” to create windows through which air can circulate. Isolated humidity readings can be taken at four specific depths of 3 in., 4 in., 5 in., and 6 in. (75 mm, 100 mm, 125 mm, and 150 mm) below the surface by knocking out only the windows down to the appropriate section.



The *humidity sleeve tool* (top item in photo above) is used to knock out the windows and to drive the sleeve fully into the pre-drilled clearance holes. The tool should always be used for this purpose to ensure that the sleeve is not damaged during placement.

Humidity Sleeve Pre-Placement Preparation

ASTM F2170 requires moisture measurements to be taken at 40% of the depth of the slab. For a 7 in. (175 mm) slab, this corresponds to the bottom hole in the humidity sleeve; for 5 in. and 6 in. (125 mm and 140 mm) slabs, this corresponds to hole 4 in the humidity sleeve; for 3 in. and 4 in. (75 mm and 100 mm) slabs, this corresponds to hole 3 in the humidity sleeve. After determining the required depth, use the humidity sleeve tool to remove all of the windows down to the selected hole (see photo at right).



If isolated measurements in the 1/2 in. (13 mm) to 2 1/2 in. (64 mm) depth range are required, use the sleeve tool to knock out both windows in the appropriate section only. If isolated measurements are required at depths exceeding 2 1/2 in. (64 mm), use the sleeve tool to knock out the window in the base of the sleeve (see photo at right).



If a measurement is required across the entire length of the humidity sleeve, use the sleeve tool to knock out all of the windows in all four sections of the sleeve.

Note: *Cutting off the bottom of the humidity sleeve at the required measurement depth can reduce the time required to reach equilibrium.*

Humidity Sleeve Placement Procedure

Drill 12 mm (15/32 in.) diameter clearance holes at the measurement points to a depth of at least 85 mm (3 1/4 in.). Then, remove all waste material from the holes.

Note: *If you have cut the humidity sleeve to the required length, you need only drill the clearance holes to that depth (50 mm (2 in.) minimum depth).*

Insert the humidity sleeve tool into the humidity sleeve (see photo at right), and drive the humidity sleeve into the clearance hole with a hammer (see photo below). When installed correctly, the underside of the humidity sleeve flange should be touching the surface of the slab.



IMPORTANT: *ASTM F2170 requires three humidity sleeve tests for the first 1000 ft³ (28 m³) and at least one humidity sleeve test for every additional 1000 ft³ (28 m³) thereafter.*



Taking Measurements in Humidity Sleeves

To take measurements with humidity sleeves, complete the following steps:

IMPORTANT: *Remove the tapered gray seal prior to inserting the Hygrostick into the sleeve. The Hygrostick should slide all the way into the sleeve, leaving only the thicker connection end exposed.*



1. Push a GE Protimeter Hygrostick[®] into the humidity sleeve (see photo at right) and place the yellow protective cap on the connector.
2. To ensure that moisture equilibrium conditions are reached within the humidity sleeve, wait at least 72 hours before taking a humidity reading.
3. Connect the Hygrostick to a GE Protimeter Hygromaster or a GE Protimeter MMS instrument (see photo at right).



Note: *It is possible to connect the Hygrostick directly to the instrument, but it is preferable to use the Hygrostick extension lead (part number BLD5802).*

4. The meter reading must not drift by more than 1% of the relative humidity reading over a 15 minute period. It may take several hours to several days to reach equilibrium, depending on such factors as the initial temperature difference between the probe and the concrete.

Note: *The instrument may be turned OFF and disconnected from the Hygrostick while the probe equilibrates with the concrete.*

5. Observe and record the readings, then remove the Hygrostick from the humidity sleeve. If additional testing will be required at the same location, replace the humidity sleeve cap. When the re-testing is needed, simply repeat the steps in this section.

Alternative Method

Cap the humidity sleeve for at least 72 hours after installation. Then, insert the Hygrostick probe.

Ambient Conditions

ASTM F2170 requires the ambient conditions above the slab to be at service temperature and humidity for at least 48 hours before testing is carried out. It is also required that the instrumentation should be within $\pm 5^{\circ}\text{F}$ ($\pm 2.8^{\circ}\text{C}$) of the building service temperature to ensure fast and reliable readings. Thus, one should avoid storing the instrument in a hot or cold climate, such as a vehicle.

Calibration of Instruments and Probes

Refer to the calibration section of the ASTM F2170 document for guidelines.

Note: *NIST traceable calibration certificates for GE Protimeter instruments are available from GE Sensing.*

Important Notes - Please Read Carefully

Prior to placement of the humidity sleeves, the actual test area shall be clean and free of all foreign substances. All residual adhesives, curing compounds, sealers, paints, floor coverings, etc. shall be removed. Removal shall be accomplished using approved OSHA work practices. For removal of existing resilient floorings or residual adhesive, strictly observe the notes below.

!WARNING!

Do not sand, dry sweep, dry scrape, drill, saw, beadblast, or mechanically chip or pulverize existing resilient flooring, backing, lining felt, or asphaltic cut-back adhesives. These products may contain either asbestos fibers or crystalline silica. Avoid creating dust. Inhalation of such dust is a cancer and respiratory tract hazard. Smoking by individuals exposed to asbestos fibers greatly increases the risk of serious bodily harm. Unless positively certain that the product contains non-asbestos material, presume that it contains asbestos. Regulations may require that the material be tested to determine its asbestos content. RCFI's recommended work practices are a defined set of instructions addressing the task of removing resilient floor covering structures whether or not they contain asbestos. When RCFI's recommended work practices are followed, resilient floor covering structures that contain (or are presumed to contain) asbestos can be removed in a manner that complies with the current occupational exposure to asbestos standard's permissible exposure limits (PEL), as issued by the Occupational Safety and Health Administration (OSHA).

Note: *Various federal, state, and local government agencies have regulations covering the removal of asbestos-containing material. If considering the removal of resilient floor covering or asphaltic cut-back adhesive that contains or is presumed to contain asbestos, review and comply with the applicable regulations.*

Note: *Certain paints may contain lead. Exposure to excessive amounts of lead dust presents a health hazard. Refer to applicable federal, state, and local laws and to "Lead-based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing" regarding:*

- appropriate methods for identifying lead-based paint and the removing of such paint
- any licensing, certification, and training requirements for persons performing lead abatement work.

Use only qualified or certified lead abatement contractors to remove lead-based paint.