TESTING ROOF MEMBRANES

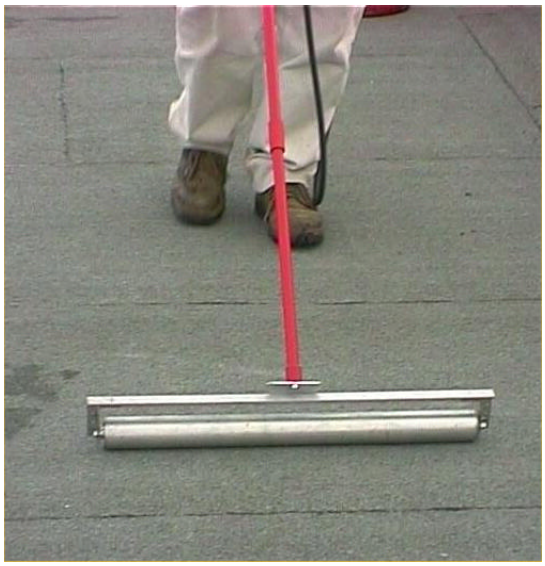
Buckleys, specialist designers and manufacturers of High Voltage Test Equipment, have created "Roofing Test Kits" suitable for locating leaks in roof membranes. Damage can be caused by tradesmen working on the roof area, whether the structure is old or new. The problem is to find the faults which can be the size of a pinhole and invisible to the naked eye.

The PHD 2-40 and PHD 1-20 Pinhole / Holiday Detectors can be used to find faults in roof waterproof membranes (non-conductive) with a great deal of success. The PHD 2-40 Pinhole/Holiday Detector is recommended for roof membranes as it can test thicknesses of up to 26mm. For thinner membranes, of 20 microns to 6.5mm, the PHD 1-20 can be used as an alternative.

Principle of operation

The earth lead from the PHD unit is connected to a convenient earth point on the structure. A high voltage (calculated against the membrane thickness) is applied (using an electrode) to the dry surface of the membrane.

Where there are no faults present the membrane acts as an insulator, stopping the flow of current out of the PHD unit. When the electrode passes over a fault or hole, the high voltage jumps the gap between the electrode and the water or conductive layer under the membrane, causing a current to flow. The audible and visual alarm on the PHD will alert the operator who can mark up the points in need of repair.



Two types of electrodes are recommended for testing, a phosphor bronze brush, if the surface is uneven, or a special roller for large smooth areas.

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0207

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Criteria for successful testing

There are a number of criteria that need to be met for successful detection of membrane faults:

a) The test can only be carried out on roof membranes which have a conductive substrate (either aluminium foil, concrete, brick, steel or water etc).

b) The surface must be dry when the testing procedure is carried out. As water is a conductor of electricity, it would be impossible to find faults in a wet surface.

c) The thickness of the waterproof membrane must be known so that the test voltage can be calculated.

Using the formula of the square root of the membrane thickness in microns (1/1000 of a mm) x 250, a membrane with a thickness of 5mm would require a test voltage of 17,677 volts $\sqrt{}$ 5000 = 70.71 x 250 = 17677.5 volts

d) The membrane material must be able to withstand the test voltage - testing a sample laid on a sheet of metal would confirm this (see below). Note: Using a test voltage which is too high may damage the membrane and give false alarms.

Testing a sample

A sample of material of uniform thickness (about 30cm square and less than 2mm thick) should be laid onto a metal sheet.

Whilst the Holiday Detector is turned off, the Test Probe handle (fitted with a pointed probe electrode) and earth lead should be connected to the unit. The other end of the earth lead should be attached to the metal sheet.

Starting with the output of the PHD set at minimum, the probe should be placed onto the membrane surface. The high voltage output should be turned on and slowly increased until the material beaks down and activates the alarm on the Holiday Detector or the output reaches maximum. The electrode should be lifted off the surface and a note made of the output voltage shown on the PHD which caused the material to break down. The process should be repeated a number of times on new areas of the sample, allowing at least 20mm from any previously used areas, noting the “break-down” voltage each time.

A calculation should be made to find an average of the voltages. The Dielectric Strength of the material would be approximately 75% of the average of the voltages. If the material will not break down, the thickness of the membrane material should be reduced by half and the above processes repeated. The results obtained can vary from 8kv to 40kv per mm.

For a material to be tested using high voltage its dielectric strength must be greater than 4kv per mm and preferably 8kv per mm. The greater the dielectric strength the less chance there is of making a fault during the testing process.

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Method of testing

A suitable point on the structure should be identified as an earth connection for the earth lead of the Pinhole Detector.

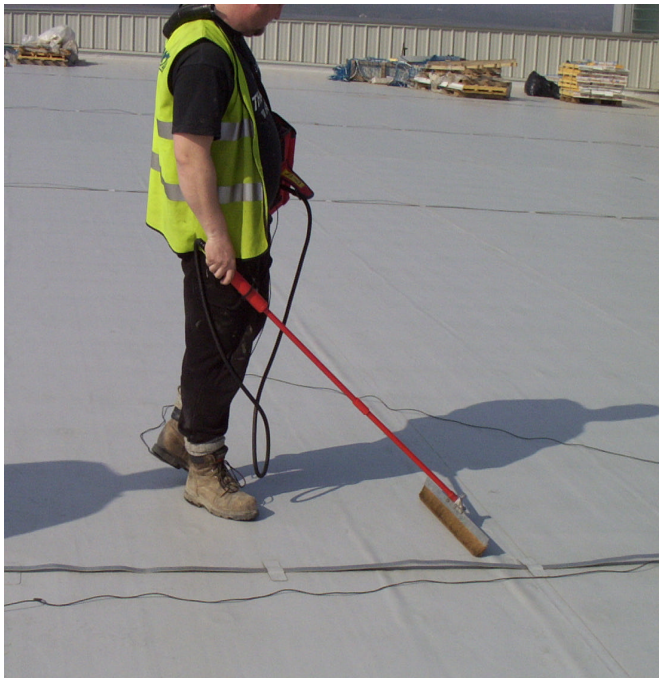
Following the instructions in the operating manual of the PHD unit, the output voltage should be set according to the calculation made using the formula shown above. The Earth lead and test probe handle should be connected to the PHD whilst the unit is turned OFF.

The other end of the Earth lead should be attached to the earth connection point of the structure ensuring that a good electrical contact has been made.

With the PHD still turned OFF, extension rods should be connected to the test probe handle. Using the shoe attachment, a suitable electrode should be attached to the opposite end of the extension rods. Any electrode used must be in good condition as a damaged one will not make full contact and faults could be missed.

The operation of the Pinhole Detector should be checked by touching the electrode onto the substrate. The audible alarm should then be activated but if not, the lead connections should all be checked. Sometimes it may be necessary to adjust the Sensitivity Control on the unit. Reducing the setting will make the unit more sensitive and increasing the setting will make the unit less sensitive i.e. for situations when the coating is damp.

The electrode should be passed slowly over the membrane surface at a maximum rate of 100mm per second, paying particular attention to edges, holes and irregularities in the coating. The test voltage may need to be reduced to test the edges as the coating may be thin.



When a fault is identified by the detector, the electrode should be moved sideways in order to identify the precise location of the problem. All faults should be ringed with a suitable marker so that repairs can be carried out at a later date. The identification of the fault should be far enough away from the defect to allow the repairs to be made without covering the markings as the substances contained in some markers can affect the adhesion of the repair material.

Testing should be continued across the complete surface and all faults marked. Damaged areas should be re-tested after repairs have been carried out.

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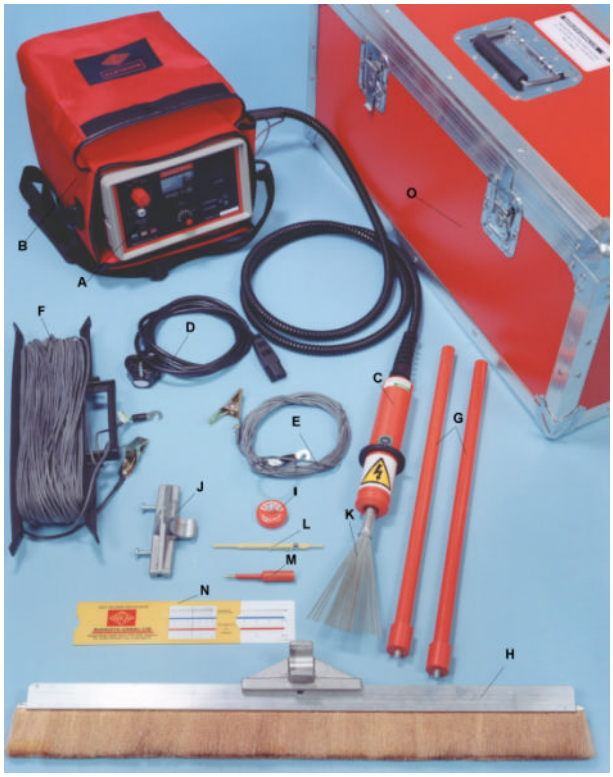
The Roofing Test Kits

Two special kits are available which include all the equipment necessary for the testing process:

PHD 1-20 Roofing Test Kit (our ref: D24)
PHD 2-40 Roofing Test Kit (our ref: D44)



The kits comprise:

PHD 1-20 or 2-40 Pinhole/Holiday Detector with built-in charger (A), shoulder bag (B), test probe handle with 2m high voltage lead and pressure safety switch (C), mains charger lead (D), 5 metre earth lead (E), 50 metre earth extension lead (F), 2 x 460mm extension rods (G), 600mm phosphor bronze brush electrode (H), earthing magnet (I), electrode shoe (J), drum brush electrode (K), trimming tool (L), pointed probe electrode (M),test voltage calculator (N) all contained in a robust carrying case (O)

A comprehensive instruction manual for the unit is also supplied.

The Roller Electrode is available as an extra in widths of:
20” / 500mm (our ref E850)
24” / 600mm (our ref E860)
28” / 700mm (our ref E870)

SAFETY NOTICE

Ensure all guidelines are followed as set out in the PHD operating manual

All Buckleys products are manufactured under the controls established by a quality management system that meets the requirements of BS EN ISO 9001:2000 and are supplied with a one-year “back to base” warranty. The equipment is robust and reliable and will give years of service if maintained in accordance with our instructions. Annual re-calibration is recommended for all Buckleys PHD Holiday Detectors. We can provide a full repair and calibration service offering a fast turn-around service for customer’s equipment.

Note: Due to ongoing technical developments, all stated information is typical and is subject to change without notice or obligation.

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