SPRA
Single Ply Roofing Association

SPRA TECHNICAL GUIDANCE S08/25

NON-DESTRUCTIVE TESTING OF SINGLE PLY MEMBRANE ROOF COVERINGS

SCOPE

This guide includes the methods of testing of completed roof systems with continuous waterproof coverings, which are in common use in the UK and for which a range of service providers exists. Techniques such as radar and hydrogen ion detection, which were developed for other applications and are rarely used, are not described.

Flood testing is not described, because its applications are very limited and water ingress resulting from a failure can extend drying periods and cause internal damage. Flood testing may be appropriate for ballasted or paved finishes to small roofs such as balconies but for larger areas, load and safety issues generally preclude its use. Thermal imaging is not described because its primary function is evaluation of thermal performance but it is useful for strategic assessment of entrapped water in roof systems where the type and design of the structure is known.

INTENDED FOR

This guide is intended to provide clients, designers, facilities managers and main contractors with the necessary information to ensure quality in the selection and provision of testing services.

OBJECTIVE OF TESTING

It is important to decide the test objective before selecting a method. Some methods are better suited to strategic assessment of entrapped moisture (for example in existing roofs); others provide evidence of the integrity of the new waterproof covering.

METHODS

The efficacy of all methods described here depends upon the experience of the operator, the proper functioning and calibration of the equipment, and prior knowledge of the roofing specification and the structural support. For integrity testing, a completely dry roof, not yet exposed to the weather may produce spurious results. Hence, there should be a reasonable period of wet weather following roof construction before the test is carried out.

Where plant installation or following trades are expected, testing after completion of the roofing works and again at completion of all works at roof level is recommended.

COMPLEMENTARY VISUAL INSPECTION AND TESTING OF SEAMS

The methods described should be complemented by visual inspection of all seams – especially at details – and by manual testing of field seams using a suitable probe.

This inspection may be carried out by the roofing contractor, membrane manufacturer or testing service provider, but it is recommended that the party responsible be identified in the contract documents. They must be able to repair immediately any failed seams or similar defects identified.

HEALTH AND SAFETY CONSIDERATIONS

- Prior to commencement, the service provider must submit for approval a risk assessment.
- None of the methods described presents a significant health and safety risk in respect of the electrical output.
- Normal health and safety procedures as regards edge protection and/or fall arrest facilities, all in compliance with HSE Regulations, must be fully operational prior to the test. If electrically-conductive edge protection is removed temporarily, other means of fall restraint must be provided.
- Some membranes may be slippery when wet, especially if soap solution is used during testing to extend drying times. Appropriate footwear is essential. Testing must not be carried out in frosty conditions.
- Whether or not other works are in progress, suitable head protection must be worn since testing frequently involves access to areas with restricted height or width clearance.
- Some equipment (e.g. large-model electrical capacitance) is heavy and requires care when being passed up through access hatches etc.

▲ HIGH VOLTAGE DISCHARGE TEST

QUALITY CONTROL CHECKLIST

- SPRA recognises that the roofing contractor may wish to test the roof as part of their own quality procedures but recommends that the final test and certification should be provided independently of the contractual parties.
- The service provider must submit for approval a job-specific method statement prior to the test. This must demonstrate that the technique to be used is effective for the roof specification and construction circumstances. If there is any doubt as to the efficacy of the method, a sample test should be considered.
- Prior to the test, a coordinate system should be agreed between client and service provider based upon a roof drawing, which can also be used to identify the location of defects.
- The roofing contractor should always be in attendance to conduct repairs immediately following the test. The test service provider must then re-test the repair so that a final certificate of integrity can be issued.
- Services as required for repairs (e.g. a power supply for welding single ply) must be available.
- For the electrical resistance method, a ready supply of water at roof level must be available.
- All points of potential leakage should be marked on the roof surface with a waterproof marker that can be subsequently cleaned off if necessary once repairs are complete.

ROOFING AND WATERPROOFING TEST ASSOCIATION (RAWTA)

The *Roofing and Waterproofing Test Association* (RAWTA) was formed by the coming together of established independent UK test houses whose main operations are in the testing of waterproofing systems in the built environment. There are two distinct operations in that respect: the detection of leak sources in existing installations and the testing and certification of newly installed membranes and systems.

RAWTA is committed to assisting the roofing and waterproofing industries in raising standards by ensuring that installed systems are fully tested as far as can be reasonably expected.

For further information about RAWTA and its membership, visit rawta.org.uk.

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ELECTRICAL EARTH LEAKAGE	HIGH VOLTAGE DISCHARGE	ELECTRICAL CAPACITANCE	VACUUM BOX
Uses low voltage direct current to detect distortion in the electric field across the waterproof covering caused by electrical leakage to earth at locations of potential water leakage. A loop conductor is placed around the test area and may be used to exclude details and structural elements (e.g. smoke vents or plant support rails) which would otherwise distort the results.	Uses high voltage (safely, due to very low current) to detect points of electrical discharge to earth through the waterproof membrane.	Detects reflection of low intensity radio waves from liquid water lying below the waterproof covering.	Detects air leakage into a vacuum chamber placed over the membrane as evidence that a potential water leakage path is present.
Applications Accurate location of points of electrical leakage to earth, which may be actual or potential sources of water ingress. Can be used on upstands up to the point of termination to the structure. Well suited to mechanically fixed single ply membranes.	**Applications** An alternative integrity test to electrical earth leakage. Accurate location of points of electrical discharge to earth, which may be actual or potential sources of water ingress. Can be used on upstands up to the point of termination to the structure.	**Applications** Best suited to strategic assessment of moisture entrapment below the waterproof covering or as a quick 'first estimate' of integrity as a complement to other more suitable methods. May detect moisture up to 35mm below the roof surface. Hand-held, or large rollable wheeled models are available.	**Applications** A method of integrity testing only. Suitable for membranes that cannot be tested by electrical methods. A very slow method, unlikely to be suitable for the whole roof but may be used to test seams and/or (with suitable ancillary components) details.
Requirements Waterproof membrane must be an electrical insulator. A continuous electrical earth must be available below the waterproof membrane, either by a foil-faced insulation, a foil-faced vapour control layer or an electrically conductive deck. The roof surface must be wet in the area under test. Although the method is effective on waterproof coverings with ballast or paved overlays, it is strongly recommended that these components be set aside (existing roofs) or not laid (new work) prior to the test. The finished roof must have been exposed to the weather, including rainfall, for some days for the method to be fully effective.	**Requirements** Waterproof membrane must be an electrical insulator. A continuous electrical earth must be available below the waterproof membrane, either by a foil-faced insulation, a foil-faced vapour control layer or an electrically conductive deck. The roof surface should be *dry* in the area under test. Careful calibration is essential to avoid damage to the membrane and/or spurious results due, for example, to fastener plates immediately below the waterproof membrane. An exposed waterproof membrane is essential. Voltage necessary to test a given membrane thickness (vertically) may be insufficient to test the integrity of a seam (which may be 25mm or more in width) hence the method is generally less effective than electrical earth leakage. It can be used in addition to electrical earth leakage to improve certainty of the result.	**Requirements** Waterproof membrane must be an electrical insulator. A continuous electrical earth is not required below the waterproof covering. The roof surface should be dry in the test area. Careful calibration on an area of roof system known to be dry is essential prior to the test.	**Requirements** Waterproof membrane must be sufficiently smooth to allow a seal to the vacuum unit. Requires a source of clean water.
Limitations Ineffective with electrically conductive membranes such as EPDM and some PIB single ply, all foil-faced bitumen membranes and some paint finishes. May not be effective with timber panel decks such as plywood. A fully adhered insulation and membrane may be difficult to test.	**Limitations** Ineffective with most EPDM and PIB single ply membranes, all foil-faced bitumen membranes and may be ineffective on some painted surfaces. May not be effective with timber panel decks such as plywood.	**Limitations** Ineffective with most EPDM and PIB single ply membranes, all foil-faced bitumen membranes and may be ineffective on some painted surfaces.	**Limitations** Ineffective on rough surfaces (e.g. mineral finishes).

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