ASTM D7877

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Detec Systems
Looking for an alternative to Flood Testing?

• Flood testing is costly in time and money
• Results are often inconclusive
• Will not detect membrane breaches that are not leaking
• Does not pinpoint any leak location
Low Voltage Leak Location Basics

- Most membranes are electrical insulators
- At a breach location, an electrical path is formed through the water and breach to the deck
- The path through the breach is detected electronically
High Voltage Leak Location Basics

- A metal brush is swept across the membrane.
- A high voltage is applied between the membrane and the deck.
- At a breach an electric arc jumps the air gap.
- The arc current is detected and alerted electronically.
Conductance Testing and Leak Locating Methods

- Low Voltage Electric Field Vector Mapping
- High Voltage Membrane Testing
- Low Voltage Membrane Scanning Platform
- Low Voltage Vertical Surface Scanning
Electric Field Vector Mapping

- Probes and receiver unit used to trace electric field to the source of a membrane leak
- Can be used on roofs with a limited amount of overburden
- Requires considerable skilled operator to achieve satisfactory results
Electric Field Vector Mapping circa 1980

- Developed in Germany by H. Geesen
- Patented in the US in the early 80's
• A cable is looped around membrane area to be tested
• The test area is wetted down
• A generator establishes an electric field between the water and the deck
• A meter and probes are then used to trace leakage current to any breach
Electric Field Vector Mapping Equipment
• The insulating layers above the membrane make it very difficult for the fault current to reach the surface layers.
Electric Field Vector Mapping Limitations

- Testing cannot be done on conductive membranes
- The substrate directly below the membrane must be sufficiently conductive
- Requires a continuous layer of water over the area to be tested
- Locating breaches on a protected membrane can be very difficult due to the interruption of the tracing current at the surface
- Operator skill and knowledge is critical in achieving satisfactory results
High Voltage Membrane Testing

- A high voltage (up to 40 KV) generator is connected between the substrate and a wire probe
- Operator performs a “spark test” on roof membrane
- A spark occurs if the insulating membrane is breached and a path to ground occurs
High Voltage Membrane Testing Equipment
High Voltage Limitations

- Works only on non-conductive membranes
- The substrate directly below the membrane must be sufficiently conductive
- Overburden must be removed
- The membrane surface must be dry
- Excessive test voltages can damage membranes
- The operator must be isolated and protected
Membrane Scanning Platform

- Provides QC testing during membrane application
- Scans and tests 100% of the membrane
- No perimeter cable required.
- Does not require continuous coating of water (only a light spray ahead of the scanner is needed)
- Short learning curve
Membrane Scanning Platform

- Test voltage applied by metal sweeps to the deck
- Outer sweep picks up defects in area under test
- Inner sweep sees defect when directly on top of breach
Membrane Sweep Platform View
Roof Membrane Integrity Scanner Equipment
Vertical Scanning and Detailing

- Uses an “electric sponge” to wet and test vertical surfaces
- Provides detailed membrane testing on vertical surfaces, corners, parapet/wall seams, penetration seals etc.
Scanning the Waterproof Lid on a Reservoir in Seattle
Locating and Marking Membrane Breaches
Platform and Vertical Scanning Limitations

- Testing cannot be done on conductive membranes such as EPDM
- The substrate directly below the membrane must be sufficiently conductive for purposes of this test
- This method is not suited to scanning membranes with overburden
Comments on Electronic Leak Locating

• The most effective method to detect and locate membrane damage during construction
• Uniquely identifies damage location
• QC scanning after membrane installation and before roof completion can help identify trade damage
• Conventional roof assemblies can be scanned effectively if a conductive surface is placed *directly under* the membrane
Incorrect placing of a Metal Mesh

- Metal mesh placed in assembly as a ground plane to allow electronic leak detection
- The metal mesh must be placed directly under the membrane
Conductive Primers

- In a conventional roof, the substrate under the membrane is usually an insulator.
- Electronic scanning requires a conductive surface directly under the membrane.
- Non-metallic, conductive primers are available that supports electronic membrane scanning.
- Eliminates the need for a metal component under membrane.
Forensic Testing of a Conventional Roof using ELD

- The roof assembly must have sufficient moisture (or is known to have been leaking recently) to provide a water path to building ground.
- Overburden must be removed in the area to be scanned.
- It is recommended that the area be sprayed with water and left overnight if possible (or carry out the testing after a rain period).
- Avoid or isolate grounds such as drains, flashings, exposed conduits etc.
- Locate and connect to a suitable building ground.
### Daily Field Report

**Project:**

**Site Location:**

**Submitted To:**

**Date:**

**Time Start:**

**Time End:**

**Work Performed:**

- [ ] Site
- [ ] Installation
- [ ] Testing
- [ ] Site Visit

**Equipment Used:**

- [ ] Video
- [ ] LID Multi-Reader
- [ ] Other

**Site Work Conditions:**

- [ ] Brown Grass
- [ ] Dirty
- [ ] Muddy
- [ ] Heavy Traffic
- [ ] Cluttered

**Weather Conditions:**

- [ ] Hot
- [ ] Warm
- [ ] Cold
- [ ] Clear
- [ ] Clouded
- [ ] Rain
- [ ] Snow

**Roof System Type:**

- [ ] Conventional
- [ ] Bent

**All Detec Rides and Guests:**

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<thead>
<tr>
<th>1</th>
<th>2</th>
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**Site Contacts:**

| 1 | 2 | 3 |

**Details of Work Performed and/or Observed:** (Include floor level, area location, square footage, number of breaches, etc.)

**Items Discussed:** (Schedule, issues, etc.)

**Summary:**

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**Operator/Technician:**

**Print**

**Signature**

**Date**

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Should Detec locate a membrane breach, the contractor shall be notified and given the opportunity to repair the breach and have the area re-scanned to confirm the integrity of the membrane. The located breach will be recorded in this document and a copy provided to the Contractor. Detec holds no responsibility should the Contractor choose not to repair the breach at the time it is located.
Conclusions

• The new ASTM D7877 standard provides the industry with a guideline on the application and use of electronic testing for waterproof membranes

• The new standard helps in the understanding of both the capabilities and limitations of the various test methods in current use

• The new standard provides an viable alternative to flood testing