

SECTION 07 59 00

ELECTRONIC LEAK DETECTION – HIGH & LOW VOLTAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Engage an Independent Testing Agency to provide an Electronic Leak Detection (ELD) Technician to perform Electronic Leak Detection to verify that the membrane is free of any holes, open seams or capillary defects that will allow water to pass. Electronic Leak Detection shall include:
 - 1. High Voltage Electronic Leak Detection for roofing and waterproofing membranes.
 - 2. Electric Field Vector Mapping (Low Voltage Vector Mapping) for roofing and waterproofing membranes.
 - 3. When required, a permanent On-demand Electronic Leak Detection System (ELDS) for roofing and waterproofing membranes.

1.2 SUBMITTALS

- A. Field Quality-Control Reports: Prepare and submit hard copy and digital reports with a description of the ELD techniques employed, summary of findings, and CAD scaled drawings of the tested areas with the locations of all defects (and trace wire and connection boxes for the ELDS if provided) accurately mapped on the drawing.

1.3 QUALITY ASSURANCE

- A. Installing and Testing Firm Qualifications: The approved Independent Testing Agency shall have a minimum three year record of satisfactory experience providing Low Voltage Vector Mapping and High Voltage ELD services on projects of similar size and scope.

1.4 BREACH-FREE CERTIFICATION

- A. Breach-Free Certification of Membrane Integrity: At the conclusion of the testing, the testing agency shall provide a Breach-Free Certification of Membrane Integrity, provided the following conditions are met:
 - 1. Contractor provides personnel and materials to repair any defects located with the testing.
 - 2. Repair materials have sufficient time to set up to allow the ELD Technician to utilize either High or Low Voltage ELD to retest any problem areas.
 - 3. All repairs pass retesting.

PART 2 - PRODUCTS

2.1 ALTERNATIVE GROUNDING MEDIUM

- A. In assemblies where the deck is not electrically conductive or there are nonconductive materials installed between the waterproofing membrane and the conductive deck, e.g. insulation,

coverboards, vapor retarders, etc., an alternative grounding medium must be installed directly under the membrane to accept the electronic leak detection test currents.

- B. Alternative Grounding Medium, Basis of Design: Detec TruGround™ Electrically Conductive Primer, available from **IR Analyzers / Vector Mapping** (1-800-879-1964)

2.2 ELECTRONIC LEAK DETECTION

- A. Independent Testing Agency, Basis of Design: **IR Analyzers / Vector Mapping** (1-800-879-1964) ELD Fusion® - Complete Coverage Electronic Leak Detection.

2.3 HIGH VOLTAGE ELECTRONIC LEAK DETECTION

- A. Scope: Perform a High Voltage ELD Survey on all available and testable membrane areas in the Contract typically not inspected with the Electric Field Vector Mapping technique; including all vertical surfaces such as parapet walls, flashings and curbs, transitions from the horizontal surfaces to the vertical surfaces, and horizontal membrane areas directly adjacent to the vertical surfaces. High Voltage Electronic Leak Detection shall be performed on a dry membrane surface.

2.4 ELECTRIC FIELD VECTOR MAPPING (LOW VOLTAGE VECTOR MAPPING)

- A. Scope: Perform an Electric Field Vector Mapping Survey on all horizontal membrane areas in the contract. Electric Field Vector Mapping shall be performed on a wetted membrane surface.

2.5 PERMANENT ON-DEMAND ELECTRONIC LEAK DETECTION SYTEM (ELDS)

- A. Scope: When required, at areas where the membrane will be covered with overburden, the ELD Technician will install a permanent On-demand Electronic Leak Detection System to facilitate future Electric Field Vector Mapping (Low Voltage Vector Mapping) with the overburden in place. The ELDS will consist of trace wire loops installed on top of the membrane in area increments not to exceed 7500 sf, and weather tight low voltage connection boxes to provide access to the trace wire loops. Trace wire loops to be installed by ELD Technician. Connection boxes to be installed by Contractor.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The ELD Technician will meet with the Installer and review the sizes and locations of areas to be tested.

3.2 TESTING PROCEDURES - HIGH VOLTAGE ELECTRONIC LEAK DETECTION

- A. Test equipment shall consist of conductive phosphor bronze brush electrodes and a portable battery powered generator capable of providing variable DC current from 1000-30,000 volts at low amperage.
- B. The ELD Technician shall connect one terminal of the generator to a ground in the assembly (typically a steel or concrete deck, or alternative grounding medium such as a conductive primer or metal grid). Connect the other terminal to the phosphor bronze brush. Calibrate the voltage level to the thickness of the membrane being tested.

- C. The ELD Technician shall methodically pass the brush electrode over all testable vertical membrane surfaces in the contract and approximately 1 foot of horizontal membrane directly adjacent to the vertical membrane areas. Successive passes will overlap previous passes by a minimum of 3 inches. Breaches will be identified when an audible alarm indicates that the electric current has passed through a defect and grounded to the conductive material beneath the membrane.
- D. The ELD Technician shall mark breach locations on the membrane with spray paint, chalk, tape or other approved method.

3.3 TESTING PROCEDURES - ELECTRIC FIELD VECTOR MAPPING (LOW VOLTAGE VECTOR MAPPING)

- A. Test equipment shall consist of a portable battery powered generator capable of providing a pulsed 38-40 volt DC current, two sensor poles, current flow detector (potentiometer) and trace wire. The trace wire will consist of .38mm polyethylene monofilament tightly twisted with 9 strands of .20mm stainless steel wire and have a minimum tensile strength of 180 pounds.
- B. Place conductive trace wire around the perimeter of the area being tested in area increments not to exceed 7500 sf. Place trace wire on top of membrane approximately 4 inches from the perimeter. Each successive test will overlap the areas previously tested with the Low Voltage technique, and the areas tested with the high voltage technique by a minimum of 3 inches.
- C. As needed, provide metal penetrations through the membrane with isolation loops connected to the perimeter trace wire to prevent unintended grounding (false positive results).
- D. The ELD Technician shall connect one terminal of the pulse generator to the trace wire loop. Connect the other terminal to a ground within the assembly (typically a steel or concrete deck or alternative grounding medium such as a conductive primer or metal grid).
- E. Wet the entire test area prior to the start of each test and introduce current in the trace wire to create an electrical "plate" on the surface of the membrane. Maintain wet for the duration of the testing.
- F. Utilize the potentiometer and two sensor poles to methodically test all horizontal membrane surfaces in the contract. If no current flow is detected, the ELD Technician will certify that the tested area is free of any holes, open seams or capillary defects that will allow water to pass.
- G. Current flow indicates that current has grounded through a breach. The ELD Technician will trace the current vectors to their source(s) to locate any membrane breaches. Breaches will be marked on the membrane surface with spray paint, chalk, tape or other approved method and will either be repaired, or screened from the test area with isolation loops. Testing will continue until all breaches in each test area are located, repaired and retested, or isolated with trace wire loops, and there are no longer current vectors to interpret.
- H. The ELD Technician shall maintain communication with the Contractor's representative regarding the number and locations of breaches detected.

3.4 PERMANENT ON-DEMAND ELECTRONIC LEAK DETECTION SYSTEM (ELDS)

- A. When required, at areas where the membrane will be covered with overburden, the ELD Technician will install a permanent On-demand Electronic Leak Detection System to facilitate future Electric Field Vector Mapping with the overburden in place. The ELDS will consist of trace wire loops installed on top of the membrane in area increments not to exceed 7500 sf, and

weather tight low voltage connection boxes to provide access to the trace wire loops. Trace wire loops to be installed by ELD Technician. Connection boxes to be installed by Contractor.

3.5 FIELD QUALITY CONTROL

- A. Contractor shall repair or remove and replace components of membrane system where test results indicate holes, open seams or capillary defects that will allow water to pass.
- B. After repairs are complete as per roofing or waterproofing membrane manufacturer's requirements, retesting in repaired areas will be performed at Contractor's expense to verify the integrity of the membrane.

END OF SECTION