

# Fact Sheet

## A PASSIVE SENSOR FOR ROOF MOISTURE SENSING

### PROBLEM

Early detection of leaks in low-slope, compact roofing systems can save significant maintenance costs, because repairing or replacing these roofs can cost 76 to 108 \$/m<sup>2</sup> (7 to 10 \$/ft<sup>2</sup>). Only early detection can prevent a leak from becoming severe and causing significant damage long before it is obvious to building occupants.

### HISTORY

Inspection techniques that detect moisture in roofs from leaks or condensation include on-the-roof and aerial infrared thermography, nuclear moisture meters, and dielectric meters. These methods require training as well as expensive and complex equipment to perform roofing inspections.

As an alternative to these methods, cable-based systems and individual sensor technologies exist. One type of individual embedded sensor incorporates water-activated battery-powered autonomous transmitters mounted in an array within the layers of low-slope compact roofing. When the battery becomes wet, the associated transmitter sends a signal that indicates wetting and identifies the transmitter's location. Individual sensors, upon wetting the batteries, eventually deplete their energy and become inoperative, and cannot be reset or recharged once triggered. Their batteries have a limited shelf life and, even if in a dormant state, eventually have to be replaced.

### SOLUTION

A low-cost passive sensor (U.S. Patent # 5,818,340) has been developed and tested under simulated conditions. This small, individual sensor requires no batteries for operation and therefore will last for the life of the roof. These sensors are easily embedded during installation of a new roof, and reset when the surrounding roofing material returns to a dry state. To determine if there is moisture at a location in the roofing, an inexpensive hand-held instrument is held in proximity to each sensor. Energy in the form of a pulsed radio signal is transferred to the sensor, causing the sensor to resonate, or retransmit energy. The frequency of the retransmitted radio energy indicates whether the sensor is wet or dry. The sensor can be interrogated in roofing beneath standing water, and also can be used to sense condensation in walls and insulation.

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