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Detection of Hidden Corrosion in Metal Roofing Shingles Utilizing Infrared Thermography

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Abstract

A method is proposed to detect hidden corrosion in metal roofing shingles. The method involves three components: 1) application of a simple heating source that can cause a temperature discrepancy between uncorroded shingle and corroded shingle, 2) acquisition of temperate data using a digital infrared camera, and 3) data analysis that can help us locate hidden corrosion. Experiments were conducted to test the effectiveness of the proposed method. Samples with different material, thickness, and surface coating were subjected to accelerated corrosion on one half of the interior surface. The other half of the interior surface was left uncorroded as a baseline. Using a digital infrared camera, thermal images were collected and analyzed. Two different data analysis methods were proposed to detect the corrosion. It was found that corrosion detection was sensitive to the metal coating type and exterior coating type. Corrosion detection was much clearer for Al-Zn coating than GZn coating. As for the exterior coating type, corrosion detection was clearer for no coating or acrylic coating than PVDF. Although the natural sunlight was promising in detecting corrosion of some shingle types, an additional heating source greatly improved the corrosion detection.

Keywords: Corrosion, Detection, Infrared, Metal Shingles, Thermography.

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