Abstract

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Damage Detection and Localization by Interpretation of Inner Electrical Resistivity Measurements

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Abstract: minimize Early diagnosis of structural damage not only reduces maintenance costs, but also increases the structure reliability, elongates the structure service life, and reduces the operational costs. This is why damage detection is one of the fundamental prerequisites for structural health monitoring (SHM). SHM as a strategy can be defined as the process of identifying damage continually with time, using minimum labor involvement. This is in contrast to visual inspections which fail to assess hidden damage accurately at early stages of occurrence. Accordingly, a variety of damage detection techniques were introduced recently to apply SHM on structural systems. SHM as a procedure includes data collection from sensors, followed by data processing, and finally interpretation of the post-processed data to obtain sufficient information about the structural integrity and reliability. In this paper, it is suggested to use the phenomenon of electrical resistivity measurements variation as an indicator of damage initiation and propagation. An inner electrical resistivity measuring technique (SIERM) using a square configuration of probes is proposed for detecting crack initiation and following its propagation. Cement Based Composites (CBC) blocks, with probes embedded inside, are the test bed for the proposed technique. The specimens were loaded under compression, splitting tension, and flexural loads during the tests. Results indicate that the electrical resistivity sensors have high sensitivity to detect crack locations and to reflect their propagation within the specimens. This is done through the correlation between the SIERM results and loading up to failure.
KEYWORDS: Damage Detection, Health Monitoring, Electrical Resistivity ,Cement-Based, Composites, Nondestructive, Testing.