

A study on transmission line configuration for structural health monitoring using electromagnetic waves

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ABSTRACT

Structural health monitoring (SHM) of concrete structures is necessary because structural safety is directly linked to life safety. This study proposes a transmission line configuration for SHM based on time domain reflectometry (TDR). For this purpose, six transmission lines consisting of electrical wires, rebars, and joints were prepared. The TDR waveforms were measured and analyzed in air and concrete using six transmission lines to select the most suitable configuration. A two-line wire with joints was selected as the optimal transmission line for SHM because it exhibited the highest sensitivity among the configurations. Experiments to apply SHM were performed on defective concrete blocks containing an optimal transmission line. The results showed that the defect locations in concrete were precisely investigated using TDR waveform analysis. The distances estimated from the TDR waveform were similar to the measured distances for the locations of the defects and joints in the concrete blocks. This study suggests that a transmission line consisting of two-line wires and joints may be an effective non-destructive evaluation tool for assessing the structural health of concrete.

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