

**Project Title: Experimental Studies and Theoretical Analysis On Concrete Structures to Evaluate Structural Integrity of Highway Bridge Concrete Columns**

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**TRB Keywords:** Highway Bridges, Nondestructive testing, Concrete structures, Crack Detection, Corrosion evaluation, Structural Integrity, Acoustic Emission, Resistivity studies.

**NCITEC Funds:** \$17,301

**Matching Funds:** \$17,301

**Project Summary:**

Under the MSU Sub-Award, an inspection of bridge structures at Hampton roads, VA was conducted, to assess their integrity and safety. Presence and propagation of corrosion and fatigue cracks in reinforced concrete structures were investigated using Acoustic Emission (AE) technique and resistivity studies. When more than one type of defects is involved in damaging the structure, it becomes more difficult to identify the damaging activities and apply the most appropriate corrective measures. One of the major issues in NDT practices is that, with the presence of two different kinds of defects, test results may resemble the same and as a result, it is difficult to identify the nature of defect, unambiguously.

It is planned to pursue the theoretical analyses and experimental studies on concrete structures, to evaluate the integrity of concrete columns using the nondestructive testing methods. In these efforts experiments will be carried out both on bridge structures and on laboratory test samples to arrive at a more reliable methodology in recognizing the type of active defects. This effort will involve frequency spectral analyses using a range of acoustic emission probes of a wide range of frequency responses and resistivity studies using an ac excited Wenner arrays of optimum test conditions. A Nondestructive Testing methodology to reduce the ambiguity in evaluating the integrity of bridge structures will be developed, thus enabling corrective maintenance procedures to be applied at early stages of defects initiation and propagation will be possible, thus arresting the propagation of defects in timely manner.

The proposed research effort will provide a testing method for use by NDT professionals, to assess the crack initiation and corrosion damage in the concrete structures, unambiguously.