

Project Title: Steel Girder Supporting Bridges: An Experimental Study and Theoretical Analysis to Evaluate Structural Integrity of Steel Girders

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Project Summary:

Under the earlier MSU Sub-Award, an inspection of steel girders supporting a bridge on I-664 in Hampton Roads, VA was conducted, to assess their structural integrity. Presence and propagation of corrosion and fatigue cracks in steel girders were investigated using Acoustic Emission (AE) technique. When steel girder corrosion and fatigue cracks are developing in the structure, it becomes crucial to timely identify the defects and apply the most appropriate corrective measures. In this extended project, we propose to conduct a theoretical analysis supplemented by experimental studies on a steel girder bridge on I-664 in Hampton Roads adding fresh inputs to the earlier which studied single defect.

It is proposed to re-visit the interstate I-664 bridge crossing to capture the current level of AE activity at this bridge and determine any possible changes to the integrity of the structure over the past year. Past data on the AE footprint of the structure proved the existing defects to be inactive, however, this additional long-term monitoring will provide a valuable evidence as to whether the previously identified cracks are dormant or not and whether there are any new defects formed that could compromise the structure. This will also allow to enhance the methodology for AE bridge inspection. An equipment assessment and literature review on the current state-of-the-art with regard to AE equipment and its application to civil infrastructure monitoring will be conducted to supplement the choice of the necessary equipment for future application with respect to different structures and materials.

The extended study will be conducted by upgrading the current AE monitoring equipment to enable the proposed studies. The upgrade will include procurement of low power sensors and related data acquisition equipment and supplies to replace the expendable items and to provide additional capability to the system for future use in the AE research. This upgrade will also provide the necessary items to complete the AE system for use within the HU lab setting for student training. The proposed project will result in the additional AE field data and data analysis that will allow for increased understanding of the AE application technique with respect to steel girder bridges.