

PROJECT OVERVIEW REPORT

1. UTC Identifying Number
DTRT13-G-UTC28
2. Center Identifying Number
CAIT-UTC-NC61
3. Project Title
COLLABORATIVE PROPOSAL: Structural Health Monitoring of Representative Cracks in the Manhattan Bridge
4. Principal Investigator & Contact Information
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7. Project Description
The Manhattan Bridge is 6855 feet long, crosses the East River and connects the island of Manhattan to Brooklyn. It is subjected to repeated dynamic loads, especially by the transit system trains with the average daily traffic of 1000 trains per day. As a result of repeated loads, especially those by the trains that run on full capacity, multitudes of cracks have been developed in the floor beams at the piers, as well as at bottom cords of trusses and stringers. The owners of the Bridge have raised a number of concerns about the size and number of cracks. In addition, the dynamic amplification associated with the bolted rail joints has raised a serious concern among the NYCDOT engineers. The main objectives of the proposed structural health monitoring (SHM) system are to (1) quantify the level of dynamic amplification due to the bolted rail splices, (2) detect and monitor the growth of the cracks in the main supporting elements of the critical span(s) within the Manhattan approach, and (3) quantify the effectiveness of fatigue mitigation strategies implemented by NYCDOT. The monitoring system will be designed to establish a

correlation between the load imposed strains, i.e. a number of trains simultaneously crossing over the bridge, and their impact on crack growth and displacements.

8. Implementation of Research Outcomes (or why not implemented)

The intended outcome of the project is to design a SHM system with unique features, including fiber optic based monitoring of cracks. This tool will provide bridge owners with a new and innovative approach for effective troubleshooting in signature bridges. The size of the bridge (6855 feet) will not allow for full implementation of the proposed SHM system. The bridge owners will determine its usefulness and efficiency for future installation of more sensors to cover the entire length of the Bridge.

9. Impacts/Benefits of Implementation (actual, not anticipated)
To Be Determined

10. Dates and Budget

Start date: 9/1/2018

End date: 6/30/2019

UTC (CAIT) Dollars: \$292,024

Cost Sharing: \$0

Total Dollars: \$292,024

11. Keywords

Cracks, Fatigue, Condition Assessment, Safety, Structural Health Monitoring, Bridges

12. Web Links (Reports and Project Website)

<https://cait.rutgers.edu/research/collaborative-project-structural-health-monitoring-of-representative-cracks-in-the-manhattan-bridge/>