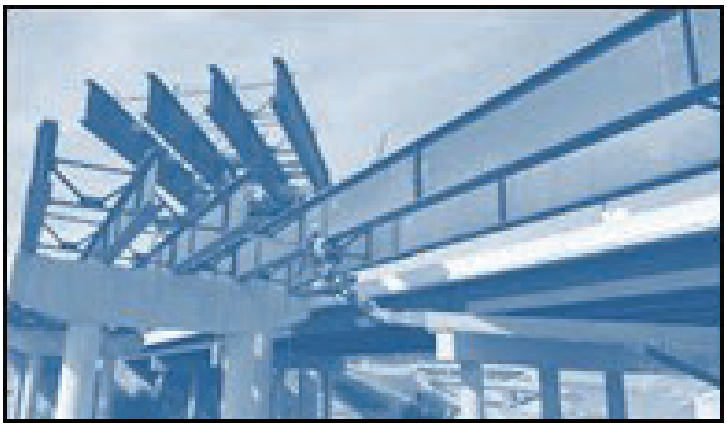
Research Summary

Development of Comprehensive Inspection Protocols for Deteriorated Steel Beam Ends

Research Need

The measurement and classification of important parameters in bridge insopection which have not been typically measured in the past by inspectors and enhancing the inspection protocols so that important deterioration information needed for the new improved procedures is documented during inspections.



Goals/Objectives

1. Effective and efficient procedures for collecting important data from deteriorated steel beam ends using new procedures.

2. Explore new practical inspection techniques and also provide inspection solutions using new technology such as LiDAR scanning or drone technology to obtain the critical measurements.

3. A comprehensive inspection and documentation protocol which will be used along with the new load rating procedures for more accurate and effective load rating of steel bridge beam ends.

4. Identification and classification of unique cases which would require future research or advanced modeling that cannot be described by the new load rating procedures.

5. Computational evaluation of steel girders with end corrosion as part of a bridge system.

Methodology

This research reviewed and documented current inspection procedures across the different MassDOT districts and identified the impact of the important parameters in the remaining capacity of deteriorated beam ends.

The research used LiDAR to obtain critical data for the load rating procedure. Measurements were performed in the lab and their accuracy and efficiency was assessed.

The system behavior of bridges with deteriorated beam ends will be explored through computational methods.

Key Findings

The project evaluated current inspection procedures and identified many limitations and constraints of the inspection practices.

The use of LiDar was shown to be very promising for bridge inspections as long as it is used with caution. More work is needed in this area.

There are significant reserves of capacity when bridges are analysed as a system.

Use of Findings

There is a lot of room for improvement regarding the existing bridge inspection procedures, and those improvements could greatly increase the safety and efficiency of bridge inspections, while also decreasing inspection costs.

Any new procedure should be designed to yield consistent results in order to ensure that the condition of all bridges is thoroughly assessed and monitored over time to prevent any catastrophic structural failures in the future. Laser scanning, and UAVs are known by some inspectors and are advanced technologies that can be used to estimate corrosion.

The efficiency of 3D laser scanning as a potential technology for bridge inspection has been explored and validated. LiDARs can address the shortcomings of conventional data acquisition techniques while at the same time abolish the sensitivity of ultrasonic thickness gauges along bumpy surfaces. Thickness estimations resulting 3D laser scanning post-processing were verified, and subsequently employed for capacity estimations.

Project Information

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