FACT SHEET

Improved Load Rating Procedures for Deteriorated Unstiffened Steel Beam Ends

RESEARCH PROJECT TITLE

NETC 19-3: Improved Load Rating Procedures for Deteriorated Unstiffened Steel Beam Ends

STUDY TIMELINE

September 2020-January 2024

PRINCIPAL INVESTIGATOR

Simos Gerasimidis, Ph.D.
The University of Massachusetts Amherst
Sergio Breña, Ph.D.
The University of Massachusetts Amherst

Aidan Provost
The University of Massachusetts Amherst
Georgios Tzortzinis, Ph.D.
Technische Universität Dresden
Shahrukh Islam
The University of Massachusetts Amherst

NETC CONTACT

Kirsten Seeber
NETC Coordinator
CTC & Associates LLC
608-620-5820
netc@ctcandassociates.com

MORE INFORMATION

https://www.newenglandtransportationconsortium.org/projects/netc-19-3/

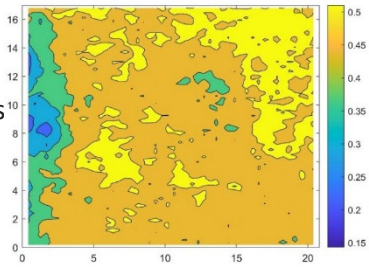
The New England Transportation Consortium, a cooperative effort of the transportation agencies of the six New England States, funded this research. Through the Consortium, the states pool professional, academic and financial resources for transportation research leading to the development of improved methods for dealing with common problems associated with the administration, planning, design, construction, rehabilitation, reconstruction, operation and maintenance of the region's transportation system.

Introduction and Problem

Aging and deteriorating infrastructure is a growing national and worldwide problem. New England is home to 10,155 steel bridges, 7,344 of which are labelled as "Fair" or "Poor" via the InfoBridge database. A major issue that leads to this rating is steel beam end corrosion due to water, de-icing chemicals, and other debris travelling from the deck to the abutments below. Accurately evaluating and determining the section loss and capacity of these ends is a challenging task for bridge inspectors and load rating engineers.

Methodology

The first task of the project was to collect and compile inspection reports provided by DOTs within New England. The research team was able to carefully identify trends and patterns in the data, which was used to determine the most common scenarios of corrosion encountered in bridges within New England states. Following this task, corroded bridge girder specimens were selected from existing structures to be documented and experimentally tested in the structural testing facility at UMass Amherst. The specimens were also computationally analyzed for their section loss and remaining capacity. The final goal of this project was to evaluate the current capacity rating procedures across all the New England states against the experimental results and recommend updates to theses procedures.



Conclusions

There were many conclusions drawn over the study that span from corrosion profiles to load rating evaluation. The research team found that beam specimens from the same bridge exhibit similar corrosion profiles. Along with this, scanning provides a fast and accurate method for evaluating section loss and observing these section loss profiles. Utilizing this vast scanning data, capacity evaluations were conducted via each of the New England state's provisions. While many of the state's provisions performed well, the MassDOT provisions provide the most comprehensive evaluation and most accurate predictions for the capacity of the corroded end specimens.

Implementation and Benefit

There is great potential for implementation regarding the inspection processes and each state's corroded bridge beam end capacity estimation procedures. Utilizing scanning technologies provides a fast and accessible way to capture vast amounts of detailed data. Additionally, implementing or updating each state's provisions to the most accurate evaluation methods would provide greater accuracy and certainty in the capacity estimation of corroded beam ends.