

**Completed Project Review and Update:**

**Project Number and Title:** 1.1 Field Live Load Testing and Advanced Analysis of Concrete T-Beam Bridges to Extend Service Life

**Research Area:** Thrust Area 1

**PI:** W. Davids, UMaine

**Co-PI(s):** (N/A)

**Reporting Period:** 9/30/19 – 12/31/19

**Submission Date:** 03/13/20

**Technology Transfer:**

Describe any activities involving the dissemination of research results (be sure to include outputs, outcomes, and the ways in which the outcomes/outputs have had an impact during the reporting period.) Please use the tables below for any publications, presentations, conferences, workshops, etc. in addition to the description of any other technology transfer efforts that took place during the reporting period. List **all other outputs, outcomes, and impacts after the tables** (i.e. patent applications, technologies, techniques, licenses issued, and/or website addresses used to disseminate research findings).

<b>Table 3: Presentations at Conferences, Workshops, Seminars, and Other Events</b>				
<b>Title</b>	<b>Event</b>	<b>Type</b>	<b>Location</b>	<b>Date(s)</b>
Field Live Load Testing and Advanced Analysis of Concrete T-Beam Bridges to Extend Service Life	TIDC 2020 Quarter 1 Update Seminar	Seminar	Remote	1/24/2020

<b>Table 4: Publications and Submitted Papers and Reports</b>				
<b>Type</b>	<b>Title</b>	<b>Citation</b>	<b>Date</b>	<b>Status</b>
Report	Investigation of Behavior of Skewed and Un-Skewed Reinforced Concrete T-Beam Bridges and Load Rating Improvement Through Proxy Finite Element Analysis	Schanck, A. <i>Investigation of Behavior of Skewed and Un-Skewed Reinforced Concrete T-Beam Bridges and Load Rating Improvement Through Proxy Finite Element Analysis</i> . University of Maine, Orono, ME. Report No. 20-20-1613.	12/20/2019	Accepted by Maine DOT
Report	Field Live Live-Load Testing and Advanced Analysis of Concrete T-Beam Bridges to Extend Service Life	Schanck, A., Davids, W. <i>Field Live Live-Load Testing and Advanced Analysis of Concrete T-Beam Bridges to Extend Service Life</i> . University of Maine: Orono, ME.	1/31/2020	Accepted by TIDC

**OUTPUTS:**

This research has resulted in an increased understanding of the behavior of reinforced concrete T-beam bridge behavior through diagnostic live-load testing. In particular, it examined the differences between the behavior of skewed and unskewed structures and resulted in improved rating factors for a collection of five such structures. In addition, a method

by which older, reinforced concrete bridge structures can be load-rated with a higher degree of accuracy than is available through conventional beam-line analysis. This method uses a novel finite element modeling technique to account for these structure's considerable post-elastic capacity and ductility, resulting in increased rating factor over both conventional analysis and diagnostic live-load testing in most cases.

**OUTCOMES:**

As a result of this research, the load ratings of five reinforced concrete T-beam bridges were improved through an increased understanding of their behavior. This has effectively removed these bridges from the list of those in need of remedial action by the Maine Department of Transportation.

**IMPACTS:**

Improvement of the rating factors of five, older, reinforced concrete bridges has allowed the Maine Department of Transportation to remove them from the list of structures in need of remedial action (for instance load posting, repair, or replacement). This has allowed the Department to allocate scarce resources elsewhere and has mitigated potential costs to the general public due to construction and repair delays.

**Workforce Development**

No opportunities of development have been provided.