UTC Project Information – Project 1.13	
Project Title	Structural Integrity, Safety, and Durability of Critical Members and Connections of Old Railroad Bridges under Dynamic Service Loads and Conditions
University	University of Connecticut (UConn), Storrs, CT
Principal Investigator	Ramesh B. Malla, Ph.D., F. ASCE, F. EMI, A.F. AIAA, M. CASE (Institutional Lead)
PI Contact Information	E-mail: Ramesh.Malla@uconn.edu; Phone: (860)486-3683 Address: Department of Civil &Environmental Engineering, 261 Glenbrook Road, Storrs, CT 06269-3037
Funding Source(s) and Amounts Provided (by each agency or organization)	Federal: $190,044 University of Connecticut: $190,069
Total Project Cost	$380,113
Agency ID or Contract Number	69A3551847101
Start and End Dates	October 01, 2021 - September 30, 2023
Brief Description of Research Project	Most of the New England railway bridges were designed and built more than a century ago with outdated design codes and materials. The objective of this research project is to investigate the structural behavior of critical members and connections, such as eye-bars, pins, and gusset plates (Fig. 1 and 2), of old truss-type steel railway bridges in the Northeast region under dynamic structural response factors such as service load, environmental conditions, and material aging. The proposed project will establish a systematic framework to apply analytical, computational, and experimental/field testing techniques to pinpoint, evaluate, and mitigate the damage in the connections between steel members in old railroad bridges. Starting with a critical review of the existing data of past connections issues and failure from selected bridges, the research team will work closely with New England's Department of Transportation (DOTs) and railroad companies to generate reliable data recording and evaluation of bridge type versus connections problems, existing mitigation methods, and current repair techniques. Existing data collected from operational and maintenance teams, such as images and reports, if available, will also be used. Updated Finite Element (FE) Models will be used to simulate different operation scenarios, such as braking and traction, to establish parameters to identify and analyze possible critical member's connections under different scenarios. Similarly, the research will focus on the detailed local analysis of those critical connections, with an emphasis on dynamic behavior, impact, and material aging. The updated FE Model will be used to establish parameters to identify and evaluate critical member's connections. An optimization of the number and location of sensors will be determined by using an optimization algorithm such as genetic algorithm, and will aim to develop an effective and efficient method of finding the location and severity of damage using vibration-based methods such as Modal Strain Energy Change in conjunction with some optimization algorithms. The output data from strain gauges and other sensors collected in field- and scaled- prototypes will be used to validate and verify the global, and local, FE model of the critical member's connections. Finally, different connection strengthening and anti-wear methods will be evaluated and implemented numerically and analytically to check their effects on extending a bridge's future life.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	This project is in its initial research phase. Implementation of Research outcomes will be reported upon completion of initial research.
Impacts/Benefits of Implementation (actual, not anticipated)	This project is in its initial research phase. Impacts and benefits of the research will be reported after the implementation phase.
Web Links	Coming Soon

• Reports • Project website	