Gusset-less Bridge Truss Connection

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Report Title

Gusset-less Truss Connection Physical and Structural Model to Aid Bridge Inspection and Condition Assessment

NHDOT Bridge Design/ Bridge Maintenance

Nicholas Goulas
Nicholas.Goulas@dot.nh.gov
Steve Johnson
Steve.Johnson@dot.nh.gov

Principal Investigators

Erin S. Bell, Ph.D., P.E.
Ricardo A. Medina, Ph.D., P.E.

University of New Hampshire
Department of Civil and Environmental Engineering

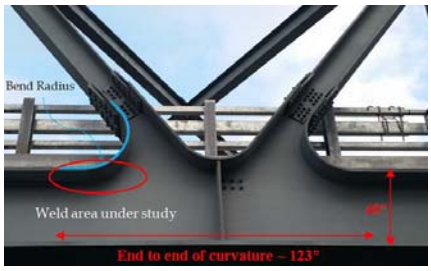
Report Link

https://www.nh.gov/dot/org/projectdevelopment/materials/research/projects/26962m.htm

NHDOT Research Unit

Bureau of Materials and Research
5 Hazen Drive
Concord, NH 03302
(603) 271-3151

Why was it studied?

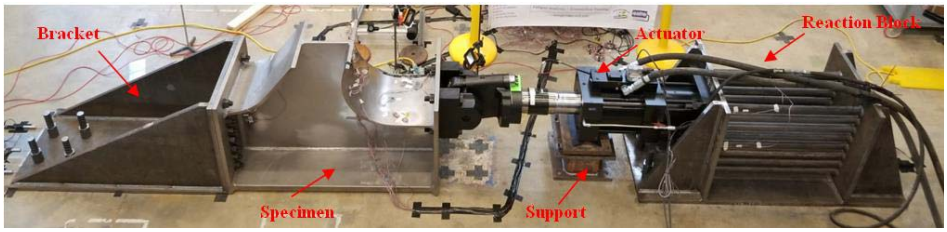


The Memorial Bridge spans the Piscataqua River between Portsmouth, NH, and Kittery, ME. The original Memorial Bridge began operation in 1923 making it over 89 years old when it was officially closed for structural deficiencies in 2012. The original design had three spans that included a center vertical lift. In 2013, the new Memorial Bridge, designed by HNTB Corp., was opened to traffic. The new bridge used the existing piers and had a similar design with a lift-span in the center and a steel truss structural system. One major change was the innovative connection designed for the members of the truss system. In most steel truss bridges, the connections between the members are made using gusset plates. When using gusset plate connections, multiple structural members are framed into one joint. The gusset plates are bolted and/or welded to each side of the members. Although widely used, the gusset plate connections have major drawbacks:

- Gusset plates cover the structural members making bridge inspections more difficult.
- The members framing into the connection location cause stress concentrations.

What was done?

The goal of this research was to investigate the structural performance of this connection through laboratory testing. More specifically, the study evaluated the fatigue performance of the gusset-less truss connection. In addition to the structural performance, the study helped the Department understand the connection and the critical locations for future inspections.



What did we learn?

The main benefits of using this type of connection are as follows:

- Compared to traditional connections, there was a reduction in number of bolts needed.
- The connection is much easier to inspect since nothing is shrouded behind a large plate.
- The spliced connections can be partially replaced while the bridge is under load.

How can we use it?

Although ultimately determined by NHDOT, given the performance of the fatigue test specimen, the period and frequency of any nondestructive evaluation assessment could exceed ten years without concern of fatigue performance. The overall project intends to use the laboratory data to aid in the development of an inspection protocol for the Memorial Bridge.