

I-91 Springfield Viaduct Structural Life Extension

Client:

CME Associates

Location:

Springfield, MA

Services Provided:

Real-time dynamic stress monitoring and fatigue analysis.

Value Provided:

- Structural model validation to assess the fatigue life of critical bridge components
- Data verified model prediction for 35 years of remaining service life of the superstructure
- Results used to prioritize decisions for Asset Management

Background & Project Challenges

The Interstate 91 Viaduct, constructed in late 1960's is an elevated bridge that runs through Springfield, Massachusetts. The elevated structure consists of multiple simply supported spans with a total length of approximately one mile in need of replacement that could cost the owner about half the total amount it spends annually on roads and bridges. Based on the feasibility study performed by CME Associates, MassDOT selected the option to rebuild the viaduct as is, by performing a full deck replacement and evaluate the existing structure through instrumentation and monitoring to provide a minimum 20 year service life.



Geocomp Role & Accomplishments

Geocomp's instrumentation plan included 150 spot weldable strain gages installed on superstructure steel members and 4 triaxial accelerometers and 2 linear potentiometers installed on selected bridge piers. Valuable stress loading and displacement data from one typical week of live traffic conditions were collected with *iSite*TM high speed data loggers at a frequency of 200 Hz. The precise instrumentation installation and data processing using rainflow-counting algorithms developed by Geocomp allowed CME to perform fatigue life calculations to determine the remaining service life of the superstructure using field data to validate their model.

Data processing consisted of the development of an automated program to perform the stress loading cycle counting for the fatigue analysis in accordance with ASTM E1049-85 - Standard Practices for Cycle Counting in Fatigue Analysis. The data collected also allowed for differentiation between traffic stress loading and thermal induced stresses that can often be magnitudes greater than live load stresses.

As a result of the successful performance of the instrumentation and monitoring program, the client was able to validate and refine advanced numerical models. Predictions based on the stress loading data resulted in an estimated 35 year life extension of the I-91 Springfield Viaduct superstructure.