

Title:

Remote Monitoring and Wheel Load Distribution Study in Land Bridge in Vernon Co., WI

Background and Problem Statement:

Under the Innovative Bridge Research and Construction Program, Wisconsin Department of Transportation and the Federal Highway Administration supported a study that included installation of various sensing devices and remote monitoring for structural response in the Land Bridge located on state highway 131 in Vernon County, Wisconsin. This is the first hybrid high-performance steel bridge in Wisconsin and it spans 275 feet over a stream approximately 40 feet below. The bridge was constructed in 2001 and it consists of a curved double-tub steel construction with composite concrete deck. The WisDOT wishes to extend the monitoring study and to include a study of the wheel load distribution effect in the Land Bridge. Research effort is needed to develop a better understanding of the thermal and traffic effects on the superstructure for this bridge. The results of the study can be used to better understand the load effects on the bridge and to determine the expected life of the bridge under traffic and environmental factors.

Scope:

The additional continuous monitoring study will include interpretation of the data from all sensing devices and data presentation in a format that is useful for bridge engineers to determine the life expectancy of the bridge under normal conditions. Working with the WisDOT staff, the longitudinal and transverse effects of wheel loads will be studied on the box girders in the bridge. Experimental measurements will be made under control vehicle loads through data from the sensing devices in the bridge. A technical report will be prepared and submitted to WisDOT at the completion of the study to present the results of the monitoring and the wheel load distribution studies. The study will evaluate and compare the field-measured data with those obtained from analytical/computer solutions as well as the service load and strength design methods under the AASHTO standard specifications and make appropriate recommendations.

Specific Results, Findings, Tools, etc.:

- Better understanding of the effects of traffic and thermal loads in the Land Bridge.
- Better understanding of the traffic wheel distribution effect on the girders in the Bridge.
- Recommendations for life expectancy in the bridge due to both traffic and environment.
- Evaluation and comparison of the measured wheel load distribution data with analytical solutions and AASHTO guidelines.
- Recommendations for future work in this area by WisDOT.

Length of Research Project and Approximate Cost to Complete:

The project is proposed to be a 2-year study with an approximate cost of \$30,000.

Urgency and Potential Benefits:

Based on the results of this study, WisDOT engineers can determine the life expectancy of the Land Bridge more precisely and have a better understanding of the wheel load distribution in the bridge. The results of the wheel load distribution study may be combined with those from other bridges in Wisconsin to arrive at a guideline for more effective design of bridge elements.