State of Wisconsin/Department of Transportation

RESEARCH PROGRESS REPORT FOR THE QUARTER ENDING: March 31, 2008

Program: SPR-0010(36) FFY99	Part: II Research and Development
Project Title: Monitoring and Load Distribution Study for the Land Bridge	**Project ID: 0092-07-09**
Administrative Contact: Nikki Hatch	**Sponsor: Wisconsin Department of Transportation**
WisDOT Technical Contact: Ed Fitzgerald	**Approved Starting Date: 10/01/06**
Approved by COR/Steering Committee:	**Original End Date: 10/01/08**
Project Investigator (agency & contact): Uinv. Of Wisc.-Milwaukee, Dr. Al Ghorbanpoor	**Current End Date: 01/01/09**
	Number of Extensions: 1

Percent Complete: 65%

Request a No Cost Time Extension (Please Select One): ( ) YES (X) NO

Reason for No Cost Time Extension:

Project Description:

With funding provided through the USDOT's Innovative Bridge Research and Construction Program (IBRC), a study was conducted at the University of Wisconsin-Milwaukee that was entitled, "Fatigue Resistance and Monitoring of HPS Bridge Members" in the Land Bridge. The bridge is located in the Vernon County, Wisconsin and is constructed of a 270-foot long simple span curved double-tub girders made of high-performance steel (HPS) flanges. The project is identified as WISDOT Project ID # 1000-02-02 and it had a performance duration from June 2000 to August 2005. This study was completed in two phases. The Phase I study included a series of laboratory cyclic load tests of full size hybrid steel girders made of high-performance steel flanges and more commonly used weathering steel webs to establish their fatigue resistance and suitability for use in the Land Bridge. The Phase II study consisted of installation of various sensing devices (strain gages, LVDT's, vibration gages, and temperature gages) in the bridge and remote monitoring of the bridge elements responses due to loads from traffic and temperature fluctuations.

As a result of the Phase II study, the investigators were able to obtain results to document the response of the bridge girders during a full year cycle (from April 2004 to March 2005). It was found that thermal load cycles played a dominant role in causing stresses up to 8.0 ksi in the girders. The live stresses caused from the effect of routine traffic were not as severe. Since the documented bridge response at the time was only for a period of one year, it was uncertain that if it had offered a true representation based on the normal service conditions. Since all relevant sensing devices and supporting instrumentation were already installed at the bridge, it was proposed to extend the monitoring period for the Land Bridge for a longer period of time to obtain a more reliable representation of the bridge behavior. Also, the presence of the current instrumentation in the bridge was suitable for expanding the scope of the project to include an effort to better understand and document the distribution of truck wheel loads on the bridge girders based on the specific structural configuration of the Land Bridge.

The primary objective of this study is to continue to monitor the Land bridge for an additional two years, to continue to document the load history, and to obtain the response of the bridge for a longer period of time. Also, it is intended to study the effects of truck wheel load distributions on the tub girders through field test preformed at the bridge using WisDOT trucks with known axle loads. An analysis of the bridge will be performed using a finite element computer program to correlate with the results of the load tests.

Progress This Quarter:
(Includes project committee meetings, work plan status, contract status, significant progress, etc.)

Research staff for this project has continued to collect monitoring data from the sensors (strain gages and LVDTs) installed at the bridge, Figures 1 and 2. A field visit to the site of the Land bridge was made on January 25, 2008 to examine the status of the data acquisition system and download data to a storage device. Because of modem problems, the data that has been stored at the site was downloaded manually.

The research team has analyzed the acquired data from the routine traffic load, thermal effect, and truck-load tests to evaluate the load distribution in the bridge. The data is being compared with the results of finite element analysis for verification. The finite element analysis of the bridge under traffic load, known truck load from the field testing, and environmental load is being continued. A new finite element software license has been obtained to allow 3-D analysis of large structures under this project.

Work Next Quarter:

We will continue to monitor the land bridge structure for service and environmental loads and analyze the recorded data from the service loads as well as the field testing under known truck load. The research staff will continue the finite element analysis of the bridge to verify the load distribution pattern observed during the field testing.

Circumstances Affecting Progress/Budget:

None.

Gantt Chart:

MONTHS	0 2 4 6 8 10 12 14 16 18 20 22 24 27
TASKS	
A. Assessing Conditions of Existing Sensing Devices and Instrumentation	
B. Remote Monitoring of the Land Bridge	
C. Review of Available Literature	
D. Numerical Analysis	
E. Field Testing	
F. Final Report	

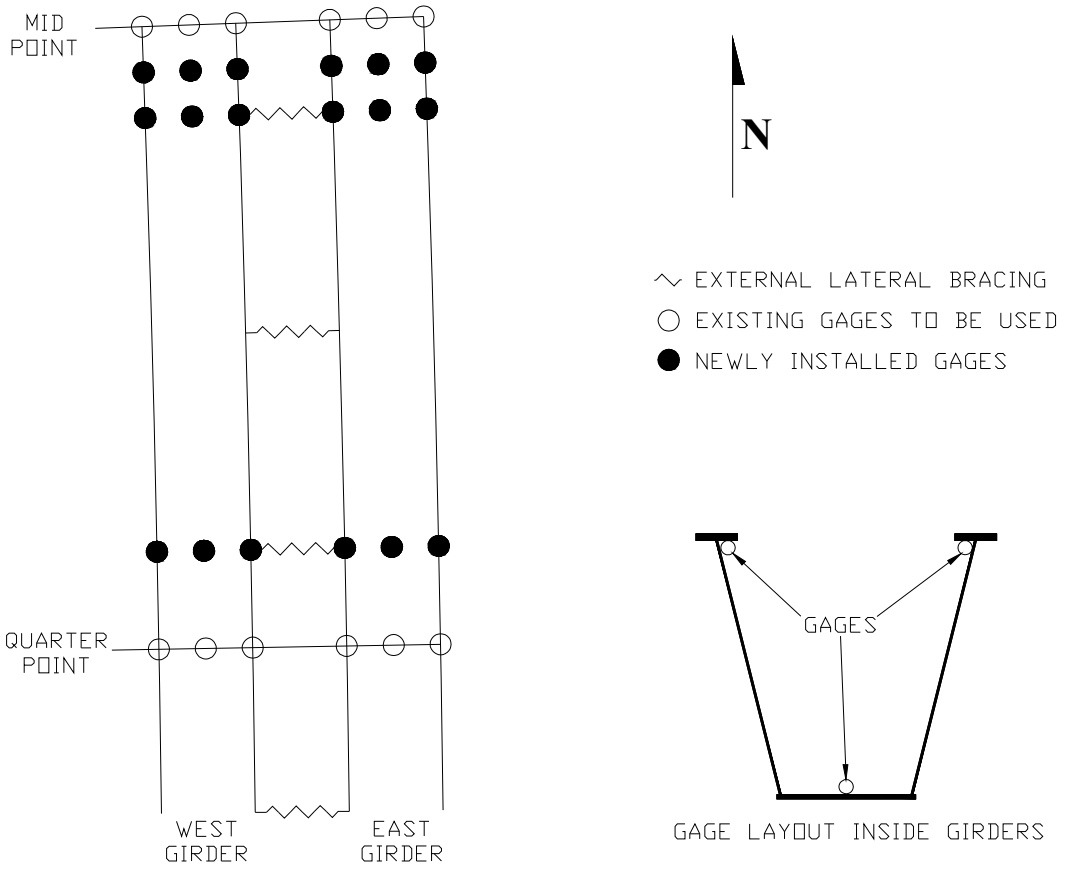

Figure 1: Strain Gage Locations Used for Load Distribution Testing

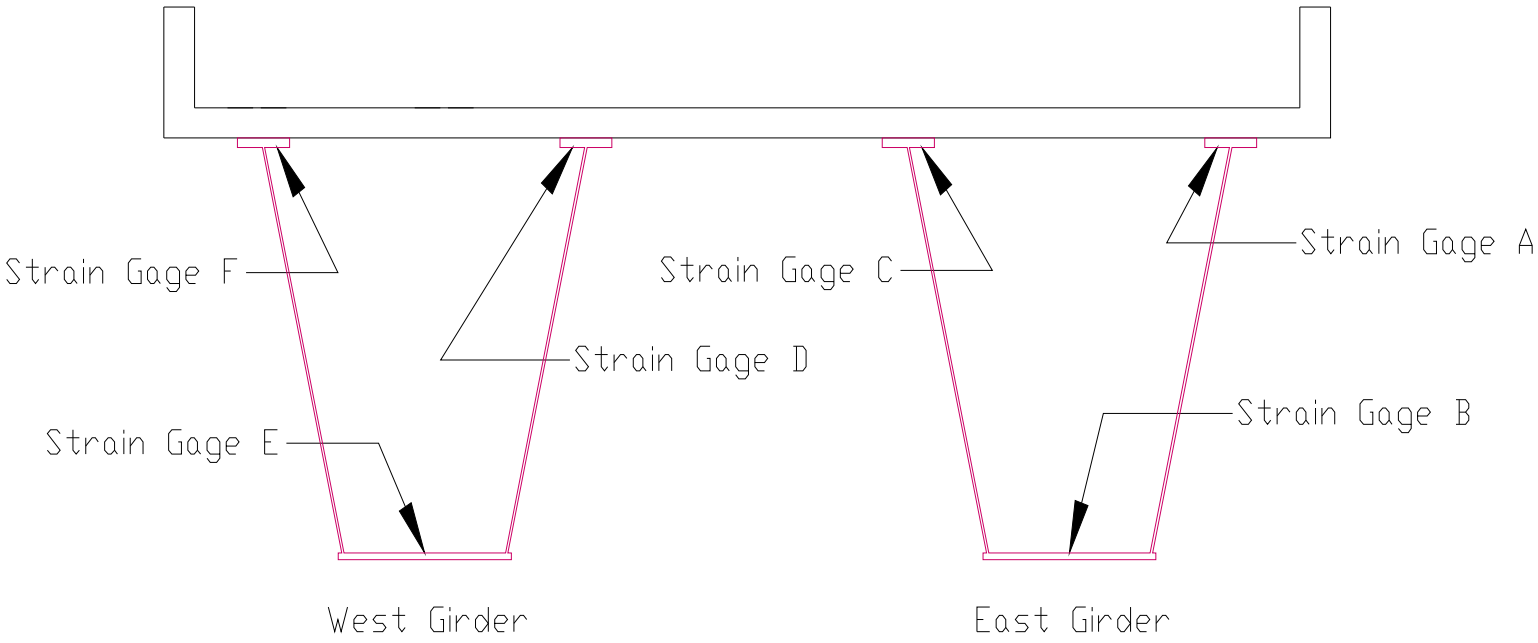

Figure 2: Strain Gage Identification As Used for Load Distribution Testing