



ABOUT ARSENAL BRIDGE

Industry: Civil

Location: Rock Island, Illinois;
Davenport, Iowa

The Government Bridge, also known as the Arsenal Bridge, connects Rock Island, Illinois to Davenport Iowa. The Arsenal Bridge starts very close to the Rock Island Arsenal, a U.S. Army facility, which sits on a small island. This engineering feat was constructed in 1896, a 336 foot-long 360-degree swing span bridge that can carry a load of 2,000 tons.



The Arsenal Bridge

The Challenge

The Arsenal Bridge features a combined two-lane highway-railway with the highway spanning 1,556 feet and the railway spanning 1,848 feet. The upper deck of the bridge hosts the two railway lines, while vehicles operate on the lower deck, allowing access for pedestrians and bicycles with designated lanes on each side.

Given the high volume of rail and vehicle traffic and the complexity of the bridge, a reliable Structural Health Monitoring System (SHMS) is needed to monitor the integrity and behavior of the bridge structure to safeguard against the effects of heavy loads.

The Solution

The innovative design solution for the Arsenal Bridge consisted of Luna's optical sensing interrogator, sensor multiplexer and controller and data storage module, used in conjunction with Luna os3100 Strain Sensors, os4300 Temperature Sensors and 3-D Accelerometers, Fiber Optic Tilt Meter, as well as Conventional AE weather and corrosion sensors. With the bridge sectioned into four different monitoring zones, 67 sensors blanketed the upper and lower decks of the structures along the entire length.



INSTRUMENTS USED

During this installation, Luna's sm130-500 Optical Sensing Interrogator and sm041-416 Optical Channel Switch Extension were used in conjunction with our os3100 Strain Sensors, os4300 Temperature Sensors, Luna 3D Accelerometers, Fiber Optic Tilt Meter, and Conventional AE weather and corrosion sensors.

The Luna Fiber-Bragg grating sensor arrays were pre-assembled to length for each bridge segment, then once on-site, unpacked and prepared for installation. Once installed, the sensors were connected to the Luna interrogator, and began gathering and delivering data via Luna's ENLIGHT application software to systems interator Chandler Monitoring Services (CMS) IntelOptics™.

CMS's customized GUI software provides alerts and analysis when various sensing systems approach or exceed established limits. IntelOptics also communicates with numerous sensing systems to display status and provide information in one centralized user program which can be accessed remotely.

This design approach highlights and validates Luna's solutions as state-of-the-art innovative technology.

The Results

The SHMS employed on the aging bridge will greatly reduce the risk of catastrophic failure by providing advance warning of growing structural problems caused by corrosion or materials degradation. This project highlights and validates Luna's solutions as state-of-the-art innovative technology for remote structural health and corrosion degradation monitoring of steel bridges.



Access via man-lift and scaffolding



Sensors being prepped for installation