



Vicksburg Bridge

Vicksburg, Mississippi, USA

December 2010



Vicksburg Bridge- General Characteristics

The Vicksburg Bridge is a cantilever bridge that crosses over the Mississippi river from Delta, Louisiana to Vicksburg, Mississippi.

Four Lane Highway Structure where I-20 joins US 80.
Traffic: Vehicle 25,000/day (2007)

Length: 12,974 feet (3,954 m) with a total of 7 spans
Longest span: 1870 feet (265 m)
Width: 60 feet (18m)





Aim	To monitor the integrity and behavior of the bridge structure as well as the high volume vehicular & marine traffic that could cause fatigue & possible damage.	
Location	Vicksburg, Mississippi	
System Integrator	Chandler Monitoring Systems, Inc. http://www.chandlermonitoring.net	
Customer	Concurrent Technologies Corporations	
Date	December, 2010	
Instrumentation	(1) Micron Optics sm130-500 Optical Sensing Interrogator (1) Micron Optics sm041-416 Optical Channel Switch Extension	
Sensors	(37) Micron Optics os3150 Strain Sensors (16) Micron Optics os4350 Temperature Sensors (10) Micron Optics os7100 3-D Accelerometers (6) FBG Tech Fiber Optic Tilt Meters	(1) FOS&S Pressure Sensor (4) Rohrback RCS-36 corrosion sensor (8) CEL Displacement Sensors (1) Security Sensor Hatch door and mat
Auxiliary Feature	(3) Bosch PTZ Camera System (1) WeatherHawk 500 Weather Station (1) BP Solar BP375J PV Solar Power Station	
Project Scope	Employ monitoring system on the bridge to greatly reduce risk of catastrophic failure by providing advance warning of growing structural problems caused by corrosion & degradation as well as damage from barge traffic. Demonstrate and validate state-of-the-art innovative technology approaches for remote structural health and corrosion degradation monitoring of bridges.	

The monitoring system instrumentation is composed of:

- Single optical interrogator (model sm130-500)
- 4x16 channel sensor multiplexer (model sm041-416)
- Optical FBG sensors & other sensors

Custom Designed
Computer System

Sensor Interrogator
sm130-500



Sensor Multiplexer
sm041-416



MOI 3150 Strain



MOI 7100
Accelerometer



MOI 4350 Temp.



CEL Displacement



FBG Tech Tilt Meter



FOS&S Pressure

The Vicksburg Bridge utilizes the high power, high speed swept wavelength laser of the sm130 Optical Sensing Interrogator. The combination of both x30 technology and optical sensors allow users to monitor dynamic sensors and measure static sensors. This rugged yet robust module is deployed in a variety of markets to provide accurate information for long-term field operations.

- Provide Measurement of:

- FBG strain gages,
- Temperature probes
- Accelerometers
- Pressure
- Displacement
- Other FBG Sensors



The combination of the sm130 interrogator with Micron Optics industrial grade multiplexer module provides the Vicksburg Bridge the benefits of additional channels to multiply the total optical sensor count per interrogator. This switch technology features low insertion-loss, fast response time, and high repeatability.



- Expands 4 parallel channels to 8 or 16 sub-channels
- Accommodates 100's of sensors
- Solid state technology tested to trillions of cycles
- Switch and coupler based multiplexers can achieve up to 64 connections

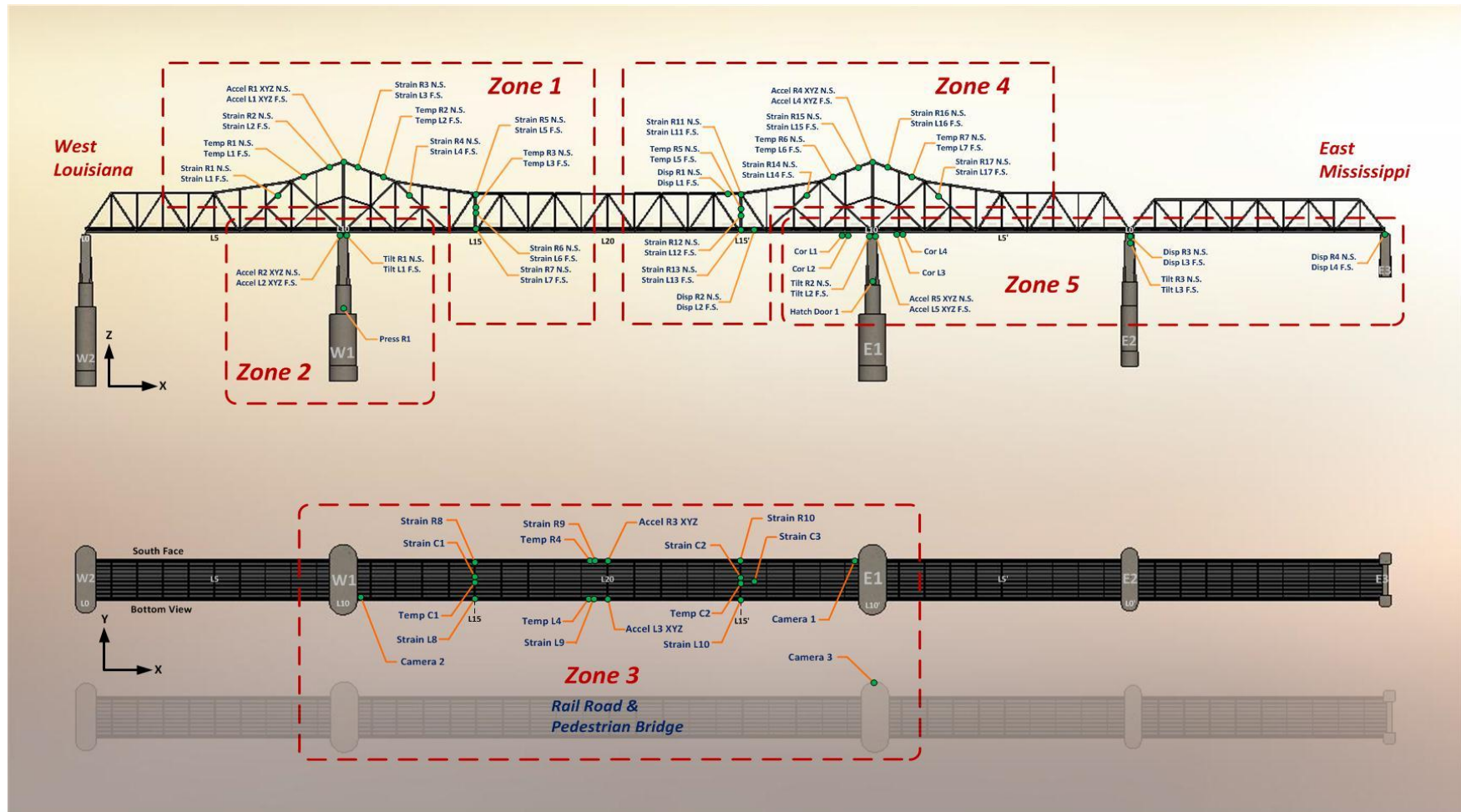
The optical system is housed inside NEMA rated box with controlled temperature and humidity.



Vicksburg Bridge: Structural Monitoring System Overview

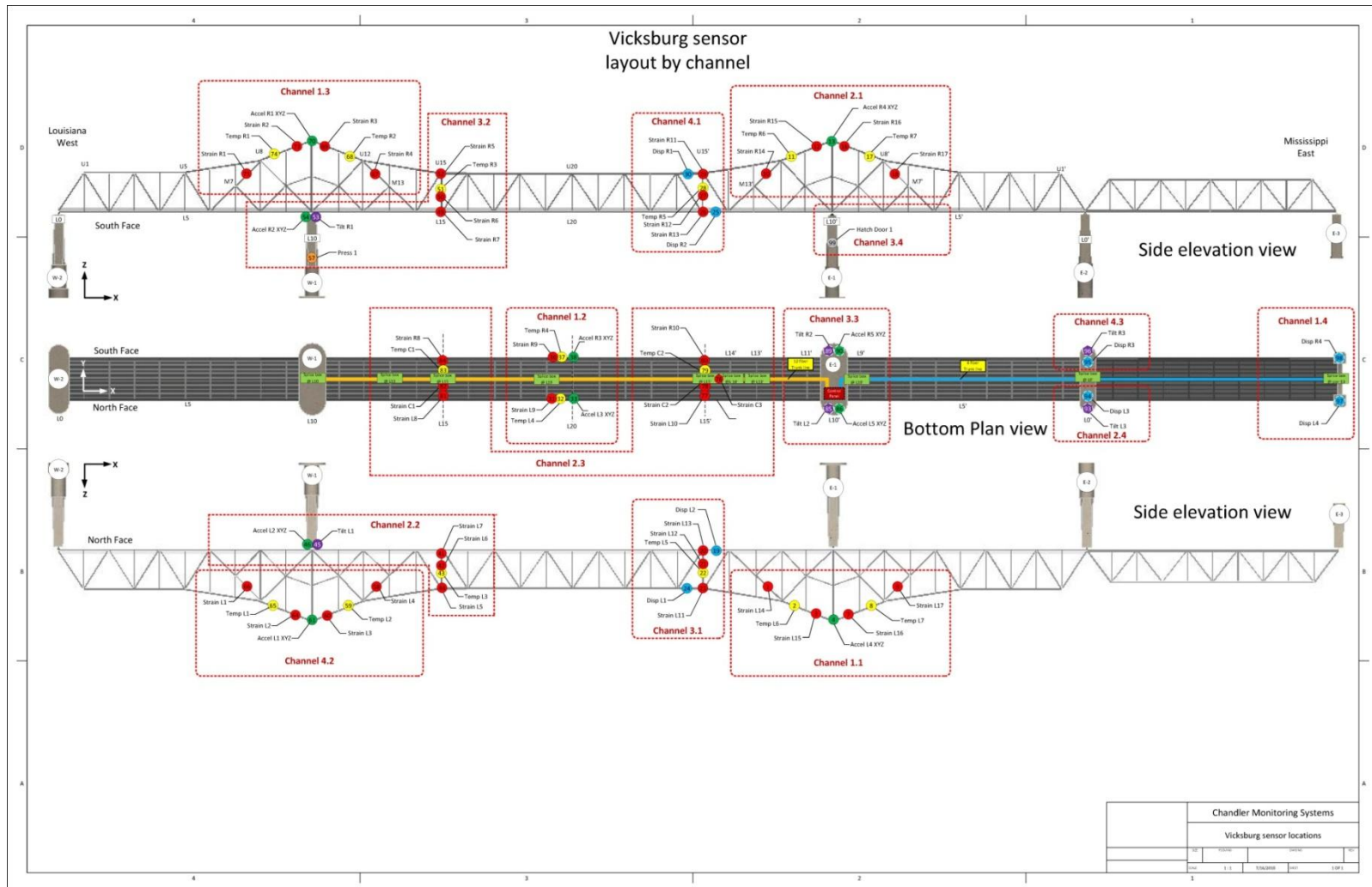
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- The bridge is broken up into five different zones.
- Sensors were installed along the structure including the steel superstructure below the road deck and at the piers.




Vicksburg Bridge: Sensor Network Configuration

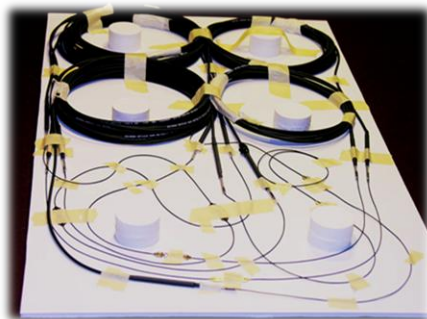
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Each section uses a variety of sensors on a single fiber connected to the interrogator in order to monitor the structural health of the bridge.



Services	
Installation	CMS installation staff provides end-to-end installation of the SHM (structural health monitoring) systems. The CMS installation staff is insured, certified in safety procedures and trained and experienced in the latest technologies.
Monitoring	CMS provides complete monitoring services including analysis of data and regular customer reports. Included in the monitoring system are defined thresholds for alarms and alerts. CMS provides the customer with complete training on the system description, operation, and maintenance.
Software	CMS provided the customer with the IntelliOptics™ Software package. This is a customized graphical user interface software application package which provides the customer with a single monitoring interface for all of the system components. The IntelliOptics™ system monitors, gathers data, and provide alerts and analysis when various sensing systems approach or exceed established limits.
Application	Vicksburg Bridge application: http://www.chandlermonitoring.com/applications/structuralcivil/vicksburg-bridge/



Vicksburg Bridge: Results

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The Vicksburg Bridge CMS Structural Health Monitoring System is installed and up and running successfully. Shortly after the system installation completed, a barge that had broken apart upstream sent sections crashing into the bridge piers. This impact set off alarms notifying both the customer and CMS allowing them to monitor the change in various sensor measurements, identify the crash location, and watch a live-feed with the camera system. Bridge inspectors and DOT members were physically inspecting the location within a few minutes of the crash.

Weeks later a barge section remains pinned against a bridge pier. Members from the Army COE, MSCDOT, LADODT, and other organizations utilized the advantages of an optical sensing monitoring system to keep the bridge open to traffic while assessing the structural health of the Vicksburg Bridge.





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