

Indian River Inlet Bridge - Rehoboth Beach, Delaware



Bridge Owner: State of Delaware DOT

CEL Customer: University of Delaware, Department of Civil and Environmental Engineering, Center for Innovative Bridge Engineering
Dr. Harry (Tripp) Shenton

Project Description

Comprehensive fiber optic structural health monitoring system combining embedded strain/temperature sensors, accelerometers, tilt meters, joint displacement sensors and chloride penetration sensors. The system will be synchronized with attached anemometer.

Project Duration

Staged installations throughout the entire bridge construction process, est. completion date Fall 2011.

System Use

The system will serve long term both as a research tool to analyze and track performance of the structure over its life as well as a real time warning system for problem areas.

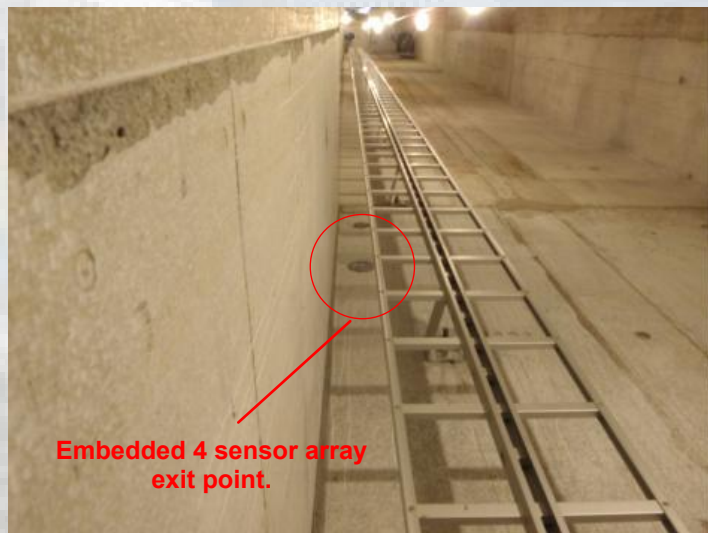
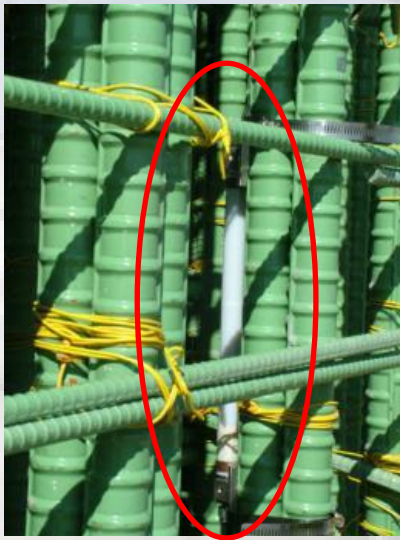
System Details

- 68 - Embedded optical strain/temperature sensors
- 3 - Optical joint displacement sensors
- 9 - Optical tilt meters
- 10 - Single axis optical accelerometers
- 17 - Double axis optical accelerometers
- 4 - Optical chloride penetration sensors
- 10 - Electronic chloride penetration sensors

Optical interrogators will be housed on-site with PC. Remote access via LAN connection. System will take measurements every 10 minutes or full time during certain strain or weather conditions. Acquisition speed 1000Hz.

Project Photos:

Pylon Sensors



Embedded 4 sensor array exit point.

Edge Girder Sensors

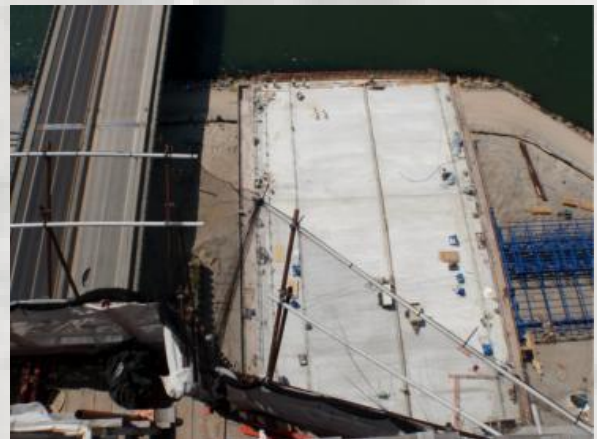


Accelerometer mounting plate and junction box for deck and edge girder arrays.

Deck Chloride Sensors



General Site Photos



Summary:

From the time the replacement bridge at the Indian River Inlet was proposed DeIDOT had intended to incorporate a monitoring system to help in the ongoing maintenance and inspection process. DeIDOT contracted the University of Delaware's Civil Engineering team to evaluate monitoring technologies and make a recommendation for the best system. Udel decided on CEL's fiber optic system due to the inherent benefits of embeddable, long life, high speed sensors.

A traditional electronic strain gage system would have limited life, numerous control boxes and excess wiring due to the need to have a single wire per sensor. Optical sensors eliminate those problems due to their immunity to environmental conditions, virtually limitless distance per system and ability to have multiple sensors per single fiber.

DeIDOT's progressive approach utilizing this sophisticated system is a model for how structural health monitoring can add a high level of precision to the process of inspecting and evaluating the physical integrity and long term performance of a bridge.

Sensing systems of all types have been used for years to do short term data analysis of structural health, but fiber optics have ushered in a new era of long term, continuous, real-time analysis combined with an immediate warning system of problem areas.

The Indian River Inlet bridge when completed will be one of the first in the United States to have an embedded monitoring system that continually tracks how the bridge performs in daily use, extreme weather conditions or other impact events.

"The University of Delaware Center for Innovative Bridge Engineering (CIBrE) is leading the effort to design and install a comprehensive structural health monitoring system on the new Indian River Inlet Bridge, located in Sussex County, Delaware. CIBrE is pleased to have onboard Cleveland Electric Labs as the sensor and fiber-optic system vendor and integrator. From the beginning of the project, CEL has worked in partnership with CIBrE to develop a robust and economical system that will provide the bridge owner with valuable feedback from the structure, to be used in the long-term maintenance and operation of this signature bridge. CEL and their installation/integration team from Chandler Monitoring Systems have brought unique skills, innovation, field experience, and an extensive background in optical systems to the project, all the while, working in a professional and responsive manner to achieve the projects goals within budget. We are extremely pleased with this partnership and the ongoing relationship we have with Cleveland Electric Labs"

Dr. Harry (Tripp) Shenton

CLEVELAND ELECTRIC LABORATORIES Advanced Technologies Group Fiber Optic Sensing Solutions

www.clevelandelectriclabs.com

Ohio Sales Office

1776 Enterprise Pkwy.
Twinsburg, OH 44087

Jim Zammataro

330-425-4747 x219
jz@cel-atg.com

Arizona Sales Office

361 S. 52nd St.
Tempe, AZ 85281

Brad Taylor

480-967-2501
btaylor@cel-atg.com

Installation Services Provided By:

