

Building for Tomorrow

The Indian River Inlet Bridge Newsletter



A publication by the Delaware Department of Transportation (DelDOT)

April 2011



Harry Shenton

In this month's issue of *Building for Tomorrow*, we'll be looking at something that will not be visible once the new Indian River Inlet Bridge is finished: sensors. You may be wondering why a bridge would need sensors, but they play a very important role in monitoring any changes that may occur with the bridge.

These changes can be caused by a lot of different factors, like wind, rain, ice, and many others. Each of these factors cause minor changes in the bridge, changes that would not be noticeable to us, but easily identified by the sensors on the bridge.

This month's featured guest is Harry "Tripp" Shenton, III, who is the Chair of the Department of Civil and Environmental Engineering at the University of Delaware (UD). UD is working on installing sensors all over the bridge. From wind sensors on the very top of the pylons to sensors that are embedded in the concrete deck, this new technology will provide a new and unique perspective of the bridge.

The monitoring system is a fiber-optic based network of over 100 sensors that are mounted to the bridge. This unique system is based on the same technology that is used in today's telecommunications, such as cell phones. Information/data is transmitted by pulsed light down a very thin glass fiber. Sensors of various types are placed strategically on the bridge to measure different things. For example, the force inside the pylons, the motion of the deck, and the amount of chloride (salt) that has penetrated the deck from the ocean spray. The sensors will be connected to a central computer that is located off site. Readings will be taken periodically and also during high wind events, like Nor'easters or hurricanes. By analyzing the data, engineers can better understand how the bridge is reacting to and enduring the various environmental weather conditions.

Structural monitoring is an emerging new concept in bridge engineering. Systems have been installed on a number of existing older bridges in the U.S., and a few new bridges in Asia and Europe, but this is the first permanent structural monitoring system to be installed on a cable supported bridge in the U.S.

New Science For A New Bridge!



A University of Delaware graduate student installs cable between the sensors through the edge girder rebar cage prior to concrete being poured.

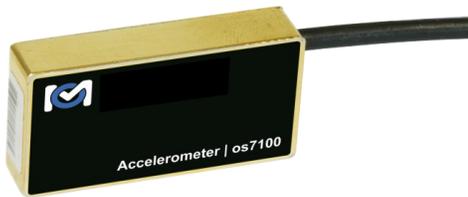
A state-of-the-art Structural Monitoring System is being installed on the new Indian River Inlet Bridge. When completed and operational the system will provide DelDOT engineers with real-time data on how the bridge is performing, and will provide an early warning for potential problems before they get too severe.

A good analogy of the monitoring system can be found in your car. Today cars have dozens of onboard sensors and multiple computers. The computers record information from the sensors and store it for later retrieval by your mechanic. The downloaded information tells them how your car is performing and if there are any problems. The warning lights on your dashboard provide immediate feedback to you when something is wrong.



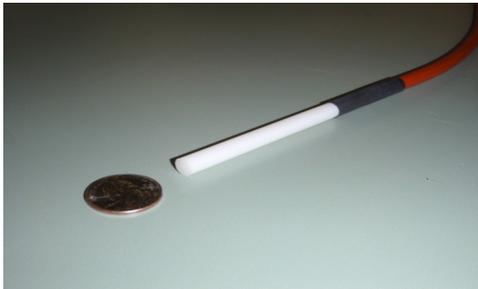
Fiber Optic strain sensor installed on the bridge pylon rebar during construction.

What Do They Look Like?: The Monitors and Sensors Used on the New Bridge



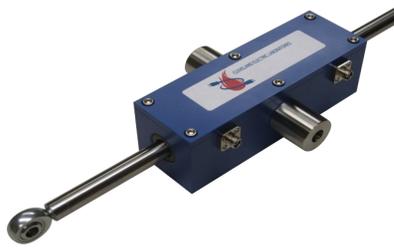
Accelerometer:

These are mounted to the bridge surface to measure movement and vibration in the deck, pylons, and cable stays.



Chloride Sensor:

These are embedded in the roadway and measure the concentration of chloride ions from road salt and ocean spray in the concrete, which can cause reinforcing steel (rebar) to corrode if it is exposed.



Displacement Transducer:

These measure large scale horizontal movement of the bridge as it expands and contracts with temperature changes.



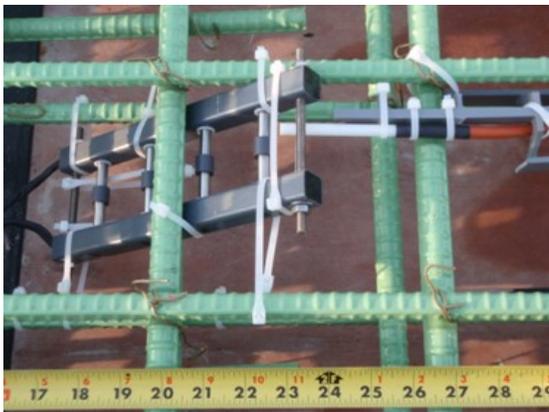
Tilt Meter:

These are mounted to the surface of the bridge to measure the tilt or change in angle of the deck and pylons.



Strain Gauge:

These are embedded in the edge girders and pylons, and measure localized, small-scale displacement and deformation.



Chloride Sensor Installed:

These are installed on the reinforcing steel before it is covered with concrete.



Strain Sensor Installed:

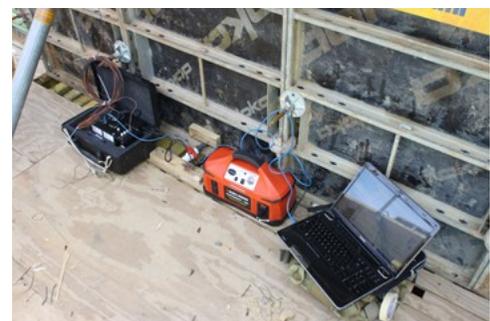
These are installed on the reinforcing steel of the edge girder before it is covered with concrete.



Do you want to take a tour
at the site of the new
Indian River Inlet Bridge

You can sign up your class
or group to take a tour by
clicking on the link below!

[Click Here to Sign Up!](#)



Fiber Optic Data Acquisition:

Testing equipment for the sensors that are being installed.

Facts About the Sensors and Where They Are On the Bridge

Total Number of Sensors on the Bridge:

225

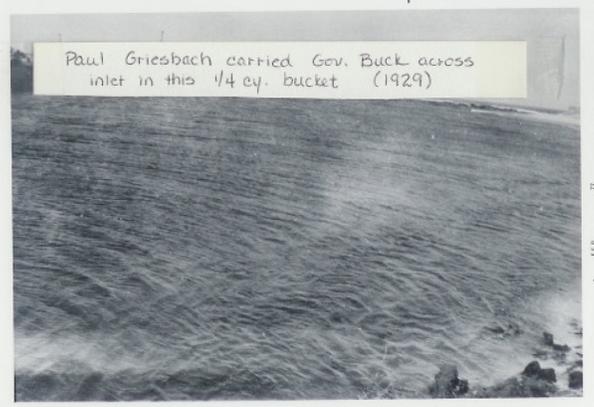
Miles of Fiber Optic Cable on the Bridge:

2



- Stay Accelerator
- Wind Speed & Direction
- Deck Strain
- Tilt
- Chloride

A Moment of Bridge History



These photos from 1929 show the mouth of the Indian River Inlet as work was being done to it by the Army Corps of Engineers. As you can see in the note on the bottom picture, the Governor at the time, Clayton Douglass Buck, was taken across the inlet in the bucket pictured in the top picture. This was a great way to get a view of the work being done.



Employee Spotlight!



This is where you get to meet someone who is building the Indian River Inlet Bridge!



What's your name?: Gary Wenczel

Where are you employed?: University of Delaware; employed for 9 years

What is your job title?: Project Manager

Where are you from?: Hamilton, NJ

Where do you live now?: Lancaster, PA

What are some special skills that you bring to the project?: Bachelor of Applied Science from the University of Delaware. The program gave me a good all-around understanding of project management, which has been very helpful in my work here.

What is your favorite part about working on this project?: Working with the people down here is great. They are very supportive and try to help you in any way possible. Also, everyday is something new, which lets me be creative.



Photos from the Job Site

March 2011



A view of the new Indian River Inlet Bridge from the waters of the Indian River Inlet. This photo was created by connecting two separate ones to show the two sides of the bridge that are under construction at the same time (Skanska USA Civil Southeast).



Workers at the new Indian River Inlet Bridge test batches of concrete prior to scheduled pours on the site (Skanska USA Civil Southeast).



Excess cable is visible from the bottom of the bridge as the stay cables are locked into place in their anchor boxes (Skanska USA Civil Southeast).



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