



Project Summary

Organization

Louisiana Department of Transportation and Development

Solution

Bridges

Location

New Orleans, Louisiana, USA

Project Objectives

- Design the new I-10 Twin Span Bridge spanning 58,388 linear feet
- Leverage state-of-the-art materials to lower maintenance costs
- Improve safety and quality of life for the community by increasing bridge safety and capacity

Products Used

MicroStation®, ProjectWise®, I/RAS B, ProjectWise® InterPlot® Organizer, InRoads, STAAD®, LEAP® CONSPAN, LEAP® RC-PIER

Fast Facts

- US \$750 million bridge project executed by five separate contracting teams
- Started just 14 days after Hurricane Katrina
- Required over 1,700 plan sheets

ROI

- Completed project ahead of schedule and US \$53 million under budget
- Avoided costly change orders and project delays
- All project design information is now available for reuse during bridge operations and maintenance

Louisiana DOTD Designs and Builds New I-10 Twin Span Bridge in a Challenging Environment

Integrated Bentley Software Enables Rapid, Cost-effective Design and Makes High-integrity Data Available for the Future

Hurricane Katrina Heavily Damages Crucial New Orleans Bridge

One of the most important bridges that the Louisiana Department of Transportation and Development (LADOTD) manages is the I-10 Twin Span Bridge crossing Lake Pontchartrain between Slidell, La., and New Orleans. Approximately 5.5 miles in length, this crossing includes a total of 11 miles of bridges that connect New Orleans, New Orleans Ports, and the petrochemical industry along the Mississippi River. The bridge, which serves as one of the main evacuation routes for New Orleans, was severely damaged by Hurricane Katrina, rendering it unusable in either direction. Although the LADOTD temporarily repaired the bridge, the extensive damage meant it would need to be replaced. To rebuild and repair these structures following Hurricane Katrina, LADOTD turned to Bentley software, including InRoads, STAAD, and LEAP CONSPAN, to help ensure the success of the project.

DOTD Acts Quickly in a Challenging Environment

When Hurricane Katrina devastated the Gulf Coast in August 2005, both the east and west bound lanes of the I-10 Twin Span Bridge suffered numerous damages including 64 lost spans, 473 spans with shifted alignment, and approximately 4.3 kilometers of broken bridge railing. Given the extent of the destruction in the entire region, the LADOTD faced many challenges in repairing and ultimately replacing the bridge, including enormous competition for resources, especially equipment and personnel. "With these conditions it was hard to do any project, let alone a project of this magnitude," explained LADOTD Bridge Engineer Administrator, Arthur W. D'Andrea. The LADOTD, however, was quick to initiate plans to repair damaged I-10 bridge structures, with construction beginning just 14 days after Katrina, and temporary repairs completed within four-and-a-half months. It was clear, however, that the repaired structure was only a temporary solution, and the bridge would need to be replaced.

"Selling" the New Bridge

The LADOTD's next challenge was securing federal funding to replace the heavily damaged I-10 Twin Span Bridge. Its goals

for the replacement bridge included better storm protection, safe accommodation of six traffic lanes, enhanced barge collision resistance, and utilization of well-known materials and techniques to provide for a low maintenance and 100-year-long service life. "It took us about six months to actually get a final commitment to get the money," said D'Andrea. To help convince the U.S. federal government of the necessity for a new bridge, the LADOTD used Bentley's MicroStation, with its Luxology rendering engine. "With MicroStation we were able to create renderings, which really helped us sell the need for the replacement bridge," explained D'Andrea.

Collaborating on New Bridge Designs

Planning for the replacement bridge began in September 2005, with construction scheduled to start in spring 2006. The engineers had only four months to complete the entire design, acquire permits, complete the geotechnical analysis, and assemble over 1,000 engineering drawings. The LADOTD designed the new I-10 Twin Span Bridge using an integrated set of Bentley software with MicroStation as its primary design tool, InRoads for roadway design, STAAD for general structural design, LEAP CONSPAN for bridge superstructure, and LEAP RC-PIER for substructure design. Altogether, these products were used to create and manage over 1,700 plan sheets that included designs for a structure with 444,000 linear feet of 36-inch precast concrete piles, 317,300 linear feet of BT78 girders, and 29,600 linear feet of AASHTO TYPE III girders.



Precast reinforced concrete caps designed with LEAP RC-PIER were used for the majority of the spans.

“Bentley’s integrated products enabled LADOTD to respond quickly during challenging conditions to design a safer bridge with increased capacity and a longer life-span, all while keeping the project ahead of schedule and \$53 million under budget.”

*— Arthur W. D’Andrea,
Bridge Engineer Administrator,
Louisiana Department of
Transportation and Development*

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The LADOTD knew that collaboration would be essential to successfully deliver a project of this magnitude. Civil engineers, bridge engineers, and geotechnical engineers needed information to be accessible and presented in a format that could be understood and consumed easily. They also recognized that all of the information collected and generated during the design project would be critical to ensuring the continuity of the new I-10 Twin Span Bridge through operations and maintenance.

Bentley software helped those involved in the project to collaborate quickly and efficiently. For example, using ProjectWise, they were able to quickly integrate a design team distributed over multiple locations and enable everyone to work together efficiently on bridge design. The design team could share files in a reusable format, open them using their preferred software, quickly review submittals and make changes, and relate the data automatically to relevant aspects of the overall design. ProjectWise was also used to store all data received by partners, consultants, and contractors. “Not only were there thousands of drawings, but tens of thousands of emails with attachments,” said D’Andrea. “One of the contractors had over 10,000 major activities that were being tracked. And within each of those 10,000 activities, if each one generated three emails, you’d have 30,000 emails.” Equally important, ProjectWise was able to maintain the massive volumes of bridge design data with full integrity and security.

Bentley’s bridge design products also provided flexibility with the analysis of structural systems enabling LADOTD to be able to predict the performance of the bridge to meet the new design criteria for a safer bridge. In addition, Bentley design tools, including MicroStation, assisted the engineers by enabling them to present various scenarios visually, which provided clarity to the design. This clarity was essential in

avoiding costly change orders and project delays. In addition, STAAD provided flexibility with the analysis of structural systems predicting behavior and producing better design outcomes.

Project Delivered Ahead of Schedule and Under Budget

The US \$750 million project was executed by five separate contracting teams that took on different tasks on a tight schedule, including:

- Repairing and adding to the old structures severely damaged by Hurricane Katrina,
- Demolishing the damaged twin span structures,
- Constructing the brand-new Twin Span Bridge,
- Disassembling and storing the one mile of temporary ACROW bridge.

Adding to the complexity of these tasks, contractors had to complete tasks while maintaining ongoing traffic flows, respecting the state’s right-of-ways, and working in a chaotic, post-Katrina environment.

Using Bentley software, the Louisiana LADOTD successfully avoided common challenges facing bridge infrastructure projects – fragmented data, lost time searching for information, lack of software interoperability, difficulty reusing data throughout the bridge lifecycle, and constant re-engineering. As a result, the project was delivered quickly and under budget in very challenging conditions. “We were able to not only complete the project ahead of schedule, but also to return approximately 12 percent of the original US \$803 million to the hurricane relief fund,” said D’Andrea. In September 2011, six years after the hurricane, both new 5.5 mile-long structures opened, providing enhanced service and hope for communities in the area.



More than 345,000 linear feet of prestressed-precaster girders were designed with LEAP CONSPAN.



Construction proceeded at an efficient and fast pace.