A Modern Marvel Crosses the Mighty Mississippi

(Continued from Page 67) 8,000 psi concrete, providing the deck with sufficient capacity and stiffness to cope with the high axial forces near the towers. The deck panels were stored for 180 days before being erected to reduce the effects of concrete creep and shrinkage, which tend to shed axial load from the concrete deck into the steel girders. To longitudinally posttension the deck, four-strand tendons were placed near the anchor piers and in the center of the main span, where beneficial compression from the stay cables is reduced. Over piers 2E and 2W, the posttensioned tendons were spaced as little as 12 in. apart, requiring careful detailing of each panel to avoid conflict between protruding deck panel reinforcement, posttensioned tendons, infill reinforcement, and shear studs. A 2 in. thick 4,000 psi latex-modified concrete wear surface was applied on the deck between the barriers.

The edge girders have longitudinally stiffened webs with a 6 ft constant depth over the length of the bridge. Except for the flanking spans and the section over pier 2, the edge girder top flange is constant at $1\frac{3}{8}$ in. thick and 32 in. wide. The bottom flange is 36 in. wide and ranges in thickness from 2 to $3\frac{1}{2}$ in. Flange sizes were increased, and a higher grade of steel (70 ksi in lieu of 50 ksi yield strength) was selectively implemented within the flanking span and over pier 2 to compensate for higher bending demands. The size of the edge girders was governed by live loads, except at the central portion of the main span, which was governed by the cable loss load case. Typical floor beams are 4 ft deep with $\frac{3}{4}$ in. thick and 24 in. wide top flanges and $\frac{3}{4}$ in. thick and 18 in. wide bottom flanges.

Stay cables are attached to the deck using relatively simple anchorages welded directly to the edge girder top flanges. This provides a direct load path through the top flange into the girder webs. Precautions were applied to prevent lamellar tearing of the top flange by ultrasonically testing the top flange for inclusions and through use of Z steel conforming to the ASTM standard A770 (*Standard Specification for Through-Thickness Tension Testing of Steel Plates for Special Applications*). The anchorages are fitted with stiffeners that extend over the entire length of the anchorage gusset plate and the full depth of the edge girder. The stiffeners were designed to provide sufficient strength and stiffness to allow effective implementation of cable friction dampers located at the guide pipe ends. To suppress stay vibrations, the friction dampers provide structural damping levels between 0.4 and 0.6 percent of critical for the first four modes. The SSI 2000 stay system, developed by VSL International Ltd., is used for the bridge, the sizes ranging from 21 to 69 strands per stay.

The superstructure was constructed with the balanced-cantilever method using a 10-year return period for construction winds at a mean hourly wind speed of 60 mph. Construction was performed using an American S-30 stiff-leg derrick crane at each cantilever tip. The construction materials for the main span were fed through the side span, requiring careful orchestration of main-span and side-span construction activities. Two temporary bents located at each side span stabilized the partially completed bridge for construction wind and out-of-balance dead-load forces. The tower design and the construction sequence were arranged to permit significant overlap of the tower and superstructure construction so that deck construction could commence after completion of the towers' lower crossbeams. Tower construction did not need to be completed until five deck segments had been erected on each side of the tower.

The design of the John James Audubon Bridge prevailed over two competitors' proposals in technical score and cost. The path to the successful project involved close collaboration on the part of the designer and the contractor, and the resultant robust design put constructability and technical excellence on equal terms. The record-setting bridge is one of 16 projects making up the Louisiana Department of Transportation and Development's Transportation Infrastructure Model for Economic Development program, an initiative that is intended to encourage economic development through investment in transportation projects. **CE**

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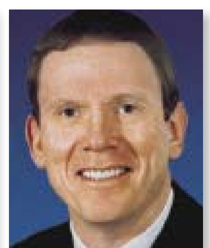

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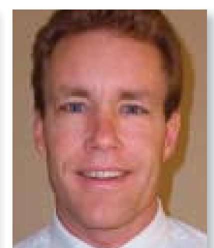

Shafer

PROJECT CREDITS **Client:** Louisiana Department of Transportation and Development **Program manager:** Louisiana Timed Managers, a joint venture of Parsons Brinckerhoff, New York City; LPA Group, Columbia, South Carolina; and GEC, Baton Rouge, Louisiana **Designer/builder:** Audubon Bridge Constructors, a joint venture of Flatiron Corporation, Firestone, Colorado; Granite Construction, Watsonville, California; and Parsons Corporation, Pasadena, California **Prime design consultant:** Parsons Corporation, Pasadena, California **Design consultants for cable-stayed main bridge:** Buckland & Taylor Ltd., North Vancouver, British Columbia (structure); Parsons Corporation, Pasadena, California (foundations/independent check); Dan Brown and Associates, LLC, Sequatchie, Tennessee (geotechnical); RWDI, Guelph, Ontario (wind); and Leonhardt, Andrä und Partner, Stuttgart, Germany (independent analysis check)