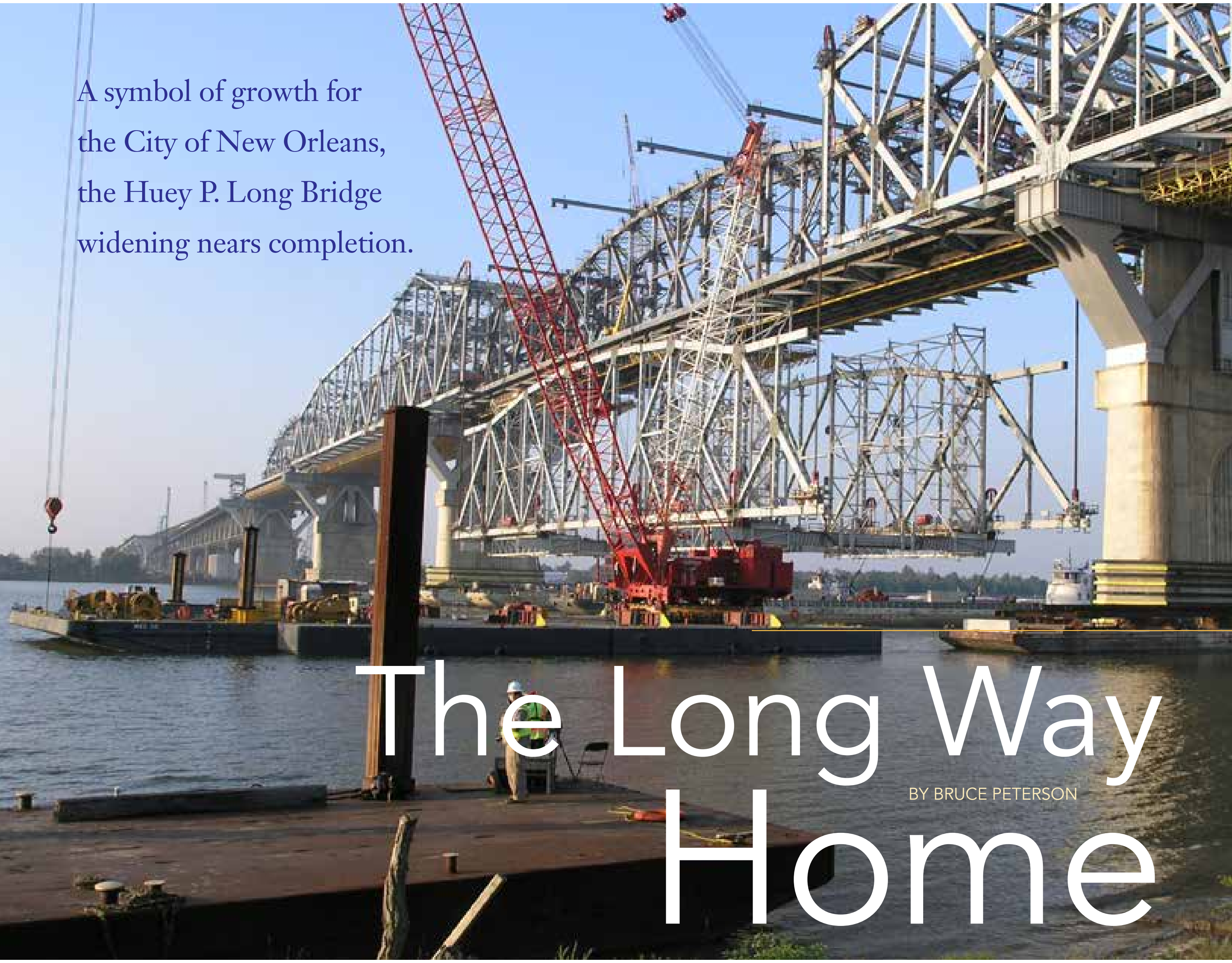

A symbol of growth for the City of New Orleans, the Huey P. Long Bridge widening nears completion.

The Long Way Home

BY BRUCE PETERSON

THE HUEY P. LONG BRIDGE has been vital to the economy of New Orleans and Louisiana for more than seven decades.

One of the first Mississippi River spans built in Louisiana, the cantilevered steel through truss bridge has been carrying both rail and highway traffic across the Mississippi River, just outside of New Orleans, and facilitating economic growth for the city since it was completed in 1935. While it shares a rich history with New Orleans, its most important role lies ahead.

During the 1930s, the bridge was built to carry both rail and highway traffic, which was relatively common at the time. At 23,000 ft between railroad abutments, the main spans included 9-ft highway travel lanes cantilevered off of the railroad bridge. Today, the bridge remains an important artery for both forms of traffic, and until recently the original 9-ft highway traffic lanes were still in use by motorists. With traffic volumes continuing to increase at this vital crossing of the Mississippi River, however, additional traffic capacity was needed.

In 1982, a study was conducted for a new bridge crossing on a nearby alignment. Five alternatives were studied, but due to the large amount of right-of-way required on either side of the bridge—coupled with the inherently high costs associated with a major river crossing—a new crossing was not considered a viable option. Additionally, despite the fact that the public wanted and needed additional highway capacity across the river, numerous public meetings all resulted in the same conclusion: No agreement could be reached on a location for new river crossing. Consequently, in 1986 the Louisiana Department of Transportation and Development (LADOTD) decided to investigate widening the existing span in order to provide the needed highway capacity on the existing traffic corridor.

Modjeski and Masters, the structural firm that designed the original bridge, was engaged to design its update. The first major challenge was to address whether or not soils could support the increased load. The bridge's foundation is a caisson founded on deep sand layers located below the typical compressible clay layers found at the surface. Fortunately, the geological investigation determined that these deep sand layers could support the additional loads of a widened bridge.

All photos: Modjeski and Masters

▲ The bridge has gone from two 9-ft lanes to three 11-ft lanes.

◄ A system of steel "W" frame pier caps support the truss lines for the new lanes.

► A view of the new truss line system.

Innovative Support

Once the soil was deemed adequate to support the increased foundation loads, plans for the Huey P. Long Bridge Widening project could begin. The final approved design involved expanding lanes from two 9-ft lanes to three 11-ft lanes, with a 2-ft inside shoulder and an 8-ft outside shoulder. To achieve this, the design used a unique steel "W" frame pier cap expansion supported on a concrete encasement of the lower portion of the existing pier. This expanded pier cap was needed in order to support the additional truss lines that would be used to support the new lanes. The combined total weight of the steel pier caps used for the widening project is nearly 4,750 tons, just under 1,000 tons per pier.

Construction began in April 2006 and with a final construction cost of approximately $1.2 billion, it has become the largest construction project in Louisiana's history. The first phase of the seven-year, four-phase project involved widening of the main support piers. Four concrete river piers and one land pier were widened by encasing the lower portion of the existing piers with concrete. The encasement began at the top of the caisson distribution block and extended up approximately 97 ft. This encasement, which widened the piers from 60 ft to 80 ft, supported a new steel frame that was, in turn, used to support the widening trusses, which enabled the

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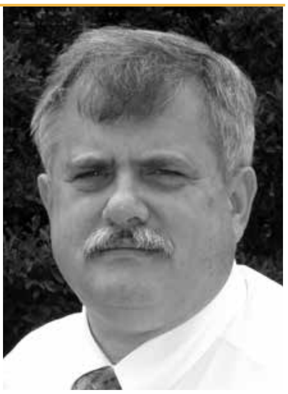

The widening project involves the addition of more than 22,000 tons of new steel.

widening of the main river spans. The 53-ft-tall steel frame, which was commonly referred to as the "W" frame due to its appearance, is 152 ft wide at the top, but only 75 ft wide at its bearings on top of the encasement.

The second phase of the work modified portions of the existing railroad approaches so that the new, wider highway approaches could pass through them. Modifications to the existing railroad trestles were necessary on both sides of the river. On the west bank, one of the existing steel towers had to be removed to permit new at-grade roadways to pass traffic to the other side of the railroad trestle. Two straddle bents, consisting of concrete columns supporting a steel box girder, were designed to support the existing railroad superstructure. Special bearings were designed to permit the box girder to behave as a simple beam and at the same time resist "rolling over" as a result of railroad longitudinal forces.

As the interruption of railroad traffic had to be kept to a minimum, the removal of the existing tower, the erection of the steel box girder and the restoration of rail traffic had to be done within a 24-hour closure period. Like the west bank, a portion of the east bank trestle conflicted with the new roadways, but on the east bank two trestle towers had to be removed and the existing railroad superstructure replaced with longer girder spans, which were supported on concrete straddle bents. Again, the interruption of rail traffic had to be minimized for this work, but as there are two tracks, one could allow rail traffic to continue while the new longer superstructure was erected on the other.

The third phase was the widening of the main bridge. One of the most difficult challenges of this phase was the requirement to maintain highway, rail and marine traffic throughout construction. While short outages could be arranged, longer interruptions were not possible. The most difficult issue was highway traffic. The original bridge supported two lanes of highway traffic on an 18-ft-wide roadway supported by a floor beam bracket cantilevered from the outside of the existing trusses, while the new wider roadway would be supported on a floor beam that would span 50 ft between the existing and widening trusses. Swapping one for the other would typically require closing the roadways. The problem was solved by incorporating the original floor beam bracket into the widening floor beam, thus permitting highway traffic to continue to use the original roadway while widening construction was performed. Highway traffic impacts were further minimized when the contractor, MTI (Massman, Traylor, and IHI), along with HNTB (who performed the construction engineering for MTI), developed an alternative method of erection that permitted three 530-ft-long sections of the widening trusses to be erected at one time as opposed to erecting them one individual member at a time. For this erection, an upstream and downstream section of the widening trusses, braced with a stability frame, were floated on barges to the bridge, and then both widening trusses and stability frames were hoisted into position by the constructor's team using strand jacks. This approach minimized both vehicular and marine traffic impacts during construction. (See "Lift, Slide, Attach, Repeat" in the 09/2010 issue for more on this erection scheme.)

Approaches Approaching

The fourth and final phase, estimated for completion next August, involves construction of new approaches. As of this past spring, a portion of the new roadways were opened to traffic, while construction teams continue to remove the old lanes and replace them with the remaining sections of the final widened roadway. When completed, phase four will ultimately complete the replacement of the original two 9-ft lanes with three 11-ft lanes, adding the shoulders, demolishing the old approaches and main deck and adding signaled intersections and approach ramps at either side of the bridge to improve flow and connectivity.

The widening of the Huey P. Long Bridge presented many unique design and construction challenges not often encountered in typical bridge design and rehabilitation projects. From maintaining highway traffic during the widening phases to using a construction method that resulted in large, truss segments being erected as complete units, the teams worked together to solve challenges that facilitated the continuous flow of traffic across the bridge for the duration of the project.

Today, the Huey P. Long Bridge Widening Project stands as a symbol of growth and rebuilding for the city of New Orleans, particularly during a time when economic expansion is critical for the region. At the completion of the project, it is estimated that more than 22,000 tons of new steel will be added for the main span widening alone. MSC

Owner
Bridge: New Orleans Public Belt Railroad
Highways: Louisiana Department of Transportation and Development

Structural Engineer
Modjeski and Masters, New Orleans

Construction Manager
Louisiana TIMED Program

Erection Engineer (Main Bridge Superstructure)
HNTB, Kansas City, Mo.

General Contractors
Main Bridge Superstructure: MTI, a joint venture of Massman Construction Co., Kansas City, Traylor Brothers, Inc., Evansville, Ind. (AISC Member/AISC Certified Erector) and IHI Corporation
Approaches/Main Bridge Deck Widening: KMTC, a joint venture of Kiewit, Metairie, La., Massman and Traylor Brothers
Main Bridge Substructure: Massman
Railroad Modifications: Boh Bros. Construction, New Orleans

Steel Team

Fabricator
Industrial Steel Construction, Gary, Ind. (AISC Member/ AISC Certified Fabricator/NSBA Member)

Detailers
Superstructure: Candraft Detailing, Inc., New Westminster, B.C. (AISC Member), and Tenca Steel Detailing, Quebec, Quebec (AISC Member)
Approaches: Tensor Engineering, Indian Harbour Beach, Fla. (AISC Member/NSBA Member)