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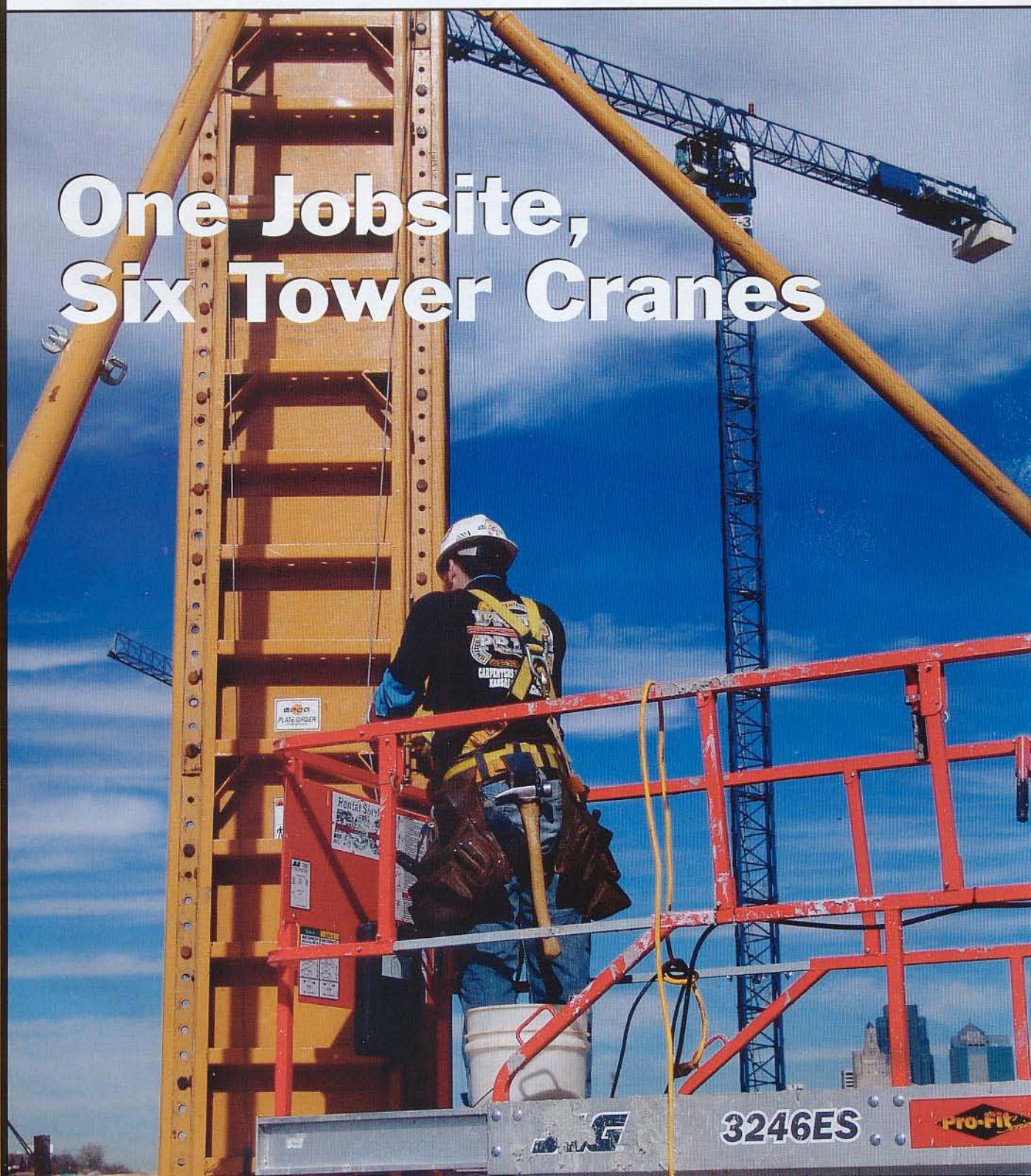

One Jobsite, Six Tower Cranes

Putting FLORIDA Back Together

By Jim Talbot

Massman Construction's 600-ton floating crane prepares to lift a span into place on Phase 1 of the Escambia Bay Bridge repair project in Pensacola. The crane was used to replace 12 235-ton spans in two days on the westbound side of the bridge, completing the repairs seven days ahead of the deadline.

Midwest Contractors Team Up To Repair Hurricane-Damaged Bridge

Hurricane Ivan struck Pensacola, Fla., the night of Thursday, Sept. 16, and on into the next day. It was the third of four hurricanes to hit Florida in the 2004 season and the Category 4 hurricane heavily damaged the Interstate 10 Bridge spanning Escambia Bay.

The force of the hurricane caused 46 spans on the eastbound bridge to displace more than three girders and topple into the water. Twelve spans toppled over on the westbound side. Fifty eastbound spans and 16 westbound suffered misalignment.

Loss of the bridge meant a detour of 130 miles for the 8,000 trucks and other traffic that traveled the bridge daily.

By mid-day – even before the waters had receded – Florida Department of Transportation (FDOT) engineers were assessing the damage, trying to estimate the work necessary to restore at least half the bridge.

Much of the bridge superstructure consists of low-level, precast, prestressed spans supported by six girders. The spans are 60 feet long and 35 feet wide, and each weighs about 235 tons. The low-member elevation off the water is about 12 feet, but the bridge rises to a level of 55 feet above the water for ship navigation. The bridge length is 13,596 feet.

The FDOT RFP anticipated substituting spans from the most heavily damaged

eastbound bridge onto the westbound bridge, and building on steel foundations. For the purpose of speed, FDOT waived durability requirements and specified "off-the-shelf" systems. Steel was the natural choice for any new substructures required in this high priority project. The department planned to use existing prefabricated Acrow steel bridge components to repair the more heavily damaged eastbound side until a new bridge or replacement components could be designed and built.

Before the complete extent of the damage was known, FDOT had asked contractors to bid on 14 days for Phase 1 to repair the westbound lanes and 90 days for Phase 2 to repair the eastbound lanes. The state established $50,000 a day incentive as the bonus early in the morning in an attempt to get things moving quickly.

FDOT later revised the time to repair the eastbound side to 24 days but the $50,000 per day bonus and/or penalty was not sufficient for contractors to expedite repairs since they tended to incorporate delay penalties in their bids.

To overcome this hurdle, FDOT's top management approved a $250,000/day bonus/penalty with a cap of $3 million. This broke the logjam, with one of four contractors bowing out and others joining forces. The contractors continued to work with their designers throughout the afternoon then met with FDOT for a final question and answer session in late afternoon before turning in their bids at 9:30 p.m., Sept. 17.

The approach by a joint venture of Gilbert Southern of Nebraska and Massman Construction of Missouri, aided by the Parsons Transportation Group as a consultant, included a proposal to delay removal of the submerged slabs until the second phase. Instead, they proposed to drive steel piles through the existing submerged spans, leaving them under water. They planned to straddle the existing piers and any obstructing sections of concrete spans. The goal was to expedite the effort towards completion of Phase 1 to qualify for additional bonus. This would quickly get traffic rolling. They'd figure out later how to remove the submerged concrete.

The outboard pier design created high bending moments, which required a new substructure with larger, heavier steel cap and pipe piles of greater thickness. The extra cost for materials would be more than offset by the greater speed and bonus for completing Phase 1.

After further negotiation, FDOT and Gilbert/Massman agreed to an emergency contract of $26.4 million for both the eastbound and westbound lanes. The Phase 1 deadline was 24 days with a $250,000/day bonus/penalty. The Phase 2 deadline was 90 days with a $50,000/day bonus/penalty.

The clock began to tick at 12:00:01 a.m., Sept. 18.

Phase 1

That morning, the contractors began to order materials and mobilize workers. The joint venture mobilized forty welders from offshore platforms from a sister company Kiewit Off Shore (KOS) for welding new substructure components. This decision brought in the talent to quickly fabricate piling which jumpstarted the urgent project. They would work twelve-hour shifts around the clock.

The contractors also mobilized Massman's 600-ton floating crane which had been scheduled for work with the Louisiana DOT (LDOT) after LDOT postponed its contract to help with Florida's Recovery efforts. The crane – one of just a few of its type in the United States – can pick up a 300-plus ton load 100 feet away from its center pivot.

Neighboring states granted permits for oversize widths and loads for piling and other supplies. For the new substructures, the contractors ordered 36-inch pipe pile with ¾-inch wall thickness since they knew it would handle any situation they encountered.

To expedite approval of engineering calculations and drawings, FDOT committed to a four-hour turnaround 24/7 until traffic was under way on completion of Phase 1.

By Sept. 19, heavy equipment began to arrive. Contractors were identifying subcontractors and dive teams. On Sept.

Specialized hydraulic Goldhofer platform trailers on a barge are used to lift and remove span 43 from the eastbound side. The span was moved and set into westbound Span 61.

22, welding began on the pipe piles, which came in by truck in the form of 40-foot sections. For Phase 1, the team had to build seven new substructures consisting of 28 pilings, each of which was 160 feet long.

The contractor also identified and purchased 36-inch steel roll beams from a disassembled bridge in Tennessee, got the mill certifications from Tennessee DOT for them, and shipped them to the job site for use in Phase 1 substructures.

In addition to the new substructures, the contractor had to realign 16 spans on the westbound bridge and substitute 12 superstructure spans taken from the eastbound bridge. After six days of preparation, Barnhart Crane & Rigging was ready to move the misaligned spans back into position. Workers jacked the spans up and placed Teflon pads underneath the beams. They used a combination of techniques to straighten and slide the spans back into position, including horizontal hydraulic jacks, tugs and barges, Goldhofer hydraulic platform trailers, and a custom skidding system.

By day eight, Sept. 25, additional cranes arrived to help with the debris removal and clean up. Pile welding continued. By day 10, the welding operation ceased to be critical; two days later, the contractor had driven nearly all the new piles for the westbound substructure. Work began on the approaches.

The 600-ton crane finally arrived on the job site on day 11, somewhat delayed by a resurgence of Hurricane Ivan. By the next day workers had put the crane together and it was ready for work. Its first job was to pick one of the submerged westbound spans out of the water in preparation for a replacement with an eastbound span. This was the only submerged span removed of the 12 on the westbound side.

On day 13, a specialized hydraulic Goldhofer trailer on a barge was used to lift and remove span 43 on the eastbound side. Workers strapped it to the barge, and tugboats pushed the barge around to the westbound side and set it into westbound Span 61. The barge floated the span to the only gap on the west side of the navigation channel. Once workers slid the span into place, it created a completed bridge two-thirds of the length on the westbound side.

One of the 60-foot prefabricated steel Acrow bridge sections is lifted into place during the Phase 2 repair of the eastbound lanes.

On day 15 workers final activities were being completed for the new substructures. In this configuration four new piles frame the original substructure, sitting outside its original footprint. Two 36-inch deep rolled steel beams serve as the steel caps on each side of the old substructure.

On day 16, crews moved the 600-ton crane to the east side of the high-level bridge section in position to begin placing its eleven missing westbound spans. The contractor chose locations from which the crane could set two spans without the need to move to a new position. The barges began delivering a span taken from the eastbound lanes every two hours and five spans were placed on the first day of span relocations.

On day 17, October 4, the crane set the remaining seven spans into place. The last span was in position at 11:30 p.m., seven days ahead of the bonus/penalty deadline. This qualified the contractor for a $1.75 million bonus.

By 6 a.m. the next day one lane of traffic started rolling across the repaired section of the bridge in both directions. Governor Jeb Bush, U.S. Secretary of Transportation Norman Mineta, several FHWA dignitaries, and representatives from FDOT and Gilbert/Massman were on hand for a ceremony to reopen one of the twin structures.

Phase 2

Phase 2 called for the contractor to repair the eastbound bridge with existing spans and steel Acrow sections within 90 days of the signing. The original plan was to create alternating existing spans consisting of 60 feet of concrete and an open 60-foot hole. A total of 7,000 feet of prefabricated Acrow bridge system would span across the entire alternating concrete/gap system of the bridge.

This FDOT concept would provide sufficient area to slide in spans if replacement/repair was feasible. It also eliminated the necessity for custom steel work since the Acrow system would be allowed to "float across" and not be abutted at each end.

The contractor recommended special end panel hardware and truss panels to

permit connection of the steel Acrow superstructure directly to the piers. FDOT eventually accepted this option, which shortened the prefabricated steel section to a total of 3,480 feet (58 missing spans x 60 feet long), saving money and time. But it precluded sliding in new concrete underneath the Acrow steel system in the event it was more cost effective to repair this bridge rather than replace it. Engineering studies later ruled out repairing the bridge, making complete replacement necessary sometime in the future.

FDOT owns over 10,000 feet of Acrow and Mabry modular bridge components, stored near Orlando. In preparation for Phase 2, FDOT contracted for 250 loads of these components to start shipping to the job site. The parts started arriving at site on day 6 and continued over the course of 20 days in lots of 12 to 16 loads a day. The trucks essentially brought in steel components – bolts, frames, trusses, and floor beams – that had to be assembled. Assembly began about mid-way into the completion of Phase 1.

Following completion of Phase 1, crews continued working on the eastbound side, aligning and straightening spans and setting up to remove 46 submerged spans. Removing them was a challenge but the team had previously removed Span 61 westbound and had new ideas to gain efficiency. Many were buried in mud. Divers helped with the rigging. One hundred four pilings and a total of 26 steel bent caps were replaced.

The single lane configuration was selected because of the anticipated long period of service. The Acrow spans weighed 50,000 pounds before adding the deck, which adds another 10,000 pounds.

By day 56 the contractor was getting ready to set the last of the Acrow steel spans.

On day 65, 26 days ahead of schedule, the contractor completed the final two Acrow bridge sections, one on each side of the elevated bridge at the navigation channel. By beating the 90-day deadline, the contractor qualified for the maximum Phase 2 bonus of $1.1 million.

In all, Phase 2 crews had erected a total of 3,640 feet of Acrow steel bridge and built 26 new substructures for the eastbound lanes.

The repair used about 3.9 million pounds of new steel for piles and substructures. The Acrow bridge system weighs about a 1,000 pounds per linear foot, adding about 3.5 million pounds of steel in the eastbound superstructures. Cost of the repair, including bonuses, was roughly $9.7 million for the westbound lanes and $21 million for the more heavily damaged eastbound side.

FDOT expects the replacement bridge will cost about $325 million including Design, Construction and CEI services. The replacement contract will be advertised under a design/build contract and plans call for a milestone bonus to open at least four lanes of the new bridge in December of 2006. ■