

Woodrow Wilson Bridge Beats Obstacles

By Tom Ichniowski

After more than four years of construction, the \$2.4-billion plan to build a new Woodrow Wilson Bridge across the Potomac River and expand adjacent segments of the Capital Beltway has reached the one-third-complete mark. The scorecard so far? Neil Pedersen, head of the Maryland State Highway Administration, which oversees the lion's share of the contracts, says: "We are on schedule. We are slightly under our budget. For a megaproject these days, that is quite an accomplishment."

After the huge cost run-up on Boston's "Big Dig," any \$1-billion-plus transportation megaproject faces sterner scrutiny than before from the U.S. Dept. of Transportation, not to mention other federal and state auditors. What puts the Wilson bridge even more squarely at center stage is that it is Washington, D.C.'s megaproject, with Congress and U.S. DOT right on its doorstep. "We're in the spotlight, so the expectations are really ramped up," says Robert D. Douglass, project director for Maryland's highway agency.

While pleased with the progress so far, project officials know that there is lots left to do and a tight timetable. For Russell Fuhrman, executive project manager for general engineering consultant team Potomac Crossing Consultants, the overriding issue is "schedule, schedule, schedule." Fuhrman also is a senior manager with Parsons Brinckerhoff, New York City, which with San Francisco-based URS and Baltimore-based Rummell Klepper & Kahl LLP make up PCC.

The massive construction job was triggered by the need to replace the existing 44-year-old Wilson Bridge, a six-lane bascule structure. It was designed to handle 75,000 vehicles a day, but is groaning under its current 200,000-vehicle daily load. Because the bridge's drawspan only has a 50-foot channel clearance, motorists also have endured about 250 openings a year so ships can pass through. A 2004 evaluation rated the old bridge's condition as "fair," but, as in previous reviews, found weld metal and base metal cracks, rusting and loose or broken deck panel tie-down rods.



New Look. V-shaped concrete piers mimic upstream Memorial Bridge's arches.

Knowing that patchwork could not go on indefinitely and that more capacity was needed, a new crossing emerged after a long public debate. The plan now being built includes two parallel 6,075-ft-long bascule bridges, each featuring reinforced concrete piers and structural steel girders. The southern bridge will be 110 ft wide and its upstream sibling 124 ft wide. Each will have room for six lanes plus shoulders. At the peak, each deck rises about 100 ft from the top of the pier foundations. With a 135-ft clearance, annual drawspan openings should drop to 65.

The key date staring at the project team is spring 2006, when the new southern bridge is slated to open. Traffic then will be shifted to that new structure and the old bridge will be demolished. Work has proceeded on both new bridges, but once the old bridge is demolished, contractors can push single-mindedly on the second new bridge, aiming for a 2008 opening.

Keeping the project on track has not been easy. Maryland officials initially bid the superstructure as a single contract, but they were dis-

mayed at the December 2001 bid opening when the lone bid came in at \$860 million, or more than 70% above their estimate, officials were shocked. Searching for options, they recruited an outside panel, led by former Utah DOT Executive Director Thomas Warne, whose key recommendation was to split the job into three contracts—one for the bascule section; a second for the mostly overland segment from the Virginia shore to the bascule; and a third piece, mostly over water, from Maryland to the drawspan.

The three-contract gamble has paid off. Maryland had more bidders—three, seven and four proposals, respectively, for the three contracts. More importantly, the three low bids came in at a combined \$496 million, almost matching the state's original superstructure estimate. SHA's Douglass says the rebidding "cost us a year," but saved \$362 million.

Another factor behind the increased competition was that Maryland, under pressure from FHWA, dropped a union-only project labor agreement requirement. Douglass says there are contractor-negotiated union agreements on the bascule and Maryland approaches, but not the Virginia approach. Nonunion G.A. & F.C. Wagman Inc., York, Pa., won three Maryland interchange contracts, while one won by John Driggs Co., Capitol Heights, Md., was a union contract.

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Tight Quarters. Until existing bridge (right) is demolished, it restricts amount of space available for working on new northern bridge (center).

As it Becomes Beltway Savior

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PLAs “became a true non-issue from our standpoint,” Douglass says.

In the foundation phase, another serious problem cropped up. Shock waves from driving piles were killing hundreds of fish. “Nobody had anticipated this,” says Michael S. Baker, of URS, PCC’s environmental construction manager. Without a fix, piledriving could have been halted for several costly months.

The remedy was air bubbles. Compressed air was fed through a perforated hose circling a pile. An outer steel tube surrounded the loop of hose. The “curtain” of air bubbles absorbed the shock waves and reduced fish fatalities to only a few. The fix was not expensive, Baker says. “This was done with stuff they had in the yard.”

Steel prices were a third major threat. As steel costs soared, Maryland sought ideas from its steel fabricators, contractors and others. The outcome was a pact reached last summer for the Maryland approach and bascule under which contractors agreed to

absorb increases up to 7% above steel’s price at the time of the bid. The state will cover increases above 7%, up to a cap of \$4 million on the bascule and \$9 million on the Maryland approach. Contractors also agreed to triple the penalties for missing deadlines, to \$75,000 a day. A similar deal is in the works for the Virginia approach.

“It’s a fair solution that the state came up with,” says J. Daniel Bell, American Bridge Co. bascule project manager. Bob Dacre, vice president for project management with bascule steel fabricator PDM Bridge LLC, Eau Claire, Wis., agrees. “I think that everybody did the right thing and we reached an agreement that we consider fair and equitable,” he says. Maryland officials are “very tough bargainers, but their word is good and their commitment to dealing in a fair and forthright manner is there,” he adds.

Contractors on each bridge segment say their jobs are going well, but they point to challenges, some of which stem from the bridge’s distinctive design. Designers aimed for “something that is aesthetically pleasing,

that matches the architecture of the bridges in the area,” says Greg Shafer, project manager for designer Parsons, Pasadena, Calif. They had in mind crossings like the arched Memorial Bridge upriver. Besides good looks, the new crossing had to provide enough capacity and keep maintenance costs to a minimum. “Of course there are a lot of difficulties in achieving that,” says Shafer. Arches were ruled out because of soft soils and the presence of a bascule. Instead, Parsons turned to V-shaped piers that aim to mimic arches.

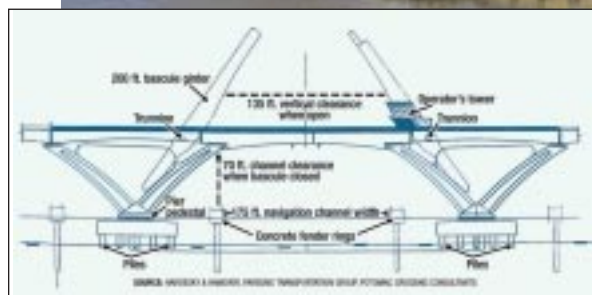
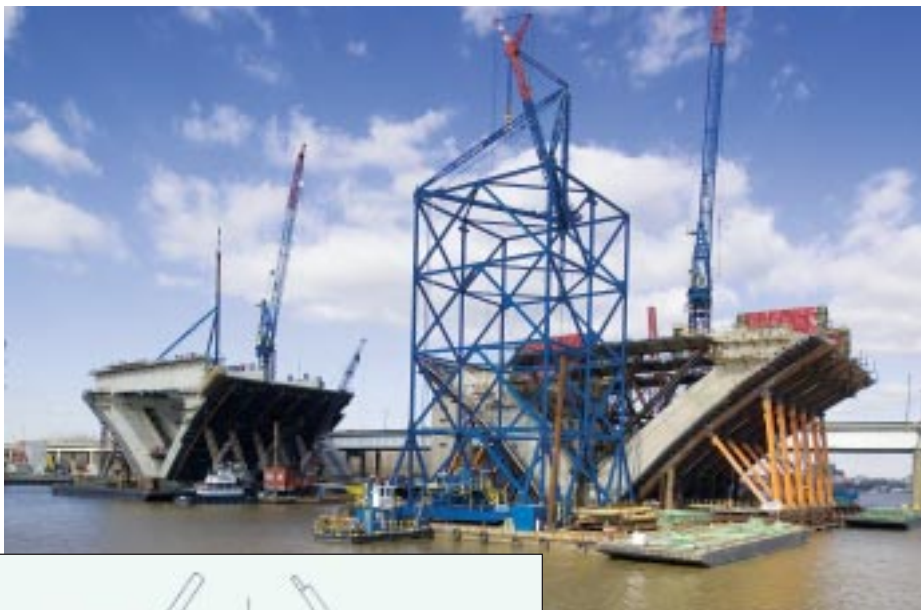
On the Maryland and Virginia approaches, the concrete piers are pre-cast and are “very difficult to build,” says Michael D. Bonin, area bridge engineer for PCC and URS. For one thing, heights vary, from about 39 ft to slightly more than 100 ft. Moreover, they have “a very complex shape,” Bonin says. The V’s have reveals and curve and flare out as they rise.

“It’s all different geometry,” says Lyell Tripp, Maryland approach project director for Edward Kraemer & Sons Inc., Plain, Wis., which is teamed with American Bridge, Coraopolis, Pa., and Trumbull Corp., West Mifflin, Pa. “It’s hard to control geometry...when everything’s changing all the time,” Bonin adds.

On both approaches, the unusual shape prompted contractors to use long-line pre-casting, in which the formwork is all in place to make an entire leg of a V.

The Virginia approach precast operation is situated beneath the new southern bridge, where space is limited and access is tight, says Bob McTavish, area manager for Granite Construction, Watsonville, Calif., which is teamed with Corman Construction Inc., Annapolis Junction, Md., on that approach contract. McTavish expects to finish his part of the new southern bridge ahead of schedule. But on the new northern bridge, “the amount of work we’ve got to do and the amount of time will be much tougher,” he says. One factor is the limited access until the old bridge is demolished.

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Brawny. Cast-in-place bascule piers are larger and more numerous than others in order to support heavy leaves.

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The bascule section also has the V-piers, but they are cast in place, using a series of incremental concrete pours. The reason is that the bascule legs have to be much more muscular than their neighbors because they must support the eight bascule “leaves,” which weigh between 1,900 and 2,200 tons each. Each bascule pier therefore has three Vs, while the approach piers each have two. In section, each of the four walls of the bascule’s hollow legs is at least 2 ft thick, compared with 1 ft, 3 in. on the approach pier legs.

Officials with the bascule segment’s team, American Bridge and Kraemer, say an important element in their job is the custom-built steel falsework that they developed with Janssen & Spaans Engineering Inc., Indianapolis. Each pier face has three falsework sections, about 70 ft tall and 30 ft wide. The sections are movable and reusable. Ken Hirschmugl, Kraemer’s bascule project official, says the falsework was 80% designed on the November 2002 bid day, “because that was the real trick to understanding how you would build this thing.”

Having multiple contractors for the superstructure saved the project, but it complicat-

ed management. “The tradeoff for the affordable bid is an increase in owner risk for managing the interfaces,” says Jim Ruddle, PB vice president and PCC construction manager.

Good coordination is imperative because of the many interchange contracts and benchmark dates to hit. Fuhrman, a former Army major general and Corps of Engineers’ civil works director, likens the project to organizing for combat. Part of that battle plan includes periodic “corridor coordination meetings” for contractors, says Ruddle.

An extensive partnering program is another important element, officials say. It undoubtedly laid the groundwork for the steel pact, Pedersen says. “You have to have a genuine partnering process in place so trust has been built to resolve problems as quickly as possible,” he says.

So far, project officials have met bidding, foundation and steel problems. But they are vigilant. Says Fuhrman: “Who knows what it might be tomorrow?”

Solid. Long-line precasting (top) is producing piers for Maryland and Virginia approaches.



Cooper River Bridge Nears Completion

SCDOT estimates that its new landmark Cooper River Bridge will be ready to open in May or June—a year ahead of schedule. Measuring 2.5 miles in length, this bridge has the longest cable stay span in North America, reaching 1,546 ft over the river. As of mid-February, all of the bridge’s 128 cables were in place and all of its steel and concrete girders were erected. The mainline bridge and its fifteen ramps employ 1,299 steel girders and 709 concrete girders. The main span towers are founded on 10 ft diameter drilled shafts surrounded by rock islands. The towers will stand 570 ft above the water and the bridge will rise 186 ft above the water. The bridge, a design/build project, replaces two bridges connecting Charleston and Mount Pleasant. It offers eight lanes for traffic plus a pedestrian/bike lane. Cost: \$632 million.

