# A value proposition for bridge projects

## Delivering safe, functional infrastructure efficiently and economically

By Craig Finley, P.E.

Times may be tough everywhere, but we're still building bridges in the United States. The American Road and Transportation Builders Association (ARTBA) estimates that the value of construction on domestic bridge projects increased nearly 14 percent to $23.2 billion in 2007. This followed increases of 7 percent in 2005 and 38 percent in 2006. ARTBA predicts that growth will continue in 2008, though more slowly, at about 3 percent.

At the same time, recession concerns, the housing slump, rising energy and labor costs, and building material price inflation are conspiring to drag down the entire construction sector. Perhaps most alarming, state government revenue — a key driver in the bridge construction market — is dropping.

According to the Rockefeller Institute of Government, state tax revenues across the nation decreased by 4.3 percent during the fourth quarter of 2007. Robert B. Ward, deputy director of the Institute, said, "States are experiencing a classic nutcracker effect. Costs are rising sharply just as revenues falter. The result may be a squeeze on states' ability to fund services."

One effect of this financial pinch is that some state departments of transportation are stretching project budgets over multiple years. This can result in delayed payments to the contractor and, in essence, require the contractor to provide temporary "financing" of the project. The contractors, in turn, can become skittish about bidding on projects or ratchet up prices to compensate for a potential hit — which means less competition and higher project costs.

What's the message to those of us in the bridge construction industry? The taxpaying public and their representatives are willing to spend money for safe, functional bridges, but only if we build them in the most economical and efficient manner possible.

This dynamic is a driving factor in an increased interest in innovative project delivery, including value engineering, public-private partnerships, and creative contract terms, including design-build and design-build-operate-transfer. These methods, some of which are commonly used overseas, may soon become the norm here in the United States as well.

### Value engineering redesign reaps big bucks for Estero owner

The value engineering redesign of the Estero Parkway Flyover in Southwest Florida is an example of how an engineer and contractor, working together, can ensure that a bridge project meets the public's need and minimizes the expense and inconvenience it causes. The Estero redesign resulted in a $1.85 million return to project owner Lee County, as well as a significantly less intrusive construction process at the busy project site.

The Estero Flyover is 561 feet long, with spans of 340 feet and 221 feet, and is approximately 116 feet wide. It will extend Estero Parkway over I-75, connecting with Ben Hill

**Design and Construction Team**

Project
Estero Parkway Flyover

Owner
Lee County, Fla.

Structural engineer
Finley Engineering Group, Tallahassee, Fla.

Contractor
Zep Construction, Fort Myers, Fla.

Fabricator
Tampa Steel, Tampa, Fla.

By using shallower steel girders, the redesign of the Estero Parkway Flyover allows for smaller grades that require much less fill on each approach.

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Griffin Parkway, which then meets with Corkscrew Road to the southeast.

Once complete, the Estero Parkway Flyover will alleviate traffic on the parkway and nearby I-75 in the Estero community, which is southeast of Fort Myers. It will complement the widening of Corkscrew Road while providing a link to areas east and west of I-75. It will also provide an alternate east-west route for travelers using the Tamiami Trail and I-75.

The value engineering redesign replaces twin, cast-in-place concrete box girders with a single, four-steel box girder design. This eliminates a large falsework support system, reduces construction time, decreases foundation design requirements, and simplifies construction.

The redesign also calls for a staged temporary tower support scheme to optimize the efficiency of the steel section, which allowed the steel bridge solution to be competitive against the initial cast-in-place concrete design.

By using shallower steel girders, the redesign allows for smaller grades that require much less fill on each approach. It also enhances overall project safety with the elimination of the falsework over the interstate and reduces risks associated with a constrained traffic pattern through the falsework system.

In addition, the driving public benefits from the redesign through reduced traffic maintenance requirements. Contractor Zep Construction can erect the bridge in longer sections, which means fewer obstructions in the roadway, as well.

It should be obvious, based on these details, that price differences between steel and concrete had only a minor impact on the overall savings. Instead, the economic gain was derived primarily from instituting structural changes that reduced the amount of material needed and decreased labor costs with a significantly more efficient construction process.

## Minimizing impact on adjacent projects

Similarly, the value engineering redesign of Miami Intermodal Center Bridge 10A from concrete to steel focused on improving constructability and creating better solutions to the project's site-specific challenges.

Located next to the Miami International Airport, the Miami Intermodal Center (MIC) is a massive ground transportation center. When completed in 2011, this Florida Department of Transportation (FDOT) project will significantly improve the ability of residents and visitors to move between the major transportation systems of South Florida — including Miami, Palm Beach, Fort Lauderdale, and the Florida Keys. It will also ease traffic around the busy Miami International Airport.

Bridge 10A is a key piece of this

By converting the superstructure to steel and using only one superstructure type, the redesign greatly simplifies construction and minimizes the impact on ongoing operations and construction projects at the Miami Intermodal Center.

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### Design and Construction Team

**Project**
Miami Intermodal Center, Bridge 10A

**Owner**
Florida Department of Transportation District 6, Miami

**Structural engineer**
Finley Engineering Group, Tallahassee, Fla.

**Contractor**
Turner Construction/ GLF Construction, Tampa/Clearwater, Fla.

**Fabricator**
Tampa Steel, Tampa, Fla.

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Timely completion of Bridge 10A at the Miami Intermodal Center is critical because it is one piece of a huge, coordinated and complex construction project — any delays would affect adjacent projects and result in significant loss of money and time.

$1.4 billion project because it provides access to the 3.4 million-square-foot Rental Car Center (RCC) that will house all the rental car agencies serving the airport.

The 584-foot-bridge was initially designed to be a cast-in-place concrete-on-falsework section combined with a concrete U-beam superstructure. The original design also called for three different superstructure cross-sections, including a curved cast-in-place multi-cell box constructed on falsework. As designed, the construction would have been excessively complicated and labor-intensive considering the construction activity going on around it.

The value engineering redesign incorporates a five-span, dual-steel box girder superstructure with a variable width and high degree of curvature. By converting the superstructure to steel and using only one superstructure type, the redesign eliminates the need for falsework. This greatly simplifies construction and minimizes the impact on ongoing operations and construction projects at the rental facility.

The redesign includes dual constant-depth steel box girders with a cast-in-place deck. It accomplishes the variable width by using a sub-stringer and intermediate diaphragms that distribute load back into the main girders. The redesign also removes a span and reduces the number of piers. It eliminates large-wall piers in favor of slender, fluted columns under each box, and increases the size of the square prestressed piles from 18 inches to 24 inches to reduce the impact of the footing size on existing utilities.

Ultimately, the number of piles decreased from 163 to 60, due to the lighter superstructure, more efficient support placement, and higher capacity foundations. This not only provides a cost savings, but also minimizes the impact on ongoing construction activity at the site.

Overall, the redesign will save more than $500,000 in construction costs, while accelerating the schedule and

delivering a structure that fits in better with its surroundings.

Since bridge projects are rarely excluded from the age-old saying, "time is money," faster project completion can't be underestimated. The project must be finished in two years, a goal the redesign will help the contractor meet. Timely completion of Bridge 10A at the MIC is critical because it is one piece of a huge, coordinated and complex construction project — any delays would affect adjacent projects and result in significant loss of money and time.

### Cooperation key

In each of these projects, well-conceived decisions that addressed project-specific challenges resulted in money and time savings for the owner. But more to the point, each of these examples illustrates how cooperation among the major players on a bridge project — owner, contractor, and engineer — can produce great outcomes.

Much of the time, great bridge projects don't even require great innovation. On the two Florida projects, contractor and vendor assistance was essential in developing value engineering redesigns that were most consistent with the contractors' skills and experience, that addressed the owners' principal needs, and that best suited the project environment.

Unfortunately, bridge designers often do not consider these fundamental factors — at least not to the extent they should. This is a major reason that we see budgets blown, deadlines missed, and ultimately, parties heading to arbitration or court.

If we are to continue justifying public investment in bridge projects, the industry needs to follow through on the promise to deliver safe, functional bridges efficiently and economically. As designers and contractors, we can only succeed at this by checking our egos, being realistic in our financial ambition (don't be greedy!), and by working together to produce the solutions that aren't necessarily the easiest or most comfortable, but are the ones that make the most sense for the situation at hand. ▼

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