

# Beauty and the Beast

BY DENNIS GOWINS, P.E.



**In taming congestion, Orlando's Lake Underhill Bridge widening project will be beautiful—and beautifully effective.**

**CONGESTION CAN BE A BEAST ON ORLANDO'S STATE ROAD 408.** Just ask any of the more than 150,000 daily commuters who pay a toll to use the major artery to and from downtown. Increased demand, backups at toll plazas, and a general lack of mainline capacity create 55 hours of delays per motorist annually.

To sooth the bottleneck, the Orlando-Orange County Expressway Authority has undertaken a \$450 million improvement program to widen 12 miles of S.R. 408 from Hiwassee Road to Goldenrod Road. Program improvements include the reconstruction of the Holland East and Holland West main toll plazas and the installation of express E-PASS lanes, so that customers may travel at the posted highway speed instead of creeping along. Once complete, the overhaul is expected to significantly condense commute times and increase the corridor's overall capacity by 50%. S.R. 408 will be well-positioned to handle the more than 215,000 daily commuters projected by 2025.

The final leg of the current S.R. 408 improvement program calls for widening the Lake Underhill Bridge from eight to 12 lanes, increasing the bridge's traffic capacity by 50%. The Expressway Authority, which plans, builds, maintains and operates a network of five tolled expressways in the Orlando metropolitan area, is funded completely by tolls. It has taken extra steps to respect the surrounding neighborhoods of its customers by ensuring the mile-long project will be both highly functional and highly attractive.

## Beauty Comes at a Price

Lake Underhill Bridge is punctuated with two pylons with faux cable stays resembling a cable-stayed bridge. Dramatic nighttime lighting will be added to spotlight the structure, which has been dubbed Orlando's new eastern gateway. Complementing this structure to the east will be the Conway Road Bridge. This highly curved steel box girder structure will be framed by four pylons in

combination with highly landscaped planter walls.

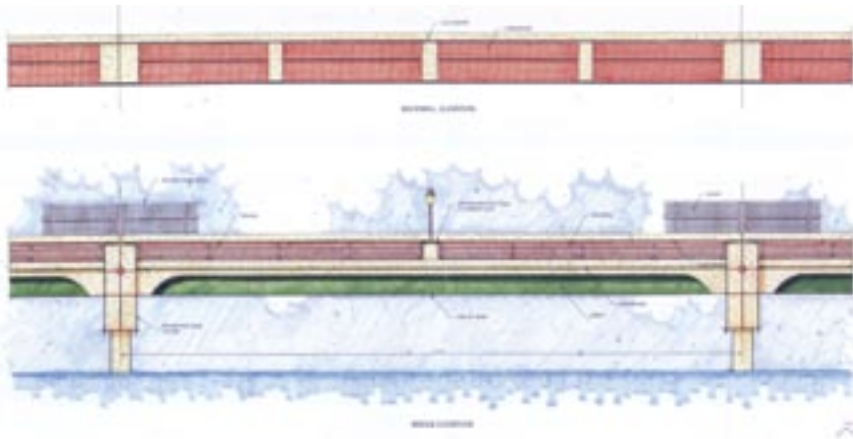
HNTB was selected as the prime consultant to provide final engineering and construction plans for the Lake Underhill widening project, which runs from Crystal Lake Drive to Conway Road. At the request of the Expressway Authority, the original design featured two "braided ramp" bridges, each more than 2,400 ft long. They were to be a combination of steel plate girders and AASHTO prestressed girders. The steel plate girders were to span the ramps below and yield a braided ramp configuration. The braiding concept was intended to eliminate traffic weaving between the Crystal Lake Drive and Conway Drive ramps.

The low bid for the project came in at \$105 million—too much, according to the Expressway Authority. It rejected the bids and directed HNTB to redesign the project without the braided ramp bridges.

Because it impacted other aspects of the adjacent projects currently under construction, completion of the Conway Road Bridge was the only milestone built into the new design. The Expressway Authority's request for a new design could have jeopardized the project's schedule, but HNTB established an aggressive one-year schedule for the redesign and hoped for a better bidding environment than the original project bid, which occurred just a few weeks after Hurricane Katrina. When the firm delivered the redesign, bidding was tight with the low bid being within 1% of the engineer's estimate.

Scrapping the initial design proved to be a very cost-effective decision for the Expressway Authority. Less than 18 months later, HNTB presented a new design with a new price tag: \$77.9 million—more than \$25 million less than the original bid. This past March, designs for the Lake Underhill widening project were completed. The project includes:

→ Expanding one mile of S.R. 408 from six to 10 lanes.



- Widening Lake Underhill Bridge to 12 lanes.
- Modifying the ramps at Crystal Lake Drive and Conway Road Interchanges.
- Widening the mainline bridges at Crystal Lake Drive and Lake Underhill Road.
- Creating a parallel 1,700-ft pedestrian bridge spanning the lake that will be the missing link in connecting a series of trails in the area.

Bids for the redesign were opened on May 8, 2007, and construction began this summer. The project is scheduled for completion in early 2010. More than 290 tons of steel will be used in the fabrication of the structure.

### Putting it into Context

At least \$10 million of the project's budget will be spent on aesthetics and to preserve the fiber of the surrounding community. As such, the Expressway Authority was at liberty to incorporate design elements that might not have been considered on a tighter aesthetics budget. For example, in lieu of curved plate girders for the Conway Road Bridge, they chose curved steel box girders, which traditionally are more expensive.

The Authority also approved the additional expense of enclosing the area beneath the deck between the steel box girders to give the appearance of a single steel box. This will provide a smooth appearance to motorists traveling below.

The bridge is a highly curved two-span structure with an overall length of 270 ft. The curvature's tight 280-ft radius and spiral transitions presented a complex geometrical challenge. The use of two steel trapezoidal box girders yielded both a technical and aesthetically pleasing solution.

The Expressway Authority's decision to put the Lake Underhill project in a context-sensitive design is part of a national and

statewide trend in transportation planning. It requires the input of all stakeholders to develop a transportation facility that fits its physical setting and preserves scenic, aesthetic, historic, and environmental resources, while also improving mobility and safety.

Throughout the entire S.R. 408 widening project, the Expressway Authority has incorporated sound walls, eye-pleasing retaining walls, tiered landscaped planter walls, improved lighting, decorative bridge treatments, colored concrete, and extensive landscaping. Architects even borrowed design elements from Orlando's downtown neighborhoods. For example, the battered pylons featured at each bridge in the program reflect the battered columns found on the front porches of bungalows throughout downtown neighborhoods. Sedate colors, aesthetic wall treatments, and high-quality lighting fixtures follow the community's standards.

The Expressway Authority used the Florida Department of Transportation's Interstate 4 urban design criteria as a foundation for the S.R. 408 improvements. Criteria include:

- Placing emphasis on adjacent properties and cross streets.
- Reflecting the character of the surrounding neighborhood in the design of retaining and sound walls.
- Providing good lighting for pedestrian safety under bridges.
- Landscaping, so the focus is on the vegetation, not the walls.
- Minimizing the use of chain-link fence.

The design of the S.R. 408 expansion program also follows the vision of the Downtown Orlando Community Redevelopment Agency (CRA). As part of its Downtown Orlando 2020 Vision plan, the CRA touched on downtown gateways that announce: "You have arrived."

The Lake Underhill project is symbolic of the entire city. In planning the

At least \$10 million of the project's budget will be spent on aesthetic elements to integrate the bridges into the surrounding communities.

project, the Expressway Authority obviously thought well beyond the scope of its right-of-way. By considering the community along its corridor, the design moves far beyond asphalt and concrete to respect the people who live and work along this road, as well as those who drive on it. The entire community will benefit. **MSC**

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### Designer

HNTB, Orlando, Fla.

### Fabricator/Detailer

PDM Bridge, Palatka, Fla. (AISC/NSBA Member)