



The elevated roadway near Brandon uses colors reflective of the more natural environment, landscaping, and water features found in the area. Photos: ©FIGG

Construction of the elevated roadways was within the existing at-grade median, allowing toll paying customers on the expressway to travel freely during rush hours.

AN ELEGANT, ELEVATED, ELECTRONIC SOLUTION **TO URBAN CONGESTION**

by Martin Stone, Tampa-Hillsborough Expressway Authority and Jose Rodriguez, FIGG

Precast concrete elevated tollway drastically reduces travel times

In 2006, events across the United States celebrated the 50th anniversary of the Interstate system—Eisenhower’s bold vision to solve logistic and economic issues of the 1950s. That transportation challenge was met with a powerful mobility plan that created a new system of highways to connect people, deliver goods and services, and improve the quality of life across the United States. Fast forward to today. Our cities have grown and the demands on our roadway system, including many of our interstate highways, require expansion to meet capacity needs.

Many roadways are faced with failing levels of service and gridlock rules the day for far more hours than ever envisioned. Development has closed in on the boundaries of the existing roadway rights-of-way, prohibiting

at-grade expansion from being available at any cost. One solution to provide the next generation of capacity in existing corridors, within existing right-of-way, is to create elevated roadways along the median. This offers the opportunity to double traffic capacity without the expense of right-of-way acquisition.

This common sense transportation solution addresses urban congestion by combining the innovations of precast concrete segmental bridges, reversible express lanes, cashless open road tolling, and full electronic controls. The revolutionary “six lanes in six feet” freeway was designed by FIGG and constructed within the 46-ft-wide median of the at-grade existing Lee Roy Selmon Crosstown Expressway, saving the costly acquisition of expensive, urban right-of-way, while reserving the

profile

LEE ROY SELMON CROSSTOWN EXPRESSWAY / HILLSBOROUGH COUNTY, FLORIDA

ENGINEER AND CONSTRUCTION ENGINEERING INSPECTION: FIGG, Tallahassee, Fla.

PRIME CONTRACTOR: PCL Civil Constructors, Inc., Tampa, Fla.

CONCRETE SUPPLIER FOR CAST-IN-PLACE AND PRECAST CONCRETE: CEMEX, Tampa, Fla.

POST-TENSIONING SUPPLIER: VSL, Hanover, Md.

AWARDS: *The project has received awards or recognition from six organizations.*



remaining median for future at-grade expansion. The expansion provides three lanes toward Tampa in the morning peak rush hour and three lanes out of Tampa, into the rapidly growing suburb of Brandon, in the afternoon peak commuter hours. During midday, a central segment is closed and the

Tampa and Brandon segments operate independently in a direction that optimizes local traffic circulation. The elevated lanes are limited to use by cars and buses, leaving truck traffic to the at-grade lanes. The current toll rate is \$1.50 for a passenger vehicle and entry is free flowing as tolls are collected

electronically via in-vehicle transponders or with license plate recognition.

The opening of the elevated lanes has provided a spectacular reduction in congestion and increased the ease of commuters' daily travel. Previous speeds of less than 15 mph in the peak hours

PRECAST CONCRETE SEGMENTAL BRIDGE / TAMPA-HILLSBOROUGH EXPRESSWAY AUTHORITY, FLA., OWNER

BRIDGE DESCRIPTION: Precast concrete segmental single cell box girder erected using the span-by-span method

SUPERSTRUCTURE FORMWORK: Southern Forms, Guild, Tenn.

SUBSTRUCTURE FORMWORK: EFCO, Orlando, Fla.

STRUCTURAL COMPONENTS: 3023 concrete segments in 196 spans with a typical span length of 142 ft

BRIDGE CONSTRUCTION COST: \$120 million

rose to free-flow speeds of about 60 mph, translating into one full hour of round-trip travel timesavings for some commuters. The elevated lanes were efficient to construct, had the least environmental impacts, allowed at-grade traffic to remain in operation, were built in the existing right-of-way, and improved economic development in both Tampa and Brandon.

Now, less than a year since opening to traffic, the reversible elevated lanes of this new expressway are carrying traffic volumes that exceed forecasts by 25 percent, bringing the Tampa-Hillsborough Expressway Authority, which owns the Crosstown, a good return on their investment, while the newly expanded highway has also served as a major impetus for the renaissance of the Channelside area of Tampa. Forecasts for the first year of operation pegged ridership at 12,500 vehicles per day. By March of 2007, traffic on the elevated lanes was already exceeding 16,000 vehicles per day.



Precast concrete segments, 59-ft-wide and weighing 70 tons, were cast in a nearby facility, then delivered to the site for erection. Erection activities were timed to allow rush hour traffic on the at-grade lanes to move freely.

Looking Backward and Moving Upward

Through the Tampa region's rapid growth, the Crosstown Expressway volume more than doubled from 13.1 million tolling transactions in 1982 to 30.2 million transactions in 2002, resulting in severe congestion for thousands of commuters coming into Tampa from the eastern suburbs. Commuter traffic frequently

'Minimal environmental impacts also sped approvals.'

translates into highly directional percentage splits and this holds true in Tampa, with more than a 75:25 split during the peak hours. Additionally, almost 80 percent of all of the daily traffic occurs during the morning and afternoon commuting peak periods.

It was clear early in the planning stages that a reversible lane project would address commuters' needs, allowing the Authority to build just one facility that would serve double duty. The next challenge was to determine how to expand within a congested corridor that had developed around the Expressway. Acquiring right-of-way was prohibitively expensive and in many areas, not available at any price; thereby, restricting the Authority to the existing footprint. Elevating the roadway within the existing median and right-of-way provided the answer to expanding in a financially feasible manner.

The majority of the project is a three-lane precast concrete segmental bridge, founded on 6-ft-wide piers, to provide six lanes of capacity; thus, "six lanes in six feet." The public in Tampa reacted favorably during the planning stages of the project, readily endorsing a solution for easing gridlock and supporting the pleasing aesthetics of the project, along with the extensive gateways planned for each terminus. Minimal environmental impacts also sped approvals and the

project was bid to begin construction in June 2002. The low bid, offered by PCL Civil Constructors, Inc., was approximately \$65 per sq ft, far below the average cost for all bridges built in Florida during the past 20 years. A total of 17.5 lane-miles was constructed at approximately \$120 million, translating into \$7 million per lane-mile. Costs for the entire project, including extensive development at both gateways; the Traffic Management Center, which includes new offices for the Authority; major at-grade improvements; and the elevated lane construction were approximately \$420 million.

Gigantic Legos

Because of the unique characteristics related to building precast concrete segmental bridges, the media often used the term "legos" to describe the construction technology and the quick, systematic assembly of this highly visible project. Segments for the elevated expansion were precast in a facility established in the Port of Tampa, just a few miles from the site. A total of 3023 concrete segments were cast in 24 months, utilizing 11 casting cells. On average, 46 segments were match cast each week (40 typical segments and six pier or expansion joint segments). Concurrent with the off-site casting operations, drilled shafts for the foundations and cast-in-place piers were being constructed in the median.



In several areas, where access was limited, segments were delivered over the already completed sections of the elevated roadway—building the new roadway from the top.

Match casting of the segments ensured that they would fit together precisely once on-site for erection. The reinforcing cage is being lowered into one of the 11 casting cells used for the project.

Span-by-span construction was used to erect the 59-ft-wide, 70-ton segments, which were delivered during non-peak traffic hours in order to maintain traffic on the existing expressway. In areas where access was limited, precast segments were delivered over completed sections of the elevated lanes. A steel truss was used to temporarily support the segments, allowing for post-tensioning of the typical 142-ft-long spans while traffic below moved freely. Once an entire span was stressed with post-tensioning strands, the structure became self-supporting and the truss was launched forward to repeat the operation for the next span. This led to fast, efficient erection that proved to be seamless for the traveling public as the contractor achieved an average erection rate of two spans per week. During the month of March 2004, 2400 linear ft of bridge was completed. And, this was all accomplished with no interruption to rush hour traffic.

Of key importance during design was that drivers utilizing the original at grade expressway lanes feel comfortable with the elevated lanes in close proximity. The use of precast concrete provided the opportunity to create a sculpted rounded, smooth bridge structure that is visually appealing to the traffic below, as well as for the areas outside the right-of-way. This was also accomplished through the use of light surface sealants with tint and an alternating color used as an inset to the pier to create additional perceived height of the structure.

A special feature of the box shape is that the at-grade driver views only half of the smooth structure underside,

In one month, 2400 linear ft of bridge were erected.



'On average, 46 segments were match cast each week.'

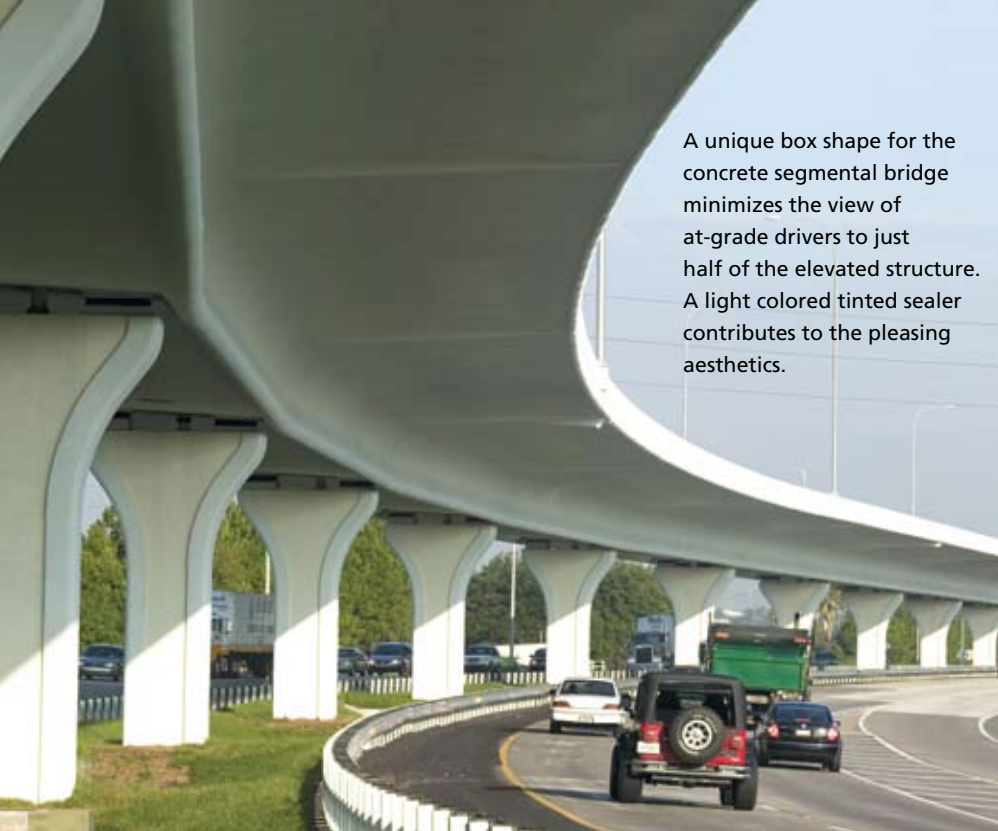
limiting the structure's visual size. The resulting perception of those traveling at grade is a streamlined, aesthetically pleasing structure. With two sections of elevated lanes, totaling more than 5 miles in length, different color schemes were developed, appropriate to each setting. The more urban bridge, nearing downtown Tampa, has a very light blue-white overall tinted sealer, with a tan inset to the piers; while the Gateway Bridge, closer to Brandon, uses a very light colored tint on the overall bridge, with a metallic blue inset on the piers—reflective of the more natural environment, landscaping, and water features found in the area. All drainage from the elevated lanes is internal to the piers, keeping the structure lines very clean.

Gateways

In addition to efficiently increasing the volume of traffic that could be moved through the corridor, it was important to

address the disbursement of that traffic at the terminal gateways. The gateways are new entrances to both downtown Tampa and Brandon. Urban aesthetics with extensive landscaping, signage, and other features were planned to enhance the respective neighborhoods. In Brandon, scenic landscaping, a winding off-road recreational trail for walking and cycling, along with numerous sites for resting, relaxing, and enjoying the environment have enhanced property values and added to the community.

At the downtown terminus, Meridian Avenue has been transformed from a two-lane street through an aging industrial district to a modern six-lane urban thoroughfare. A \$50 million investment in the city included urban aesthetics that created a visually stimulating and exciting pedestrian-friendly walkway, which spurred approximately \$1 billion in new residential and commercial development. The Authority also consolidated traffic management operations for the city and expressway under one roof, with state-of-the-art software to safely control traffic operations and provide efficient emergency response, when necessary.

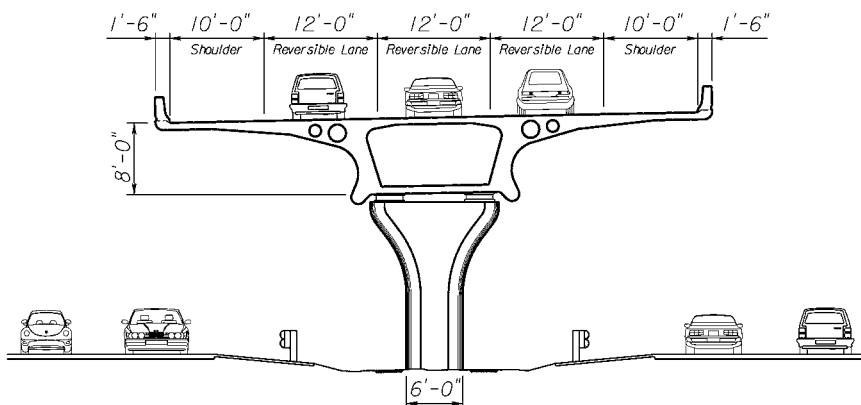


A unique box shape for the concrete segmental bridge minimizes the view of at-grade drivers to just half of the elevated structure. A light colored tinted sealer contributes to the pleasing aesthetics.

Free-Flow Tolling

During planning, it was recognized that traffic needed to be as free flowing as possible, while minimizing the labor to collect tolls. The elevated lanes are the first Florida transportation project to utilize totally cashless Open Road Tolling. It is also the first application of free-flow tolling in the statewide SunPass™ system that is wider than two lanes. Video toll collection was added to allow open access to all users, with or without a transponder. The Toll-by-Plate program creates a unique Video Toll Account (VTA) for occasional users, who may call a special toll-free number prior to

entering the elevated lanes, or up to 72 hours afterwards, to register for a VTA. Users with a credit card provide their license number to receive either a limited time use of the facility or an on-going VTA, which requires only a minimum \$5 balance in a prepaid account. By providing a variety of payment options, both prior to and following use of the system, the Authority focuses their enforcement resources on those who intentionally and repeatedly refuse to pay tolls, reducing mistaken violations and increasing net revenues.



“Six lanes in six feet” With the pier base just 6 ft wide in the existing median, the reversible elevated lanes provide six lanes of capacity.

The Results

The end results are a beautiful new parkway, community asset gateways at both downtown Tampa and Brandon, positive economic growth driven by the infrastructure development, decreased commuter timeframes—all positive, direct benefits to residents and visitors in the greater Tampa area. The bottom line is impressive. Prior to opening the elevated lanes, morning drive times from the Brandon area to downtown averaged between 30 and 40 minutes. With the opening of the new elevated lanes, average drive time is now just 10 minutes or less. Safety has increased with the diversion of trucks to the at-grade lanes and the elimination of merging traffic with limited access ramps. More than 110,000 trips per month were added to the system after full operations were achieved in January 2007. These additional expressway trips represent



The Lee Roy Selmon Crosstown Expressway is the first transportation project in Florida to use Open Road Tolling—a totally cashless system. Tolls are collected electronically with the statewide SunPass™ system or the Toll-by-Plate program.

diversions from local parallel nontolled highways, which improve the mobility of the entire local transportation network. Public transit service from Brandon to downtown Tampa has experienced a ridership increase of over 40 percent on two express routes, now that the buses truly do travel at express rates of speed, resulting in two additional successful express routes on the elevated lanes.

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For more information on this or other projects, visit www.aspirebridge.org.