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Community/Condotte/de Moya, JV

Takes on Massive \$560M Dolphin
Expressway-Palmetto Expressway
Interchange Redesign

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Dolphin Expressway-Palmetto Redesign Requires Multi-Com Innovative Solutions



Editor's Note: Due to the size and scope of the Dolphin Expressway-Palmetto Expressway Interchange Redesign, we have dedicated two features to the project. In the July issue, we will focus on the construction of the interchange.



Expressway Interchange pany Engineering Team and

By Debra Wood

With more than 430,000 vehicles choking through the 1960s-era Dolphin Expressway-Palmetto Expressway interchange in Miami, engineers rose to the challenge to design a safer and less-congested interchange.

"It's the intersection of the two largest expressways in Miami," says Enrique Espino, Chairman of Community/Condotte/de Moya, JV, the joint venture team responsible for designing, building and financing the \$560 million project. "It is one of the most congested interchanges in the area."

The joint venture team of Community Asphalt Corp., Condotte America, The De Moya Group, all of Miami, and engineers BCC Engineering of Miami; FINLEY

Engineering Group of Tallahassee, Florida; Stantec, Coral Gables, Florida; APCT Engineers, Doral, Florida; and others, began collaborating on the project more than a year before the Florida Department of Transportation (FDOT) let it out for bid.

"The most exciting thing about this project is how our team developed ideas during the bid phase to overcome the challenges of the project and successfully execute it," says Craig Finley, PE, Managing Principal of FINLEY. "The competitive nature of our team, the out-of-the-box problem solving and the execution made the project."

The project entails construction of new connections between the Dolphin Expressway (SR 836) and the Palmetto Expressway (SR 826) in all directions and ramps and frontage roads for local traffic. That



Design-Build Team

- Owner: Florida Department of Transportation (SR 826)/Miami-Dade Expressway Authority (SR 836)
- Contractor: Community Asphalt Corp., Condotte America, The De Moya Group, JV, Miami, Florida
- Prime Design Consultant: BCC Engineering, Miami, Florida
- Segmental Bridge Design and Construction Engineer: FINLEY Engineering Group, Tallahassee, Florida
- Other Design work: Stantec, Coral Gables, Florida, APCT Engineers, Doral, Florida, FR Aleman & Associates, Doral, Florida
- Overhead Gantry and Casting Machines: DEAL, Bay Harbor Islands, Florida
- Bearings and Expansion Joints: The D.S. Brown Company, North Baltimore, Ohio
- Casting and Erecting Segments: Rizzani De Eccher, Bay Harbor Islands, Florida
- Post-Tensioning Contractor: VSL, Hanover, Maryland
- Construction Engineering and Inspection: AIM Engineering & Survey, Inc., Lehigh Acres, Florida



required 45 permanent bridges on multiple levels, four of those segmental on the top two levels, and a temporary bridge constructed to maintain traffic during construction.

“Our team developed a traffic control master plan of all major phases of how to build the system and lay it out, which was a big undertaking,” says Jose Munoz, Design Project Manager for BCC Engineering, the prime design consultant. “The primary reason for the segmental bridges was the ability to construct the long span flyovers while maintaining traffic, but it does bring a high degree of aesthetic value to the location.”

The interchange redesign represents the largest, most-complicated and final improvement to the Palmetto Expressway, according to Oscar Gonzalez, Spokesman for the FDOT. During the past 16 years, the FDOT has added lanes, increased shoulder widths and reconfigured entrance and exit ramps on various sections of the 16-mile long corridor, which as deemed in 2010 as operating at an “F” level of service.



FDOT, owner of SR 826/Palmetto Expressway, is overseeing construction of the project in partnership with the Miami-Dade Expressway Authority (MDX), which owns SR 836/Dolphin Expressway. MDX contributed approximately \$200 million for the construction of the project and approximately \$80 million of the funding came from the American Recovery and Reinvestment Act.

Redesign Adds Value

The design-build team redesigned FDOT’s original concept to increase functionality.

“We optimized and improved the design,” Espino says. “By making it a design-build, they got the most out of the project. The group of people and engineers all put their heads together to do the best they could.”

Finley explains, “Early on, our team strategy was to get the most project for the budget.”

The group bid on the project based on a preliminary design from FDOT developed years ago as a baseline. FDOT also presented five concept plans for the interchange.

“They gave the teams an opportunity to find ways to innovate, cut costs, add value and figure out how to give FDOT additional scope of work,” Munoz says. “We did a lot of value-added design changes.”

BCC began by looking at the existing traffic needs. The FDOT plan eliminated three movements with local roadways. BCC engineers redesigned the project to maintain traffic in those three directions. BCC designed additional interchanges to provide access to local roads.



“Connecting the two major highways is a complex undertaking but the real challenge from a design standpoint was to make the connections with the local streets,” Munoz explained. “We changed the concept. We redesigned the system of collector-distributor roads and frontage roads.”

The initial FDOT plan called for eight segmental flyover bridges, on the third and fourth levels of the interchange. The redesign contains four segmental bridges at the top, fifth level.

“We reduced the complexity of several of the flyover movements,” Munoz says. “We simplified the construction and the traffic-control plan, providing the same movement without such a complicated structure.”

BCC studied the original plans for potential bottlenecks and made several adjustments, such as extending auxiliary lanes and converting single lane ramps to two-lane ramps in several locations to enhance traffic flow.

“The minor tweaks did not add significant cost, but they added value,” Munoz says. “The big cost savings was with reducing the flyovers.”

The existing infrastructure presented challenges as well. The portion of the expressway, beneath Miami International Airport’s glide path, required a design to not conflict with the airspace. Among the modifications was the use of shorter light poles.

At the bottom level, three active rail lines and the North Lane Canal run through and beneath the interchange. The design required rerouting the canal without interrupting water flow. Embankments for the original road came from the canal.

BCC found a less-expensive way to relocate the canal using large structural pipe culverts and aligning the canal farther from the more complicated interchange features, reducing bulkhead walls and even a long bridge section which straddled the canal in the FDOT concept.

“From a geometric standpoint it was challenging,” Munoz says. “We had ground-level features, such as the railroads, canal and local streets to contend with, as well as a ceiling with the airport’s glide path. In between all that, we had to fit a four-level interchange and make sure it all connected.”

Segmental Bridge Design

FINLEY offered several suggestions for the segmental bridges, including adding a linear haunch, a repetitive detail that enabled construction of longer spans and simplified the casting machines and piers; the use of polystyrene core forms, left in place inside the concrete columns, to reduce the foundation loads; the use of 24-inch piled foundations; and a change in the pier caps to a golf-tee shape, which allowed placement of temporary jacks and the elimination of secondary supports and falsework.

“This was huge, because it meant the maintenance of traffic could be independent of the superstructure erection,” Finley says.

FINLEY also suggested using diabolos to form a void in the concrete and continuity of the post-tensioning duct through the void. FDOT had formerly used steel pipe. But FINLEY had used the diabolos on international projects and thought it would be ideal for the interchange. It reduced the weight and the external tendons will decrease maintenance costs in the future.

“It worked fantastic and is becoming a FDOT state standard,” Finley says.

As the project enters its final year, it continues on track and within budget. Espino expressed pride in the group’s ability to bring together a team of traditional competitors to design and build this project. ●