Offsite/ Accelerated Construction of a Busy Interchange Bridge

(Old Title: Replacement of a Busy Urban Interchange Bridge Using Accelerated Bridge Construction Techniques)

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Summary

Parsons Brinckerhoff, Inc. is designing the replacement of a busy urban interchange structure over Interstate 4 (I-4) in the Orlando metro area for the Florida Department of Transportation (Florida DOT). The interchange structure carries nine lanes of traffic, and a quarter million vehicles pass through the interchange daily. PB incorporated accelerated bridge construction techniques, such as off-site construction and transportation using self-propelled modular transporters (SPMT), in the design to reduce the construction schedule and traffic disruptions. This will be the first time these innovative techniques are used to replace a busy urban interchange structure in Florida.

Keywords: accelerated bridge construction; off-site; urban; self-propelled modular transporters.

1. Introduction and Existing Conditions

The Florida DOT contracted with Parsons Brinckerhoff (PB) to replace a busy urban interchange between State Road (S.R.) 436 and I-4 in Altamonte Springs, a suburb of Orlando, Florida. The existing interchange bridge is a 270-foot long, four-span structure and carries nine lanes of S.R. 436 traffic over I-4. Over a quarter million vehicles are projected to pass through the interchange daily. The Florida DOT management set a goal that the design for the interchange replacement should consider ways to reduce the construction schedule and traffic disruptions.

2. Proposed Interchange Geometry

The proposed interchange between S.R. 436 and I-4 will be a single point urban interchange (SPUI). Since I-4 is below S.R. 436, the SPUI will be on a bridge. The proposed interchange bridge will be a 228-foot long two-span structure and will carry 11 lanes of traffic. Consistent with other SPUIs on a bridge, the interchange bridge will be hour-glass shaped, very wide- approximately 330 feet- at the bridge ends and relatively narrow- approximately 178 feet- at the mid-point.

3. Design Alternatives

3.1 Conventional Multi-Phase Bridge Replacement Alternative

In the initial phase, a 75-foot-wide section of the proposed bridge would be constructed on each side of the existing bridge. Then the entire S.R. 436 traffic would be shifted to the outside, onto the newly constructed portions of the bridge and finally the middle portion would be reconstructed. In order to accommodate the S.R. 436 traffic during the phased construction, the outside portions of the conventional bridge would need to be almost as wide in the centre as it is at the ends, resulting

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in a rectangular bridge with 26,400 square feet of additional bridge area than the smaller hour-glass shape geometry. The multi-phase construction of this 330-foot-wide bridge is expected to require 24-to-27-months and over 100 lane closures, traffic shifts or deviations from typical traffic pattern.

3.2 Accelerated Bridge Replacement Alternative Using Off-Site Construction

One of the most effective accelerated bridge construction (ABC) techniques is the off-site construction of the entire bridge systems. PB designed a traffic control scheme that created two 200-foot-wide vacant areas between the I-4 through lanes and the ramps within the Florida DOT right-of-way. The bridge will be constructed in two halves, split along the centerline of S.R. 436 as shown in Figure 1. In overnight operations, the two bridge halves would be transported parallel and adjacent to the existing bridge and set on top of the temporary bents using SPMT. During the move, the I-4 traffic would use the existing two-lane exit and entrance ramps to bypass the construction zone.

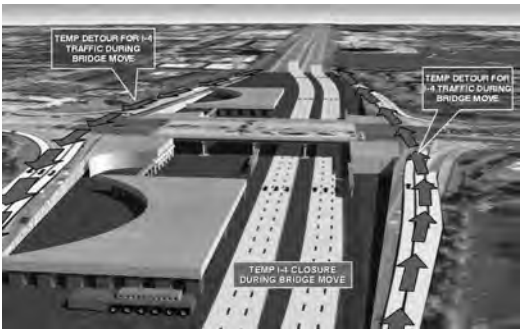

Figure 1: Bird's Eye View of Off-site Bridge Construction Scheme

The S.R. 436 traffic would be shifted onto the new bridge halves in the interim location. The existing structure would be demolished and the new substructure would be constructed. Finally, the two bridge halves would be moved using either skidding or SPMT on to the permanent substructures in the final location during overnight operations. The estimated cost of the off-site construction, including the cost of SPMT and the temporary supports, is $2.47 million. The ABC scheme saves approximately 26,400 square feet of structures or approximately $3.5 million, which will offset the cost of the off-site construction. This will be the first time these innovative techniques are used to replace an urban interchange structure in Florida.

4. Accelerated Bridge Construction Benefits and Conclusions

The ABC scheme will reduce the construction duration to less than 12 months. ABC scheme will reduce 90% of the lane closures, traffic shifts or other deviations from the typical traffic pattern compared to conventional construction. It will also reduce distractions that the construction workers and travelling public cause to each other, thereby improving the safety of the travelling public and the construction workers [1]. Off-site construction is typically expected to improve the quality and service life of the structure and correspondingly reduce future maintenance costs. There will be substantial time and monetary savings to the public because the ABC scheme significantly reduces construction-related congestion and travel delays. The construction cost is expected to be comparable. All of these improvements should enhance the public perception of this urban transportation project.

5. Acknowledgements

Ms. Beata Stys-Palasz and Mr. Mark Robinson, Interstate Project Office, Florida DOT, District V

6. References

[1] U.S. Department of Transportation/ Federal Highway Administration, *Manual on Use of Self-Propelled Modular Transporters to Remove and Replace bridges*, June, 2007, p. 16.