



Photo Courtesy of  
PCL Civil Constructors, Inc.

Located in Caddo Parish, Louisiana, Segment K of the 36-mile I-49 North Corridor Interchange consists of a new section of four-lane interstate highway that stretches from I-220 in Shreveport to the Arkansas state line. Louisiana's economic growth by opening the state to new or expanded commercial opportunities. Segment K includes the design of the I-49/I-220 interchange and a partial cloverleaf interchange at Martin Luther King, Jr. Drive.

At a cost of \$65 million for the ramp portion of the I-49/I-220 interchange, these bridges are the first post-tensioned, precast segmental bridges constructed in Louisiana. The three precast segmental bridge ramps consist of 700 precast segments, a deck area of 273,500 sq. ft. The three ramps present very complex geometry for an interchange in the middle of a relatively undeveloped locale, with each ramp having its own unique box girder width (varying from 30.5 ft to 64 ft wide), straddle piers, cantilever piers and horizontal curves down to a 550 ft radius.

## Jury Comments

The first precast segmental bridge in Louisiana is aesthetically pleasing and a winner all around. A beautiful example of a segmental bridge in a rural area. With the wide-open spaces afforded in this rural setting, cranes were able to simply and efficiently erect the balanced cantilevers. This project clearly demonstrated the efficient and effective accelerated bridge characteristics of segmental bridge construction. At final bidding, only one contractor bid the steel alternate and the precast concrete segmental bridge won handily over the steel design.

# I-49/I-220 Interchange Segment K

*Category: Rural Bridges and Viaducts*

## Innovation of Design and/or Construction

A critical detail that greatly simplified the post-tensioning details was the use of 'Diabolos' to allow for a single form void in the segment deviators to accommodate the wide range of tendon geometry for the entire project. The use of diabolos greatly simplifies segment fabrication by eliminating the commonly used pre-bent steel pipes that require custom fabrication for each tendon's geometry and post-tensioning installation by allowing for a continuous external post-tensioning duct to be used between the anchorage diaphragms. This eliminates the duct splices that would be required with steel bent pipes and reduces post-tensioning duct installation costs. This simplified post-tensioning detail provides for better overall quality in the production of the precast segments and require fewer and more easily accessible fabrication and inspection points, reducing the overall effort required to produce each box girder segment.

## Rapid Construction

The combination of precasting the superstructure segments and ground based cranes erection lead to rapid on-site erection of the superstructure. All three precast segmental bridge ramps were erected in balanced cantilever using ground based cranes. Cantilevers were stabilized using temporary towers supported directly on the permanent footings. Counterweight-segments were used to minimize out-of-balance longitudinal bending moments in the foundations. End span unit segments were erected on temporary falsework until closure with the adjacent cantilever was completed.

## Aesthetics and/or Harmony with Environment

While the superstructure itself presents a well-proportioned structure that conforms to the "form follows function" philosophy that creates a superstructure that "looks right" when viewed by the travelling public. Aesthetic enhancements were incorporated in the project





## CREDITS

by adding chamfered pier-columns with rustication panels on the longitudinal to minimize the “mass” effect of the substructure beneath the superstructure.

### Cost Competitiveness

This project was bid with two bridge alternative designs; a precast concrete segmental alternate and a twin steel box girder alternate. At final bidding, only one Contractor bid the steel alternate and the precast concrete segmental bridge alternate won handily over the steel design. Below are the bid statistics:

- The average cost per sq. ft. = \$238/sq. ft.
- Segmental bridge cost: \$65 million dollars.
- Total deck area: 273,500 ft<sup>2</sup>  
(Ramp SE: 117,150 ft<sup>2</sup>; WN: 21,350 ft<sup>2</sup>; EN: 135,000 ft<sup>2</sup>).

### Minimization of Construction Impact on the Traveling Public

This interchange was an enhancement to the Interstate I-49/I-220 Interchange Shreveport, LA. The existing

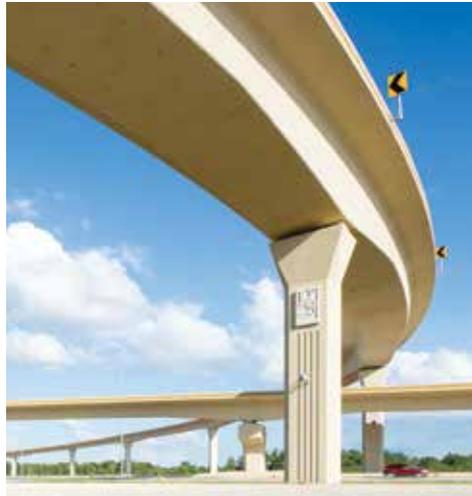


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roads were two lane and therefore temporary alignment shifts were used to easily maintain traffic flow during construction of the new ramps. This project is good example of where the substantial benefit to upgrading the interchange was worth the minor inconvenience of the traffic shifts during construction.



Owner:

**Louisiana DOTD**

Owner's Engineer:

TRC Engineers, Inc.

Designer:

**Finley Engineering Group, Inc.**

(Ramps SE & WN)

TRC Engineers, Inc.

(Ramp EN)

Contractor:

**PCL Civil Constructors, Inc.**

Construction Engineering Services:

**Corven Engineering, Inc.**

Construction Engineering Inspection:

**Louisiana DOTD**

with Technical Support by

**FIGG Engineering Group**

Precast Producer:

**PCL Civil Constructors, Inc.**

(Self-Perform)

Formwork for Precast Segments:

**DEAL/Rizzani de Eccher USA, Inc.**

Erection Equipment:

Rental Manitowoc 2250

Bulldog Erectors, Inc.

Lifting Frame Design

Construction Technologies

& Engineering, Inc.

Post-Tensioning Materials:

**Schwager Davis, Inc.**

Bearings:

**R.J. Watson, Inc.**

Expansion Joints:

**D.S. Brown Company**

Epoxy Supplier:

Pilgrim Permocoat, Inc.

Prepackaged Grout:

The Euclid Chemical Company

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