

This precast prestressed concrete segmental box girder bridge, with longitudinal post-tensioning, was selected primarily because of its economy, structural advantages and aesthetic qualities.

Ramp B Bridge Over U.S. Highway 23

The Ramp B Bridge is on an exit ramp for the U.S. Highway 23 interchange near Pikeville, Kentucky. U.S. Highway 23 was relocated as part of a large project consisting of relocating a highway, railroad and river through a mountain. The old river bed formed a horseshoe bend around Pikeville and was preventing the city from expanding. With the relocation of the river, the old river bed could be filled and new land provided for industrial and commercial expansion.

Ramp B provides access to Pikeville when traveling south on U.S. Highway 23. The geometry of the interchange required Ramp B to cross back over U.S. 23 and Ramp C. This caused the Ramp B bridge to be in a 10 degree horizontal curve, superelevated almost 1 in. per ft (83 mm per m), and located in a vertical curve. Also, Ramp B was the top level of a tri-level interchange and the deck was approximately 50 ft (15 m) above the ground.

When planning for the bridge began in 1976, it was apparent that the normal type of design for interchange bridges could not be used. It would take 185 ft (56 m) of center span to clear the second level bridge over Ramp C. This span length, degree of curve and height above ground eliminated PCI-AASHTO beams, precast deck beams or cast-in-place girders as a choice for framing.

When preliminary plans were prepared, two framing systems were selected for comparison. The first was a conventional curved plate girder system supporting a cast-in-place concrete deck. The second was to use a precast prestressed segmental box girder system with longitudinal post-tensioning. The top slab of the box girder section would serve as the deck with an overlay and Jersey barriers to be added in the field. The ratio of center span to end spans was two to one. This span ratio was ideal for the box girder bridge enabling it to be constructed by the balanced cantilever method and thus eliminate temporary shoring.

Cost estimates were prepared for both alternatives and preliminary plans submitted to the state for a final decision. The state chose the segmental bridge based on the lower cost. Other advantages favoring the segmental bridge included the high shear and torsion resistance offered by concrete box girders and for its adaptability to the horizontal and vertical curvature. State officials were not deterred by the fact that this type of construction was relatively new in Kentucky and required a higher level of technology.

The new three-span bridge has spans of 93 ft 6 in., 185 ft and 93 ft 6 in. (28.5, 56.4 and 28.5 m). The overall length of this bridge is 381 ft (116.1 m). The structure





consists of 48 precast box girder sections. Each section is approximately 8 ft long and 9 ft deep (2.44 x 2.74 m). The top flange of the box section which makes up the deck slab is 28 ft 4½ in. (8.65 m) out to out.

All box girder segments were fabricated in Lafayette, Indiana, using the short line method of match casting. The segments were trucked to the site.

The contractor began erecting segments in June 1985. The bridge was opened to traffic on October 2, 1987. During the past year the facility has been operating with total satisfaction.

The total cost of the project was \$959,226 with the precast prestressed concrete work amounting to about \$673,000.

The total unit cost was \$89 per sq ft.

This bridge project won an award in the 1988 PCI Professional Design Awards Program.

Credits

Architect/Engineer: Johnson, Depp & Quisenberry, Owensboro, Kentucky, and Janssen, Spaans & Associates Inc., Indianapolis, Indiana, a Joint Venture.

Precast Concrete Manufacturer: Hydro Conduit Corporation, Lafayette Plant, Lafayette, Indiana.

General Contractor: Melco-Greer Inc., London, Kentucky.

Owner: Kentucky Transportation Cabinet, Frankfort, Kentucky.

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