2011 – US 6 Bridge over Keg Creek

Description

Meta Fields
Other Related Url 0 Other Related Link :
http://www.trb.org/StrategicHighwayResearchProgram2SHRP2/Pages/Video-One_Design-10,000_Bridges_536.aspx
Construction Schedule 0 Construction Schedule File : 2015
Specifications 0 Spec File : 2492
Abc Construction Equipment : Conventional
Miscellaneous Prefabricated : CIP reinforced concrete closure joints; Bars in splice couplers; Socket connection (in precast substructure)-(abutments); UHPC closure joints; Precast approach slab; Prefabricated railing
Prefabricated Bridge Elements : MDcBs (Modular decked beams); Precast cap & column(s); Precast backwalls; Precast wingwalls
Contracting : Full lane closure; Incentive / disincentive clauses
Project Delivery : Design-bid-build
Decision Making Tools : TPF-5(221)
Longitude : -95.6620178
Latitude : 41.289753
Nbi # : 43231
State Id # : 7814.2S006
Construction Equipment : Conventional
Total Bridge Length Ft : 204.5
Max Span Length Ft : 70
Beam Material : Steel
Spans : Three-span
Location : Rural
Owner : State
State : IA
Year Abc Built : 2011
Rapid Embankment : Fully-contained flooded backfill
Other Related Url : 3
Construction Schedule : 1
Contract Plans : 1
Incentive Program : HfL (Highways for Life): $400,000; SHRP2: $250,000
Funding Source : Federal and State
Costs : The engineer’s estimate for the project was $2.10 million. The low bid was $2.66 million ($564,000 = 27% higher than engineer’s estimate). There were 7 bidders. The cost per square foot of bridge was $231 compared to $124 for conventional construction in this region in 2011.
Contacts : Ahmad Abu-Hawash, P.E. Chief Structural Engineer, Office of Bridges and Structures Iowa Department of Transportation ahmad.abu-hawash@dot.iowa.gov 515-239-1393
High Performance Material : High-performance concrete (HPC) for all precast elements; Ultra-high-performance concrete (UHPC) deck closure joints; Self-consolidating HPC in substructure pockets, deck lifting loop pockets, and precast approach pavement joints

Contact Us | Phone: (305) 348-0110 | Email: abc@fiu.edu | 10555 W. Flagler Street, EC 3680 Miami, FL 33174

Stakeholder Feedback : Extra attention is needed for field tolerances. Approximately ¼ inch of bridge width was added for each of the six modules as they were erected. This additional width added up to 1.5 inches, making it difficult to install the last segment. The contractor made a last-minute substitution of self-consolidating HPC instead of UHPC in the deck lifting loop pockets and in the precast approach pavement joints to avoid running out of UHPC due to form slippage in one location that resulted in UHPC loss.

Construction Method : The bridge was constructed as a three-span continuous bridge by combining field-cast UHPC joints with simple-span modular segments erected with conventional cranes. UHPC joints were used for both the longitudinal joints between adjacent modular beam segments and, for the first time in the US, the moment-resisting transverse superstructure joints at each pier. Prior to construction, structural testing was done to evaluate the moment-resisting transverse connection over the piers. The bond broke between the UHPC joints and deck panels, and cracking was observed in the panels. As a result, the beam ends across the piers were retrofit with longitudinal rods post-tensioned to 70 ksi in the field.The contractor fabricated the precast elements on site, and concrete drilled shafts were constructed outside the bridge footprint at the two interior support locations. The bridge was then closed and demolished. The 4-ft square precast columns were installed on the drilled shafts, connected with grouted splice couplers in the columns. The 85-ton pier caps were lowered onto the columns, connected with grouted splice couplers in the caps. Abutment steel H-piles were driven, and precast abutment stem and wingwalls were assembled. Self-consolidating high-performance concrete (HPC) was cast in the abutment cap pockets. The 60-ton modular steel beam and composite concrete deck segments were installed, complete with traffic railing on the outside segments and suspended abutment backwalls. Longitudinal and transverse closure joints in the deck were cast with UHPC. The precast approach slabs were assembled. Self-consolidating HPC was cast in the deck lifting loop pockets and in the precast approach pavement joints. The deck and approach slabs were diamond ground to final profile.Fully-contained flooded backfill was used to minimize approach settlement and avoid the bump at the end of the bridge. A structural health monitoring system was installed to assess the overall bridge performance during and after construction.The contract included incentives / disincentives of $22,000 for road closure with detour in effect per day less than / greater than the 14-day maximum closure.

Replacement Or New Bridge : The replacement bridge has two traffic lanes, one in each direction, and two 8-ft-wide shoulders. It consists of precast semi-integral abutments, precast columns and pier caps connected with high-strength grouted couplers, and modular beams with composite slab superstructure. Each superstructure span consists of six modular full-span beam segments. The segments are 7.3-ft wide with two W30x99 steel rolled I-beams and 8.5-inch-thick composite concrete deck. Six-inch-wide longitudinal closure joints filled with ultra-high-performance concrete (UHPC) connect the segments.

Existing Bridge Description : Built in 1953, the existing three-span 180-ft by 34.7-ft two-lane continuous concrete girder bridge was structurally deficient and required replacement.

Traffic Management : Traffic management alternative, if constructed conventionally: extended use of 22 (13 out-of-distance)-mile detour

Average Daily Traffic At Time Of Construction : 5380

Dimensions : 204.5-ft-long and 47.2-ft wide three-span modular decked steel beam bridge (67.25 ft - 70 ft – 67.25 ft)

Primary Drivers : reduced traffic impacts, improved material quality and product durability, improved work-zone safety

Impact Category : Tier 3 (within 2 weeks)

Mobility Impact Time : ABC: 2 weeks of traffic disruption; Conventional: 4-6 months

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Project Location :

on US 6 over Keg Creek 6 miles east of the city of Council Bluffs in Pottawattamie County

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