



2008 - Jakway Park Bridge

Description

Meta Fields

Project Summary : This bridge is the first highway bridge built with the UHPC pi-girder concept, the first North American highway bridge to incorporate batching of UHPC in a ready-mix truck, and the second North American highway bridge built with UHPC girders.

Project Location : 136th Street over the east branch of Buffalo Creek in northeast Buchanan County

Mobility Impact Time :

- ABC: 52 days
- Conventional: 15-20 additional days

Impact Category : Tier 5 (within 3 months)

Dimensions : 115.33-ft long and 24.75-ft wide three-span ultra-high-performance concrete (UHPC) pi-girder bridge (30.58 ft × 51.17 ft × 30.58 ft) [pi-girder in center span only]

Average Daily Traffic At Time Of Construction : 30

Traffic Management : extended use of 5-mile detour

Existing Bridge Description : The existing single-span pony truss bridge was 64-ft long and 16-ft wide with timber substructure. It had two 8-ft-wide traffic lanes and two 3-ft-wide shoulders. Built in 1900, the bridge was destroyed in a flood and required replacement.

Replacement Or New Bridge : The replacement bridge has two 12-ft-wide traffic lanes and two 3-ft-wide shoulders. The middle span's cross-section consists of three 8.33-ft-wide 2.75-ft-deep adjacent pretensioned UHPC pi-girders with 3-inch-wide tapered webs spaced at 4.42 ft. The deck is 4.13 inches thick between webs and tapered from 6.88 inches to 5.25 inches outside the webs at the deck edge.

Construction Method : The 50-ft-long simple-span pi-girders were fabricated in three separate pours on three separate weeks in September 2008 at a plant in Canada. Ready-mix trucks were used to batch the UHPC mix to reduce costs. The required compressive strength after steam curing was 21,500 psi, and the final average compressive strength approached 30,000 psi. While the pi-girders were being fabricated, the contractor graded the bridge site and constructed the conventional cast-in-place integral abutments on steel H-piles and cast-in-place pier caps on steel H-piles encased in concrete. The pi-girders were trucked to the site and erected on plain neoprene bearing seats in mid-October 2008, approximately one month after the last pi-girder was fabricated. They were tied together transversely with No. 8 reinforcement bars in grouted pockets at 18-inch spacing and with steel diaphragms across the bottom of the flanges at quarter points. The contractor encased the pi-girder ends in cast-in-place diaphragms with 3,500 psi concrete compressive strength. The two reinforced concrete slab end spans were constructed conventionally. No deck surface preparation was done other than a tack coat. The contractor applied a 3/8-inch asphalt chip seal to provide texture. Because the project was so late in the year the chip seal was placed in the spring of 2009. Construction monitoring allowed assessment of structural performance. The contract required the bridge to be closed a maximum of 53 calendar days. The bridge was re-opened in 52 days. The Iowa DOT standard specifications were used on the project. No incentives or disincentives were included in the contract.

Stakeholder Feedback : This bridge was the first project in Buchanan County to use UHPC. The County learned much about the use of UHPC, e.g., how best to cure UHPC since it cures differently than conventional concrete. The purpose for the project was to optimize the use of UHPC in precast bridge girders. The project engaged a novel superstructure design referred to as a pi-girder, designed to carry HL 93 loads over an 87 ft span. Numerous hurdles existed, and solutions were implemented to overcome the issues. Practical concerns with the ability of precast concrete fabricators to efficiently construct UHPC components within their normal operations were addressed through the use of ready-mix trucks to mix and transport the concrete to the forms. Another very positive aspect is UHPC's impervious nature and self-consolidating properties. However, this prevented placing a texture on the UHPC and raised concerns about whether a surface texture could be bonded to it. The County placed an asphalt chip seal on the deck as a friction surface and it appears to be performing well; the County expects epoxy friction surfaces to work well also. The rate of mechanical property development of the UHPC is an aspect that would benefit from additional investigation. UHPC tends to display an hours-long dwell time prior to the initiation of any mechanical property development. As such, precasting

