

# Little Cedar Creek Bridge— Big Innovation

by Brian P. Moore, Wapello County



The underside of the completed Little Cedar Creek Bridge showing ultra-high-performance concrete (UHPC) waffle panels on conventional precast, prestressed concrete I-beams. All photos: Wapello County.

**B**ridge engineers are seeking new ways to build better bridges, reduce work zone travel delays, and reduce maintenance costs. Agencies are challenged with replacing critical bridge components with minimal disruption to the traveling public. Using ultra-high-performance concrete (UHPC) for precast panels and connections is a new system that offers great potential for both new and rehabilitation bridge projects.

In the fall of 2011, Wapello County, Iowa, used UHPC two-way-ribbed, modular deck panels (waffle panels) and UHPC field-cast, continuity connections to construct the Little Cedar Creek Bridge. All connections from panel to panel and from panel to beam used UHPC. The bridge consists of 14 waffle panels. The panels are 15 ft long, 8 ft wide, and 8 in. deep, with the top flange portion of the “waffle” squares only 2½ in. thick. The waffle panels sit on conventional precast, prestressed concrete I-beams, 39 in. deep, spanning 63 ft. The bridge is 32 ft 2 in. wide. The panels are connected to the beams by reinforcement extending from the beams into the space between the ribs of the panels and the tops of the beams. This reinforcement is encapsulated with UHPC.

This first-of-its-kind bridge has proven very successful. The design of the bridge and

initial testing was by the Iowa Department of Transportation. The design was relatively straight forward and utilized the unique properties of UHPC. Production of the panels was by Coreslab Structures Inc. in Omaha, Neb., and was completed with ease, with very few adjustments to existing technologies or processes. The UHPC was furnished by Lafarge North America Inc. Construction moved quickly due to the use of the modular panels and readily available equipment, materials, and techniques. The UHPC field casting process was new to the contractor, Bloomfield Bridge & Culvert, and required some additional early instruction, but the process went quickly and smoothly.

Overall the Little Cedar Creek Bridge project was a huge success exceeding all expectations of Wapello County. It shows how UHPC can change the way bridge decks are constructed and can significantly extend the service life of highway infrastructure in this country. Wapello County believes that UHPC has not only performed well in this project but shows great promise for innovation in the future.

*Brian P. Moore is the Wapello County engineer in Ottumwa, Iowa*



The Little Cedar Creek Bridge in Wapello County, Iowa.



Short extended reinforcing bars are shown in the longitudinal and transverse joints prior to placing the UHPC field-cast closures.

## EDITOR'S NOTE

More articles that mention this project or UHPC field-cast connection techniques, can be found in these issues of ASPIRE:™

- Fall 2009, “Route 31 Bridge over Canandaigua Outlet,” pp. 28-30.
- Summer 2010, FHWA: “Deployment of Ultra-High-Performance Concrete Technology,” pp. 50-51.
- Fall 2010, FHWA: “The Highways for LIFE Pilot Program,” pp. 42-43; Winter 2011, Wapello County, p. 46.