



# Full Depth UHPC Waffle Bridge Deck Panels

Highways for LIFE Technology Partnerships 2009 Award \$382,971

## → Contact Information

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## → Need for Innovation

Bridge engineers are seeking new ways to build better bridges, reduce work zone travel delays, and improve repair techniques thereby reducing maintenance. Additionally, owners are challenged with replacing critical bridge components (particularly bridge decks) during limited or overnight road closure periods. Precast panels manufactured from UHPC can provide significant durability improvements to bridge decks due to the high strength, extremely low permeability, and improved connection details inherent in the system. The use of this innovation will result in reduced construction time for new and rehabilitated bridges, the ability to upgrade the load-carrying capacity of existing bridges, and improved durability of bridge decks.

## → Project Overview

Coreslab Structures (Omaha), Inc., demonstrated waffle design modular panels on a bridge project in Wapello County, Iowa. The bridge deck panels will be manufactured with ultra-high performance concrete (UHPC) and installed with field cast UHPC joints which fully develop the joint reinforcement for bridge deck continuity. The demonstration bridge is 33'2" wide by 60' long, consisting of 14 waffle slabs.

## → Project Status

Completed in November 2011, the structural performance of the bridge is being monitored by Wapello County, Iowa.

## → Project Team

Coreslab Structures (Omaha), Inc.  
Lafarge North America, Inc.  
Iowa DOT  
Iowa State University  
Wapello County, Iowa



**Final Setup of the Phase 1 Specimen**

The panels are cast in an inverted orientation to allow the driving surface to be cast into the demonstration bridge panels with the use of a form liner.



**Placing the UHPC**

The UHPC is placed with a specially designed bucket, which aligns the steel fibers in the longest direction of the panel. This helps to increase the flexural strength of the panels.



**Setting the Pans**

The form is filled with UHPC and then the pans are set as an assembly. By placing the pans as an assembly, the panels can be cast substantially faster and with less chance of error.



**Panel Rotated to the Vertical Position**

The panel is rotated to the vertical position by the casting bed to reduce the handling stresses on the piece.



**Underside of Bridge**



**Completed Bridge**

## → Additional Information

- Final report: <http://www.fhwa.dot.gov/hfl/partnerships/hif13031/chapt00.cfm>
- Design Guide for Precast UHPC Waffle Deck Panel System, including Connections: <http://www.fhwa.dot.gov/hfl/pubs/hif13032/chap00.cfm>
- Webinar: UHPC for Precast Bridge Decks and Connections: Design Guide, Construction Experience, and Owner Perspective: June 25, 2013 <https://connectdot.connectsolutions.com/n134083201306>
- Video on project at [www.fhwa.dot.gov/hfl/partnerships/coreslab/index.cfm](http://www.fhwa.dot.gov/hfl/partnerships/coreslab/index.cfm)
- Webinar: Ultra-High Performance Concrete, An Introduction to the Material And Potential Applications, recorded November 18, 2010 at [www.fhwa.dot.gov/hfl/commtool.cfm](http://www.fhwa.dot.gov/hfl/commtool.cfm)
- Webinar: Field-Cast Ultra-High Performance Concrete Connections for Prefabricated Bridge Elements and Systems; recorded April 21, 2011 at [www.fhwa.dot.gov/hfl/commtool.cfm](http://www.fhwa.dot.gov/hfl/commtool.cfm)
- FHWA TechNote Ultra-High Performance Concrete (pdf) at [www.fhwa.dot.gov/publications/research/infrastructure/structures/11038/](http://www.fhwa.dot.gov/publications/research/infrastructure/structures/11038/)