

# Wapello County Looks to the Future

by Brian Moore, Wapello County

**W**apello County in southeastern Iowa has been aggressive in looking for ways to lengthen the service life of bridges. Although a relatively small county, with 36,000 people in 436 square miles, the county has taken the lead on two recent innovative projects that will aid design techniques across the country.

The county has 180 bridges in all, with about 40 replaced in the past 6 years. New bridges are always made of concrete, either precast, prestressed concrete beams or cast-in-place concrete slabs. This approach is taken due to concrete's longevity, its efficiency in handling heavier live loads, and the economy with which structures can be built in a short time.

## County Uses UHPC

The county has taken the lead in finding ways to extend the life span of its bridges through the use of ultra-high-performance concrete (UHPC). The first use was on the Mars Hill Bridge, consisting of three 110-ft-long, precast concrete, modified 45-in.-deep Iowa bulb-tee beams topped with a cast-in-place concrete deck. The UHPC offered a compressive strength of 30,000 psi, which eliminated the need for shear reinforcement in the beams.

Wapello County was familiar with UHPC and saw the potential in using it to improve bridge designs and lower long-term maintenance costs.



*Wapello County's first bridge to be built with UHPC was the Mars Hill Bridge. It features three 110-ft-long precast, prestressed concrete, 45-in.-deep Iowa bulb-tee beams topped with a cast-in-place concrete deck.*

Designers worked with Iowa State University and the Iowa Department of Transportation to use the Mars Hill Bridge as a prototype. The county received a grant through the Federal Highway Administration's (FHWA's) Innovative Bridge Research and Construction (IBRC) program to fund research and pay the premium created by trying innovative techniques.

The project proved so successful that a second bridge was designed for Little Cedar Creek, with the help of an FHWA Highways for LIFE grant. The project, to be completed in spring 2011, contains 14 UHPC deck waffle panels on a 60-ft-long, 33-ft-wide concrete bridge. The panels are 15 ft long, 8 ft wide, and 8 in. deep at the deepest point, with the shallow portion of the "waffle" squares only 2.5 in. deep.

We believe these waffle panels offer the best application for UHPC for Iowa bridges due to the properties of the material and the design's flexibility and longevity. The design is simple, manufacturing (by Coreslab Structures in Omaha, Neb., using Ductal UHPC from Lafarge North America) is easy and construction moves quickly. The lightweight panels will allow rehabilitation of bridges without needing to strengthen the substructure to handle heavier live loads. It also will be possible to rehabilitate

bridges under traffic by replacing one lane at a time. In addition, UHPC is virtually impermeable.

The goal now is to learn from these two projects and expand UHPC's application to a longer bridge, such as a three-span structure. These projects are fairly simple, but they offer great potential to aid future projects around the country, which is our goal.

*Brian Moore is Wapello County Engineer in Ottumwa, Iowa.*

## EDITOR'S NOTE

*For more information on the Mars Hill project, see the Summer 2007 issue of Aspire.™ For more on the Little Cedar Creek project, see the FHWA article in the Fall 2010 issue.*

*Wapello County's second bridge to include UHPC is the bridge over Little Cedar Creek, which features 14 precast concrete "waffle" panels for the deck. This offers one of the best uses for UHPC for Iowa bridges due to the properties of the material and the design's adaptability and longevity.*

