

ABC Innovative Projects

Madison County Bridge					
Location	on 290 th Street over Branch Clanton Creek in Madison County, southwest of the city of Des Moines				
State	Iowa				
Owner	Madison County				
Year ABC Built	2007				
State ID #	14B-551-100				
NBI #	232301				
Coordinates	Latitude:	41.22865014	Longitude:	-94.02317607	
Contact Person	Ahmad Abu-Hawash, P.E. Chief Structural Engineer, Office of Bridges and Structures Iowa Department of Transportation Phone: 515-239-1393 Email: ahmad.abu-hawash@dot.iowa.gov				
Mobility Impact Time	ABC:	4.5-month closure; 4.5 weeks of actual construction (Closure could have been limited to a few days, but as one of the first ABC projects in Iowa with limited funding and very low traffic volume, the Iowa DOT elected to be generous with the contract period.)		Conventional:	six months
Impact Category	<i>Tier 1</i>	<i>Tier 2</i>	<i>Tier 3</i>	<i>Tier 4</i>	<i>Tier 5</i>
				See above	X
Primary Driver(s)	reduced traffic impacts, reduced onsite construction time, improved site constructability				
Description	<ul style="list-style-type: none"> • 46.67-ft long and 24.08-ft wide single-span adjacent box beam bridge • Rural location • Average Daily Traffic count: 10 (2004) • Traffic management alternative, if constructed conventionally: extended use of 3-mile detour <p>Existing Bridge: The existing two-lane single-span timber bridge was 22-ft-long and 18-ft-wide. It was founded on timber piles with timber backwalls. Built in 1940, the bridge was deteriorated and required replacement.</p> <p>Replacement Bridge: The replacement bridge has two 12-ft-wide traffic lanes. The superstructure cross-section consists of six 4-ft-wide 2.25-ft-deep adjacent pretensioned box beams. The integral abutment is a 27.33-ft-long, 3-ft-wide precast abutment that varied in depth from 3.5-ft at the ends to 3.75-ft in the middle. The footings are supported on steel H-piles. High-performance concrete (HPC) was used for all precast concrete on the job.</p> <p>Construction Methods: All precast elements were fabricated in the precast plant. Each precast reinforced concrete abutment footing was 27.33-ft long, 3-ft wide, and varied in depth from 3.5-ft at the ends to 3.75-ft in the middle. The footings were cast with five full-depth pockets to go over the piles; the pockets were created using 21-inch-diameter corrugated metal</p>				

	<p>pipe. The beams were cast with corrosion sensors applied for monitoring by the researchers. Surface texture was applied to the beams in the plant, with no grinding or surface texture applied in the field since this is a gravel road.</p> <p>The contractor drove the piles, and then welded the shear studs along the length of pile to be inserted into the abutment cap pocket. The abutment footings were set in place, and a high-early-strength concrete mix was used to fill the pockets. The beams were erected onto the abutment footings in an hour and a half. The contractor then stopped operations for the winter. In the spring the contractor returned to the site and constructed cast-in-place abutment backwalls on top of the precast abutment footings. The longitudinal keyways between beams were filled with non-shrink grout, and the transverse tie located at midspan was hand-tightened. The remainder of the bridge, including cast-in-place wingwalls and railings, were constructed conventionally.</p> <p>A pre-bid meeting was held to share the vision of the accelerated construction process. Contractors and precasters were given the opportunity to review contract documents and ask questions prior to bidding. No incentives were included in the contract. After the bid award, a pre-construction conference was held with the contractor, subcontractors, precaster, designer, representatives from the local university, and FHWA.</p> <p>See “Other Related Information” section for link to 2007 Conference Proceedings paper that includes the construction timeline.</p> <p>Stakeholder Feedback: See “Other Related Information” section for link to January 2009 evaluation report.</p>			
High Performance Materials	<ul style="list-style-type: none"> • High-performance concrete (HPC) for all precast concrete 			
Photos				
Project Planning	<i>Decision-Making Tools</i> <ul style="list-style-type: none"> • 	<i>Site Procurement</i> <ul style="list-style-type: none"> • 	<i>Project Delivery</i> <ul style="list-style-type: none"> • Design-bid-build 	<i>Contracting</i> <ul style="list-style-type: none"> • Full lane closure
Geotechnical Solutions	<i>Foundations & Walls</i> <ul style="list-style-type: none"> • 		<i>Rapid Embankment</i> <ul style="list-style-type: none"> • 	
Structural Solutions	<i>Prefabricated Bridge Elements & Systems</i>			<i>Construction</i>
	<i>Elements</i> <ul style="list-style-type: none"> • Adjacent box beams • Precast abutment cap 	<i>Systems</i> <ul style="list-style-type: none"> • 	<i>Miscellaneous</i> <ul style="list-style-type: none"> • CIP reinforced concrete closure joints • Grouted keys • Grouted PT ducts • CIP pockets in precast caps 	<ul style="list-style-type: none"> •
Costs	<p>The engineer’s estimate for the project was \$120,700. The low bid was approximately \$159,900 of which \$131,500 was the bridge portion of the project. There were six bidders. The cost per square foot of bridge was \$110 compared to \$60 for conventional</p>			

	construction in this region in 2007.			
Funding	<i>Federal only</i>	<i>State only</i>	Federal and State	<i>Other</i>
			X	
Incentive Program (\$)	<i>Highways for LIFE</i>	IBRD	<i>SHRP2</i>	<i>Other</i>
		\$200,000		
Contract Plans	Complete Set: Final Plans [http://www.iowadot.gov/bridge/ibrc_projects/madison_ibrc_final_0221_2006.pdf]		ABC *:	
Specifications	Complete Set: Standard Specifications [http://www.iowadot.gov/specifications/index.htm]		ABC *:	
Bid Tabs	Bid Tab (link to pdf) Cost Estimate (link to pdf)			
Schedule	Engineer's:	Not available.	Actual:	
Other Related Information	Iowa DOT IBRC/IBRD Website [http://www.iowadot.gov/bridge/ibrcibrd_research.htm] Precast Concrete Elements for ABC: Laboratory Testing, Field Testing, Evaluation of a Precast Concrete Bridge, Madison County Bridge, January 2009 Research Report [http://www.iowadot.gov/operationsresearch/reports/reports_pdf/hr_and_tr/reports/TR-561%20Vol%202.pdf] FHWA Connections Manual for PBES Details 2.5.2 A, 3.2.3.1 A February 2009 Iowa DOT Research News (link to pdf) 2008 Iowa DOT ABC Workshop Report (link to pdf) "Accelerated Construction in Iowa," 2007 National Bridge Conference Proceedings [http://www.iowadot.gov/bridge/ibrc_projects/final_accelerated_construction.pdf] Iowa DOT Bridge Standards Website [http://www.iowadot.gov/bridge/v8ebrgstd.htm]			
Photo Credits	Iowa Department of Transportation			

* Specific to the ABC used in the project.