

ABC Innovative Projects

24th Street Bridge over I-29/I-80					
Location	on 24 th Street over I-29/I-80 in the city of Council Bluffs in Pottawattamie County				
State	Iowa				
Owner	State				
Year ABC Built	2008				
State ID #	7801.70080				
NBI #	044691				
Coordinates	Latitude: 41.23215993		Longitude: -95.87923054		
Contact Person	Ahmad Abu-Hawash, P.E. Iowa Department of Transportation Phone: 515-239-1393 Email: ahmad.abu-hawash@dot.iowa.gov				
Mobility Impact Time	ABC: < 6 months, one construction season		Conventional: 16 months, two construction seasons		
Impact Category	<i>Tier 1</i>	<i>Tier 2</i>	<i>Tier 3</i>	<i>Tier 4</i>	Tier 5 X
Primary Driver(s)	reduced traffic impacts, improved work-zone safety, improved material quality and product durability				
Description	<ul style="list-style-type: none"> • 353.5-ft-long and 105.67-ft wide two-span bridge (178.5 ft - 175.0 ft) • Urban location • Average Daily Traffic count: 15,000 (2004); 24,400 (projected 2030) • Traffic management alternative, if constructed conventionally: staged over two construction seasons – same as ABC but twice as long. <p>Existing Bridge: The existing four-span 215-ft by 60.8-ft four-lane continuous pretensioned concrete I-beam bridge was replaced as the first part of a multi-state (Iowa and Nebraska) effort to improve and upgrade the capacity of the Council Bluffs Interstate System.</p> <p>Replacement Bridge: Each replacement span consists of 12 steel welded plate girders that are 5-ft deep and spaced at 9 ft, and 8-inch-thick precast full-depth deck panels. The bridge has an 82-ft roadway width (two traffic lanes each direction plus two turn lanes), a 10-ft multi-use trail on one side, and an 8-ft sidewalk on the other side. The new vertical profile on 24th Street was raised about 5 ft to gain the necessary vertical clearance over I-29/80.</p> <p>Construction Methods: The bridge was constructed in two phases, maintaining at least one lane of traffic in each direction and a third lane to accommodate left turns. The existing bridge was partially removed to construct the first stage of the replacement bridge. The traffic was then switched to the new portion of the bridge to construct the remaining half. Traffic was maintained on I-29/80 except during placement of the bridge girders and deck panels directly over the interstate, when traffic was routed onto the 24th Street ramps.</p> <p>The 70 precast transversely pretensioned panels (52-ft long and 10-ft wide) were made with self-consolidating high-performance concrete to improve consolidation around the reinforcement and longitudinal post-tensioning ducts. The panels were cast offsite in a</p>				

	<p>controlled environment and steam cured. The panels span about half the width of the bridge and accommodated the two phases of construction traffic. The panels were erected, shear studs installed, transverse keys grouted, longitudinally post-tensioned and ducts grouted. The shear stud pockets were then filled with self-consolidated concrete, and the 12-inch-wide longitudinal strip joining the two halves of the bridge deck was cast. A two-inch concrete overlay was then placed.</p> <p>Researchers had examined methods to splice the longitudinal post-tensioning ducts at transverse joint locations to keep moisture or grout from infiltrating the ducts. The result of the investigation indicated that sealing the post-tensioning duct connections with waterproof duct tape or a combination of waterproof duct tape and butyl rubber was adequate. An investigation of precast diamond plate texturing, chemical etching, and sandblasting surface treatments revealed that sandblasting delivered the highest bond for transverse joint shear transfer between panels. (See evaluation report under “Other Related Information.”)</p> <p>Fully-contained flooded backfill was used to minimize approach settlement and avoid the bump at the end of the bridge. A structural health monitoring system was installed to assess the deck panel and overall bridge performance during and after construction.</p> <p>Stakeholder Feedback: Because of the size and scope of this project, at least two construction seasons would have been required to complete it using traditional methods. The decision for a maximum of one full construction season was made after consulting with local contractors. All contractors at the constructability review meeting held to discuss accelerated construction methods for the project were in favor of staged construction for one full construction season.</p> <p>To reduce the project delivery time and open all lanes of the new bridge within one construction season (April through October), the Iowa DOT selected the cost-plus-time (A+B) contract bidding process with a maximum of 210 days in the contract. The winning bid was 175 days. Up to 14 closure detours of I-80/I-29 were allowed, with liquidated damages of \$4,000 per hour if the specified time to open was not met. The I-80/I-29 closures were for short durations with onsite detour (ramps) during off-peak hours.</p>			
High Performance Materials	<ul style="list-style-type: none"> • HPC • Self-consolidating HPC in panels • HPS 70W in girder bottom flange & top flange in negative moment region 			
Photos Additional 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"> • A+B bidding • Incentive / disincentive clauses
Geotechnical Solutions	<i>Foundations & Walls</i> <ul style="list-style-type: none"> • 		<i>Rapid Embankment</i> <ul style="list-style-type: none"> • Fully-contained flooded backfill 	

Structural Solutions	Prefabricated Bridge Elements & Systems			<i>Construction</i>
	Elements	Systems	Miscellaneous	•
	<ul style="list-style-type: none"> • Full-depth precast deck panels w/ PT 	•	<ul style="list-style-type: none"> • CIP reinforced concrete closure joints • Grouted keys • Grouted blockouts w/ shear connectors • Grouted PT ducts • Standard concrete overlay 	
Costs	<p>The engineer's estimate for this project was \$7.1 million. The low bid was \$5.9 million (\$1.1 million = 16% lower than engineer's estimate). There were 4 bidders. The cost per square foot of bridge was \$140 compared to \$120 for conventional construction in this region in 2008; however, comparison of this accelerated construction project with conventional construction is not valid since the bridge includes unique aesthetic features along with mass concrete.</p> <p>Road user costs were \$1,500 per day. A comprehensive economic analysis including delay-related user costs revealed that the Iowa DOT's approach realized a cost savings of about \$1 million or 8 percent of the total project over conventional construction practices. A significant amount of the cost savings was from reduced construction time. In addition, the experience gained on this project is helping the Iowa DOT implement these innovations more routinely on future projects.</p>			
Funding	<i>Federal only</i>	<i>State only</i>	Federal and State	<i>Other</i>
			X	
Incentive Program (\$)	Highways for LIFE	IBRD	SHRP2	<i>Other</i>
	\$1 million	\$400,000		
Contract Plans	Complete Set:	Contract Plans (link to pdf)	ABC *:	
Specifications	Complete Set:	Estimating Proposal (link to pdf) SP010315 (link to pdf) SP010316 (link to pdf)	ABC *:	SP010314-Panels (link to pdf) SP010319-A+B (link to pdf)
Bid Tabs	Bid Tabs (link to txt)			
Schedule	Engineer's:		Actual:	Contractor's Schedule (link to pdf)
Other Related Information	Iowa DOT 24th Street Bridge Website [http://www.iowadot.gov/bridge/ibrcibrd_research.htm] November 2010 Evaluation Report (link to pdf) 2010 America's Transportation Awards [http://www.americastransportationaward.org/Default.aspx?ContentID=128] December 2009 NSBA Steel Bridge News [http://www.modernsteel.com/Uploads/Issues/December_2009/122009_Dec09_24th_Bridge_web.pdf] November 2009 Highways for LIFE Final Report [http://www.fhwa.dot.gov/hfl/summary/ia/] 2008 Iowa DOT ABC Workshop Report (link to pdf)			

	<p>"Accelerated Construction and Innovations: The 24th Street Bridge," 2007 NSBA Conference Proceedings [http://www.aisc.org/WorkArea/showcontent.aspx?id=20522]</p> <p>August 2007 Mid-Continent Transportation Research Symposium Proceedings [http://www.intrans.iastate.edu/pubs/midcon2007/Abu-HawashInnovations.pdf]</p> <p>Iowa DOT Bridge Standards Website [http://www.iowadot.gov/bridge/v8ebrgstd.htm]</p>
Photo Credits	Iowa Department of Transportation

* Specific to the ABC used in the project.