ABC Innovative Projects

MD 450 Bridge over Bacon Ridge Branch						
Location	on MD Route 450 over Bacon Ridge Branch in central Anne Arundel County west of the city of Annapolis					
State	Maryland					
Owner	State					
Year ABC Built	2008					
State ID #	02072					
NBI #	100000020072010					
Coordinates	***Latitude:*** 38.98610			***Longitude:*** -76.6089		
Contact Person	Jeffrey Robert, P.E. Senior Project Engineer Office of Structures Maryland State Highway Administration Phone: 410-545-8327 Email: jrobert@sha.state.md.us					
Mobility Impact Time	***ABC:*** 67-day closure to complete both bridges			***Conventional:*** 3 additional weeks per bridge		
Impact Category	*Tier 1*	*Tier 2*	*Tier 3*	***Tier 4***	*Tier 5*	
				X		
Primary Driver(s)	reduced traffic impacts, improved work-zone safety, reduced onsite construction time – to open the bridge in time for school in the fall, improved site constructability, improved material quality and product durability, reduced life-cycle cost					
Description	• 58-ft-long and 44-ft-wide single-span prestressed concrete slab beam bridge • Rural location • Average Daily Traffic count: 8,000 (2006 year) • Traffic management alternative, if constructed conventionally: extended use of 10-mile detour ***Existing Bridge:*** The existing bridge was a 36-ft-long, 26.67-ft-wide single-span concrete beam bridge with concrete substructure. It had two 12-ft-wide traffic lanes and no shoulders. Built in 1925, the bridge was rated as structurally deficient and functionally obsolete and required replacement. ***Replacement Bridge:*** The replacement bridge has two 12-ft-wide traffic lanes and two 8-ft-wide shoulders. The cross-section consists of eleven 2.25-ft-deep slab beams (one 3-ft-wide beam and ten 4-ft-wide beams). The beams are post-tensioned together transversely, with a cast-in-place 4,000 psi reinforced concrete overlay that increases from the 4-inch-thick minimum at the edges to accommodate the two percent cross-slope from baseline. The outside beams were precast with curbs and embedded anchor bolts to connect the steel traffic railing. The integral abutments were cast in place over 12.75-inch-diameter steel pipe piles. The surface profile was elevated relative to the old bridge to reduce an existing flooding problem. ***Construction Methods:*** The construction contract was the first Maryland State Highway Administration					

<table>
<tr><td></td><td colspan="4">(MDSHA) project to include more than one significant bridge awarded to one contractor. It included two bridges that were designed as similar as possible: the MD 450 Bridge over Bacon Ridge Branch and the MD 28 Bridge over Washington Run. The bridges are in different districts of the state.

The slab beams were fabricated at a precast plant. MDSHA required the contractor to assemble the slab beams at the plant prior to shipment to ensure proper alignment of the transverse ducts.

The contractor demolished the existing bridge and constructed the abutments using conventional construction techniques. Cranes were used to place the slab beams on elastomeric bearing pads. The construction crew then tensioned the transverse tie-rods, grouted the shear keys between beams, and placed reinforcement for the cast-in-place overlay. The contractor was required to place the reinforcing mat such that it could be lifted off the bridge just prior to placement of the overlay to permit the entire deck to be cleaned. Prior to beginning the overlay placement, the contractor was then required to float a cement slurry across the bridge deck and work it into the top of the slab beams. Keeping the slurry moist with a misting operation, the contractor then placed the reinforcing mat back into position and cast the special-mix Portland cement concrete overlay and integral abutment backwalls as a continuous placement while the slurry was in a non-set condition. During the seven days that the overlay cured, the contractor installed the bridge railing and did other finish work prior to opening the bridge to traffic.

The contract included an incentive of $9,000 per day the bridge was opened earlier than 67 days, with a maximum of $63,000. The disincentive was $9,000 per day the bridge was closed longer than 67 days, with no maximum.

Stakeholder Feedback:
Contract administration was a challenge because MDSHA construction projects are administered by the local district offices and the projects were located in different districts. Decisions varied between the two districts, requiring the contractor to administer the projects as two independent projects and resulting in duplication of effort.</td></tr>
<tr><td>High Performance Materials</td><td colspan="4">•</td></tr>
<tr><td>Photos

Additional photos</td><td colspan="4">    </td></tr>
<tr><td rowspan="2">Project Planning</td><td>Decision-Making Tools</td><td>Site Procurement</td><td>Project Delivery</td><td>Contracting</td></tr>
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• Incentive / disincentive clauses</td></tr>
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<tr><td rowspan="2">Structural Solutions</td><td colspan="3">Prefabricated Bridge Elements & Systems</td><td>Construction</td></tr>
<tr><td>Elements</td><td>Systems</td><td>Miscellaneous</td><td>•</td></tr>
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	• Adjacent slab beams	•	• Grouted keys • Grouted PT ducts • Standard concrete overlay	

Costs	The engineer's estimate for the project was $ 3.7 million. The low bid was $ 3.5 million for the two bridges ($200,000 = 5% lower than engineer's estimate). There were 7 bidders. ABC techniques saved an estimated $45,000 in delay-related user costs. The net savings on the project totaled $61,000.			
Funding	***Federal only***	*State only*	*Federal and State*	*Other*
	X			
Incentive Program ($)	***Highways for LIFE***	*IBRD*	*SHRP2*	*Other*
	$717,157 (20%); includes MD 28			

Contract Plans	**Complete Set:**	Contract Plans (link to pdf)	**ABC *:**	
Specifications	**Complete Set:**	Special Provisions (link to pdf)	**ABC *:**	
Bid Tabs	Bid Tabs (link to pdf)			
Schedule	**Engineer's:**	Time / Cost Comparison (link to tif)	**Actual:**	
Other Related Information	September 2010 Highways for LIFE Final Report [http://www.fhwa.dot.gov/hfl/summary/md/md00.cfm]			
Photo Credits	Maryland State Highway Administration (MDSHA)			

* Specific to the ABC used in the project.