

ABC Innovative Projects

<i>I-93 Bridge over Loudon Road (Route 9)</i>					
Location	on I-93 over NH Route 9 (Loudon Road) at Exit 14 in the city of Concord				
State	New Hampshire				
Owner	State				
Year ABC Built	2010				
State ID #	13742-C				
Federal ID #	non-federal				
Coordinates	Latitude:	43.208819	Longitude:	-71.533125	
Contact Person	Ronald L. Kleiner, Jr., P.E. Project Engineer, Bureau of Bridge Design New Hampshire Department of Transportation Phone: 603-271-2731 Email: rkleiner@dot.state.nh.us				
Mobility Impact Time	ABC:	weekend closure (60 hours) to replace each superstructure; total 3-month construction period	Conventional:	eight months	
Impact Category	<i>Tier 1</i>	<i>Tier 2</i>	<i>Tier 3</i>	<i>Tier 4</i>	<i>Tier 5</i>
		X			
Benefits	Reduced onsite construction time was important to avoid construction during the summer when two NASCAR Sprint Cup races at the nearby NH Motor Speedway generated increased traffic.				
Description	<ul style="list-style-type: none"> • 82-ft long and 86.8-ft wide single-span steel girder bridge • Urban location • Average Daily Traffic count: 70,000 on I-93; 25,000 on Loudon Road • Traffic management alternative, if constructed conventionally: full temporary bridge or temporary bridge widening <p>Existing Bridge: The bridge consists of two adjacent two-lane superstructures supported by shared abutments. The bridge carries I-93 northbound and southbound over NH Route 9 (Loudon Rd) at Exit 14. Each superstructure has six steel girders at 7.5-ft spacing. Built in 1966, the bridge decks were deteriorated and required replacement.</p> <p>Construction Methods: The replacement of the southbound portion took place over a weekend in April 2010. Loudon Rd was closed to traffic at 7:00 pm. Southbound traffic on I-93 was then reduced to one lane and diverted to the northbound deck. The northbound deck carried two lanes northbound and a single lane southbound for half the weekend. Late Saturday night, that configuration was reversed to two lanes southbound and a single lane northbound for the remainder of the closure.</p> <p>Once the closure began, the existing deck and six steel girders were removed and new 3-ft-deep steel girders at 7.5-ft spacing were placed. Full-depth, full-width precast concrete deck panels were then set on the new girders. The panels were post-tensioned, and a cast-in-place closure pour was placed at each end of the span. Both roadways were returned to their original traffic configurations at 7:00 Monday morning, resulting in a 60-hour closure period. The northbound superstructure was</p>				

	<p>completed during a similar closure over a weekend the following month, in May 2010.</p> <p>Construction to prepare the roadway for the traffic switch began prior to the closure utilizing night work. Also, the membrane and asphalt overlay were placed, bridge rail installed, and elastomeric bearings replaced outside of the closure period. The work outside the closure period was done during off-peak hours.</p> <p>The contract included a \$100,000 No Excuse bonus if the contractor had all four I-93 traffic lanes reopened through the work area prior to Intermediate Completion Date #1. Also included was a \$1,250 per full hour incentive that all Loudon Road traffic lanes were reopened within the project area prior to Intermediate Completion Date #1, with a \$30,000 maximum. The contract included the same No Excuse bonus and incentive for Completion Date #2. In addition, the contract included a \$40,000 No Excuse bonus for meeting the I-93 lane opening requirements described above for both Intermediate Completion Date #1 and Intermediate Completion Date #2. The maximum combined contract No Excuse bonus and incentive award was \$300,000.</p> <p>The contract also included road-user cost disincentives that were to be assessed not as a penalty, but for added expense incurred by the traveling public. An unlimited disincentive of \$3,750 was included for each full hour beyond Intermediate Completion Date #1 that all four I-93 traffic lanes were not reopened. In addition, an unlimited disincentive of \$1,250 was included for each full hour beyond Intermediate Completion Date #1 that all Loudon Road traffic lanes were not reopened within the project area. The contract included the same unlimited disincentives for Completion Date #2. No upper limit to the dollar amount of the disincentive clauses was included in the contract.</p> <p>Stakeholder Feedback:</p> <p>The original contract called for replacement of only the deck, completed during weekend closure, with existing girders repainted at night outside the closure period. The contractor value engineered a proposal to replace the girders. One of the driving considerations in his decision to replace the girders was that he would not need to be extremely careful with the deck removal; if he were to damage a girder that was to remain in place, the repair would be costly from a time perspective.</p> <p>The only major issue on the project was related to the grout for the post-tensioning ducts setting up faster than expected. Getting shear key grout to flow around the post-tensioning ducts was problematic, and was leading to some leaking. (See <i>Lessons Learned</i> below.) That resulted in delays, but both roadways reopened significantly ahead of schedule. The project was a complete success.</p>			
<p>High Performance Materials</p>	<ul style="list-style-type: none"> • 			
<p>Photos</p> <p>Additional photos</p>				
<p>Project</p>	<p><i>Decision-Making Tools</i></p>	<p><i>Site Procurement</i></p>	<p><i>Project Delivery</i></p>	<p><i>Contracting</i></p>

Planning	<ul style="list-style-type: none"> • State Process 	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • Design-bid-build 	<ul style="list-style-type: none"> • Incentive / disincentive clauses • No Excuse bonus • VE
Geotechnical Solutions	<i>Foundations & Walls</i>		<i>Rapid Embankment</i>	
Structural Solutions	<i>Prefabricated Bridge Elements & Systems</i>			<i>Construction</i>
	<i>Elements</i>	<i>Systems</i>	<i>Miscellaneous</i>	•
	<ul style="list-style-type: none"> • Full-depth precast deck panels with post-tensioning 	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • CIP reinforced concrete closure pours • Grouted keys • Grouted PT ducts • Overlay – asphalt with membrane 	
Costs	<p>During the study phase of the project, the precast deck construction alternative was determined to result in a 38% savings over an alternative utilizing a full temporary bridge, and a 13% savings over an alternative involving a temporary bridge widening.</p> <p>When the cost comparison was done, four factors were considered: Bridge Cost, Temporary Bridge Cost, Roadway Cost, and Temporary Roadway Cost. The new bridges at the time totaled 7093 sq ft bearing-to-bearing, out-to-out. Including all four cost factors, the engineer's estimated \$ / sq ft costs were:</p> <ul style="list-style-type: none"> • ABC Construction - \$326 total bridge cost per sq ft of bridge deck area • Temporary Widening - \$376 / sq ft • Temporary Bridge - \$530 / sq ft <p>The new bridges ended up being six inches wider than they were at the study phase. The actual ABC construction cost was \$391 / sq ft of deck area.</p>			
Funding	<i>Federal only</i>	<i>State only</i>	<i>Federal and State</i>	<i>Other</i>
		X		
Incentive Program (\$)	<i>Highways for LIFE</i>	<i>IBRD</i>	<i>SHRP2</i>	<i>Other</i>
Contract Plans	Complete Set:	Contract Plans (link to pdf)	ABC *:	Typical Section (link to tif) Panel Details (link to tif)
Specifications	Complete Set:	Proposal (link to pdf) Addendum (link to pdf)	ABC *:	SP 528 – Panels (link to doc) SP 520 – Closure Pours (link to doc) SP 520 – Closure Pours Addm (link to doc)
Bid Tabs	Bid Tabs (link to pdf)			
Schedule	Engineer's:		Actual:	Contractor's Proposed Schedule for Second Weekend Closure (link to pdf)
Other Related Information	Lessons Learned (link to doc)			
Photo Credits	New Hampshire Department of Transportation			

* Specific to the ABC used in the project.