

ABC Innovative Projects

Volmer and Johnson Creek Bridges						
Location	US 26 (Sunset Highway No. 47) at Milepost 2.24 and Milepost 3.26 over Volmer Creek and Johnson Creek, respectively, in Clatsop County					
State	Oregon					
Owner	State					
Year ABC Built	2011					
State ID #	Volmer Creek:	21188	Johnson Creek:	21189		
NBI #	Volmer Creek:	21188	Johnson Creek:	21189		
Coordinates	Latitude:	Volmer Creek:	45.918800	Longitude:	Volmer Creek:	-123.894281
		Johnson Creek:	45.906553		Johnson Creek:	-123.880467
Contact Person	Bruce V. Johnson, P.E. State Bridge Engineer Oregon Department of Transportation Phone: 503-986-3344 Email: bruce.v.johnson@odot.state.or.us					
Mobility Impact Time	ABC:	4 weeks		Conventional:	6 - 8 months	
Impact Category	<i>Tier 1</i>	<i>Tier 2</i>	<i>Tier 3</i>	Tier 4	<i>Tier 5</i>	
				X		
Primary Driver(s)	<ul style="list-style-type: none"> • reduced traffic impacts • reduced onsite construction time • improved work-zone safety • minimized environmental impacts • reduced life-cycle cost 					
Description	<p>Volmer Creek Bridge:</p> <ul style="list-style-type: none"> • 29-ft-long and 44-ft-wide single-span precast prestressed slab beam bridge <p>Johnson Creek Bridge:</p> <ul style="list-style-type: none"> • 29-ft-long and 48-ft-wide single-span precast prestressed slab beam bridge • Rural location • Average Daily Traffic count: 6,200 (2010) • Traffic management alternative, if constructed conventionally: extended use of 40-mile detour <p>Existing Bridge: The two existing single-span timber bridges were 20 ft long and 40 ft wide with timber caps on concrete substructures. They had two 12-ft-wide traffic lanes and two 8-ft-wide shoulders. Built in 1942, the bridges were structurally deficient and required replacement.</p> <p>Replacement Bridge: The replacement bridges each have two 12-ft-wide traffic lanes and two shoulders (8.3 ft wide – Volmer; 10.3 ft wide – Johnson). Each bridge consists of 4-ft-wide, 21-inch-deep recycled pretensioned concrete slab beams salvaged from another project (11 beams – Volmer; 12 beams - Johnson). The abutments consist of precast caps with</p>					

backwalls founded on steel pipe piles. Precast approach slabs, sleeper slabs, and shear lugs were also used.

Construction Methods:

The precast abutment caps, shear lugs, and approach slabs were fabricated at a precast plant. The caps are 3 ft wide and minimum 3 ft deep, with 2-ft-diameter pockets that extend to mid-height for pile-to-cap connections. Each cap was fabricated in two segments (each 22 ft long – Volmer; 24 ft long – Johnson) to accommodate staged construction. The sixteen 30-ft-long recycled slab beams were staged at a nearby site.

The bridges were replaced in three stages over a four-week construction period. During each week of the four weeks the contractor ran crews 24/7 to tear out half a bridge and replace it between Sunday night and Friday at 3:00 pm.

In the first stage in April 2011 the contractor reduced traffic to one lane. The pipe piles and sheet pile walls were driven in the closed lane and then covered. Traffic was shifted to the previously closed lane, and the process was repeated for the remaining half of the bridge. The contractor then diverted the stream to protect fish from demolition and construction debris.

In Stage 2 traffic was reduced to one lane in the westbound lane, with flaggers managing the two-directional traffic. The work began on Sunday night with the removal of the first half of the existing bridge in the eastbound lane. The previously driven piles were excavated, and the first segment of the abutment cap was installed over the piles. The cap was braced and the cap pocket was grouted. The process was repeated at the other end of the bridge. The first half of the precast slab beams were erected on elastomeric bearing pads. The precast sleeper slabs and approach slabs were erected and the traffic barriers were installed. The waterproofing membrane and asphalt overlay were placed. Other finish work was completed, and the bridge was opened by 3 pm on Friday.


In Stage 3 traffic was diverted to one lane in the eastbound lane. The above process was repeated to replace the second half of the two bridges. After the second abutment segment was installed, the mid-depth tie rod was tightened and the blockout at the interface was filled with non-shrink grout. Epoxy grout was applied to the abutment ends, and the precast shear lugs were bolted in place to prevent lateral movement of the slab beams.

The contract required replacement of the two bridges in four weeks, with at least one lane of traffic remaining open with no more than 20-minute delays throughout the construction project. In addition, both lanes were required to be open for weekend traffic to and from the coast. There were times when the contractor's crews were working 16-18 hour days to meet the challenge. There was no incentive/disincentive clause included in the contract.

Stakeholder Feedback:

The success of ABC rests with careful pre-planning, pre-staging and prefabrication of components, and use of materials that can reduce the time of construction. Two examples included the use of precast slabs (avoiding the need of onsite cure time) and the use of special rapid-set grout that cured in two days rather than the usual five to seven days.

A construction project usually has several priorities such as schedule, quality of materials, traffic safety, environmental compliance, and employee safety. Although the Oregon DOT tries to do its best in all of these areas, sometimes conflicts arise. When

	<p>the schedule takes priority the owner should acknowledge that they might need to compromise in other areas. On this project it was not clear to all team members that schedule had to take priority. Examples on this job where the schedule prevailed were maintaining the 20-minute road closure specification, responding to the concerns of environmental personnel, staging affecting the design of the wearing course, and providing access to emergency vehicles.</p> <p>Maintaining the allowable 20-minute wait for a flagging operation was difficult to impossible at times due to the high traffic volumes on US 26. This was exacerbated during times when construction equipment was in the traffic lane, such as when off-loading slabs or equipment. On this project the schedule took priority, which created recurring traffic delays.</p> <p>For four weeks this project operated 24 hours per day. Inspectors worked in 6-hour on-site shifts; adding time for travel, paperwork, and on-site discussion meant that at least four inspectors were each working five 10-hr days. Vacations also impacted the available crew since it was a summer project. Due to the importance of the schedule, this project became a priority for the rest of the construction office staff. Overall, it was four very intense weeks for the construction office during which other projects experienced decreased attention. The Construction Engineering budget, which was initially higher than what is normally allowed, was overrun on this project.</p>			
High Performance Materials	<ul style="list-style-type: none"> • 			
Photos Additional photos				
Project Planning	Decision-Making Tools <ul style="list-style-type: none"> • State process 	<i>Site Procurement</i> <ul style="list-style-type: none"> • 	Procurement <ul style="list-style-type: none"> • Design-bid-build 	<i>Contracting</i> <ul style="list-style-type: none"> •
Geotechnical Solutions	<i>Foundations & Walls</i> <ul style="list-style-type: none"> • 		<i>Rapid Embankment</i> <ul style="list-style-type: none"> • 	
Structural Solutions	Prefabricated Bridge Elements & Systems			<i>Construction</i> <ul style="list-style-type: none"> •
	Elements <ul style="list-style-type: none"> • Adjacent slab beams • Precast abutment caps w/ backwalls • Steel sheet piling 	Systems <ul style="list-style-type: none"> • 	Miscellaneous <ul style="list-style-type: none"> • Grouted keys • CIP pockets in precast substructure • Epoxy joints • Asphalt overlay w/ membrane • Precast approach slabs • Precast curbs • Other – precast sleeper slabs • Other – precast shear lugs 	

Costs	The engineer's estimate for the project was \$1.65 million. The low bid was \$1.81 million. There were eight bidders.			
Funding	<i>Federal only</i>	<i>State only</i>	Federal and State	<i>Other</i>
			X	
Incentive Program (\$)	<i>Highways for LIFE</i>	<i>IBRD</i>	<i>SHRP2</i>	<i>Other</i>
Contract Plans	Complete Set:	Volmer Bridge Plans (link to pdf) Johnson Bridge Plans (link to pdf)	ABC *:	
Specifications	Complete Set:	Not available.	ABC *:	
Bid Tabs	Not available.			
Schedule	Engineer's:	Not available.	Actual:	
Other Related Information	ABC Guidelines including Decision-Making Framework, ODOT Bridge Design and Drafting Manual, Section 1.1.2.9.12 [http://www.oregon.gov/ODOT/HWY/BRIDGE/docs/bddm/dec-2012_finals/section_1-2004_rev_dec-2012.pdf] ODOT Bridge Engineering Website [http://www.oregon.gov/ODOT/HWY/BRIDGE/]			
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* Specific to the ABC used in the project.