ABC Innovative Projects

Keaiwa Stream Bridge					
Location	Route 11 near the town of Pahala on the southeast side of the Island of Hawaii				
State	Hawaii				
Owner	State				
Year ABC Built	2001				
State ID #	159				
NBI #	001000110307223				
Coordinates	***Latitude:*** 19.213333		***Longitude:*** -155.465278		
Contact Person	Paul T. Santo, P.E. Bridge Design Engineer Hawaii Department of Transportation Phone: 808-692-7611 Email: paul.santo@hawaii.gov				
Mobility Impact Time	***ABC:*** 7 months		***Conventional:*** Estimated 9 months		
Impact Category	*Tier 1*	*Tier 2*	*Tier 3*	*Tier 4*	***Tier 5***
					X
Primary Driver(s)	• minimized environmental impacts – deck topping did not require shoring or falsework in the streambed • reduced traffic impacts • reduced onsite construction time – precast planks were fabricated during pier construction				
Description	• 230-ft-long and 42.33-ft-wide seven-span prestressed concrete slab beam bridge (30 ft – 5 @ 34 ft – 30 ft); 42.5º skew • Rural location • Average Daily Traffic count: 2,100 (2010) • Traffic management alternative, if constructed conventionally: extended use of detour road across adjacent crossing over temporary pipe culverts ***Existing Bridge:*** Built in 1937, the existing bridge was an 81-ft-long, 27.6 ft-wide three-span concrete continuous slab bridge with concrete wall piers on shallow foundation. A record rainstorm in late 2000 caused major damage to the bridge, which was on the only route on the southeast side of the Big Island of Hawaii. ***Replacement Bridge:*** The Hawaii Department of Transportation chose to replace the damaged bridge with a longer structure to prevent future damage from flooding. The replacement bridge has two 11-ft-wide traffic lanes and two 9-ft-wide shoulders. The cross-section consists of 4-ft-wide, 11-inch-deep 7,000 psi precast prestressed concrete planks with a 6-inch-thick cast-in-place concrete topping. The conventionally constructed substructure consists of six reinforced concrete wall piers on narrow continuous footings; the piers are skewed 47.5º from the longitudinal axis. The bridge was designed for seismic loads. ***Construction Methods:*** The contractor demolished the existing bridge and constructed the spread footings, abutments, and wall piers using conventional construction techniques. The deck planks				

	were fabricated at a precast plant and shipped to the job site. Cranes were used to place the deck planks on elastomeric bearing pads. Shear keys between planks were filled with non-shrink epoxy grout; the planks were not transversely post-tensioned. The deck was cast over the planks and into the reinforced concrete closure joints over the piers. The Nebraska Open Concrete Bridge Rail type was used. No deck overlay or deck sealing was applied. The contract included an incentive payment not to exceed $300,000 towards the opening of the bridge to two-way two-lane traffic by 180 calendar days from the Notice to Proceed date. The contract also included a penalty of $10,000 per calendar day for delay in opening the bridge. The contractor was allowed to work 24 hours a day, 7 days a week to complete the bridge construction. The bridge was opened seven months after the flooding. The contractor started work at his own risk shortly after the flood and prior to the Notice to Proceed (NTP); the bridge was opened to traffic less than three months after the NTP. This was less than the six months specified in the contract, and the contractor was paid the full incentive of $300,000. If conventionally constructed, the bridge would have been closed for about nine months.
High Performance Materials	•
Photos	 

Project Planning	*Decision-Making Tools*	*Site Procurement*	***Project Delivery***	***Contracting***
	•	•	• Design-bid-build	• Full lane closure • Incentive / disincentive clauses

Geotechnical Solutions	*Foundations & Walls*	*Rapid Embankment*
	•	•

Structural Solutions	***Prefabricated Bridge Elements & Systems***			*Construction*
	Elements	*Systems*	***Miscellaneous***	•
	• Adjacent slab beams	•	• Grouted keys	

Costs	The engineer's estimate for this project was $10.1 million. The low bid was $6.3 million ($3.8 million = 38% lower than engineer's estimate). There were three bidders. The cost per square foot of bridge was $346. The cost for conventional construction in this region in 2001 was not available; however, it would have been higher.

Funding	*Federal only*	*State only*	***Federal and State***	*Other*
			X	

Incentive Program ($)	*Highways for LIFE*	*IBRD*	*SHRP2*	*Other*

Contract Plans	**Complete Set:**		**ABC *:**	Precast Plank Details (link to pdf)

Specifications	**Complete Set:**	Standard Specifications [http://hawaii.gov/dot/highways/specifications2005/specifications/spectble.htm]	**ABC *:**	Special Provisions (link to pdf)
Bid Tabs	Bid Tabulations (link to pdf)			
Schedule	**Engineer's:**	Not available.	**Actual:**	
Other Related Information	Fall 2001 Hawaii LTAP Newsletter (link to pdf) May 2002 AASHTO TIG / FHWA *Prefabricated Bridges: "Get In, Get Out, Stay Out"* (link to pdf)			
Photo Credits	Hawaii Department of Transportation			

* Specific to the ABC used in the project.