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Crossing an Environmentally Sensitive Creek
The Satus Creek Bridge represents an entirely new innovation in bridge design. It is a curved prefabricated concrete bridge. It was built in segments and then delivered to a remote site. The impressively long 180 foot single span was necessary to satisfy environmental constraints at the highway crossing of Satus Creek.

The bridge is located 25 miles southwest of Toppenish Washington along US 97. It was constructed as part of a $13.4 million project completed in the first part of 2013. It replaced an old, load restricted timber bridge built in 1942. This new and modern resilient structure corrects design deficiencies with the old timber bridge including vehicular impact and seismic resistance. Several unique features are implemented in the design including horizontally curved and spliced prefabricated girder segments.

Bridge Facts Profile:
Bridge Structure Cost: $2.49 million
Owner: Washington State Department of Transportation
Bridge Designer Engineer: Michael Bressan, PE
State Bridge Architect: Paul D. Kinderman, PE, AIA
State Bridge Engineer: Bijan Khaleghi, PE, SE, PhD
General Contractor: Franklin Pacific Construction Company, Seattle, WA
Post-Tensioning Contractor: Schwager Davis Inc., San Jose, CA
Pre-caster: Concrete Technology Corporation, Tacoma, WA

nerdy bridge engineer facts:
Only a bridge engineer would dream about these technical facts.

• The bridge approaches are conventional class 4000A concrete.
• The tub girders are the WSDOT U78PTG5 series.
• The tub girders concrete strength at 28 days is 8.5 ksi.
• Elastomeric bearing pads were installed at each Pier.

• The shallow foundation consists of conventional cast in place concrete 18'-0" high.
• Concrete seals were required both at Pier 1 and Pier 2.
• The bridge construction cost was $2.49 million.

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Innovative Horizontally Curved Prefabricated Girders

The superstructure is built from open precast concrete box girders, referred to as “tubs” in bridge parlance. The new feature is horizontally curved girders, which are tipped to match a steep cross slope dictated by the local roadway geometric constraints. The tub girders are a variation on WSDOT’s popular U78PTG5 series. The “78” indicates the height of the tub webs in inches and the “5” identifies the width of the bottom flange in feet.

To achieve the long simple span across Satus Creek, each ‘girder line’ consists of three precast girder tub segments. Spliced sections, prefabricated miles away, were shipped to the site. Temporary towers were used to support the segments while the concrete bridge roadway deck was cast. Each vertical ‘web’ had three post-tensioning tendons for a total post-tensioning of about 1,253 tons per web. That’s a lot of force. It’s the weight of many, many cars. The tendons are tensioned girder bridge to be built in the State of Washington. It is a cost effective, durable and resilient structure that is aesthetically pleasing while satisfying the geometric and environmental constraints of the site. The Satus Creek Bridge was a testing ground for the WSDOT Bridge and Structures Office. The team did not encounter significant issues during the design or construction phases of this project. It was a great success!

Aesthetics: A beautiful setting

The bridge is located in a beautiful setting. The bridge surfaces respond to these textures and colors. The abutments and retaining walls were cast in place with fractured basalt form-liners, while the finish was colored with a natural oxidizing agent to blend with the terrain. The barrier and girders were colored and textured for contrast.