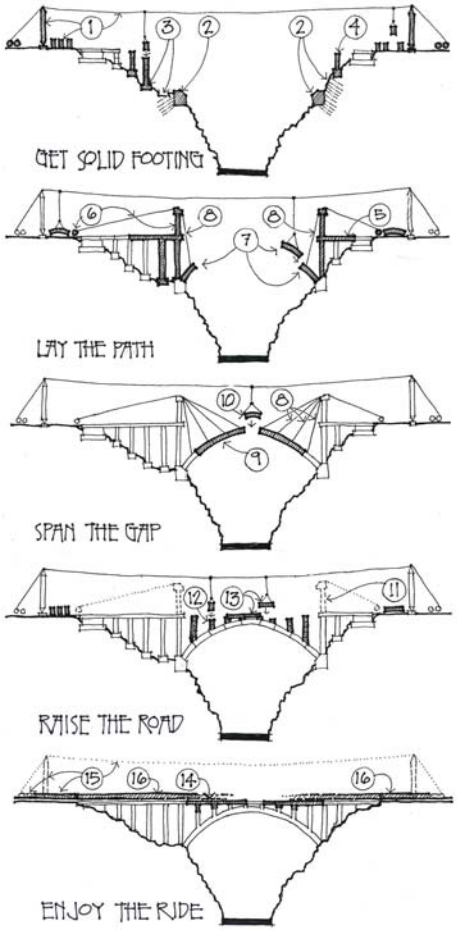


INNOVATIVE DESIGN FOR THE DECK ARCH BRIDGE

The Design Team worked through six deck arch options to find one for best form and function - a unique hybrid structure with a concrete arch coupled with a composite steel superstructure.

Engineers needed to find a bridge system that would perform well during high winds or a possible earthquake. The Design Team chose to use a pair of ribs for the arch instead of a single wide arch. Steel struts that flex in an earthquake or under high winds connect the twin ribs to protect the whole arch from damage. The arches transfer the forces to the canyon walls.

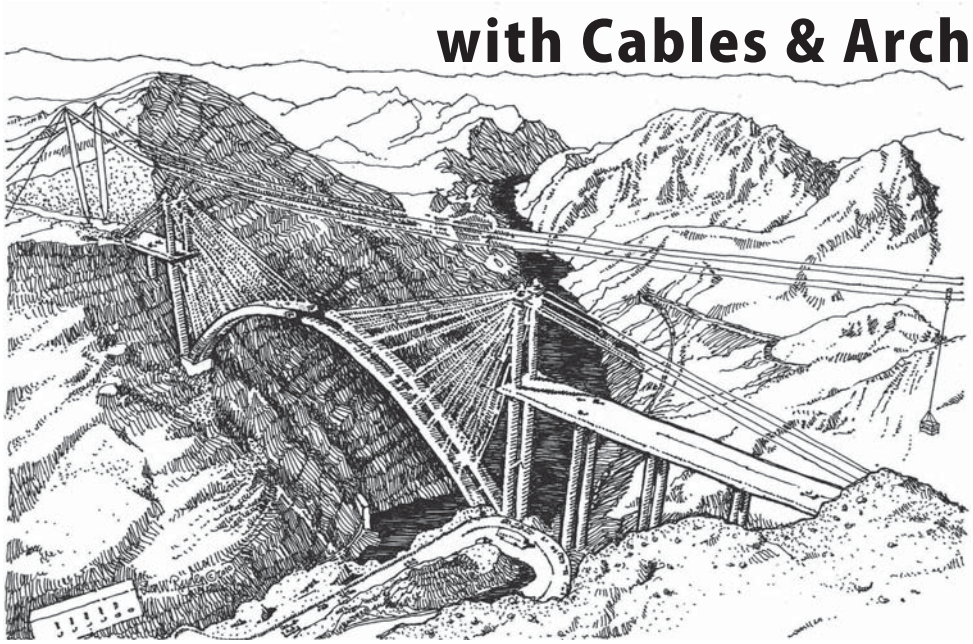
The twin arch ribs support concrete columns which in turn support the bridge deck system. The bridge engineers used high-strength concrete where compression forces controlled the design in the arches and columns. Where flexing forces drove the design, they used steel for the struts and deck girders.

HOW TO BUILD AN ARCH BRIDGE ACROSS A WIDE CANYON

1. Set up towers, cables, winches and staging areas.
2. Stabilize cliff and set arch foundations.
3. Place concrete foundations for columns.
4. Build precast concrete columns on foundations.
5. Install beams and road decks of bridge approach.
6. Erect temporary towers and cable stay anchors.
7. Install arch rebar and cast concrete segments.
8. Install temporary stay cables on arch segments.
9. Install steel struts between twin arch ribs at columns.
10. Place concrete for final closure of arch.
11. Remove towers and cable stays from arch.
12. Build precast concrete spandrel columns and cap beams.
13. Install steel box girders of main bridge span.
14. Build road deck of main bridge span.
15. Remove towers, cables and staging areas.
16. Build barriers and railing on visitor walkway and deck.

SPAN THE GAP

with Cables & Arch



ARCH CONSTRUCTION METHOD

The bridge arches were constructed from both canyon walls at once reaching toward the middle.

The opposite halves of the twin-rib arch were each made of 26 segments that hung in mid-air from cables until the builders placed the concrete of the final, narrow closure.

The cableway system lowered pre-made cages of steel reinforcing bars into place for each cast-in-place concrete segment. Fearless workers toiling 800 feet above the river connected the steel cages by hand. They set the forms, placed the concrete, and moved up for the next segment. High performance concrete with a compressive strength of 10,000 psi was needed to handle the massive loads.