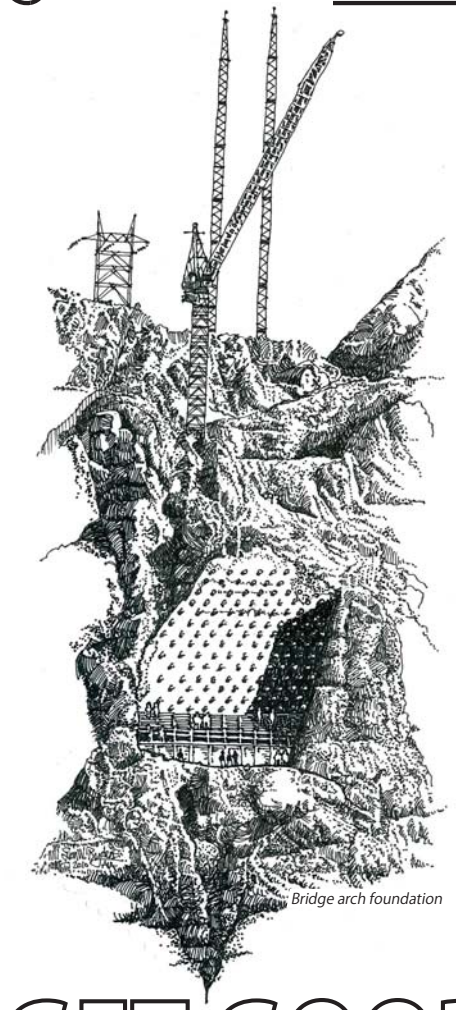


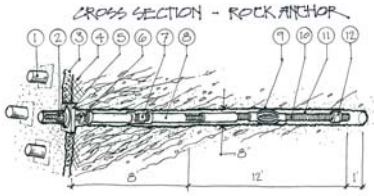
Bridge arch foundation

ROCK ANCHORS

To protect the foundations and stabilize the slopes, rock anchors tightly hold together the fractured rock faces on slopes and cliffs.

Geotechnical (rock and soil) engineers determined where they must stabilize the slopes by studying rock surfaces and testing rock core borings. If the fractured rock is deep, then they may install rock anchors into deeper solid rock. The rock anchor installations have a staggered pattern, like the stars on the American flag, at least five feet apart. This finished array of anchors locks the rock slope in place and helps to resist erosion.

Each rock anchor includes a steel bar tendon grouted with concrete into a narrow drill hole. To reach solid rock the anchor hole may be more than sixty feet deep. A cylindrical metal cap protects the bar from corroding. The rock anchors in the heavily-fractured slopes in this passageway required a sheet of steel mesh fabric draped over the bar tendon extending out beyond the rock face. Thin layers of shotcrete have been sprayed to hold the rock in place under the mesh.



1. Anchorage cover protects against corrosion
2. Nut
3. Shotcrete prevents small, loose rock from ravelling
4. Steel mesh fabric protects areas of loose rock between anchors
5. Bearing plate and washers
6. High-strength bar tendon
7. Bar couplers splice two bar tendons end to end
8. Smooth sheathing acts as a bond breaker
9. Centralizer keeps the bar aligned in the drill hole
10. Corrugated sheathing around the bar tendon
11. Grout around the anchor
12. End cap

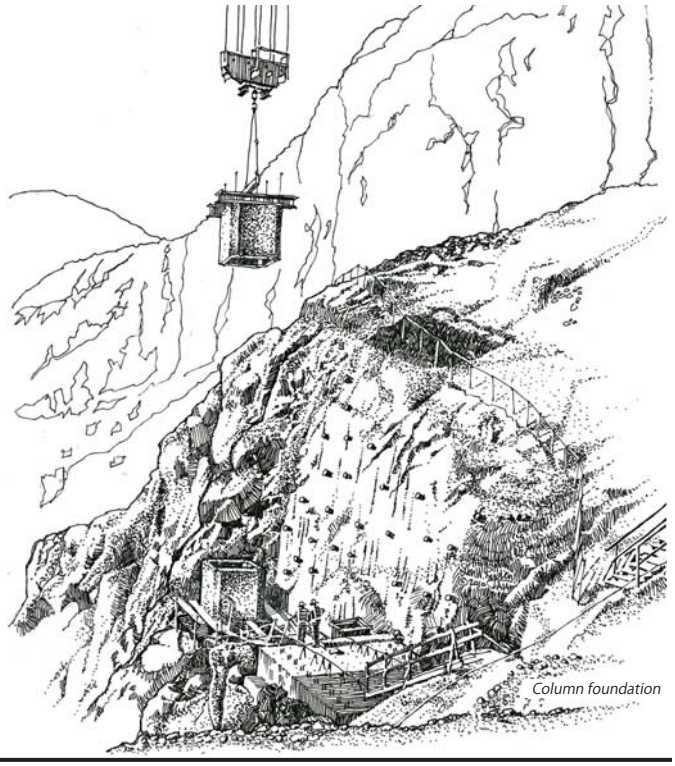
GET GOOD FOOTING
with Anchors & Foundations

CONCRETE FOUNDATIONS

Each end of the River Bridge arch bears on a huge reinforced concrete foundation cut into the rock cliff face.

To build each foundation on its rock shelf, the contractor created a cage of steel reinforcing bars enclosed in a boxlike form. The crew pumped concrete through a hose to fill up the foundation form in shallow layers or "lifts." A virtual forest of reinforcing bars projected out of the sloped face of the foundation to connect with the first segments of the twin-rib arch. The smaller foundations for the paired columns are built in a similar manner.

The arch foundations, each the size of a two-story building, transfer the thrusting forces of the bridge arch into the earth. Within each foundation, a cage of steel reinforcing bars works in tension to help resist the forces of construction load, earthquake, and wind. The solid concrete works in compression to help resist the force of gravity. Great care was taken to get good footing, for a bridge is no better than its foundation.



Column foundation