

Grout curtain cut-off and drainage

TURKWEL DAM

WEST POKOT DISTRICT - KENYA



The TURKWELL Gorge Hydroelectric Project consists mainly of:

- a double-curvature arch dam, 150 m high and 160 m along its crest. It contains 160,000 m³ of concrete,
- 7 km of water tunnels and access galleries,
- an underground power house with an installed capacity of 106 MW.

The dam is located on the River Suam in the North West Kenya. All the geotechnical works related to the project were carried out by BACHY.

The rock in the region of Turkwel is a very homogeneous granite that has suffered little weathered. It has a very high unconfined compressive strength (> 200 MPa) and is very abrasive.

Two main faults, known as M1C and M2C, cross the two abutments and were treated from the drainage galleries.

Rockhead consolidation

The cleaned surface of the rock foundation under the dam was first consolidated as and when the level of the dam under construction gave access to the face to be treated. Contact grouting of the rock/concrete interface was also performed as part of this phase of the works.



The completed dam

CLIENT:	KERIO VALLEY DEVELOPMENT AUTHORITY
CONSULTANT ENGINEERS:	SOGREAH
MAIN CONTRACTOR:	SPIE BATIGNOLLES
SPECIALIST CONTRACTOR:	BACHY
DURATION OF WORKS:	OCTOBER 1988 TO FEBRUARY 1991

WORKS QUANTITIES

Rockhead consolidation curtain

800 no. holes
6,600 m drilled

79 tonne of cement injected

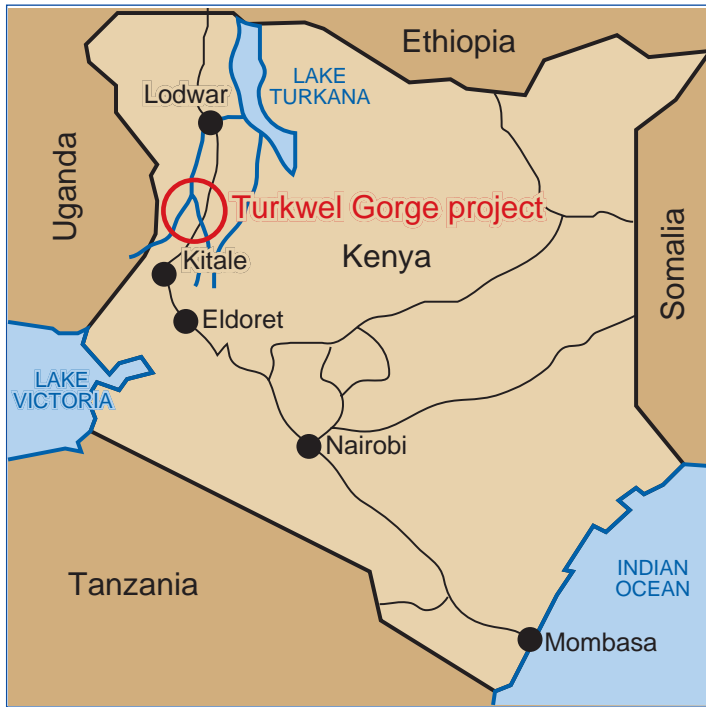
Grouted curtain

345 no. holes
12,600 m drilled
Average depth: 35 m
maximum: 100 m
2,400 no. water tests

96 tonne of cement injected

Drainage

600 no. holes
14,500 m drilled
Average depth: 22 m
maximum: 100 m



Map of the area



The gorge after excavation to foundation level

Grout curtain cut-off

The grout curtain was installed from the drainage galleries at five different levels down to a depth of 85 m below the foundation of the dam and extending to 125 m on both sides of the centre point of the dam.

This was a monolinear curtain with a basic interval of 5 m between the primary holes. Where significant grout takes were encountered, secondary and, in some

instances, tertiary holes were also required.

After water testing, the drill holes were injected with a stable bentonite/cement grout with a water/cement ratio of 1. The bentonite content of the mix was steadily increased until injection refusal was achieved at predetermined refusal pressures between 1 MPa and 2.5 MPa depending on stage depth.

The Lugeon Tests indicated that the

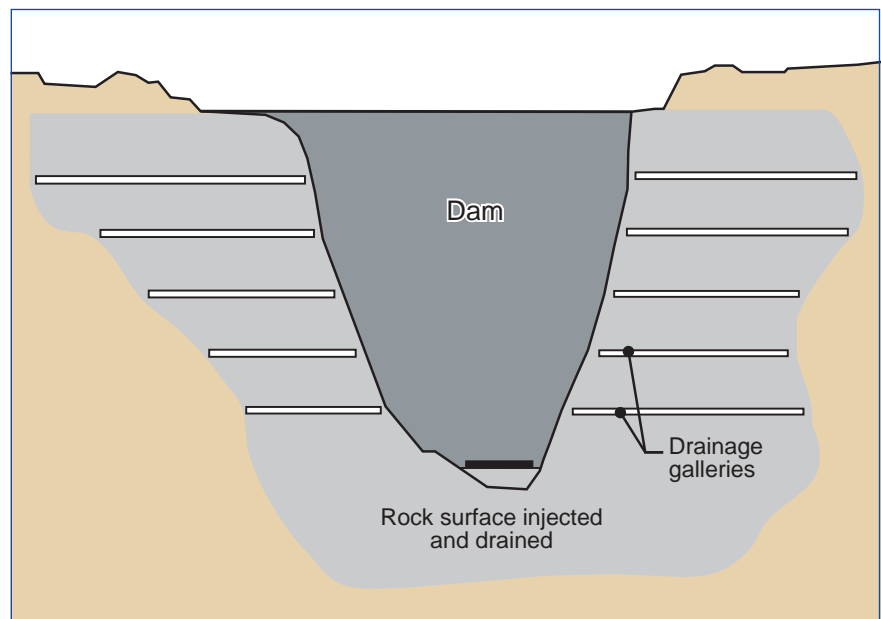
permeability of the foundation was generally very low. Only 3.5% of the stages tested gave a Lugeon Value of greater than 5 and the average grout take was only 7.8 kgf of cement per metre of hole.

Drainage curtain

The drainage curtain is located just downstream of the grout curtain cut-off. The drainage holes are spaced at an average 2 m apart and actually interconnect the five separate drainage gallery levels.



View downstream of the right abutment



Elevation of the grout curtain cut-off