The Project
The Ertan Hydropower Project is situated in the province of Sichuan in the southwest of China. The plant comprises a large concrete dam with a height of 240 meters, several tunnels and an underground powerhouse complex with a total excavation volume of approximately 3.7 million m³. The station comprises 6 turbines of 550 MW each. The capacity is 17,000 Gwh per year. The underground works of the Ertan project are performed by the SINO-GERMAN ERTAN JOINT VENTURE LOT II with Philipp Holzmann / Hoch Tief / Changjiang Gezhouba as JV partners. The dimensions of the caverns are for the powerhouse about 30 m wide and 60 m high, the transformer chamber about 17 / 25 m and the surge chamber about 20 / 60 m with vertical walls.

The Problem
The project area lies in a regional block formed by basalt, granodiorite and gabbro with low seismic activities. An extensive investigation program was performed including a great number of exploratory adits, borings, in-situ and laboratory testing. From stress measurements and other indications high primary stresses were determined of about 30 to 40 Mpa. This causes heavy rock burst problems and deep rock mass movements during the excavation of the caverns and tunnels. The rock burst problem is mostly concentrated in the massive and brittle granodiorites, rather than in the more granular gabbros.
Geoconsult’s Contribution

GEOCONSULT was called by the JV to assess the geotechnical conditions after the first heavy rock bursts had happened. An engineering geological model was developed to form a basis for further analyses. A 3D numerical calculation performed at the GEOCONSULT facilities gave an accurate prediction of the critical points to be expected during the further excavation. Particularly the transitions from the turbines to the draft tubes caused great concern with principal stresses up to 120 Mpa. The follow-up of the construction showed the reliability of the prediction model. During summer 1995 a major rock burst event destroyed a part of the pillar between Transformer Chamber and Powerhouse and much of the Draft tubes no. 1 and 2. GEOCONSULT gave an analysis of the situation, the proposals for remedial works, additional support and new ductile support methods to absorb the kinetic energies released in the rock burst events.

PROJECT:
ERTAN HYDROPOWER PLANT

TYPE OF PROJECT:
Hydropower plant

LOCATION:
Sichuan, China

CLIENT:
Sino-German Ertan JV Lot II

PROJECT DATA:
Large concrete dam
Height: 240 m
Turbines: 6 / 550 MW each
Total excavation volume: approx. 3.7 million m³
Capacity: 17,000 GWh/a

Powerhouse cavern:
Width: approx. 30 m; Height: approx. 60 m
Transformer chamber:
Width: approx. 17 m; Height: approx. 25 m
Surge chamber:
Width: approx. 20 m; Height: approx. 60 m

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