

# TEESTA DAM

SIKKIM STATE - INDIA



## Constructing watertight cutoffs using jet grouting and grouting

Stage 5 of the Teesta Dam is part of the works carried out on the hydraulic development of the River Teesta in India. Works on the water intake include a 95m high concrete gravity dam, a river diversion tunnel and two cofferdams isolating the 50m deep excavation into highly permeable alluvia. Solétanche Bachy was responsible for constructing the watertight cutoffs in the two cofferdams.

The method selected to meet the requirements of the project consisted of a combination of jet grouting and grouting in order to form a cut off through sand containing large boulders:

- Construction of a line of jet grouted columns with "as drilled" survey for all boreholes. Based on this survey, column spacing and diameter was adjusted on a case-by-case basis in order to achieve a minimum overlap of 0.50m between two adjacent columns,
- Tubes à manchette were used to grout bentonite cement and silica gel into the sand outside the secant jet column cut off.,
- The drillholes were extended into the underlying rock to form a single line grouted cut off. The holes were grouted in descending stages.



*Jet grouting and grouting works on the upstream cofferdam*

CLIENT:	NHPC
SUPERVISING ENGINEER:	NHPC
CONSULTING ENGINEER ON THE WATERTIGHT CUTOFFS:	SOL-EXPERT INTERNATIONAL
MAIN CONTRACTOR:	JAIPRAKASH INDUSTRIES LTD
SUBCONTRACTOR FOR THE WATERTIGHT CUTOFFS:	SOLÉTANCHE BACHY
WORKS PERIOD (suspended during monsoon):	JANUARY 2002 - JUNE 2003

### MAIN QUANTITIES:

- 8,500m<sup>2</sup> of watertight cutoff
- 420 jet grouting columns (or 14,500m<sup>3</sup> of jet grouting)
- 360 grouting drillholes ( 1,100m<sup>3</sup> of bentonite-cement grout and
- 900m<sup>3</sup> of silica gel injected)



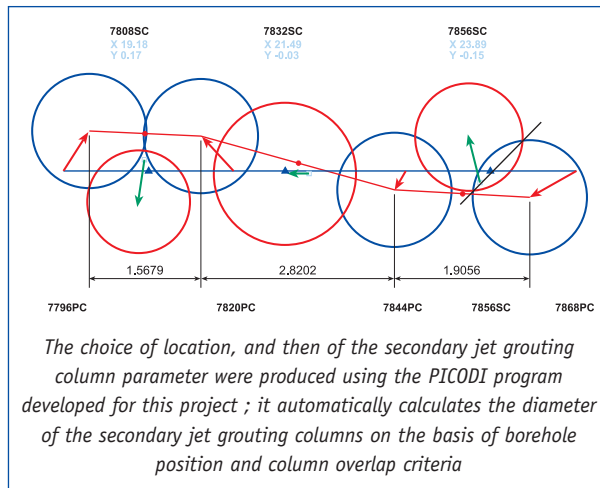
Constructing the grouted curtain



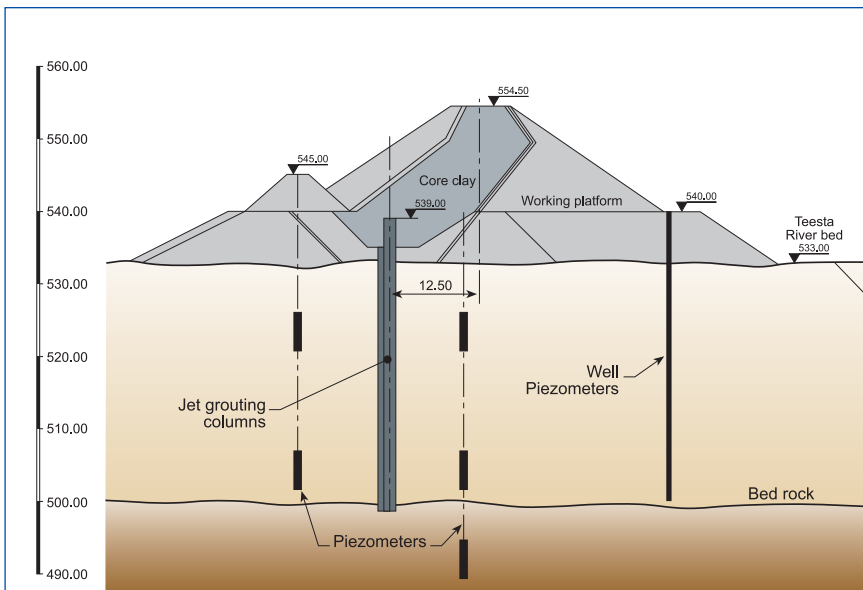
Dam excavation

In order to drill through boulders of all sizes and to adhere as closely as possible to the theoretical hole alignment,, the rod/tube roto-percussion method was the adopted. The as-drilled survey was carried out after withdrawing the drill string and the borehole was then filled with grout. The jet tool could then re-drill the same trajectory without having to drill through hard rock. The columns were constructed using the double jet technique (grout column surrounded by air). The drilling for the grouting was carried out using a similar method: the tube a

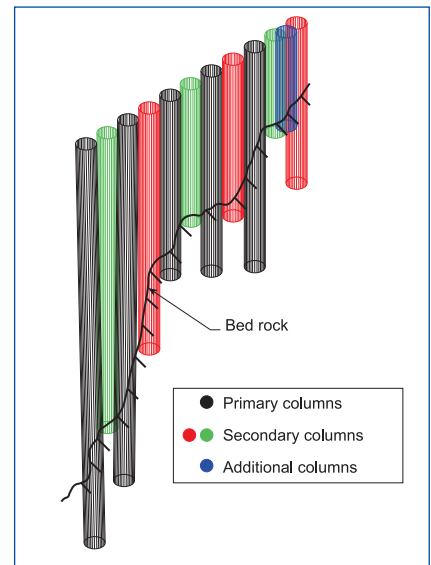
manchette was inserted into the borhole and the sleeve grout placed as the tube was withdrawn. This drilling method produced as drilled survey results showing an average misalignment of less than 1.6% at a depth of 40 m.



For 4 months, the site worked 6 days out of 7 and 24 hours a day. It involved 42 expatriates and 170 employees and workmen recruited locally, 7 drilling rigs, 3 jet grouting pumps, 3 automatic grout batching plants and 12 the capacity to grout at 12 locations simultaneously.



Permeability test instrumentation



3D view of the jet grouting columns by PICODI