SESSION 21: UNDERGROUND WORK

Papers:

SOME ASPECTS OF THE BEHAVIOUR OF TUNNELS THAT CROSS ACTIVE FAULTS
I. Brown and T.L. Brekke, Vol 2, 189-194

ENGINEERING GEOLOGICAL INVESTIGATIONS IN SOFT ROCK TERRAIN, PORO-O-TARAO TUNNEL, NZ
G.W. Borrie and B.W. Riddolls, Vol 2, 195-200

IN SITU ROCK STRESS MEASUREMENT AT RANGIPO
M.J. Pender and M.E. Duncan Fama, Vol 2, 201-204

THE EFFECTS OF SOME STRUCTURAL PROPERTIES OF ROCK ON THE DESIGN AND RESULTS OF BLASTING
T.N. Hagan, Vol 2, 205-213

Paper by I. Brown and T.L. Brekke

Mr W.E. Bamford asked why many existing tunnels which crossed active faults had a rigid lining. Mr Brown replied that this was often not intentional, but was erected as a temporary support and never removed.

Paper by M.J. Pender and M.O. Fama

Dr L.D. Wesley asked if there had been any measurements taken during the construction of the powerhouse that confirmed the measured state of stress.

Mr P.J. Millar commented that deformation measurements had been taken during the construction of the powerhouse and also during the investigation work, Millar (1977) and Bryant and Deane (1977). He felt that this evidence, along with geological mapping, Hegan (1977) tended to indicate that the horizontal normal stresses were less than the vertical normal stresses. Thus the large scale measurements during the construction of the powerhouse seemed to be at variance with stress results reported by the authors.

References:

1. Hegan, B.D. 1977
   Engineering Geological Aspects of Rangipo Underground Powerhouse
   Symposium on Tunnelling in New Zealand, Hamilton

2. Bryant, J.M. and Deane, P.A. 1977
   Rock Deformation Investigations at Rangipo
   Symposium on Tunnelling in New Zealand, Hamilton

3. Millar, P.J.
   The Design of Rangipo Underground Power House
   Symposium on Tunnelling in New Zealand, Hamilton

In reply, Dr Pender said that Mr Millar had raised some valid points. In situ rock stress measurement was a complex process and one would be rather foolish not to attempt to cross check the measurements by other means. He felt the discrepancy was not perhaps as great as Mr Millar suggested. In essence, the authors' results suggest that the horizontal normal stress is slightly larger than the vertical normal stress, whereas Mr Millar's deformation measurements suggest that the horizontal normal stresses are slightly less than the vertical normal stresses. The interpretation of displacement measurements assumes that the jointed rock mass is isotropic and that there are no shear stresses in horizontal and vertical planes in the rock mass. These effects could contribute to the differing conclusions. However, an even more significant effect relates to the extent of the deformations observed with extensometers. Some deformation will always occur before they are installed, so that the measured displacements when the excavation is carried forward will not fully reflect the stresses which are released.

Paper by T.N. Hagan

Mr G. Boyd said that, in coal measure sediments in which hard bands were commonly encountered, Mr Hagan had mentioned that splitting at the hard/soft contact was preferable during gaseous expansion into these joints. One might imagine that the hard and soft bands were momentarily uniaxially loaded. He asked whether the author had any comments on observations or on the possible consequences of rock breakage during this possible loading stage of the rock. Mr Hagan replied that the gas rushed along cracks and belled out into the softer sediments. This caused a rapid drop of pressure intensity, therefore detracted from the breakage in the harder sediment.