SESSION 13: ROCK MECHANICS

Papers:

ZONAL CONCEPT FOR SPATIAL DISTRIBUTION OF FRACTURES IN ROCK
N.R.P. Baczynski; vol 2, 29-33

A RATIONAL APPROACH TO THE POINT LOAD TEST
J.R.L. Read, P.N. Thornton and W.M. Regan; vol 2, 35-39

Paper by N.R.P. Baczynski

Prof Endersbee commented that it is important in considering the distribution of joints and fractures in rock to have regard to the statical conditions under which the cracks have formed in the first place, and the influence of one set of fractures on the formation of a later set in another direction. The development of the Griffith theory and later work in rocks by Hoek, Bianiawski, Brace etc, provide a conceptual basis. The commonly observed scale effect in rock strength testing reveals a straight line relationship in log to log plots strength vs. size. The distribution of fractures in the rock mass could be expected to follow a similar relation as indicated by the observations reported in the paper. Similarly in the rock mass, one set of fractures provides an automatic crack arrest mechanism for any later cracking in other directions - there is thus an expected tendency for cracks to terminate at other cracks. This is the normal observation in nature.

Mr Hagen asked how one could differentiate natural from blast induced discontinuities. The author replied that natural discontinuities were often filled with calcite or gypsum, while the blast joints were fresher looking and had a radiating pattern from the blast.

Mr Robertson asked whether the sampling technique was line or areal sampling and commented on the difficulties associated with line sampling. The author confirmed that areal sampling was used.

Paper by J. Read

Mr P.A. McAnally reported on tests made on samples from seven sites with sandstone, greywacke and phyllite rock types. A good correlation was obtained between ripping production and log Is(50). Thirty tests are required to give the mode of the result reliability.

Dr A.J. Bowling related a number of conclusions he had arrived at as a result of this work on rock fill:

1) He had some problems in establishing the correlation factor between Is(50) and UCS. He felt that these are two different types of rock quality indices and that a correlation may not necessarily be observed.

2) He had observed that on rockfill Is(50) seemed to correlate better with the average quality.

3) The stress distributions on the point load and UCS specimens are very complex. However for ideal elastic behaviour analytical solution for various slopes imply that UCS = 25 to 50 x tensile strength, whereas other results suggest a factor of 10 to 20.

Prof D. Stapledon added to these comments: Dr Bowling has told us that his work has indicated point load strengths show better correlation coefficients than unconfined compression strength, for the same rock substance type. I suggest that the simple reason for this is the smaller sample size in the point load test and the narrow near-planar zone between the 'points' through which failure invariably occurs. The point loading virtually restricts the failure surface to this narrow zone. On the other hand, the unconfined compression test may produce a variety of failure modes including shear, crushing, induced tensile splitting and combinations of these.

Dr B.N. Whittaker commented that the point load test method is exceedingly attractive for performing several tests on rock cores in the field. A major problem with weak rock is satisfactory recovery for removal to a laboratory for preparation and subsequent strength testing; say uniaxial compressive strength. The point load test can provide a large body of useful strength data without undue preparation and the method is likely to increase in popularity. It is particularly useful to geologists and geotechnical engineers operating in the field. However, the point load test should not be seen as a replacement for uniaxial compressive strength tests, tensile tests or bonding tests since these are very important for use in design formulae. Triaxial compression test data are also very important in design work and point load testing cannot provide guidance here.

The point load test should be seen as making a valuable contribution to gaining a better appreciation of the relative strength of rock. There are many circumstances where only point load testing can be carried out and in such situations it provides a special service which far outweighs visual estimates of strength.

Mr A. Moon asked if the author used Broch and Franklin's correction curves to get from his test value to the Is(50) values quoted in his paper. He explained that the original paper was based largely on a limited number of tests on high strength isotropic rocks of a certain size, whereas the author is considering anisotropic rocks with a wider strength range. Mr Read confirmed that he did use Broch and Franklin's correction curves.