SESSION 10: TESTS AND SPECIFICATIONS

Papers:

AN IMPACT SOIL TEST AS ALTERNATIVE TO CALIFORNIA BEARING RATIO
B. Clegg; vol 1, 225-230

ALTERNATIVE COMPACTION SPECIFICATIONS FOR NON-UNIFORM FILL MATERIALS
G.A. Pickens; vol 1, 231-235

GEOTECHNICAL TESTING FOR LEIGH CREEK COALFIELD
R.L. Cavagnaro; vol 1, 237-242

Paper by B. Clegg

Mr A.D. Hosking commented that this test replaced the CBR test and removed the bugs from the old system; eg, slowness, and he was pleased to see what appeared to be a worthy replacement for the CBR test.

Prof Fukuoka said that he was very interested in the presentation. He hoped that this kind of apparatus would be used widely. He said that a similar device had been invented in Japan by S. Asai about thirty years ago but was not in use today. He did not know why it was not in use. The Japanese Government did not specify the method. An official specification was very important if the test was to be used widely. He also wondered if it would be possible to get support from the Australian government. Mr Clegg replied by saying that he had mentioned the Japanese device in his references. The device consisted of an anvil dropped onto a plate and the degree of rebound was measured. He thought that his device was much more simple as he eliminated the plate. There were inherent problems when using a plate, such as poor seating. A poor contact would give substandard results. His device used electronic components which eliminated many problems and was considerably cheaper. In reply to the second question, he said that government approval has been talked about but that patents made this difficult.

Mr D.P. McNicholl asked the author to give more information on the use of the impact soil test for soil testing, and asked whether he would recommend it as an alternative method for quality control on large earthworks projects where supervisory staff were limited in numbers. The Hong Kong G.C.O. had used a modified McIntosh Probe for checking density rapidly over large areas down to 1 or 2m. Mr Clegg's device appeared to have potential for assessment of the surface layer but he wondered whether it gave an indication of compaction below that. Mr Clegg replied that experiments with the device had shown that impact values varied with the density and moisture content. There was a good regression correlation except when over zero air voids, but in practice such material was unsuitable for rolling anyway. The method gave good field control, and he had found that it gave a very quick answer. The engineer could monitor improvement as work proceeded and locate low density areas needing further work.

Mr G.L. Duske said the paper mentioned the use of a plastic calibrating ring for field calibration whereas the presentation mentioned the use of a rubber ring, and asked which type was used, whether a material having a particular hardness was required for calibration purposes, what that hardness number was, and whether there was a relationship given between hardness number and impact values. Mr Clegg replied that polyurethane rubber was used as a calibration device. Originally lead spheres had been used but these were destroyed after each test. The polyurethane rubber was then tried and found to be entirely satisfactory. Hardness and impact values had no relation. The instruments were calibrated electronically. Mr Duske also asked if the plastic degraded with time and was told it did not.

Mr J.H.H. Galloway said that geomechanics standard tests of any type were little more than a necessary evil. They provided a framework on which to think, they were not a substitute for thought. Though our constitutional and legal systems tended to worship them, Mother Nature, with whom the geomechanics engineer had to cooperate, had scant regard for them. If the object of a compaction specification was to ensure that some desirable quality was achieved in the compacted material, then he suggested the following points were what we should be thinking about:

a) What were the desired properties and how did these correlate with the one measured (dams, roads etc)?

b) Testing and specifications of themselves provided no control. At the most they provided the means by which the achieved level of control could be indicated. Control lay in the eye and in the judgement of the inspector.

c) There were several published methods of reducing the inherent variability in compaction curves. If the compaction specification became a substitute for thought, beware!

Mr Pickens agreed with Mr Galloway's comments but said that the law courts must be dealt with. These specifications were necessary to describe materials and their properties.

Dr R.D. Northey said that, arising from the problems of testing and specifying field compaction for some allophanic volcanic soils in Taranaki and the Central North Island, such as those described by Mr Parton and Mr Olsen yesterday, he had constantly advocated the use of a minimum strength and maximum air voids approach to such materials in the field. The first time he recalled the use of this approach was in New Plymouth some 20-25 years ago for roading and residential development fills, where they had prescribed a minimum penetration resistance of 80 psi with maximum air voids of 10%. Following his visit to Papua New Guinea in 1972 he had observed the use of even worse allophanic soils in roading and earthworks. He understood that the approach was now being used there also, but with lower penetration resistance because of high natural water contents and high rainfall. He commended Mr Pickens' extension of the method to such a wide range of materials and strongly recommended their application.

Paper by R. Cavagnaro

Dr B.W. Riddolls said he had found the UK National Coal Board cone indentor an extremely useful and quick index test for characterising low strength materials such as those described from Leigh Creek coalfields. He asked whether the author had used or had considered using this device and whether he knew if it had been used in comparable situations in Australia. Mr Cavagnaro did not know of the device or its principles.

Mr G. Boyd asked whether it had been shown clearly that clay seams extended down dip. If not, was it possible that the clay seam represented a zone of deformation due to loads induced by mining. With regard to imperfect breakage in the uniaxial point load and chisel tests, he asked how much of a problem this represented and how it could be overcome. Finally, he asked what recommendations had been made for spoil pile stabilisation at Leigh Creek. Mr Cavagnaro said the clay seams extended over a considerable distance and showed up in investigation drilling. He thought they had been induced by deformation during tectonic folding. In answer to the second question, he said that imperfect breakage was a big problem. The dots on the diagram referred to 2 or 5 good tests where breakage did not occur. Many tests actually failed. He also commented that rocks could be too soft, so that the point load induced indentation rather than breakage. The spoil pile stability was always a problem but this was reduced if piles were not placed on the low wall. The safest method was to remove all spoil from the mine.

Mr J. Read asked three questions concerning point load and chisel cutting resistance:

1) With weak rocks, especially at the lower end of the strength range, platten penetration could occur before failure. He asked whether this happened and, if so, how it was accounted for.

2) In Fig.3, no attempt was made to separate out families, and he questioned whether such a wide scatter was of any value in classification.

3) With regard to Fig.7, in view of the wide scatter in Fig.3, how did the author manage to get a better looking fit between $I_S(50)$ and chisel resistance in Fig.7, than in Fig.3?

Mr Cavagnaro replied that the first question was similar to Mr Boyd's earlier question. He pointed out that Fig.7 involved fewer tests than Fig.3 which showed the overall trends. Individual units gave a better correlation than the rock as a whole because of a wide variation in properties.