



May 6th - May 11th

Concluding Session

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CONCLUDING SESSION

The session was chaired by Professor Shamsheer Prakash, Chairman of the Organizing Committee on 11th May 1984. Professor Prakash first invited Dr Vinod Garga to present the highlights of the Conference Proceedings with particular reference to the future research and development needs.

Dr V K Garga's presentation

The Conference Chairman, Dr. Prakash, has requested me to present brief remarks on the future research and development needs from the point of view of the practising engineer as reflected in the Proceedings of this Conference.

During the last five days, a number of important concepts and ideas have been presented by the authors, the general reports and in the discussions. I would briefly like to recount some of the ideas which deserve further investigation. The following list is not implied to be comprehensive, and certainly reflects a personal bias.

- * Ground improvement has been a consistent theme in all of the sessions, whether it be for soft soils or tunnels or foundations or for lateral support. It is necessary to define limits of the applicability of the various methods of ground improvement, such as dynamic consolidation, stone columns and vibro-flotation. In particular, it would be helpful if reliable and quick means of evaluating the efficiency of these and other methods in the field are developed. We have had the opportunity of listening to very interesting and somewhat opposing points of view during the discussion on the applicability and reliability of the dynamic compaction technique.
- * There are many observations, including data presented at this Conference, which suggest that the placement of a comparatively stiff raft over soft compressible deposits tends to reduce stresses in the latter much more than that predicted by the elastic theory. This, if found to hold generally true, has enormous implications on the design of embankments over soft deposits. A further investigation of this aspect appear to be most desirable.
- * There is a need of better understanding of the effect of low-level vibrations, for example those induced by construction machinery, blasting, vehicular traffic, on the dynamic behaviour of soils. Unfortunately, case histories of this aspect are very scarce.
- * Methods for systematic normalization for energy imparted in the SPT, and especially at large depths, as carried out in the various countries around the world should be developed so that data from the various sources can be meaningfully compared. While some work on this has been carried out in U.S.A. and Japan, I obtained a distinct impression from the General Report that more such data is required.
- * What is the depth to which liquefaction in level ground can occur? In many countries it is assumed that liquefaction will not occur below a depth of 15 to 20 m. Is it a safe assumption? Detailed case histories and theoretical studies to clarify this issue will be most helpful.
- * I found the concept of artificial introduction of air or gas in the groundwater to increase its compressibility and consequently to increase the resistance of the ground against liquefaction very interesting and deserving of more attending.
- * More studies are required to define the acceptable levels of deformations in foundations and embankments during partial liquefaction. We have heard during this Conference that a 5% strain potential is often deemed to be acceptable for embankment foundations. What is this criteria based on? More case histories are required to clarify this point.
- * There is a need for the development of equipment and techniques for undisturbed sampling of soils susceptible to liquefaction and this is especially important for marginally stable soils. A decision to undertake ground improvement generally implies major expenditures. Consequently, it would be of practical importance if such decisions could be based on reliable field and laboratory tests.
- * There is a need for theoretical studies and laboratory and field data on the behaviour of creep piles, as described by Professor Hansbo at this Conference, in soils other than the Swedish clays, before their use can be widely accepted.
- * It is apparent from discussion at this Conference that the methods for estimation of tectonic stresses in highly fractured and weak rock for design of tunnel linings are very approximate. A comparison of the various methods would be especially helpful to the design engineer. I think all participants would agree that there is need for more complete case histories to clearly bring out comparisons between prediction and performance.

Finally, the University of Missouri-Rolla and Dr. Shamsheer Prakash are to be congratulated for organizing this Conference and for their efforts in bringing together geotechnical engineers from diverse parts of the world to share their experiences.

Delegates were thereafter invited to present their views, suggestions and recommendations.

Earnest J. Armstrong (Australia) pointed out that in most documentation of case histories, neither costs aspects are mentioned nor legal situations are considered.

K. Rainer Massarch (Sweden) pointed out that foundation failures may not always be for geotechnical reasons. What is more, the engineers, sometimes, do have to accept certain degree of failure for reasons of economy. He also voiced his concern that aspects of economy has not been discussed while discussing case histories.

Geoffrey E. Blight (South Africa) suggested that the five day period is too long for a Conference and it would be most ideal if it is held only for three days. The Conference themes should be well defined and distributed without thinking of parallel sessions. The ideal venue for the next Conference would be a small city, University or a college. He pleaded for more time to be given to the authors.

Charles F Ripley (Canada) congratulated the organisers for a successful Conference and suggested that such efforts should continue round the world. He highlighted the importance of case histories particularly to the practising engineers.

T. Ramamurthy (India) highlighted the need for deriving lessons from case histories. Supporting the view of Dr. Blight, he pleaded for providing more time to the authors and the discussions. He voiced his disappointment on key-note speakers leaving the sessions after their respective presentation because in so doing they deprive the delegates of the benefit of their expertise.

David G. Winter (USA) emphasised the need for presenting a more critical review of papers by the general reporters.

He suggested reduced time for reporting and more time for discussions.

Thereafter Professor Prakash invited Dr R K Bhandari to read out the resolutions drafted in consultation with the delegates to the Conference.

RESOLUTIONS (Dr R K Bhandari, India)

The Conference Proceedings leave one in no doubt that case-histories do work as a double edged sword. They are assets, if well documented. They are impediments to the wheel of progress, if perched on scanty data, false diagnosis or interpretation and on mixed up ideas. Real case histories may take 5 to 10 years to develop and naturally premature publications do call for analysis and re-analysis as more and more data become available. Ideally speaking, one may like to collect all the facts, data and observations before venturing on documentation. But practically speaking, it would not always be intermediary stages or discourage enthusiastic researchers on this score.

Failures could be technical or economical and it follows therefore that success stories are as important as failure case records. On behalf of all of you, I would like to summarise:-

The participants of the International Conference on Case Histories in Geotechnical Engineering held at St. Louis from May 6 to 11, 1984 - recognising that case histories provide a major driving force in the advancement of the frontiers of Geotechnical Engineering, and in their documentation appropriate grouping and synthesis lie the possibility of generic dependable conclusions - propose that:

1. The ISSMFE or such other International bodies be approached by the organisers of this Conference to set up a Permanent Committee on Case Histories in Geotechnical Engineering with, inter alia, the following objectives:
 - 1.1 To organise International Conference on Case Histories in Geotechnical Engineering periodically.
 - 1.2 To evolve appropriate mechanisms of promoting the documentation of case histories on well defined themes.
 - 1.3 To formulate norms and procedures to ensure that the documentation and the divulgence of case histories is free from legal implications.
 - 1.4 To encourage National Societies of the ISSMFE to contribute and to serve as vehicles of progress towards achieving the above objectives.

Discussion by E J Armstrong - Principal E J Armstrong & Associates --Coffs Harbour Australia,

Post Mortem Discussion - Last Session

I do believe the brief final day post mortem was useful. I would wholeheartedly support the comments made by Geoff Bight regarding venue, facilities for after session interchange, limitation of topics and number of papers. The first day could be described in the Australian vernacular as the "Bum's Rush". Far too many papers for the time allocated.

I would reiterate my comment that only one paper in some 1500 pages of text put a specific \$ cost to the project and process (Vol III 2nd last paper).

A world conference is an ideal forum for learning about how the costs of plant, labour and materials can affect solution strategies in different conditions, countries and locations. Any engineering problem can be solved with access to unlimited money. Rarely is this the case and it behoves the Site Investigations Engineer to propose to his client a solution that is technically adequate, economic and safe. Value for money is a reasonable expectation with any project, hence my plea for inclusion of such information into the "Case History".

The organisers in the pre-conference listings wisely gave each paper an identifying number. It is a pity that these numbers were not carried through into the volumes I to III even if the sequence was not chronological. Further confusion resulted from spreading various themes through more than one volume and not in sequential order. eg Themes 6 & 8 spread through volumes 2 & 3, Theme 5 through Volumes 1 & 3.

To aid in this interchange of experiences perhaps consideration could be given to selecting (if need be by lot) certain papers for more detailed discussion during each session. It would, of course, be a requirement that the authors of any paper selected for discussion must be present.

An hour to an hour and a half in most sessions for a keynote address is not really profitable use of time. For example, in my own case, attendance at this conference cost \$1000 per day without counting likely income to be earned had I stayed in my office working.

It is my experience that the most stimulating and profitable conferences are those in which most of the talking comes from the people in the body of the auditorium with those on the rostrum as catalysts.

Congratulations to the organisers for all the hard work they put in together with the willing work of their assistants. It is to be hoped that the above comments and those of other commentators will be of help to future Conference Organisers. These comments are offered in a spirit of helpfulness and the pursuit of excellence which should be the aim of us all, in all that we do.

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