Workshop 5 / Atelier 5

Scour of foundations

L'affouillement des fondations

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The workshop was organised by TC 33 (Technical Committee no. 33 on Scour of Foundations) of the International Society on Soil Mechanics and Geotechnical Engineering (Convenor: J.-L. Briaud, Texas A&M University, USA). Scour of foundations is a topic well known in hydraulic research and practice but rather a new field to be discussed in geotechnical engineering. The first symposium on scour of foundations was held in Melbourne, Australia, November 19, 2000 (see http://www.civil.tamu.edu/research/scour-tc33/) It became obvious that on one hand there is a lot of knowledge that has to be collected and published. On the other hand there remain many questions to researchers.

To initiate further communication, members of TC 33 prepared and presented three papers, highlighting some aspects of the state-of-the-art in scour design.

In the first paper, Annandale gave a survey of scour to demonstrate the impact of that phenomenon on human life and economy (Annandale, G.; Melville, B.; Chiew, Y.-M.: Scour Case Studies). He began with the many different types of scour, covering not only scours of foundations but also scour of dam structures and coastal and offshore scours. Three case studies of a bridge pier scour, a submarine pipeline scour and tunnel scour showed what can happen, what can be done against scouring and what should not be done.

A state-of-the-art of the practice for bridge scour analysis in the United States was given by Briaud (Briaud, J.-L.; Richardson, E.V.: United States Practice for Bridge Scour Analysis). The presentation did clearly show that there are also now empirical and theoretical approaches to scour calculation. In the paper details are given of the huge knowledge that has been gathered to date in the United States. In the presentation, all these details could not be repeated. Instead pier scour and abutment scour were presented. It was concluded that equations exist for coarse grained soils, that equations are in development for other materials, that research is active, that national guidelines are maturing in some countries, and that international guidelines would be helpful for many countries.

The third presentation concentrated on geotechnical aspect, i.e. the soil-water-structure interaction. (Heibaum, M.: Geotechnical Parameters of Scouring And Scour Countermeasures). Besides the effects of hydraulic loads on the surface of soil and rock, the response of the pore water pressure and the stress regime in the soil has to be considered. With a simple model it was tried to explain the negative effects of excess pore water pressure on the scour process as for example hydrodynamic soil transportation. To build up a sufficient protection, in all permeable scour countermeasures a filter is needed. This often causes problems for both grain filter or geotextile filter. One method to overcome these difficulties is to use geosynthetic containers that are accordingly designed.

The three papers will be published in " Mitteilungsblatt der Bundesanstalt für Wasserbau. Karlsruhe, Germany" (ISSN 0772-5801).

In the discussion, the importance of taking into account the soil-water-interaction was emphasized by researchers from Japan, who asked even more phenomena to be taken into account. They showed in a

short contribution, based on earlier research (Sassa, S.; Sekiguchi, H.: Analysis of wave induced liquefaction of sand beds. Géotechnique 51, No.2, pp.115-126, 2001) that not only the compressibility of the pore water has to be considered but also the elastoplastic behaviour of the subsoil. A contribution of the authors is also found in this conference (J. Miyamoto, S.Sassa and H. Sekiguchi, 2001. 'Wave-induced liquefaction and flow deformation in sand beds. Volume 3, pp 2239-2242).

Successful scour protection in practice using geosynthetic containers (and geosynthetics in general) was reported from Dr. Heerten, underlining the general remarks of such elements in the presentation of Heibaum.

The discussion showed that generally there is an urgent need for further research on the geotechnical side to understand scour processes. Therefore "Scour of Foundations" will be dealt with in more detail during the First International Conference on Scour of Foundations (ICSF-1), November 17-20, 2002 at Texas A&M University, College Station, Texas, USA (http://tti.tamu.edu/conferences/scour).