Geotechnical Engineering
Volume 165 Issue GE3

Editorial
Jones and Rigby

ice | proceedings

Proceedings of the Institution of Civil Engineers
Geotechnical Engineering 165 June 2012 Issue GE3
Pages 125–126 http://dx.doi.org/10.1680/geng.2012.165.3.125

ice Institution of Civil Engineers publishing

Editorial

1 **David E. Jones** MSc, CEng, FICE, MIMMM, FGS
Geotechnical Engineering Manager, United Utilities Engineering, United Utilities, Warrington, UK

2 **Pam J. Rigby** MSc, CEng, CGeol, MICE, FGS, Eur Geol
Principal Geotechnical Engineer, United Utilities Engineering, United Utilities, Warrington, UK

We are delighted to welcome you to the June issue of *Geotechnical Engineering*. This is one of our special themed issues, Geotechnical Engineering for Embankment Dams. Recent themed issues have proved popular in terms of the number of abstracts and papers received and while there will not be a symposium, such as last year's at Queens University Belfast, Geotechnical Engineering for Embankment Dams has been well supported and it is intended that some of this interest and content will be carried forward to the 17th Biennial Conference of the British Dam Society at the University of Leeds in September (http://www.britishdams.org/2012conf/). In the meantime we trust that the range of papers available will be appreciated by the readership and, as ever, encourage submission of discussion items.

This themed issue began with planning in late 2009 and a call for abstracts early in 2010. The issue was to focus on geotechnical themes of investigation, design, construction, renovation and maintenance of embankment dams. The themes that were encouraged included

- case histories
- geotechnical investigation and monitoring
- geotechnical analysis and modelling
- design of embankments, foundations, cores, cut-offs and drainage
- innovation
- geotechnical inspection, investigation and design
- construction and testing
- performance monitoring
- geotechnical risk analysis and safety
- current research.

It was encouraging to note that the submission of abstracts covered each of these aspects and more: case histories represented five continents, landmark embankment dams through to smaller flood alleviation storage facilities; design covered internal erosion, probabilistic and deterministic analysis, seismic design, and assessment and innovative materials; performance was represented by settlement, displacement and flow monitoring.

From the abstracts received, five papers have been developed covering a range of interesting dam topics to comprise this issue. They include a dam raising case history, internal erosion modelling, performance monitoring, probabilistic modelling and research into embankment materials utilising case history evidence.

In the first paper, Hieatt *et al.* (2012) provide a case history of a large-scale raising, Mangla dam in Pakistan. It was the largest embankment dam project in the world when it was constructed in 1967 and remains one of the largest to date. The authors note that the Mangla dam is, in fact, formed by four major dams for which there was provision in the original design in order to offset the effects of future sedimentation. The huge sediment load carried by the rivers feeding the Mangla dam cause sedimentation and by 2000 the loss of reservoir capacity was a significant issue. It is reported that advances in geotechnical and seismic engineering, changes in design parameters and the collection of many years of performance data enabled refinements to the original raising design. The work also provided the opportunity to address some areas of seepage. The project ran from 2004 to 2009 and, for a dam documented in many earlier papers, the authors are able to provide a useful update and impressive statistics on the work they describe as one of the largest dam-raising projects ever undertaken.

Marco Redaelli's (2012) paper 'Reliability of flood embankments: a new methodology' considers the prediction of some aspects of the structural performance of embankments in extreme hydraulic conditions as part of flood risk assessment. The author highlights the challenge arising from in uncertainties regarding the characteristics and conditions of earth structures for flood defence networks. The author suggests that the modelling of piping through the embankments could be improved. He presents a methodology that he believes overcomes the limitations of a condition grade approach. The paper details how through-piping of the embankment is addressed with elicitation of subjective probabilities. The author provides users with tabulated solutions for a quick reliability assessment for the evaluation of uncertainties. The information required to produce a better prediction is also noted. He particularly highlights the need for future research development on a set of judgement-based fragility curves for the through-piping mode of failure.

In the third paper Dounias *et al.* (2012) consider the long-term performance of several Greek dams. The authors briefly consider the mechanisms affecting the post-construction deformation of embankment dams. Crest deformation of older dams is found to have attained a nearly constant small rate of deformation. Crest deformations take many, possibly hundreds, of year to develop and differ for each dam; it is suggested that some patterns are identified for similar dams. The authors detail what they consider to be the factors influencing deformations for embankment dams and particularly note the horizontal crest deflections in dams with central cores, where they advise movements towards upstream are occasionally observed.

In the fourth paper, 'Embankment dam probabilistic assessment for climate scenarios', Preziosi and Micic (2012) present a probabilistic methodology to quantitatively measure a notional reliability index against upstream and downstream embankment dam slope failure. They consider that for small embankment dams, exposed to more extreme climate scenarios, deterministic assessments do not provide sufficient accuracy. The authors advise that the probabilistic model encompasses uncertainties associated with soil properties, dam geometry and rainfall parameters. They propose a notional reliability index for the dam for selected precipitation scenarios. The authors provide a benchmark that reflects the critical conditions conducive to slope failure. The paper reflects on the implication of inclusion of probabilistic climate models for associated risks. The authors advise they have developed an effective new management tool for risk assessment of embankment dams as categorised by the UK Flood and Water Management Act 2010 (2010).

Abouzar Sadrekarimi (2012), in the fifth paper 'Effect of soil particle mineralogy on embankment dams', takes a further look at the large displacements of the Lower San Fernando dam resulting from the 1971 San Fernando earthquake. The dam was constructed by hydraulic filling techniques and it was this detail that has been widely believed to have produced liquefiable sand deposits, vulnerable to earthquake. Laboratory testing on quartz sands placed in order to resemble the soil properties of hydraulic filling indicates them to be dilative. The author thus concludes that mineralogy, particle deformation and crushing are other contributory factors in soil deformations. He suggests that the results indicate that sand particle composition and compressibility may have caused the failure and large displacement of the Lower San Fernando dam, even if the sand had been in a dense state.

In concluding the editorial we would like to offer thanks to the reviewers and assessors who assisted the authors in preparation of these papers and all contributors who proposed abstracts. The reviewers will be named in the journal later in the year. We would be delighted to see written discussion arising from the topics covered; the details for the submission of discussion are found at the end of each paper. As with each of the themed issues we have increased the length of the edition and we hope you agree that the papers provide an interesting and selection of embankment dam topics.

REFERENCES

Dounias GT, Anastasopoulos K and Kountouris A (2012) Long-term behaviour of embankment dams: seven Greek dams. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **165(3)**: 157–177, http://dx.doi.org/10.1680/geng.11.00052.

Flood and Water Management Act 2010 (2010) *Elizabeth II*. Her Majesty's Stationery Office, London, UK.

Hieatt M, Shah SRA, Khan RA *et al.* (2012) Some geotechnical aspects of raising Mangla dam, Pakistan. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **165(3)**: 127–141, http://dx.doi.org/10.1680/geng.11.00041.

Preziosi MC and Micic T (2012) Embankment dam probabilistic assessment for climate scenarios. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **165(3)**: 179–193, http://dx.doi.org/10.1680/geng.11.00038.

Redaelli M (2012) Reliability of flood embankments: a new methodology. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **165(3)**: 142–155, http://dx.doi.org/10.1680/geng.11.00039.

Sadrekarimi A (2012) Effect of soil particle mineralogy on embankment dams. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **165(3)**: 195–206, http://dx.doi.org/10.1680/geng.11.00031.