



Numerical Modelling and Computation Methods of Concrete Face Rockfill Dam

by Mr. Steven Toh Chin Kok, Grad. IEM

Mr. Steven Toh Chin Kok, Grad. IEM is currently heading the geotechnical engineering of dams in Angkasa Consulting Services Sdn. Bhd. He is also a co-opted member of Geotechnical Engineering Technical Division (GETD) of IEM.

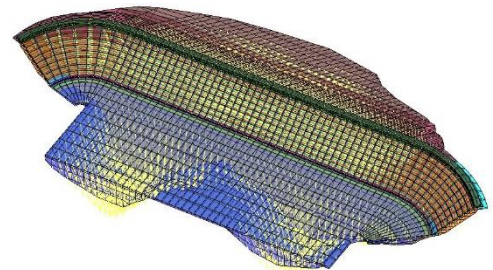


IEM's Geotechnical Engineering Technical Division (GETD) organised an evening talk on "Numerical Modelling and Computation Methods of Concrete Face Rockfill Dam" on 26 November 2015 at Tan Sri Prof. Chin Fung Kee Auditorium, Wisma IEM. The talk was delivered by Prof. Xu Zeping and attended by 47 participants.

Prof. Xu outlined the purposes of numerical modelling and computation methods of Concrete Face Rockfill Dam (CFRD) in four areas and they are as follows:

- Predict performance of CFRD
- Verify design scheme
- Understand the features
- Study on special problems

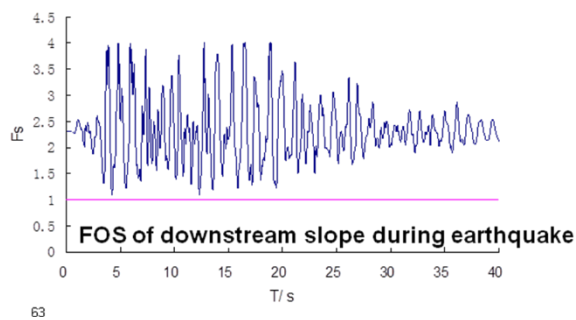
In CFRD engineering, the prediction of performance of a dam is very important for structure design and determination of construction schemes. In recent years, tall CFRD projects were constructed and the topographic and geologic conditions of dam sites unique and usually complicated, thus posing great challenges to theoretical modelling and analytical methods of numerical analysis of CFRD.



Prof. Xu focused his talk on numerical modelling and computation methods for stress and deformation analysis of CFRD. He discussed the engineering properties of rockfill material and the constitutive models for simulating stress-strain relationship. The latter included nonlinear elastic models, elasto-plastic models and the models for creep deformation.

Prof. Xu cautioned that “For proper consideration of the volume changes of rockfill material under shear stress, which include volume reduction and volume dilation, the elasto-plastic models with the application of multiple yield surface and non-associated flow rule are considered theoretically perfect. At present, those models are still facing some difficulties in testing, parameters determination and computation methods however.”

Numerical analysis on the stress and deformation properties of CFRD is conducted by finite element method. For CFRD, the computation method should consider the non-linear stress strain features of rockfill materials. In addition, the interface of concrete face slabs and rockfill should also be well simulated, as the non-linear contact properties of concrete and rockfill will have significant impacts on the stresses of concrete slabs. For tall CFRD, the creep deformation of rockfill is an important factor to be considered. Based on the mathematic models for creep deformation of rockfill, the correspondent computation method is developed to take into account the influences of the impacts of rockfill creep deformation.



After the introduction of the theoretical models and computation methods for the numerical analysis of CFRD, Prof. Xu presented several cases to illustrate the stress and deformation features of CFRD in different conditions. At the end, the latest technologies and developing trends for numerical analysis of CFRD were discussed.

