

**Report on Evening Talk on Embankment Deformations include Creep in Compression and Shear**

by Ir. Yee Thien Seng

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Professor Jim Graham, formerly of the University of Manitoba, Canada gave an evening talk on “Embankment Deformations include Creep in Compression and Shear” at the Tan Sri Professor Chin Fung Kee Auditorium, Wisma IEM, Petaling Jaya on 10 October 2013. The talk commenced at 5.40 pm and was attended by 32 participants.



Professor Graham (picture) started by describing the development of the elastic-viscoplastic (EVP) soil behaviour model to include creep behaviour in foundation clay soils. Creep in soils is a term to encompass time dependent deformations in soils independent of effective stress increases owing to continued volume change as well as shear deformation subsequent to an effective stress change.

In the EVP model, creep occurs during the whole compression process after completion of the instantaneous compression at the beginning in the soil following the application of an instantaneous external loading. It differs from the contemporary framework where secondary compressions only commenced after the completion of primary consolidation. This allowed the new model to reproduce the similar settlement behaviours that are independent of primary consolidation durations as observed in the later stages of all very long period monitoring of embankments around the world. The model will reproduce the generation of excess pore water pressures in the foundation ground that vary with time and strain-rate effects under a constant external loading.

It also permits the evaluation of yield strengths and shear strengths from the effects of rates of load application and rates of strain. With these features formulated in terms of elastic-viscoplasticity, the EVP model permits modelling of the following:

- (a) incremental loading,
- (b) constant rate of loading including ‘creep’ at constant effective stress,
- (c) constant rate of straining including ‘relaxation’ at constant volume and
- (d) creep in shear strains.

Professor Graham presented case studies to show that the EVP model was able to produce good agreement with measured deformation behaviours against time for reclamation work at Chek Lap Kok international airport, Hong Kong and a highway embankment at Limavady, Northern Ireland. Its success has attracted considerable international attention to the model even though it did not exactly match the measured pore water pressures behaviour.

The talk ended at 7.15 pm following a brief question and answer session. Ir. Liew Shaw Shong, the GETD chairman presented the certificate of appreciation and souvenir to Professor Graham accompanied by applause from the floor.