

# PERTEMUAN PERSATUAN

## Meetings of the Society

### Ceramah Teknik (Technical Talk)

## Understanding slope movements and the failure process

ANDREW MALONE

### Laporan (Report)

Prof. Andrew Malone gave an illuminating talk on "Understanding slope movements and the failure process" on 10th May 1999 at the Department of Geology, University of Malaya. The talk was based on numerous case histories of slope movements and failures investigated by the Geotechnical Engineering office (GEO) of Hongkong. It is particularly interesting since the approach to the investigations/studies incorporated both geological and geotechnical studies. An abstract of the talk is attached below.

Some 80 "members" attended the talk, with a vast majority being members of IEM (geotechnical engineers). A lively and prolonged discussion session followed the presentation.

### Abstrak (Abstract)

This presentation will summarise the results of recent research into slope movements and the process of failure of cuttings in saprolitic materials formed by the tropical weathering of igneous rocks.

Evidence will be presented of slope movements and failure in twenty-three Hong Kong case histories. All cases relate to hillside cuttings. Landslides occurred in 22 cases. In one case movements were detected at an early stage and the failure process was brought to a halt before main failure occurred.

The landslides are separated into two groups, based on their geometry and the velocity of movement at main failure: steep-shallow landslides and deep landslides.

The steep-shallow landslides move extremely rapidly at main failure and travel many metres or tens of metres until arrested. In contrast, the deep landslides generally move slowly at main failure, displacing by 1 to 3 metres at most before coming to rest. Movement of the deep landslides may be reactivated by severe rainfall conditions. Whereas the deep landslides show evidence of movement before main failure, the steep-shallow landslides generally do not.

The differing velocity of movement of the two types of landslide may be explained in terms of the mechanical properties of the materials within the rupture zone. Pre-main failure movement of the deep slow-moving landslides may be the result of progressive development of the rupture zone within the saprolite mass. In contrast, it appears that rupture initiates in the steep-shallow landslides just before the main failure occurs. Hence, in theory, the latter landslides will be energetic but the former will not.

In describing slope movements the presentation will follow the classification of stages of slope movement suggested by Leroueil *et al.* (1996). Use of this new classification system is recommended for studies of landslides in tropically weathered soils and rocks.

The presentation will conclude with a discussion of the implications of the findings for slope design.

Tan Boon Kong  
Chairman  
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Engineering Geology & Hydrogeology

**Footnote:** Professor Malone teaches in the Departments of Earth Sciences and Civil Engineering of the University of Hong Kong, where he is responsible for a new MSc programme in Applied Geosciences. He also works for the World Bank as an adviser on landslides. Previously he was the head of the Geotechnical Engineering Office in Hong Kong. He graduated in Civil Engineering from Leeds University in 1964 and was awarded a Ph.D. from Imperial College in Engineering Geology in 1969. He was invested with the Bronze Bauhinia Star in the 1998 Honours List of the Hong Kong Special Administrative Region of the Peoples Republic of China.

