

# Recent Landslides / Research

## Landslide Causes a Building Collapse in Malaysia

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### Introduction

A 12-story reinforced-concrete building collapsed due to a landslide in Malaysia, killing at least 50 persons. Failure occurred on Saturday, 11 December 1993, at 13.35-13.40 hrs. The site was located in Talman Hillview, Ulu Klang (or spelled Hulu Kelang) in the suburbs of Kuala Lumpur, as shown in Fig. 1. The collapsed building was Block 1 (or called Block A) of the Highland Towers condominium complex, which also contains Blocks 2 and 3 of the same building. The Block 1 building was constructed on a hillside in 1979 as the first structure in the complex. Fig. 2 shows the entire complex after collapse. Fig. 3 shows the plan of the complex.

The failure took place during the rainy

season; heavy rainfall had occurred in the preceding night. The landslide movement was in the direction indicated by the red arrows in Fig. 3. The hilltop is situated at the top of the figure. A retaining wall was situated above and to the right of the collapsed building. In between, and just below the upper retaining wall, were a parking garage and badminton courts.

### Photographic Data

Photos (a), (b), (c) and (d) in Fig. 4 were taken in this order by a nearby resident, Bruce Mitchell, who said: "I heard the crack of the retaining wall giving way. The whole block started to move. The building first slid forward in a vertical position for about ten feet, making little noise. When it started to topple, it went over very quickly. Then there was an explosion of glass and of air" (cited from *Asiaweek*, 22-29 December 1993).

These photographs supposedly were taken from a midheight story of Block 2 in the directions indicated by arrows in Fig. 3. In Fig. 4, the building of Block 1 is seen on the right in (a) and to the left in (b), and toppling clockwise in (c) and (d). Also in Fig. 4 (a), fractured asphalt pavement (marked as "A") on top of earth blocks is visible between the retaining wall and the roof of the parking garage. This suggests that the ground between the retaining wall and the building failed and was upheaved by compressive stress applied by landslide movement. Fig. 4

(b) shows a tilted electric light pole (B), spreading debris (C) from the failed retaining wall at the back, and a crack on the foreground (D). From another photo taken between (a) and (b), it was clear that this crack was extending; it could be along the landslide boundary. The locations of (A), (B), (C) and (D) are plotted in Fig. 3. Figs. 4 (c) and (d) show the toppling process of the building.

### Further Information

A few more words are cited from local newspapers as to observations by nearby residents on the process of landsliding and collapsing.

A Block 2 resident said that he saw a slight landslide from the hill at the back of Block 1 as early as the preceding night, and that the landslide, which was getting bigger and bigger, must have forced the building to collapse (*The Star*, 12 December 1993).

A Block 1 resident said that since trees were uprooted in the preceding year, there had been mud all over the road everytime it rained (*The Star*, 12 December 1993).

A Block 1 resident said that it was shortly after noon when she heard a very loud sound like something huge dropping down the hillside behind the Block. She said: "I looked towards the hill and saw a landslide. Large rocks were rolling down the hill and trees were being uprooted. The earth and rocks were moving towards the car-park and the badminton court. The rocks broke into pieces when they struck the badminton court and the

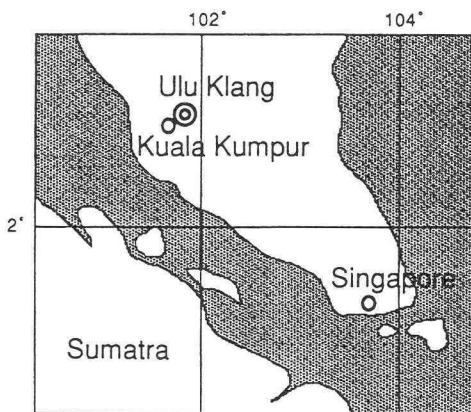


Fig. 1 Index map.



Fig. 2 Air photo of the Highland Towers condominium complex including the collapsed building (Courtesy of *New Straight Times*, 13 December 1993).

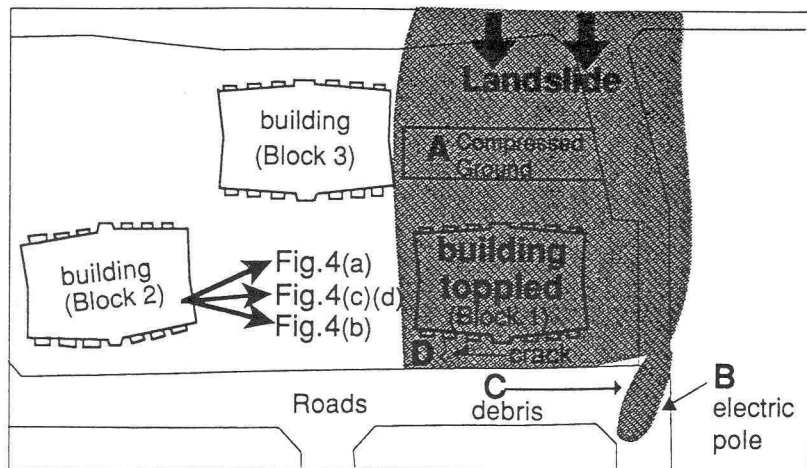


Fig. 3 Plan of the site and the locations of ground deformations prior to building collapse.

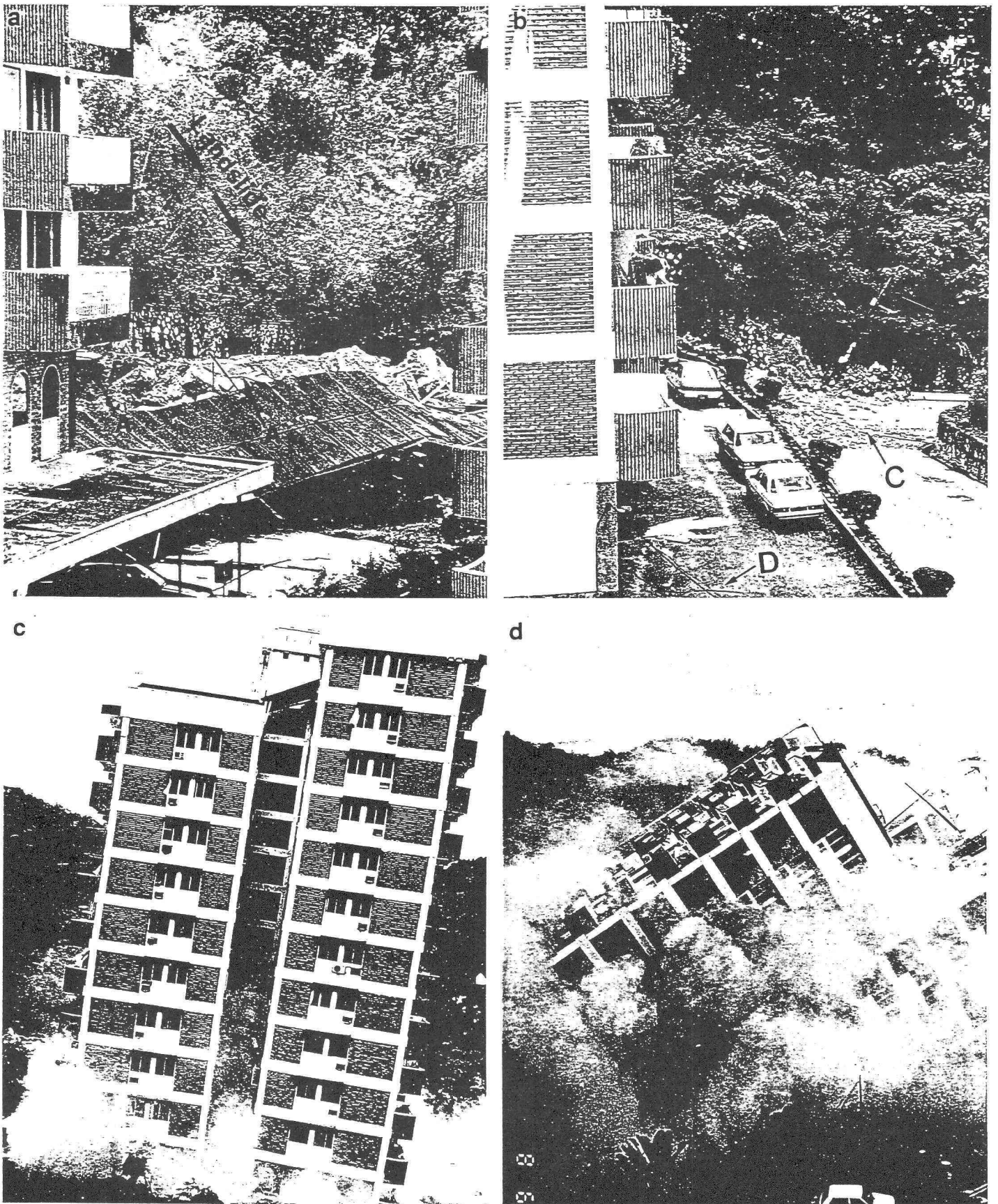


Fig. 4 Process of toppling of the building.

car-park. The earth and rocks then slammed against the building. The floor started shaking as the whole building started to sway. I was thrown left and right following the movement of the building". "The apartment's roof had started to crack. Then there was a deafening sound, like a very loud thunderbolt" (New Straits Times, 15 December 1993).

**Comments**

Apart from possible defects in the structure, it is certain that the building collapse was initiated by a landslide, which took place as a result of loss in stability of slope. Heavy

rainfalls must have increased water content, and hence fluidity of clayey sands lying on the granitic bed rock. The process of excavation and embankment prior to building construction may have participated in the loss of stability.

A large-scale investigation is reported to be under way locally to make clear the cause of the building collapse. The author has heard that the building foundation was constructed on steel piles. Final conclusions remain to be drawn after the investigation has revealed the underground structure of the site.

The author gratefully acknowledges the keen interest and stimulating and instructive discussions extended by Prof. Kyoji Sassa of the Disaster Prevention Research Institute, Kyoto University, Japan, on this topic. Mr. Keiichi Aoki of the Kuala Lumpur Office of the Overseas Economic Cooperation Fund (Japan) provided access to photographs and newspaper articles.

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