

Geological study on the slope movement of toppling type

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In general, it is supposed that the stability of a slope in which bedding plane and schistosity show a reverse dip slope is higher. However, it has been observed that cut slope failures and landslides are sometimes occur even in a reverse dip slope with a steeper inclination. The existence of a fold in the stratum (bedrock creep) is considered to be a prime phenomenon for such collapses and landslides.

The author had an opportunity to investigate, the mechanism of failure after observing deformations on some reverse dip slopes. Therefore, this paper explains the collapse mechanism of the reverse dip slope based on the above investigations.

It can explain the mechanism of the toppling collapse of the slope as follows.

1) Condition of toppling displacement of the stratum.

The toppling displacement has been generated on the reverse dip slope of the steep inclination. The condition of the toppling displacement is for the block in the toe of slope to be pushed outward, and to be removed.

2) Occurrence of the open cracks due to toppling displacement.

The toppling displacement occurs for a long term in a natural slope. In a cut slope, however, it occurs in a short period. The tensile stress acts on the upper part of the slope and the open cracks occur.

3) Inflow of rainwater into open cracks and development of pore pressure.

Sometimes, a big pore pressure develops in a slope despite a little volume of water that flows into the open cracks. This causes, the open cracks to grow further, especially under the repeated action.

The base of toppling layer fails as the open crack widens, and the instability of the slope increases.

4) Occurrence of collapse

When the fracture lines along the toppling layer base progress, a continuous fracture plane is formed. As a result, the pore pressure developed in the open cracks act on this plane, and the strength of slope cannot endure the pore pressure, which results in collapse.