

Geological problems of tunnel passing through landslide graven

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There are a great number of tunnels constructed in landslide area in Japan, and these area have problems in terms of maintenance for tunnel. This paper introduces two examples of tunnel project come across graven of landslide, and presents their geological problems and measure to meet the situation.

Case 1: At the tunnel planned in Cretaceous sedimentary rocks the existence of the graven had been confirmed immediately before tunnel excavation. Various countermeasures for the tunnel were carried out against this graven, so that the construction was performed with safety. Since the graven were filled up soft clay and volcanic ash it might be a significant accident with no counter measures.

Case 2: At the tunnel planned in Tertiary deposits where there was no information on the graven, the collapse occurred during construction. Because of abundant water stored with many rock fragments in the graven, rapid water flow into the tunnel resulted in the late of completion for tunneling.

As mentioned above, the landslide moving with large displacement forms graven zone at the top and has many cracks and openings. In this zone loose and unconsolidated materials are embedded and store abundant ground water if they have pocket of porous area. When excavation with no measure is performed, accident with tunnel collapse potentially may occur. However, it is common to misunderstand as fault in the case of site investigation and tunnel excavation. Even though old landslide areas with large scale displacement are considered to stop moving precaution must be needed for existence of landslide graven. In authors experience, it is founded that there are often misidentification on any landslide existence to have large scale and eroded.

In under to be good practice it is very important to detect landslide form initially by reading topography and interpreting aerial photograph. Identification of landslide form should be based on field survey and also using laser scanning method the width and length of landslide graven in detail sometimes easily may be determined. When the plane of landslide is determined, the sliding depth of landside is estimated to be from $1/3$ to $1/11$ of this width and the width of graven should be noted to be the same value of it