Stability of reinforced slope with Rock Bolt and Rope Net Method

Hiroyoshi Nakashima, Harushige Kusumi, and Katsumi Teraoka
Graduate School of Kansai University
3-3-5 Yamate-cho, Suita-shi, Osaka
JAPAN
E-mail: k984045@kansai-u.ac.jp

Abstract

We suggest the Rope Net and Rock Bolt method having function of slope stabilization and conservation of natural state. The purpose of study is to establish design of ropenet and rockbolt method preserving landscape and natural environment. The mechanical behavior and deformation behavior of the method were partially clarified by past studies. The purpose of this research is to understand the mechanism of reinforcement effect by rock bolt setting of the method and the result of research add in the existent design method.

1. INTRODUCTION

Many unstable slopes exist about 1000 slope failures each year have occurred in Japan. An about 90% of the failed slope is natural slope having the trees vegetation and the failure occurred in the surface ground within 3 meters in depth. The slope failure is mainly caused from the heavy rain and small earthquake. While the failures have to be prevented, the natural environment such as trees and vegetations on the slope has to be also maintained. Therefore, the retaining structure and the shotcrete, which have to cut the trees on the slope, are not suitable from the point of view of the conservation of natural state. From this point, the rock bolt and rope net method is developed to protect the slope failure with the natural conservation. The shearing test by the model 1/10 scale is conducted. As a result, it is clarified that the rock bolt setting has a large effect on the slope behavior.

2. EXPERIMENTAL PROCEDURE

The share test is assumed 1/10 scale. The shearing box is 600mm in length, 500mm in width and 350mm in the layer. Reinforcement rock bolts, pressure plates, rope net and soil are set up in the shearing box. The shearing transformation is given to the sharing box at constant speed by an automatic load device. Then, rock bolt and rope net are put strain gauges to understand behavior of these reinforcement with deformation. The number of rock bolt per one share test are 7 in the normal spacing of the design and 13 in the narrow spacing as the number of pressure plate. The soil ground condition is changed by water content.

3. RESULTS AND DISCUSSION

The shear stress is the highest when soil condition is optimum water content in narrow rock bolt spacing.
It found shear stress of both of rock bolt spacing tend to decrease with increasing water content.
Then, the reduction coefficient μ is calculated by a pull of superior part value of rock bolt and the largest value of pull force of rock bolt. The values in narrow rock bolt spacing are low that are equal to the shotcrete 0.2~0.6. In the percentage of acting reinforcement members against all it, reinforcement effect of rock bolt rise substantially in narrow rock bolt spacing but reinforcement effect of rope net is almost no change.
There are subject of future investigation in consideration for cost-benefit performance.