

Probabilistic Safety Assessment of Existing Ground-Anchored Slope during Earthquake

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Abstract

Ground anchoring is one of the popular methods for maintaining the stability of slope. In this study, a quantitative probabilistic safety assessment (PSA) of existing ground-anchored slope during earthquake was proposed by using the residual tensile force of ground anchor. The PSA can reproduce former maintenance experiences quantitatively. The PSA approach consists of “safety concept”, “probabilistic model” to estimate the failure probability and “thresholded” to evaluate the safety of the slope.

A failure probability of a ground-anchored slope during earthquake should be evaluated based on the variation of tensile forces acting in the ground anchors. Those residual tensile forces have been usually measured by lift-off tests, which typically require time and cost.

In order to overcome this shortcoming of the lift-off test, a non-destructive evaluation for residual tensile force of ground anchors was newly developed. In the developing process, the tendon tension part of a ground anchor is assumed to be a “string”. Therefore, the frequency of its free vibration can be determined by line density, tension length of the PC steel and the operation tensile force.

A series of large scale experiments were conducted by using a proposed measuring equipment shown in Fig.1. It is found out

that the proposed technique can easily indicate the magnitude of the residual tensile force of the ground anchor.

The maintenance engineers can quantitatively evaluate the safety of the anchored slope during earthquake based on the failure probability calculated with only by the tensile force.

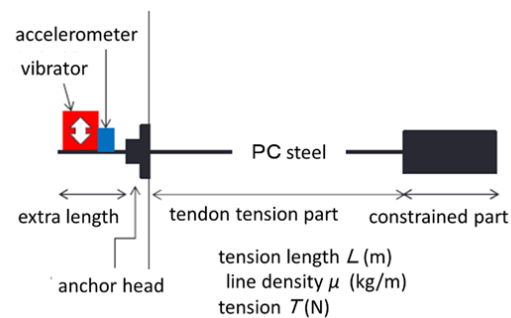


Fig. 1 Vibrator and accelerometer at extra length of anchor head.

Acknowledgments

This work was partially supported by the JSPS (Grant No.18K18875).

References

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