

Trial of Soil Survey Behind Retaining Wall by Cone Penetration Test

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1. Introduction

To acquire knowledge related to “advance” survey methods for retaining walls for residential land and soundness evaluations of residential retaining walls, electric cone penetration tests (JGS 1435-2012; hereinafter CPT), which are one ground survey method, were carried out in the vertical and inclined directions at a residential retaining wall which had suffered earthquake damage.

2. Survey Method

The retaining wall (Fig. 1) that is the object of the survey is a concrete masonry retaining wall located in Soma City, Fukushima Prefecture, and was damaged in the 2011 Off the Pacific Coast of Tohoku Earthquake (Great East Japan Earthquake). After repairs in 2013, it was damaged again in earthquakes that occurred in 2021 and 2022 with epicenters off the coast of Fukushima Prefecture.



Fig. 1 Retaining wall surveyed in this study

The CPT is normally performed in the vertical direction. However, if the probe is penetrated from above the back side of a retaining wall, the distance between the wall

and the probe will increase as the probe descends to the underside of the wall, and it will not be possible to investigate the ground adjacent to the wall. Therefore, in addition to the vertical CPT, a CPT is also performed at an inclined angle of 30 ° (hereinafter, inclined CPT) in parallel to the inclination of the retaining wall surface (Fig. 2).

3. Results and Conclusion

The ground composition at the penetration position could be understood by the vertical and inclined CPT

survey behind the retaining wall. Because there was no clear difference between the strata detected by the two tests except at GL–5.0 m to GL–6.5 m, the inclined CPT can obtain almost the same results as the vertical CPT (Fig. 3, Fig. 4). Based on this, the ground conditions behind a retaining wall and directly under the wall, which are related to wall damage, can be understood by performing an inclined CPT. This is expected to contribute to rationalization of earthquake-resistance diagnosis and seismic reinforcing design. In the future, however, it will be necessary to accumulate examples of points where the inclined CPT method was applied under conditions other than flat land (rear side of retaining walls).

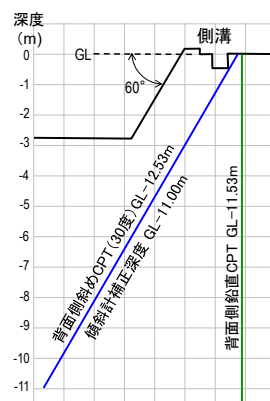


Fig. 2 Diagram of surveyed section

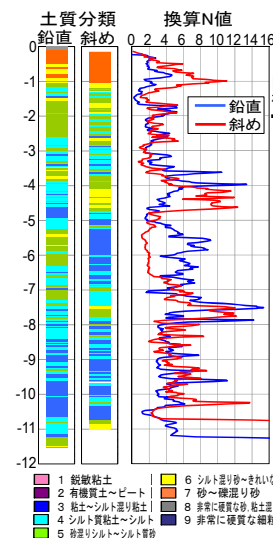


Fig. 3 Comparison of survey results by vertical and inclined CPT

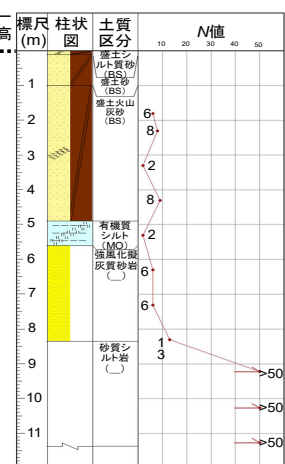


Fig. 4 Columnar section of road embankment near the survey site

For more information:

1) Shuichi Takeya et al., On-site Survey of a Retaining Wall Damaged by the 2022 Off Fukushima Earthquake: Part 1: Trial of soil survey behind retaining wall by cone penetration test, Summaries of technical papers of annual meeting, Architectural Institute of Japan, July 2023

2) Overview of “Technology Development Contributing to Revitalization and Resilience of Cities by Rationalization of Structural Regulations Related to Buildings and Ground”

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