CHARACTERIZATION OF SPATIAL VARIABILITY OF MASADO PROFILES

Hiroshima University, Member ○ Athapaththu A. M. R. G.
Hiroshima University, Int. Member Tsuchida T.
Hiroshima University, Member Suga K.
Hiroshima University, Member Kano S.

1. Introduction

Masado soils are inherently heterogeneous and have been formed by a combination of various geological, environmental, and physical-chemical processes over the years. Evaluation of inherent variability using conventional filed tests often costly and consumes time. Recently developed lightweight dynamic cone penetrometer (LWDCPT) which facilitates continuous and simultaneous recording was used for determination of in-situ strength of natural Masado slopes spatially. This paper describes the inherent variability and correlated distance of Masado slopes. The outcome of the research facilitates promise of applications in investigating of natural Masado slopes.

2. Classification of Masado profiles

Series of in-situ LWDCPT tests were conducted at Ikeno-ue situated on the northern slope of Gagara Mountain in Hiroshima prefecture, Japan. A primary grid as shown in **Fig.2** was established having 5 m intervals. Additional in-situ tests were conducted at 2.5 m, 1 m, and 0.25 m grids points established within the main grid as shown in **Fig.2** in order to find the variability of cone resistance spatially. Based on the 5 m grid data, six patterns were identified with cone resistance varies with depth is shown in **Fig.1**. Pattern A shows gradual increase of cone resistance varying with depth. Even though the trend of varying cone resistance of pattern B is similar to that of pattern A , higher penetration resistance can be observed near to the ground surface. The increment ratio is higher in pattern C than that of patterns A, and B .Patterns D, and E illustrate low values of cone resistance up to the hard layer and pattern D illustrates shallow profile than that of pattern E. Pattern F demonstrates the shallowest profiles. The different areas identified by the patterns are illustrated in **Fig.2**.

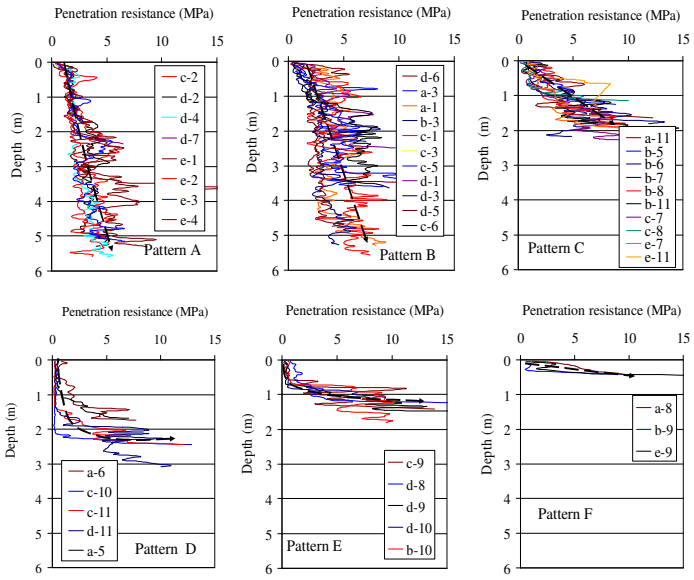


Fig.1 Classification of Masado Profiles: Six Patterns

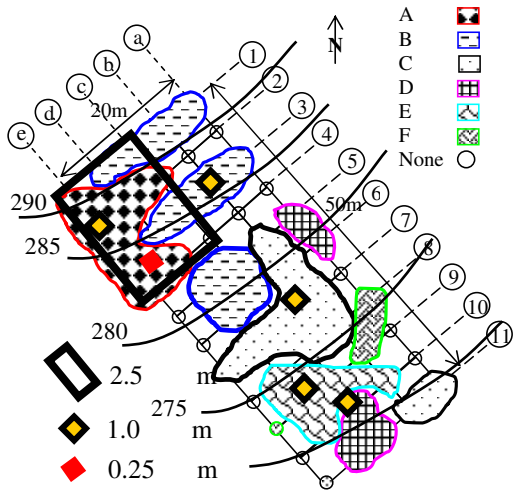


Fig.2 Areas of Patterns and Grids

Key words: Masado, Cone resistance, Spatial variability

Graduate School of Engineering, 1-4-1, Kagamiyama, Higashi Hiroshima, 739-8527. Tel: 0824247785

3. Inherent variability of cone resistance at different grid spaces

The inherent variability of Masado profiles at different grid spaces were determined by means of COV, coefficient of variance (percentage of standard deviation normalized to the sample mean), and are shown in **Figs.3,4,** and **5**. **Fig.5** represents the variability that reported within the most of the areas identified by pattern A. COV of different patterns implicate different values depending on the grid spaces and are found to be varied from 0-40%. However, most of the patterns showed geotechnically reasonable COV which is close to 20%. The COV at close proximity is found to be less than 20% at most of the depths. These values are within the typical COV values for the in situ tests reported by several researchers.

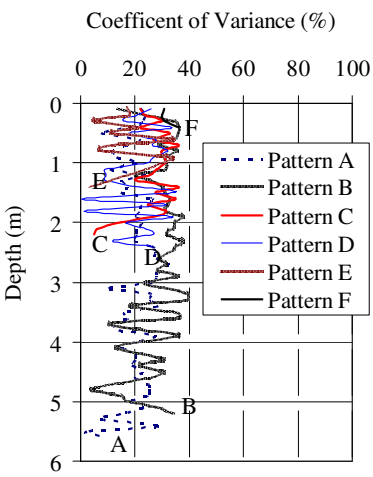


Fig.3 Scatter of data in 5 m grids

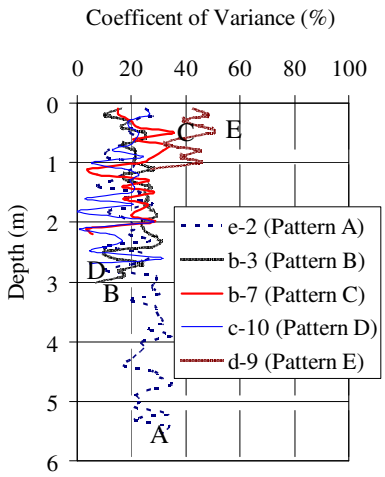


Fig.4 Scatter of data in 1 m grids

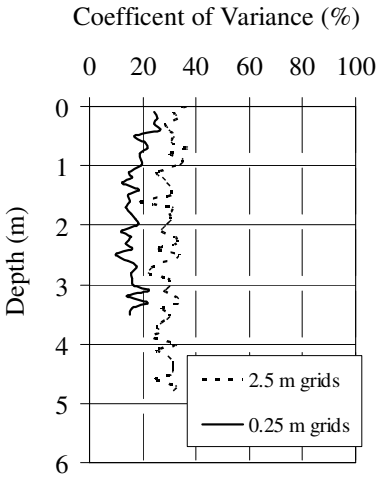
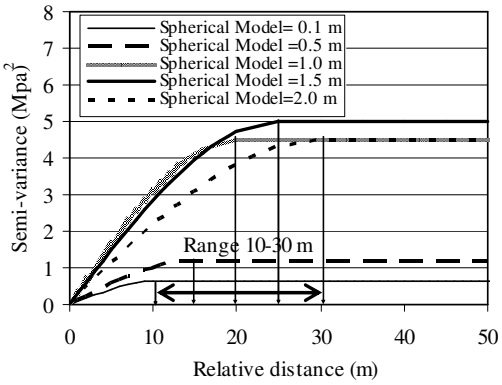


Fig.5 Scatter of 2.5 m and 0.25m grids

4. Evaluation of correlated distance

Geo-statistical analysis was carried out in order to find the correlated distance of cone resistance varies with the 2D space (XY plane). The widely used Spherical model was used to model the data collected from different grid spaces mentioned above. **Fig.6** illustrates the finding of the analyses and it was found that correlated distance of cone resistance varies from 10 m to 30 m depending on the depth. Further it was observed that correlated distance increases with the depth.



5. Discussion

The findings of this research can be applied directly or in slightly modified form for investigation purposes in Masado slopes. The correlated distance is much useful in determining the grid spaces of carrying out in situ investigations. Classification of profiles is useful for identification of particular soundings at the site and distribution of patterns. The inherent variability can be incorporated in carrying out geotechnical analyses.

6. Concluding remarks

1. It was found that Masado profiles can be classified into six major patterns depending on the cone resistance varying with the depth. The inherent variability was ranging from 0-40% depending on the grid spaces concerned. The average COV was found to be 20% and it is almost similar to the ranges of COV reported by researchers elsewhere for in situ penetration tests.
2. The range of influence of Masado soils was found to be varying with the profile depth. The correlated distance varies from 10 m to 30 m with the depth increases from 0.1 m to 2.5 m.