

GRANULAR SOIL DEFORMATIONS BUILT UP DURING AN INTENSE EARTHQUAKE

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1. INTRODUCTION

The Great Hanshin Earthquake of 1995 has left signs of its intense seismic motion in soils at various places in Kobe, and these signs are found to be correlated somehow with the features of disaster at those places (Special Issue of Soils and Foundations, 1996). The intense shake caused a number of slope failures and rock falls in the Rokko mountain range that rises north behind Kobe City. The scratches were found mostly on weathered granite slopes along the bundle of faults running through the mountains (Ito, 1995). Many small rivers flow from the Rokko mountains into the Osaka bay. These rivers have carried, over the centuries, large amounts of soil, sand, and other suspended matter in their waters, and this sediment has built up into fan-shaped alluvial plains that are lined up along the mountainside of Rokko (Huzita, et al. 1983). Kobe city spreads over this narrow alluvial plane formed between the Rokko mountains and the Osaka bay. Frequent flooding in this area has formed layered soil profiles of these alluvial fans with relatively loose and soft soil layers being sandwiched in their interiors. These soft layers might have been responsible for amplifying the ground motions to a considerable extent, and may retain traces of their plastic deformations. The traces are thus expected to be found on a large number of underground structures like manholes, which are just upright piles of discrete concrete rings. The authors have collected data of dislocated manhole rings in Kobe City to discuss how the soil deposits were displaced during the quake. It is to be shown herein that quite large strains exceeding a couple of percents or larger were probably imposed on some soils. The importance of studying granular soil behaviors, thus, emerges from the findings obtained through the investigation.

* This manuscript was prepared for the "Proceedings of the workshop on Prediction and Assessment of Earthquake-triggered Landslides", Kyoji Sassa eds., 1997.