

Parameter Estimation and Numerical Analysis of Self-Weight Consolidation of Slurried Marine Clay

Fumiyoshi Kondo

Miyazaki University, Miyazaki, Japan

Md. Asgar Ali Sarkar and Takefumi Nakazono

Kagoshima University, Kagoshima, Japan

Masato Kunitake

Miyazaki University, Miyazaki, Japan

ABSTRACT

The self-weight consolidation characteristics of slurried marine clay with high water contents were investigated. Numerical analysis of self-weight consolidation was also performed using the consolidation equation considering the effect of clay self-weight derived by Mikasa (1963). The volume ratio (f) and effective stress (p) relationship, and the hydraulic conductivity (k) and volume ratio (f) relationship are needed as parameters for numerical analysis. The f - p relationship was determined by a centrifugal model test using a small centrifuge by two methods, and the k - f relationship was determined by the centrifugal model test and standard oedometer test. The validity of these parameters was then investigated in comparison with the measured and calculated settlements.

KEY WORDS: Self-weight consolidation, slurried marine clay, centrifugal model test, oedometer test

INTRODUCTION

The settling and self-weight consolidation rate of dredged clay are important factors to be considered in the planning of land reclamation and for the use of reclaimed land. The settling rate of a clay suspension with a high water content and high salt concentration, as in seawater, is so rapid that during land reclamation estimation of the settling rate by the self-weight consolidation of slurried clay becomes the main problem. The settling type of slurried marine clay in seawater shifts from zone settling to self-weight consolidation when the initial water content decreases to less than 1000% (Imai, 1980; Kondo et al, 1996).

The volume ratio f is defined as $f=1+e$, where e is the void ratio. The relationship of the volume ratio (f) and effective stress (p) is needed as a parameter for estimation of the final settlement, and that of the hydraulic conductivity (k) and the volume ratio (f) is

needed for estimation of the settling rate in numerical analysis of one-dimensional consolidation (Mikasa, 1963; Takada, 1983). Nishimura et al (1992) reported that these parameters significantly influence the results. These relationships for numerical analysis of the self-weight consolidation of slurried clay as dredged clay can be determined using a seepage force test or a centrifugal model test with a large centrifuge (Imai, 1979; Mikasa and Takada, 1984). On the other hand, Umehara and Zen (1980) have determined these relationships using a consolidation test with a constant rate of strain. Toriyama (1981) has also determined these relationships using a triaxial consolidation test. However, because the experimental devices needed for the seepage force test, constant rate of strain consolidation test and triaxial consolidation test are so complicated, they are not commonly used.

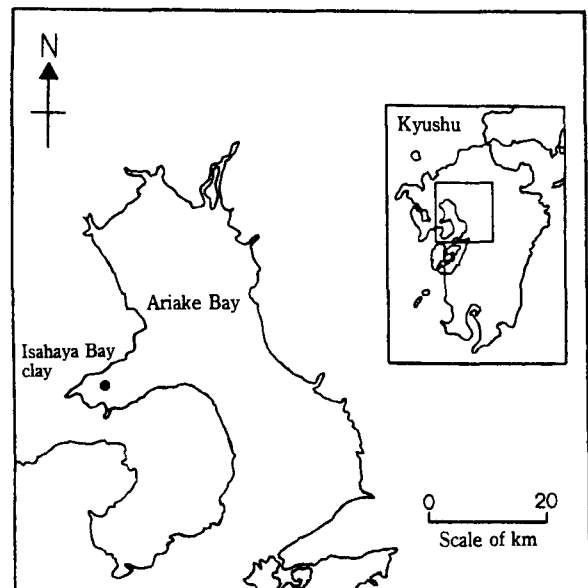


Fig. 1 Sampling site of Isahaya Bay clay