POSSIBLE MICROSTRUCTURE OF CEMENT STABILIZED CLAYS

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1. INTRODUCTION

Very few studies have done on the microstructure of cement stabilized clay. Nagaraj et al. (1998) proposed the possible microstructure of cement treated clays and compared with that of uncemented clays. Their presentation is modified and presented here. Yamadera et al. (1999) investigated the pore size distribution and permeability of remold clay, undisturbed clay and cement stabilized clay and revealed that they posses the same coefficient of permeability at the same void ratio.

2. EFFECT OF WATER/CEMENT RATIO ON CEMENTATION BOND STRENGTH

The sample used for this study is Ariake clay from Saga plain. The influence of the water/cement ratio, *w/c* on the cementation bond is explained by Figs.1 and 2. In order to express the strength of cementation bond, It is possible to illustrate in terms of yield stress from the oedometer test. The water/cement ratio is defined as the ratio of weight of water of clay to the weight of cement power (in the other words, the ratio of clay water content to cement content). The cement content is defined as the ratio of weight of cement power to dry weight of clay. Figure 1 shows a relation of e~logσ'_v of two cement stabilized samples having the same *w/c* ratio of 15 at 7 days of curing. The first sample is the mixture of 150% clay water content and 10% cement content. The second sample is the mixture of 184% clay water cement content and 12% cement content. It is of interest to mention that these both states of cement stabilized Ariake clay having the same *w/c* value of 15 provide the same value of yield stress, σ'_y even their initial water content and cement content are different. The strain~logσ'_v relation of both states, moreover, provides the same manner as shown in Fig. 2. Thus it is worthy of conclusion that the water/cement ratio, *w/c* is a dominant parameter for enhancing cementation bond strength.

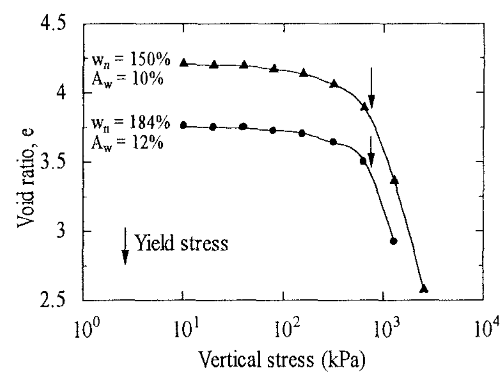

Figure 1 Relationship between void ratio and vertical stress of both states of cement stabilized samples having the same *w/c* of 15

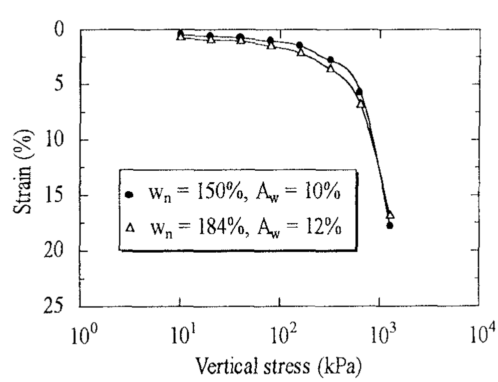

Figure 2 Relationship between strain and vertical stress of both states of cement stabilized samples having the same *w/c* ratio of 15

3. MICRO FABRIC OF CEMENT STABILIZED CLAYS

The micro fabric of cement stabilized clay can be explained by the permeability test result. Figure 3 shows the generalization e/e_L of cement stabilized Ariake clay at LI = 1.0 and 1.5, as well as reconstituted sample (e_L is the void ratio at liquid limit state). It is concluded that the micro fabrics of cement stabilized and uncemented clays are similar proportional to their liquid limit water content. Hence the role of the cementation bond is only to weld the fabric without changing of micro fabric.

4. MICROSTRUCTURE OF CEMENT STABILIZED CLAYS

Based on the above results, the possible microstructure of cement stabilized clays can be proposed as shown in Table 1. The effect of *w/c* on the microstructure of cement stabilized clays is classified into two categories. Any states of cement stabilized clay, which have the same water content of mixture but different *w/c* ratio are mentioned in case 1. The stabilized clay with lower *w/c* ratio provides higher the cementation bond strength, P'_b but the fabric is identical.

The second case is the states of stabilized clay having the same *w/c* ratio but different clay water content and cement content. The void ratio and permeability of stabilized clay with higher *w/c* ratio must be higher than those of stabilized clay with lower *w/c* ratio. Yet the cementation bond strength, P'_b is the same.

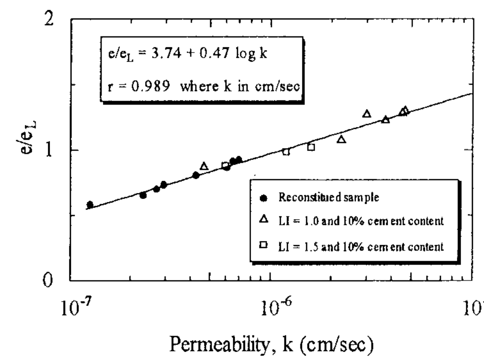

Figure 3 e/e_L~log k plot of cement stabilized Ariake clay and reconstitute sample

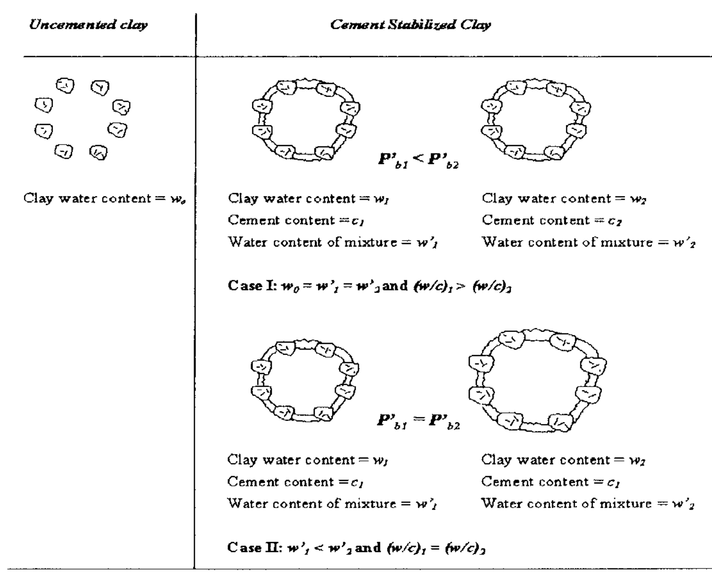

Table 1 Possible microstructure of uncemented and cement stabilized clay

5. CONCLUDING REMARKS

The effect of water/cement ratio, *w/c* on the microstructure of cement stabilized clays is manifested in this paper. The conclusions can be drawn as follows:

(1) The cementation bond strength of cement stabilized clays is strongly governed by the *w/c* as illustrated in Figs.1 and 2.
(2) The role of cementation is only to weld the fabric without changing of micro fabric.
(3) Microstructure structure of stabilized clays is classified into two categories. The fabric of the clay-cement mixtures is identical as long as their water contents are not different. Moreover, the cemenation bond strength is unique for the clay-cement mixtures having the same *w/c* ratio.

REFERENCES

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