TIME EFFECT ON LIQUEFACTION POTENTIAL OF SILT CONTAINING VARIOUS AMOUNTS OF CLAY PARTICLES

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SUMMARY

Presented in the paper are the results of experimental research of liquefaction characteristics of silt by varying the content of clay particles and time. The laboratory tests were run on remoulded silt specimens by using cyclic dynamic triaxial device. The presented analysis particularly show that clay particle content Pc=9% is a turning point of silt character variations at any deposited time. Another important result from the analysis is that varied rule of silt structure increases with content of clay particles and time effect.

INTRODUCTION

Many earthquake disaster examples have proved that not only saturated sand but also saturated silt subsoils could suffer liquefaction damage. Wang (wang, 1979) in 1976, his investigation of Tang Shan Earthquake, showed that silt liquefaction occurred in the seaside Tian Jin city leading to severe damages to many engineering structures. In the 1995 Hyogoken-Nanbu Earthquake widespread liquefaction occurred in the seaside area of Kobe city leading to large ground deformation and severe damages to many engineering structures. (M.Cubrinovski et al., 1996)

Up to now, the phenomenon and assessment of the liquefaction of silt have been studied deeply and extensively by researchers, Zhong (Zhong, 1980) and Qiu (Qiu ed al., 1988). In order to study liquefaction mechanism and resistant characteristics of silt, the authors (Niu et al., 1996) once run on remoulded and undisturbed silt samples of varying the dry density and varying the content of clay particles (Pc) by using cyclic dynamic triaxial device, in addition, liquefaction assessment and resistant characteristics of the silt have been studied Relationship of liquefaction characteristics and time were further analysed through three year's test and research, so the general rule of liquefaction behaves of silt is drawn.

Soil Characteristics, Silt and clayey particles of preparative silt samples used is this study were taken from the site which is located near YiFen bridge, on the west bank of Fen river in northern TaiYuan. The soil were deposited and dried on the bank Fen river. The physical properties of soil are summarised in Table 1.

Table 1

Soil	Specific Gravity	Plasticity index	Medium diameter(mm)	Coefficient of uniformity	Content of clay particles(%)
Silt	2.69	7.9	0.043	2.8	0
Clayey particles		20.99			40

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All the remoulded samples were made in laboratory. The content of clay particles were 3%, 6%, 9%, 12%, 16%, and they were put in soil box 900×400×300mm to deposit. These samples were divided into three groups according to their dry densities 14.4, 15.6, 16.4KN/m3 respectively. Through 0.5, 1, 2, years' deposition, samples were made for test. Cyclic Triaxial Device, The instrument used is DSD-200 model cyclic triaxial device, stress controlled, designed by china. Its index properties are as follows:

Frequency	0.01HZ-50HZ
Maximum vertical pressure	25KN
Maximum confining pressure	1.0MPa
Height of sample	10cm
Diameter of sample	5.0cm

All remoulded silt samples were also studied for their microstructure by KYKY-AMARY 1000B scanning electron microscopy in the laboratory. Voltage is 25KV. All surface of samples were treated by C or Au.

In order to closely investigate the liquefaction resistant characteristics of saturated silt. The author performed laboratory dynamic triaxial, liquid limit (Wl), and plastic limit (Wp) tests on all samples with different clay particle contents and different dry densities. The test results are shown in Fig 1, 2, and 3.

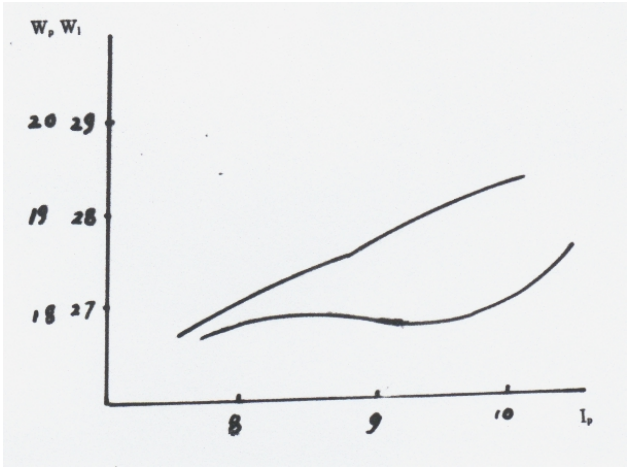

Fig.1 Correlationship W_p , W_l , and I_p

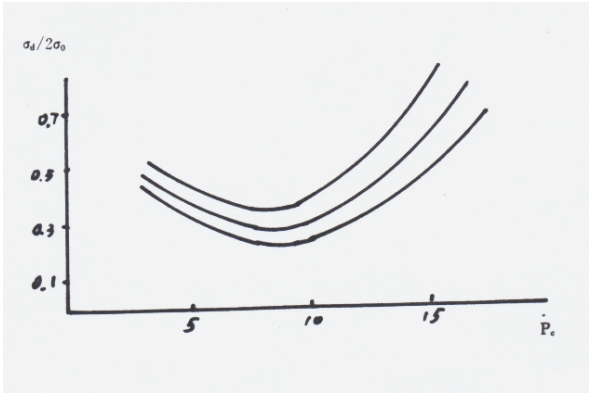

Fig.2 Correlationship $\sigma_d / 2\sigma_0$ and P_c

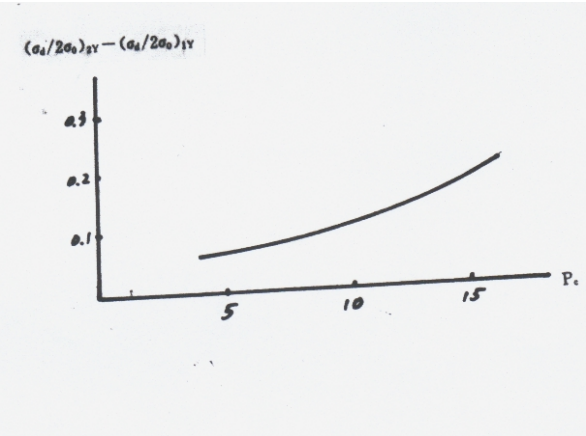

Fig.3 Correlationship $\left(\sigma_d/2\sigma_n\right)_{2Y}-\left(\sigma_d/2\sigma_n\right)_{1Y}$ **and** P_c

Figure 1 shows the closer relations of liquid limit (Wl), plastic limit (Wp) and plasticity index (Ip). Figures 2, 3 show the results of the clay particle contents (Pc) and cyclic stress ratio at different time effect. It can be judged that the fine content is a significant factor on silt liquefied. Figures2, 3 show that the dynamic shear strength increases with content of clay particles, and silt structure is getting stronger due to time effect.The forms of clay particle arrangements are based on a microphotograph analysis (photo.1, 2). The density of silt will increase with the action of time effect.

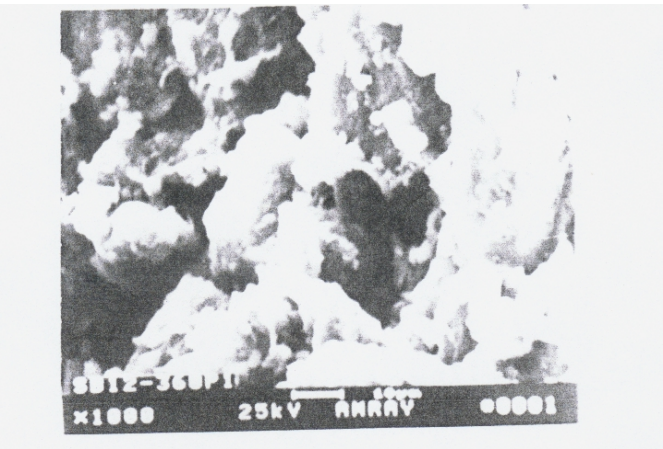

Photo.1 Pc=12 (one-year micro-photograph)

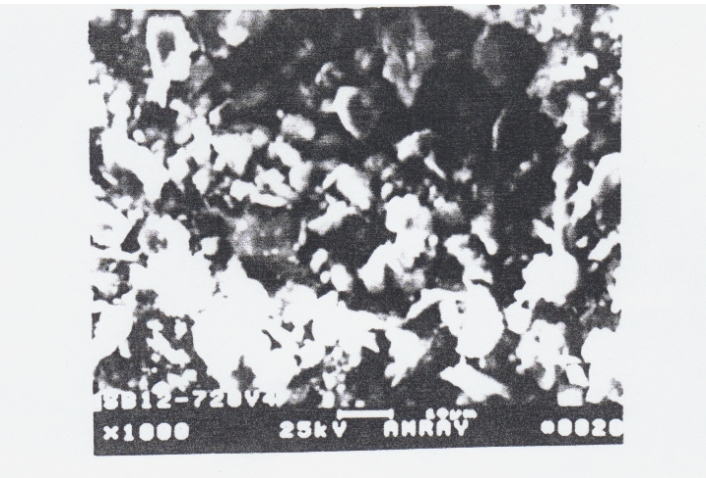

Photo.2 Pc=12 (two-year micro-photograph)

CONCLUSIONS

Based on the result of the study described above, the following general conclusions can be drawn out:

1. Clay particle content Pc =9% is a turning point of silt character variations.

2. The cyclic stress ratio of remolded silt changes with content of clay particles in a curve of paraboloid, the lowest shear strength is at 9% of content of clay particles at any deposited time.

3. The dynamic shear strength increases with content of clay particles and silt structure is getting stronger due to time effect.

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