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STATISTICAL RELATIONS BETWEEN GEOTECHNICAL PROPERTIES OF
ARIAKE CLAY IN SAGA PLAIN

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INTRODUCTION

Saga plain a low land of less than 5 meter above sea level with an area of about 400km² lies in north of Ariake sea in Kyushu. The Ariake clay is a very Soft clay deposited around the shore of the Ariake sea. The thickness of Ariake clay in saga plan is generally 10 to 20 m with a maximum value of 30 m. In this study, relation among geotechnical properties of Ariake clay in saga plain were analysed by using simple and multiple regression analysis accompanied with F test.

ANALYSIS OF DATA

The study used geotechnical properties of Ariake clay from 110 exploratory boreholes drilled up to depth of 40 m in different place of saga plain, and then the data of up to depth of 20 m were selected for later analysis. Clay mineral in Ariake clay are montmorillonite, illite, hydrohalloysite and metahalloysite (Onitsuka et al, 1976). The natural water content of Ariake clay, in general, is higher than liquid limit, N value 0 to 5, and unconfined compressive strength (q_u) mostly less than 1 kg/cm². The sensitivity of Ariake clay is mostly greater than 16 (Nakamura et al, 1985), that increase with decreasing of its salt content (Onitsuka, 1988).

Simple and multiple regression analysis were used to obtain relation between Physical (void ratio; e , consistency limits; LL & PI , total unit weight; γ_t in gr/cm³, depth; DEP in meter) and mechanical (unconfined compressive strength; q_u in kg/cm², compression index; C_c , pre consolidation pressure; P_c in kg/cm²). Some of the results are presented in tables 1 and 2, and figures 1 to 4.

Table 1 Regression results for mechanical properties

	Equation	R	F test
q_u	$q_u = 0.061 + 0.042DEP$	0.854	567.7
	$q_u = 1.571\gamma_t - 1.859$	0.618	130.3
	$q_u = 0.036DEP + 0.256\gamma_t - 0.653$	0.871	329.3
	$q_u = 0.27 + 0.037DEP - 0.002w_n$	0.866	314.3
	$q_u = 0.37DEP + 0.674\gamma_t + 0.254e - 0.936$	0.871	219.6
C_c	$C_c = 0.612e - 0.409$	0.858	644.2
	$C_c = 0.015w_n - 0.342$	0.833	522.6
	$C_c = 0.013DEP + 0.64e - 0.585$	0.866	342.1
	$C_c = 0.658e - 0.002LL - 0.334$	0.862	330.1
	$C_c = 0.011LL + 0.128$	0.506	79.3
P_c	$P_c = 0.068DEP + 0.117$	0.863	491.9
	$P_c = 1.195q_u + 0.159$	0.871	448.3
	$P_c = 0.023DEP + 0.835q_u + 0.127$	0.889	268.9
	$P_c = 0.02DEP + 0.84q_u - 0.047e + 0.272$	0.894	186.5
	$P_c = 0.064DEP + 0.002w_n - 0.148e + 0.328$	0.871	174.5

Table 2 Regression results for physica properties

Equation	R
$\gamma_t = 1.788 - 0.814\log e$	0.954
$\gamma_t = 3.05 - 0.797\log w_n$	0.961
$e = 0.024w_n + 0.142$	0.98
$PI = 0.73(LL - 22)$	0.96

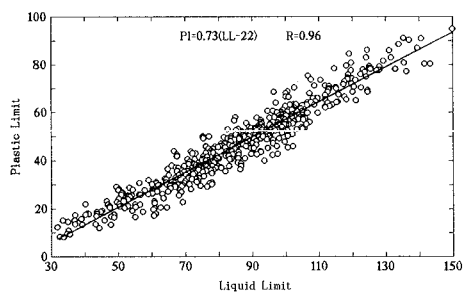


Fig.1. Consistency limits of Ariake clay

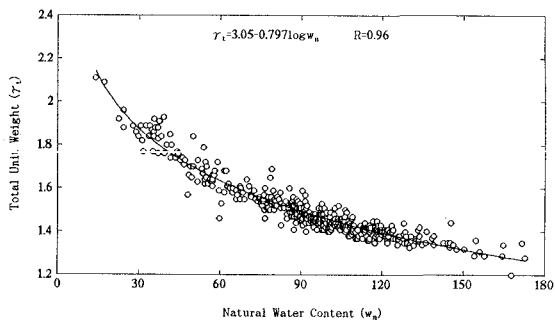


Fig.2. Total unit weight (γ_t) in relation to natural water content (w).

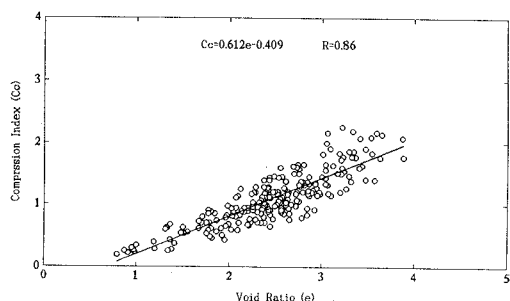


Fig.3. Compression index (C_c) in relation to void ratio (e).

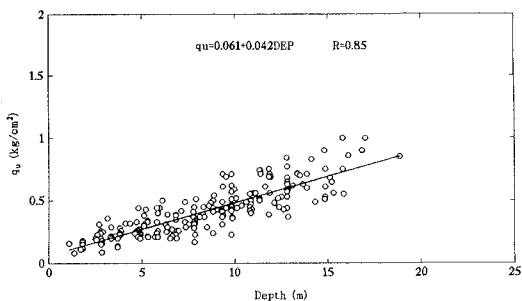


Fig.4. Uniaxial compressive strength(q_u) in relation to depth

CONCLUSION

With considering the F value, all of relation in table 1 and 2 are acceptable, even with 1% ($\alpha = 0.01$) level of significance, and can be used due to available data in first stage of soil investigation of any engineering plan.

Physical (void ratio, total unit weight, plastic limit) and mechanical (unconfined compressive strength, compression index, pre consolidation pressure) properties of Ariake clay can be estimated with presented relations only by knowing natural water content, depth of sampling, and liquid limit.

REFERENCES

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