EVALUATION OF GEOTECHNICAL PROPERTIES OF QUATERNARY SEDIMENTS IN NORTH-WESTERN PART OF IRAN(GILAN PLAIN) USING MULTIPLE REGRESSION ANALYSIS

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Introduction

The investigated area which is located in the northwestern part of Iran (Gilan plain) is mostly underlied by fine grained soils. The area suffered a catastrophic earthquake in 21 June 1990. As the area is located in one of the most hazardous seismic zones of Iran and subsurface materials are weak, for re-construction activities of the area, the evaluation of mechanical and physical properties of fine grained soils are necessary. In this study relation between some of major physical and mechanical properties of soils were analyzed using multiple regression analysis and the obtained relations can be useful in primary decision for engineers design during re-construction activities of the area.

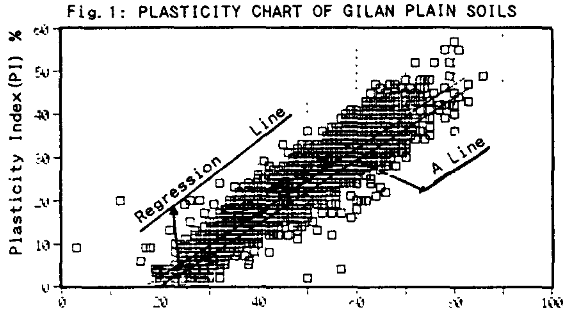
Data source

In this work the results of 139 site investigation projects containing geotechnical information were collected. Only the more fundamental geotechnical tests results such as shear strength parameters, compression index, N spt, atterberg limits, water content, void ratio, density,... were input into a computer data base.

Analysis of the data

By considering the soil graine size (passing No. 200), the soils were divided into two groups, fine grained and coarse grained soils. In this study fine grained soils were selected for regression analysis. Figure 1 shows the plasticity chart for Gilan plain. The soils show widespread range of plasticity characteristics and the regression line for these soils is approximately parallel to A line. For performing multiple regression, first of all the fine grained soils were classified into low plastic soils (group 1) and high plastic soils (group 2). Figure 2 illustred distribution of low and high plastic soils. The Rasht area involves two groups of soils but the other area especially coastal area, located in low plastic group.

Fig. 1: PLASTICITY CHART OF GILAN PLAIN SOILS



Multiple regression analysis were adopted to obtain the relationships between unconfied compressive strength (qu) and compression index (Cc) with some physical properties of soil such as depth, water content, atterberg limits, density, void ratio, N spt and also preconsolidation pressure (Pc) were analyzed. The results are given in table 1. In order to easily and fastly determine the major physical properties of soils by other physical properties, which is needed for initial evaluation of soil characteristics in design activities, the simple linear regression analysis were performed between a pair of physical properties and also relation between compression index with physical properties of soils. Tables 2 and 3 show the results of simple linear regression analysis

The variability of physical properties of these soils with depth

Were investigated.

Concluding Remarks

In this study, the relationships between compressibility and unconfied compressive strength with some major physical properties of fine grained soils in northwestern part of Iran(Gilan plain) using multiple regression analysis were investigated and the following results were obtained:

Independent variables were determined by examining the magnitude of the contribution of independent variables to dependent variables during the analysis and the magnitude of contribution shown by F values.

Void ratio of the soils show linear relation with their water content and density and also density with water content, which in all cases the correlation coefficient is relatively high. The obtained equations by multiple and simple regression analysis can be useful for engineer in re-construction activities of the area.

Plasticity chart of soils shows the widespread range of plasticity and type of fine grained materials.

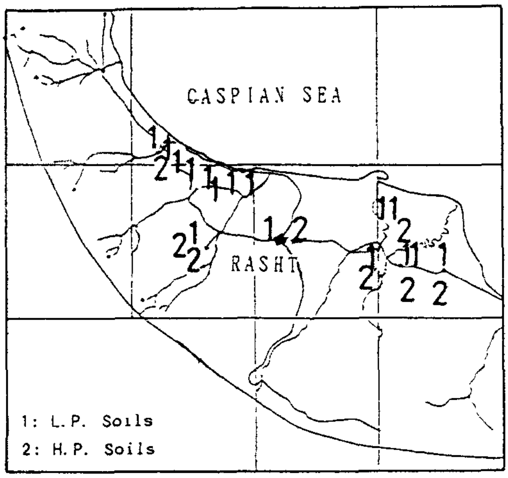


Fig. 2: Distribution of fine grained soils in Gilan Plain

Table 1: Multiple Regression Results

	Regression equation	R*	s.g**
q_u	$q_u = -5.44+3.34\ \gamma_t$	0.593	2
	$q_u = -4.82+2.77\ \gamma_t+0.28\ Pc$	0.64	2
	$q_u = -7.14+3.76\ \gamma_t+0.47\ e_0+0.288\ Pc$	0.657	2
	$q_u = -10.16+0.019\ w\%+5.06\ \gamma_t+0.403\ e_0+0.27\ Pc$	0.663	2
	$q_u = -4.3+2.65\ \gamma_t$	0.45	1
	$q_u = -13.8+0.05\ w\%+6.47\ \gamma_t$	0.59	1
	$q_u = -12.94+0.024\ d+0.044\ w\%+0.34\ \gamma_t$	0.63	1
	$q_u = -12.26+0.024\ d+0.04\ w\%+5.9\ \gamma_t+0.18\ Pc$	0.65	1
C_c	$C_c = -0.004+0.27\ e_0$	0.63	1
	$C_c = 0.44-0.2\ \gamma_t+0.2\ e_0$	0.64	1
	$C_c = 0.42+0.001\ WL-0.213\ \gamma_t+0.193\ e_0$	0.65	1
	$C_c = 0.02+0.283\ e_0$	0.7	2
	$C_c = -0.04+0.005\ w\%+0.17\ e_0$	0.74	2
	$C_c = -0.15+0.004\ w\%+0.002\ WL+0.176\ e_0$	0.746	2
	$C_c = 0.3+0.002\ w\%+0.002\ WL-0.2\ \gamma_t+0.17\ e_0$	0.75	2

*: Multiple correlation coeficient
**: Soil group

Table 2: Simple Regression Results for physical properties of Soils

	Regression equation	r	s.g*
e_0	$e_0 = 0.189 + 0.0217\ w\%$	0.82	2
	$e_0 = 0.12 + 0.0235\ w\%$	0.89	1
γ	$\gamma_t = 2.22 - 0.0096\ w\%$	.89	1
	$\gamma_t = 2.3 - 0.012\ w\%$	.93	2

Table 3: Simple Regression Results for Cc

	Regression equation	r	s.g*
C_c	$C_c = -0.079 + 0.39\ e_0$	0.79	2
	$C_c = -0.35 + 0.3\ e_0$	0.78	1
	$C_c = 1.71 - 0.75\ \gamma_t$	0.75	2
	$C_c = 1.25 - 0.53\ \gamma_t$	0.65	1
	$C_c = -4.15 + 0.0075\ w\%$	0.8	1
	$C_c = -0.043 + 9.88\ w\%$	0.77	2

*:soil group

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