COMPUTERIZED SOIL MECHANICS TESTS AND SOIL REPORTS OF THE GEOTECHNICAL INSTITUTE OF SHIRAZ UNIVERSITY

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The Geotechnical Institute of School of Engineering of Shiraz University is responsible for geotechnical investigations and consultings. The process of preparation and checking of test reports was time consuming and required a great deal of effort on the part of the soil technicians and the consultants. In addition the synthetic evaluation of the results of different investigations performed on the same soil type was not easily possible. The authors, as consultants to the Geotechnical Institute, have computerized all soil tests and soil logs of the borehole results and also comparative analysis of the data obtained. The computerized scheme covers different soil tests. The log of the soil graphically presents important field test results. In addition, the computerized synthetic correlation of data base can be used for predicting foundation behavior. This computerized scheme has resulted in economy and great time saving and promoted research in corresponding fields.

INTRODUCTION

The Geotechnical Institute of the School of Engineering of Shiraz University was founded in 1967 to promote consulting and research in the area of soil Investigation. It has been responsible for testing and preparing soil reports for many important projects such as silo structures, dams, high-rise buildings, hospitals, etc.

The authors as consultants to the Geotechnical Institute prepared a data base using the test results carried out during the first 25 years of Institute life and were able to correlate soil properties such as modulus of elasticity and unconfined compression strength to the standard penetration number [1].

Although the School of Engineering has recently acquired computerized Soil Mechanics laboratory equipped with data loggers and also several computer programs for soil tests, but due to the following reasons the authors developed their own computerized Soil Mechanics test and soil logs reports with data base

capability. First, most of the available programs are in executable forms and variations in the programs if needed are difficult to achieve. Second, most of the programs are self sufficient and can not be tied to data base.

In this paper, after explanation of the programs, their effects on the operation of Geotechnical Institute are discussed. It will be seen that the computerized scheme has resulted in economy and time saving and has also promoted research works.

COMPUTERIZED SCHEME

The policy behind the development of the programs was based on:

a) Adaptability to Institute soil testing equipments.

b) Ease of operation by personnel of the Institute.

c) Capability of being tied to data base for correlation and research purposes.

Based on the above policy multi-purpose program package Works of Microsoft and Grapher package for graphing were used as the basis for development of the programs. The capability of having word processor, data base, spreadsheet and graphing at the same time, permitted the preparation of the programs to be carried out systematically. The technician had access only to the cells in the data sheet that required data input, while calculating cells were protected and graphs would be created automatically and the data would be tied to data base.

The basic soil tests computerized cover: grain size analysis (sieve analysis), hydrometer test, liquid limit and plastic limit determination, compaction test, field density determination, unconfined compression strength, triaxial compression tests with automatic evaluation of Mohr's envelope and strength parameters ϕ (angle of internal friction) and C (cohesion) of the soil and consolidation test.

The outputs include the tabulated test results and corresponding graphs. Samples of results are presented in Figures 1to 5 which show the result graphs of sieve analysis, compaction test, time rate of settlement for consolidation test, Mohr's strength envelope and strain versus pressure for consolidation test.

Most of the output tables and graphs are oriented to normal printers, although, plotters can also be used.

The soil log of the borehole is also computerized including important field test results such as standard penetration tests, densities, field unconfined strength test etc.

The data base includes the following information at different depths for all soil borings:

a) Description of the soil

b) Soil classification

c) Dry density

d) Atterberg's limits

e) Natural water content

f) Unconfined compression strength

g) Percent passing No. 200 sieve

h) Consolidation parameters

i) Strength parameters ϕ and C

j) Madulus of Elasticity

k) Standard penetration number

l) Specific gravity

In addition, the diameter of the borehole, ground water level and any other available information may be included.

Occasionally correlation computer programs are run to find the required relations between measured soil properties for a given soil type.

The preparation of test results for a normal geotechnical investigation project concerning 5 borings with the average depth of 20 meters for each boring, would take approximately two weeks of the technicians and consultants time prior to computerization. Using the computerized scheme this work would be finished in one day maximum provided a personal computer and a printer are available. Computerization has freed the technicians from many laborious calculations and cross checkings and has made it possible for the consultnants to see the results prepared more efficiently, neatly and rapidly.

CONCLUSIONS

The computerized scheme at Geotechnical Institute of School of Engineering of Shiraz University has resulted in economy and time saving. It has also promoted research in correlating of soil properties. At present, updating the programs to run under MS Works, Window's oriented programs are under preparation.

ACKNOWLEDGMENT

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REFERENCES

1. Behpoor, L. and Ghahramani, A., Correlation of SPT to strength and modulus of elasticity of cohesive soils, proc. 12th International Conf. on Soil Mech. & Foundation Eng., pp. 175-178, Rio de Janeiro, 1989.

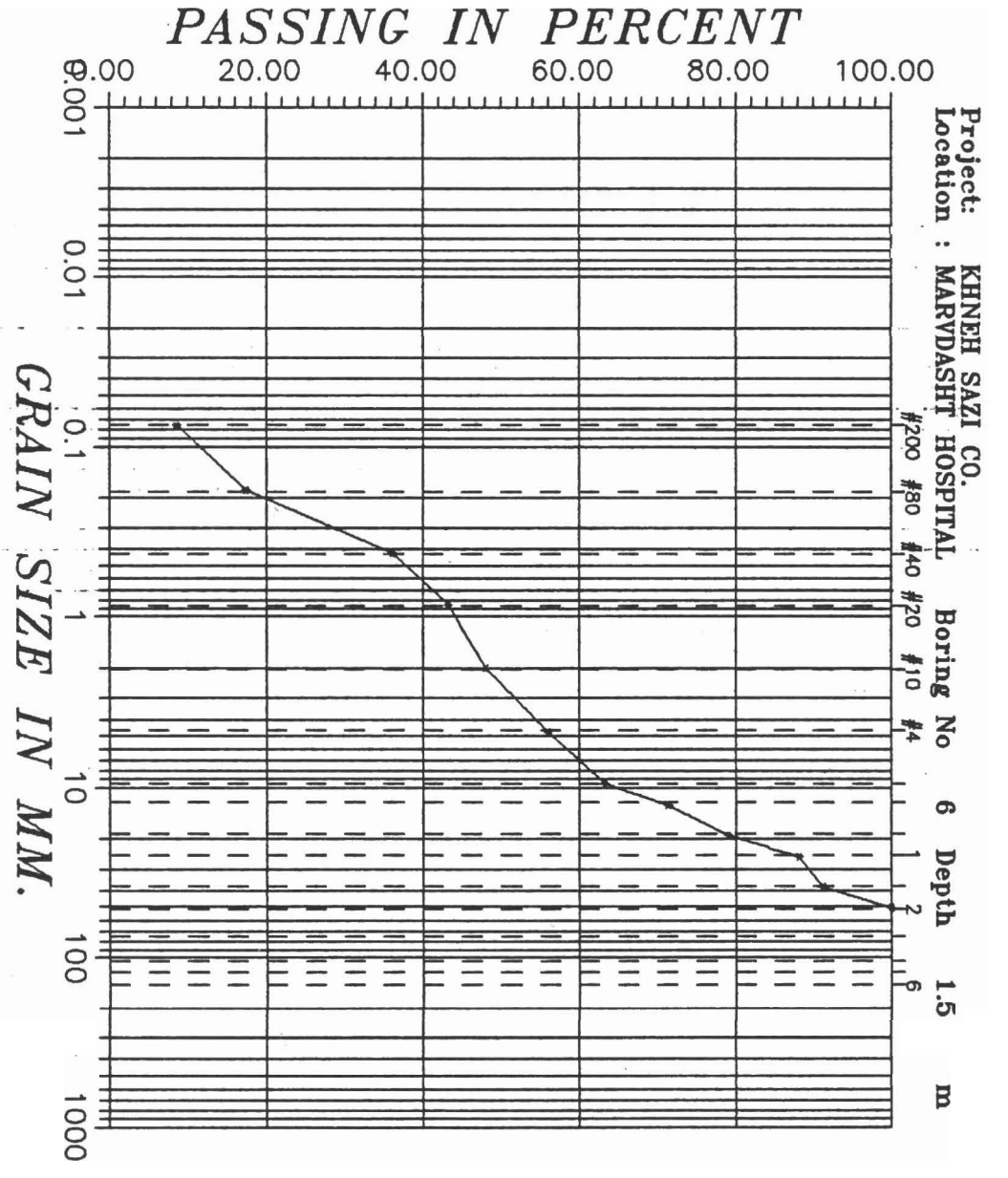

Fig. 1. Sieve analysis

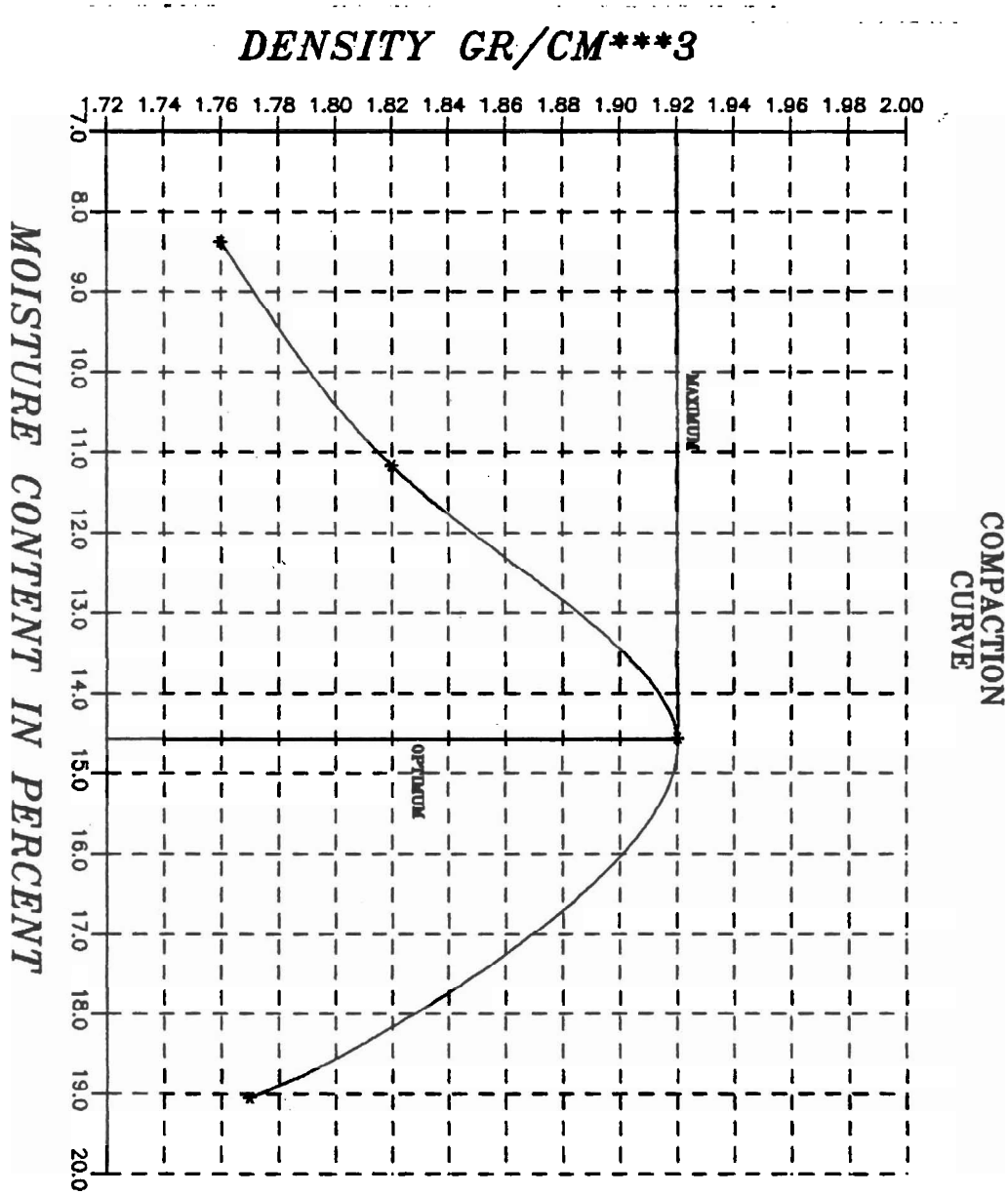

Fig. 2. Compaction test

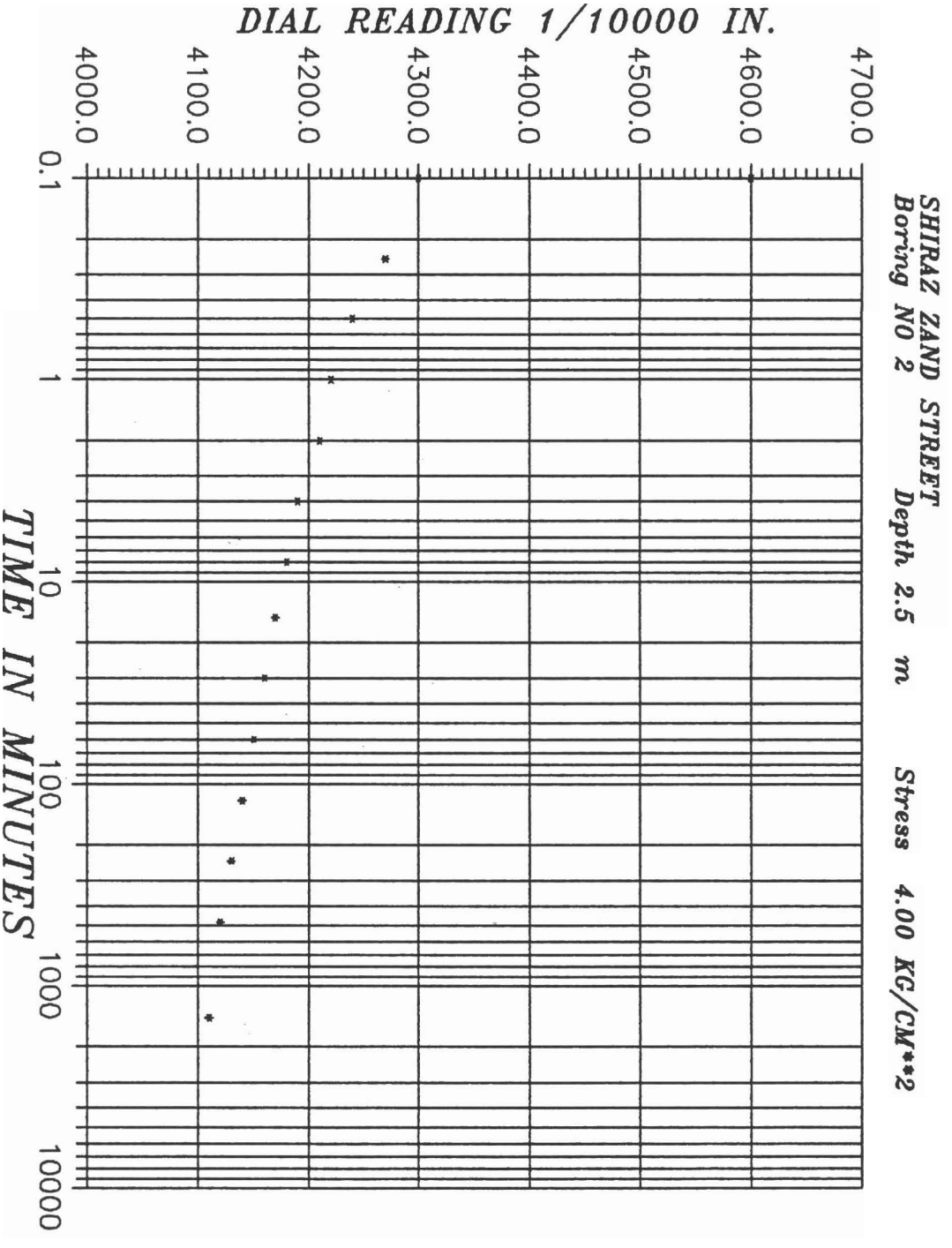

Fig. 3. Consolidation time rate of settlement

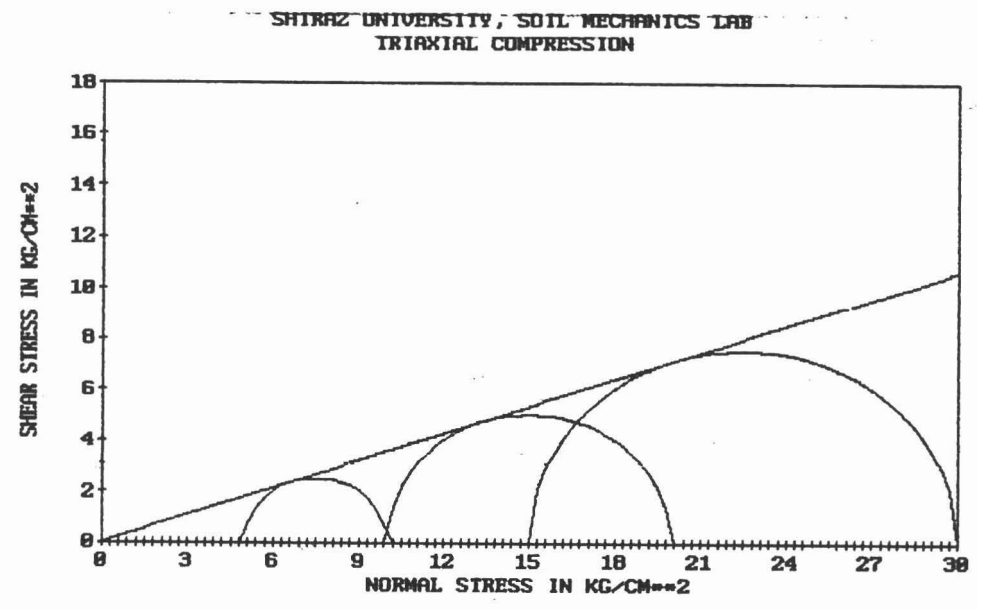

Fig. 4. Mohr's strength envelope

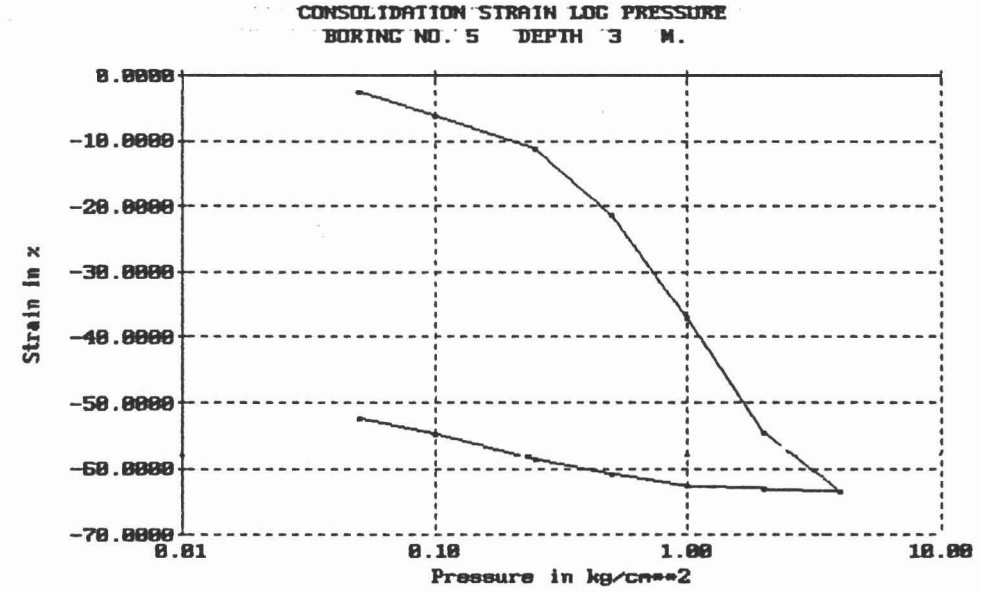

Fig. 5. Consolidation strain versus pressure