Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2015, 7(3):671-674

Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Web-based language teaching in China: Status Quo, Methodology and Prospect

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ABSTRACT

With the rapid economic growth, China has made considerable progress in the development of engineering. Geotechnical engineering, social development, due to its good practicability, has been effectively helpful in civil engineering construction projects, and can also play a positive role in areas related to rock and land engineering technology. Geotechnical engineering requires constant innovation to ensure a sustainable and successful development of it. Since innovation is the basis of the development of any industry, only by constant innovation can an industry remain strongly competitive in its developing process. Therefore, based on the practical experience in geotechnical engineering, this paper aims to give a brief description of the technological innovation methods and practices in geotechnical engineering, in order to promote the innovation and development of geotechnical engineering technology.

Key words: geotechnical engineering technology, innovation methods, practice.

INTRODUCTION

It can be seen from the history of China's geotechnical engineering development that the rapid economic growth has brought various engineering branches into being, such as subsea tunnels, high speed railways and cross-sea bridges, which have impacts on and bring challenges to the development of geotechnical engineering. Theoretical analysis, extra-laboratory testing, and engineering practice are the major links of geotechnical engineering studies, where certain amounts of time, as well as many natural resources, have been saved due to the fast-developing modern science and technology. Such development has bred several new engineering materials, providing new possibilities for geotechnical engineering. Therefore, the geotechnical engineering has a promising future, but only with the support of science and technology can it be guaranteed a sustainable development. As for geological conditions, the shortage of resources, the complex geological environment, the weak ecological environment, and the serious natural disasters in China have resulted in a restricted geotechnical environment and hindered the development of geotechnical engineering. Therefore, the importance of protecting geotechnical environment has come to a national or even a global concern, and the protection of geotechnical environment has been going along with the innovation of geotechnical engineering technology so as not to repeat the mistake of developing economy at the cost of the environment. It is the principle of sustainability that ensures a long-term development of technology and innovation of geotechnical engineering. Geotechnical engineering as a comprehensive subject is the integration of Soil Mechanics, Engineering Geology, Rock Mass Mechanics, and Basic Engineering, so it is related to many fields due to its such comprehensiveness. Its major objects of study are rock mass and soil mass, which require operators to possess excellent practical skills of engineering. The change of rocks and soil in the operation leads to the change of stress field, and consequently, matters of complex structure are formed. As the influences on rock mass in different areas and environments are different, the strength and permeability of the soil texture will be measured in practice. Under the influence of civil engineering and complex typography, the factors of geotechnical engineering could be deformed. This will affect the stability of the final rock mass, but the constructions near the rock mass that have small acting forces on it will be slightly influenced.

INNOVATION METHODS AND PRACTICE OF GEOTECHNICAL ENGINEERING TECHNOLOGY

1. Geophysical exploration

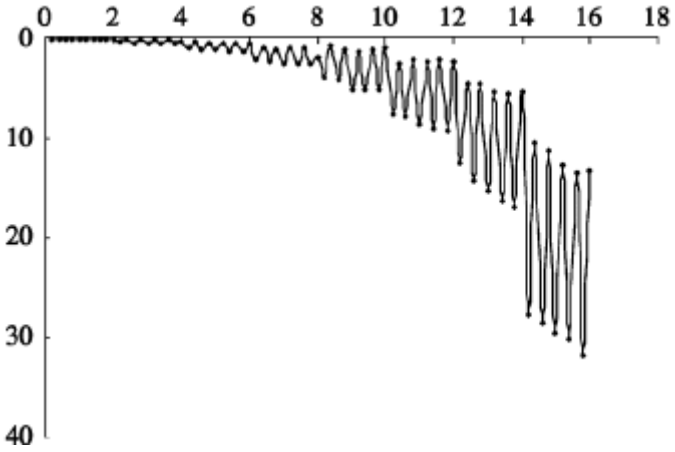
Engineering geophysical exploration is based on electromagnetic and electric theory. The shallow seismic refraction wave method and the detection method of elastic wave used in geophysical exploration can also be employed in geotechnical engineering. In addition, the major effect of geophysical exploration methods is to improve the efficiency of tradition survey methods and ensure the accuracy of results. Since basic conclusions obtained through geophysical exploration methods have a certain degree of accuracy, these methods can provide effective reference data for the complex condition and reveal the basic structure of rock and soil, and then promote the innovation of technologies for geotechnical engineering, improving the geotechnical engineering technology to meet the basic requirements of designs. It should be noticed that, geophysical exploration is an integrated work, and geophysical exploration methods will be adopted throughout the basic working process of the construction industry for mutual promotion and verification. Additionally, the accuracy of the measured object will be improved by means of geophysical exploration methods, making it possible for the measures of geotechnical engineering activity to have a comprehensive development. Elastic wave is the main application method that needs to be mentioned in geophysical exploration projects, the operating principle of which is based on the nature of different mediums. Since the velocity of elastic wave varies in different mediums, elastic wave can reach its highest speed by geophysical exploration methods. Among those methods, the most straightforward way is to draw support from the velocity of shear wave of the soil. During the operation, attentions should be paid to the soil property and the environment of construction site in order to ensure the soil cover is at the same depth. On the occasion that the surface of the underground object has changed, the basic kinetic knowledge of elastic wave can be used as a solution, the major equations of which are shown in Fig. 1

$$E_d = \rho \cdot v_p^2 \frac{(3v_p^2 - 4v_s^2)}{v_p^2 - v_s^2} \cdots (kPa)$$

$$G_d = \rho \cdot v_s^2 \cdots (kPa)$$

$$\sigma_d = \frac{v_p^2 - 2v_s^2}{2(v_p^2 - v_s^2)}$$

As engineering geophysical exploration provides ground investigation with effective data and information, experimental data must be collected very carefully in the measurement process in which relevant instruments and data are used. Only when the accuracy of data is ensured can the experiment be carried out smoothly. Therefore, the accuracy is of great importance. This requires the professional skills from the geophysical engineers, because they are needed in daily engineering operation under random conditions.



2. Drilling and pitting

Drilling and pitting are different from geophysical exploration, because they present the basic situation of soil texture to people more intuitively. So, in most exploration projects, it is highly possible to adopt drilling and pitting, both of which are normally chosen by experienced Engineers. Between drilling and pitting, the former is mainly

used to detect substances in the stratum, and with samples of soil texture collected during the exploration, the type of rock and soil can be clearly exposed. This, in the ambit of Physics, is one of the physical methods in the ambit of Physics. In addition to drilling, pitting is a relatively more accurate method to detect substances under the stratum with the help of mechanical equipment. However, compared with similar applications, the amount of human resource and material resource consumed is also relatively larger. So with sufficient funds, pitting is the prior choice. The major presentation of drilling force is shown in Fig. 2.

3. *In-Situ* test

3.1cone penetration test (CPT)

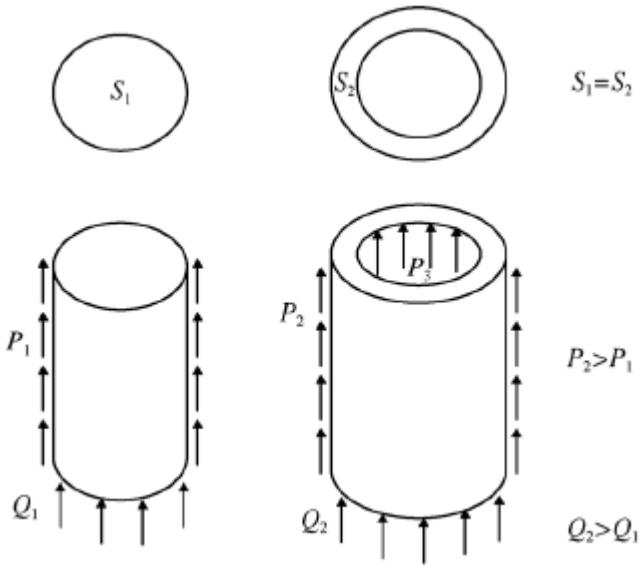
Cone Penetration Test (CPT) is a convenient testing technique to analyze the soil texture. It uses certain mechanical equipment to press metal detectors of proper specifications into the soil under quasi-static conditions. As certain pressures are generated in the soil and transformed into electric signals through a probe sensor, the process of soil permeation will be shown through the instrument panel for better understanding.

According to the analysis of the current situation of geotechnical engineering in China, Probes used is usually single-bridge probes, pore pressure penetration probes, and dual-bridge probe, and CPT can detect the properties of different soil textures. From geotechnical exploration projects and the existing soil data, it can be found that, under different penetration power, the result of CPT is different. CPT has its unique advantages compared with other methods, but at the same time, it also has some disadvantages. For example, the resolution is inadequate and CPT fails to meet international standards, which restricts the widespread use of it in geotechnical engineering applications.

3.2dynamic penetration test (DPT)

Dynamic Penetration Test (DPT) is another kind of test mode, whose major mode of operation is to use metal detectors to probe into the soil. This process requires specific tools and conditions for exploration, as well as physical index for reference.

Among the three types of DPT, light, heavy, and extra-heavy, light penetrometer is mainly used to detect the top soil while also having positive effects on sandy soil and slit soil. In addition, both the mechanical equipment required in DPT and the operating method is relatively simple. In the operating process, relevant data need to be recorded and then put into the dynamic formula: R= (0.8*N-2)*9.8 {R—allowable bearing capacity of ground, Kpa, N—blow count by light penetrometer}. The basic process of DPT is clearly shown in Fig. 3.



4. Compression test

Compression test can be an indoor test. During the test, operators need to integrate the data according to the real situation of soil textures, and conduct soil compression based on these data. In this process, the compression coefficient can be obtained as the result of the compression test.

5. GPS measurement techniques

GPS measurement techniques are realized by transforming satellite signals, which is a means to convey messages.

However, these techniques were applied relatively late in China, and therefore enjoy great possibilities of development from of macro and economic perspectives. In the process of exploration projects, GPS techniques can be used to make accurate measurements in rugged, inaccessible mountainous areas. First, a basic description of the topography is needed to draw a basic plan. This requires high-standard tools for information collection, which are carefully adjusted to the actual environment. In addition, stuff need to be familiar with all information needed. Places to be surveyed should be properly selected before the exploration, while data collecting methods should also be carefully ascertained, in order to ensure the accuracy and universality of the data. After collecting information, related data shall be recorded, which could become the basis for future research. The following fig. 4 illustrates the studying process of soil texture.

The basic nature of the experimental results of Table soil

Soil name	Cohesion	Internal friction angle	Moisture	Wet density p	Dry density pv	Hole enzyme ratioe	Saturation (sr)	Alkaline Index1	Plastic limit (wp)	Plasticity index1p
			α_{1-2}	E_a						
	kpa	Degree	%	g/cm^3	g/cm^3		%	%		
			Mpa^{-1}	Mpa						

6. Computer - Aided Design (CAD)

Computer-Aided Design (CAD) is a widely applied technology in geotechnical engineering, which can provide real-time feedback of the basic situation of soil texture, and give straightforward presentation of information through Computer-Aided Design (CAD). It not only helps with collection of field data of geotechnical engineering, but also contributes to that of civil engineering, thus promoting data collection and analysis.

CONCLUSION

With the rapid development of science and technology, technological innovation in engineering is bound to occur. Exploration should be carried out with consideration of sustainable development. Economic development should be accompanied by environment protection. Only in this way can technological innovation significant in real sense be achieved. Exploration technology must maintain its advantages, and at the same time, be adjusted to the environment where it is applied, so as to achieve desirable exploration results.

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