CS-235

THE EXPERIENCE IN PERFORMING HIGH EMBANKMENT WORKS USING EXPANSIVE SOILS IN INDONESIA

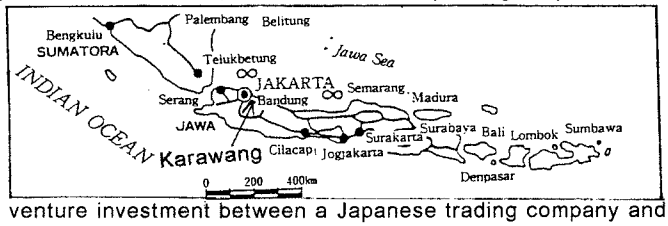
Takenaka Civil Engineering and Construction Co., Ltd.
Hiroki Hoshikawa, Akio Watanabe, Masamichi Tagaki, Junji Hori

PREFACE

Throughout the history of Japanese construction industry, Japanese contractors have established a solid record of achievement in many developing countries, ranging from infrastructure facilities to regional development and power station installations. We should constantly deal with various risk and uncertainty during the operations in those countries, due to contrasted environment condition compared with Japan, unstable society and also politics. We hereby illustrate our experience in high embankment works using peculiar tropical soil in Indonesia during the construction of Karawang International Industrial City (KIIC)

OUTLINE OF THE PROJECT

Karawang International Industrial City project is located about 60 km east of Jakarta City and about 4 km south of Karawang City, which is capital of Karawang regency in West Java as indicated below map. The site is adjacent to a toll road, the Jakarta-Cikampek highway, which is on its northern boundary.



The project is a joint venture investment between a Japanese trading company and a local company with 50:50 share allocation. It is divided into 3 phase of development with total area of 1,118 ha. The construction works involve 18,210,000 m^3 of earth moving volume and the installation of 2 major treatment plant for sewage disposal and water supply. There are only few projects with such extensive scale being constructed by few contractors in Japan. The project amount which have reached 6 billion yen seems inexpensive compared with similar scale in Japan. The total construction period is 58 months, commenced in June 1993 and completed in March 1998.

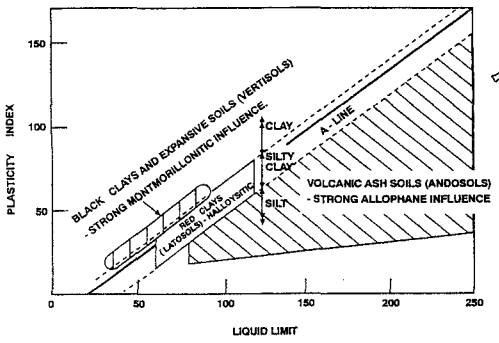
EXECUTION OF THE PROJECT

Indonesia archipelago is laid along the tropical zone. Its temperature and humidity are relatively high. The general climate over KIIC area is characterized by two monsoon seasons, distinct dry and wet seasons. The wet season is from December to March and dry season is from June to September. The ground of KIIC is primarily composed of clayish soil with high content of montmorillonite in the upper part. The main characteristic of aforesaid soil is its poor consistency to any change in water content. If the soil is dry, it will shrink to its minimum volume and become fairly stable. However, as the water infiltrate into the soil, it will swell rapidly and loss its significant strength. Due to its extreme swelling/shrinkage ratio, high compressibility and sensitivity to water content; the expansive soil is naturally unsuitable to be used as embankment material.

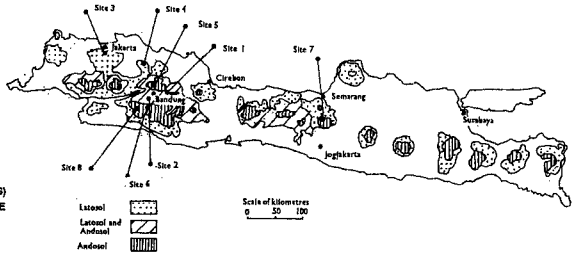
Key Words: Expansive Soil, Project Management, Huge Project, Conditions of Contract
21-1, 8-chome,Ginza, Chuo-ku, Tokyo, Japan TEL:03-3542-6321 Fax:03-3541-8825

We indicate the classification and geographical distribution of Indonesia.

Classification



Geographical distribution of Indonesia



Influence of mineralogical composition on position on plasticity chart.

Reference :
Wesley. L.D.(1988)"Engineering classification of residual soils" Proc. Second Int. Cont. on Geomechanic in Tropical Soils, Singapore, 1:77～84.

In the circumstances, we should arrange the construction program that enable to accommodate the above site condition. Earthwork, which originally scheduled to be carried out throughout one-year period, was accelerated to be concluded by the beginning of rainy season. Other facility and structure works was scheduled for following dry season. However, unexpected slope failures still occurred at several locations during transition period from wet season to dry season. Therefore, we established a special team to review and study the specifications and working methods applied previously. We initially carried out soil sampling and testing. The result indicated that the soil is more expansive and less stable than our earlier presumption. We proposed to the Owner and the Engineer (consultant) the adoption of quality control procedures using the data obtained from Cone Penetration Test (CPT) and the type of equipment which appropriate for the execution of embankment work based on the result of trial compaction. The safety factor (FS) was considered 1.2 at the planing stage but finally adjusted to 1.5 in order to meet minimum requirement for undrained shear strength. This undrained shear strength is measured by CPT and then cone resistance is applied to the "standard point of control".

REVIEW

In general, consultant is employed as independent engineer by the project owner to control the planning and execution of project, such as supervision on contractor performance. According to the condition of contract, consultant should be in neutral position in making any judgement or decision. However, in practice, they frequently tend to act on behalf of the Owner. We, the contractor, consequently learned that high capability in negotiation for design change or working method revision and in dealing with various claims was strongly required. We fully understood that contractor should have comprehensive knowledge and experience, including the capability of information, communication, planning and total project management, for successful implementation of overseas project.

CONCLUSION

The overseas projects might be seen and understood as special construction works in regard to treatment in quality control and project management compared with those in Japan. However, we realized both projects are similar in the term of technical requirement of civil engineering field.