CHAPTER

8

GEOTECHNICAL PROPERTIES OF TOKAI CLAY FOR DOUBLE TRACK CONSTRUCTION

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8.1 INTRODUCTION

With the ever-growing economic activity in Malaysia, infrastructure development such as highways or railways interlinking the Southern and Northern regions of Peninsular Malaysia is deemed to be important in cultivating the industry. However, the construction of such infrastructure would impose certain challenges to engineers especially when predicting the pre and post-construction behaviour of subsoil without established data.

During the construction of the Electrified Double Track railway project across Northern region of Malaysia, which started in the year 2007, a rather homogeneous subsoil layer consisting of 15m of soft clay was encountered at Tokai, Kedah. Soft clay is classified as clay with undrained shear strength of less than 25 kPa according to Brand and Brenner (1981) and the lack of understanding of the in-situ behaviour of this thick layer of soft alluvium subsoil might result in unsafe and less optimum design. A series of subsurface investigations consisting of in-situ and laboratory testing was planned and executed in detail to study the geotechnical properties of the overburdened soft clay at Tokai,

Kedah. The soft clay is termed Tokai clay in this paper. Interpretation of engineering properties of Tokai clay was carried out and correlations of vital properties such as undrained shear strength and compressibility parameters are established from both laboratory and in-situ testing for easy reference in the future for development at this area.

8.2 GEOLOGICAL FORMATION

The proposed electrified double track is located in Peninsular Malaysia and stretches from Ipoh to Padang Besar with a total track length of 329 km. The location of the case study in Tokai (Figure 8.1) which is underlain by the Alluvium formation and the age of Alluvium is quarternary. Generally, Alluvium consists of mainly coastal plain marine deposits and fluviatile deposits in main river valleys. The subsoil of Tokai is relatively homogenous, consisting of very soft to soft clay (15m thick) overlying dense silty sand to sand.

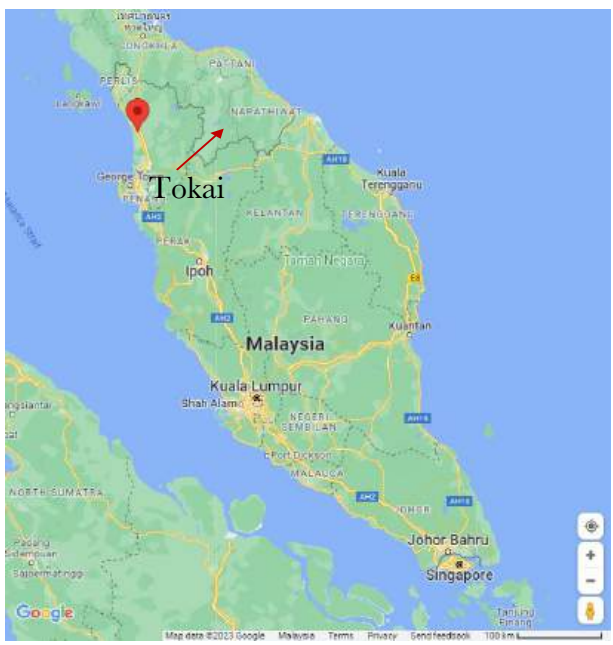

Figure 8.1 Location plan of Tokai in Peninsular Malaysia (Source: www.googlemaps.com)

8.3 SUBSOIL PROPERTIES OF TOKAI CLAY

8.3.1 Basic Soil Properties

Figure 8.2 shows that the unit weight of Tokai clay for the top 12m is in the range of 12 kN/m^3 to 14 kN/m^3. This coincides with those unit weight encounters by past researchers for soft clay in Peninsular Malaysia.

Liquid limits (*LL*) of Tokai clay generally range from 50% to 150% and this is almost in agreement with those values suggested by Hussein (1995) for West Coast Peninsular's soft clay which ranges from 40% to 125%. Figure 8.2 indicates both the plasticity index and liquid limit of Tokai clay decrease with increasing depth. The observed trend is in conjunction with the conclusion drawn by Hussein (1990) in his research on Peninsular Malaysia's soft clay that the Liquid Limit decreases with depth.

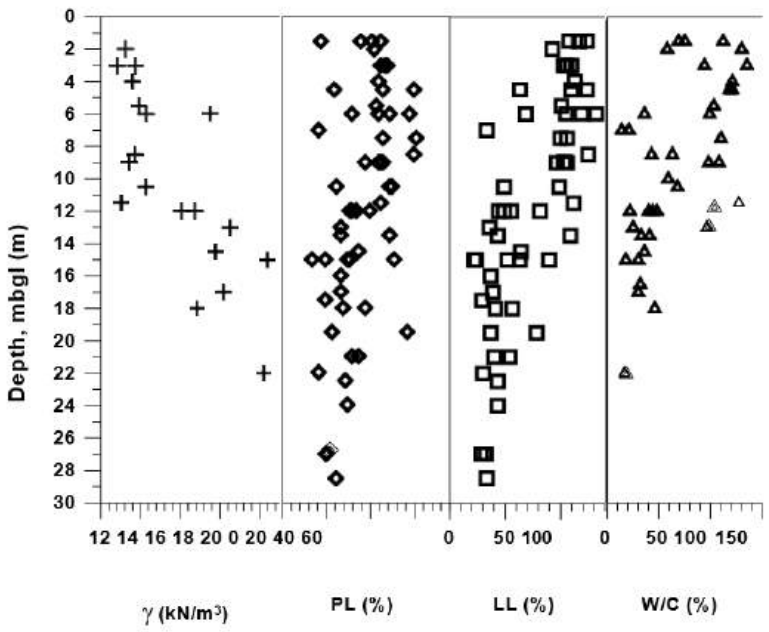

Figure 8.2 Basic soil properties at Tokai