

Abstract No: A-203

SARAWAK HEMIC PEAT CONSOLIDATION SETTLEMENT AND SHEAR STRENGTH BEHAVIOUR

N. M.Sa'don, A. R. Abdul Karim, Z. Ahamad and A. Mariappan

Universiti Malaysia Sarawak, Sarawak, MALAYSIA

**Corresponding author: msazzlin@unimas.my*

SUMMARY

Peat layer in Sarawak alone represents 13 percent or about 1.66 million hectares of Sarawak's total land area. They are mostly in low-lying areas; with in some areas, peat exceeding 10 m in depth. During past few decades, the demands of urbanisation resulted in the expansion of land development into swamp and deep peat areas. Thus, proper understanding, management and construction practices should be emphasized on peat to overcome consequential occurrence of ground subsidence problems. The objectives of this study are to investigate the consolidation settlement parameters and shear strength behaviour of hemic peat in Sarawak. The samples were taken from Matang, Batu Kawa, and Kota Samarahan, Sarawak. The initial characteristic tests consist of the degree of humidification, loss on ignition, Atterberg limit, particle density; moisture content and pH value. The results recorded high moisture content and organic content for Sarawak hemic peat. The value of Compression Index, C_c , determined from the oedometer test for hemic peat is in the range of 1.13 to 3.20 and compression ratio, $C_c/1+e_o$ is classified as very compressible (> 0.20) for all three locations; Matang, Batu Kawa and Kota Samarahan,. From the direct shear box test, the cohesion, c' values are in the range of 8.0-18.0 kPa and angle of internal friction ϕ' in the range of 24° - 37° .

Keywords: *Sarawak hemic peat, peat consolidation, degree of humidification, loss of ignition.*

INTRODUCTION

Peat is defined as highly organic soil with the heterogeneous mixture of partially decomposed plant remains, with some contents of sand, silt and clay under damp and anaerobic condition at low temperature. The content of organic remains in peat is sufficiently fresh and undisturbed to permit identification of plant remains whose structure ranges from more or less decomposed plant remains to a fine amorphous mass. Approximately 1.7 million ha (13%) of the total land area of the Malaysian state of Sarawak State's total land area, are covered with tropical peat land (refer Figure 1) and about 90 percent is classified as deep peat with depth of more than 1.5 meter (Melling, *et al.*, 2002). The depth of peat layer increases from the coast towards the inlands. According to Huat *et al.*, (1997), field investigation conducted in Western Sarawak has proven that there are three significant layers differentiated by its level of humidification based on the Von Post classification system, where each layer overlies the subsequent layer. The top thin layer of 0.5 m to 1.5 m thick is recognized as sapric (H7-H10) peat with fiber content of less than 33 percent. The second layer of peat, overlain by sapric peat, is recognized as hemic peat (H4-H6) with fiber content ranging from 33 to 66 percent. The near beneath of peat soil layer, overlain by hemic peat, is recognized as fibric peat (H1-H3) with fiber content of greater than 66 percent. A layer of grey mangrove clay may be seen under the fibric layers. The content of peat differs from location to location such as origin fiber, temperature and humidity (Huat *et al.*, 2009).

Peat has poor engineering properties, such as high compressibility and low in shear strength, due to high void ratios which results in higher values of compression index, C_c and secondary compression, C_α , when compared with other soil types. A study by Mesri *et al.* (1997) showed that the secondary compression is prominent in peat deposits because it exists at a high void ratio, which exhibit high values of C_c and displays a high ratio of C_α/C_c . Table 1 presents the summary of the natural moisture content with the relevant C_α/C_c values for different peat deposits (Mesri *et al.*, 1997). Landva (1980) reported the in-situ vane shear tests on peat with void ratio of 6.1 – 11.5 displayed shear strength levels ranging from 5-35 kPa. However, Lea and Brawner, (1963) observed that the low strength will increase when fibers, and the particles of the peat come together under compression. Such a considerable gain in strength is attributed to the exceptionally high values of the effective angle of shearing resistance ϕ' , which has been observed in various laboratory testings on peat (Karunawardena, 2007). This paper presents the findings on geotechnical characteristics, consolidation settlement parameters and shear strength of