STRENGTH PROPERTIES OF REINFORCED PEAT USING FIBER-POLYESTER AND SHREDDED RUBBER-CRUMB AS REINFORCEMENT MATERIAL

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ABSTRACT

This paper presents an investigation of the strength improvement of reinforced peat by using the fiber reinforcement techniques of the lightweight waste material, i.e., tire-waste disposal. The fiber-polyester and shredded rubber crumb are extracted and process for the collected tire-waste disposal. In this study, the fiber-polyester and shredded rubber-crumb are mixed with peat (Pt), with undrained shear strength, c_u of <10 kPa and 5 % cement content, which act as a binder. The peat samples are mixed at various percentages of fiber-polyester and shredded rubber-crumb. The compacted fiber-reinforced peat samples were prepared at optimum moisture content, mixes thoroughly to a uniform condition by laboratory mixer and air cured for 7 and 28 days in a single batch. The strength improvement of undrained shear strength, c_u of >100 kPa is targeted at minimal percentages of cement added. The Unconfined Compression Strength (UCS) and California Bearing Ratio (CBR) tests are performed for determination of the engineering properties of fiber-reinforced peat. Based on the results obtained, one can be seen that both fiber-polyester and shredded rubber crumb shows an increment in unconfined compressive strength value of 214 kPa and 55 kPa, respectively. In summary, the study shown that, the inclusion of fiber-polyester and shredded rubber-crumb from tire-waste disposal increased the effective contact area between reinforced material and peat, which then improved the strength significantly, and the used of tire-waste disposal for the construction may not only provide the alternative mean of recycling and reusing, however, it also addressed economic and environmental concerns and reduce construction cost by making the best use of locally available materials.

***Keywords*:** Peat, fiber-reinforced, shredded rubber-crumb, polyester fiber and tire waste disposal

INTRODUCTION

Peat is defined as a non-homogeneous deposit of partially decomposed vegetative matter saturated with water and encountered in low-lying areas where the water table is near or above the ground surface (Edil, 2003). They are present mostly in surface soils, but in some cases as deep deposits. The overall hydrological characteristic depends upon the rainfall and the surface topography. High moisture content in peat is the main factor contributing to the characterization of peat with low bearing capacity and bulk density. Due to this, peat is incapable of carrying excessive weight. The consequences for engineering structures on peat resulting from the high and rapid compressibility are often very serious (Singh and Huat, 2003). A study performed in Sibu town by Tai et al. (2003) shows that the removal of water by drainage leading to the bulging of peat near roads and caused ground settlement due to their poor mechanical performance.

In Sarawak, about 90 percent of peat is classified as deep peat (depth of more than 1.5 meters). The depth of peat soil layers increases from the coast towards the inland. According to Huat and Bahia (1997), field investigation conducted in Western Sarawak has proven that there are three significant layers differentiated by its level of humidification, where each layer overlain the subsequent layer. The top thin layer of 0.5 m to 1.5 m thick is recognized as *Sapric peat* with a fiber content of less than 33 percent. The second layer of peat, overlain by sapric peat, is recognized as *Hemic peat* with fiber content ranging from 33 to 66 percent. The near beneath of peat soil layers, overlain by hemic peat, is recognized as *Fibric peat* with a fiber content of greater than 66 percent, and a layer of grey mangrove clay may be likely to be seen under the fibric layers. Further classification using Von Post degree of humidification, peat can be categorized into three main groups, namely Fibric (H1-H3), Hemic (H4-H6) and Sapric (H7-H10). The content of peat differs from location to location due to the factor such as