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# STRENGTH AND DURABILITY EFFECT ON STABILIZED SUBGRADE SOIL

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*Abstract* – This paper presents the development of strength and durability effect of stabilized soil. The clayey soil collected from Kota Samarahan, Sarawak was admixed with cement, fly ash and rubberchip as an additive for stabilization purposes. The optimum mixture determined was then used as a recommendation for the design guidelines of sub-grade based on JKR Standard Specification for Road Works. The stabilized clay specimens were prepared with 5% cement and various fly ash and rubber chips contents, of 5%, 10% and 15%, respectively. The specimens were then cured for 7 and 28 days before subjected to Unconfined Compressive Strength (UCS) tests and California Bearing Ratio (CBR) tests. As observed, the stabilization improved the strength and stiffness of the soil properties significantly. However, the addition of 15% rubberchip shows a reduction in strength for both 7 and 28 days curing period. From the study, the optimum mixture, which fulfilled the JKR Standard Specification was the mixture of 5% cement and 15% fly ash. However, the mixture of 5% cement and 10% rubberchip is also recommended to be used as an alternative to stabilize the subgrade for low volume road.

***Keywords*:** fly ash, rubberchip, subgrade

## 1.0 INTRODUCTION

In road and highway constructions, not only the pavement or premix quality is given serious scrutiny, but the substructure below the pavement is also equally vital. The stability of the underlying soils needs serious attention so as to ensure that the pavement structures that has been constructed can enhance the durability of the pavements. It is important to provide the optimum performance for the pavements because the pavement structures are significantly impacted by the direct loading of the traffic. Unfortunately, in Sarawak, some locations are frequently not adhered to the project requirements due to the availability of the soft soil and it is clearly inadequate for the traffic loading demands. In order to meet such requirements, the subgrade material requires a treatment to stabilize the soils in the specified area to provide a stable subgrade and also a suitable working platform for the needs of the pavement construction. As the materials used for road construction are getting more expensive, stabilizing the local soil and improved its physical properties through soil treatment is one of the alternatives.

The Portland cement, which is basically a compound of silica, alumina and iron has been widely used in order to stabilize soils especially in the highway construction [1], [2]. There are two basic reactions occur in cement stabilization which is hydration and pozzolanic reactions and it is well documented in the literature [3], [4]. As stated by [3], when cement is combined with water, the hydration reactions will occur and the cement-treated material will gain strength as well as the pozzolanic reactions that contribute to the strength of a specimen. An experimental work done by [5] shows that compressive strength development for 7 days soaked clay soil-cement mixture are 200 psi to 400 psi and for 28 days the results shows that it can reach 250 psi to 600 psi by using 9% to 16% of cement. However, [6] come out with a suggestion of the required cement quantity as 4% to 6% from the dry mass of the soil that can gain the strength of 100 psi (700 kPa) and they also concluded that the amount of 4% cement by dry weight of the soils are adequate for cement stabilization. [2] also stated that a reasonable criterion for soil stabilization is the increase of the strength of the untreated soil compared to the stabilized soil by 50