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EFFECT OF FLY ASH ON THE COMPRESSIBILITY BEHAVIOUR OF PEAT: An Experimental Study

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Abstract: Peats are considered as geotechnically problematic soil, due to their high compressibility and low shear strength. To improve peat chemical and mechanical method of stabilization is widely used. This paper focuses on an experimental study to chemically stabilize peat by deep mixing method (DMM) using ASTM class F fly ash as the stabilizer. Peat: fly ash ratio of 90: 10 was used in the stabilization mix. Testing such as index properties tests (organic content, specific gravity and Atterberg limit), direct shear test and Rowe cell test were conducted for raw peat and fly ash stabilized peat. For the Rowe cell test, 30 mm diameter central fly ash stabilized DMM column was placed in the raw peat sample, and the consolidation test was performed for raw peat sample, and the consolidation test was performed for raw peat and the peat with central fly ash stabilized column. Based on the experimental findings, peat used can be classified as sapric amorphous peat with a Von Post scale classification of H8 class. In addition, cohesion (c) increases with the addition of 10% of fly ash while friction angle (Ø) reduces with fly ash addition. Compressibility parameters (C_v, C_α and C_c) decrease with the addition of 10% fly ash to peat and the reason for the reduction is fly ash absorbs water from peat and undergo reactions producing stiffer matrix. Percentage reduction in C_v and C_α are 12.7% - 33.4% and 7.1% - 25.93% depending on the normal stress, while the percentage reduction in C_c is 10.5%.

Key words: Chemical stabilization; Compressibility; Fly ash; Peat; Rowe cell; Stabilized column

1. Introduction

Peats are results from decomposition of plant and other organic matters, mostly under anaerobic condition. In Sri Lanka, 2500 hectares of land is covered by peat land along the Western coastal area up to 15 m thick below the ground surface and the coverage of peat land is around 2500 hectares (Bord and Mona, 1984). Peat is classified into two main types such as fibrous and amorphous. Von Post (1992) further divided this into Von Post scale system. In this system, peat is classified from H1 (completely fibrous peat) to H10 (completely amorphous peat) based on degree of humification, water content, fiber content and botanical composition (Huat et al, 2005). According to ASTM (2008), standard classification of peat is down to three classes namely fibric (fibrous; least decomposed with fiber content of more than 67%), hemic (semi-fibrous; intermediate decomposed) and sapric (amorphous; most decomposed with fiber content of less than 33%).

Peat is a problematic soil for constructions due to long term consolidation settlement, localized bearing failures and slip failures (Huat et al, 2011; Kolay et al, 2011). In order to overcome these problems and make peat land suitable for construction work, engineers have proposed two different ground improvement methods: (1) mechanical method and (2) chemical method. Mechanical methods of ground improvement include displacement and replacement, stage construction, preloading, stone columns, piles, vertical drains and light weight fill (Duraisamy et al, 2007). In the mechanical method, there is no chemical reaction between soil and stabilizer. In chemical method, surface stabilization and deep in-situ mixing methods (DMM) are used by adding chemical admixtures such as sand, cement, fly ash, gypsum, bentonite, kaolinite and sodium chloride (Huat et al,