Bull Eng Geol Environ
DOI 10.1007/s10064-016-0890-6

ORIGINAL PAPER

Evaluating the compression index of fibrous peat treated with different binders

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Received: 13 October 2015 / Accepted: 20 April 2016

Abstract Fibrous peats feature high compressibility and correspondingly very low strength. In this study, an investigation into the compressibility of untreated and stabilized fibrous peat with different binders—namely cement, lime, gypsum, and fly ash—is presented. The technique adopted for sample preparation was aimed at simulating the in-situ condition of the deep soil mixing technique. For this purpose, the binder dosages were selected in the range of 100–400 kg/m^3 of wet fibrous peat at its natural water content. This binder range was determined based on the unconfined compressive strength of the treated samples. All the treated samples were cured for 14, 28, and 90 days in both air and water. The consolidation behavior of the treated peat samples was assessed by performing a Rowe cell consolidation test. The test results revealed that the increase in cement, fly ash, and gypsum contents led to considerable decreases in compression indices of the treated fibrous peat. No significant changes in the compressibility properties of lime-treated peat were observed. In addition, the inclusion of well-graded sand as filler decreased the compression indices of the treated samples significantly. Finally, in comparison with air curing, the use of the water curing technique for all the stabilized samples, regardless of binder type, showed better performances.

Keywords Fibrous peat · Compressibility · Unconfined compressive strength · Binder · Stabilization

Introduction

Peat is an unconventional geomaterial with more than 75 % organic content. This soil is produced by the incomplete decomposition and disintegration of plants growing in wet places where there is a lack of oxygen (Huat 2014). In particular, peat consisting mainly of fresh fibers and slightly decomposed plant material is referred to as fibrous peat. It is extremely acidic and has a high fiber content, making it easily identifiable. Due to the texture of the peat, sampling in this soil is very difficult (Kalantari et al. 2011). The structural arrangement of fibrous peat is highly dependent on the parent plant and its degree of decomposition (O'Kelly and Som 2013). Different kinds and amount of fibers provide a wide range of acidity in fibrous peat. For instance, Mesri and Ajlouni (2007) proposed a range between 4 and 7 for pH of the peats. Due to this high organic matter in fibrous peat, this soil is very spongy and compressible. Additionally, a high initial void ratio, low pH, and high water-holding capacity are the

This article complies with the scope of the Bulletin of Engineering Geology and the Environment and we declare that the findings of this research article have not been published anywhere. We hereby submit our research findings for your kind attention and review.

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Published online: 30 April 2016