

Research Article

Investigation of the Application of Various Water Additive Ratios on Unconfined Compressive Strength of Cement-Stabilized Amorphous Peat at Different Natural Moisture Contents

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Natural peat is considered incapable of supporting built structure due to its poor engineering properties. Chemical stabilization is one of the peat soil improvement methods which has been studied by many researchers. This study describes an investigation of water additive (*W/A*) ratio application on cement-stabilized peat strength. Peat soil at different moisture contents, which are 1210%, 803%, and 380%, were stabilized with cement by *W/A* ratio of 2.0, 2.5, 3.0, 3.5, and 4.0. Unconfined compressive strength (UCS) test was conducted after the specimens were being air-cured for 28 and 56 days. The result shows that there is an increase of UCS value as the decrease of *W/A* ratio (the increase of cement dosage) and the increase of curing time and peat moisture content. The higher strength found in the specimen with higher moisture content, compared to the lower one at the same *W/A* ratio, shows that the mix design of cement-stabilized peat using *W/A* ratio should have differed under different peat natural moisture contents. From the result, it is also found that cement hydrolysis reaction occurred despite the presence of humic acid in the peat soil, which by many studies is assumed will hinder the cement-soil reaction.

1. Introduction

A mixture of fragmented organic material formed in wetlands under suitable climatic and topographic conditions is called peat. Peat is derived from vegetation that has been chemically changed and fossilized as described by Dhowian and Edil [1]. Approximately, Malaysia has 2.6 million hectares of peatlands. Sarawak has the largest area of peat soils in Malaysia for about 69.08% of the total peatland area in the country [2].

In civil engineering, peat is classified as a problematic soil due to its weak characteristic related to its ability to support the civil structures. Peat consists of water and decomposed plant fragment with no measurable strength in its natural state. Peat has a high natural moisture content, high compressibility including significant secondary and

tertiary compression, low shear strength, high-degree spatial variability, and potential further decomposition as a result of changing environmental conditions [3]. Peat properties are site-dependent. Not only has a high natural moisture content, peat also has a wide range of moisture content depending on sites. The water content of peat can be more than 1500% [4]. Huat et al. [5] reported that the natural water contents of peat sample from several locations in Malaysia were found to range from 150–700%. Moisture content in the range of 200–2200% is reported by Zainor-abidin and Wijeyesekera [6] for east Malaysian peat.

Ground improvement method has to be done prior to construction on peat. Chemical stabilization such as cement-peat stabilization is considered the effective method for peat stabilization especially for deep peat which can reach up to 10 meters deep. There are some factors that influence