Abstract

This study consists of three main parts. In the first main part, the parameters controlling the strength have been investigated by using the various types of clay and proposed the strength prediction of cement and biomass ash stabilized clay by using only a single laboratory trial. It is found that the prime parameter controlling the strength of cement and biomass ash stabilized clay is the clay-water/blended cement ratio, w_c/C^*. The binder content of the blended cement, C^* is the summation of the input of cement, C_i and the equivalent cement, C_e. The C_e is determined based on the concept of an efficiency factor (k), which is adopted as a measure of the relative performance of supplementary cementing material compared with Type I Portland cement. The C_e is equivalent to $k.BioF$ where $BioF$ is biomass ash content and k is efficiency factor. From the analysis, the value of k is dependent upon the replacement ratio and curing time, and irrespective of binder content and water content. To verify the proposed strength equation, the field strength is considered on the second part. The cement column construction of Express Highway No.9 (East outer ring road) in both of wet and dry mixing method has been investigated, it is found that the minimum field unconfined compressive strength is lower than laboratory unconfined compressive strength due to the difference in mixing cement column method and curing condition. The suggested procedure for determination the cement content for cement column is introduced by using the strength prediction. Owing to the environment concern, the role of biomass ash from microstructural consideration on strength development in blended cement stabilized clay has been investigated in the final part. Some influential factors such as water content, cement content, curing time and replacement ratio on the unconfined compressive strength are well understood. A study on the microstructure is carried out using a scanning electron microscope, mercury intrusion pore size distribution measurements and the thermalgravity analysis. Strength development in blended cement stabilized clay is dependent upon cementitious products due to combined effect

(hydration and dispersion). The cementitious products increase with time, resulting in the reduction in total pore volume and increasing in unconfined compressive strength. This biomass ash is a material dispersing clay-cement clusters when interacted with water. The dispersing effect increases the cementitious products, and is dependent upon replacement ratio.