

ABSTRACT

Earth based construction materials are identified as green and low carbon materials. There are sustained R&D efforts in developing stabilised earth products for buildings and other structural applications. The thesis addresses some specific issues on the characteristics of stabilised soil compacts through an extensive experimental R&D work.

Details of three types of stabilised soil products, brief review of literature and scope of the thesis are presented in **chapter 1**. **Chapter 2** is on investigations pertaining to influence of soil grading on the characteristics of cement stabilised soil compacts. Considering wide range of grain size distributions representing two broad soil groups (coarse- and fine-grained soils) influence of soil grading especially the clay size fraction in controlling the strength, durability and absorption characteristics of cement stabilised soil compacts and bricks were examined in greater detail. Optimum soil grading limits yielding maximum strength and the reasons for such behavior was investigated through the analysis of void ratio, surface area porosity and SEM imaging. The investigations showed that clay fraction of the soil mixture and the void ratio (density) of the compacted specimen play crucial role in influencing the characteristics of cement stabilised soil compacts.

Chapter 3 is focused on swell-Shrink characteristics of stabilised soil bricks, adobe bricks and rammed earth. Dimensional changes occurring during the manufacturing process of stabilised soil products were monitored considering the influence of cement content and moulding moisture content. Physical changes such as initial shrinkage, swelling and drying shrinkage occurring during manufacturing process was traced and mapped and the practical significance of the results are discussed.

The main focus of **chapter 4** is on effect of aspect ratio of the masonry unit on apparent compressive strength of stabilised soil block and masonry. The anomalies in assessing the characteristic compressive strength of masonry unit while considering the geometrical parameters have been discussed. The shape modification correction factors provided in different codes of practice and reports indicate absence of any unique correction factor accounting for geometry of the masonry unit. Results of compressive strength tests on twelve geometrically different cement stabilised soil bricks/blocks were analyzed in deriving shape modification correction factors. A new definition for aspect ratio based on the surface area of the masonry unit has been proposed. A bi-linear relationship between shape modification correction factor and new aspect ratio has been derived for normalizing the compressive strength of stabilised soil brick/block.

Chapter 5 deals with status of clay minerals in the stabilised soil compacts. The study was aimed at ascertaining the presence of residual clay minerals in the cement and lime stabilised soil compacts. The investigations revealed that it is possible to retrieve a large percentage of natural clay minerals in cement stabilised soil products whereas in lime-stabilised soil products only a small fraction of the clay minerals can be retrieved, as the natural clay gets consumed in the lime-clay reactions. The thesis ends with a summary of the results with concluding remarks and scope for further investigations.