

ABSTRACT

The rammed earth technique has been explored in the past, for the construction of load bearing walls in the buildings. Rammed earth construction involves compaction of partially saturated loose soil-sand mix in a rigid formwork. The thesis presents results of investigations on cement stabilised rammed earth (CSRE). A brief summary on the origin and development of rammed earth has been summarised in the first chapter. The literature review highlights the gaps in the current knowledge on CSRE and the need for such studies. Initial part of the investigations examines the optimum compacted layer thickness needed for CSRE resulting in maximum compressive strength for the CSRE. Also, the influence of super-plasticiser additives in reducing the compaction energy in CSRE and the effects on mechanical characteristics of CSRE has been dealt in detail. The results show that the optimum compacted layer thickness for CSRE is in a narrow range of 90 – 100 mm and small dosages of superplasticiser reduce the compaction energy of CSRE drastically. The stress-strain characteristics of CSRE have been examined in greater detail. The influence of dry density, soil composition, cement content and moisture content on the compressive strength and stress-strain characteristics of CSRE are presented. An analytical model to predict the stress-strain response of CSRE was developed and validated. Establishing the shear strength parameters and developing Mohr-Coulomb failure envelopes for CSRE in dry and wet conditions formed the next part of the investigations. The influence of cement content and moisture content on the shear strength parameters of CSRE was investigated in greater detail. The thesis delves on reinforced CSRE mainly to improve the flexure strength due to out of plane bending. The bond strength between rebars and CSRE matrix was assessed through standard pull-out tests and the results presented. With this background, the study focuses into the flexural behaviour of plain and steel reinforced CSRE beams. Development of the stress block and stress block parameters, and thereby arriving at the design calculations for reinforced CSRE were the main contribution of the study. The thesis concludes by providing a summary of all the investigations carried out. The immediate usefulness of the results of the thesis to the construction industry has been highlighted.