

STRUCTURAL CHARACTERISTICS OF STONE MASONRY



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MASTER OF TECHNOLOGY IN COMPUTER AIDED DESIGN OF STRUCTURES

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ABSTRACT

For thousands of years, sand and gravel are used for construction. Today this demand is continuously increasing and has become the major environmental concern in the country, resulting in scarcity of fine aggregate. With the increasing awareness about the environment, ill-effects of sand mining and the ever increasing cost of fine aggregate soil-cement mortars have become suitable alternative for masonry construction.

This project work is devoted to studies on feasibility of using soil-cement mortar for stone masonry construction and also for a better understanding of masonry behaviour with special reference to two varieties of granite. Also, the study of mix proportion of fine grained soils in cement mortar and its effect on failure characteristics as applied to bond strength and masonry compressive strength is studied.

The *first chapter* begins with a brief introduction regarding the necessity of soil-mortar and importance of the project work. Major research works reported in the literature on stone masonry construction with stabilised mortars are reviewed in *Chapter 2*.

The *third chapter* deals with the objectives and methodology adopted in the present study

The *fourth chapter* deals with characterization of stones and soil-mortar along with various experiments conducted to determine its properties of engineering interest. The compressive strength of grey granite (type I) and pink granite (type II) and that of 1:3 cement mortar and 1:3 cement-soil mortar. Modulus of elasticity of grey and pink granite along with 1:3 cement mortar (CM) and 1:3 cement-soil mortar (CSM) is found out.

The *fifth chapter* deals with stone-mortar bond strength and masonry behaviour with particular reference to shear-bond strength and compressive strength of stone masonry prism. Shear bond strength of grey granite was comparatively less than that of pink granite. Experiments are conducted to determine the compressive strength of stone masonry prisms with CM and CSM.

The *sixth chapter* deals with stress analysis of stack-bonded masonry prisms in compression using 2D and 3D finite element analysis using NISA/Display IV. The lateral stress developed in stone blocks and mortars are studied in detail. The study shows that 2D and 3D results are quite similar. Stress-strain curve as per FE results are compared with Lenczner's theory and experimental values. FE results are found to be in perfect agreement with experimental values till the onset of initial cracks in masonry prism.

The thesis ends with the last chapter summarising the major observations on the entire work.