

CHARACTERISTICS OF HIGH STRENGTH CONCRETE BLOCK MASONRY USING CEMENT-SOIL MORTAR



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Submitted by
SHWETHA C.S
4VM13CCS16

Under the Guidance of
ARUN. L

ASSISTANT PROFESSOR
Department of CIVIL Engineering
VVIET, Mysuru
and

H S PRASANNA
PROFESSOR
Department of CIVIL Engineering
NIE, Mysuru



**DEPARTMENT OF CIVIL ENGINEERING
VIDYA VIKAS INSTITUTE OF ENGINEERING AND
TECHNOLOGY**

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ABSTRACT

Development of the construction project inherently contributes to the economic and social development and enhancing both the standard of living and quality of life. For thousands of years, sand and gravel are used for construction. Due to extreme mining of river bed to reach the demand of sand which is accelerating in construction industry has lead to the ecological imbalance. 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 cement-soil mortar for concrete block masonry construction. It includes a better understanding of masonry behaviour with special reference to two types of concrete. The strength characteristics of masonry depend on the strength and elasticity parameters of concrete, mortar and their interactive behaviour. Also, the study of mix proportion of fine grained soils in cement mortar and its effect on elasticity 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 literature on concrete block 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 concrete block and soil-mortar along with various experiments conducted to determine its physical properties. The soil suitable for masonry is selected. The compressive strength of type I concrete block and type II concrete block and that of 1:3 cement mortar and 1:3 cement-soil mortar is determined. Modulus of elasticity of type I concrete block and type II concrete block along with 1:3 cement mortar and 1:3 cement-soil mortar is found out.

The *fifth chapter* deals with concrete-mortar bond strength and masonry behaviour with particular reference given to shear-bond strength and prism

compressive strength. Shear bond strength of type II concrete block was comparatively less than that of type I concrete block. Compressive strength of the prisms is determined. Study on determination of the rate of moisture transport between concrete block and mortar.

The *sixth chapter* deals with stress analysis of stack-bonded masonry prisms in compression using 2D and 3D finite element analysis. The lateral stress developed in concrete block and mortar is studied in detail. The study shows that 2D and 3D results are quite similar and the magnitude of stresses is not substantially different. Also comparison of stress-strain curve obtained theoretically and experimentally is validated from FE analysis using NISA display 1V.

The thesis ends with a last chapter summarising the major observations and suggesting guidelines for further research.