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EXPERIMENTAL DETERMINATION OF MATERIAL PROPERTIES OF SLIP-FORMED LOAD BEARING WALL PANELS FOR MEDIUM -RISE BUILDINGS

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Composite of cement, crusher dust, and coir is being used to build load-bearing walls of building structures using a special construction technique called slip-formed method. This technique was first introduced by Dr. A.N.S. Kulasinghe in mid 80s as a low cost and rapid construction technique. However, the construction of buildings using this method is restricted up to five storeys due to non-availability of essential design parameters (i.e. mechanical and material properties of the composite). Therefore, in the present study an extensive experimental program was carried out to find the material properties of the composite.

As no particular standard testing method was available for this type of special composite material, initially the investigations were carried out according to the British standards for testing of concrete with some modifications. However, later it was decided to prepare the specimens according to the actual method of construction used in the field, by changing the method of compaction and curing of specimens. This paper presents the data on a wide range of material properties of different mixtures of crusher dust to cement such as 1:6, 1:8, 1:10, 1:12 and 1:14 used to make slip formed load bearing wall panels.

In the preliminary study carried out according to the British standards, it was observed that the Young's modulus increases from 2.4 GPa to 9.3 GPa and Poisson's ratio decreases from 0.17 to 0.11 with increasing cement content whilst a progressive increase in compressive strength from 0.505 MPa (1:12 at 1 day) to 5.193 MPa (1:8 at 28 days). was observed with age. In contrast, the results obtained using the field method showed a progressive increase in compressive strength ranging from 0.65 MPa (1:14 at 1 day) to 11.95 MPa (1:6 at 28 days) with age. It is also found that with the increasing cement content the Young's modulus increases from 5.98 GPa to 10.65 GPa, Poisson's ratio decreases from 0.17 to 0.12, flexural strength increases from 0.225 to 1.402 N/mm^2, and splitting tensile strength increases from 0.284 to 1.541 N/m^2. The specific weight ranges from 1.810 to 1.953 and the average specific weight is 1.9.

The strength parameters obtained using British standards are relatively higher than that of the field method but is in good agreement with each other. However, as the field method of testing is very much closer to the actual construction method, the strength parameters found by the field method will be closer to the actual strength of this special composite material. It can be concluded that when considering strength and economy, the best mix proportion to be used for slip-formed load bearing wall panels is 1:12. One of the main objectives of this study is to use these slip-formed load-bearing walls for medium rise buildings. The more logical approach to understand the overall structural behaviour of a building under various combinations of loading such as dead, imposed, wind and earthquake loading is to develop a computer aided analytical model, using finite element technique. As the accuracy of the results form the computer model greatly depends on the material properties of the composite, the material properties obtained from the above experimental program will be of prime importance.