Effect of partial replacement of crusher dust by river sand in slip formed load bearing wall panels

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Construction of load bearing wall panels using cement and crusher dust was first introduced by A.N.S. Kulasinghe in 1980s. These load bearing wall panels are constructed using cement and crusher dust with a special construction technique called slip-formed method. Slip-formed load bearing wall panels together with pre-cast columns, beams and composite slabs, the cost of a building structure can be reduced by about 50% compared to typical concrete framed building.

In this research programme, an attempt was made to find the variation of strength of the composite material when crusher dust is partially replaced by river sand. This was found to be important as crusher dust is not freely available at some parts of the country. Material properties such as compressive strength of cubes of 1, 7 and 28 days, compressive strength of cylinders at 28 days, splitting tensile strength, flexural strength (i.e. Modulus of rupture) and unit weights were obtained in different mix proportions of cement, crusher dust to river sand in 1:9:3, 1:6:6, 1:3:9 and 1:0:12. The w/c ratio used for all mixes was 0.5.

From these results, it was observed that a progressive increase in compressive strength with the age in all mix proportions. It was also observed that with the introduction of river sand, compressive strength, modulus of rupture, splitting tensile strength and unit weight increase for a maximum when mix proportion of crusher dust to sand is 1:1 and further increment of sand content causes reduction of all those strength parameters. The increase in strength can be attributed to the increase of interlocking of particles in the composite with the introduction of sand particles up to certain extent and the consequent reduction of strength may be due to the less bond and higher void ratios with the increased sand content.

Using these variations, it would be able to predict the variation of strength of other mix proportions such as cement to crusher dust in 1:6, 1:8, 1:10 and 1:14, when crusher dust is partially replaced by river sand. Further, with the knowledge of these strength variations in different mix proportions, builders will have a choice to use either crusher dust or river sand by considering strength and economic feasibility.

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