VISVESVARAYA TECHNOLOGICAL UNIVERSITY
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A Dissertation Report on

"INVESTIGATIONS ON THE USE OF ALTERNATIVE FINE AGGREGATES IN CEMENT CONCRETE"

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By

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ABSTRACT

Concrete is a composite construction material composed of conventional cement, fine aggregate, coarse aggregate, water and admixture/s. Natural sand is commonly used as fine aggregate in making concrete. The consumption of natural sand is very high, due to the extensive use of concrete across the world. Many research activities are underway to replace the sand as fine aggregate by various alternate materials. The replacement of sand by alternatives addresses many environmental and economical challenges. The reported literature highlights on the replacement of natural sand by M-sand, slag sand and pond ash separately. There is no report available about the use of all the three alternate fine aggregates together. The present research deals with the study of concrete with available alternative materials to natural sand such as M-sand, slag sand and pond ash at different replacement levels by holistic approach.

Cement concrete of the grade M25 was designed using natural river sand as fine aggregate. The sand was replaced by M-sand, pond ash and slag sand with different percentage of replacement levels (0, 20, 40, 60, 80 and 100%), maintaining a constant slump of 100 mm using super plasticiser. Concrete cubes, cylinders and beams were cast, cured and tested. The compressive, split tensile and flexural strengths were determined. The properties of concrete with and without sand are compared and analysed.

The maximum dosages of super plasticizer for M-sand, slag sand and pond ash as replacement were 1.45, 1.25 and 1.85 % respectively for a constant slump of 100mm. The compressive, split tensile and flexural strength of concrete with slag and M-sand as fine aggregate, increases with the replacement level. The optimum replacement level for M-sand and slag sand was 60%. In case of concrete with pond ash as a fine aggregate, the compressive strength was higher for 40% replacement level compared to conventional concrete, whereas the spilt tensile and flexural strength was optimum at 60% replacement level. It is evident that M-sand, pond ash and slag sand can be substituted for natural river sand to prepare concrete for various civil engineering structures. Thus natural river sand can be conserved without compromising the salient properties of the structural material.