

Experimental Analysis on LECA as Fractional Substitution for Sand in Mortaring and Concreting

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Abstract: This research work deals with partial usage of LECA (Lightweight Expanded Clay Aggregate) as partial replacement for fine aggregate in mortaring, plastering and concreting. The experimental work had been gone through by replacing the fine aggregate by 25%, 50%, 75% and 100%. M20 grade of mortar and concrete is used in this project, the consistency of water-cement ratio initiated at 0.4 and increased up to 0.5. When the percentage of LECA increased the w/c ratio also get increased. Material study like specific gravity, water absorption and grading of LECA was initially done. strength characters of mortar cube and concrete had been done for 7,14 and 28 days. A comparison study of conventional specimens and LECA was done in this project. Comparatively replacing LECA in 100% obtaining the optimum strength in concreting and in mortar cube 25% replacement of LECA obtain the maximum result. The compressive strength of brick masonry structure had been studied for 9"x9" wall by replacing the fine aggregate by using LECA.

Keywords: sand, replacing, LECA, mortar, concrete, brick wall, compressive strength

I. INTRODUCTION

Sand is the main constituent of construction world. Without sand, the mortar or concrete will not function as intended. Sand is used for filling the voids it supports to pay uniform strength to concrete and in plastering it offering by cover the surface in peaceful manner. By taking fine aggregates from the riverbed will spoil the eco system of water, so the replacement of fine aggregate is an important issue in this era. Many of the government agencies and private sector were insisting to use M-Sand, some of the drawback were seen in M-Sand like water absorption, grading, angular and workability. So it is needed to find the alternative solution for fine aggregate. Here we planned to replace the fine aggregate by using LECA.(Light expanded clay aggregate). LECA is a material made of clay burnt in kiln under 1200°C used as coarse aggregate in light weight concrete, which is easily available in the market and less expensive.

Whether doing large-scale or small-scale construction projects, in order to make the building process cost-efficient and run more smoothly, building materials need to be easy to handle, easy to transport and flexible to work. LECA satisfies the above requirements and also Durable, Recyclable, Environment friendly and Resistant to fire.

This project aims to use crushed LECA as fine aggregate by partial replacement for sand in various proportions like 0%, 25%, 50%, 75% and 100% for M20 grade of mortar and concrete.

II. LITERATURE REVIEW

M. Mahdy was concluded that concrete to be considered is light weight concrete (using leca as coarse aggregate) that is concrete with a density in the range 1.65-1.85 t/m³.in order to obtain high strength concrete, LECA was treated by solution of silica fume of different concentration (10% and 20 %) by weight of mixing water .three levels if silica fume (5, 10, 15%) and two ratios of coarse of total aggregate content (0.48, 0.65 by volume) were used. For this concrete, information on mechanical properties was provided. Silica fume content seems to lead to high early age strength in 7 days with relatively smaller increase in strength at 28 days .the economic silica fume content for LWC is 10 % .At 0.48 coarse aggregate ratio, the compressive strength and flexural strength were higher than for 0.65 coarse aggregate ratio.

A research by Gurpreet singh and Rafat Siddique on effect of waste foundry sand as partial replacement of sand states that, Waste foundry sand(wfs) is the major byproducts of metal casting industry and successfully used as a land filling materials as many years. This experimental investigation natural sand was partial replaced with (0%, 5%, 10%, 15%, and 20%) of wfs by weight.

A examine from malkit singh and Rafat Siddique on Effect of coal bottom ash as partial replacement of sand on properties of concrete conclude that Coal bottom ash is formed in coal furnaces, it also used for as structural fill. Effects of coal bottom ash on properties of fresh concrete, mechanical and durability properties.