

Experimental Investigation on Engineering Properties of Recycled Fine Aggregate with Adding China Clay

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ABSTRACT-In India every year has construction debris are generated in the building industry. The disposal of rubble is difficult because it can require massive space for its disposal. The rubble can be recycled or reuse is very less. The project work is intended and for replacement of natural fine aggregate with 0%,50%,100% of recycled fine aggregate (RFA), and cement is partially replaced with china clay at 20% by its cement weight.

KEYWORDS

Rubble, China clay, Mix design, Compressive strength, Workability, Recycled Fine Aggregate.

INTRODUCTION

These waste materials need a large place to dump and hence the disposal of wastes has become a severe social and environmental problem. On the other hand scarcity of natural resources like river sand is another major problem which results in increasing the depth of riverbed and also changes in climatic conditions. The quality and reactivity of China clay are strongly dependent on the characteristics of the raw materials used. China clay can be produced from a variety of primary and secondary sources containing Kaolinite. China clay is refined calcined form of potters clay under carefully controlled conditions to create an amorphous alumina silicate which is reactive in concrete. This project also covers experimental study for the possibility of effective replacement of cement with china clay along with optimum range 20 % and RFA is (0% 50%, 100%). China clay differs from other cementitious materials like

slag, fly ash and silica fume, in that it is not a byproduct of an industrial process.

RECYCLED FINE AGGREGATE

In many countries, recycled fine aggregate has been authentic to be active for low strength concrete, and to a limited extent for structural grade concrete.

Effective Benefits includes:

To reduce the environmental problems generated from dumping the waste to the construction and also demolition waste.

The amount of substance going to sanitary landfill is reduced.

CHINA CLAY

In developing nations, the requirement of Portland cement is increasing suddenly. China clay is also known as metakaolin, it is an arid calcined form of layer silicates potter's clay. The particle size of china clay is smaller than cement particles, but not as fine as silica fume. China clay is available in different ranges and qualities. The exploratory program is created to investigate the china clay as a partial replacement with cement at 20%. The attributes and sensitivity of china clay is strongly reliant on the characteristics of raw materials used. It also reduces the hardened cement porosity to liquid and gases.



MATERIAL USED

CEMENT: OPC of 43 grade conforming to IS 8112 is used in the inspection. The specific gravity of cement is 2.95

FINE AGGREGATE: Locally available river sand passing through 4.75mm IS sieve conforming to grading zone-II of IS 383-1970 is used. The specific gravity of fine aggregate is 2.6.

COARSE AGGREGATE: Crushed stone with a maximum size 20mm. The specific gravity of CA is 2.7.

RECYCLED FINE AGGREGATE: RFA obtained from crushed waste concretes of different qualities and made with granitic

stones and demolition waste are used by replacing of natural river sand (0%, 50%, 100% by its volume).

EXPERIMENTAL TESTING

COMPRESSIVE STRENGTH : In using of compression testing machine (CTM), for every mix 24 number of cubes of size is 150mm (7 days, and 24 days). The load is applied gently until the failure stage.

TENSILE STRENGTH : In using the cylinder which splits across the vertical diameter, every mix 12 number of cylinders of 300*600mm are cast, and tested in CTM.

RESULTS AND DISCUSSION

COMPRESSION STRENGTH The test is carried out compressive strength of M20 grade of concrete. The compression strength is tested for nominal concrete for 3 cube on different curing periods. Then it is tested for three different proportions of RFA+MK with increase of proportion, there is gradually increase strength.

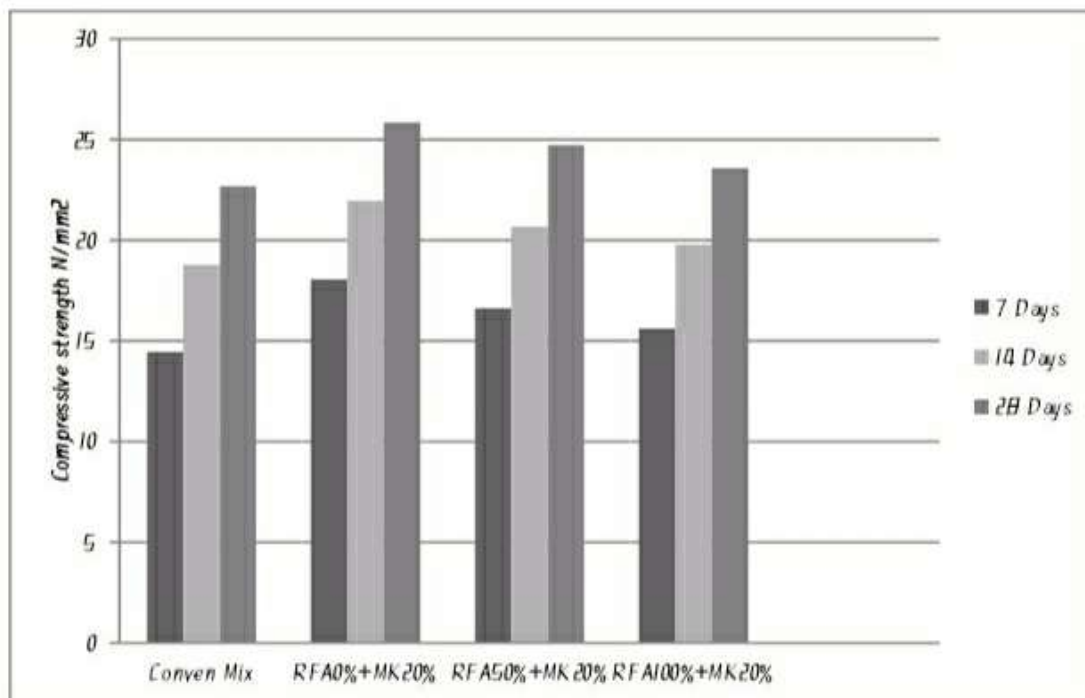


TESTING ON CUBE SPECIMEN

CUBE COMPRESSIVE STRENGTH CALCULATION

SL.NO	SPECIMEN FOR CUBE	COMPRESSIVE STRENGTH IN 7DAYS(N/mm ²)	COMPRESSIVE STRENGTH IN 14DAYS (N/mm ²)	COMPRESSIVE STRENGTH IN 28 DAYS (N/mm ²)
1.	Nominal mix	14.45	18.77	22.68
2.	0% RFA+20%MK	18.05	21.09	25.85
3.	50%RFA+20%MK	16.62	20.67	24.72
4.	100%RFA+20%MK	15.61	19.78	23.58

COMPRESSIVE STRENGTH CHART

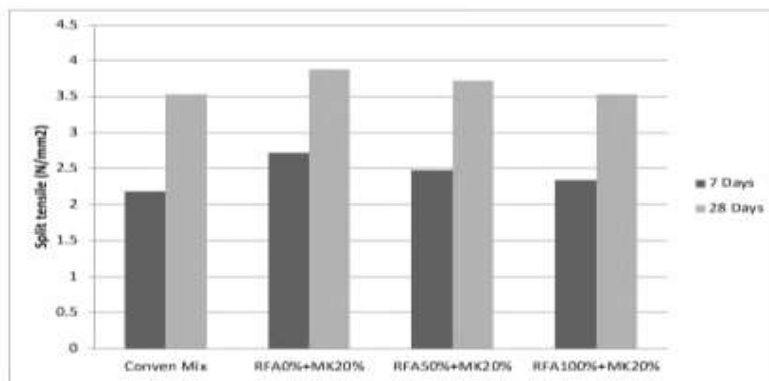


SPLIT TENSILE STRENGTH The test is carried out to obtain the splitting tensile strength of M20 grade of concrete. The test is carried out by cylindrical specimen horizontally between the loading surfaces of a compression testing machine and the load is applied, until the initial crack of the specimen.



SPLIT TENSILE STRENGTH

SI.NO	SPECIMEN FOR CYLINDER	SPLIT TENSILE STRENGTH IN 7DAYS(N/mm ²)	SPLIT TENSILE STRENGTH IN 28DYS(N/mm ²)
1.	Nominal mix	2.18	3.53
2.	0% RFA+20%MK	2.72	3.88
3.	50%RFA+20%MK	2.48	3.72



SPLIT TENSILE STRENGTH CHART

CONCLUSION. Based on the experimental results of the test, the following conclusion can be drawn. China clay improves the compressive strength of concrete. The compressive strength increase by 10 to 14% as the china clay is 20% .Replacement of sand with RFA reduces the compressive strength of concrete. However, /replacement of cement with china clay leads to

reduction caused by replacing sand with RFA the compressive strength of concrete by 14%,9% and 4% compared to conventional concrete at 0%,50%,and 100% replacement of sand with RFA respectively at 20% replacement of cement with china clay .At 20% replacement of cement with china clay 5% of the 28 days strength is attained at 7 days. Flexural strength is better as 50%replacement of sand with RFA. However, even at 100% replacement, with20% china clay addition the flexural strength is improved by 4% as a conventional concrete. A minimum of 7.5% china clay is required to prevent any strength loss.

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