ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Recycle Aggregate for Improving Performance of Concrete and Concern for the Environment Impact

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ABSTRACT:

Concrete is always expected to be stronger and more durable than in the past, while being cost and energy efficient. Moreover, the three major advantages that concrete possesses over other construction materials have to be conserved: the possibility of being fabricated practically anywhere; the ability to take the form imposed by the shape of a mould; and low cost of the components and the manufacture.

These factors have driven the advances in improving the performance of concrete over years, and continue to do so. The need for improving the performance of concrete and concern for the environmental impact arising from the continually increasing demand for concrete, has led to the growing use of alternative materials component.

I.INTRODUCTION:

Concrete is the most widely used construction material having several advantages such as high strength, good mould ability durability weather and fire resistance. The use of light weight aggregate in mortar has increased in recent years. Records indicate that blast furnace cement was used for the mortar during the construction of the Empire State Building in the 1930s. Light weight aggregate has been used as a constituent material of mortars for over twenty years and in the case of some of the bagged proprietary mortars for an even longer period.

These materials not only impart technical benefits to both the fresh and hardened properties of mortar they are also environmentally friendly. light weight aggregate material is a product resulting from construction, demolition and excavation waste, therefore, reduces the quantity of primary raw materials that have to be extracted from the ground. The normal means of achieving this is to combine the material with Portland cement.

II.RELATED WORK:

Applications include partial replacement (up to 30% of coarse RCA) for virgin material in concrete production for non-structural work such as kerbs and gutters. Current field experience with the use of recycled concrete aggregates for structural applications is scarce. It was suggested that RCA could be incorporated into 30- to 40-MPa concrete exposed to benign environments but with some penalties in mix adjustment, permeability and shrinkage properties. There were no visual detrimental effects in the concrete and it was expected that the cost of the increase in cement content could be offset by the lower cost of recycled concrete aggregates. RCA has a lower specific gravity 2.44–2.46 and higher water absorption 4.5–5.4 than most natural aggregates.

Fine RCA, in particular, has an even lower SG of around 2.32 and a very high water absorption of 6.2%. RCA concrete has unit weight in the range of 2240–2320 kg/m3. It has higher water demand and gave lower compressive strength than control concrete made from natural aggregate at equal water to cement ratio RCA concrete has similar flexural strength but lower elastic modulus than control. RCA also resulted in higher drying shrinkage and creep but comparable expansion to control. The adherence of mortar to the surface of RCA was the main cause of higher water absorption, lower SG and poor mechanical properties. Excessive expansion or swelling can be caused by contamination by plaster and gypsum.

III.IMPLEMENTATION:

General: Concrete is by far the most widely used construction material today. The versatility and mouldability of this material, its high compressive strength and the discovery of the reinforcing and pre-stressing techniques have helped to make up for its deficiencies like low tensile strength, ductility etc.,

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thereby enlarging its field of utility. Concrete with conventional materials is becoming costlier day by day due to its mass utilization worldwide. As concretes with 60 to 100 Mpa cube compressive strengths are aimed at, the increase in cost is likely to be much more. The increase in the construction of multi-storied complexes, buildings of various shapes etc., has led to the search for lightweight materials. In view of the above studies on various materials like Granulated BF slag, Steel furnace slag, Furnace bottom ashartially. India is one of the fast developing countries in the world. Various fields like Industry, Infrastructure, Construction, Agriculture etc., have a major role in achieving an all round development. This development has urged the industrial sector to produce various goods that are necessary.

These industries and factories besides producing various useful goods have also become a source of waste products. And it has become necessary to find ways and means of disposing off or utilizing these waste materials, which may otherwise end up in polluting the surroundings. This led to the investigation of searching fields of utilization of these waste products for a better purpose. Research work was carried out on this subject not only in India but also all over the world. The results of such works showed that there could be no better place other than the construction field, where a large quantity of such materials can be utilized in a better and economical way.

On the other hand the field of Construction has also its role to play in the development of the country by not only in increasing the construction work but also in a more sophisticated manner. This in turn has an effect on the various materials and their quantities that are to be used. Therefore, this also led to the investigation of new materials, which can be utilized for thepurpose even more economically. Especially work has done on the utilization of the by-products obtained from various demolitions. In this way the construction field and the industrial sector have been linked together, reducing the environmental hazards and serving the economical problems.

Products like foamed blast furnace slag, furnace clinker, cinder, pulverized fuel ash etc. are the waste products obtained from various demolitions. It has been found that each one of these has quite a good use in the construction field. These products are either used in their original form as are obtained or changed slightly so as to serve a better purpose.

The pulverized fuel ash for example, is used in concrete either as a replacement to cement and sand or converted to sintered fly ash to be used as coarse aggregate. A lot of work has been done on utilization of RCA in concrete as replacement to coarse aggregate. In the present investigation studies are made on RCA concrete, coarse aggregate replacing by RCA.If disposed off on the land, this RCA causes air pollution and if into any water source then it has hazardous effects on the aquatic life. Therefore, its proper utilization will safeguard the environment from any disaster. Based on the above facts, in this investigation an attempt has been made to use RCA as a replacement to coarse aggregate ranging from 10% to 50% by weight. substitute aggregate or to complement it when high performance is needed.

IV.EXPERIMENTAL INVESTIGATION:
A.GENERAL:

Experimental investigation was planned to study the effects of partial replacement of cement by fly ash and GGBS on strength properties of concrete. To achieve the objectives of the investigation the experimental program was planned to cast and test the cylinders to study the stress-strain of the details of the experimental program for cylinders are mentioned in Table no:1.

B.EXPERMENTAL PROGRAM:

SL. NO	DESCRIPTION	MIX PROPORTION	W/C	FLY ASH	GGBS	NO.OF CYLINDERS
1	PLAIN	1:1.85:4.32	0.49	-	-	12
2	10%FLY ASH	1:1.85:4.32	0.49	10%		12
3	20%FLY ASH	1:1.85:4.32	0.49	20%		12
4	30%FLY ASH	1:1.85:4.32	0.49	30%		12
5	40%FLY ASH	1:1.85:4.32	0.49	40%		12

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6	10%GGBS	1:1.85:4.32	0.49		10%	12
7	20%GGBS	1:1.85:4.32	0.49		20%	12
8	30%GGBS	1:1.85:4.32	0.49		30%	12
9	40%GGBS	1:1.85:4.32	0.49		40%	12
10	10%F&G	1:1.85:4.32	0.49	5%	5%	12
11	20%F&G	1:1.85:4.32	0.49	10%	10%	12
12	30%F&G	1:1.85:4.32	0.49	15%	15%	12
13	40%F&G	1:1.85:4.32	0.49	20%	20%	12

Table:1:

APPENDIX -B

Quantity of concrete required for cylinder:

Volume of cylinder =(π*0.152/4)*0.3 = 5.301*10-3 m3

Total density =2343.09kg/m3

Weight of concrete/cube = 2343.09*5.301*10-3 =12.42kg

Wastage =20%

=1.2*12.42

=14.90kg

Cement required/cube =(1/7.54)*14.90 =1.97kg

F.A required/cube =1.97*1.85

=3.65kg

C.A required/cube =1.97*4.32

=8.51kg

Water required =0.965kg

Total Quantity of concrete for Three cylinders = 44.7kg

Cement =5.91kg

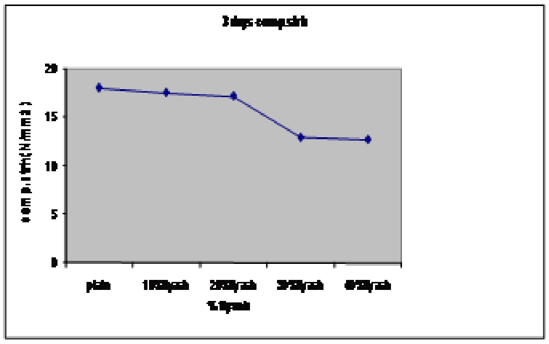
F.A =10.95kg

C.A =25.53kg

Water =2.895kg

Graph showing Compressive Strength of concrete for RCA for 3-days:

Fig:1



V.CONCLUSSIONS:

The compressive strength in replacement of 10% fly ash with cement for 28-days obtained is 19.42 N/mm2 and the strain at ultimate stress is 0.00269. The compressive strength in replacement of 20% fly ash with cement for 28-days obtained is 20.53 N/mm2 and the strain at ultimate stress is 0.00237. The compressive strength in replacement of 30% fly ash with cement for 28-days obtained is 21.05 N/mm2 and the strain at ultimate stress is 0.0022. The compressive strength in replacement of 40% fly-ash with cement for 28-days obtained is 19.41 N/mm2 and the strain at ultimate stress is 0.00132.

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