WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Experimental Study of Concrete Grade by Partial Replacement of Fly Ash and Glass Powder with Cement & Recycled Aggregate with Ordinary Coarse Aggregate

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A B S T R A C T

Protection of atmosphere and conservation of natural resources is the basis of any development. And the existing R and D are constantly undergoing technological and industrial advances in waste management. In order to address the environmental effects associated with cement production, it is important to advance other concrete making commitments. As a result, extensive research is underway, replacing cement with a variety of waste and industrial sprouts. As a partial replacement of the efforts of cement for fly ash, glass of waste, rice husks etc. It has already been achieved in the concrete industry. If less waste is found to be lighter and more expensive for concrete construction, greater benefits will be derived from waste management use and depression in construction costs. The work examines the possibility of having fly ash, a glass of powder as a substitute for cement instead. The first phase continues with the replacement of 25% cement content in a variety of fly ash (FA) and glass powder (GP). It is then subjected to flexural and compression strength, for 7, 14 & 28 days and covered with traditional concrete. Adequate results were obtained with a combination of 75% cement and fly ash 25% on average, w.r.t properties were tested.

Keywords:Compressive Strength, Flexural strength, Fly Ash, Glass powder, Replacement.

INTRODUCTION

In recent years awareness of environmental degradation has increased as a result of the community's interest in building using waste or recycled concrete has also grown. When we look at our surroundings, we can see so many things that we think of waste to be considered opportunities. Pieces of waste glass in stores are disposed of as disposable items but empty glass can be reused without chemical reactions. Fly ash is produced in large quantities in tropical energy plants as an abate product that is easy to dispose of and harmful to the environment. Used concrete composites are produced with crushed concrete recycled composite can be used for many purposes. The main market is the basis of information channels about the revitalization of the asphalt pavement into a new asphalt pavement. Used aggregates receive a demolished structure and are divided to be used as a composite in the production of other concrete.

A glass of materials used in everyday construction and other purposes will be an ideal recycling item. The use of recycled glass in the aides of a new room ends up causing a strain. The amount of waste glass will be gradually increased by using the longer ones because at any time it improves the use of the results of the glass. When glass waste is recycled to make cement products, the cost of creating cement will decrease. Glass or plated glass, carefully weighed and processed, may reflect features similar to those of stone or sand. Cement organizations should treat OPC and fly ash combinations as benchmark, depending on performance, cost, power, etc., when setting performance focuses on PPC generation. The use of PPC or the combination of OPC and fly ash is necessary to find the pressing need today to maintain development management. Significant research has been done on the use of fly-ash concrete structures as cement replacement. It is a well-known fact that ash flies have significant benefits in terms of safety from sulphate attack, soluble base silica reaction, carbonation, chloride attack and economy.

1.1. MATERIALS & METHODOLOGY

1.MATERIALS USED

- Cement (OPC)
- Sand
- Aggregate
- Fly ash
- Glass Powder

CEMENT: Cement having interconnected & glue properties providing a binding medium for the unglued ingredients. Chemically cement constitutes 60-67% Lime (CaO), 17-25% Silica (SiO2), 3-8% Alumina (Al2O3), 0.5-6% Iron Oxide (Fe2O3), 0.1-6% Magnesia (MgO), 1-3% Sulphur Trioxide (SO3), 0.5-3% Soda And Potash (Na2O+K2O).

SAND: Sand is a naturally occurring particle made of rocks that are well separated from mineral particles. It is notable for its size, beauty, gravel, and durability. Sand can also be referred to as the text category of soil or soil type; which means soil containing particles over 85% in size (in size).

NATURAL COARSE AGGREGATE: Construction aggregate, or essentially “Aggregate”, is a material used in construction which includes mix particles of slag gravel, sand, recycled concrete, crushed stone etc. Joint construction, or actually "Blended", is a material used in construction that includes mixed particles of slag stone, sand, recycled concrete, crushed stone etc. Scales contain composite materials for example, concrete and asphalt concrete; the essence serves as the consolidation of everything that is integrated. Due to the high pressure of the compression as compared to most soils, aggregates are often used within the garbage requirements for example, French foundations and pipes, septic drain fields, retaining wall drains, and side pipes. Aggregates are also used as bases under foundation, roads, and rails.

FLY ASH: Fly ash, otherwise called flue-ash, may be the most prominent among fossil fuels, and it is composed of those fine particles that emit flue gases. The ashes that do not rise are called ashes below. In the mechanical context, an ash fly usually refers to the burning of coal. Fly ash is absorbed by electrostatic storms and suction pumps before the gases pass through the coal-fired power plant. As such, it depends on the source of the burning coals continuously and the content of fly ash particles.

GLASS POWDER: Glass is a clear color produced by dissolving a mixture of silica, soda ash, and CaCO3 at temperatures simulated by cooling when the hardening takes place without crystallization. Glass products are commonly used in our everyday manufactured items. Since the increase in waste glass leads to recent years and these discarded pieces of glass have been discarded and sometimes not used. Disposable glass filters are not used because the glass is not professional and does not rot.

FLEXURAL STRENGTH: 10cm * 10cm * 50cm beams are cast to gain flexural strength. The beam tests were performed at the age of 28 days of the specimen. The installation of the template on the machine is done with each IS: 516-1959 in sub-sections 8.3.1 page and 17. Uploads are used at an increasing rate of 108KN / min. The load is applied until the sample fails and is loaded where the failed sample is recorded. As described in the IS code flexural strength is calculated.

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1.2. OBJECTIVE OF RESEARCH

In this experimental procedure of investigation, the following are the main objectives of study:-

1. To comprehend the efficiency of fly ash, glass powder and recycled aggregate in efficiency improvement.

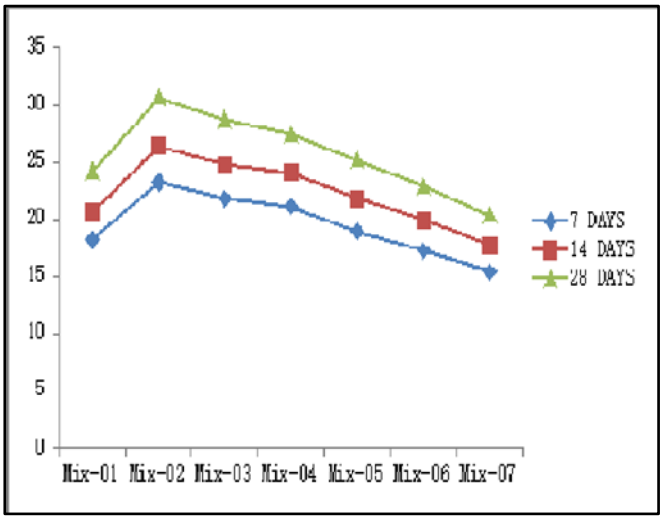
2. To evaluate the utility of fly ash, glass powder and recycled concrete aggregates as a fractional additional of ingredients in conservative concrete.

3. To study the various behavior of concrete under the partial replacement of fly ash, glass powder and recycled aggregate.

1.3. RESULT &DISCUSSION

Table 1: Compressive Strength Result

Mix	COMBINATION (% Replacement)	Compressive Strength (N/mm^2)		
		7 days	14 days	28 days
M-1	C+S+NCA	18.17	20.63	24.13
M-2	C(75%)+S+NCA+ FA(25%)+GP(0%)	23.20	26.40	30.61
M-3	C(75%)+S+NCA+ FA(20%)+GP(5%)	21.74	24.72	28.67
M-4	C(75%)+S+NCA+FA (15%)+GP(10%)	21.08	24.03	27.36
M-5	C(75%)+S+NCA+FA (10%)+GP(15%)	18.91	21.75	25.16
M-6	C(75%)+S+NCA+ FA(5%)+GP(20%)	21.08	19.87	22.86
M-7	C(75%)+S+NCA+ FA(0%)+GP(25%)	21.56	17.71	20.32

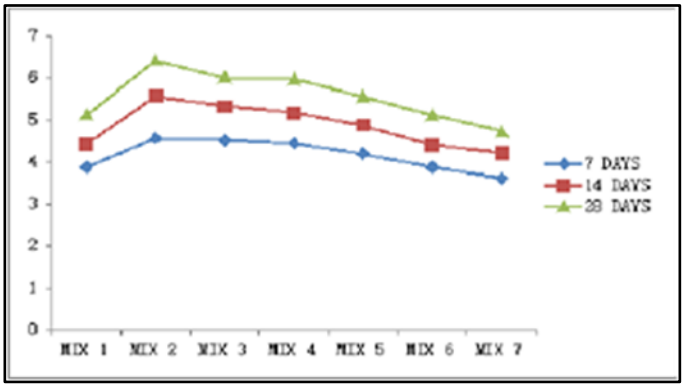


Graph 1: Compressive Strength in N/mm^2 at various age (Days)

Table 2: Flexural Strength Result

Mix	COMBINATION (%Replacement)	Flexural Strength (N/mm^2)		
		7 days	14 days	28 days
M-1	C+S+NCA	3.88	4.45	5.14
M-2	C(75%)+S+NCA+FA(25%)+GP(0%)	4.85	5.58	6.43

M-3	C(75%)+S+NCA+FA(20%)+GP(5%)	4.53	5.34	6.02
M-4	C(75%)+S+NCA+FA(15%)+GP(10%)	4.46	5.19	5.98
M-5	C(75%)+S+NCA+FA(10%)+GP(15%)	4.21	4.89	5.57
M-6	C(75%)+S+NCA+FA(5%)+GP(20%)	3.88	4.43	5.13
M-7	C(75%)+S+NCA+FA(0%)+GP(25%)	3.62	4.20	4.75



Graph 2: Flexural Strength in N/mm2 at various age (Days)

.CONCLUSION

Above charts and earlier discussion, subsequent conclusion is given below: -

The exchanging of cement at an optimal proportion by FA (25%), enhanced compressive and flexural strengths as equated to predictable concrete in stage-1.

In stage-1, proceeding reducing proportion exchanging of FA (25% to 0%) by cumulative proportion exchanging of GP (0% to 25%), a reduced strength is fined, i.e. When GP is used as a exchanging material, and strength of concrete gets reduced.

When mix proportion providing optimal strength in stage-1 is considered for stage-2, 10%NCA exchanging by RCA gives a higher strength values for both compressive and flexural.

On cumulative proportion exchanging of RCA by substituting NCA, a continue reduction in strength is examined. It revealed, only 10% exchanging of NCA by RCA gives enlarged strength assets.

NCA are replaced by RCA for all 7 days, 14 days and 28 days curing period, the extreme compressive and flexural power is noted when 25% cement is replaced by FA & 10%

The growth in flexural power is additional when equated by compressive power with exchanging of conservative ingredients.

It can be determined from this dissertation effort that FA can be used as a fractional exchanging of cement and RCA can be used as a partial exchanging of NCA up to an optimal values. GP is not that useful as far as exchanging of cement is worried about. A more detailed revision can be voted out to discuss use of concrete having such materials in future.

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