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A Literature Review on Properties of Study Concreteby Addition of Ggbs & Fly Ash

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ABSTRACT

Due to rapid development in infrastructure, it turns out to bevery necessary to find and adopt some eco-friendly products. It is becoming more and more obvious that gradual evolution in the field of construction has adverse effect on the well-being the earth and putting future generations in danger. Concrete could also be used for a few special purpose that special properties are more important than those commonly considered. The most important objective of this study is to assess the chances of usage of GGBS (Ground Granulated Blast Furnace Slag) in concrete. The enhance mentina technology requires studying effects caused by the mineral admixture on the strength of the cementitious materials. This project represents the results of an experimental investigations accomplish to understand the suitability of GGBS in production of concrete. In this experimental study the impact of GGBS on strength of referral concrete M20 was prepared using 43 Grade OPC and the other mixes were prepared by replacing part of OPC with GGBSThe replacement levels were 0%, 20%, 30% & 40% (by weight of cement) for GGBS and replacing fine aggregate with 0%, 20%, 30% & 40% crusher dust.

Key words: Power GGBS, Cement, CA & FA, Compressive Strength, Flexural Strength and Drying Shrinkage

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INTRODUCTION

Concrete is a very tough and adaptable construction material. It consists of cement, sand and aggregate (e.g., gravel or crushed rock) mixed with water. The cement and water form a paste or gel which coats the sand and aggregate. When the cement reacts with the water, it hardens and holds the entire mix together. The initial hardening reaction usually occurs within a couple of hours. It takes some weeks for concrete to reach full hardness and strength. Concrete has tendency to harden and attain strength for few more years. Concrete withstands compression (crushing), but is extremely poor in tension (stretching). For concrete to resist tension, it is reinforced with steel bars (rebar), polymer strands or fibers. After the water, cement is second most used material within the world. But this rapid production of cement, create a big environmental problem for which it is need to find out civil engineering solutions. Emission of CO_2 within the production process of the cement. 1 tone of CO_2 is estimated to be released in the environment when 1 tone of OPC is manufactured. As people are more concerned about environment and creating an awareness among the public about the limited energy sources in earth crest and for future generation, we have to save it or find an alternative energy sources. Similarly, it is needed to create awareness in construction field too. This is second environmental issue associated with consumption of lime. As there's no alternative binding material which totally replace the cement so the utilization of partial replacement of cement is well accepted for concrete composites.

LITERATUR REVIEW

Vinayak Awasare, Prof. M.V. Nagendra has done research on strength properties of partially replaced GGBS concrete and also compared crushed sand with natural sand in concrete. Research has shown that 30%cement can be replaced by cement with 100% crushed sand gives better compressive strength and flexural strength than 100% cement and natural sand in concrete. Gopi reddy Madan and G. **Vimal anandan (2019)** in this analysis, GGBS used as a partial replacement of cement, crusher dust as a partial replacement of FA, SSW as a partial replacement of CA. This study has concluded that workability of concrete increases while GGBS, SSW and QD is replaced for cement, coarse aggregate and fine aggregate respectively. The compressive strength increases by 6.40% and the split tensile strength increases by 9.52% for cement, fine aggregate and CA replacement by GGBS, QD and SSW respectively when compared to conventional concrete.

Amunuri S Kumar, P Indrateja, G Nikhil, Rama chander D (2017) have studied that use of GGBS significantly decreases the risk of damages caused by alkali–silica reaction (A SR), provides higher resistance to chloride ingress—reducing the risk of reinforcement corrosion and provides higher resistance to attacks by sulphate and other chemicals. This research has shown that the increment in % of GGBS brings about abatement in quantity of cement. The diminishment in the cost of cement at the present market is14%, on account of GGBS as substitution of PPC in concrete by GGBS gives the economy in the development as well as encourages ecological inviting transfer of the waste slag which is made in tremendous amounts from the steel ventures. B K Varun, **Harish BA (2018)** the objectives of the study to evaluate the fresh properties of control concrete of M-30 grade and concrete made with partial replacement of cement by fly ash and ground granulated blast furnace slag. Research has come to the conclusion making concrete with the combination of Fly ash and GGBS and cement with different percentages gives good results compared to control concrete. So the best method to use these materials is infusion. Due to environmental issues in the production of cement, industrial by products like fly ash and GGBS are used as supplementary materials in concrete and it saves cost of production of concrete, and makes it eco-friendly. Quaid Johar **B, Kuldeep Dabhekar (2016)** have studied on the effect of concrete with various replacement of GGBS, and this research paper mainly specialise in compressive strength and flexural strength of concrete. With the replacement of OPC of 53 grade with GGBS will get a notable reduction of CO_2 gas emission. And therefore GGBS is an eco-friendly construction material. when utilized in concrete it replaces as much as 80% of ordinary Port land cement of 53 grade. GGBS concrete has better water impermeability characteristics and make concrete resistance from sulphate and chloride attack. And hence service life is enhanced and the maintenance cost is reduced.

Materials Used

In the present investigation materials used are

1. Portland Pozzolana Cement 43 grade PPC.
2. GGBS (Ground Granulated Blast FurnaceSlag).
3. Crushed sand as fineaggregate.
5. Crushed Granite as coarse aggregate of size not greater than 20mm.
6. Water

Material Properties

Cement: In this present work 43 grade ordinary Portland cement (OPC) will be used for casting cubes and cylinders for all concrete mixes. The cement is of uniform colour i.e. Grey with light greenish shade and is free from any hard lumps. The tests will be conducted on cement are initial and final setting time and normal consistency. Testing on cement is completed as per IS codes.

Initial setting time	110 mins
Final setting time	180 mins
Normal consitency	32%
Specific surface area	2921 $cm^2/_{gm}$

GGBS: Ground granulated blast furnace slag is in white colour and is free from lumps. Tests conducted on GGBS are initial and final setting time and normal consistency.

Initial setting time	110 mins
Final setting time	156 mins
Normal consitency	36.5%
Specific surface area	3085 cm^2/gm

Fine aggregate: Artificial fine aggregates were obtained from crusher plant. The sand used for this project was locally procured and conformed to grading zone II as per IS 383-1970. The test result indicated that, the sand was satisfying the

requirement according IS code, the silt content and clay lumps were within thelimits. Same sand was used throughout all concretemix.

Specific gravity	2.805
Water absorption (%)	2.459
Loose bulk density (kg/lit)	1.77
Fineness modulus	2.785

Coarse aggregate: Coarse aggregates (natural aggregates) used was a crushed volcanic basalt rock. The following tests were carried out for both natural and recycled coarse aggregates, as per the method given in relevant IS code of practice

Specific gravity	2.8
Water absorption (%)	2.4
Loose bulk density (kg/lit)	1.33

Mixing of concrete– The design formulation is based on the ISCODE 10262-2000 for M20 grade of concrete (Fck20Mpa). Water cement ratio is calculated as 0.54. The mix ratio is (1:1.58:3.03). Mixing of concrete was carried out by machine. Machine mixing isn't only efficient but also economical. Before the materials are put in to drum about 25% of the total quantity of water demand is poured into the mixer and to stop sticking of cement on the bodies or at the bottom of the drum Exact mixing of material is done and is very necessary for the production of uniform concrete until the mass of the concrete becomes homogeneous and uniform in colour with a proper consistency.

Testing of Specimen

Test on fresh concrete – The workability test was taken as per IS CODE 456-2000. Workability is that the capability of a fresh concrete mix to fill the form/mould accurately with the specified vibration and without compromising the concrete's qualityWorkability depends on water content, aggregate (shape and size distribution), Cementitious content and age (level of hydration and may be changed by adding chemical admixtures, like Super plasticizer. **Slump Cone Test** – The concrete slump test measures the consistency of fresh concrete before it sets. It is carried out to check the workability of freshly made concrete, and thus the convenience with which concrete flows. It also can be utilized as an indicant of an improperly mixed batch. Slump test is employed to work out workability of fresh concrete. Slump test as per IS CODE 1199-1959 is followedThe apparatus used for doing slump test are Slump cone and tamping rod. Workability can be measured by the concrete slump test, a simplistic measure of the plasticity of fresh batch of concrete. Slump is generally measured by filling an "Abrams cone" with a sample from a fresh batch ofconcrete.

Test on hardened concrete

Compression Strength test – The compression test is used to determine the hardness of cubicle specimens of concrete. The strength of a concrete specimen depends upon cement, aggregates, bond, w/c ratio, curing temperature & age & size of specimen. Mix design is that the major factor controlling the strength of concrete. **Drying Shrinkage test**- As the contracting of a hardened concrete mixture because of the loss of capillary water. This shrinkage causes an increase in tensile stress, which can cause cracking, internal warping, and external deflection, before the concrete is subjected to any quite loading.

CONCLUSION

1. The sturdy of paper on different times suggest that the compressive strength of concrete mixes decrease with increase presence of Fly ash. It should be kept in mind that the optimum limit of mixing of fly ash is 45% and more than that may not be safe for different concrete mixes.
2. Generally with the increase of fly ash there is steep increase in strength from 7 to 28 days which is indicative that early strength of concrete is reduced with increase in proportion of fly ash. Above all the variation in early strength is more than that of in later strength. Hence the fact remains that Fly Ash has an adverse effect on early strength of concrete.
3. Depending upon the percentage of Fly Ash as well as time of curing sometimes mixes of higher strength can be economical than that of mix lower strength.
4. Making concrete with the combination of GGBS and cement with different percentages gives good results compared to control concrete. So the best way to use these materials is in combination.

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