A Review on New Development in Concrete by Using GGBS and Silica Fume

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***Abstract*- This Sustainable development shall meet the need of the present without compromising the ability of the future generation to meet their requirements. It also shows development that is going to be made to sustain the resources by using them effectively without unnecessary wastage. The use of GGBS and Silica fume to the preparation of green concrete is because the production of cement emits carbon di oxide to the atmosphere. As the resources in the planet are getting day by day there is seriously a need of alternative of cement which is more eco-friendly and also possess the same properties and strength as that of the ordinary Portland cement. My study is based on the use of GGBS and silica fume in place of cement and to investigate the properties at different proportions.**

***Index Terms*- GGBS, Silica Flume, Concrete**

INTRODUCTION

Concrete is the second most used material in the world after water. Ordinary Portland cement has been used traditionally as a binding material for preparation of concrete. Increasing emphasis on energy conservation and environmental production has led to investigation of alternatives to customary building material. Among the goals of these investigation are to reduce greenhouse gas emission and minimize the energy required for material production.Currently, Portland cement is the leading material for the industrial concrete demand worldwide, fulfilling a demand of over 1.5 billion tons annually. The production of Portland cement is energy-intensive and releases a significant volume of carbon dioxide (co_2) to the temperature.

For each ton of Portland cement manufacture, it is estimated that one ton of co_2 is released into the environment. Also the emission by cement manufacturing process contributes 7% the global carbon dioxide emission. The process involved very high temperatures (1400 - 1500 ^{o} C), the destruction of quarries to extract raw materials, and the emission of greenhouse gases such as CO_2 and NO_X.

The costs associated with these energy requirements are significant. Consequently, the need arose for further investigation into cementitious product with decreased environmental impacts and enhanced economic benefits. Readily-available commercial by-products such as ground granulated blast furnace slag and silica fumes have been adopted to meet these demands. To these end, it was estimated that the amount of GGBS 6 lakhs tons.

Concrete is a basic building material that will continue to be in demand for into future. A world without concrete, and its dominate precursor, ordinary Portland cement (OPC), is hard to imagine. Although there are different types of concrete that have been developed for use in different application, their common virtues are familiarity, fire resistance, resistance to the elements and comparatively low cost.

MATERIAL AND METHODOLOGY

Today the word green is not just limited to color, it represents the environment, which is surrounding us. Concrete which is made from concrete wastes that are eco-friendly are called as "Green Concrete". The other name for green concrete is resource saving structures with reduced environmental impact for e.g. Energy saving, co_2 emissions, waste water. Concrete waste like slag, power plant wastes, recycled concrete, mining and quarrying wastes, waste glass, incinerator residue, red mud, burnt clay, sawdust, combustor ash and foundry sand. Green Concrete is a term given to a concrete that has extra steps taken in the mix design and placement to insure a sustainable structure and a long life cycle with a low maintenance surface e.g. Energy saving, CO_2

emissions, waste water. The goal of the center for green concrete is to reduce the environmental impact of concrete. To enable this, new technology is developed. The technology considers all phases of a concrete construction's life cycle, i.e. Structural design, specification, manufacturing and maintenance, and it includes all aspects of performance, i.e.

1) Mechanical properties (strength, shrinkage, creep, static behavior etc.)
2) Fire resistance (sprawling, heat transfer etc.)
3) Workmanship (workability, strength development, curing etc.)
4) Durability (corrosion protection, frost, new deterioration mechanisms etc.)
5) Thermodynamic properties (input to the others properties)
6) Environmental aspects (CO_2-emission, energy, recycling etc.)

There are a number of alternative environmental requirements with which green concrete structures must comply:

- CO_2 emissions shall be reduced by at least 30%.
- At least 20% of the concrete shall be residual products used as aggregate.
- Use of concrete industries own residual products.
- Use of new types of residual products, previously land filled or disposed of in others ways.
- CO_2- neutral, waste-derived fuels shall substitute fossil fuels in the cement production by at least 10%.

Coarse Aggregate:

Coarse aggregate are boulders, Granite chips, Natural stone etc. In the process of sieve analysis the materials which retains on IS Sieve of 4.75mm are called coarse aggregate. Generally broken hard stone is used as a coarse aggregate. The type of work decides the size of aggregates. For examples thin slabs require small size coarse aggregates. The aggregates which are used for the green concrete should be hard, durable and clean. It should be free from clay and other natural impurities. The presence of above substances avoids the binding capacity between aggregates and binding materials. Coarse aggregate of size 10mm and 20mm are used in the present study. Coarse aggregate used in case of cement concrete can be used in case of Green concrete also where the coarse aggregate conform to IS-383-1970.

Fine Aggregate:

The material which passes through IS sieve of 4.75 mm are called fine aggregate. Fine aggregate should consist of natural sand or crushed sand. In the present study, river sand was used. The required properties of fine aggregates are, it should be hard, durable, clean and also free from impurities. The silt contain should not exceed 4%. In place of sand we can also use bottom ash which can be replacement of sand. Up to level of 20% replacement of sand gives a good compression strength.

Ground Granulated Blast Furnace Slag (GGBS)

It is a by-product obtained in the manufacture of iron and slag. Here lime stone, iron ore and coke are filled into the furnace and the resulting slag of molten form will float above the molten iron at temperature of 1500 ^{o} c to 1600 ^{o}c. the slag which contains mainly siliceous and aluminous residue can be obtained by tapping from the molten iron. Then this slag should be quenched by cold water to get the glass granulate. This material is dried and ground into the required size which is called as ground granulated blast furnace slag. Just like cement bags GGBS is also available in market in 50 kg packing bags.

Silica Fumes:

Silica fume, also known as micro silica, is amorphous (non-crystalline) polymorph of silicon dioxide, silica. It is an ultrafine powder collected as a by-product of the silicon and ferrosilicon alloy production and consists of spherical particles with an average particle diameter of 150 nm. The main field of application is a pozzolanic material for high performance concrete. It is sometimes confused with fumed silica. However, the production process, particles characteristics and fields of application of fumed silicon are all different from those of silica fume.

Cement:

The ordinary Portland cement (OPC) of ultratech cement 53 grade is used to avoid temperature curing was not carried out.

Viscoflux-2203+ ViscoFlux-2203+ is fourth generation advanced polycarboxylate polymer

admixture for high performance concrete and slump retention properties. The polymer significantly reduces water with improved slump life of the mix, particularly those containing supplementary cementious material like GGBS. Fly Ash and Micro silica. ViscoFlux-2203+ compatible with all types of cement that meet recognized national and international standards.

The methods which will be adopted are as below:
1) To developed the green concrete with locally available GGBS, Silica fume.
2) To study the effect of ratio of GGBS, Silica fume on compressive strength of green concrete.

The following tests are to be performed for fine aggregates in future:-
PROPERTIES OF FINE AGGREGATE (RIVER SAND)

S. No	Properties	Method of Test
1	Water absorption %	IS: 2386 (part 3)
2	Specific Gravity	IS: 2386 (part 3)
3	Impact value %	IS: 2386 (part 4)
4	Crushing Value	IS: 2386 (part 4)

Laboratory Testing:
The lab testing of the specimen will comprise of the following tests which includes:-

1) Slump Cone Test
2) Compaction Factor Test
3) Flow Table Test
4) Compressive strength Test
5) Splitting Tensile strength Test
6) Flexural Strength test
7) Water Permeability Test
8) Water absorption Test

CONCLUSION

1) The strength with different mixes of GBSS and silica fume will be calculated.
2) Workability and the corresponding strength will be analyzed as we know that workability increases strength decreases.
3) By using GGBS and Silica Fume, Rheological factors will also be analyzed.

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