



A RESEARCH: DAGLOCS COMPOSITION

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ABSTRACT

This project work basically targeted towards the aim of making an economical and durable concrete composition which comprises of same strength in comparison to the conventional concrete. It promotes the use of waste materials which is more suitable for preparing a concrete mix in a most efficient manner. Although for overcoming the limitations of the concrete mix GGBS is used with OPC, which makes the concrete more durable and economical. The concrete mix will resist the chemical and weathering effect due the use of GGBS. Today the water scarcity is also a big problem in some part of the world, therefore for overcoming this problem DIDP is used in this concrete mix for reducing the use of water content. The durability and strength of this concrete mix is increased with the use of admixture Silicamate. Here in this composition we are using steel scrap fibre (SSF) for increasing the toughness performance of the concrete under the different types of loading applied during the different processing's and this fibre reinforcement provides the higher amount of energy arrangement in the upper most section of the load deflection curve. The Toughness of any structure is defined as the area of the loading to the deflection curve of the structure. In the concrete technology fatigue failure is very normal due to its cyclic and repetitive application on the road surfaces due to the regular moving of the traffic. Thus, for improving the fatigue performance of the concrete we are using steel scrap fibre (SSF) which results in the proper toughness of the concrete and this SSF particularly response for the better serviceability and very minor growth of crack and the corrosion. The actual moto towards making this composition is to reuse the steel scrap fibres which results in the cost-efficient and eco-friendly behaviour of the concrete structures. These all components together with makes the concrete mix economical and durable with the required strength.

Keywords : GGBS, DIDP, OPC, SSF, Coconut Shell, Silicamate.

I. INTRODUCTION

Today in the era of concrete technology we have achieved a lot of targets and in overcoming those obstacles we have faced many milestones for the enormous amount of improvement in the characteristics of the concrete. But matter of the fact is that today we are far ahead from our target and many of the milestones are to be achieved. In the history of concrete, the economical and durable construction play a vital role and results in the better construction. Today the cost of construction is too high so that a low-class family cannot afford the construction of buildings in a very nominal cost, and also that construction may not be guaranteed i.e. weather it will be durable or not. In this research process we have seen a very interesting behavioral change in this DAGLOCS Composition. This project work mainly assesses the mechanical and chemical changes in the concrete and this study provides a confined and precise value for the use of different materials which will be used in this composition within a predefined ratio which is obtained after the designing of the M30 and M40 grade concrete structures under different ratios.

We know that Ordinary Portland Cement generally prepared with a very long process which puts a very higher cost in its preparation and also its preparation results in the extensive emission of greenhouse gases, these greenhouse gases results in the pollution of environment through the depletion of the ozone layer. In the recent time we had seen that due the excavation of raw materials (which are extensively used in the processing of the cement manufacturing) at higher level, after sometime the whole world will face the scarcity of those cement manufacturing raw materials. Thus, we must have to develop the alternative of the ordinary Portland cement for maintaining the concrete construction through the centuries.



In this project work ground granulated blast furnace slag (GGBFS) is introduced for making the concrete composition cost-effective and more durable structures in comparison to that conventional concrete structures. This ground granulated blast furnace slag not only provide the strength and durability but it also provides the resistance against the chlorine and sulphate attack moreover it also provides the resistance against the weathering attacks. The important thing in this composition is that each material which are involved in this composition are used in a particularly specified ratios and in a particularly well-designed amount. The involvement of various chemical compound specifies that whole concrete will fulfill the each and every requirement of the concrete composition. In the recent trend the cost of Ordinary Portland Cement is increasing at a very extensive rate, since the Ordinary Portland Cement mainly made up with the raw materials i.e. limestone which is obtained by quarrying the earth at the efficient depth, this quarrying with proper precision is attended for obtaining a large amount of required chemical composition which is easily found during the excavation of limestone in the earth surface.

II. LITERATURE REVIEW

Dr. Arun Kumar Dwivedi concluded the fact that the replacement of OPC with the GGBFS results not only maintaining the economy of the concrete but also it provides the eco-friendly disposal of the wastes which are obtained from the industries as a by-product.

Pooja Shrivastava, Dr. Y. p. Joshi provides the fact that the use of steel scrap fiber (SSF) in a specified ratio results in the improvement of the compressive, flexural and tensile strength of the concrete.

Tomas U. Ganiron Jr projects the attention on the sustainable use of the coconut shell in the concrete because their study on coconut shell use in the concrete revolves the fact that these concrete gives same strength in comparison to the conventional concrete.

III. MATERIALS

This composition involves the best alternatives of cements and aggregates for the partial replacement such as:

A. Ground Granulated Blast Furnace Slag (GGBS)

Ground Granulated Blast Furnace Slag is obtained from iron industries in a by-product form, it is glassy and granular in nature, after drying it is further converted in fine powder form. The higher percentage of CaO results in the increase of compressive strength of structures. Its initial setting time and final setting time is greater than that of Ordinary Portland Cement. GGBS is capable to resist the sulphate, chloride and other weathering attacks.

Table I. Compositions of GGBS

Components	Presence (%)
CaO	30-50
SiO ₂	28-38
Al ₂ O ₃	8-24
MgO	1-18

B. Ordinary Portland Cement (OPC)

This cement is widely used in whole world because of its cementitious properties. It is obtained by mixing of limestone and clay minerals at the increased temperature in a rotatory kiln. Ordinary Portland Cement involves two-third proportions of calcium silicates. The heat of hydration of OPC cement is greater than that of GGBS therefore OPC starts its reaction with water earlier to that of GGBS.

C. Coarse Aggregate

Coarse aggregates are those aggregates whose particle size is greater than 4.75mm. It is used in concrete because it has tendency to resist the higher compressive strength. The round shaped aggregates increase the

workability of the concrete. Its specific gravity is in between 2.6 to 2.68. The angular shaped aggregates results in the higher compressive strength of the concrete.

D. Coconut Shell

Coconut shell is now using as the best alternative of coarse aggregates because of its higher strength and modulus of elasticity. It shows no any change in concrete properties after the partial replacement with coarse aggregates. It not only reduces the unit weight of the concrete structures but also helps in the conservation of natural resources.



Figure 1. Coconut Shell

E. Fine Aggregate

Fine aggregates are those aggregates whose size is less than 4.75mm. Its specific gravity lies between 2.6 to 2.66. It is basically used for providing bonding chain in between the different particles of the concrete i.e. it acts as filler materials. It provides a good compressive strength to the concrete structures.

F. Lathe Scrap

Lathe Scrap provides a good compressive strength to the concrete structure. It acts as a cracking control material. It also acts as fibrous material which provides a good bonding property to concrete structure. This material has higher modulus of elasticity in comparison to any other material. Due to lathe scarp mixing the strain property of the concrete increases upto a greater extent.



Figure 2. Lathe Scrap

G. Silicamate

Silicamate is an admixture which provides the bonding characteristics in between the concrete materials. It also increases the flowability of the concrete due to which the workability of the concrete increases upto higher extent. The main reason behind its property of increasing bonding strength is the increased silica content in it, because silica plays a vital role in the bonding characteristics of any of the concrete materials.



Silicamate is a water reducing admixture so it can be used in those structures which are to be made at that location where availability of water is less. During concrete mixing, only portable water can be mixed in the concrete. Dirty or polluted water results in the decrease in characteristics strength of the concrete structure. In this concrete mix it is used for the purpose of reducing the heat of hydration and in whole for avoiding the cracks generated during the setting of the concrete mix.

H. Diisodecyl Phthalate (DIDP)

Diisodecyl Phthalate is a plasticizer which is mainly used for the purpose of increasing the workability of the concrete. Since due to the use of angular shaped aggregates there may be a possibility of the reduction of workability of the concrete so for increasing the workability of concrete the DIDP plasticizer is used which is economical in cost.

Proper mixing of plasticizers in the concrete leads to the better workability of the concrete so that the possibilities of cracking and shrinkage reduced upto a greater extent. In this concrete mix Diisodecyl Phthalate is used because it is economical in cost and easily available in the market so that everyone can use this component in concrete mix.

IV. METHODOLOGY

Various methods are used for mixing of whole components of this concrete mix. The concrete mix is designed as per the requirement of concrete structures. This concrete composition is mainly for the concreting of heavier structures. Various methods are as follows:

A. Designing of concrete mix

Designing of the concrete mix is done as per Indian Standard Code 10262 – 2009. Proper mixing of two cements along with their specific gravity is done for the required characteristic strength of the concrete structures. Unusual mixing of different concrete materials may lead to the disfunctioning of the concrete structures.

In this concrete mix 50% to 40% of cement replacement is done because previous experimental data is showing the fact that the characteristic strength is same after the partial replacement of cements. Setting time may be the issue but after putting the higher percentage of Ordinary Portland Cement in that concrete mix the setting time of whole concrete mix is balanced due to increase in the heat of hydration of the cement in the concrete mix.

This concrete mix comprises of 20% to 40% difference in the coarse aggregates and coconut shell. It is combined such that the specific gravity of this individual mix is same as that of the coarse aggregate. After the mixing of coconut shell in this concrete mix in partial amount the slightly varying strength will be shown according to the previous studies but as the time passes the strength gets increases in this advance composition due to the GGBS proportions in this concrete mix.

Since GGBS starts its chemical reaction with water after a long time so that the heat of hydration in this concrete mix will be lower.

In the concrete mix Ground Granulated Blast Furnace Slag and Ordinary Portland Cement contributes a specified ratio of 40% to 50% in the cement proportions. The higher percentage priority is given mainly to the Ordinary Portland Cement and Ground Granulated Blast Furnace Slag stands with lower percentage priority.

During the mix design of cements proper selection of ratios are the main point for the concern because cements are the basic constituent of any concrete mix.

Percentage of water cement ratio also be a basic point of concern for this concrete mix because any unusual selection of water cement ratio in this composition may deteriorates the whole characteristic strength of the concrete mix.



B. *Mixing of concrete mix*

This concrete mix involves the various levels of the mixing of the individual components of this composition which are as follows:

- In its initial stage of the mixing of this composition two different cements (Ground Granulated Blast Furnace Slag and Ordinary Portland Cement) are mixed in a specified proportion such that the OPC will provide initial strength to the concrete and GGBS will extend the final setting of the concrete mix so that the durability of the structures will increase up to a greater extent.
- In the second stage of mixing the coarse aggregate and coconut shell is mixed in a specified proportion so that by the mixing of coconut shell the total weight of the concrete structure will be reduced up to an increased level. The proper selection of the proportions of the coarse aggregate and coconut shell will lead to best characteristic strength and a better workability of the concrete.

If any issues of workability are seen due to the mixing of coarse aggregate and coconut shell then the plasticizer can be changed to the implementation of higher grade of concrete.

- In the third stage of the concrete mix the mixing of Fine aggregate and Lathe Scrap is done due to the increased modulus of elasticity of the lathe fiber. Since Lathe scraps are easily available in the workshops which are the by-product of machineries designing.

After the partial replacement of fine aggregate with the lathe scrap in a specific quantity the compressive strength of the concrete structures increases in large amount. Lathe scrap has the fibrous properties so that it will combine with concrete compositions and adopt its physical and chemical properties in well specified manner.

- In the fourth stage of the concrete mix the whole mixing process will be focused to the mixing of plasticizers and admixtures. In this composition Diisodecyl Phthalate is used as the plasticizer and Silicamate is used as an admixture. These chemicals are used in this composition because the Silicamate reduces the water content in this composition and Diisodecyl Phthalate increases the workability of the concrete up to a greater extent.

Proper use of these plasticizers and admixtures leads to the best workability and reduction of the water content, which will be useful in desert location, where availability of water is less and heavier structure is required.

V. RESULTS AND DISCUSSION

From the above analysis of this composition interesting results are obtained which are as follows:

- Proper utilization of coconut shell reduces the weight of the concrete up to a greater extent.
- With the help of GGBS the lifespan of the concrete structures can be increased due to the setting properties of the GGBS cement.
- Due to the use of lathe structure fibrous compound is obtained in the concrete mix, so that the complex design of compound takes place.
- By the use of Diisodecyl Phthalate initial viscosity will be maintained for increasing the various concreting properties of the composition.



- With the use of Silicamate the water content can be reduced upto a greater extent and bonding characteristic will be also improved.

VI CONCLUSION

From the above results various conclusions are obtained which are as follows:

- When the OPC is replaced through GGBS in partial amount same characteristic strength is seen in whole concrete structures which means this new composition will be economical in comparison to that of the traditional concrete.
- By the replacement of Lathe scrap and coconut shell with the GGBS the sudden increase in strength is observed due to the extension of the initial and final setting of the concrete.
- With the use of these wastes in the concrete the cost of construction will decrease upto 50%.
- By the use of plasticizers and admixtures surprising changes are observed in the concrete mix properties.

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