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Experimental Study of Partial Replacement of Cement With Flyash and GGBFS in Concrete

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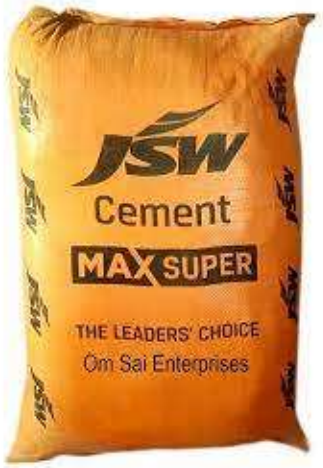
Abstract: Concrete is the most used construction material in the civil engineering .Concrete is the world's consumable product next to water .The fly ash and GGBS has been used as a partial replacement of cement in the concrete. The fly ash is obtained as combustion of pulverized coal and collected by mechanical dust collector or electro static precipitator. The GGBS is a by -product of iron and steel industry,obtained by quenching of molten iron slag from a blast furnance in a water or steam to produce a glassy granular product that is then dried into fine powder. By utilizing these two products as a partial replacement of cement in concrete, the concrete can be more eco friendly by reducing the use of cement.

INTRODUCTION

Concrete Concrete is the most widely used construction material in the world and it has played a major part in shaping civilization. The Romans were the first at using concrete but it was also known to the Egyptians and in a primitive form to Neolithic civilizations. The main difference between the concrete found in these classical civilizations and modern ready mixed concrete is the binding agent.Understanding these individual ingredients in a little more detail provides an insight into ways of obtaining the best results for different types of project. Concrete is the product of mixing, aggregate, cement and water. The setting time of concrete is chemical reaction between the cement and water, not a drying process. This reaction is called hydration, the reaction liberates a considerable quantity of heat this liberation of heat is called heat of hydration. There is an initial set when the concrete will cease to be liquid but have little strength, thereafter the concrete will gradually gain strength over a time until it achieves the strength required

MATERIAL

1.Ordinary Portland Cement (OPC): OPC is a special blended cement useful in general construction work and is especially suitable for applications in environmental conditions. 53 grade cement is used and it is used as a binding material.



2.Coarse aggregate :

The size of the aggregate is more than 4.75mm is called as a coarse aggregate.For this project, we are using 10mm size aggregate.It is used as a concrete material to increase thestrength.

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3.Fly Ash

Fly Ash is a material which is coal combustion product extracted from the flue gases throughelectrostatic precipitators in dry form.

4. Ground Granulate Blast Furnance Slag (GGBS):

GGBS is obtained by quenching molten iron slag from a blast furnance in water or steam, to produce a glassy, granular product that is then dried and ground into a fine powder**.**

5. **Fine Aggregate:**

Fine Aggregate is the essential ingredient in concrete that consist of natural sand or crushed stone . The quality and fine aggregate density strongly influence the harden properties of the concrete.

TESTS ON MATERIALS USED:

1.Impact test on aggregate:

Aggregate Impact Value test determines the aggregate Impact Value (AIV) of aggregates which provides a relative measure of the resistance of an aggregate to sudden shock or impact. Resistance of the aggregates to impact is termed as toughness.Impact Value should not be less than 45% for aggregates used for concrete other than wearing surface and 30% for concrete used in wearing surface.

2.Crushing Test On Aggregate:

The aggregate crushing value provides a relative measure of resistance to crushing under a gradually applied compressive load. To achieve a high quality of pavement, aggregate possessing low aggregate crushing value should be preferred.The aggregate crushing value forcement concrete pavement shall not exceed 30%. The aggregate crushing value for wearing surfaces shall not exceed 45%.

1. Fineness test on cement:

The fineness of cement has an important bearing on the rate of hydration and hence on the rate of gain of strength and also on the rate of evolution of heat. Finer cement offers a greater surface area for hydration and hence faster the development of strength. According to the IS recommendations, the standard value of fineness of cement should have a fineness

that is less than 10%, or the fineness of cement should not be higher than 10%.

2. Specific Gravity:

Specific gravity separates bad particles which are lighter than other particles, from good aggregates. Using specific gravity in cement mix design, we calculate the solid volume of aggregates in concrete mix. Gavel, water and cement are used for this test.The specific gravity of coarse aggregate of 10mm is 2.7.

Cube casting

ADVANTAGES

- Increased workability
- Reduction of cement consumption
- Thermal cracks and heat of hydration are reduced
- Cost-effective
- Additional strength to concrete

CONCLUSION:

As we have replaced cement with ggbs&flyashwe conclude that we can reduce the cement in the construction and eco-friendly to nature .

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