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Binary Fly Ash Concrete Using Ggbs Blends Power Studies

S.Swapna
Assistant Professor,
Department of Civil Engineering ,
Christu Jyothi Institute of Technology and Science.

Abstract:

Cost and energy efficient, while it's always solid and stronger than it was in the past has always expected more. In addition, concrete and building materials, which should be more than the mall's three major advantages: in virtually any location would be the possibility of tampering. The ability of the impleme ntation of the shape of the mold to form.And components, and reduce manufacturing costs. These factors more substantial progress in improving the performance of the year and continue to do so in a state of shock. Ever-increasing demand for concrete concern for the environmental effects of concrete and the need to improve the performance of alternative materials has led to increased use of part. Was that silica dust, rice silent ash, fly ash content as it is clear now that, and ground granulated blast furnace blast furnace slag and waste extent the cement used to fill or require a high-performance, whereas This must be done with great natural ingredients that met the production of kaolin. This study investigated the concrete containing fly ash and GGBS Blended study aims to establish the binary. The absence of concrete admixtures and water / cement ratio of 0.42 and emphasize the percentage of a mixture of 1: 1.17: probe in place of cement, fly ash and GGBS 3.02.The ratio. 0% 0.10% 0.20% 0.30% and 40%. Studied mechanical properties are evaluated bilateral blended solid strength. Such as the 28-day strength of hardened concrete in terms of mechanical properties up to replace 30% of it has been improved. The ash particles increased bucket of concrete action and buzzes and fly ash cement paste to fill the small spaces between grains in part can be combined with the head.

I. INTRODUCTION

Solid most widely used on a wide range of building materials and a high strength, good weather durability of the mold and fire resistance capability as there are many advantages. slag use of ground granulated blast furnace (GGBS) and in recent years the growth of fly ash in mortar. Records show in 1930 during the construction of the Empire State Building, which is the use of blast furnace cement mortar. Fly ash is found that some of the assets in the case of mortars for more than twenty years of mortar shells have been used as a constituent. These materials transported, and they are environmentally friendly, new properties and mortar shells as your limited to the technical advantages of both. Industrial processes and resulting from the use of materials and products for each, must be extracted from the ground, which reduces the amount of raw materials. Country, possibly a hydraulic granulated blast furnace slag is classified. This docking means inherent qualities, "but it should be active. Is to combine this material with Portland cement, natural ways to achieve. Classified fly ash powder, as a pozzolana. Ingredients type usually does not, "is the quality, but if it is combined with highly alkaline materials will be the formation of products under the docking docking.

II. FLY ASH

In the United Kingdom known historically as pulverized fuel ash, fly ash, a by-product of burning coal in power plants pulverized. The mortar shell that increase the performance characteristics of both head and buzzes and materials. Available in some parts of Europe, natural pozzolan; These are made from volcanic ash and use back to Roman times.

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2.1. Reaction mechanism

Due to the mineralogical composition of the coal used, some fly ashes produced within Europe may have latent hydraulic properties in addition to pozzolanic properties. The majority of UK ashes do not. When Portland cement hydrates it produces alkali calcium hydroxide (lime). Pozzolanas such as fly ash can react with this lime to form stable calcium silicate and aluminate hydrates. These hydrates fill the voids within the mortar matrix, thus reducing the permeability and the potential for efflorescence. Additionally, the reduction in the quantity of lime remaining further decreases the occurrence of efflorescence. This process improves the strength, durability, and chloride and sulfate resistance of the mortar.

The addition of fly ash to a mortar, either as a cementations material or as an aggregate, normally results in a reduction in the quantity of water required for a given level of consistence. Mortars containing fly ash have improved fresh properties, in particular, cohesion and resistance to segregation and bleeding. Furthermore, they will tend to have a slower setting time which is advantageous in warmer weather conditions.

Mechanism of Hydration:

2C3S+6H-C3S2H3+3CH

2C3S+4H-C3S2H3+CH

Pozzolanic Reaction:

3CH+6H-C3S2H3

III. Ground granulated blastfurnace slag (ggbs)

During the manufacture of iron, blastfurnace slag is produced as a by-product. This material is rapidly cooled to form a granulate and then ground to a fine white powder (ggbs), which has many similar characteristics to Portland cement. When ggbs is blended with Portland cement further recognised cementitious materials such as Portland-slag cement and blastfurnace cement are produced. In the UK, ggbs is manufactured and generally sold as a separate powder which is then batched and blended within the mixer. It is used extensively in the construction industry to produce concretes, grouts and mortars.

3.1. Reaction mechanism

The hydration mechanism of a combination of ggbs and Portland cement is slightly more complex than that of a Portland cement. This reaction involves the activation of the ggbs by alkalis and sulfates to form its own hydration products. Some of these combine with the Portland cement products to form further hydrates which have a pore blocking effect. The result is a hardened cement paste with more of the very small gel pores and fewer of the much larger capillary pores for the same total pore volume. Generally, the rate of strength development is slower than for a Portland cement mortar.

3.2. GGBS Utilization

GGBS has been used in mortars for many years, generally in ready-to-use retarded mortars. Increasingly, the dry silo system is coming into use and ggbs is also being used in this method of producing mortar. Typically, ggbs has been used at between 25 and 50% replacement of the Portland cement with or without the addition of lime.

IV. RELATED WORK:

India is one of the fast developing countries in the world. Various fields like Industry, Infrastructure, Construction, Agriculture etc., have a major role in achieving an all round development. This development has urged the industrial sector to produce various goods that are necessary. These industries and factories besides producing various useful goods have also become a source of waste products. And it has become necessary to find ways and means of disposing off or utilizing these waste materials, which may otherwise end up in polluting the surroundings. This led to the investigation of searching fields of utilization of these waste products for a better purpose. Research work was carried out on this subject not only in India but also all over the world. The results of such works showed that there could be no better place other

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than the construction field, where a large quantity of such materials can be utilized in a better and economical way. On the other hand the field of Construction has also its role to play in the development of the country by not only in increasing the construction work but also in a more sophisticated manner. This in turn has an effect on the various materials and their quantities that are to be used. Therefore, this also led to the investigation of new materials, which can be utilized for the purpose even more economically. Especially work has done on the utilization of the by-products obtained from various industries. In this way the construction field and the industrial sector have been linked together, reducing the environmental hazards and serving the economical problems.

V. EXPERIMENTAL PROGRAMME

5.1. GENERAL:

Experimental programme was planned to study the effects of partial addition of glass fiber on strength properties of concrete.

To achieve the objectives of the investigation the experimental program was planned to cast and test the cubes and cylinders to study Strength. The details of the experimental program for cylinders are mentioned in Table no:1

5.1.1. SIEVE ANALYSIS FINE AGGREGATE:

Si.no	Sieve Size	Sand retained on sieve (gm)	% weight retained	Cumulative %Of mass retained	%passing(100-cummulative % mass retained)
1	4.75	8	8	1.6	98.4
2	2.36	16	24	4.8	95.5
3	1.18	62	86	17.2	82.8
4	600µ	84	170	34	66
5	300 µ	242	412	82.4	17.6
6	150 µ	80	492	98.4	1.6
7	Pan	8	500	100	0
		Fineness modulus=338.4/100 =>3.38			

5.1.2. Zone of sand:

From the above table it has been observed that sand conforming to grading zone II

5.2. COARSE AGGREGATE:

Crushed granite stone aggregate of 20mm nominal size was used throughout the work. Specific gravity of stone aggregate was found to be 2.59. The fineness modulus is 7.36

5.3. SIEVE ANALYSIS COARSE AGGREGATE:

Sl.no	Sieve Size	Mass retained (gm)	% Mass retained	Cumulative %Of mass retained	%passing(100-cummulative % mass retained)
1	40	0	0	0%	100
2	20	0.76	0.76	38%	62
3	10	1.222	1.982	99%	0.9
4	4.75	0.008	1.99	99.5%	0.5
Fineness modulus of coarse aggregate=736.8/100=>7..36					

5.4. EXPERMENTAL PROGRAM:

S. N	GF (Kg/ m^3)	GRADE OF CONCRETE	MIX PROPORTION	W/C	NO.OF CYLINDERS	NO.OF CUBES
1	0	M25	1:1.42:2.98	0.475	3	3
	0.9		1:1.42:2.98	0.475	3	3
2	0	M35	1:1.13:2.59	0.38	3	3
	0.9		1:1.13.2.59	0.38	3	3

Table:1

VI. RESULTS & DISCUSSIONS:

Varying the percentages of fly ash and GGBS we tried to study the effect of partial replacement of cement on the properties of concrete. Cement is replaced by fly

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ash and GGBS in percentages of' 10,20,30,40 by weight. With cement, natural sand, coarse aggregate, fly ash and GGBS constituting the basic materials, number of cylinders was cast varying the percentages of fly ash & GGBS. The mix design for M30 grade concrete was done in accordance with IS-10262 method and the same was adopted for the work. Therefore, concrete with and without fly ash and GGBS replacement was tested for strength studies. Based on the studies done blended concrete the following discussions are presented in succeeding paragraphs.

6.1. EFFECT OF FLYASH ON COMPRESSIVE STRENGTH :

It is seen that for plain concrete the 28-day compressive strength has maintained more the target strength even up to 40% flyash replacement. However, it is seen 5.1, that for plain concrete with 40% replacement of cement by flyash, the compressive strength is 40.26MPa which is more than the target mean strength of M30 concrete. Hence from economy consideration, cement can be replaced up to 40% by flyash, where flyash is cheaper than cement.

Results of 28 days compressive strength of cubes of plain and flyash are shown in table:5.1. It is observed that strength is gradually increased from 41.35N/mm2 to 42.96N/mm2 at 30% and decreased to 40.26N/mm2 at 40% replacement of cement with flyash. It is graphically represented in fig no:5.2b.

6.2. EFFECT OF FLYASH ON SPLIT TENSILE STRENGTH:

It is seen that for plain concrete the 28-day split tensile strength has maintained more the target concrete strength even up to 40% fly ash replacement. However, it is seen from table 5.2, that for plain concrete with 40% replacement of cement by fly ash, the split tensile strength is 2.69 Mpa, which is in between the target mean strength of M30 concrete. Hence from economy consideration, cement can be replaced up to 40% by fly ash.

6.3. EFFECT OF GGBS ON COMPRESSIVE STRENGTH :

It is seen that for plain concrete the 28-day compressive strength has maintained more the target concrete strength even up to 40% GGBS replacement. However, it is seen from table 5.2, that for plain concrete with 40% replacement of cement by GGBS, the compressive strength is 38.82 Mpa, which is in between the target mean strength of M30 concrete. Hence from economy consideration, cement can be replaced up to 40% by GGBS.

6.4. EEFECT OF GGBS ON SPLIT TENSILE STRENGTH:

It is seen that for plain concrete the 28-day split strength has maintained more the target concrete strength even up to 40% GGBS replacement. However, it is seen from table 5.2, that for plain concrete with 40% replacement of cement by GGBS, the split tensile strength is 2.54 Mpa, which is in between the target mean strength of M30 concrete. Hence from economy consideration, cement can be replaced up to 40% by GGBS.

6.5. EFFECT OF FLYASH + GGBS ON COMPRESSIVE STRENGTH:

It is seen that for plain concrete the 28-day compressive strength has maintained more the target concrete strength even up to 40% Flyash + GGBS replacement. However, it is seen from table 5.1, that for plain concrete with 40% replacement of cement by Flyash + GGBS, the compressive strength is 40.15 Mpa, which is in between the target mean strength of M30 concrete. Hence from economy consideration, cement can be replaced up to 40% by Flyash + GGBS, where flyash and ggbs is cheaper than cement.

6.6. EFFECT OF FLYASH + GGBS ON SPLIT TENSILE STRENGTH:

It is seen that for plain concrete the 28-day split tensile strength has maintained more the target concrete strength even upto 40% Flyash + GGBS replacement. However, it is seen from table 5.2, that for plain

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concrete with 40% replacement of cement by Flyash + GGBS, the compressive strength is 2.52 Mpa, which is in between the target mean strength of M30 concrete. Hence from economy consideration, cement can be replaced upto 40% by Flyash + GGBS, where flyash and ggbs is cheaper than cement.

6.7 RESULTS OF COMPRESSIVE STRENGTH(MPa) OF CUBES:

Plain	Flyash				GGBS				Flyash + GGBS			
	10%	20%	30%	40%	10%	20%	30%	40%	10%	20%	30%	40%
39.23	41.3	42.6	42.9	40.2	40.3	41.5	41.8	38.8	40.5	41.9	43.0	40.1

TABLE-6.1

6.7. RESULTS OF SPLIT-TENSILE STRENGTH (MPa) OF CYLINDER:

Plain	Fly ash				GGBS				Fly ash + GGBS			
	10%	20%	30%	40%	10%	20%	30%	40%	10%	20%	30%	40%
1.8	2.63	2.87	2.98	2.69	2.26	2.59	2.89	2.54	2.56	2.79	2.87	2.52

TABLE-6.2

VII. GRAPHS

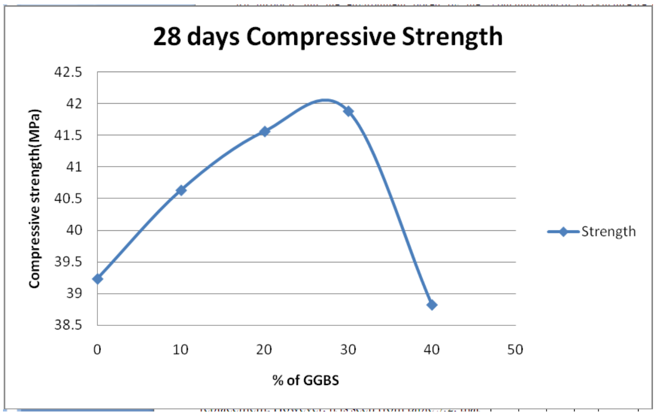

Figure 7.2a 28 days compressive strength of plain and ggbs

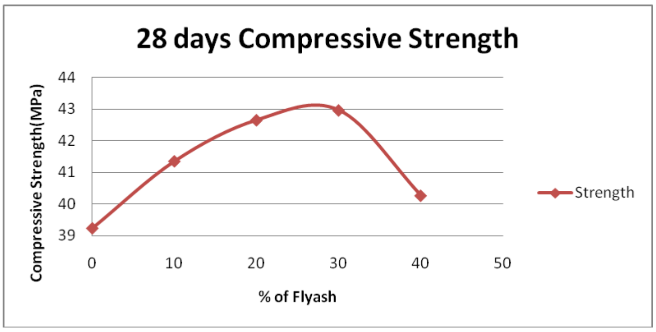

Figure 7.2b 28 days compressive strength of plain and fly ash

VIII. CONCLUSIONS:

The compressive strength was found to be maximum at 30% replacement of cement with fly ash. The compressive strength was found to be maximum at 30% replacement of cement with GGBS. The compressive strength was found to be maximum at 30% replacement of cement with flyash + GGBS. The split-tensile strength was found maximum at 30% replacement of cement with flyash. The split-tensile strength was found maximum at 30% replacement of cement with GGBS. The Split-tensile strength was found maximum at 30% replacement of cement with flyash+ GGBS.

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