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"Experimental Analysis of Concrete Mix Design Using Admixtures"

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Abstract - *A research project is being carried out on structural grade concrete containing low cement and high volumes of admixtures (FLY ASH , GGGBS , RICE HUSK ASH) this report is primarily concerned with the literature information on high-volume admixtures concrete. An extensive literature search was completed about technologies involving high volume uses admixtures in concrete for structural applications*.

Key Words: Fly ash , GGBS (Ground Granulated Blast-furnace Slag), Rise husk ash , Master Polyheed , Sieve analysis test, Aggregate crushing strength, Impact value test , Abrasion value test, Flakiness index test, Elongation index test and also Our aim is study of concrete mix to improve the strength by using proper proportion of materials and various admixtures.

1.INTRODUCTION

Concrete is the most broadly used production fabric within the global and it has performed a primary part in shaping civilization. The romans had been the primary at the use of concrete but it become also recognized to the egyptians and in a primitive form to Neolithic Civilizations. The principle difference between the concrete observed in these classical civilizations and modern-day geared up blended Concrete is the binding agent. The egyptians used crushed gypsum, the romans knew that the way to make lime by means of burning Beaten limestone and that they even found that including volcanic ash or antique bricks and tiles improved the placing Function in their cement. Current concrete become evolved after the invention of portland cement. First patented in 1824 But not advanced in its gift form until 1845 while better kiln temperatures had been performed, portland cement made knew Varieties of creation feasible. Despite those advances attempts to deliver the building trade with ready blended concrete on Website online foundered till the late 1920's while transport vans have been outfitted with a drum that agitated the concrete at the same time as on the

Pass. Inside the uk, the first ready blended operation was set up in 1930 and by using the 1960's a a success countrywide community of Concrete flora turned into firmly established. Today, ready blend concrete contains a combination of aggregates, cement, water and a Kind of admixture. Information those character elements in a little extra element provides an insight into ways of Obtaining the satisfactory consequences for distinct varieties of project. Concrete is the product of blending, combination, cement and water. The Setting time of concrete is chemical reaction among the cement and water, not a drying process. This reaction is called Hydration, the reaction liberates a big amount of heat this liberation of warmth is known as warmth of hydration. There may be an Preliminary set while the concrete will stop to be liquid however have little power, thereafter the concrete will regularly gain Power over a time until it achieves the strength required.

1.1 GGBS (Ground Granulated Blast-furnace Slag):- Blast-furnaces operate at temperatures of about 1,500°C and are fed with a carefully controlled mixture of iron ore, coke and limestone. The iron ore is reduced to iron and the remaining materials form a slag that floats on top of the iron.

A by-product from the blast-furnaces used to make iron. This slag is periodically tapped off as a molten liquid and if it is to be used for the manufacture of GGBS it has to be rapidly quenched in large volumes of water. The quenching optimises the cementitious properties and produces granules similar to a coarse sand. This 'granulated' slag is then dried and ground to a fine powder.

1.2 Rice husk ash:- Rice husk ash improves the robustness of self-compacting high performance concrete. Having a macro-mesoporous structure, rice husk ash can be used as a viscosity modifying admixture. Rice husk ash and fly ash has synergic effect on self-compactability and compressive strength.

1.3 Fly ash:- A by-product of coal-fired electric generating plants, it is used to partially replace Portland cement (by up to 60% by mass). The properties of fly ash depend on the type of coal burnt. In general, siliceous fly ash is pozzolanic, while calcareous fly ash has latent hydraulic properties.

1.4 Plasticizer

Masterpolyheed Was used in our investigation. It is a third generation highly effective plasticizer for concrete & mortar. The dosage of the plasticizer was fixed based on the requirement for workability. The technical data related to the plasticizer used.

METHODOLOGY

4.1 Conduct the test on aggregate:

1) Impact value test (IS 2386 Part IV - 1963).

2) Abrasion value test (IS 2386 Part IV - 1963).

3) Flakiness index test (IS 2386 Part I - 1963).

4) Sieve analysis test (IS 2720 Part IV - 1985).

5) Aggregate crushing strength (IS 2386 Part IV - 1963).

6) Elongation index test (IS 2386 Part I - 1963).

4.2 Conduct the test on water:

1) PH value of water.

4.3 Conduct the test on cement:

1) Fineness test.

2) Consistency of cement.

3) Setting time test (initial setting and final setting).

Then design of concrete mix in which the strength of concrete will increase and it also reduce the required quantity of cement concrete becomes economical than conventional concrete.

We study the all properties regarding the admixtures (Fly-ash, GGBS , Rise Husk, Master Polyheed).

6) Design Grade M45

1) Characteristics of compressive strength required in the field at 28 days is 45 MPa (45N/mm2)

2) Maximum size of aggregate=20mm (Angular)

3) Degree of workability =0.90 Compaction factor.

4) Degree of quality control =Good

5) Type of exposure =Mild

6.1 Test material data

1) Specific gravity of cement (OPC of grade 53)=3.14

2) Specific gravity coarse aggregate =2.89

3) Specific gravity Fine aggregate =2.9

6.2 Water absorption

1) Coarse aggregate =1%

2) Fine aggregate=3%

6.3 Free surface moisture

1) Coarse aggregate =Nil

2) Fine aggregate =Nil

6.4 Sieve analysis of

1) Coarse aggregate 2) Fine aggregate

Target mean strength:

The target mean strength for specified characteristics cube strength is given by

following formula:

$$ft= fck+ K x S$$

Where,

K=Statistical coefficient

S=Standard Deviation

(S=4, Assumed Standard deviation as per IS 456:2000)

fck= Characteristics compressive strength at 28 days.

Ft= 45+1.65 x 4=51.60

Ft= 51.60 MPa.

1) Selection of water cement ratio

The w/c ratio required for target mean strength

Of MPa =0.43 Adopt Water cement ratio of 0.46

2) Selection of water & sand content:

Water content per meter cube of concrete=180Kg

Sand content as percentage of total aggregate by absolute volume =25% Quantities For13 (one m.cu.) D. V = 52%. more of wet volume = 1.52 x 1 =1.52m3 Quantity = D.V/ (sum of proportion) x (times of that material) V.C=0.31799 x1440=454 kg.

Total cement for 1 meter cube is 454 kg/m3

V.S=0.31799 x 1.2 x 1600= 610.54 kg/m3

V.A=0.31799 x 2.58 x 1495= 1226.52 kg/m3

C.A=60% of wt of aggregate =60/100 x1226.52

=735.91 kg/m3 F.A=40%of wt of aggregate = 40/100 x 1226.52

= 490.61 kg/m3

Quantity of water = 195 lit/ m3

Quantity required for one block:

Size of mould = 150 x150 x150mm

V=0.003375m3 D.V=1.52 x 0.003375

= 0.00513 m3

Volume of cement = 0.00513/ 4.78 x 1 x 1440

= 1.54 kg

Volume of sand = 0.0012878 x 1600

= 2.06 kg

Volume of aggregate= 0.002769 x 1495

= 4.13 kg

C.A 60% of Aggregate= 0.60 x 4.13

= 2.478 kg

F.A 40 % of aggregate = 0.4 x 4.13

= 1.652kg

Actual quantity required for block (12):

Cement = 18.48 kg

Sand = 24.72 kg

Total Aggregate = 49.56 kg

Coarse aggregate = 29.73 kg

Fine aggregate = 19.82 kg

Quantity of water=7.94 lit.

Ingredients	Quantity per m3	.003375 m3)
Cement	454 kg	1.54 kg
Water	165 kg	0.66 kg
Coarse aggregate 20 mm	735.91 kg	2.48 kg
Fine aggregate	490.6 kg	1.65 kg

Table -1: Proportion wise quantity of material

MODELING AND ANALYSIS

4.4 Method Used:

1) Trial and error method.

2) Target strength: 45 Mpa.

4.5 Important Criteria:

1) High strength is achieved if the particle packing is dense with minimum voids. For this high paste volume is essential.

2) Mineral and chemical admixtures are used.

3) Two batches of concrete were prepared: one without superplasticizer, one with superplasticizer. In this experimental work for each mix of composite, a total 33 specimen of following Type were prepared.

4) For compressive strength test, 3 cube of each proportion having size 15X15X15. All above specimens were prepared with various **Fly ash , GGBS , Rise Husk** with replacement of cement by the 10 % - 30% of its weight.

4.6 FUTURE SCOPE IN INDIA

- Low cost, high performance fiber offers the potential to solve the largest problem in the cement and concrete industry i.e. cracking and structural failure of concrete.
- Because of the higher performance (strength, temperature range, and durability) and lower potential cost predicted for polypropylene fibers , they have the potential to cost effectively replace fiberglass , steel fiber , polyethylene fiber , polyester fiber , aramid and carbon fibers products in many application in India.
- As a raw material required for manufacturing of polypropylene fiber is abundantly available in India (Deccan Trap region), the manufacturing plant can be install. This will reduce the cost of polypropylene fiber and stimulates growth of construction industry in India.
- High strength concrete is used for structures are supposed to carry large loads.

1. Railway Bridges up to 58 Mpa.

2. Diaphragm Walls up to 50-55 Mpa.

3. Abrasion -resistant Concrete 40-60 Mpa.

4. High rise buildings 40-60 Mpa.

RESULTS AND DISCUSSION

Name of proportion	Mix proportion	Compressive Strength (After 28 days) KN/m	Increase in strength (%)
M 0	ORDANARY MIX	47.34	7.4
M 1	10:20:0	54.60	23.57
M 2	10:20:0.5	50.98	15.33
M 3	10:20:1	56.91	28.71
M 4	10:20:1.5	49.50	12.24
M 5	10:20:2	43.79	-0.5
M 6	15:15:0	57.35	29.68
M 7	15:15:0.5	61.49	38.91
M 8	15:15:1	49.81	12.91
M 9	15:15:1.5	50.09	13.55
M 10	15:15:2	51.03	15.64

Table -2: Results

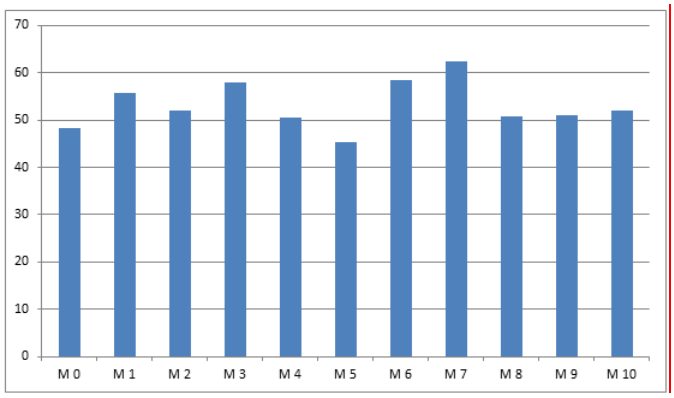

Fig.-Bar chart of test result

CONCLUSIONS

- The Reduction of environmental pollutants and economy in concrete construction was attainable mistreatment rice husk ash as partial replacement of cement.
- In most of the cases, compressive strength decreases with the increase in percentage of GGBS at early age but it increases with increase in percentage of GGBS at later ages.
- As the GGBS content increases, the water/binder ratio also decreases for the same workability and thus, the GGBS has positive effects on the workability.
- The Use of fly ash GGBS , Rise Husk in concrete up to 30% it didn't affect on compressive strength of concrete, it is a better replacement for cement in concrete because of its low cost.
- The Superplasticizer as a Masterpolyheed allowed reduction of water content.
- The design can be used high strength concrete 45 MPA it's a strong.
- Fly ash , GGBS , Rise husk is a good replacement of concrete.
- Increase Bond of concrete to steel Reinforcement.
- The rice husk ash is appropriate as extra cementious material, which may be obtained by controlled or natural incineration and used with or while not any process.
- The Concrete contains rice husk ash having density within the vary for traditional weight concrete and thus can be used for general purpose application.

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