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EFFECT OF 30% FLY ASH AND 60% M SAND AS A REPLACEMENT ON THE M40 GRADE OF CONCRETE WITH THE ADDITION OF VARIATION IN STEEL FIBER

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***Abstract*— In this present investigation continuous growth in the construction industry .The available source of natural fine aggregate are procured and it transferred to long distance which effect the construction cast, for this reason it is very much necessary to substitute in concrete by an material added partially ,without compromising the quality of concrete .fly ash & M sand are the one of the replacement of material for cement & natural sand respectively. This work aim is to using these partial replacement of materials like cement by fly ash and natural sand by M sand to study the strength of M40 grade of concrete and we added the steel fifer to the concrete.**

The tests are conducted to find out the strength of M40 grade of concrete with curing period 3,7,& 28 days of compressive strength ,split tensile strength & flexural strength . In this work we maintained the fly and M sand are kept constant 30% & 60% respectively and steel fibre are varied in the range from 0%,0.5%,1%,1.5%& 2%. And the water cement ratio is taken 0.4%. at the end of the optimum results are concluded at 30% of fly ash & 60% of M sand with 1% of steel fiber gives good strength increment in compressive strength ,split tensile strength & flexural strength at optimum mix.

***Keywords*— Fly ash, M sand ,Steel fibre, compressive strength ,split tensile strength & flexural strength**

I. INTRODUCTION

In present day's the Concrete is using usually as construction material for the a range of types of structures due to its fine resilience. For a extended span it is considered to be a durable and sustainable material which is requires a less maintenance in during its living span. Concrete plays an a very vital role for achieve high strength at early age of time to fulfill the necessity of the structures. Then a lesser amount of and manageable life of conventional concrete under the different types of climatic conditions conventional concrete possesses major deficiency like low down bond strength, low down tensile force high permeability and also develop additional cracks. Fly ash is one of the most commonly used mineral admixtures in high force concrete. It has become the select best for high force concrete, Adding Fly ash to the concrete mix will improves the workability, force & impermeability of concrete whereas it makes the concrete strong against chemical attacks, strengthening corrosion effect, which intern increases the Comprehensive force. It is a most uses of Fly ash in normal concrete is because of its physical and chemical properties. Fly ash is natural which impart the several environmental settlements. Fly ash as it is a pozolanic material develops the properties of concrete. Fibres which will be concrete section are used to look behind the concrete against the flexural crack which is known as steel fibre. Which will be unbreakable material and also top to prevent shrinkage cracks and to attain high tensile force and durability of concrete a small steel fibres are added at the time of the mixing of the concrete with an aspect ratio 50, and thus it improve the concrete properties in nature. Hence the substitute of Fly ash with cement and natural sand by Robo Sand (M- sand) with addition steel fibres in normal concrete develops the properties such as flexural force, tensile force, toughness, brittleness, corrosion conflict & ultimately increases in life span of the structure. Manufactured sand is an a alternative material for natural sand and for the various constructions; this sand is collected from basalt stone by crushing in a crusher backyard near Kalaburagi. It is a replacement material to natural sand so because of the faster mounting construction activities, the demand of sand has increased in a huge excess. The main reason for utilizing M-Sand is its availability and carrying Cost and also it can easily be accessible at the locality place, which confine reduces the cost of transportation.

Manufactured sand is one such most recent fine aggregate material used in construction sector to fulfill the needed specifications. It is available in abundance of amount. The M-sand has fineness in nature which acts like as an a pore substantial material which increases the strength and durability of concrete. Now a days the natural river sand become very costly and less availability because of the subsequent increasing daily demand in the area of construction sector. Hence manufactured sand can easily be used as Partial substitution to natural river sand.

II. OBJECTIVES

In this since from the fixings their relatively scope in which they chooses the Portland bond for their planning of the solid, in which there is no trade off in the compressive quality & its low in practical. We will be focussing towards an growth in the quality workability & hardness of the rigid by decreasing the concrete material & by supplanting the fly Ash remains. Totally we are concentrating on the decline of problems which is going on in the industrial waste by using it is a ingredient in concrete. Here the steel fibres are used & added in different a proportion which was perform well. The steel fibres in a different proportions has compared with the normal concrete. For enhancing in the workability, force of the concrete by replacement of fly ash as will be reduces the cement content. In this investigational work Fly ash is maintained constant as 30% and M- sand is maintained as 60 % to with respect of cement and natural sand. Only The steel fibres with different volumes of proportion & performances will be compared here.

As we need glance at changed tests comes about by variable extent of steel filaments keeping fly powder and M-sand as constant. By deciding the mechanical properties of the perfect rate of the steel fibre added to obtain the compressive quality and in addition split rigidity and flexural force. In this work we will be find out the special effects of fly ash & M sand in concrete by maintain as constant parameters and also with different proportion of steel fibres are varied and added to concrete. Steel fibres will be adding from 0%, 0.5%, 1%, 1.5% & 2% with the replacement of 30% of fly ash & 60% of Msand with respect of partial substitution for cement and natural sand. Steel fibres in different proportions is compared & find out the optimum among all of them. By keeping the cement by fly ash and natural sand by M-sand constant with constant proportion. Only the steel fibres are being varied throughout the project. Only thing is to improve the strength properties of the concrete.

III. L ITERATURE REVIEW

1. B. Praveen et.al [1]

In this study compressive force, tensile force and flexural force are evaluate. In this project we substitute the Fly-Ash to the cement for obtain the optimum value. The Optimum value Is taken as 25% of the fly ash. Now maintenance the fly ash percentage steady and partial replacement of fine Aggregate by robo sand with increasing percentage has taken place. The test on concrete cubes is Compressive test, on cylinders is tensile test and on beams is flexure test. The curing of cubes, cylinders and Beams is 7-days, 28-days and 90 days. From the above experimental investigation, the Robo sand can be used as an substitute material for fine aggregate. From the experiment investigation concluded that 50% of fine aggregate can be replaced with Robo sand

.2. T.Subramani et.al [2]

The current study aim is to be utilize M- sand as fine aggregate for replace natural river fine aggregate & also the compressive force of the cure specimen is considered on at the 28,7,14 Days. Split tensile force, Flexural force, at this time we have conduct a test on concrete by using the fly ash and M sand. By utilizing these materials find out power on a concrete by addition of partial substitution of cement with fly ash and total substitute of sand with m sand. Compressive forces reduce when cement is replace by fly ash. As fly ash percentage increase Compressive force and split strength decreases.

3. Mohd.Adnan Ahmed et.al [3]

The investigation study has shows that SCC with 5 % of silicafume and 20, 30 percent substitute of river sand by manufactured sand indicates fresh SCC with as per IS10262-2009 guidelines & improved strength properties. The technique is being used for mix design, optimum mix proportion finalized with percent Silica fume as replacement for cement at water cementr ratio of 0.45 for M_{40} grade concrete. It experimental that the enlarge in percentage summary the flow ability and passing ability of SCC of M_{40}, with 2 percent Silica Fume and compressive, flexural strength & union strength of SCC with 5 percent of Silica fume & 20, 30 percent M-sand are used for higher study.

4. Prof. Swapnil B. Cholekar et.al [4]

This present experimental is focused on a high amount fly ash concrete mix incorporate foundry as fine aggregate. In this current study, the force and resilience property with partially substitute of cement with fly ash with an special level of substitution (0%, 50%, 70%, 25%, 100%) of natural fine aggregate with foundry sand is assess. The current study will deal with the removal correlated. The Compressive force of HVFAC for special percentage of foundry sand (0%, 50%, 70%, 25%, 100%) is decreased by 1.05%, 1.19%, 1.29%, 1.36% respectively when compare with the HVFAC with foundry sand with 0% substitute at 90 days.

5. Rajendra T N et.al [5]

This Experimental investigation consisting of concrete specimen contain cement 15% with metakolin and fly ash 5%, 10%, 15% & 20% and used M.Sand as fine aggregates have been carried out. The results indicate that there was an development in the strength properties.

6. Christina Mary V [6]

This investigation work focus on force & resilience character of M_{40} grade concrete with substitute of cement by GGBS with the difference of about 10%, 20%, 30%, 40% & 50% and substitution of natural sand with M-sand by 50% and compare it with normal concrete. Here Compressive force, split tensile force and flexural force test are conducted on concrete specimen for the purpose of to getting high strength study and for resilience study RCPT, Sorptivity and Acid attack tests are conduct on harden concrete. HPC mix is also indicate the enhanced opposition to chloride when tested in a Permeability Test, Sorptivity and attack of chemical such as HCL acid when the HPC mixs were showing to this acid for 30 days era.

IV. MATERIALS AND MIX PROPORTIONS

A. MATERIALS

1. Cement: In this present investigation we use OPC (ordinary Portland cement) as a binding material.

   The test results are tabulated in a below table.

TABLE I

Shows the Preliminary Test Results Of Cement

Particulars of cement	Normal Consistency	Specific gravity	Fineness	Initial Setting	Final Setting
Test outcomes	32%	3.14	2%	44min.	398min.

2. Fine aggregate:

In this present project work fine aggregate used is naturally available river sand which is under zone-II as per IS 383:1970.The preliminary experimental outcomes of FA are as shown in the below table.

TABLE II

Shows The Preliminary Test Of Fine Aggregate.

Particulars of FA	Specific gravity	Water absorption	Fineness modulus	Silt content
Test outcomes	2.07	1.4%	3.51	2.32%

3. Coarse aggregate:

In this present project work crushed angular stone size is about 10mm and 20mm were used. Table below shows the properties of Coarse aggregate.

TABLE III

Shows The Preliminary Test Results Of CA

Particulars of CA	**Specific gravity**	**Water absorption**	**Fineness modulus**
Test outcomes	2.86	1.0%	6.80

4. M –Sand (Manufactured-Sand) **:**

Manufactured-sand is a locally obtained and it is collected from BMP GROUP crusher Pvt Ltd, it is near to sultanpur road, kalaburagi. The tests results are conducted in GPT Kalaburagi and test results are tabulated in the below table.

TABLE IV

Shows the test results of manufacture sand

Particulars	**Specific gravity**	**Fineness (Kg /m^2)**	**Water absorption**
Test outcomes	2.68	3.21	1.21%

5. **Fly Ash:**

Fly ash is a pozzolan material. It mix with lime pozzolans join to form cementations compound. Concrete contain fly ash become as a stronger, more resilient, and more resistant to chemical attack. Fly ash is also pays dividend for concrete construction. Because fly ash particle are little, they successfully fill voids in concrete. Because fly ash particles are solid and surrounding, they have “ball bearing” cause that allows the concrete to be formed using with a reduction of water. Together characteristics throw in to improved concrete workability and the durability. In this experimental work we use a fly ash is collected nearly available brick manufacture industry in kalaburagi. The test results are shows in below Table below.

TABLE V

Shows the Preliminary Test Results Of Fly ash

Sl. No.	**Particular**	**Test results**
01	Specific gravity	2.07
02	Fineness modulus	3.51

6. Steel Fibres:

In this experiment to enhance the tensile strength of concrete we are going to add the steel fibre. The steel fibres are hooked at end it is of 1mm diameter and Aspect ratio 50mm. The steel fibres were collected from Maruthi steel suppliers, Bangalore. Figure 3 shows steel fibres sample and Table VI shows the property of Hooked End SF.

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TABLE VI

Properties of Steel Fibres Used

Properties of SF	Length	Diameter	Aspect Ratio	Specific gravity	Tensile-Strength	Density
Approved values	50 mm	01.0 mm	50	7.80	1200 MPa	7860 kg/m^3

7. Chemical Admixture:

Fosroc auramix 300-plus is used as a chemical admixture and its specific gravity is about 1.06.

9. Potable Water:

In this experimental work water is used for concrete mixing and curing. water used as clean, clear & free from acid content and portable water used which is referred from IS - 456 2000 are used.

V. MATERIALS AND MIX PROPORTIONS

A. PROCEDURE FOR CONCRETE CASTING

1. As per guidelines of IS 10262 mix design is done.

2. The mix design is done for M40 grade of concrete.

3. In this experimental work substitution is make for the cement by fly ash and natural sand by M- sand.

4. In this work the substitution of cement with 30% of cementations material by fly ash & 60% substitution of natural river sand by M- sand maintain constant and steel fibre is varied.

5. Trial mixes are done for proper water-cement ratio. For getting the proper proportion of design mix.

6. With various trial mixes we can check the workability with by adding the admixture as a water reducing agent.

7. The steel fibres i.e. hooked end steel fibres is used to enhance the force of the concrete.

8. In this experimental work we are going to vary the steel fibres in various proportions (0,0.5%,1%,1.5%,2%) and check the optimum percentage of mix. Then the hardened concrete is to tested for the compressive force, flexural force & split tensile strength of the specimen of cubes, cylinders & prisms respectively.

Figure 1: Shows the casted Cured specimens

B. RESULTS AND DISCUSSIONS

1. Slump cone test:

In the fresh state of concrete the test is conducted is slump test for the purpose of checking of the workability of concrete with many trails are conducted.

Figure 2: Shows Slump cone test

TABLE VII

Represents Slump Test Results

Sl.no	% of SF added	Slump value in mm
1	0%	48
2	0.5%	60
3	1%	69
4	1.5%	65
5	2%	57

2. Compressive strength:

From the below Graph and table, we can said that there will be a considerable increase in strength of replacement concrete compare to the conventional concrete. Mix 2 i.e., Fly ash 30%, M sand 60% and 1% of Steel fibre shows the superior strength compare to other mix.

TABLE VIII

Shows The Compressive-Strength Results

Mix	Compressive Strength in N/mm^2		
	3 days	7 days	28 days
CC	19.30	37.68	50.48
Mix 1	18.17	39.66	49.93
Mix 2	22.38	42.65	53.62
Mix 3	20.35	10.39	51.37
Mix 4	17.74	39.45	49.42

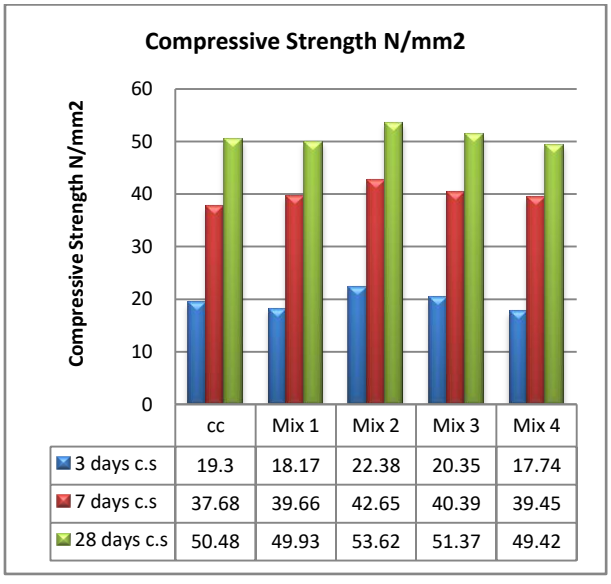

Figure 3: Shows the Compressive-Strength results

4. Split-tensile strength

From the below graph and table we can say that there is a great influence of presence of chemical admixtures, Mix 2 i.e., Fly ash 30%, M sand 60% and 1% of Steel fibre shows the better split tensile strength of concrete compare to other mix.

TABLE IX

Shows The Split-Tensile Strength Results

Mix ID	Split-Tensile Strength in N/mm^2		
	3 days	7 days	28 days
CC	2.444	3.69	4.81
Mix 1	2.696	3.25	4.58
Mix 2	3.420	4.925	5.57
Mix 3	2.725	4.60	5.06
Mix 4	2.126	3.390	4.406

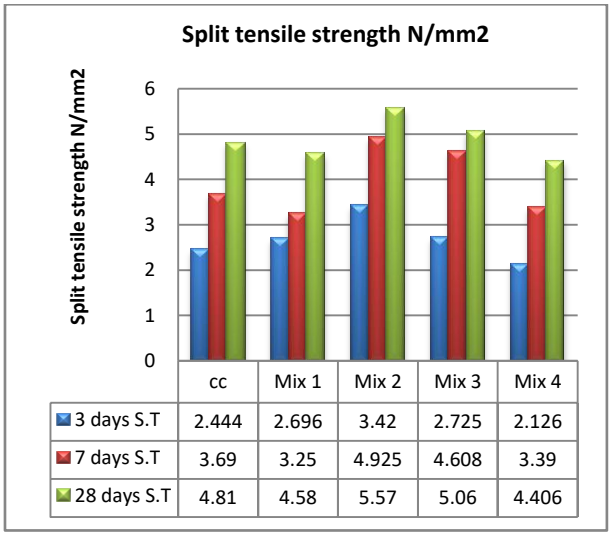

Figure 5: Shows the Split-Tensile Strength results

5. Flexural Strength

The flexural prism having size is about 700mm×150mm×150mm were casted and tested under two point load testing machine to assess the flexural-strength. The results show that, the integration of SF shows the good ductility to flexural force. The Mix 2 i.e., Fly ash 30%, M sand 60% and 1% of Steel fibre shows the extraordinary flexural strength of concrete compare to other mix.

TABLE X

Shows The Flexural-Strength Test Results

Mix ID	Flexural-Strength in N/mm^2		
	3 days	7 days	28 days
CC	2.966	3.074	5.172
Mix 1	3.76	3.759	5.82
Mix 2	4.80	5.06	6.87
Mix3	4.06	4.344	6.546
Mix4	3.93	4.12	6.205

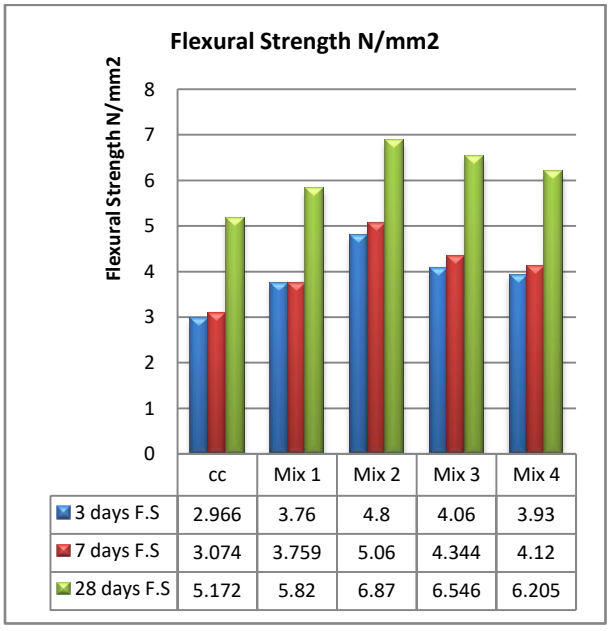

Figure 6: Shows the Flexural Strength results

VI. CONCLUSIONS

- The dosages of super plasticizer will be of segregation is noticed.
- By replacement of fly ash & M sand with 30% & 60% in OPC for cement and natural river sand is taken as a constant.
- Here steel fibres strength is observed in this experimental work. The maximum strength will be gained in this shear which is almost depends on the amount of fibres added to the concrete. In this experiment hooked end steel fibre will be optimum strength is observed.
- As will be replacing cement by 30% fly ash & 60% M sand to natural river sand can be used in all type of construction structures of i.e. 30% replacement of fly ash & 60% replacement of M sand with 1% of steel fibres will give the great strength in concrete
- To improve the strength of concrete the addition of steel fibres with variations as there will be enlarge in strength of the concrete.
- In this experiment the good outcomes will be found by replacement of fly ash i.e 30% to cement & replacement of M sand i.e. 60% to fine aggregate also in addition by weight of concrete by adding 1% of steel fibre to concrete gives the extreme strength.
- The mix of concrete will be evaluate for the tests of compressive force of high strength of concrete in which replacement of cement & addition of steel fibres is testing at 3 days, 28 days & 7 days after curing of specimens.
- In each one sequence of our concrete mixes will be evaluate by compressive force & split tensile force & also flexural force of hardened concrete.
- There will be an variety of properties will be changes are listed as follows:
- **Slump** - The slump will be high found that as 69mm in M40 grade of concrete by replacing fly ash & M sand with 1% of steel fibre.
- **Mass** – The increase is to be minor when fly ash & M sand is replacement. With 30% of fly ash & 60% of M sand by weight of the concrete steel fibres are also added.
- **Compressive force –** the optimal value in compressive force was found in M40 grade is 53.62N/mm^2 by the adding up of 1% steel fibres.
- **S. T -** the optimum value of split tensile strength was found in M40 grade is 5.57 N/mm^2 by the adding up of 1% steel fibres.
- **F.S-** the optimum value of F.S was found in M40 grade is 6.87 N/mm^2 with 1% S.F.

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