International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 4, Issue 6
June 2017

Comparative Study Of Normal Concrete With Partial Addition Of Copper Wire As Fibre For The Grade Of M40

1 K.MALLI KHARJUNA RAO,

Professor, Department of civil engineering, CHALAPATHI INSTITUTE OF ENGINEEING & TECHNOLOGY, LAM, Guntur , AP, India.

2 **P. SRINIVASA RAO**,

B.Tech student, Department of Civil Engineering, CHALAPATHI INSTITUTE OF ENGINEEING & TECHNOLOGY, LAM, Guntur , AP, India.

ABSTRACT

In the present scenario the main problem in civil engineering structures is cracking, to overcome this problem generally fibre reinforced concrete is used. In this project copper wires are used as fibres.Since concrete is weak in tension hence some measures must be taken to overcome this deficiency. Copper wire is strong in tension; it can be used as a fibre reinforcement material. Present studies has been undertaken to study the effect of copper wires on plain cement concrete on the basis of its compressive strength. In this project concrete cubes were casted with various percentages of copper wire i.e. 0%, 0.5%, 1%, 1.5%, 2% by weight of cement. 3 cubes were casted for each proportion and tested for their mechanical properties. After completion of project we found that copper wires are reducing cracks as well as increasing strength also

KEYWORDS: Fibre Reinforced Concrete ,Copper wire, Compressive strength (CS) and Universal Testing Machine (UTM),Compressive testing machine (SICCCTM-01).

---

1. INTRODUCTION

We all know that concrete is a material used for construction, but many of us don't know about fibre reinforced concrete. First of all let us tell you about fibre reinforcedconcrete

FIBRE REINFORCED CONCRETE (FRC)

Itwas invented by French gardener Joseph Monier in 1849 and patented in 1867.The usage of fibres as reinforcement is not a new technique since it is in use from olden days. In the starting stage horsehair was used in mortar as fibres. In the early 1900s, asbestos fibres were used in concrete, and in the 1950s the concept of composite materials came into existence and fibre reinforced concrete became as one of the most interested topics. But asbestos is causing health problems so there is a need to invent other materials as fibres to replace the asbestos. By the 1960s, steel, glass (GFRC), and synthetic fibres such as polypropylene fibres were used in concrete, and research into new fibre reinforced concretes continues today.

Fibre Reinforced Concrete can be defined as a composite material consisting of mixture of cement mortar or concrete and uniformly dispersed suitable fibres. Fibres include steel fibres, glass fibres, synthetic fibres and natural fibres.

Fibre is a small piece of reinforcing material possessing certain characteristics properties. The fibre is often described by a convenient parameter called aspect ratio. The aspect ratio of the fibre is the ratio of its length to its diameter. Typical aspect ratio ranges from 30 to 150.

Copper wires are used as a fibre reinforcing material in concrete to study its effects on the compressive, crushing, flexural strength and cracking control

International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 4, Issue 6
June 2017

ADVANTAGES OF FIBRE REINFORCED CONCRETE:

- It will reduce the corrosion
- It is better suited to minimize cavitation /erosion damage in structures such as sluice-ways, bridge piers where high velocity flows are encountered.
- Thin sections can be used since thin FRC sections will have the equivalent strength of thicker plain concrete sections
- It avoid catastrophic failures in bridges
- The use of fibre reinforced concrete in the earth quake prone areas would minimize the human casualties.
- Fibres reduce internal forces by blocking microscopic cracks from forming within the concrete

DISADVANTAGES OF FIBRE REINFORCED CONCRETE:

The main disadvantage of fibre reinforced concrete is fabrication. The process of incorporating fibres into the cement matrix is costlier than the production of the plain concrete. It requires skilled labour. The real advantages gained by the use of FRC overrides this disadvantage.

WHY FIBRES ARE USED IN CONCRETE?

Fibres are usually used in concrete for the following reasons:

i. To control cracking due to both plastic shrinkage and drying shrinkage.

ii. To reduce the permeability of concrete and thus reduce bleeding of water.

iii. Some types of fibres also produce greater impact, abrasion and shatter resistance in concrete.

2. MATERIALS USED AND THEIR PROPERTIES

In this present investigation materials used are Cement, Fine aggregate, Coarse aggregate,Copper Wire

CEMENT:

Ultra tech cement of ordinary Portland cement (OPC) of 53 Grade was used which satisfies the requirements of IS: 12269-1987.

Table No.1: Properties of Cement

S.N.O	PROPERTIES	RESULTS
1	Normal Consistency	29.50%
2	Specific Gravity	3.0
3	Initial setting time	33 min

FINE AGGREGATE:

Locally available sand was used. The sand was conforming to zone IV as per IS: 383-1987. Aggregate passing the 9.5-mm sieve and almost entirely passing the No.4 (4.75-mm) sieve and predominantly retained on the No. 200 (75 µm) sieve.

The volume of fine aggregate depends largely upon its moisture content. When the fine aggregate is moist each particle gets coated with a film of water due to surface tension. The particles are kept separated and hence the volume apparently increases. The increase in volume is known as “Bulking” The amount of Bulking increases initially with increase in water content but decrease to zero with further increase in water content over to bulking, Fine aggregate shows completely unrealistic volume.

International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 4, Issue 6
June 2017

Table No.2: Table Showing Properties Of Fine Aggregate

S.N.O	PROPERTIES	RESULTS
1	Bulk density (kg/m^3)	1650
2	Specific gravity	2.60
3.	Fineness modulus	2.81
4.	Free surface moisture (%)	2.0

COARSE AGGREGATE:

The crushed aggregate was used from the local quarry. In this experiment the aggregate was used of 20mm down and tested as per IS: 2386-1963(I, II, III) specification.

Fineness modulus.of an aggregate is approximate proportional of the average size of particles in the aggregate. In another words coarse particles of the aggregate having of Fineness modulus is determined by adding the cumulative percentage of material retained on each sieve and dividing the sum of cumulative percentage of material retained on each sieve by100

The properties of coarse aggregate are shown in Table

Table No.3: Showing Properties Of Coarse Aggregate:

S.N.O	PROPERTIES	RESULTS
1	Maximum Nominal size	20mm
2	Bulk density (kg/m^3)	1800
3	Specific gravity	2.67
4	Fineness modulus	4.6

COPPER WIRE

Copper wireis used as a fibre reinforcing material in concrete for the following reasons:

1. Corrosion resistant
2. Antibacterial
3. Easily joined
4. Ductile
5. Tough
6. Non magnetic
7. Attractive colour
8. Alloys easily

3. EXPERIMENTAL PROGRAMME

The experimental program was designed to compare the mechanical properties i.e. compressive strength, split tensile strength, and flexural strength of high strength concrete M_{40} grade of concrete and with different addition levels of ordinary Portland cement (ultra tech cement 53 grade) with copper wire (0%,0.5%,1%,1.5%,2%) and results are compared.

3.1 Mix Proportions:

Concrete mixes were designed to a compressive strength of M_{40}grade with water cement ratio of 0.4 respectively as per IS code 10262-2009. In this case, the copper wire is added by the percentages of 0%,0.5%,1%,1.5%,2% the proportions of constituent materials for Mixes are presented in table 6

International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 4, Issue 6
June 2017

Table no.6: Mix proportion of concrete

S.NO	Materials	Quantities in Kg/m^3
		M_{50} Grade
1	Cement	400 Kg/m3
2	Water	186 Kg/m3
3	Fine aggregate	660 Kg/m3
4	Coarse aggregate	701 Kg/m3
5	Water cement ratio	0.4

The specimens of standard cubes (150mmx150mmx150mm) , standard cylinders of (150mm Dia x300mm height) and standard beams of (100mmx100mmx500mm) were cast with various percentage replacements of SF . Compression testing machine (CTM) was used to test 28 days compressive strength and split tensile strength of specimens. Universal Testing Machine (UTM) was used to test 28 days flexural strength of specimens

4. RESULTS AND DISCUSSIONS

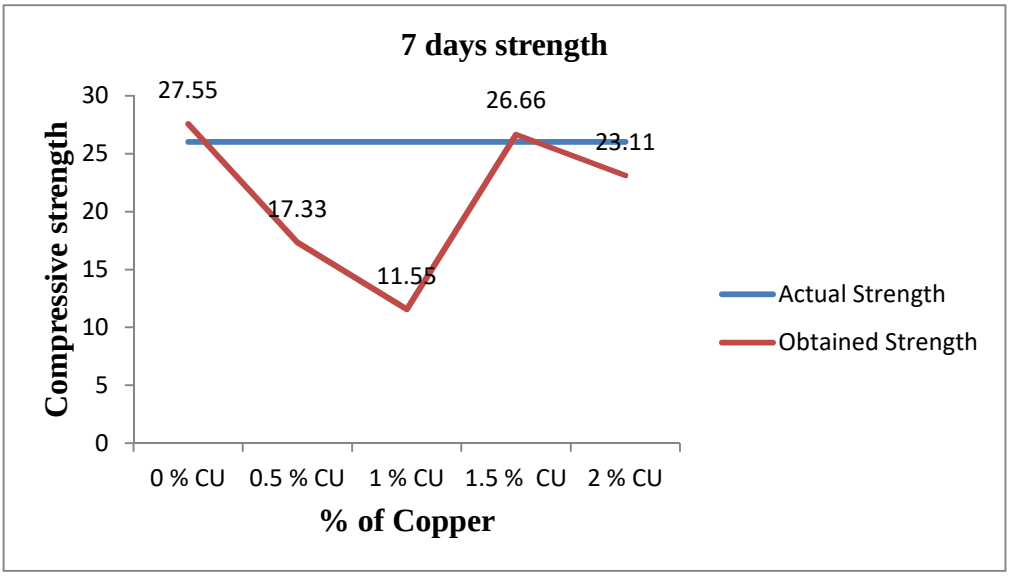
4.1 Mechanical Properties:

4.1.1 Compressive Strength:

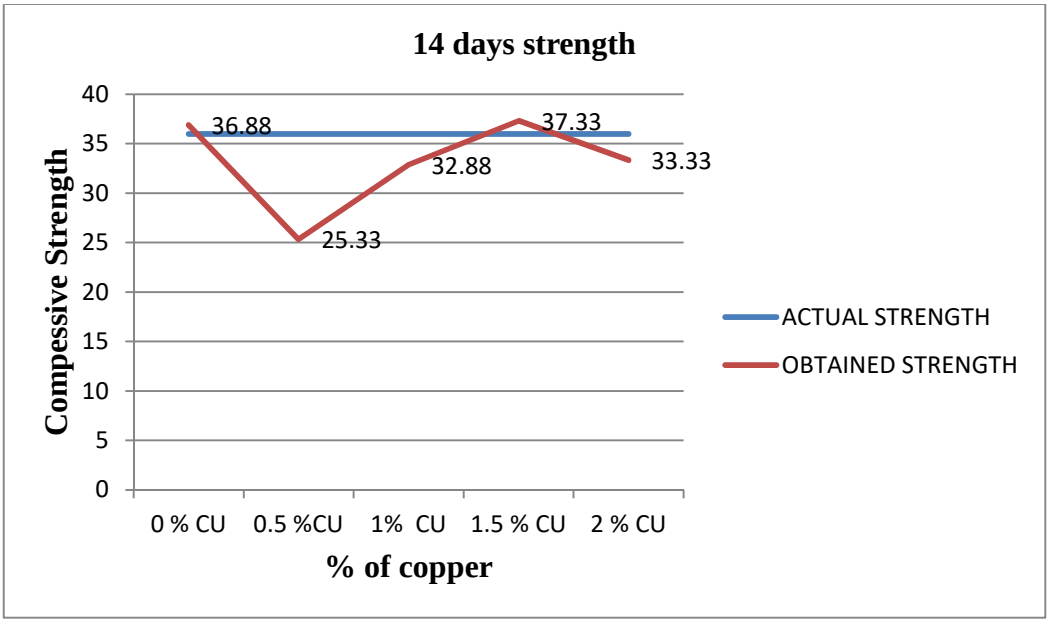
The compressive strength M_{40} grade concrete at the age of7 days, 14 days, 28 days are represented in graphs.

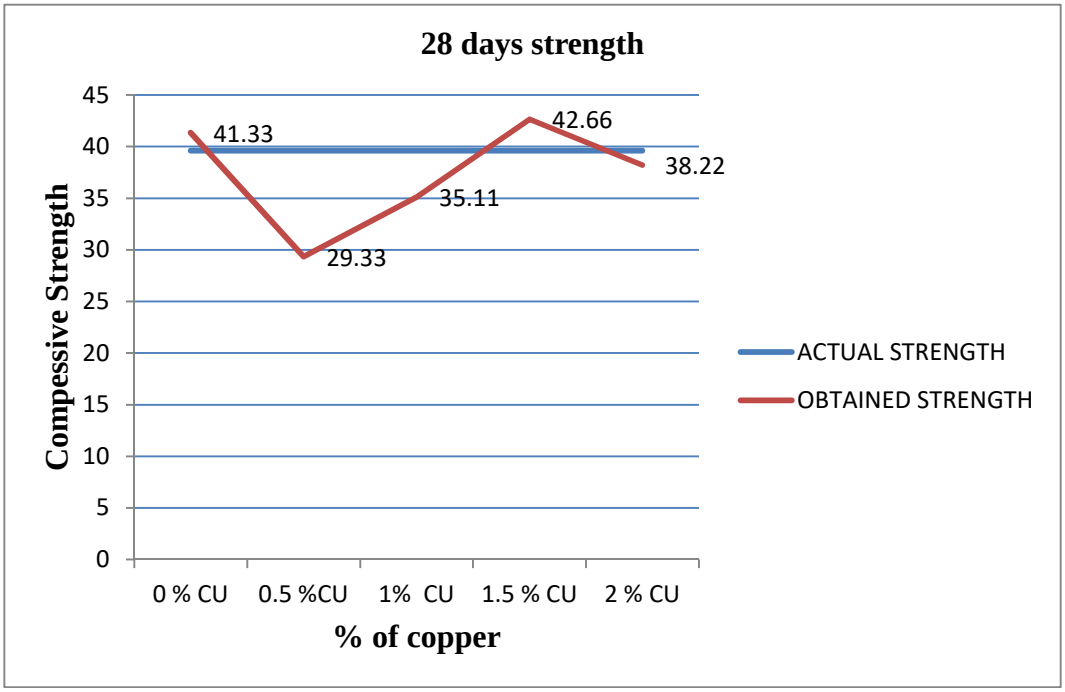
There is a significance improvement in the strength of concrete because of copper wires. Compressive strength of mixes of M40 at 7,14 & 28 days age, with addition of copper wire is increased significantly at 1.5% addition of copper wires.

Compressive strength of concrete with various amounts of copper wire is given below



International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 4, Issue 6
June 2017





5. CONCLUSIONS

Based on experimental results the following conclusions are drawn

1. Its shows that at 1.5% of addition of copper wire has given more strength when compare to the normal concrete.
2. Copper wire will not effect on weight of concrete.
3. The incorporation of copper wire in concrete has a marginal influence on the density of concrete.
4. The results indicate that for the concrete mix and copper wire used in this study, the optimum additionlevel of copper wire is about 1.5%.

5. The results of the present investigation indicate that other mix design parameters remaining constant, copper wire incorporation in concrete results in significant improvements in compressive strengths.

6. The addition of fibrous material will increase the bonding between the ingredients of concrete

7. So this study can be used to encourage industries to use copper wire as fibrous materials by 1.5% - 2% of the cement weight.

8. The cost of concrete also decreases by 10%-15% by using copper wire. Good quality control and high early strength can be achieved with the addition of copper wire which may be useful in various structural constructions such as high-rise buildings, bridges, chimneys, machine foundations, run ways etc., .

6.REFERENCES

[1]Majumdar A.J., Fibre cement and concrete - a review, Garston: Building Research Establishment, (1975)
[2]Johnston C.D., Definition and measurement of flexural toughness parameters for fibre reinforced concrete, Cement Concrete Aggregate (1982)
[3]BalaguruPerumalsamy N., Shah Sarendra P., Fiber reinforced cement composites, McGraw Hill International Editions (1992)
[4]Maidl B.R., Steel fibre reinforced concrete, Berlin: Ernst &Sohn, (1995)
[5]Johnston Colin D., Fiber reinforced cements and concretes, Advances in concrete technology volume 3 – Gordon and Breach Science publishes (2001)
[6]Neville A.M., Properties of Concrete, (2005)
[7]Gambhir M.L., Concrete Technology, (2009)
[8]Shetty M.S., Concrete Technology, (2009)
[9]Ahmed S., Ghani F. and Hasan M., Use of Waste Human Hair as Fibre Reinforcement in Concrete, IEI Journal, Volume 91 FEB, Page no 43, (2011)
[10]Banthia N., Fibre Reinfoeced Concrete