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AN EXPERIMENTAL INVESTIGATION ON STRENGTH OF CONVENTIONAL CONCRETE BY USING ELECTRIC WIRE SCRAP

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Abstract - *Concrete is the most widely used construction material in the world. Technology gets very important role in the improvement in innovation and new materials are develops due to research and experimentation. The material having some good advantages such as quality, strength, texture, material properties which gives improves the performance the concrete is having highest bonding capacity with mixture of cement, water, fine aggregate and coarse aggregate. The present investigation by the adding of waste electric wire scrap of concrete, in this research, electric wire mixed at the proportions of 0%, 1%, 2%, and 3% by weight of cement will be use. Evaluate the value of compression strength, split tensile strength and flexural strength of concrete using M20 mix, water cement ratio 0.45 and test have been carried out.*

Key Words: *Electric wire scrap, compressive strength, flexural strength, split tensile strength.*

1. INTRODUCTION

Development of infrastructures in the world for finding effective materials is heavy demand in constructions. Concrete is the major civil engineering materials, in production is day to day increase billions tons per year. Concrete used as building materials is a composite material made from several readily available constituent such as cement, fine aggregate, coarse aggregate, water and by increasing its properties by using admixtures and some other chemicals etc., are used in concrete. The properties of concrete can be classified as fresh or hardened are discussed in this paper by adding new materials or alternative materials in the place of existing materials in concrete for improving its properties. Fibers are added to the concrete to improve the strength evaluation of result by casting of concrete specimen for required mix proportions. Then the specimens are tested to find out results. In this paper identify the performance of concrete by adding of electric wire scrap a certain percentage of mix proportions.

2. METHODOLOGY

1. Studying literature related to fibers used in concrete.
2. Selection of materials depend on its quality (cement, fine aggregate, coarse aggregate, water and some other required materials).
3. Select the ratio of mix proportions by mix design or nominal mixes for grade of concrete.
4. Select the method of mixing such as hand mixing and machine mixing.
5. Casting of concrete specimen such as cube, cylinder and prism.
6. Curing of concrete by water or some other methods for 7 days , 14 days, 28 days.
7. The specimens are carried out for testing for 7days, 14 days, 28 days in various testing.

3. MATERIALS AND PROPERTIES

3.1 MATERIALS USED

1. Cement
2. Coarse aggregate
3. Fine aggregate
4. Electric wire
5. Water

3.2 CEMENT

In experimental work ordinary Portland cement (53 grade) is used as per IS: 10262. It is manufactured by grinding a mixture of limestone and other raw materials like argillaceous, calcareous, gypsum to a powder. The 53 grade depending upon the strength of the cement at 28 days and if strength not less than 53 grade, the ordinary Portland cement has zero fly ash content.
The properties of cement as follows.

Table -1: cement properties

S. No	Property	values
1	Specific gravity	3.14
2	Initial setting time	30 min
3	Final setting time	600 min
4.	Fineness	225 m2/kg

3.3 FINE AGGREGATE:

The manufacturing sand is a substitute of river sand for concrete construction. The manufacturing sand is used as fine aggregate. M- Sand is produced from hard granite stone by crushing. The crushed sand is a cubical shape with ground edges, washed and graded to as construction materials. The size of manufacturing sand is less than 4.75 mm. The specific gravity and fineness modulus of this M-Sand were found to be 2.66 and 2.56 respectively. The percentage of passing is within the limits as per IS: 383:1970

3.3 COARSE AGGREGATE

The coarse aggregate used here is 20mm in size, crushed angular shape and free from dust. The specific and fineness modulus of this coarse aggregate where found to be 2.6 and 2.98 respectively and the impact value was found to 12%. Water absorption of coarse aggregate is 0.6% the percentage of passing is within the limits as per IS: 383:1970

3.4 ELECTRIC WIRE SCRAP

Electric wire as corrosion resistance it consist of copper wire and also covered with plastic insulation at the top of wire, It have tensile strength and ductility, Addition of electric wire scrap as fibers to concrete increase the strength of structure by controlling the micro cracks due to shrinkage during curing. The electric wire scrap length is 20mm and diameter of fiber is 2.3mm. It can be taken as percentage (0%, 1%, 2%, 3%) based on it's weight of cement taken.

Fig-1 Electric wire scrap

3.5 WATER

It is the important ingredient of concrete mixed with cement it form gel for better bonding and also give its strength by adding of require amount of water based on environmental conditions. In this project work Water cement ratio (w/c) taken amount of 0.45% was used in the preparing of concrete and for this purpose pure water is used for mixing and curing purpose.

4. PROCESS OF MAKING CONCRETE

1. Batching
2. Mixing
3. Placing and compacting
4. Curing
5. Testing

4.1 BATCHING

Weight batching is the correct method for measuring the material, use of weight system in batching, facilities accuracy, flexibility and simplicity

4.2 MIXING

Hand mixing is practiced for small scale concrete works it is desirable to add 10 percent more materials. Water in small quantity should be added towards the end of mixing to get the required consistency. At the stage, even a small quantity of water makes the difference

4.3 PLACING AND COMPACTING

The mixed concrete should be placed in required location or in mould to make a concrete specimen. the moulds like cube (150X150X150mm), cylinder (150X300mm) and prism (500X100X100mm) for casting of concrete with three layers each layer is compacted by using compaction rod at 25 times

4.4 CURING OF CONCRETE

The casted concrete is removed from mould with after 24 hours then the removed as taken into process of underwater curing for 7days, 14 days and 28 days for these days hydration takes place by improving strength and maintain moisture content.

5. EXPERIMENTAL INVESTIGATION

The compressive strength of concrete is its ability o resist a crushing force. It is the ratio of load at failure to surface area of concrete specimen, compressive strength test is the most common test conducted on hardened concrete, The concrete mix design was done in accordance IS: 10262 (1982).In his project M20 grade are used the mix ratio is 1:1.5:3.By using this proportion value the volume of cement, fine aggregate, and coarse aggregate are estimated. The Ordinary Portland cement (OPC 53 GRADE), Good stone aggregate and manufacturing sand of Zone II was used as coarse aggregate and fine aggregate. For this experiment cubes (150x150x150mm), Cylinder (150 mm diameter & 300 mm height) and beam (100x100x500 mm) were casted by adding of different percentages of Electrical wire scrap (0%, 1%, 2%, 3%).

6. TESTING OF FRESH AND HARDENED CONCRETE

6.1 TESTING OF FRESH CONCRETE

1. Slump test
2. Compaction factor test

6.2 SLUMP TEST

The concrete slump test is most commonly used method of measuring the consistency of fresh concrete before it sets. It is performed to check the workability of freshly made concrete and therefore the ease with which concrete flows. It can also be used as an indicator of an improperly mixed batch..

Table-1 : slump test results

S.No	Mix proportions	Slump value
1	0%	70
2	1%	73
3	2%	75
4	3%	79

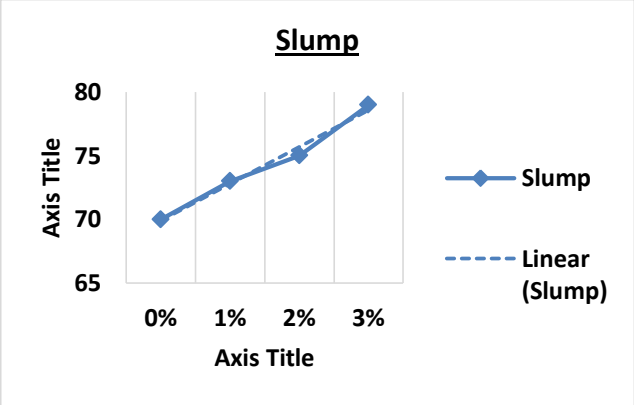

Chart -1 Slump test values

6.2 COMPACTION FACTOR TEST

The compaction factor test is designed primarily for use in the laboratory but it can also be used in the field. It is more precise and sensitive then slump test and is particularly used for concrete mix of very low workability as are normally used when concrete is to be compacted by vibration.

6.2 TESTING OF HARDENED CONCRETE

1. Compression strength test
2. Split tensile strength
3. Flexural strength

7. RESULT AND DISCUSSION

7.1 COMPRESSIVE STRENGTH

The compressive strength is carried out on cube determined by dividing the maximum of failure load of the specimen during the test by the cross sectional area of the specimen. The testing of specimen normal concrete and the percentage of adding fibers in concrete are crushed at different days (7,14,28 days) are shown in table & graph details.

Compressive strength = P/A (N/mm^2)

P- Load

A-Area of cross section

Table-2 compressive strength on cube

S.NO	mix	Avg. compressive strength (N/mm^2)		
		7 Days	14 Days	28 Days
1	0%	14.44	18.14	21.61
2	1%	19.32	23.88	26.23
3	2%	17.56	21.63	25.08
4	3%	16.21	19.92	2.82

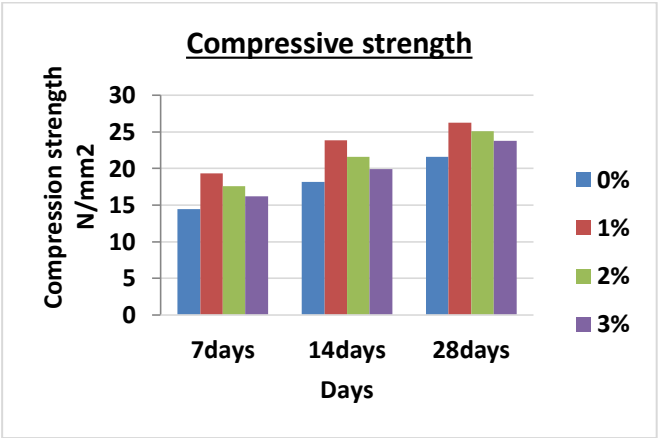

Chart-2 compressive strength on cube

7.2 SPLIT TENSILE STRENGTH

The test carried out on cylinder to find out the tensile strength. Concrete develops cracks when subjected to tensile forces. In this test various mix proportions of fibers are added to give the tensile strength result.

Split tensile strength= $2P/\pi DL$ (N/mm^2)

P-failure load

D-diameter of specimen

L-length of specimen

Table-3 split tensile strength

S.NO	MIX	Avg. split tensile strength (N/mm²)		
		7 Days	14 Days	28 days
1	0%	1.61	2.01	2.40
2	1%	2.74	2.65	2.91
3	2%	1.94	2.40	2.78
4	3%	1.8	2.21	2.64

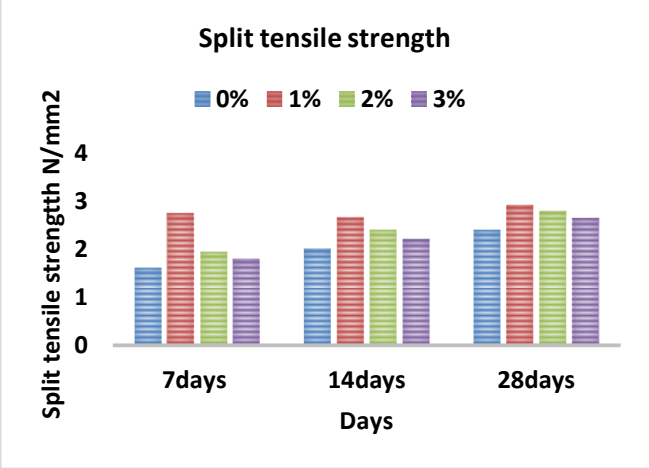

Chart-3: split tensile strength

7.3 FLEXURAL STRENGTH

The flexural strength is stress at failure in bending. Flexural strength, also known as modulus of rupture, or bend strength, or transverse rupture is a materials property, defined as the stress in material just before it yields flexural test.

Flexural strength = $3PL/bd^2$ (N/mm^2)

P-load

L-length of the specimen

b-breadth of the specimen

d-depth of the specimen

Table-5 Flexural strength on prism

S.NO	MIX	Avg. flexural strength (N/mm²)		
		7 Days	14 Days	28 Days
1	0%	3.51	4.875	6.31
2	1%	2.73	4.095	5.07
3	2%	3.31	4.485	5.85
4	3%	3.08	4.29	5.46

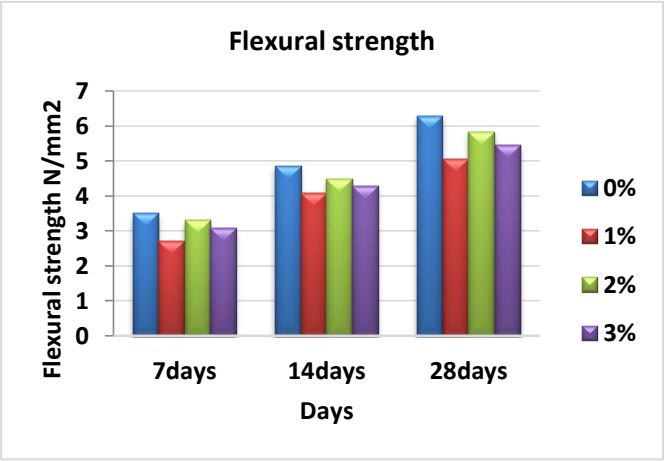

Chart-4 flexural strength on prism

8. CONCLUSION

The material tests, strength test such as compression and split tensile tests are had been carried out in the laboratory and as per code provision only. Result of experiments on different properties of different mixes in which wire is added with different percentages.

Addition of wire improves the compressive strength and slightly decreases the flexural strength. Maximum value of cube compressive strength and split tensile strength of cylinder in concrete attains by mix 1% of wire and flexural strength of prism adding 0% of wire gives maximum value of concrete. The result varies depends on their mix proportions of concrete and its properties.

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