Behavior of Concrete Using Steel Fiber and Ferro-Cement as Additives

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Abstract - In this Experimental work of concrete steel fiber and Ferro-cement partially replaced of cement, it has been Studied that the relative below as Compression stress partial adding of steel fiber and Ferro-cement appear that the magnitude relation square measure designed for target strength and lead to hyperbolic Stress-strain value.For the calculation and analysis of M25 grade of concrete has been designed on the parameter of IS code 10262-2009. The mixture with admixture and water cement magnitude relation is zero.50. The thesis consisted of casting and testing of thirty five cylinders (300mmX150mm) and fifteen cubes (150mmX150mmX150mm) that were casted in half-dozen batches. The cylinders in each batch unit of measurement divided into 5sets. In each set 5 identical specimens were casted and cured with conjointly the typical behavior is taken to represent the behavior for that set of mixes. therefore in each batch total no of cylinders and cubes come to 5. Out of half-dozen batches initial batch was casted with zero mesh means only concrete and 0 fiber, ordinal with zero mesh and 0.5% fiber, third with one mesh and third fiber , fourth with one mesh and zero.5% fiber, fifth with a pair of mesh of zero fiber and last sixth with a pair of mesh and zero.5% fiber a pair of additional specimens like cube and beams were ready one with zero mesh , fiber and second with zero mesh, 0.5% fiber.

Keywords:Stress, strain, ferrous particles, fiber, water-cement ratio , Grade of concrete, Compressive stress.

I. INTRODUCTION

Concrete might be a artificial construction materials that is most generally utilized in construction field in add the globe. it's obtained by admixture of water, cement, fine combination, coarse combination and lots of minerals admixtures in necessary proportion square measure discovered as concrete mass. The hardened concrete are worked as an artificial stone among that the voids of coarse square measure or observe by crammed by the fine aggregates and cement[7].The hardening of concrete is caused by activity or process between cement, water, reaction for associate degree extended time and hardening of concrete durable strength with the age. The properties of concrete consider the quantity and proportion of the ingredients utilized at intervals the band bond and therefore the management exercised in formwork and action. The cement comes in varied varieties and chemical compositions. It provides strength and enhances the binding properties in concrete [5].

Concrete is generally according to its compressive strength. The various grade of concrete as stipulated in IS: 456:2000. Grade of concrete M5 and M7.5 (1:4:8) are used for simple concerting works like simple foundations footing base, sub structure brick Masonry base, floor base. This concrete is called the lean concrete. For RCC work the grade of concrete should be more than M15. The grade of concrete M30 is not used for pre-stressed concrete work. [4].

The mix is designed to make the grade of concrete having required workability and a characteristic strength not less than appropriate value. The target mean strength of concrete mix should be equal to the characteristic strength plus 1.65 times the standard deviation. The advance results in the production of concrete with the suitable properties most economically[1].. However, the mix design does not provide as a guide since does not assurance the correct mix proportions for the approved performance.

The cost of concrete depends on the cost of materials which are required for producing a mean strength called characteristic compressive strength that is specified by the designer. It depends on the quality control measure[6].

The needs of concrete mix designed based on the selection and proportioning of ingredients which depends are

(a) Cement content should not be minimum to avoid cracking, shrinkage due to temperature cycle in concrete.

(b) Required maximum cement content to give durability for the particular site conditions.

(c) Required water cement ratio to give durability for the particular site conditions.

(d) The workability required for complete compaction with the compacting tools.

The improvement in physical property of concrete mass permits economical use of high strength concrete steel, higher cement relation and avoids explosive failure and additionally the instant curvature characteristics of concrete section area unit brought nearer to that of a steel section and so the analysis of intermediate concrete

structures get simplified. The concrete with improved physical property is any economical criteria. [3].

The structural property that designed for unstable resistant demands higher physical property. thus the physical property of concrete is being improved and increased by confining it in steel binders, as ties in compression member for and as the bracing in beams at this. among the structures that statically indeterminate structure the essential section, at that 1st hinge forms incidentally indeterminate additionally the section having most shear force. The bracing reinforcement, That is provided. The cement comes in varied varieties and chemical compositions in concrete. It provides strength and enhances for improve the binding properties in concrete. Moreover, use of refined arrangement of analysis closely spaced stirrups in confinement columns not solely creates plane of weakness stress between core that the and additionally the concrete and interrupts the continuity however put together adds voids the matter of steel congestion[2].

II. OBJECTIVES

The main objective of the study is to investigate the change in characteristics strength properties and workability of concrete mixed with different percentage of steel fiber with ferro cement and analysis of strain stress study.

III. MATERIALS USED

Ordinary Portland cement about 70% of cement produced in India are of this category and comes in 3grade, viz., grade 33, 43 and 53. The ordinary Portland cement contains two basic ingredients, argillaceous and calcareous. Aggregate passes through 4.75 mm IS sieve, passed aggregate is known as fine aggregate. It should be free from organic matter, durable, hard, chemically inert, clean and free from adherent coating coatings, etc . Coarse Aggregate have high hydraulic conductivity value as compared to most soils, aggregate are broadly used in drainage work like foundation, septic tank drain, road side edge drains, and retaining wall drains.

Aggregate are used as a stable foundation or road/rail base with expected. Machine cut aggregate chips passing IS sieve of 20mm (60%) and IS sieve 12mm (40%) are used as course aggregate throughout the work.Galvanized woven mesh of a square grid fabric was used. The diameter of meshed wire is 0.43mm.Ferro cement is a construction material consisting of wire meshes and cement mortar. Applications of Ferro cement in construction are vast due to the low self-weight, lack of skilled workers, no need of framework etc.

IV. METHODOLOGY

Compressive Strength of Concrete

The size of cube specimen is of 150X150X150 mm. Nominal size of the aggregate not more than 20mm, 10mm size aggregate may also be used as an alternative. Cylindrical test specimens are used in 150mm in diameter and 300mm long. The compressive strength test is the most common used in concrete cube test, because these test easily complete and the properties of concrete are related to its Compressive Strength. The compressive strength test is carried out on test specimens cylindrical or cubical in shape.

Preparation of Test Specimens

There are following step are used for hand mixing concrete.

- Used weighing machine and measure the coarse aggregate, Fine aggregate cement, steel Fiber and Ferro-cement onto a board.
- All contents mix together until it all looks the proper mix and identical color.
- Then create a hollow in the middle in the mix
- Then fill the required water into the hollow and mix the concrete material.
- These processes are done until we have a mix that is workable but not too wet.
- Then use the concrete.
- We are cast total number of cylinders of 35 and cube 15 total specimen is 50. The test specimen are molded in oiled steel mould using three layers layers of filling concrete and each layer tamped to eject air. The tops of the cubes are marked for designation purpose. Immediately after this, the sample is kept in a cool place in the laboratory. The test specimens were removed from the steel moulds.
- For longitudinal and lateral mesh with required no. of layers were wound. They may be Zero, one and two layers of mesh are providing. One end is tied to the ties and then the mesh is wound over the ties lightly completing one full rotation. The mesh and ties were tied with binding wires. For two layered specimens after the completion of first 2 mm GI wires are tied on each layer of mesh to provide spacing between two layers of mesh at required places longitudinally for each specimen 6 no of GI wire pieces of required (27cm) length are used.

Experimental Process

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- ✓ All contents mix together until it all looks the proper mix and identical color.
- ✓ Then create a hollow in the middle in the mix
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V. RESULT AND DISCUSSION

S. No.	No of Specification	% of Fibers	Specification	Average Compressive Strength in N/mm^2
1	5 Cylinder	0%	A_0	25.34
2	5 Cubes	0%	C_1	31.68
3	5 Cubes	0.5%	C_2	36.74

Behavior of Reinforcement Concrete –

1. Behavior of A-series Figure 7.1 Comparison between Stress-Strain Curve of concrete having $A_0(0,0)$, $A_1(1,0)$ and $A_2(2,0)$ deferent specimen it is observed that, A_1 (1,0) is covering the maximum stress strain curve followed by $A_2(2,0)$and $A_0(0,0)$.
2. Behavior of B-series It is observed fromFigure 7.2 Comparison between Stress-Strain Curve of concrete having $B_0(0,1)$, $B_1(1,1)$ and $B_2(2,1)$ deferent specimen (B Series)that, B_2 (2,1) is covering the maximum stress strain curve followed by $B_0(0,1)$ and $B_1(1,1)$.

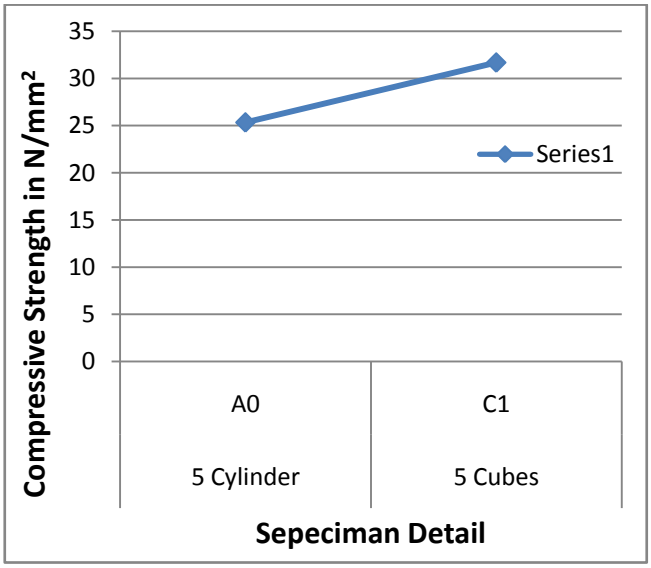

Figure 1 comparison between strengths

VI. CONCLUSION

Behavior Of Specimens Without Fibers –

1. We observed that Figure 7.3 &Figure 7.4 Comparison between Maximum stress-strain curve of concrete having Cylinder Specimen $A_0(0,0)$ and cube Specimen $C_0(0,0)$, Specimen $C_0(0,0)$ strain-strain curve is increase 10% so this isequal to approximately Cylinder Specimen $A_1(1,0)$.
2. We observed that Figure 7.3 Comparison between Maximum Stress-Strain Curve of concrete having$A_0(0,0)$ and $A_1(1,0)$, $A_1(1,0)$ is approximately 10% increase stress but strain is constant.
3. We observed that Figure 7.3 Comparison between Maximum Stress-Strain Curve of concrete having$A_2(2,0)$ and $B_0(0,0.5)$,$B_0(0,0.5)$ is approximately 1% increase stress but strain is constant.
4. We observed that Figure 7.3 Comparison between Maximum Stress-Strain Curve of concrete having $B_0(0,0.5)$ and $B_1(1,0.5)$,$B_1(1,0.5)$ is approximately 9.70% increase stress but strain is constant.

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