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Study on Fiber Reinforced Concrete UsingAsbestos

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Abstract: *All countries are focusing on sustainable technology that can be economical and adopted for the use of concrete in a better way. Concrete is most widely used construction material and it possesses very low tensile strength, low shear strength and brittle characteristics. In order to improve these properties a relatively new construction material developed through extensive research and development work called Fiber Reinforced Concrete (FRC). An attempt has been made to analyze the effect of addition of asbestos fiber in ordinary Portland cement concrete at their optimum proportions. To determine the properties, concrete compressive strength and flexural strength test were performed at different test age like 7, 14 and 28 days. M 30 grade concrete was designed as per IS 10262-2009. The additions of fiber were varying from 0%, 10% and 20%by volume of concrete for AFRC. The compressive strength of AFRC obtained for 28 days gave 34,34.1 and 34.8N/mm^2 respectively. Test results will show that the compressive strength of AFRC marginally improved, and their significant improvement in the flexural strength.*

Keywords: *fiber reinforced concrete, asbestos, mix design, coarse aggregate, fine aggregate.*

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I. INTRODUCTION

Plain concrete, regularly known as concrete, is a cozy blend of binding material, fine aggregate, coarse aggregate and water. This can be effectively formed to sought shape and size before it loses pliancy and solidifies. Plain concrete is strong in compression yet exceptionally feeble in tension. The tensile property is presented in concrete by drafting diverse materials and this endeavor has offered ascend to RCC, RBC, PSC, FRC, cell cement and Ferro concrete.

1.1.1 Reinforced Cement Concrete (R.C.C.) Concrete has been great in opposing pressure yet is extremely feeble in opposing tension. Subsequent support is given in the Concrete wherever tensile stress is expected. The best fortification is steel, since rigidity of steel is very high and the bond amongst the steel and concrete is great. As the elastic modulus of steel is high, for a similar augmentation the compel opposed by steel is high contrasted with concrete. However, in ductile zone, hair cracks in concrete are unavoidable.

1.1.2 Reinforced Brick Concrete (RBC) It is the blend of support, brick and concrete. It is a verifiable truth that brick is exceptionally frail in pressure. Thus, in the sections, lintels and pillars the concrete in the segment underneath the neutral axis don't take an interest in opposing the heap. It goes about as a filler material as it were. Henceforth to accomplish economy the concrete in tensile zone might be supplanted by bricks or tiles. Thick concrete mortar is utilized to implant the fortification. The fortification might be steel bars, extended work and so on.

1.1.3 Prestressed Concrete (PSC) Strength of concrete in tension is low and thus it is disregarded in R.C.C. design. Concrete in strain is going about as a cover to steel and keeping steel at sought separation. In this way in R.C.C. parcel of concrete is not appropriately used. Prestressing the concrete is one of the techniques for using whole concrete. The guideline of prestressed concrete is to present computed compressive stresses in the zones wherever pliable burdens are normal in the concrete basic components. At the point when such basic component is utilized burdens created because of stacking needs to first invalidate these compressive worries before presenting tractable worry in concrete. Along these lines in prestressed concrete whole concrete is used to oppose the heap. Another vital preferred standpoint of PSC is hair cracks are maintained a strategic distance from in the concrete and consequently durability is high.

1.1.4 Fiber-Reinforced Concrete (FRC) Plain concrete has inadequacies like low tensile strength, restricted pliability and low imperviousness to breaking. The splits grow even before stacking. In the wake of stacking miniaturized scale splits broaden and engender, presenting concrete to air activities. On the off chance that firmly divided and consistently dispersed filaments are given while blending concrete, breaks are captured and static and dynamic properties are made strides. Fiber strengthened concrete can be characterized as a

composite material of concrete or mortar with broken and consistently conveyed strands. Usually utilized strands are of steel, nylon, asbestos, coir, glass, carbon and polypropylene. The length to parallel measurement of filaments ranges from 30 to 150. The breadth of strands fluctuate from 0.25 to 0.75 mm. Fiber fortified concrete is having better rigidity, pliability and imperviousness to breaking.

II. PROPERTIES OF ASBESTOS FIBER

A good fiber is the one which possess the following qualities:

- It does not deteriorate in normal usage,
- It is not attacked by insects or microorganisms.
- It is used in fireproof clothing, conveyor belts,
- It is used in brake linings, gaskets, industrial packing, electrical windings,
- Good insulations properties
- Good soundproofing properties.
- Inhaled asbestos fibers have been shown to be a serious health hazard, and it has been removed from the textilesmarket.

III. OBJECTIVES

- To study detail property and characteristics of Asbestos fiber.
- To compare the characteristics strength between plane concrete and asbestos fiber by casting cube.
- To find out effect of change in percentage of asbestos fiber.

IV. LITERATURE REVIEW

Vimalanathan (2022): Generally, quantity of fibers is measured as percentage of cement content. As the volume of fibers increase, there should be increase in strength and toughness of concrete. Regarding our fiber, we hope that there will be an increase in strength, with increase in fiber content. Grade of concrete: M20, Type of cement: PPC (Fly ash based) IS 1489-IMaximum nominal size of aggregate: 20 mm Max w/c: 0.50, Workability: 0.90 compacting factor. First the Portland pozzolana cement, fine aggregates, asbestos fiber and coarse aggregates were weighed accordingly to the mix design and proportions and mixed thoroughly, then with water ratio added to it and the above components and the water is mixed thoroughly to get uniform concrete mass. Now the concrete mass is taken and it is tested for slump test in order to know the slump values for each ratio so after the mixing of the above components slump test shouldbe done. The main use of fiber in the concrete is reduce the cracks to the great extend and increase the strength in the concrete provide the good value of the usage of the concrete in the construction of the concrete structures.

R Baskar, C Merlin Rani (2012): Concrete is one of the widely used construction materials for structures. Cement concrete is an artificial stone produced by hardening mixture of cement, sand, stone chips and water. The inclusion of small fraction (usually 0.5 to 2% by volume) of short fibers to the concrete, mortar and cement paste can enhance many of the engineering properties of basic materials such as fracture toughness, flexural strength and resistance to fatigue, impact and spalling. The incorporation of fibers into concrete has been found to improve several properties primarily cracking resistance, impact and wear resistance and ductility. The tensile strength of asbestos varies between 560 to 980 N/mm2 the maximum length of asbestos fiber is 10 mm but generally fibers are shorter than this. It was observed that there in reduction in crack width with increase in the volume fraction of asbestos fibers when compared to control specimen. Hence the asbestos fibers acts as crack arrestor

V. METHODOLOGY

Step1: Collection of materials

*Cement of OPC M20 grade having specific gravity=3.11, consistency=32%, and initial setting time of 39 min.
*Fine aggregate of SG=2.30 and moisture content=2.7%
*Coarse aggregate of SG=2.69 and moisture content=1.6%

Step2: Mix calculation

Calculation/unit Volume of Concrete

- Volume of Concrete per meter cube
- Volume of cement = (Mass of cement/SG of Cement) *(1/1000) = (432.71/3.1) *(1/1000) =0.140-

meter cube,

➢ Volume of Water = (Mass of Water/SG of Water) *(1/1000) = (197/1) *(1/1000) =0.197-meter cube

➢ Volume of all in all aggregate = Volume of Concrete-(Volume of Cement + Volume of water =1-(0.126+0.158) = 0.716-m e te r cube.

➢ Volume of Coarse Aggregate = Volume of All in All Aggregate*Volume of CA* SG of CA =0.716*(0.63*2.69*1000)
=1213.4 Kg.

➢ Volume of Fine Aggregate=Volume of all in all aggregate*Volume of FA*SG of FA = 0.716*0.37*2.30*1000=609.376 Kg.

FINAL MIX PROPOTION:

Cement	**437.7kg/m3**
Water	**197kg/m3**
Fine aggregate	**609.31 kg/m3**
Coarse aggregate	**1213.4 kg/m3**
Water cement ratio	**0.45**

Step3: Slump test on fresh concrete

W/C Ratio	Initial reading(mm)	Final reading(mm)	Type of slump	Slump value(mm)
0.45	300	270	True slump	75

CASTING AND CURING OF SPECIMENS

MIXING: The process of robbing, folding, and spreading the particle is called as mixing of concrete. Concrete mixed in proportion of 1:0.75:1.5 (M30grade) and asbestos fiber are added as percentage to volume of concreting. Mixing is done by hand mixing on water tight platform

COMPACTION: The process of consolidation of concrete mix after placing in Position called compaction of concrete. It is mainly done to remove air bubble sand Give maximum density to concrete. Compaction done by hand compaction using Tamping rod.

CURING: Curing of concrete is defined as provide adequate moisture, Temperature and time to allow the concrete to achieve desired property for instead Use, curing is done by water curing method. Test specimens are completely immersed in water tank such that top surface of water should be 2 inches below the surface of water. Test specimens are cured at an interval of 7 days,14 days and28day

Step 5: compression test on specimenApparatus:

a) Machine: Compression Testing Machine.
b) Mouldsize:150mm x150mm x 150mm

PROCEDURE:

➢ The test procedure was in accordance to IS: 516-1959.The procedure of the testing was as follow,

➢ Test was conducted immediately after removal of cubes from curing while they are still in wet condition.

➢ The plates of the testing machine were cleaned to ensure it is free from films of oil and particles of grit.

➢ The specimen was placed in the testing machine (between the two platens). The axis of the specimens wascarefully aligned.

➢ Load was applied without shock and increasing continuously at rate of 140kg/sq cm/min.

➢ The compressive strength of the specimen was obtained from the machine directly.

FORMULA USED

$Fc = P\ X\ 100/A$

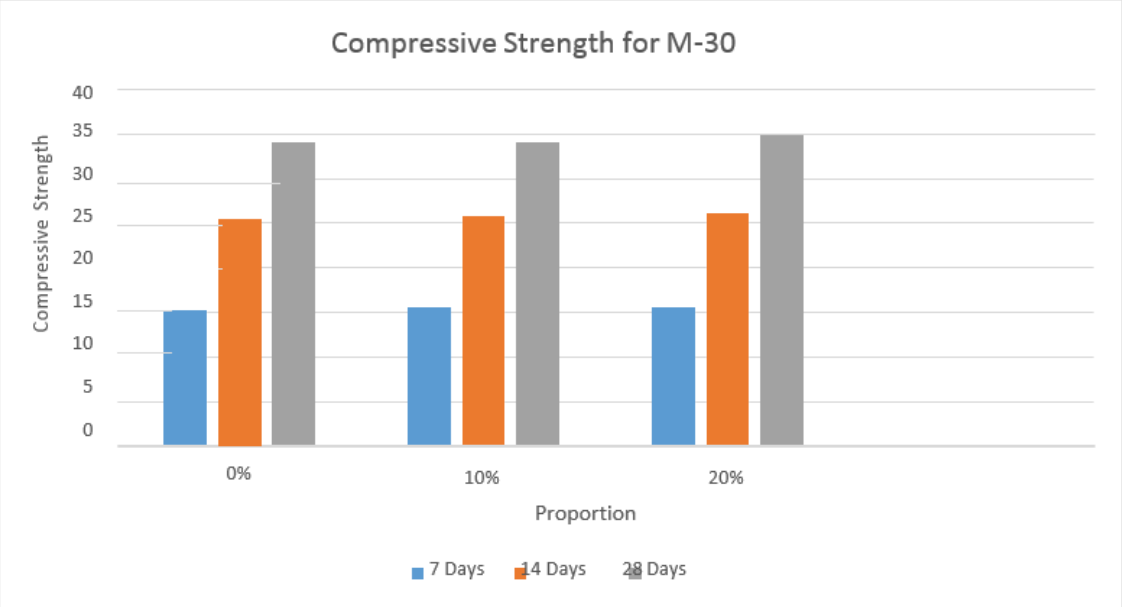
where, fc= Compressive strength of concrete (MPa)P=Maximum load applied to specimen (KN)A=Cross

sectional area of specimen (mm2)

VI. RESULT

Compressive Strength for M-30

Proportion	7 days compressive strength in N/mm^2	14 days compressive strength in N/mm^2	28 days compressive strength in N/mm^2
PC 1:0.75:1.5	15.3	25.55	34
10% AF	15.5	25.7	34.1
20% AF	15.6	26.2	34.8



VII. CONCLUSIONS

Plain concrete, regularly known as concrete, is a cozy blend of binding material, fine aggregate, coarse aggregate and water. This can be effectively formed to sought shape and size before it loses pliancy and solidifies. Plain concrete is strong in compression yet exceptionally feeble in tension. The tensile property is presented in concrete by drafting diverse materials and this endeavor has offered ascend to FRC. Here we used asbestos as major material which is a fiber known for its good strength properties i.e., high tensile strength, wear and friction characteristics and flexibility. The main objective of the project is to compare the characteristics strength between plane concrete and asbestos fiber by casting cube and to find out effect of change in percentage of asbestos fiber. For the project, we used OPC 53 grade cement of specific gravity 3.11, consistency 32% and initial setting time of 39min. Fine aggregate and coarse aggregate of specific gravity 2.30 and 2.69, moisture content of 2.7% and 1.6% respectively. Mix design resulted workability of 75mm slump, water-cement ratio of 0.45 and mix proportion of 1:1.3:2.77. Blocks of M30 grade concrete with 0%, 10% and 20% asbestos are tested for compression. The results of compressive strength for 7 days are 15.3, 15.5 and 15.6N/mm^2 respectively. For 14 days, results are 25.55, 25.7 and 26.2N/mm^2, and for 28 days it is 34, 34.1 and 34.8N/mm^2 respectively. By the result we can conclude that, strength attained by the asbestos fiber block is more compared to normal blocks, but with no much difference.

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