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EXPERIMENTAL INVESTIGATION OF CONCRETE ON USING MICRO SILICA AND SYNTHETIC FIBERS

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Abstract :*It was observed and noted that since decade of years that the cost of the building materials is currently so high that to do meaning full construction. Industrial by-products can be used in concrete as admixtures in cement and raw materials in cement clinkers or as coarse aggregates in concrete. ordinary Portland cement(OPC) is acknowledged as the major construction material throughout the world .the most important material are fly ash ,silica fume, non-silica and metakaolin. whose using cement and concrete is thus likely to be significant development in development of concrete technology in the coming few decades*

This study is to compare mechanical properties and as well as fresh concrete properties of concrete containing silica fume. fibrillated fiber and ordinary Portland cement. The aim of the study is to enable the evaluation of the suitability of mechanical properties. Concrete mixes will be prepared with Portland cement with the addition of silica fume and fiber.

Key words : *silica fume , fiber, concrete, compressive strength, aggregates etc…*

1.INTRODUCTION

concrete is considered as sturdy and solid material. Strengthened concrete is a standout amongst the most well known materials utilized for development around the globe .Reinforced concrete is presented to decay in a few areas particularly in beach front locales. There for scientists around the globe are coordinating their endeavors towards building up another material to defeat this issue. Innovation of huge development plants and gear's far and wide added to the expanded utilization of material. This situation prompted the utilization of added substance materials to enhance the nature of concrete. As a result of the analyses and looks into bond based solid which meets unique execution as for workability, quality and strength. Utilization of high strength concrete in development segment, has expanded because of its enhanced mechanical properties contrasted with standard concrete. High-quality solid alludes to solid that has a uniaxial compressive strength more prominent than the typical strength concrete got in a specific locale. This definition does exclude a numerical strength for compressive strength demonstrating an exchange from a typical strength to high strength concrete. In 1950's, concrete with a compressive strength of M35 MPa was considered as high strength concrete. In the 1990's solid with a Compressive strength more noteworthy than 110MPa was utilized as a part of created nations. In any case this numerical strength (110MPa) could be impressively lower contingent upon the attributes of the neighborhood materials utilized for these solid items. Report of ACI council 363 in 1979 characterized high-strength concrete as having compressive strength more than 41.37 MPa (6000 Psi). at present days high strength and superior concrete are in effect broadly utilized everywhere throughout the world. Most utilizations of high strength concrete have been in elevated structures, long traverse spans and in some uncommon applications in structures. In created nations, utilizing high strength concrete as a part of structures today would bring about both specialized and practical preferred standpoint. In high strength concrete , it is important to lessen the water/bond proportion and which all in all expands the concrete substance. To overcome low workability issue, various types of pozzolanic mineral admixtures (flyash, rice husk fiery remains, metakaoline, and so on and substance admixtures are utilized to accomplish the required workability. In the present test examination, the mechanical and durable properties of concrete of evaluations M25, at 28 and 56 ,90days trademark quality with various supplanting levels of concrete with silica sfume and manufactured fiber are considered.

2. MATERIALS

2.1 CEMENT

Ordinary Portland cement (53 grade) whose Fineness – 340 m2/kg ,Specific gravity- 3.1 Initial setting time - 90 min, Final setting time – 190 min. was used.

2.2 FINE AGGREGATES

In this study utilized sand of Zone-II, known from the strainer examination utilizing diverse sifter sizes (10mm, 4.75mm, 2.36mm, 1.18mm, 600μ, 300μ, 150μ) embracing IS 383:1963. Whose Specific Gravity is 2.65, Water absorption 0.6% and Fineness Modulus 2.47 was utilized.

2.3 COARSE AGRREGATE

The coarse aggregate utilized here with having most extreme size is 12.5mm. We utilized the IS 383:1970 to discover the extent of blend of coarse aggregate. Whose Specific Gravity is 2.65, Water absorption 0.4% what's more, Fineness Modulus 4.01 was utilized.

2.4 WATER

Portable water free from any harmful amounts of oils, alkalis, sugars, salts and organic materials was used for mixing and curing of concrete.

2.5 SILICA FUME

Silica fume , otherwise called microsilica, is an undefined (non-crystalline) polymorph of silicon dioxide, silica. It is a ultrafine powder gathered as a by-result of the silicon and ferrosilicon compound creation and comprises of circular particles with a normal molecule distance across of 150 nm. The principle field of utilization is as pozzolanic material for elite concrete.

2.6 FIBERS

Synthetic fibers or fibers are the aftereffect of broad examination by researchers to enhance normally happening animal and plant fibers. When all is said in done, synthetic fibers are made byextruding fiber framing materials through spinnerets into air and water, shaping a string. Before engineered strands were created, misleadingly made fibers were produced using polymers acquired from petro chemicals. These strands are called synthetic or natural fibers . A few strands are made from plant-inferred cellulose.

3. TEST PROCEDURES

3.1 SLUMP CONE TEST

1. The mold for the slump test is a frustum of a cone, 300 mm (12 in) of tallness. The base is 200 mm (8in) in distance across and it has a littler opening at the highest point of 100 mm (4 in). The base is put on a smooth surface and the holder is loaded with cement in three layers, whose workability is to be tried . Each layer is temped 25 times with a standard 16 mm (5/8 in) distance across steel rod, adjusted toward the end. When the mold is totally loaded with cement, the top surface is struck off (leveled with mold top opening) by method for screening and moving movement of the temping pole.

The mold must be solidly held against its base amid the whole operation so it couldn't move because of the pouring of concrete and this should be possible by method for handles or foot - rests brazed to the mold. Immediately in the wake of filling is finished and the concrete is leveled, the cone is gradually and painstakingly lifted vertically, an unsupported solid will now droop. The abatement in the stature of the focal point of the slumped concrete is called slump. The slump is measured by putting the cone just close to the droop concrete and the temping bar is put over the cone so it ought to likewise come over the region of slumped concrete. The reduction in stature of cement to that of mold is noted with scale. (generally measured to the closest 5 mm (1/4 in).

Fig No.3.1 CONCRETE SLUMP

3.2 V-FUNNEL FLOW TEST

About 12 liter of concrete is needed to perform the test, sampled normally. Set the V-funnel on firm ground. Moisten the inside surface of the funnel. Keep the trap door to allow any surplus water to drain. Close the trap door and place a bucket underneath. Fill the apparatus completely with the concrete without compacting or tamping; simply strike off the concrete level with the top with the trowel.

Open within 10 sec after filling the trap door and allow the concrete to flow out under gravity. Start the stop watch when the trap door is opened, and record the time for the complete discharge (the flow time). This is taken to be when light is seen from above through the funnel. The whole test has to be performed within 5 minutes.

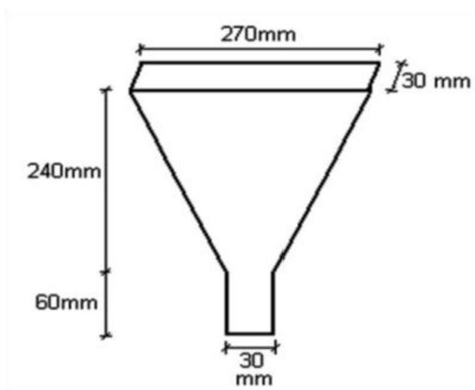


Fig 3.2 V-FUNNEL FLOW TEST APPARATUS

3.3 L BOX TEST

Around 14 liter of concrete expected to play out the test, examined regularly. Set the mechanical assembly level on firm ground, guarantee that the sliding door can open uninhibitedly and afterward close it. Soak within surface of the mechanical assembly, expel any surplus water, fill the vertical area of the device with the concrete mix. Abandon it stand for 1 minute. Lift the sliding entryway and permit the concrete to stream out into the even segment. All the while, begin the stopwatch and record the ideal opportunity for the concrete to achieve the solid 200 and 400 markss. At the point when the solid quits streaming, the separations "H1" and "H2" are measured. Ascertain H2/H1, the blocking proportion. The entire has tom performed inside 5 minutes.

3.4 COMPRESSION STRENGTH

One of the most important properties of concrete is the measurement of its ability to with stand compressive loads. This is referred to as a compressive strength and is expressed as load per unit area. One method for determining the compressive strength of concrete is to apply a load at a constant rate on a cube (150×150×150 mm), until the sample fails. The compression tests performed in this project were completed in accordance with IS standard 516 "Methods of Tests for Strength of Concrete". The apparatus used to determine the compressive strength of concretes in this experimental work was a universal testing machine (UTM). For this study samples were tested for compression testing at 7, 28, 56, 90 days of curing. The compressive strength of the concrete in terms of pressure was then calculated using the Equation

$fc=P/A$

Where,

fc = Compressive Strength of Concrete, (Kpa or psi)

P = Maximum load applied (KN or lb), and

A = The cross-sectional area of sample (mm^2 or in^2)

4. RESULTS AND DISCUSSION

4.1 V-Funnel flow test

Table 1 shows that the results of the v-funnel flow test ,the results of the fresh concrete mix. From the results it is note that the values of the v-funnel flow test passing ability of the conventional concrete Is high when compared with the concrete added with the silica fume and synthetic fiber. The conventional concrete time is calculates in seconds as 9 and the concrete with silica fume and synthetic fibers are gradually decreases

Table No.1 v- funnel flow test

Mix	V-Funnel flow(sec)
M1	9
M2	8
M3	6
M4	6
M5	5
M6	5

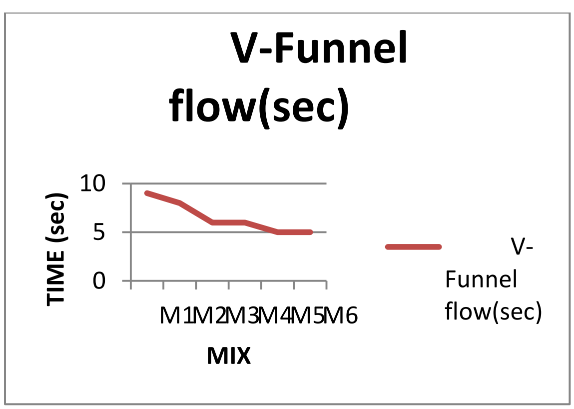


Fig No.1 v funnel flow

4.2 L BOX TEST

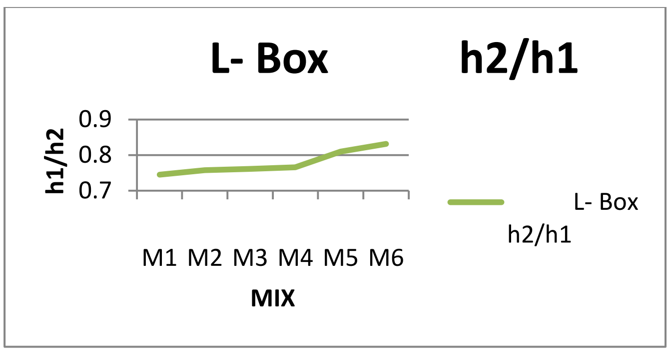
Table 2 shows that the values of the compaction ability of concrete is found using L – box test.

Table No.2 L-box test results

Mix	L- Box h2/h1
M1	0.745
M2	0.758
M3	0.761
M4	0.766
M5	0.810
M6	0.831

This test results shows that the compaction ability of the concrete with silica fume and synthetic fibers are more better when compared with the conventional concrete.

Fig No 4.2 L-box



The compaction ability of the concrete values are increased with the silica fume and synthetic fibers.

4.3 Slump cone test

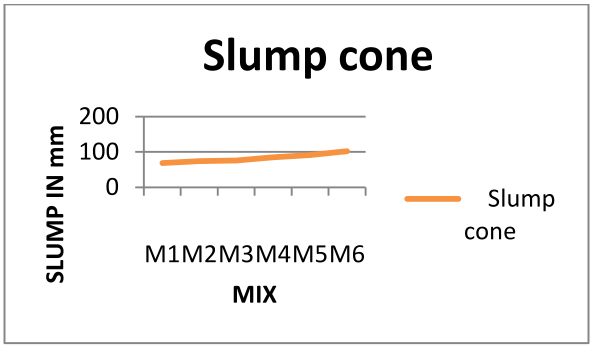
Table 3 shows that the results of the slump cone test conducted on the concrete mix to determine the workability of the concrete.

Table No.3 Slump cone values

Mix	Slump in mm
M1	68
M2	74
M3	76
M4	85
M5	91
M6	102

From the values of the slump cone conducted on the concrete at different concrete mixes it can concluded that the workability or mobility of the concrete increases with increase in the silica fume and synthetic fibers in the concrete

Fig No 4.3 slump cone



The workability of the silica fume and synthetic fiber concrete mix is more at the M6 mix its nearly (102 mm).when compared with the conventional concrete the workability of the concrete with silica fume and synthetic fibers is more.

4.4 COMPRESSION STRENGTH

Table 4 shows the compressive strength values of concrete with silica fume and synthetic fibers.

Table No.4 compressive strength results

MIX	7days	28days	56 days	90 days
M1	27.56	36.28	36.66	39.54
M2	27.87	36.69	37.1	39.98
M3	29.13	38.01	39.12	42.36
M4	29.4	39.4	41.89	43.25
M5	25.23	32.2	33.45	35.5
M6	22.12	29.75	29.33	30.25

M1-(silica fume(SF) 0% and synthetic fiber (SYF)0%),

M2 –(SF 5% and SYF 5%),

M3-(SF 10% and SYF 10%)

M4-(SF20% and SYF20%)

M5-(SF 30%and SYF30%)

M6-(SF40% and SYF40%)

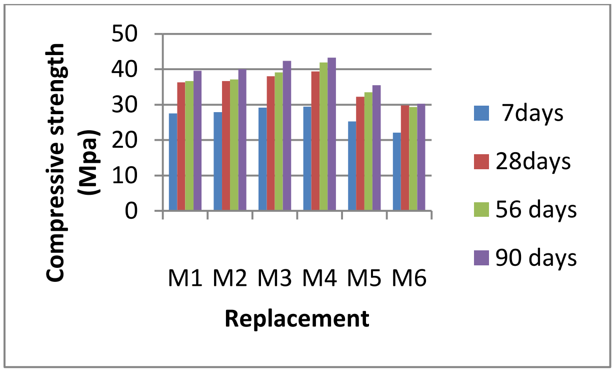


Fig No 4.4 compressive strength

5. CONCLUSION

- The compression strength of the concrete increases with increase in the silica fume and synthetic fibers up to replacement and adding 20 % after that the values compressive strength decreases gradually.

- The tests made on the fresh concrete results shows that the workability of the concrete increases with increase in silica and synthetic fiber.
- Passing ability of concrete with silica fume is low when compared with conventional concrete.
- Compact ability of the concrete with silica fume and synthetic fiber is more better when compared with normal concrete.
- Flow ability of concrete with silica and synthetic fiber is good than normal concrete.

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