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TITLE: FEASIBILITY OF GLASS FIBRES WITH OPTIMUM REPLACEMENT OF NATURAL SAND WITH ARTIFICIAL SAND

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Abstract

The huge quantity of concrete is consumed by construction industry all over the world. In India, the conventional concrete is produced by using natural sand obtained from riverbeds as fine aggregate; But now as the use of concrete has increased all over the world simultaneously use of natural sand has also increased and as the consumption of sand has increased the required good quality of sand is not available also poses the environmental problem and hence government restrictions on sand quarrying resulted in scarcity and significant increase in its cost. So an attempt has been made to discuss the properties such as workability, and compressive strength of concrete prepared by replacing fiber at (0.2%). The development of cracks and their measurement is also studied. The results have shown that the fiber can be replaced with replacement levels (0.2%) up to a maximum replacement level of 45-55% in order to produce concrete of satisfactory ,compressive strength and cracks of lesser areas.

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Index Terms: *Natural sand, Artificial sand, glass fibers, compressive test, etc.*

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1. INTRODUCTION

We cannot imagine Civil Engineering structures without concrete. Concrete is backbone of infrastructural development of whole world. Concrete has capacity to enhance its properties with the help of other suitable material. Maximum volume of concrete is made of aggregate. The aggregate characteristics are influence the workability, bleeding, segregation and durability of concrete. Fine aggregates may be natural sand, crushing natural gravels, crushing hard stones (artificial sand), etc Since from last twenty years we found that the availability of good quality of natural sand is decreasing. The natural sand deposits are drying up and hence there is an acute need to find suitable substitute that match the properties of natural sand. The natural sand deposits are being emptied by construction industries. The quarry stone crushers are situated in the nearby areas from which it is possible to get artificial sand. By using artificial sand. We can overcome environmental problems and protect river bed against erosion also and remain as filter for ground water. Thus for preserving areas of beauty, recreational values and biodiversity most of local government agencies granting permissions to aggregate producers in India and across the world. The rigorous study is necessary for use of artificial sand in place of natural sand. In this project the comparable test results of compression, flexural and split tensile strength of concrete by replacing natural sand 0%, 20%, 40%, 60%, 65%, 70%, 75%, 80% and 100% by artificial sand for M25 grade of concrete. Plain cement concrete possesses a very low tensile strength, limited ductility and little resistance to cracking. Internal micro cracks are inherently present in concrete and its poor tensile strength is due to the propagation of such cracks, eventually lading to brittle fracture of the concrete. Addition of small closely spaced and uniformly dispersed fibres to concrete would act as crack arrester and would substantially improve its static and dynamic properties. This type of concrete is known as Fibre Reinforced Concrete. Fibres are usually used in concrete to control cracking due to both plastic shrinkage and drying shrinkage. They also reduce the permeability of concrete and thus reduce bleeding of water. Some types of fibres produce greater impact, abrasion and shatter resistance in concrete.

2. OBJETIVE

- To check the feasibility of artificial sand in concrete.
- To find the good and economical replacement for natural sand.
- To achieve the specified characteristic compressive strength or more of 7days,14 days and 28 days.
- To check the feasibility of fibres in concrete.
- To make our structure in an economical cost without compromising the strength.

3.MATERIALS & TESTS

1) CEMENT: Cement (Ordinary Portland cement) 53

2) grades has been used for mix proportion for M25 Grade concrete.

For examining the suitability of cement, the following laboratory tests are performed:

a) Sieve test (as per IS 4031,Part 1-1996).

Table-1:Fineness Test

Sieve	Weight
90 µ	0.04

b) Standard consistency test.

Table-2: Standard consistency test.

Sr.No	Weight of cement	Percentage of water	Percentage of water in (ML)	Plunger penetration (MM)
1	300 g	26%	78	38
2	300g	30%	90	23
3	300g	33%	99	7
4	300g	34%	102	5

3) NATURAL SAND: Natural black colored locally available sand at yavatmal region is used.

For examining the suitability of sand, the following laboratory tests are performed:

a) Fineness modulus

Table -3: Fineness modulus

Sieve size	Weight Retained	Cumulative Weight Retained	Cumulative % Weight Retained
4.75	0.063	0.063	6.3
2.36	0.160	0.160	16
1.18	0.318	0.318	31.8
600 µ	0.259	0.259	25.9
300 µ	0.147	0.147	14.7
150 µ	0.035	0.035	3.5
Total			98.20

Fineness Modulus of Sand is 98.20.

b) Specific Gravity

Specific Gravity of Sand = 2.7.

c) Bulking of sand.

Table-4: Bulking of sand.

Sr. No	Initial volume V1	Final reading V2	% of water	Change in volume	% of Bulking
1	300	350	2	50	16.66
2	300	360	4	60	20
3	300	360	6	60	20
4	300	370	8	70	23.33
5	300	350	10	50	16.66
6	300	330	12	30	10
7	300	300	14	0	0

Maximum bulking of Sand % - 23.33%

4) ARTIFICAL SAND: Available artificial sand at yavatmal region is used**.**

For examining the suitability of artificial sand, the following laboratory tests are performed:

a) Specific Gravity

Specific Gravity of Artificial Sand =1.68.

5) COARSE AGGREGATE: 20mm and 10mm mix coarse aggregate available at yavatmal region is used **.**

a) Specific Gravity

Specific Gravity of Aggregate = 2.85.

b) Seive Analysis Aggregate

Table-5: Seive Analysis Aggregate

Seive	Weight Retained	Cumulative weight Retained	Cumulative % weight Retained
80mm	0	0	0
40mm	0	0	0
20mm	2.16	2.16	216
10mm	2.8	4.96	496
4.75 µ	0.04	5.00	500
2.36 µ	0	5.00	500
1.15 µ	0	5.00	500
Pan	0	5.00	500
Total			2712

Fineness modulus of Coarse aggregate is 27.12.

6) SLUMP CONE TEST: For 100% Natural Sand concrete.

Slump cone collapse at a height of 9.5cm.

4. MIX DESIGN

Mix design carried out for M25 grade of concrete by IS 10262:1987, having mix proportion of 1:1.844:2.983 for 1cu.m with water cement ratio of 0.50. The partial replacement of Natural sand with Artificial sand by 0.2 % of Glass fiber are following,

Table-6: Compressive Strength for 7 days

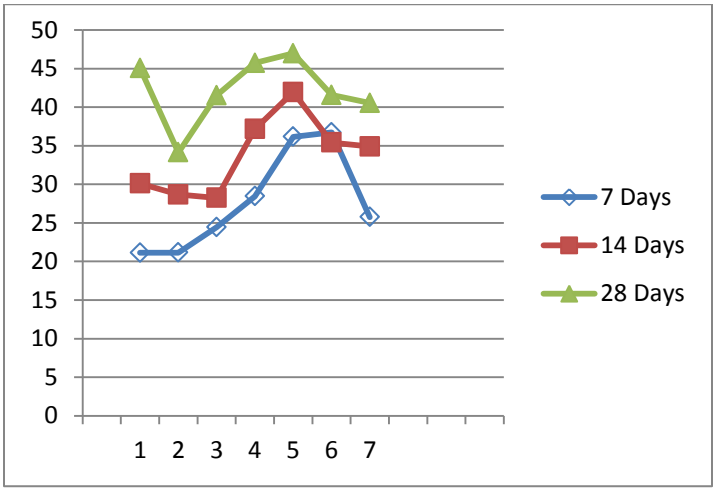
Sr.No	Natural Sand	Artificial Sand	Glass Fibers	Compressive Strength for 7 days
1	100%	0 %	0.2 %	21.12
2	90 %	10 %	0.2 %	21.15
3	70 %	30 %	0.2 %	24.45
4	50 %	50 %	0.2 %	28.45
5	45 %	55 %	0.2 %	36.96
6	40 %	60 %	0.2 %	36.73
7	35 %	65 %	0.2 %	25.75

Table-7: Compressive Strength for 14 days

Sr.No	Natural Sand	Artificial Sand	Glass Fibers	Compressive Strength for 14days
1	100%	0 %	0.2 %	30.1
2	90 %	10 %	0.2 %	28.68
3	70 %	30 %	0.2 %	28.25
4	50 %	50 %	0.2 %	37.16
5	45 %	55 %	0.2 %	41.96
6	40 %	60 %	0.2 %	35.42
7	35 %	65 %	0.2 %	34.9

Table-8: Compressive Strength for 28 days

Sr.No	Natural Sand	Artificial Sand	Glass Fibers	Compressive Strength for 28 days
1	100%	0 %	0.2 %	45.06
2	90 %	10 %	0.2 %	34.13
3	70 %	30 %	0.2 %	41.54
4	50 %	50 %	0.2 %	45.73
5	45 %	55 %	0.2 %	46.97
6	40 %	60 %	0.2 %	41.57
7	35 %	65 %	0.2 %	45.55



Graph representation of Compressive strength of concrete for M25 Grade.

5 CONCLUSION

Yes, fine aggregate i.e the artificial sand can be used as a replacement for the natural sand and we also use glass fiber as it gives more strength. The results have shown that the natural sand can be replaced with artificial sand up to a maximum replacement level of 45-55% in order to produce concrete of satisfactory compressive strength and also with cracks of lesser areas. We seen that, 100% of Natural sand gives the less compressive strength of concrete cube as compare to partial replacement of 45% of Natural sand and 55% of Artificial sand.

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