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EXPERIMENTAL INVESTIGATION ON M-SAND CONCRETE BY USING NANO SILICA AND GLASS FIBRE AS ADMIXTURE

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Abstract -.The general river sand was the cheapest asset of sand. In later a long time, the utilization of waterway sand has been expanded quickly which leads to the gigantic request within the development industry. In arrange to meet this request a number of options have come up, and one of those options is fabricated sand or M-Sand. Utilization of M-Sand can radically diminish the fetched since like waterway sand, it does not contain debasements and wastages is nil since it is made with cutting edge innovation and apparatus. M-sand that's accessible is evaluated, sieved and washed. The particles are more adjusted and granular and don't have sharp edges. Utilization of M-Sand can overcome the absconds happening in concrete such as nectar combing, isolation, voids, capillary, etc. The purpose of this research is to experimentally investigate the effect of M Sand in structural concrete by fully replacing river sand to M-Sand with nano silica 1% replacement of cement and adding glass fiber admixture (0.5%, 1%,2%) total volume of the concrete. The investigations to be carried out using several test which include compressive test, tensile test and flexural test .The aim of this experiment is to maintain the economy and environmental effect.

Key Words: **M-sand, Nano silica, glass fiber.**

1. INTRODUCTION

In common, the request of normal sand is very tall in creating nations to fulfill the quick foundation development, in this circumstance creating nation like India confronting deficiency in great quality common sand, Especially in India, characteristic sand stores are being drained and causing genuine danger to environment as well as the society. The most cause of concern is the nonrenewable nature of characteristic sand and the comparing expanding request of construction industry. Hence searching for an elective to waterway sand has ended up a need. The cheapest and least demanding elective to characteristic sand is fabricating sand by pulverizing rocks/stones in wanted estimate and review by reasonable strategy. Mahendra found that the sharp edges of the particles in counterfeit sand give way better bond with the cement than the adjusted portion of the common sand. Presence of other pollutions in waterway sand such as coal, bones, shells, mica, etc. makes it second rate for the utilize in cement concrete. The rot of these materials, due to weathering impact, abbreviates the life of the concrete. Hence a re-placement fabric to the normal sand was looked for, and fake sand was recognized as a conceivable substitute material.

1.1 Material used

1. Cement
2. Fine aggregate
3. Coarse aggregate
4. Glass fibre
5. Nano silica
6. Reinforcement bars

Cement of OPC , 43grade confining to IS456:2000, and specific gravity of 3.15, fine aggregate of specific gravity 2.74, water absorption 1%, and coarse aggregate of specific gravity 2.74, water absorption of 0.5% were taken. Glass fibre of length 50mm, 25 micrometers diameter end fibre is used. Water cement ratio is 0.45. M30 grade concrete of ratio 1:1.58:2.58.

1.2 Objectives

- In this project, we are going to fabricate a composite material in which multiple materials will be used as fiber.
- To study the properties of concrete when fine aggregate is 100% replaced by manufactured sand and with the addition of nano silica and glass fibre.
- Using M30 grade concrete proportion.
- To determine the change in compressive strength, tensile strength and Flexural strength when fully replaced in M sand.
- Analysis of test and arrive conclusion.

1.2 Scope of the study

- Due to the continuous mining of river beds for river sand has lead to a huge demand of it. The scope of this project lies within the optimum usage of a suitable replacement which is M-sand with river sand in the concrete mix and meet the demand in construction industry

- To imitate the best alternate material for the natural sand. The present study has continued made toward propose then develop some.
- Ideas which will finally valuable to the governments, financial academy and servicer for big infrastructure projects at reasonable cost.
- A specified normal. By implementing new skill finish the work early than the arranged time

2. METHODOLOGY

From the deep study of the literature review, knowledge about fabrication is gained and the methods for fabrication are well understood, as a result the methodology was framed below.

As per the framed methodology the procedure has been followed and the experimental results have been analyzed.

Fig -1: Steps involved

2.1 Experimental setup

The schematic view of the test set up as shown. A 1000KN compressive testing machine. The point of application of the load was at 50mm from the free end of the cube. The test was displacement controlled and the specimen was subjected to an increasing load up to the failure.

Fig -2: experimental setup

2.2 Failure pattern

Control specimens have failed at load. The failure was in the cube of the joint for the control specimen which is to be avoided. In the case of the wrapped specimens, the failures was noticed in the cube portion only and cylinder was intact and this is the most preferred type of failure under loads which will Prevent collapse of the Structures.

Fig-3 : Failure pattern

3. RESULTS AND DISCUSSIONS

Experiments were conducted to study hardened (compressive ,split tensile strength and Flexural strength) properties made of M30 concrete with glass fibre and nano silica as an admixture.

3.1 cube compressive strength of Concrete (M sand)

The test results of cube compressive strength of M30 grade concrete with various proportions of 0.5 %, 1%, 2% of glass fibre by weight of concrete.

Table-1 Mix design data

Glass fibre	0%	0.5%	1%	2%
Cement	1.450	1.435	1.435	1.435
M sand	2.291	2.291	2.291	2.291
C A	3.741	3.741	3.741	3.741
Water	652	645	645	645

Nano silica	0	0.0145	0.0145	0.0145

Table - 2 compressive strength (1% adding nano silica)

Percentage Addition Of Glass fibre	Compressive strength N/mm²	
	7 days	28 days
Conventional concrete	20.22	34.55
05%	26.20	41.33
1%	27.30	43.22
2%	22.70	37.10

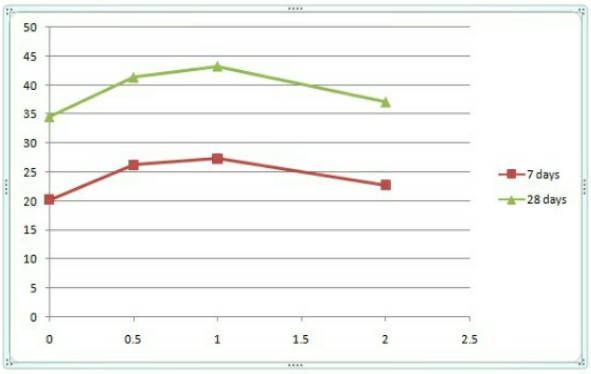

Chart 1. Chart representation of compressive strength by glass fibre

3.2 Cylinder tensile strength of Concrete (M SAND)

The test results of cylinder tensile strength of M30 grade concrete with various proportions of 0.5 %, 1%, 2% of glass fibre by weight of concrete.

Table 3- Mix design data

Glass fibre	0%	0.5%	1%	2%
Cement	2.277	2.254	2.254	2.254
M sand	3.598	3.598	3.598	3.598
C A	5.875	5.875	5.875	5.875
Water	1024	1014	1014	1014
Nano silica	0	0.0227	0.0227	0.0227

Table-4 Tensile strength (1%adding nano-silica)

Percentage Addition Of Glass fibre	Tensile strength N/mm²	
	7 days	28 days
Conventional concrete	1.69	2.97
05%	1.72	3.43
1%	1.80	3.44
2%	1.65	3.04

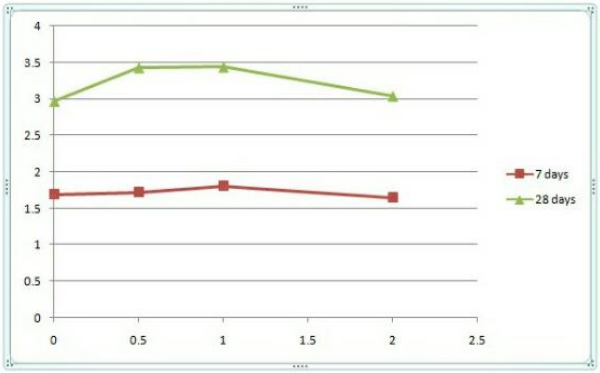

Chart -2: Chart representation of tensile strength by glass fibre

3.3 beam Flexural Strength of Concrete (M SAND)

The test results of beam Flexural strength of M30 grade concrete with various proportions of 0.5 %, 1%, 2% of glass fibre by weight of concrete.

Table 5 - Mix design data

Glass fibre	0%	0.5%	1%	2%
Cement	6.760	6.69	6.69	6.69

M sand	10.68	10.68	10 68	10.68
C A	17.44	17.44	17.44	17.44
Water	3042	3010	3010	3010
Nano silica	0	0.0676	0.0676	0 0676

Table 6- Flexural strength (1% adding nano silica)

Percentage addition of glass fibre	Flexural strength N/mm² (28 days)
Conventional concrete	6.39
0.5%	7.18
1%	7.4
2%	7.01

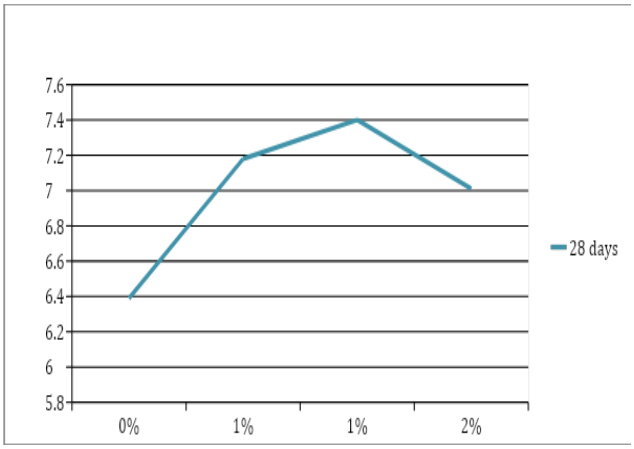

Chart- 3: Chart representation of Flexural strength by glass fibre

The Flexural strength of conventional concrete and modified concrete i.e with nano silica 1% and the fully replacement of Fine Aggregate with M-Sand at the age 28 days of Flexural Strength with adding the Glass fibre s 0.5, 1, 2 %respectively. The Flexural strength is increase as the percentages of M-Sand increases with 1% of Glass fibre when compares to 0%, 0.5%,2% glass fibre .

4. CONCLUSIONS

- From the present investigation, the following conclusions were drawn. Manufactured sand is a best alternative for natural river sand in terms of strength and durability. Replacement of 100 % manufactured sand by natural river sand yielded good compressive strength for M30 grade concrete.
- Replacement of 100% foundry sand by natural river sand yielding good split tensile strength for M30 grade concrete. Replacing 1% glass fibre and 1% of nano silica by manufactured sand induces higher strength in concrete than the conventional concrete.
- Better control over gradation and free from impurities. Shapes of the aggregate may be maintained and desired zone can be achieved. Hardness and strength better than natural river sand.

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