

Feasibility of Artificial Sand in Reinforced Concrete Structures

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ABSTRACT

The paper gift the study of replacement of natural sand with artificial sand in concrete conventionally concrete could be a mixture of cement sand and combination there's an outsized variation within the strength of concrete thanks to variation in strength of combination use there's a deficiency of natural sand thanks to significant demand in construction activities that forces to search out appropriate substitute the chipset and simple approach of obtaining substitute for natural sand is sand that is made from quires tone by device ready specially thus on get cubiform, sleek rough-textured, well ranked particles of fine combination is termed artificial sand . This paper gift the feasibleness of artificial sand in concrete for the aim of experimentation concrete mixes square measure style for M20 and M25 grades by zero to 100% with increment of twenty a brand new of natural sand by artificial sand. Compressive and tensile take a look at square measure conducted to check the strength of concrete for on top of replacement

Keywords:- Feasibility, Artificial Sand, Natural Sand, Compressive Strength, Tensile Strength.

1. INTRODUCTION

We cannot imagine the structures while not concrete. Concrete could be a main constituent of the applied science structures. it's turning into the backbone of infrastructural development of whole world. Concrete has capability to reinforce its properties with the assistance of alternative appropriate constituents. The main disadvantages of concrete square measure as follows

- Brittleness
- Very low tensile strength
- Less resistance to cracking
- Heavy mass (density)
- Plastic and drying shrinkage.
- Permeability and bleeding of water

Aggregates characteristics (size, shape, texture, grading) influence the workability, end ability, bleeding, and segregation of recent concrete and sturdiness of hardened concrete. Fine aggregates is also one amongst the subsequent types; Natural sand, crushing natural gravels, crushing laborious stones (artificial sand). With natural sand deposits the planet over evaporation, there's associate acute would like for a product that matches the properties of natural sand in concrete. within the last fifteen years, it's become clear that the provision of fine quality natural sand is decreasing. With many native exceptions, it looks to be a world trend. Existing natural sand deposits square measure being empty at a similar rate as urbanization and new deposits square measure placed either underground, too on the brink of already settled areas or too far-off from the areas wherever it's required, that is, the cities and cities wherever the makers of concrete square measure placed. Environmental issues are being raised against uncontrolled extraction of natural sand. The arguments square measure largely with regard to protective riverbeds against erosion and also the importance of getting natural sand as a filter for spring water. The on top of issues, combined with problems with protective areas of beauty, recreational worth and variety, square measure associate integral a part of the method of most government agencies granting permission to combination producers across the planet. this is often matters for the development business these days and most can agree that it'll not amendment dramatically within the predictable future. Test were conducted on cube and cylinder by substitution natural sand 1/3

, 20%, 40%, hour eightieth and 100 percent by artificial sand for M20 and M25 grades of concrete.

2. LITERATURE REVIEW

The consumption of cement content, workability, compressive strength and cost of concrete made with Quarry Rock Dust were studied by researchers Babu K.K.et.al , Nagaraj T.S.et.al, and Narasimahan et.al. The mix design proposed by Nagaraj et.al shows the possibilities of ensuring the workability by wisecombination of rock dust and sand, use of super plasticizer and optimum water content using generalized lyse Rule.

M. R. Chitlange in 2010 study shows that mixes with artificial sand as fine mixture provides systematically higher strength than the mixes with natural sand. The sharp edges of the particles in artificial sand offer higher

bond with cement than the rounded particles of natural sand leading to higher strength. The excessive harm of concrete is reduced by victimization artificial sand.

R. Ilangovana¹, N. Mahendrana¹ and K. Nagamanib states that the Physical and chemical properties of quarry rock dirt is happy the wants of code provision in properties studies. Natural watercourse sand, if replaced by hundred p.c Quarry Rock dirt from quarries, could some times offer equal or higher than the reference concrete created with Natural Sand, in terms of compressive and flexural strength studies.

Priyanka A. Jadhava and Dilip K. Kulkarni The result of concrete with partial replacement of factory-made sand on the properties of traditional strength concrete with water cement magnitude relation of zero.45 and twenty eight day's compressive, split tensile and flexural strength of 20Mpa (2900 psi) and workability (slump and compacting factor) were studied. The result of proportion replacement of factory-made sand on strength property and workability were evaluated and compared with reference mixture of 1/3 replacement of natural sand by factory-made sand.

3. MATERIAL

3.1 Cement

Ordinary Portland cement of 43 grades confirming to IS 12269-1987 was used. The physical properties are tabulated as shown below

Table -1: Properties of Portland Cement (43 Grade)

No.	Property	Value
1	Specific gravity	3.12
2	Fineness m ³ / Kg	315
3	Normal Consistency	37%
4	Initial setting time	180 minute
5	Final setting time	220 minute
6	Soundness	1.5 mm
7	7 days compressive strength	33.25 MPa

3.2 Fine Aggregate

Natural sand obtained from the river and normally available in the market was used. The artificial sand obtained from the local crusher was used. The physical properties of natural and artificial sand are listed below. The sieve analysis details are given in table 3. Both types of fine aggregate are confirming to zone II of IS 383-1970.

Table -2 : Properties of Natural and Artificial Sand.

Property	Natural Sand	Artificial
Specific Gravity	2.6	3.05
Bulk Density kn/m ³	15.60	17.62
Fineness Modulus	2.78	3.05

Table -3 : Sieve Analysis Details of Natural and Artificial Sand

IS Sieve	Percentage Passing	
	Natural Sand	Artificial Sand
4.75 mm	96.2	95
2.36 mm	88.4	78
1.18 mm	65.8	55
600 micron	47.1	40
300 micron	19.6	20
150 micron	5	12

3.2 Coarse Aggregate

Crushed natural rock stone aggregate of nominal size 10 mm and 20 mm mixed aggregate are used. The physical properties of these coarse aggregated are listed below.

Table -4 : Properties of Coarse Aggregate

No.	Property	Value
1	Specific Gravity	3.10
2	Bulk density kn/m ³	16.10
3	Fineness Modules (20 and 10) mm	7.57

Table -5: Sieve Analysis Details of Coarse Aggregates

IS Sieve	Percentage Passing
40 mm	100
20 mm	60
10 mm	30
4.75 mm	00
2.36 mm	00
1.18 mm	00
600 micron	00
300 micron	00
150 micron	00

Table -6: Quantity of Material (For Mix)

Sr.No	Grade of Concrete	M 20
1	Cement kg/m ³	360.84
2	Fine aggregate kg/m ³	651.70
3	Coarse Aggregate (10mm and 20 mm) kg/m ³	1210.30
4	Water liter /m ³	180.42
5	Water cement ratio	0.50
6	Cement aggregate ratio	1 :5.16
7	Compaction factor	0.89

4. EXPERIMENTATION

The characteristics were followed by concrete combine check programme can investigate at first . The physical Characteristics of fabric used that's cement natural sand, artificial sand and coarse mixture. The exact quantity of concrete ingredients were weighed and combined completely in laboratory machine until the consistent mix was achieved. The workability of contemporary concrete was measured in terms of compaction issue . the quality cube of one hundred fifty millimetre size is steel mould and cylinder of one hundred fifty millimetre. diameter and three hundred millimetre. length compacted on moving table. Six cubes and 6 cylinders with variable proportion of natural and artificial sand were solid for testing, the common strength was calculated the acceptance criteria victimization IS 456 – 2000 is followed and also the average values area unit illustrated in tables .

5. CONCLUSION

From the on top of result following conclusion square measure drawn. It's ascertained that replacement of natural sand with hr to eightieth by artificial sand is found possible. For M20 grade of concrete the share increase in compressive strength and lastingness by twenty nine.44% and 5.39 nada severally by replacement natural sand.

Hence artificial sand may be counseled as an honest and competitive substitute for natural sand. It may be seen that mixes with artificial sand as a fine combination provides higher strengths than mixes of natural sand because of sharp ages of the particle in artificial sand offer higher bond with cement than rounded particle of natural sand the acquisition value of artificial sand is concerning sixty% to seventy you have to that of natural sand. thus artificial sand concrete could also be jaunty than natural sand concrete. The take a look at result obtained from well plant and punctiliously performed experimental programmed considering technical, environmental and industrial factors.

Table -7: Result of Compressive Strength & Split Tensile Strength (M-20 Grade)

Sr. No	Percentage of Artificial sand	Percentage of Natural sand	Compressive. Strength N/mm ²		Split Tensile strength kN/mm ²	
			7 Day	28 Day	7 Day	28 Day
1	00	100	26.21	31.58	0.83	1.67
2	20	80	26.69	31.85	0.67	1.76
3	40	60	27.69	32.29	1.34	1.76
4	60	40	27.70	40.88	1.25	1.79
5	80	20	27.70	39.11	1.17	1.50
6	100	00	26.54	35.15	1.25	1.55

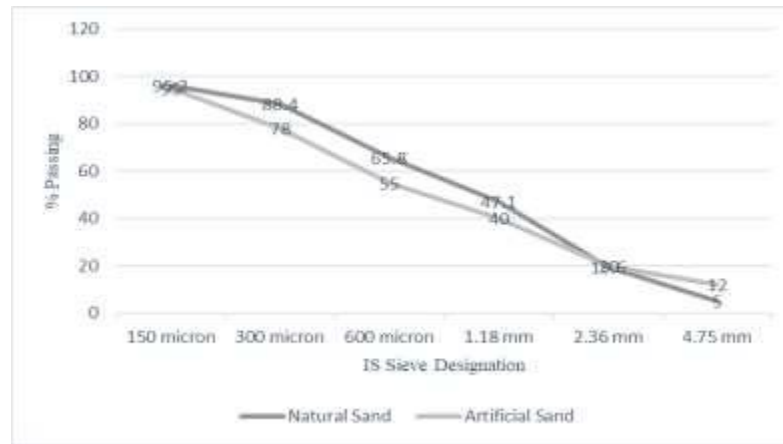


Chart -1: Sieve Analysis of Natural and Artificial Sand

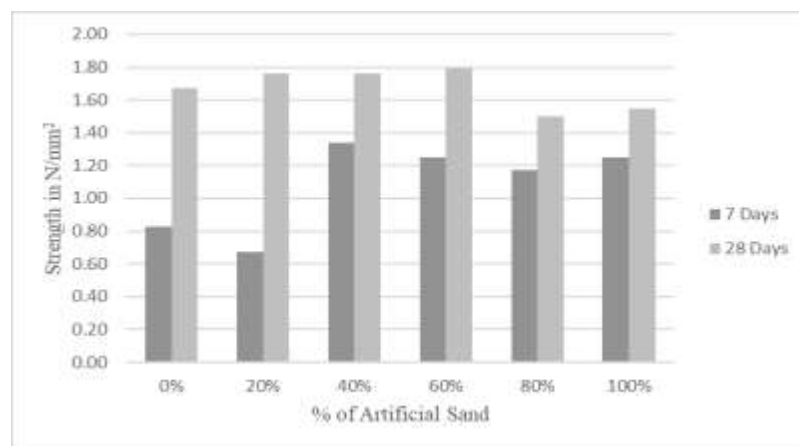


Chart -2: Graphical Representation of Compressive Strength of Concrete for M20 Grade

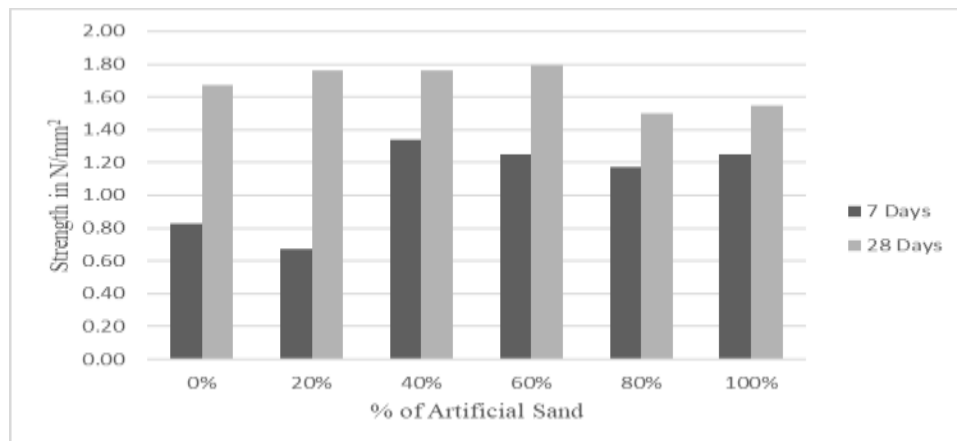


Chart -3: Graphical Representation of Split Tensile Strength of Concrete for M20 Grade

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