

Comparative Study on Cost Analysis, Strength of Concrete with Natural and Manufactured sand in Residential Building

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Abstract—The huge quantity of concrete is consumed by construction industry all over the world. This fact has forced the Government to laydown restrictions on sand quarrying process resulting in the scarcity and significant rise in its cost. The substitute and replacement of natural sand is by crushing natural stone it will easily get manufactured sand. In this Report we have considered Residential Building which has used different grade of concrete out of which the compressive strength analysis and cost analysis of M30 grade is studied.

Keywords- *Natural Sand, Manufactured Sand, Compressive Strength, Cost Analysis.*

I. INTRODUCTION

Manufactured sand is a term which has small size than 4.75mm on base of fine aggregate and which are processed from crushed rock or gravel. To study the manufactured sand the suitable replacement of natural sand firstly its compressive strength should be checked and secondly its cost comparison is studied Manufactured sands with levels of micro fines (material less than 75-micron) exceeding 10% can be used in the production of Portland cement concrete. It is clear from the definition for manufactured sand that it was never acceptable for quarries to produce a crusher dust that results from the fine screenings of all quarry crushing and call this material manufactured sand.

Initially, different natural and manufactured sand samples to be used in the concrete mixes were collected and their physical properties were studied. Then concrete mixes having different mix proportions for both natural and manufactured sand (i.e. 100%NS+0%MS, 70%NS+30%MS, 40%NS+60%MS, and 0%Ns+100%MS) were prepared and casted .after 24 hours it was put for curing . then after 7 days it's compressive strength was measured and then cost analysis was studied.

The Manufactured sand produced by proper machines can be a better substitute to river sand. The sand must be of proper gradation (it should have particles from 150 microns to 4.75 mm in proper proportion).[2]

The most commonly used fine aggregate is natural river or pit sand. [1] Fine and coarse aggregate constitute about 75% volume of the concrete volume. It is important to get right

type and good quality aggregate at construction site, because the aggregate forms the main content of concrete or mortar. Manufactured sand offers viable alternative to natural sand and it is purpose made fine aggregate produced by crushing and screening or further processing i.e. washing, grading, classifying of quarried rock, cobbles, boulders or gravels from which natural fine aggregate had been removed. [1]

The crushed rock should be processed to have fines content close to the optimum fines content or within a certain recommended range encompassing the optimum fines content.

II. METHODOLOGY

- Material used and its properties at the construction.
- Different test done on the different construction materials.
- After the study of material and different test done on the materials the concrete quantity is worked out.
- Then after mixing and placing of the work is done.
- Then after 24 hours cubes are placed for curing.
- Cube compression test is then done on 7 days and 28 days and the comparison is done on it.
- Also the material cost is studied for the different proportion of the natural sand and manufactured sand.

III. OBJECTIVES

• Due to presence of silt and clay in natural sand. If the natural sand is not properly processed then there will be damage in concrete at early stage.

- MS will Reduce the wastage of low-value by-products in the quarries.
- MS is more cost effective then the Natural sand.
- Due to Growing demand for fine-aggregates in construction MS was introduced.
- MS is lesser impurities and good working properties.
- Primary objective to know that a manufactured sand can be made to replaced by natural sand

IV. EXPERIMENTAL WORK

TABLE 1. DIFFERENT PTOPTION OF THE M30 GRADE

Material	Unit	% Replacement ns by ms			
		0%	30%	60%	100%
Cement	Kg/m ³	492.5	492.5	492.5	492.5
Fine aggregate	Kg/m ³	772.12	540.48	308.84	0
MS	Kg/m ³	0	231.63	463.27	772.12
Coarse aggregate	Kg/m ³	1010.87	1010.87	1010.87	1010.87
Water	Liter	197	197	197	197
W/C	Kg/m ³	0.40	0.40	0.40	0.40

Cube size = 15 cm x15 cm x15 cm

At, 0%

$$= (0.15 \times 0.15 \times 0.15) \times (\text{no of cube}) \times \text{factor}$$

$$= (0.15 \times 0.15 \times 0.15) \times 6 \times 1.07$$

$$= 0.0216 \text{ m}^3$$

Therefore, Total quantity of concrete required = 0.0216 x 4 = 0.0864 m³

V. RESULT & DISCUSSION

TABLE 2 SLUMP TEST

% of MS	0%	30%	60%	100%
Workability Slump (mm)	140	115	90	75

table 3comparison of 7 days &28 days compressive strength

Cube No.	0%		30%		60%		100%	
	7 Days	28 Days	7 Days	28 Days	7 Days	28 Days	7 Days	28 Days
1	28.35	40.24	30.28	42.02	28.11	32.91	27.02	33.48
2	31.77	42.20	32.12	39.26	29.80	33.91	22.46	32.00
3	30.87	41.40	32.25	41.73	29.37	33.57	25.86	31.00
Avg. (MPa)	30.33	41.28	31.55	41.00	29.09	33.46	25.11	32.16

TABLE 4 COST COMPARISON OF 6 CUBES OF 4 DIFFERENT PROPORTION

% Replacement	Surat	Pune	Mumbai
0%	90.46	112	115.6
30%	88.2	109.17	112.34
60%	86	106.31	109.6
100%	83	102.5	104.75

VI. CONCLUSION

From the above Results and comparison. It states that replacement of 60% of natural sand to manufactured sand gives the desigred compressive strength. Also the cost comparison and slump test says that the 60% gives economical cost of concrete and slump value.

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