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Use of Sea Sand in Partial Replacement of River Sand in Concrete for Construction

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Abstract:- As the river sand is widely used in development industry, the interest for fine total is expanding quickly. Stream sand has been the most broadly utilized as fine total the world over and to take care of the demand has prompted different hurtful results, for example, increment in the profundity of the waterway bed, bringing down of the water table, and saltiness interruption into the waterways. As the results, there was an immediate requirement for alternatives to river sand such as manufacturing sand which is prominently used as alternative material. An experimental study is made on the strength aspects of cement concrete by partially replacing sea sand with river sand as fine aggregate. This work gives a comparison on the relevant material properties of Sea sand (SS) and River sand (RS).

Sea sand was partially replaced in river sand (0% to 100%) for each proportion of Fine Aggregates(FA) cement concrete blocks were cast and tested for compressive strength at 7, 14 and 28 days of curing. The concrete blocks were tested. The compressive strength results for replacement (RS+SS) were tabulated and graphs were plot for compressive strength v/s curing period.

Keywords:- *River Sand, Sea Sand, Partial Replacement, Cement Concrete, Compression Strength Test.*

I. INTRODUCTION

In our today's world, the concrete has become ubiquitous, Because of its aesthetic beauty, strength and durability. Concrete had became base for all construction activities around the world. After water, concrete is the second most consumed material.

In solid, recollect that bond is the powder that responds with water to shape bond glue, a hard, strong material that structures the grid for the solid composite. The expansion of sand (fine totals) that is made up to a couple of millimeters in width makes mortar and the expansion of smashed rocks (coarse totals) of up to a couple of centimeters in breadth blend concrete.

The aggregates make up 60%-85% of the total volume in concrete, therefore in the year 2015 the amount the concrete produced worldwide can roughly be estimated to be around 20-30 billion metric tonnes and around 1.5-2 billion metric tonnes in India this account take to 1.6 tonnes per person in India.

A. River Sand:

This sand is acquired from banks or beds of streams the world over. Because of common steady loss under the activity of streaming water the River sand comprises of fine adjusted grains. The shade of waterway sand is relatively white. The current boom in the construction industry worldwide and in India and also the fact that river sand is a vital component in construction, compels us to know a few things regarding river sand.

River sand is available naturally as per the specifications of IS 383: 1970. It is comparatively clean, coarse, chemically inert and needs very less or no treatment before being put into use. Hence it is widely used in most applications of civil engineering.

B. Qualities of Good Fine Aggregates:

It should be free from organic matter, impurities like silt, clay and salts hygroscopic moisture, it should consist of clean coarse and well graded angular grains and chemically inert materials, The grains should be hard, strong and durable.

The interest for stream sand is around 3.3 million tons per month in the territory of Karnataka while the supply is only 0.8 to 0.9 million tons. Contingent upon the supply-request and separation factors, the cost of sand at present fluctuates from R 35,000 to R 40,000 a truck-stack. As per development industry gauges, to assemble a 100 sq. m structure, around 22 cubic meters of sand is required. So as this demand for aggregates grows over-exploitation of river beds, practice of unlawful methods and price volatility will increase.

Apart from sea sand, pit sand, manufactured sand, crushed gravel and crushed stones there are many other types of fine aggregates which are being used in the construction industry today, and many more suitable alternatives are at their level of research and development in laboratories around the world. To some extent these alternatives are being used, to partially or completely replace the above mentioned traditional types of fine aggregates.

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C. Sea Sand:

This sand is gotten from ocean shores or from seaward digging in remote oceans. ocean sand resemble stream sand, in surface typically fine adjusted grains, light darker in shading. As the ocean sand contains salts that draw in dampness from the climate and such assimilation causes clamminess, blossoming and deterioration of work and furthermore impedes the setting time of bond. Because of such reasons, it is the general manage to evade the utilization of ocean sand for designing purposes. It can anyway be utilized as a nearby material subsequent to being altogether washed to expel the salt.

Marine-dredged aggregates often contain primary salts which are sodium chloride and magnesium sulfate and the amount of salt on the aggregate is often not more than about 1% of the mass of the mixing water. The highest salt content occurs in sands located just above the high-tide level. Use of these aggregates with drinkable mix water often contributes less salt to the mixture than the use of seawater (as mix water) with salt-free aggregates.

Utilization *of Sea Sand Globally*: Sands got from seashore or dug from the ocean estuaries have been utilized as a part of the UK over a significant lot. Presently, in the UK, around 20 for each penny of normal rock and sand prerequisite is ocean dug with submersible pumps making it conceivable to win the material from profundities up to 50 m. Trial learns about seaward sand separated from European and American coasts have demonstrated that these materials are reasonable as development materials for the base and sub base asphalts. Likewise material from marine stores around the banks of Great Britain has been utilized as a part of solid creation for a very long while.

In China, where coastal areas are rich in sea sand, they are already in wide use in local concrete construction due to convenience in mining and transportation, mature technology, and lower costs; the cost of sea sand is only 50-70 per cent of freshwater sand.

As of late, the majority of the marine total extractions have been done in zones of the North Sea, trailed by the Baltic Sea, the English Channel, the Irish Sea and the North Atlantic Sea. The primary separating nations are the Netherlands, trailed by the United Kingdom, Denmark and France. Additionally material from marine stores around the banks of Great Britain has been utilized as a part of solid generation for a very long while.

The dug marine residue [DMS] can be utilized as a part of a few applications, for example, erosive process control, waterfront adjustment, shoreline recharging, preparations of development materials (dirt, blocks and total) or development works (establishment fill, dams and so forth.). Fast consumption of inland stores of development total has made Japan tap sand stores in waterfront waters.

D. Drawbacks of using Sea Sand:

Its use may lead to efflorescence and corrosion of reinforcement. Washing the sea sand is necessary but it's not economical. It may be used as a locally available alternative to river sand near coastal regions and in remote islands to where the transportation of river sand becomes a costly affair. Its use cement mortar needs no treatment, but in case of RCC, washed sea sand is preferred with noncorrosive reinforcing bars or steel bars coated with epoxy resins as reinforcement or use of corrosion inhibitors in the concrete is recommended.

II. OBJECTIVES

- To study the relevant material properties of Sea Sand (SS), River Sand (RS) and partially replaced SS in RS.
- To study the particle size distribution of dry sample of sea sand comparison with river sand.
- To study the variation in compressive strengths of cement concrete blocks with unwashed and washed sea sand samples as fine aggregate at 7, 14 and 28 days of curing with proportions 0%, 25%, 50%, 75% and 100% sea sand with river sand
- To study the flexural strength of cement concrete beam with washed and unwashed by using sea sand as fine aggregate with comparison with river sand for 28 days curing.

➢ *Experimental Program*

The aim of this experimental program is to compare the properties of normal cement concrete with and without sea sand in partial replacement with river sand. The basic tests and its properties carried out on materials like cement, River sand, and Sea sand. The values are listed for all samples are discussed in Table 1 and 2 given below.

Sl. No	Test conducted	Result obtained	Standard values
1.	Specific gravity	3.0	-
2.	Normal Consistency	32%	Not Specified
3.	Settling time		
	Initial Settling	80 minutes	Shall not be less than 30 minutes
	Final Settling	270 minutes	Shall not be more than 600 minutes
4.	Fineness	5%	Not more than 10%

Table 1. Properties of Cement

Sl. No	Test conducted	Result obtained		Reference codes
		River sand	Sea sand	
1.	Specific gravity	2.58	2.82	IS: 2386 (Part III) 1963
2.	Sieve analysis	Zone 2	B/W 50 to 200mm	IS: 2386 (Part I) 1963
3.	Silt content	4%	0%	IS 2386 (Part –II)
4.	Water content	5.5%	1.3%	IS: 2386 (Part III) 1963

Table 2. Properties of River Sand And Sea Sand

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III. METHODOLOGY

In this experimental study the Fine aggregate is partially replaced with sea sand in the ratio of 0%, 25%, 50%, 75% and 100% with the river sand. The Concrete mix design is calculated for M20 grade as per the guidelines IS 10262-1982. The Compression and Flexural Strength testing is done for standard mould of 150x150x150 mm for casting the cubes and beams of 150 X 300 mm.

Depending on proportion the different values of Cement, River sand and Sea sand is calculated as given in Table 3 below.

Sl No	Proportions	Cement Kg	River Sand Kg	Sea Sand Kg
1.	0%	1.04	2.08	-
2.	25%	1.04	1.56	0.52
3.	50%	1.04	1.04	1.04
4.	75%	1.04	0.52	1.56
5.	100%	1.04	0	2.08

Table 3. Quantity of Cement, River Sand And Sea Sand For 0%, 25%, 50%, 75% And 100%

IV. RESULTS AND DISCUSSIONS

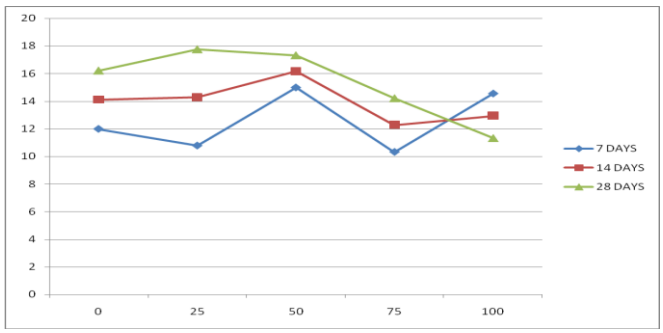
A concrete mix grade of M20 is aimed; the design mix proportion is obtained by Indian Standard method of mix design. The mix proportion obtained is 1:1.4:2.4:0.5 with w/c ratio 0.5. Sea sand is replaced with river sand in proportion of 0%, 25%, 50%, 75 % and 100%.

Compressive strength test results:

Table 4 and Graph 1 presents the Compressive strength of concrete mixes of 0%, 25%, 50%, 75 % and 100%.

Curing Period Days	100%RS (N/mm2)	25% SS (N/mm 2)	50% SS (N/mm2)	75%SS (N/mm2)	100 % SS (N/m m2)
7	11.99	10.78	14.99	10.32	14.55
14	14.10	14.28	16.16	12.27	12.94
28	16.215	17.77	17.33	14.22	11.33

Table 4. Compressive Strength Test Results



Graph 1: Graphical Representation of Compressive Strength Test Results

Table 5 presents the Flexural strength of concrete for 100% Replacement with and without of Sea sand in comparison with Normal concrete.

	Flexural Strength (N/mm2)
River sand	43
SS without wash	27
SS with wash	57

Table 5. Flexural Strength Results

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