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Research Article

Investigation on the Conversion of Sea Sand into Construction Sand using STS and FA Methods

Hemant Singh Parihar[1], Deepak Varshney[2]

Hemant Singh Parihar[1], Deepak Varshney[2]
[1]Assistant Professor, Department of Civil Engineering, GLA UNIVERSITY, Mathura, 281406(UP).
hemantsingh.parihar@gla.ac.in
[2]Assistant Professor, Department of Civil Engineering, GLA UNIVERSITY, Mathura, 281406(UP),
Deepak.varshney@gla.ac.in

Correspondence:
Hemant Singh Parihar
1Assistant Professor, Department of Civil Engineering, GLA UNIVERSITY, Mathura, 281406(UP).
hemantsingh.parihar@gla.ac.in

ABSTRACT

The most significant material of construction is concrete. This material has been termed as composite material comprising of fine aggregate, water, coarse aggregate & cement. The term fine-aggregate has been a pre-requisite in huge amount of concrete production. Usually, sand from river has been utilized as fine amount. Because of enhancement in concrete usage in construction domain, the requirement for sand is enhanced rapidly. The confines have been fed on huge scale river mining from beds of river. Hence, the simulation study has been performed on concrete cement robustness by substituting partially sand of sea with sand of river in the form of fine amount. Furthermore, in this contribution, soaked, sea sand and sand that is heated has been utilized. The sand of sea in fine amount has been substituted as per multiples of 25. This manuscript prominently examines the split TS (tensile strength) and CS (compressive strength) of concrete, where sand from sea has been utilized as fine soil that is completely or partially substituted and examined for 28 & 7 days. Also, the concrete conduct by partial substitution of fine amount with sand from sea has also been researched.

Keywords: Concrete, Fine Aggregate (FA), Sea sand, Compressive strength (CS), Split tensile strength (STS).

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INTRODUCTION

Sand is a unique uncooked material for the development enterprise at gift, however contractors should spend greater allocations for obtaining bulk loads of sand for his or her construction work. Especially throughout monsoons resources of sand taken from river are unable to estimate because of increment in riverwater table. Moreover, the government also assigned some polices in utilization of sand from river for mining and for the purpose of construction. According to the industry assets, the charge level of the river sand has grown to be skyrocketed. [1-7]

Usually, sand from river has been utilized as fine amount. Because of enhancement in concrete usage in construction domain, the requirement for sand is enhanced rapidly. The confines have been fed on huge scale river mining from beds of river. [8-11]. The simulation study has been performed on concrete cement robustness by substituting partially sand of sea with sand of river in the form of fine amount. Furthermore, in this contribution, soaked, sea sand and sand that is heated has been utilized [12-15].

OBJECTIVES

To examine the practical utilization of sea sand.

To determine the compressive strength and spilt tensile strength of concrete with distinct possibilities of seas and.

MATERIALS

PROPERTIES Cement

Ordinary Portland cement of 53 grade is used.

Figure 1: Cement

Table 1. Physical properties of Ordinary Portland cement -53 Grade

S No	Characteristics	Values perceived
1	Specific-Gravity	3.12
2	Normal stability	34%
3	Beginning setting time	29 min
4	Ultimate setting time	600 min

The physical properties of FA are presented in table 2.

Figure 2: FA

Table .2. Physical properties of FA

S.No	Characteristics	outcome
1	Specific Gravity (SG)	2.4
2	Fineness Modulus (FM)	2.74

Coarse Aggregate (CA)

The maximum magnitude of CA is 20 mm which is obtained after passing 25mm and retained in 20mm (Figure 3).

Figure 3 CA

Table .3. Physical properties of CA

S.No	Property	Outcome
1	FM	8.0
2	SG	2.875

Sea sand

Sea sand present abundant in nature but contains alkaline salts. When used in the preparation of mortar then efflorescence appears in brick masonry whereas used in reinforced concrete then corrosion is massive. Sea sand confirms to zone – III after performing sieve analysis as per IS 383 [16].

DETAILS OF PRESENT INVESTIGATION

Procedure of eradicating the content of

chloride

The sand from sea comprises huge quantity of content of chloride. Here, this creates corrosion, while it is utilized more internal to reinforcement. Hence for putting off this material of chloride, we study 2 kinds of systems.

1. Soaking and
2. Boiling process

Determination of chloride amount in soaked sea sand and boiled sea sand

For determining the water-soluble chloride in soil, on this method soluble chloride ions inside the sand pattern were induced by using including $AgNo_3$ and the ensuing Agcl. Precipitate changed into titrated to calculate the excess $AgNo_3$ the use of $K_2Cr_2O_7$indicator yellowish shade solution is fashioned. Titrate into the $AgNo_3$ precipitate and shake nicely. Brownish yellow coloration isformed [17-18].

Chloride = normality × volume of burette solution / 20

- The amount of chloride amount in sand taken from river is 46gms perlit.
- The amount of chloride amount in sand from soaked sea has been 193.25gms perlit.
- The amount of chloride amount in soaked &sand from boiled sea is 250gms perlit.

pH test

The alkalinity or acidity of a solution or suspension is usually expressed in terms of pH. Technically pH is a symbol which can be defined as the reciprocal of the logarithm of the hydrogen ion concentration. It can be determined by using pH meter or pH strips.

pH value of drinking water: 6

pH value of soaked sea

water: 8

pH value of soaked & boiled sea water: 9.5

TEST ON HARDENEDCONCRETE

The tests are conducted on hardened concrete and the compressive and split tensile strength were determined and presented in table 4 to 9.

Table 4. Compressive strength of concrete with normal sand taken from river & sea

Sno	Sand used	Compressive strength MPa	
		7 Days	28 Days
1.	100%R. S	21.85	31.90
2.	75%R. S+25%S. S	22.39	32.69
3.	50%R. S+50%S. S	**22.65**	**33.08**
4.	25%R. S+75%S. S	20.33	29.69
5.	100%S. S	19.33	28.22

Table 5. Split tensile strength of concrete with normal river sand and seas and

Sno	Sand used	Split tensile strength MPa	
		7^{th} day	28^{th} day
1.	100%R. S	2.12	3.09
2.	75%R. S+25%S. S	2.16	3.16
3.	50%R. S+50%S. S	2.19	3.24
4.	25%R. S+75%S. S	1.85	2.67
5.	100%S. S	1.77	2.56

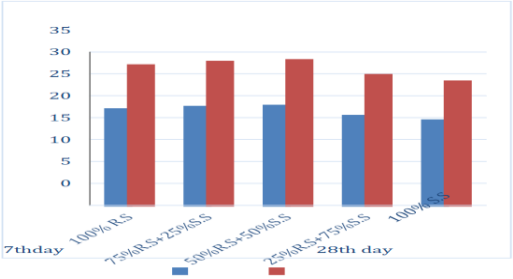

Figure 4. concrete CS with normal sand taken from river & sea

Table 6. concrete CS with normal sand taken from soaked sea & river

Sno	Sand used	CS measured inMPa	
		7th day	28th day
1.	100%R.S	21.85	31.90
2.	75%R.S+25%SOS	22.61	33.01
3.	50%R.S+50%SOS	22.88	33.41
4.	25%R.S+75%SOS	21.00	30.67
5.	100%SOS	20.19	29.48

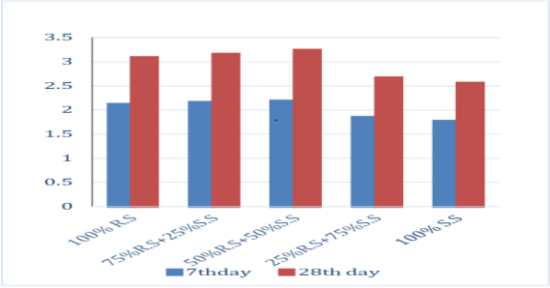

Figure 5. Concrete STS with normal sand taken from river & sea

Table 7. concrete STS with normal sand taken from soaked sea & river

Sno	Sand used	Split tensile strength MPa	
		7th day	28th day
1.	100%R.S	2.12	3.09
2.	75%R.S+25%SOS	2.18	3.19
3.	50%R.S+50%SOS	2.30	3.36
4.	25%R.S+75%SOS	2.06	3.01
5.	100%SOS	1.97	2.89

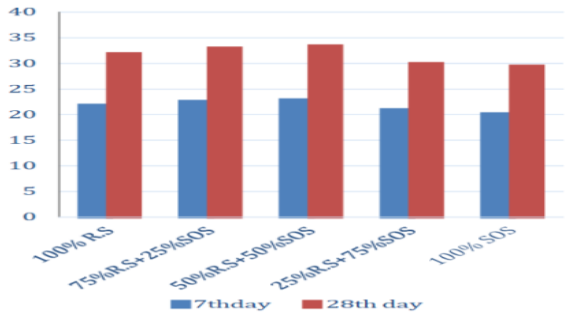

Figure 6. concrete CS with normal sand taken from river & soaked sea

Table 8. concrete CS with normal sand taken from boiled soaked sea and river

SNO	SAND UTILIZED	STS (MPa)	
		7th	28th day
1.	100%R. S	2.12	3.09
2.	75%R.S+25 % SOS+BS	3.05	3.33
3.	50%R.S+50 %SOS+BS	3.12	3.40
4.	25%R.S+75 %SOS+BS	2.13	3.12
5.	100%SOS+ BS	2.05	3.00

Table 9. concrete STS with normal sand taken from river &boiled sea so

	SAND UTILIZED	CS (MPa)	
		7th	28th day
1.	100%R. S	21.85	31.90
2.	75%R. S+25% SOS+BS	23.28	33.99
3.	50%R. S+50%SOS+ BS	23.89	34.88
4.	25%R. S+75%SOS+ BS	19.80	28.91
5.	100%SOS+BS	21.10	30.81

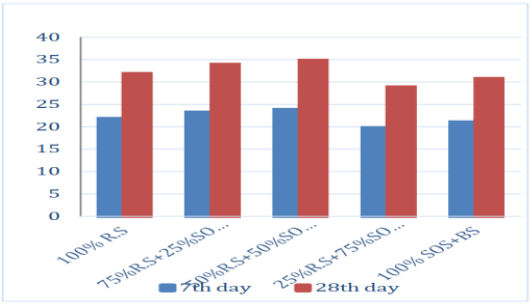

Figure 8. Concrete CS with normal sand taken from river & boiled soaked sea

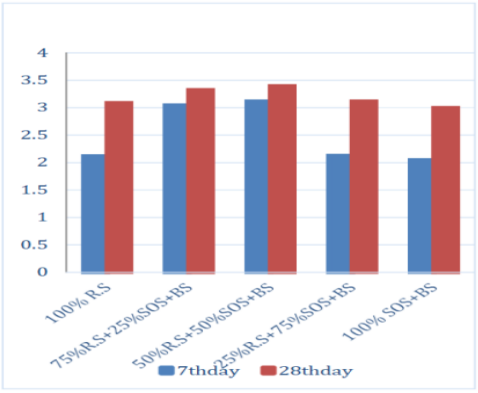

Figure 9. Concrete STS with normal sand taken from river & boiled soaked sea

Conclusion

The sand from sea & river are the effective replacements and results were found that enhanced early strength and ultimate strength of concrete.

The highestCS of concrete with 50% river sand &seasand of 50% for 7 & 28 days are 22.65& 33.08N/mm^2.

The percentage enhancement of concrete CS with 50% river sand & 50% sea sand for 7 & 28 days are 3.66 & 3.69%.

The highest concrete STS with 50% river sand & 50% sea sand over 7 & 28 days are 2.19&3.24N/mm^2.

The percentage enhancement of concrete STS

with river sand of 50% &sea sand of 50% over 7 & 28 days are 3.55 & 4.85%.
The highest concrete CS with river sand 50% &soaked sea sand of 50% over 7 & 28 days are 22.88 &33.41N/mm^2.
The percentage enhancement of concrete CS with river sand is of 50% &soakedsea sand of 50% over 7 & 28 daysare 4.71 & 4.73%.
The highest concrete STS with river sand is of 50% &soaked sea sand of 50% over 7 & 28 days are 2.30 &3.36N/mm^2.
The percentage enhancement of concrete STS with river sand of 50% &soaked sea sand of 50% over 7 & 28 days are 3.77&4.20%.

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