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Chemical study on sea sand in composite flexural element

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ABSTRACT

Generally composite structure means two or more materials combined together and act as a monolithic structure by means of connecting them by some connectors. Steel-concrete composite plays a major role in construction industry. Composite slabs are composed of steel decks and concrete. There should be a connection between steel deck and concrete to have monolithic action. Cold formed steel can be used as profile deck so that weight of structure reduces. During the application of load, flexural, vertical shear and longitudinal shear failure may occur. Amongthis, longitudinal shear failure plays a vital role. The strength of the composite slab mainly based on longitudinal shear bond mechanism between steel deck and concrete. The longitudinal shear strength depends on thickness of profile deck, shape and inclination of deck and embossment and dimples patte rnin the deck. But many of the design sare Arrived in the deck slab Design. So this project focuses on concrete layer that present above to the deck. Normally all researchers focus only on deck slab but they use concrete as it is normal concrete & light weight concrete. Due to the usage of light weight concrete, the concrete easily fail under impact. So this project aims to adopt marine concrete that is replacement of river sand by seasand.

Keywords: Marine, Light weight, Deck slab, Shear

INTRODUCTION

Now a day our construction sector particularly the middle class people gets affected too severe because of the shortage of river sand. In developing countries like India day by day the need of the construction material particularly sand is huge & essential also. But the availability of that source of the sand is very less. Due to the over collection of river sand from river beds affect our ecological cycle directly or indirectly. If the concrete has a natural aggregates then only the strength and durability become very good in nature. But in current scenario most of the building agencies and MNC companies adopt artificial sand in their projects.so instead of river sand with the help of sea sand that is enormously present in nature at the shores of the sea areas. These sea sands are cheap in cost that slightly reduces the overall cost of the construction of our task. That controlled cash may be used for other construction activity it also helps to protect few amount of river sand from being destruction for infrastructure development work [1-4].

Table 1: properties of materials method to remove salt

Property	Value
Fineness modulus of River sand	2.48(Zone = II)
Fineness modulus of Sea sands	2.46(Zone = II)
Specific gravity of cement	3.1
Specific gravity of M-sand	2.65
Specific gravity of river sand	2.65
Specific gravity of sea sand	2.71
Specific gravity of coarse aggregate	2.8

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To remove salts from sea sand,
After dry during batching of concrete,

- ✓ Primary Treatment by WaterWash
- ✓ Secondary Treatment by Alkaline Solution (NaOH)

$2H_2O+2Cl_2 \longrightarrow 4HCl + O_2$

$HCl+NaOH \longrightarrow NaCl + H_2O \downarrow$

Partially (25%) use treated sea sand with river sand (50%) & M-sand (25%).

FTIR Results

Fourier Transform Infrared Microscopy (FTIR) shows that, the presence of the chloride content has been gradually reduced after water wash. The result of the sea sand before and after washing is shown below [5-14],

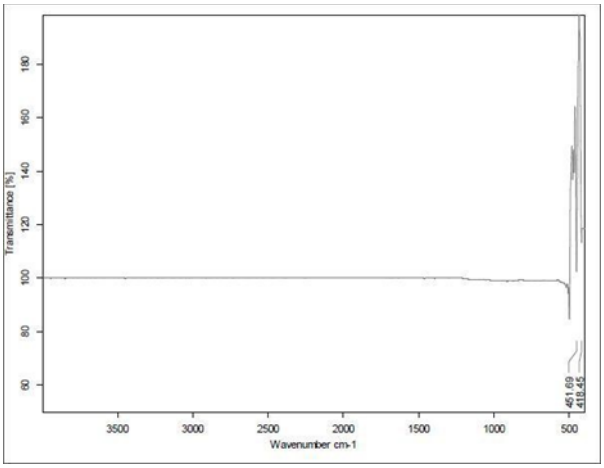


Figure 1 FTIR of sea sand before washing

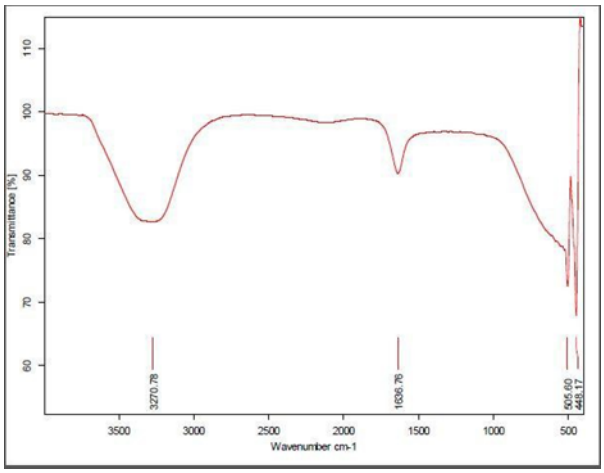


Figure 2 FTIR of sea sand after washing

Table 2: Chloride % as per ACI-318

Element	Chloride % by wt. of cement
Prestress	0.06
R.C.C (shore area)	0.1
R.C.C (normal area)	0.35
Plain	1

Table 3: Chloride % as per IS 456

Salt	Chloride % by wt. of cement
Cl	0.15% (0.01% practically)
SO_3	4%
NaCl	0.32%

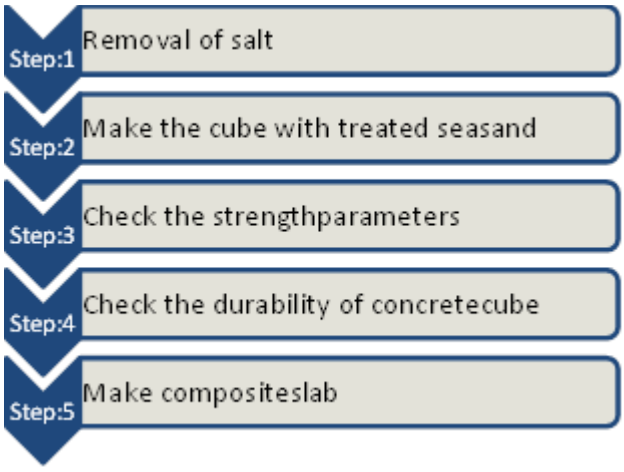
Table 4: RCPT TEST

Charge passed (coulombs)	Chloride permeability
>4000	High
2000-4000	Moderate
1000-2000	low
100-1000	Very low
<100	Negligible

LOAD SETUP

Figure 3 Slab testing setup

The test configuration and loading procedure were according to recommendation of the IS code. All slabs were simply supported and tested with two symmetrically placed line loads shown in fig.3 single hydraulic jack was used to apply load, which was distributed to the slab through a spreader beam system, which resulted in two line loads being applied to the specimen. It took approximately three days from the start of testing to failure of the last slab. Dial gauges were used to measure deflection and end-slip. Deflection at the mid- span was registered for one point. The end-slip between the steel sheet and the concrete slab was measured at single ends of the slab. The deflections and end-slip were recorded at each loading increment. The loading of all slabs was of static loading. Testing started with static loading applied by the hydraulic jack to the spreader beams, and transmitted to the slab as a two concentrated line loads across the slab width at a distance of span/4 from each support which is equivalent to theuniformly



Distributed load case. The load was increased gradually in small increments (2.5 KN), and all the loads and displacement readings were taken at each increment.

Table 5: Mix design

Cement (%)	Fine aggregate (%)	Admixture	Mix
100	100R	-	M-20
100	50R+25M+25S	Jaggery	M-20
100	25R +25S+50M	Jaggery	M-20
100	50M+50S	Jaggery	M-20

Where, R=RIVER SAND M=M SAND S=SEASAND

APPLICATION

Figure 4: Beach sand mining in West Africa

IMPORTANT INFORMATIONS

- Specific gravity of fine aggregate:2.6-2.8
- Due to high chloride content water evaporation takes place in concrete cube.
- Durability check: acid resistance & sulphateresistance & corrosion rate (half-cell potential meter).
- Calcium nitrate consist admixtures gives more dense for sea sand concrete.
- Pressure & chemical wash only give 100% removal of chlorides

CONCLUSION

- ✓ The standard journals related to the steel concrete composite slab are studied successfully.
- ✓ The preliminary works like specific gravity, fineness modulus of various construction materials as well as sea sand are worked out successfully.
- ✓ In order to find out the type of bonding in washed & unwashed sea sand the FTIR experiment is carried out successfully.

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