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Effect on Properties of Concrete containing different Percentage of Sea Sand and Mineral Admixture

Vandit J. Bhatt[1], V. H. Desani[2], Kishan Vekariya[3]
[1]*Pg. Student, Department of Civil engineering, Darshan Institute Of Engineering & Technology ,Rajkot, India-360003.*
[2]*Asst. Proffesor, Department of Civil engineering, Darshan Institute Of Engineering & Technology ,Rajkot, India-360003*
[3]*HOD, Department of Civil engineering, Noble Group of Institute ,Junagadh, India-362001*

***Abstract:** In the construction work sand is mainly obtain from river bed. Presently river sand cannot meet as per demand in construction. Sea sand can be use as alternative source and it will meet demand of fine aggregate. After research it is found that compressive strength increases by 10% with the use of sea sand as compare to normal sand. But sea sand contains of chlorine salt and it will affect on strength and durability of concrete. To reduce effect of sea sand desalinisation method is used in this research. Also effect of salt content can be reduce with the use of mineral admixture (i.e. Metakaolin and GGBS) by replacing cement in 10%,20%,30%. Strength and durability parameters is checked by performing different laboratory test like compressive strength, flexural strength, tensile strength, RCPT, acid attack, sulphate attack.*
***Keywords:** sea sand, desalinisation method, mineral admixture, strength and durability parameters.*

I. INTRODUCTION

In the previous year it is found that the amount of production of construction material reached their limits. One estimated data is observed that production of cement is 4.20 billion tonnes and production of coarse and fine aggregate is about 40 billion tonnes. River sand has been used as raw material for fine aggregate but it is not sufficient for mass concrete demand. So many country used sea sand as an alternative source from many years.sea sand contains some amount of chloride which is harmful, for this reason the use of sea sand as main fine aggregate in concrete has raised safety and durability concerns. Sea sand need to be properly processed before being used in concrete to avoid its effect in concrete. Desalted sea sand is costly for construction here in this research some desalinisation method is discussed. By use of desalinisation method sea sand can become as need for construction. After desalinisation the remaining chloride content can be reduce by use of mineral admixture. Metakaolin and GGBS were used as a pozzolanic material in this research. Metakaolin is a concrete admixture with high activity and high performance improvement. The main component of MK is Al2O3 and Sio2 have high pozzolanic activity. MK react with calcium hydroxide (CH) which is one of the hydration product of cement and make form of calcium silicate hydrate (C-S-H) gel this phenomena will improve performance of concrete. Ground Granulated Blast furnace Slag (GGBS) is a by-product from Blast furnace Slag. This study shows comparison of GGBS and OPC Cement based concrete with the normal concrete. It can be said GGBS can be highly resistant to the ingress of chloride. .

II. MATERIAL AND MIXES MATERIAL

Ordinary Portland cement (53 grade, Ultratech) for all concrete mixes and paste. Maximum Size of fine aggregate (natural sand and sea sand) , Zone III and coarse aggregate are 4.75mm and 20mm respectively used and potable fresh water used to make concrete. In addition mineral admixture MK and GGBS were used as replacement of cement to achieve high strength of concrete.

Mix	Water Kg/m^3	Cement Kg/m^3	MK Kg/m^3	GGBS Kg/m^3	CA Kg/m^3	FA Kg/m^3	w/c	Superplastisizer Kg/m^3	Density Kg/m^3
M-30	177.4	394.31	0	0	1297.58	669.38ns	0.45	1.97	2540
M-30	177.4	394.31	0	0	1297.58	669.38(SS)	0.45	1.97	2540
M-30	177.4	354.56	39.4	0	1297.58	669.38(Ns)	0.45	1.97	2540
M-30	177.4	354.56	0	39.4	1297.58	669.38(Ns)	0.45	1.97	2540
M-30	177.4	354.56	39.4	0	1297.58	669.38(ss)	0.45	1.97	2540
M-30	177.4	354.56	0	39.4	1297.58	669.38(ss)	0.45	1.97	2540

Mixes Various combination of MK and Cement & GGBS and Cement listed in table given below. M-30 grade of concrete and 0.45 w/c ratio is selected for moderate exposure condition.

III. DESALINISATION METHOD

A. Natural Accumulation Method.

Natural accumulation method is a method that piles up sea sand to a certain thickness over a long period of wind, rain, Sun to remove impurities and reduce salt content. The disadvantage of this approach is that it spends too long, while the advantages are low cost and small space. The method is applied to areas with small space, large wind power, rainfall and highly sunlight.

B. Fresh water flushing method

Fresh water flushing method is a method that utilizes fresh water flushing sea sand to reduce salt content. The disadvantage of this method is that it is a waste of fresh water resources and the prices of washing equipment are very high, while the advantage is that it can meet emergency needs. The method is suitable to situations when sand is in badly needs or places where fresh water is resourceful. In order to conserve fresh water resources, the water washing sea sand should be reused. The experiment indicates that after circulating water whose chloride ion content is 0.21% purifies sand whose chloride ion content is 0.062%, the chlorine ion content is not more than 0. 6% which meets the requirements of standards, so sand washing water can be recycled.

C. Mechanical Method

Mechanical method uses mechanical equipment to handle sea sand. Disadvantage of this method is the need for large quantity of fresh water and t machinery equipment is expensive. The advantages are that the time it spends is and the space it needs is not large. The method applies to projects with abundant fresh water resources and machinery equipment.

D. Hybrid Method

Hybrid method mixes sea sand and river sand together by appropriate proportion in order to achieve the objective of reducing salt. As for this method, there are no specific norms to be followed. But this method is very simple and easy to learn.

E. Inhibitor Addition Method

Inhibitor addition method inhibits chloride ions' corrosion to reinforcing steel bar by adding rust inhibitor in mortar mixture. This method is more common used in Japan. The disadvantage of this method is that the prices of inhibitor are much higher, while the advantage is that the technology is reliable and it can operates simply. Right now the mainstream products of the steel bar inhibitor are mixed-type inhibitors. The study on migration inhibitor is still at the initial stage abroad.

F. Biological Methods

Use biological methods to remove chloride ion in concrete. It was reported that scientists conducted pilot project which make chlorine removal bacteria cleaning chlorine-containing compounds in the soil. When chlorine-containing compounds show up, some kind of Dehalococcoides strains adapted to the environment and can clear the substance chlorine-containingcompounds. This illustrates biological methods can eliminate chlorine-containing compounds. But this approach has not been applied to construction yet.

G. Use Of Mineral Admixture

Mineral admixtures can solidify chloride ion in fresh concrete through physical and chemical interactions, effecting chlorine ions' function. However, water-Binder ratio of concrete which adds mineral admixture must be low. This is because mineral admixtures such as fly ash influenced greatly by water-Binder ratio. Only in low water-Binder ratio condition (under 0.4 or 0.42), can fly ash full play its function.

IV. CONCLUSIONS

A. Workability

Slump value observed 95mm in normal concrete mix while use of sea sand and mineral admixture in different percentage we get workability increased up to 110mm for 10% GGBS and 100% sea sand. So it is conclude that workability of concrete is increase in concrete made with sea sand and mineral admixture as compare to normal concrete mix.

B. Compressive Strength

For normal concrete compressive strength is observed 39.44 N/mm2 while compressive strength of concrete made with 50% & 100% sea sand is 33.22N/mm2 and 32.55 N/mm2. It is observed that strength of concrete made with sea sand is increase at 7 days but decrease at 28 days. By using MK & GGBS in different percentage of 10%, 20%,30% replacement with cement has recovered strength of 28 days.

C. Flexural Strength & Tensile Strength

From this research experimental work shows optimum result 3.8 N/mm^2 and 3.2 N/mm^2at 30% MK & GGBS replacement with cement and 100% sea sand.

D. Durability

From this research experimental work shows use of 10% MK and GGBS as mineral admixture more resistive as compare to Normal concrete mix and concrete mad by sea sand .

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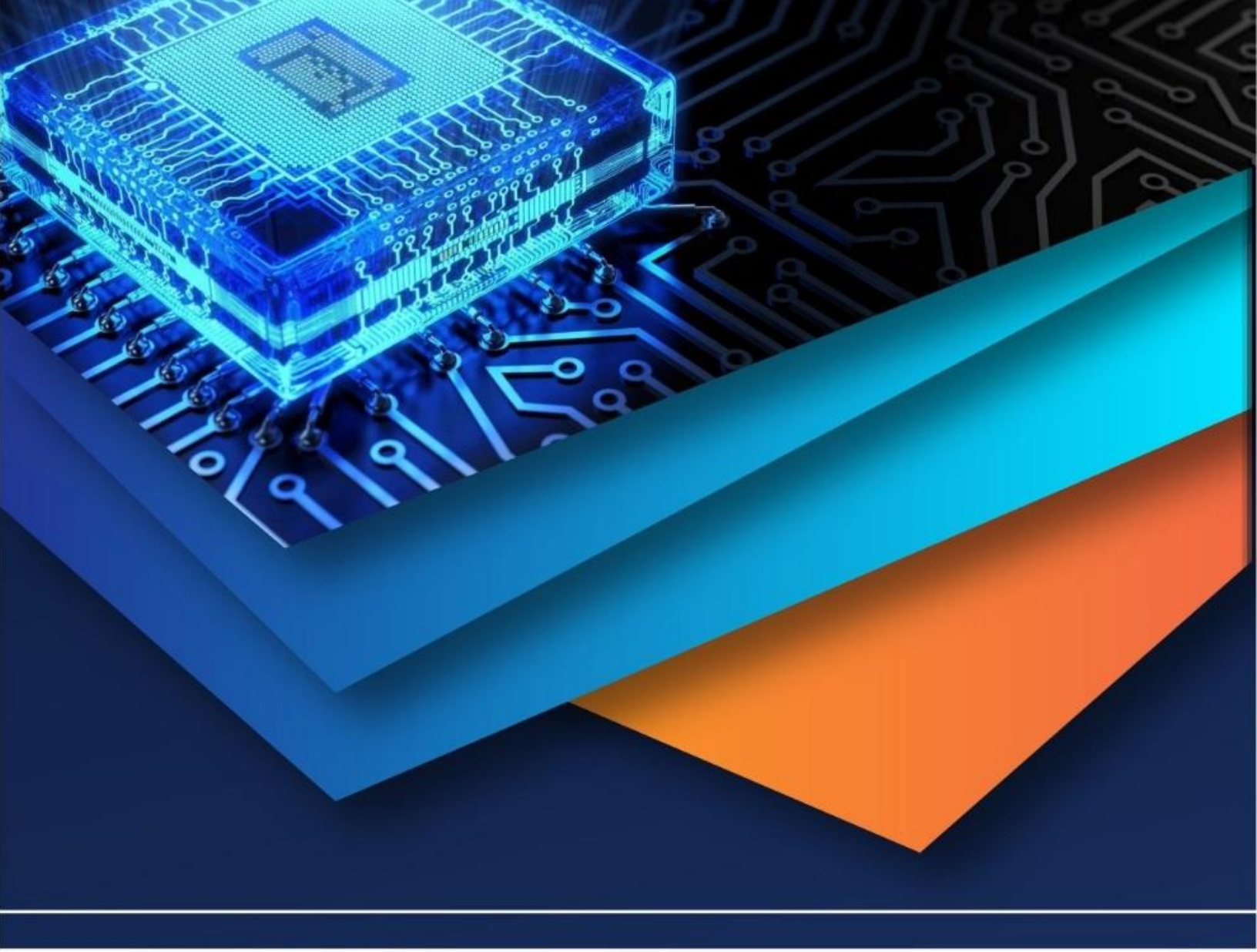

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