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An effective study on effect of sea water to the concrete mix design

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ABSTRACT

Every year, billions of tonnes of water are needed in the building industry for mixing, curing, and cleaning. As a result, there is a global scarcity of fresh drinkable water, necessitating the need to conserve fresh water. As a result, a study is being conducted to see if sea water may be used to mix and cure concrete. Furthermore, if the use of seawater as a concrete material is approved, it will be very convenient and cost-effective in construction, particularly in coastal projects.

Key words: Compressive strength, Flexural strength, Durability, salt water, Potable water

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INTRODUCTION

The most extensively used man-made construction materials are cement, concrete, and mortar. Another construction material that is as versatile as concrete is difficult to come by. Concrete's adaptability stems from the fact that it is easy to produce the qualities of concrete using only a few common elements, notably cement, aggregates, water, and (sometimes) admixtures, in order to suit the demands of every given situation. Water is an important component of concrete since it is involved in the chemical interaction with cement (Arunya et al., 2018). The quantity and quality of water must be carefully monitored because it aids in the formation of the strength-giving cement gel. Water quality is generally overlooked in comparison to other elements (bhambulkar. A. et al., 2019). Because the purity and quality of water affect the strength of concrete, it is vital to investigate the purity and quality of water. For the purposes of creating concrete, potable water is generally deemed sufficient. This does not appear to be true in all circumstances. Some waters with a tiny amount of sugar are okay for drinking but not for concrete building. Water used for mixing and curing must be pure and devoid of harmful levels of oils, acids, alkalis, salts, sugar, organic compounds, or other chemicals that could harm concrete and steel, according to IS 456:2000. The maximum amount of chloride (as C) allowed in concrete is 2000 mg/l for non-reinforced concrete and 500 mg/l for reinforced concrete.

SALT WATER

One of the most crucial components in the production of concrete is water. Fresh water bodies make up only 2.5 percent of the world's total, with the rest being made up of sea water. According to the United Nations, 5 billion people will be without access to safe drinking water. Water levels are diminishing on a daily basis as a result of excessive use and other environmental factors. A common rule of thumb for determining if water is suitable for concrete mixing is that if it is fit for drinking, it is also suitable for concrete mixing. Because of the need to store water, it is necessary to investigate potential alternatives to potable water in the building business (bhambulkar. A. et al., 2019). A lot of marine infrastructure will be built along the coast, where sea water can be obtained at a low cost. Structures constructed in a

marine environment come into direct touch with sea water. Because of its great availability along the coast, sea water can be used as a substitute for potable water in building, both for mixing and curing concrete. Because of the presence of hazardous salts, IS 456:2000 states that mixing or curing concrete with sea water is not recommended. In an unavoidable case, sea water may be used for mixing or curing plain concrete without embedded steel following careful analysis of potential drawbacks and precautions, such as the use of an adequate cement system. It's also believed that the same water that's good for mixing is good for curing. The water used for curing, on the other hand, should not leave any objectionable stains or ugly deposits on the concrete. A variety of physical and chemical weakening mechanisms work immediately on coastal and offshore marine structures (bhambulkar. A. et al., 2019). Because oceans cover 80% of the earth's surface, a huge number of structures are directly or indirectly exposed to seawater, as winds can bring seawater up to a few miles away from the coast. Most seawaters have a chemical composition that is quite consistent, with around 3.5 percent soluble salts by weight.

MATERIALS

The materials utilised were as follows:

Cement: Cement is an important component of concrete because it serves as a binding agent, holding particles together. Cement is nearly universally employed in concrete construction projects. Building work, railway sleepers, road work, tunnels, and other heavy structures are all cement-based structures.

Aggregates with a coarse texture: As coarse aggregates, crushed broken stone with an angular shape was used. The coarse aggregates were divided into two fractions: 20mm size with a specific gravity of 2.78 and 10mm size with a specific gravity of 2.76. Fineness modulus was determined to be 7.25 for aggregates with a diameter of 20mm and 6.68 for aggregates with a diameter of 10mm.

Sand (fine aggregates): Originally, angular sand was specified for concrete, but rounder grains are now preferred. The fine aggregates used in this study were Narmada river sand that had been sieved at 4.75 mm and had a specific gravity of 2.64. According to Indian standard specifications, fine aggregates were graded in zone II.

Water: Ordinary tape water clean, portable free from suspended particles and chemical substances was used for both mixing and curing of concrete

Salt water: Water from a sea or ocean is known as seawater. The average salinity of seawater in the world's oceans is roughly 3.5 percent (35 g/L, or 599 mm). This means that each kilogramme of saltwater (approximately one litre by volume) contains about 35 grammes of dissolved salts (mostly sodium (Na^+) and chloride (Cl) ions). Salt water was also used for mixing and curing concrete and mortar cubes, which was made by dissolving 35 gm/l of NaCl in ordinary water.

METHODOLOGY

To find out the effect of salt water on compressive strength, flexural strength, durability of a concrete made with salt water and compare the result with concrete made with portable water

Compressive Strength The test specimens for the assessment of concrete compressive strength were made using standard metallic cube moulds and a rodding and harsh compactions process. To reduce friction between the concrete and the cubes, the concrete cubes moulds were greased with oil before being filled with mixed concrete. After 24 hours of casting, the cubes are demoulded and cured in water of similar quality to that used in the mix preparation. The concrete cubes were cured for seven, fourteen, and twenty-eight days, respectively. Cubes were tested and the average compressive strength was reported for each hydration interval. The compression testing machine was used to test the concrete cubes, and the results were reported.

Flexural Strength In this investigation, M30 mix concrete is considered to perform in order to find out the flexural strength of concrete made with salt water and portable water at 7,14,28days of curing. For Flexural strength test 18 beams were casted of size 700 x 150 x 150mm for 7,14,28 days for M30 grade. The ingredients of concrete were thoroughly mixed till uniform consistency was achieved. Fig 2 Testing of beam specimen under three-point loading in UTM

Durability The carbonation depth is assessed by using a solution of phenolphthalein indicator of 1% and ethyl alcohol of 70 %. Carbonation of concrete is caused due to the carbon-dioxide in atmosphere. The indicator solution is sprayed on freshly exposed surface of the concrete. The color of concrete is turned to pinkish color after sprayed (E.M. Mbadikea.et al., 2010)

CONCLUSION

Following conclusion are made

1. Cubes were casted and cured in fresh water and in sea water as per the relevant IS code of practice
2. Four alternative design conditions are developed on water for mixing & curing of concrete.
3. There is higher in the strength of concrete specimen cast & cured with salt water as compared to those of cast & cured in fresh water.

REFERENCES

[1]. Arunya A, Rajesh S" Investigational Study on Effect of Sea Water on Concrete" ISSN: 1314-3395 Volume 119 No. 12 2018.

[2]. Ashtashil Bhambulkar et al., A Review on Eco Material Concrete" International Journal of Management, Technology and Engineering, Volume IX, Issue III, 2019, 5505-5508.

[3]. Ashtashil Bhambulkar et al., "A Review Technique in Structure Health" International Journal of Management, Technology and Engineering, Volume IX, Issue III, 2019, 5509-5511.

[4]. Ashtashil Bhambulkar et al., "A Review Technique in Structure Audit" International Journal of Management, Technology and Engineering, Volume IX, Issue III, 2019, 5512-5514.

[5]. Dr. Nagabhushana, Dharmaraj Hebbal, Nitin Akash, S Deepak, Mukesh Kumar "Effect of Salt Water on Compressive Strength of Concrete" p-ISSN: 2395- 0072 e-ISSN: 2395 -0056 Volume: 04 Issue: 05 | May -2017.

[6]. E.M. Mbadikea, A.U. Elinwab "Effect of Salt Water in the Production of Concrete" Vol. 30, No. 2, June 2011.

[7]. Ir. Nurmaidah, M, Kamaluddin Lubis "The Effect of Concrete Treatment with Sea Water and Fresh Water against Compressive Strength of Concrete e-ISSN: 2278-1684, pISSN: 2320-334X Volume 14, Issue 5 Ver. III (Sep. - Oct. 2017), PP 47-52.

[8]. Md. Moinul Islam, Md. Saiful Islam, Md. Al-Amin and Md. Mydul Islam" Suitability of sea water on curing and compressive strength of structural concrete" (IEB), 40 (1) (2012) 37-45.

[9]. Preeti Tiwari, Rajiv Chandak, R.K. Yadav "Effect of Salt Water on Compressive Strength of Concrete" ISSN: 2248- 9622 Vol. 4, Issue 4 (Version 1), April 2014, pp.

[10]. Prof. Sagar Gawande, Prof. Yogesh Deshmukh, Mr. Milind Bhagwat, Mr. Suhas More, Mr. Namdev Nirwal, Mr. Akshay Phadatare "Comparative Study of Effect of Salt Water and Fresh Water on Concrete" e-ISSN: 2395 -0056 p-ISSN: 2395-0072 Volume: 04 Issue: 04 | Apr -2017.

[11]. S. O. Osuji1 and E. Nwankwo "Marine Water Effect on Compressive Strength of Concrete: A Case Study of Escravos Area of Nigerian Delta" ISSN: 1115-8443 Vol. 34 No. 2, April 2015, pp. 240 – 244.

[12]. Sakthivel R Dr. V. Murugaiyan "Studies on the Effects of Seawater on Compressive Strength of Concrete Cube" ISSN Print: 0976-6308 and ISSN Online: 0976-6316 Volume 9, Issue 12, December 2018.

[13]. Selin Bhaskar, Smitha M.S, Dr. Elson John3"Relevance of Sea Water as Mixing Water in Concrete" ISSN (Online): 2319- 8753 ISSN (Print): 2347-6710 Vol. 5, Issue 9, September 2016.