

Study of Compressive Strength of Concrete Made Using Saline Water

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Abstract: A lack of potable water, an integral constituent of concrete has resulted in search for possible alternatives. While almost any natural water that is drinkable and has no pronounced taste or odour may be used as mixing water for concrete, the rising cost of such water has prompted many researchers to experiment with salt water in concrete. The principal considerations on the quality of mixing water are those related to workability, compressive strength and durability. This project involves finding the effect of saline water in the mix, on the compressive strength of concrete.

Keywords: Saline Water, Compressive Strength of Concrete.

1. INTRODUCTION

Concrete is one of the most commonly used structural materials. It is made by simply mixing cement, aggregate, sand and water in the “right” proportion. The strength of concrete varies even with the slightest variation in the ratio or quality of its ingredients. Concrete properties are highly influenced by the water type used and its proportion in the concrete mix, but actually there is little knowledge of the effects of different, alternative water sources used in concrete mix design. Therefore, the identification of the level and nature of contamination in available water sources and their subsequent influence on concrete properties is becoming increasingly important.

2. REVIEW OF LITERATURE/THEATRICAL BACKGROUND OF THE STUDY

In general, the increasing industrial activity and the rising cost of natural mineral resources, and forcing the ready mixed concrete industry to review the logistics of raw material supply. A review of literature pertaining to usage of salt water for concrete shows conflicting results. According to the technical report R306 on the effect of salt in compressive strength of concrete performed in 1964 at the US Naval civil engineering laboratory, compressive strength increases with salt content in water, reaching a maximum value between salt contents of 18g/kg to 36g/kg. A recent research conducted in India by P.Saravanakumar³ and G.Dinakaran³ concluded that salt content in water reduces compressive strength of concrete.

3. RESEARCH OBJECTIVE

The present research is an attempt to find reasons for the apparently conflicting research findings of published literature. The research plan mainly consists of testing compressive strengths of concrete made using different concentrations of salt water.

4. METHODOLOGY

Concrete samples of **150mm x 150mm** were cast using saline water of **four** different concentrations- 4g/L, 10g/L, 30g/L, 60g/L. All the four samples were cured by total submersion in pure water. The mixes were prepared in the laboratory in the ratio 1:2:4 of cement, sand and aggregates. The water: cement ratio taken was 0.5:1. For every 1 Kg of cement, 0.5

litres of water was used. These specimens were observed for 14 days for compressive strength development before crushing with universal testing machine.

Sourcing

Ordinary Portland cement, Local River sand and coarse aggregates of 20 mm from college construction site, Water and NaCl from laboratory.

150 x 150 x 150mm blocks were prepared by mixing 1kg of cement with 2kg of sand and 4kg of 20mm aggregates. Water with NaCl concentration of 4g per litre is added to obtain a mix of workable plasticity. The mix is carefully poured into the mould and compacted with tapering bar after filling every 50mm of the mould. The top layer was covered with metal plate to prevent evaporation. 12 such blocks were made of 4 different concentrations as already mentioned. The cubes were stored at a temperature of 37 degrees for 24hrs, and then placed in tanks filled with pure water.

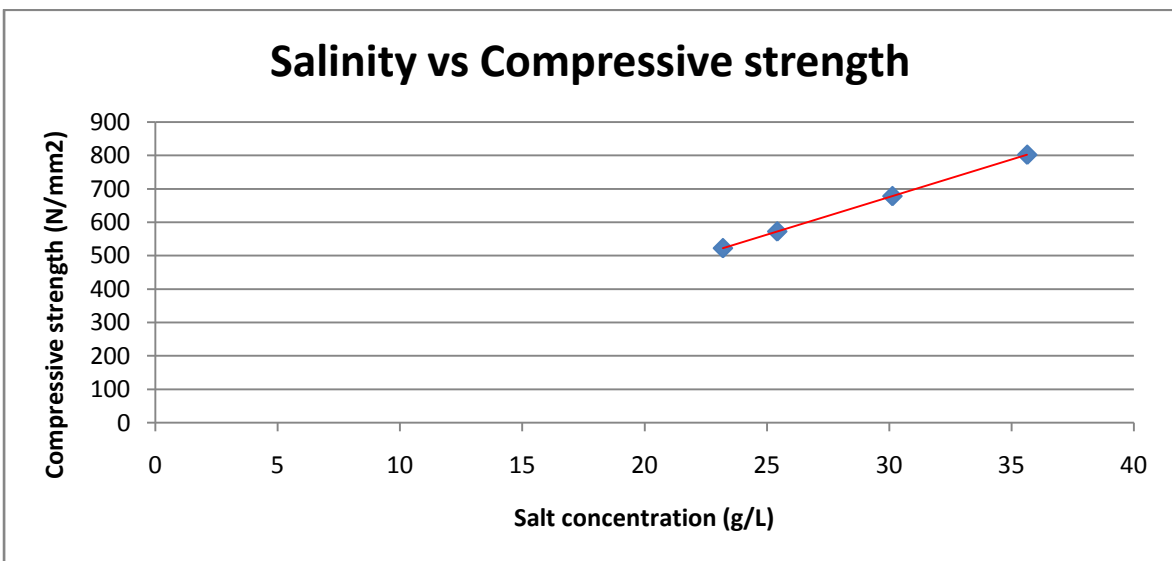
5. ANALYSIS AND INTERPRETATION

The compressive strength of the blocks was found using Universal testing machine.

The blocks were placed such that the load was not applied on the top (exposed side) and bottom sides Concrete grade: M20

The compressive strength test was done after 14 days

Salt concentration (g/L)	Maximum load (KN)	Compressive strength (N/mm ²)
4	522	23.20
10	572	25.42
30	678	30.13
60	802	35.64



The experimental results show that the compressive strength of concrete increases with increase in the concentration, the maximum being 35N/mm² when 60g/L of salt was added.

6. DISCUSSIONS AND RECOMMENDATIONS

The results show that small amounts of salinity in mixing water improve the compressive strength, of concrete tested. The results are in line with that of the R306 report. Thus, according to the results, sea water could be used for making small structures near coastal areas. Further tests are being carried out to determine the reasons for conflicting research finding reported in published literature.

REFERENCES

- [1] Journal of Civil Engineering Research and Practice, Vol. 7 No.2, October 2010
- [2] Journal of Sustainable Development; Vol. 5, No. 6; 2012
- [3] Technical report, R306, the effect of salt in concrete on compressive strength, water vapour transmission and corrosion of reinforcing steel, 22 July, 1964