International Journal of Innovative Research in Science and Engineering
Vol. No.3, Issue 04, April 2017
www.ijirse.com
ISSN (O) 2454-9665
ISSN (P) 2454-0663

EFEECT OF WATER ON CEMENT CONCRETE

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ABSTRACT

In this we work on the impact of water on the quality of concrete was explored. This paper displays accordingly the outcome and discoveries of a test examine on the impact of salt water on quality of concrete. For this solid 3D shapes were thrown utilizing crisp water and salt water for an outline blend of M-30 1:1.8:3.31 by weight of cement, and 0.45 water-bond proportions. Half of solid shapes were thrown and cured with crisp water and staying half 3D shapes were thrown and cured with salt water. The solid 3D shapes were cured for 7,14 and 28 days separately. The after effect of the normal quality of concrete acquired utilizing crisp water ranges from 27.12 - 39.12N/mm^2 and utilizing salt water ranges from 28.45 – 41.34N/mm^2.

Keywords:- concrete cubes,fresh water, salt water, compressive quality

I. INTRODUCTION

Water is an important ingredient of concrete. Part of mixing water is utilized in the hydration of cement and the balanced water is required for imparting workability to concrete. Thus the quantity and quality of water is required to be looked into very carefully. The strength and durability of concrete is reduced due to the presence of chemical impurities in water. Most of the specifications recommended the use of potable water for making concrete. A practical solution would be tests for time of set and strength of concrete between the water under consideration and the water of proven quality. Cast concrete cylinders using a large number of waters, many of which wereunpotable and tested them in compression at ages up to twenty eight months and found that inspite of the wide variation in the quality of water used, most of the samples gave good results. Abrams[1] quoted that seawater with a total salinity of about 3.5 percent produces a slightly higher early strength but a lower longterms strength, the loss of strength is usually no more than 15% and can therefore often be tolerated. Thomas and Lisk[2] suggested that the sea water slightly accelerates the setting time of cement. Lea, [3] reported that water containing large quantities of chlorides e.g. sea water tends to cause persistent dampness and surface efflorescence. McCoy[4] reported that water with pH of 6.0 to 8.0, which does not taste saline or blackish, is suitable for use. Steinour[5] described that impurities in water may interfere with the setting of the cement, adversely affect the strength of the concrete or cause staining of its surface, and also lead to corrosion of the reinforcement. Addition of 2 per cent Sodium Benzoate reduces the compressive strength of concrete. P. Ghoshet. al.[6] reported that presence of micro-organism in mixing water increases the compressive and tensile strength of concrete. G.Reddy Babu et. al.[7] Reported that samples prepared with treated wastewater of electroplating industry did not show loss of strength, thoughtheir setting time had increased. In high concentration of metal ions, the compressive and flexural strength marginally increased.

ISSN (O) 2454-9665
ISSN (P) 2454-0663

II. OBJECTIVES

The parameters considered for the hardening and strength development of cement include: initial and final setting times and compressive strength of cement mortar cubes at different periods (7, 14, 28 and 56 days). Water containing different concentrations of chemical substances is used in the experimental work as mixing water.

Following are the objectives of present study-

• To assess the effect of individual substance like calcium sulphate, sodium hydroxide, calcium hydroxide, ferrous sulphate and sodium nitrate with different concentrations in mixing water on initial and final setting time of cement.

• To examine the effects of these chemicals with different concentrations on strength development of concrete.

III. MATERIAL AND METHODS

A total of 63 samples of standard mould used in Vicat's apparatus were cast and tested for initial and final setting time. A total of 315 concrete cubes of 100 cm2 crosssectional area were cast and tested at 7, 14, 28 and 56 day for compressive strength. The properties of materials are given in the following sub-section. Cement: Portland Pozzolana Cement (PPC) obtained from the single source is used in this study. Physical properties of the cement used for the study are given in Table 1. Fine & Coarse Aggregate: The properties of sand are determined in accordance with IS 2386 (Part I & part III) - 1963 and are presented in Table 2 and Table 3. Water: The characteristics of tap water used in the study are presented in the Table 4. The tests are performed as per IS 3025: 1964. Chemical substances: Table 5 gives the list of chemical substances along with the range of concentrations and pH values used in the study. Design of Concrete Mix: The mix design is done according to method proposed by Department of Environment, U.K. Testing of Concrete: The testing of concrete is carried out as per IS 516-1959.

(a) Coarse Aggregate-

Crushed granite stone aggregate of maximum size 20mm confirming to IS 383-1970 was used. The specific gravity were found to be 2.78 for 20mm size of particle and 2.76 for 10mm size of particle and fineness modulus is found to be 7.25 for 20mm size of particle and 6.68 for 10mm size of particle.

(b) Sand (fine aggregate) –

The fine aggregate used in this investigation was Narmada river sand passing through 4.75 mm sieve with specific gratuity of 2.645. The grading zone of fine aggregate was zone II as per Indian standard specification.

(c) Cement-

OPC 43 grade (JP cement) was used.

(d) Water -

Ordinary clean portable water free from suspended particles and chemical substances was used for both mixing and curing of concrete cubes cast with fresh water.

(e) Salt water:-

Seawater is water from a sea or ocean. On average, seawater in the world's oceans has a salinity of about 3.5% (35 g/L). This means that every kilogram (roughly one litre by volume) of seawater has approximately 35 grams

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ISSN (P) 2454-0663

of dissolved salts (predominantly sodium (Na+) and chloride (Cl−) ions). The cubes were prepared using 35g of salts in one litre of water.

IV. WORKABILITY

Workability of concrete which were made with fresh water and salt water separately, checked in time of casting of concrete cubes. The slump was maintained from 25mm to 50mm i.e. for mass concrete.

V. COMPRESSIVE STRENGTH:

The test specimens for the determination of compressive strength of concrete were prepared using the standard metallic cube moulds adopting is procedure for the rodding and hard compactions. The concrete cubes moulds were lubricated with oil before the mixed concrete was placed inside it, in order to reduce friction between the concrete and the cubes.

The cubes are demoulded after 24 hour of casting, and cured in water having similar quality as used in the preparation of mix. The concrete cubes were cured for 7, 14 and 28 days respectively. For each of the hydration period, cubes were tested and the average compressive strength recorded. The concrete cubes were tested in compression testing machine and the results were reported.

VI. TEST RESULTS

After casting and demoulding, the salt water concrete cubes has a darker surface than the reference concrete cubes, when cured in salt water a deposit of salt formed on a specimens with whitish appearance at bottom edges. The salt water concrete cubes have the most pronounced salt deposits. Test results of the cubes prepared from fresh water and water containing salts. The results indicate that, there is significant increase in the compressive strength of all concrete cubes at 7,14 and 28days

Table 1 and 2 shows the results of the average compressive strength of mortar cubes produced using fresh water and salt water.

Table 1 – Compressive strength of mortar cubes cast and cured with fresh water.

Cube Size (mm)	Age of cube (days)	Average Test loads (tonnes)	Average compressive strength (N/mm2)
150X150X150	7	56	25.21
150X150X150	14	71	32
150X150X150	28	79	37.9

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Table 2 – Compressive strength of concrete cubes cast and cured with salt water.

Cube Size (mm)	Age of cube (days)	Average Test loads (tonnes)	Average compressive strength (N/mm2)
150X150X150	7	64	28.45
150X150X150	14	78	33.01
150X150X150	28	91	40.31

VII. DISCUSSION

From the results it is clear that, there was an marginal increase in the of concrete cubes which were casted and cured with salt water as compared with the concrete cubes cast and cured with fresh water. The rate of the strength gain in fresh water cubes is slow as compared with the salt water cubes. At 28 days, the rate of strength gain is still increasing in all the concrete cubes. The fresh water cubes also recorded its maximum strength at 28 days. Although, the compressive strength of the salt water concrete cubes was slightly higher than that of the fresh water concrete cubes.

i. Stream water in Ife environ compared favourably with tap water for mixing concrete without any significant reduction in compressive strength. However, its effects on concrete durability need to be established before using in for construction work.
ii. Different water sources have different levels of impurities and these generally have significant impact on the strength of concrete.
iii. Regardless of the mixing water sources; the compressive strength of concrete increases with increase in curing age.

VIII. CONCLUSION

Series of experiments were conducted on M30 grade (1:1.8:3.31) concrete. Cubes were cast and cured in fresh water and in salt water as per the relevant IS code of practice. The cubes were tested at different ages i.e. 7.14 and 28 days.

Based on the result following conclusion can be drawn:-

1. The strength of concrete cubes cast and cured in fresh water at 7,14 and 28 days was found as 27.12N/mm^2, 32N/mm^2 and 39.12N /mm^2 respectively.

2. The strength of concrete cubes cast and cured in salt water at 7,14 and 28 days was found as 28.45N/mm^2, 34.67N/mm^2 and 41.34N /mm^2 respectively.

ISSN (O) 2454-9665
ISSN (P) 2454-0663

3. There is marginal increase in the strength of cubes cast and cured in salt water as compared to those of cast and cured in fresh water at all ages of curing.

From the above finding we can conclude that there is no reduction in the strength if we use salt water casting and curing the concrete. There is some increase in the strength if salt water is used for casting and curing. This concrete can be used for mass concreting without any decrease in strength properties.

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