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Effect of Purna River Basin Water on Concrete- A case study of Akola District

Mandar M.Joshi[1], Dr.S.K.Deshmukh[2]

[1] *Asst Professor, Civil Engineering Department, Pankaj Laddhad Inst.of Tech.Buldana, MH, India*
[1]mandarjoshi1608@gmail.com
[2]*Professor & Principal, College of Engg and Tech, Akola, MH, India*
[2]satishkd20@gmail.com

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***Abstract** – The quality of water affects different properties of concrete. Limits are given in IS 456-2000 for different chemical constituents of water. Some parts of Akola District comes under saline belt of Vidarbha region of Maharashtra state, India. Mainly Akot, Balapur, Telhara Talukas comes under saline belt. The water quality in this region has very high hardness value. The surface water and ground water in this region is highly conterminous. The study centred on the effect of water quality on properties of concrete with quality of saline water as a case study. Water samples from different part of Akola district is collected and chemical constituents of the water samples are determined in the laboratory. Concrete cubes are made by using this water samples and are compared with cubes made by using potable water. The results revealed that the chemical constituent of these water samples affects the strength characteristics of concrete.*

Keywords- Concrete, saline, water, saline belt.

I- INTRODUCTION

Concrete is one of the most durable construction material and Cement is one of the most energy intensive structural materials in concrete. The principal considerations on the quality of mixing water are related to performance in fresh as well as harden state. The quality of the water plays an important role in the preparation of concrete. Impurities in water may interfere with the setting of the cement and may adversely affect the strength and durability of the concrete also. The chemical constituents present in water may actively participate in the chemical reactions and thus affect the setting, hardening and strength development of concrete. In addition to that, health issues related to the safe handling of such water must be considered. The suitability of water can be identified from past service records or tested to performance limits such as setting times and compressive strength and durability test. Limits are specified for mixing water with their constituents such as total alkalis, chloride sulfate etc. Water approved for drinking is generally satisfactory for usage in concrete production, but there are exceptional cases, for instance, in some arid areas, where local drinking water is saline and may contain an excessive amount of chloride, undesirable amount of alkali carbonates and bicarbonates, which could contribute to the alkali silica reaction (Neville, 1996).

The special study carried out by CGWB in Purna River Alluvial basin indicates that in southern parts of Akot and Telhara talukas and northern parts of Akola and Balapur talukas brackish to saline ground water has been observed.

Water serves the following purpose

1. To wet the surface of aggregates to develop adhesion because the cement pastes adheres

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quickly and satisfactory to the wet surface of the aggregates than to a dry surface.

2. To prepare a plastic mixture of the various ingredients and to impact workability to concrete to facilitate placing in the desired position.
3. Water is also needed for the hydration of cementing materials to set and harden during the period of curing.

II -LITERATURE REVIEW

Abrams[1] noticed that seawater with a total salinity of about 3.5 percent produces a slightly higher early strength but a lower long terms 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.

Mc Coy [4] found that water with pH of 6.0 to 8.0, which does not taste saline or brackish, 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.

III- MATERIAL AND METHODS

A total 05 samples of standard mould used in Vicat's apparatus were cast and tested for initial and final setting time. A total 10 cubes of having standard size 150 mm x 150mm x150mm were cast and tested at 28 days for compressive strength having grade M20.The used material properties are as follow.

Cement: Portland Pozzolana Cement (PPC) 53 grade ACC concrete plus is used in this study. The cement has Specific Gravity as 3.09 and Fineness as 6%

Fine & Coarse Aggregate: Locally available course aggregates having size 12 mm and crushed/manufactured sand is used.

Water: Water samples from different sample station is collected and tested for various properties. Underground bore well water from saline belt region is used for making concrete. The tests are performed as per IS 3025: 1964.

Design of Concrete Mix: The mix design is done as per Indian Standard code IS-10262 (2009)

Testing of Concrete: The testing of concrete is carried out as per IS 516-1959.

Results

The sample collection stations are denoted as
Akot – Station (A), Balapur – Station (B)
Telhara- Station (C)
The water testing results obtained are tabulated as follow.

Parameters	Maximum permissible Limit	Observed Values		
		A	B	C
TH (mg/l)	600	800	950	750
NO_3 (mg/l)	45	55	57	60

*TH = Total Hardness

Sample Station	28 days compressive strength (N/mm^2)	Initial setting time (Minutes)	Final setting time (Minutes)
A	18.60	139	408
B	19.70	130	389
C	18.20	140	405
Potable water	23.3	150	350

IV-CONCLUSION

The Initial and Final setting time of cement is affected by the quality of water used. As Total hardness increases, initially the compressive strength increase but after 28 days the compressive strength is decreased. Average reduction in strength is nearly 5 % when compared with results obtained for potable water sample. Possibly Potable water should be used for concrete making purpose.

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