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

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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 Buldana District comes under saline belt of Vidarbha region of Maharashtra state, India. Mainly Sangrampur, Shegaon and Jalgaon Jamod talukas and villages under this talukas are comes in 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 Buldana 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 bel

1. 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 small north eastern part of Shegaon taluka 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 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.

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.

Material and Methods

Sample stations are named as follows.

Sample Designation	Location/water sample
A	Potable water
B	Jalgaon Jamod
C	Sangrampur
D	Shegaon

A total 16 cubes of having standard size 150 mm x 150mm x150 mm 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 & Discussions

The sample collection stations are denoted as

Potable water – (A), Shegaon – Station (B)

Jalgaon Jamod - Station (C), Sangrampur- Station (D) The water testing results obtained are tabulated as follow.

Table 1.

Parameters	Maximum permissible Limit	Observed Values		
		A	B	C
TH (mg/l)	600	870	950	750

*TH = Total Hardness

Table 2.

Sample Designation	Average Compressive Strength (in N/mm^2)			
	7 days	14 days	21 days	28 days
A	14.50	16.70	19.30	21.80
B	17.50	18.60	15.20	14.30
C	18.20	19.50	16.50	14.20
D	16.70	18.50	16.10	14.30

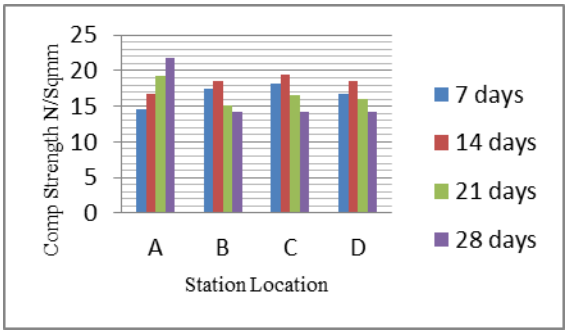

Figure -1.

The results obtained from the chemical analysis showed that the collected water samples have higher concentrations of hardness.From Table No.1 is can be seen that the hardness exceeds the permissible limits.Table No. 2 and Figure No.1 show that the compressive strength of concrete cubes produced with potable water increased with age and this goes a long way to depict the suitability of potable water for concrete. With potable water produced concrete, there was a progressive increment in compressive strength from 14.50 N/mm^2 to 21.80 N/mm^2.It was found from Table 2 that the compressive strength of concrete cubes produced with saline water at early age of 14 days tends to increase but later shows massive loss of compressive strength with its progression in age. The presence of elements such as Na, K, Ca, Cl helped to increase the rate of hydration which facilitated the early compressive strength increment but it later witnessed drastic reduction due to excessive hardness.

Conclusion and recommendations

Following the observations made in this study, it can be concluded that concrete produced with potable gained acceptable strength with age. Though, there was slight decrease in the strength but later on, the strength became steady. The concrete produced with saline water increases it's compressive at the 14days but later decreased drastically at the 21days and 28days.

Recommendations

1. Portable or fresh water should always be used for making concrete to achieve maximum compressive strength over time.
2. Saline or hard water should not be used for concrete production.
3. All water intended to be used for production of concrete must be checked and tested to make sure it conforms to the laid down standards.

References

[1] Quality of Mixing Water in Cement Concrete "A Review" G.Reddy Babua, B.Madhusudana Reddy, N. Venkata Ramana, Science Direct Materials Today: Proceedings 5 (2018) 1313–1320
[2] A.M. Neville, Water, Cinderella ingredient of concrete. 22(9):66-71.
[3] J. McCoy, Mixing and curing water for concrete, ASTM Sp.Tech.publ.No.169B: 1978: 765-773
[4] IS 3025:2002-Methods of Sampling and Test (Physical and Chemical) for Water and Wastewater
[5] IS 456-2000 Plain and Reinforced Concrete - Code of Practice
[6]. Duff, Abrams A. Tests of impure waters for mixing
Concrete, *Proceedings of the American Concrete Institute*, 20, 50, (1924).
[7]. Lea, F.M. The chemistry of cement and concrete, *St.*
Martin press, New York, 511-553, (1956).
[8]. Steinour, H.H, Concrete mix water- How impure it can be? *Journal of the PCA Research and Development Laboratory*, 2(3), 32-50, (1960).