

## Study of Different Parameters of Saline Water from Buldana District for Its Use in Concrete

Prof. Mandar M.Joshi  
*Asst.Professor*  
*Applied Mechanics Department*  
*Anuradha Engineering College, Chikhli*  
*Dist: Buldana (MH), India*  
*mandarjoshi\_1608@yahoo.com*

**Abstract-**The quality of mixing water affects workability, strength and durability properties of concrete. Limits are placed on the contribution of mixing water to the total alkalis, chloride and sulfate of all concrete ingredients in order to control the durability of the concrete. Some parts of Buldana District is comes under vidarbha region of Maharashtra state, India. Mainly Sangrampur, Shegaon and Jalgaon 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. The results revealed that the chemical constituent of these water samples exceeds the permissible limit which may affect the strength characteristics of concrete.

**Keywords-** saline, water, Buldana, concrete

### 1. INTRODUCTION

The properties of concrete are vital factors, which determine to a great extent the strength and serviceability of structures. Concrete is plastic and malleable in green state but strong and affect the strength of the concrete or cause straining on its surface, corrosion of the reinforcement. Water fitted for drinking is generally satisfactory, but there are exceptional cases. For instance, in some arid areas, local drinking water is saline and may contain an excessive amount of chloride, undesirable amount of alkali carbonates and bicarbonates. Water containing large quantities of chlorides tends to cause dampness and surface efflorescence. Such water should not be used where appearance of concrete is of importance or where a plaster finish is to be applied. The chemical analyses revealed that groundwater contained high concentrations of sodium Na, potassium K, chloride  $\text{Cl}^-$ , and carbonate  $\text{CO}_3^{2-}$  amongst others which led to concrete strength reduction. Consequently, proper water analysis should be encouraged before choosing water for concrete work. Even though, the basic requirement for water for concreting is its potability; the question that comes to mind is the availability of potable water for concreting. In developing countries, provision of water to meet domestic demand has not been fulfilled. If the potable water available cannot meet the domestic requirement, it will be difficult for an average contractor to comply with the

requirement for mixing water in contract document. The contractors would seek for alternative means by using available surface water once it is clean, clear and of little or no odour for concrete work without testing its suitability.

In Buldana District, Sangrampur, Shegaon, and Jalgaon talukas come under saline belt. The surface water and ground water in this region have high salinity. The water is not suitable for drinking purpose. It contains high concentration of hardness, sodium Na, potassium K, chloride  $\text{Cl}^-$ , and carbonate  $\text{CO}_3^{2-}$  amongst others which led to concrete strength reduction.

It is recommended that the water is tested through a certified lab. The water should confirm the standard IS: 3025-1986 which is briefly described below.

- Limit of Acidity: To neutralize 200 ml sample of water, use phenolphthalein as an indicator. It does not require more than 2 ml 0.1 normal NaOH.
- Limit of Alkalinity: To neutralize 200 ml sample of water, use methyl oil as an indicator, it does not require more than 10 ml 0.1 normal HCL
- Limit of Solids
  - Organic: 200 Mg per liter
  - Inorganic: 3000. Mg per liter
  - Sulphate: 400 mg per liter
  - Chloride: 500 mg per liter for RCC work and 2000 mg per liter for concrete not containing steel.

Physical and chemical properties of ground water should be tested along with soil investigation

and if the water is not found conforming to the requirements of IS: 456-2000, it should not be used. The water found satisfactory for mixing is also suitable for curing. However the water used for curing should not produce any objectionable stain or unsightly deposit on the surface. It is a common thinking in construction work that the water fit for human consumption is generally acceptable for mixing mortar or concrete and curing work. However, the water must be tested before using in construction work. When you are making huge expenditure on construction work, a negligible amount spent on water testing should not be saved. Tested water or treated water should be used as this will increase the strength of cement concrete and enhance the life of building.

**Treatment of Water:** It is advisable that water should be tested in lab and if found unsatisfactory, it should be treated according to directions of laboratory. It is generally observed that ground water has some quantities of salt.

**Quantity of Water:** Water is an important component for mortar or concrete. The quantity and quality of water have much effect on the strength of mortar and cement concrete. It has been observed many times that in spite of using best raw materials, cement and tested water; concrete does not provide required results. Engineers/contractors think that there is something wrong in cement, but they do not consider water cement ratio or quantity of water added in the mix. When the water is mixed in mortar, it reacts with cement and forms a binding paste which fills small voids in the sand. This creates a close cohesion of sand particles and cement. In case of cement concrete the voids formed between sand and coarse aggregate gets filled with the paste forming a cohesive substance/concrete. The required quantity of water is used to prepare mortar or concrete, but in practice it is seen that more water is mixed to make the mix workable. This is a bad practice and additional water weakens the strength of cement paste. Extra water also weakens adhesive quality.

## **2. LITERATURE REVIEW**

According to Neville<sup>1</sup> the quality of water plays a significant role; impurities in water may interfere with the setting of the cement paste; adversely affect the strength of the concrete or cause straining on its surface, corrosion of the reinforcement. Steinhour<sup>3</sup> agreed that some waters which adversely affect hardened concrete may be harmless or beneficial when in mixing. In drawing specifications for many civil engineering projects, the water requirement is

covered in a clause saying it must be fitted for drinking.

However, some waters that are not fit for drinking may be suitable for concrete production<sup>2</sup>. McCoy<sup>4</sup> opined that water with pH range of 6.0 to 8.0 is good for concreting. He also suggested the use of water with pH 9.0, which does not taste brackish in concrete work. Furthermore, mixing water with high content of suspended solids needs to stand in a settling basin before use; a turbidity limit of 2000 ppm has been suggested by U.S. Bureau of Reclamation<sup>7</sup>. Natural waters that are slightly acid are harmless, but water containing humic or other organic acids may adversely affect the hardening of concrete<sup>1</sup>. Different ions have separate effect on concrete<sup>3</sup>. Doell<sup>5</sup> investigated the effect of algae on concrete, which resulted to entrainment of air with a consequent loss of concrete strength. Building Research Station<sup>8</sup> reported the success recorded in the use of water with higher salts contents such as chloride (higher than 500ppm) and trioxosulphate v (higher than 1000ppm). Chatveera et al<sup>4</sup> utilised and recycled sludge water as mixing water for concrete production and found that concrete slump and strength reduced drastically. Compressive strength, mineralogy, chloride ingress, and corrosion of steel bars embedded in concrete made with seawater and tap water were investigated based on the several long-term exposures under tidal environment. Seawater-mixed concrete showed earlier strength gain. After 20 years of exposure, no significant difference in the compressive strength of concrete was observed for concrete mixed with seawater and tap water. Islam and Kaushik<sup>9</sup> studied the mixing and curing effect of sea water on setting time, compressive strength of cement-sand mortar and corresponding concrete, rebar corrosion, chloride content and variation of alkalinity over a period of 18 months in a laboratory simulated splash/tidal zone of marine environment. The test results indicate that sea water was not suitable for the mixing and curing of both plain and reinforced concrete in marine conditions. Su et al<sup>11</sup> described the effect of different types of mixing water on properties of mortar and concrete such as compressive strength, setting times and workability. The compressive strength of concrete mixed with wash water or underground water was as good as that with tap water. Therefore, it was suggested that underground water should be considered as mixing water for concrete and wash water be recycled where tap water resources are scarce. The potential use of groundwater and oily production water in flowable fills was investigated

by Al-Harthy et al<sup>12</sup> Flowable fill blends prepared using brackish groundwater gave higher strength than mixes prepared using oily production water. Kumar<sup>10</sup> studied the effects of the quality of mixing water and initial curing on the strength of concrete exposed to seawater attack in marine environment for a period of 1year. Results of this study showed that the use of precasting in place of casting-in-situ mitigated the effect of marine environments on concrete specimens considerably.

### 3. MATERIALS AND METHODS

Water samples from different part of Buldana District mainly from Sangrampur, Shegaon and Jalgaon Jamod talukas were collected. The collected water samples were taken to laboratory for analyses. The parameters monitored were, pH, Hardness and Chloride.

pH was calculated by using pH meter (model no 335). Hardness is determined by using EDTA method. The chloride content of each water sample was measured by adding to a known sample volume of 1.5ml of K<sub>2</sub>CrO<sub>4</sub> and titrating the resulting solution with silver nitrate solution.

### 4. RESULTS AND DISCUSSIONS

The results obtained are compared with the standard permissible values for various parameters. The results obtained are tabulated as below.

Sr.no	Sample No.	parameter	Permissible Limit	Observation	Remark
1	Dhamgaon Badhe	Hardness	350ppm	920 ppm	Not OK
		chloride	500ppm	196ppm	OK
		pH	6 to 8	7.5	OK
2	Varvat Bakal (Sangrampur)	Hardness	350ppm	500 ppm	Not OK
		chloride	500ppm	174ppm	OK
		pH	6 to 8	8.00	OK
3.	Chikhli (MIDC Area)	Hardness	350ppm	660 ppm	Not OK
		chloride	500ppm	180 ppm	OK
		pH	6 to 8	7.50	OK
4	Buldana (Local)	Hardness	350ppm	470 ppm	Not OK
		chloride	500ppm	190 ppm	OK
		pH	6 to 8	7.50	OK

### CONCLUSIONS

The tested water samples from different part of districts have high salinity. The water quality in this region has very high hardness value. The surface water and ground water in this region is highly continuous it exceeds the permissible limit of hardness for its use in concrete. It may affect the

strength of concrete. Future work of this project is to check the effect of hard water on various properties of concrete.

### REFERENCES

- [1]. Neville, A.M. (1996): Properties of concrete, 4<sup>th</sup> Edition, ELBS Longman London, 1 - 50.
- [2]. Portland Cement Association (2005) [Http://www.cement.org](http://www.cement.org)
- [3]. Steinour, H.H. (1960) Concrete mix water – how pure it can be? *Journal Portland cement Association*, Research and Development Laboratories, 3, (3): 32 – 50.
- [4]. Chatveera, B., Lerwattanakul, P. and Makul, N. (2006) Effect of sludge water from ready-mixed concrete plant on properties and durability of concrete, Elsevier, *Cement and Concrete Composites*, 28(5):441 – 450.
- [5]. Doell, B.C. (1954) Effect of algae infested water on the strength of concrete, American Concrete Institute, *Proceedings*, 51: 333 – 342.
- [6]. McCoy, W.J. (1956) Water for mixing and curing concrete, ASTM, *Special Technical Publication* 169:355 – 360.
- [7]. U.S. Bureau of Reclamation (1975) Concrete manual, 8<sup>th</sup> Edition.
- [8]. Building Research Station (1956) Analysis of water encountered in construction, Digest, No.90, HMSO, London.
- [9]. Islam, S. and Kaushik, S.K.(1995) Suitability of seawater for mixing structural concrete exposed to marine environment, American Concrete Institute *Cement and Concrete Research*, 17(3): 177 - 185.
- [10]. Kumur, S. (2000) Influence of water quality on the strength of plain and blended concretes in marine environments, American Concrete Institute *Cement and Concrete Research*, 30(3): 345 – 350.
- [11]. Su, N., Miao, B. and Liu, F.(2002) Effect of wash water and underground water on properties of concrete, American Concrete Institute *Cement and Concrete Research*, 32(5): 777 - 782.
- [12]. Al-Harthy, A.S., Taha, R., Abu-Ashair, J., Al-Jabri, K. and Al-Oraimi, S. (2005) Effect of water quality on the strength of flowable fill mixtures, American Concrete Institute *Cement and Concrete Research*, 27(1): 33 - 39.

