



## PHYSICO-CHEMICAL ANALYSIS OF DRINKING WATER

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*Abstract: The Objective of this research is to check the various parameters of potable water of the selected sites, that gives the result of sample to compare it with Standard values as per IS 10500:2012. Vital aspects of this research is to check suitability of water for drinking purpose. The safety of drinking water is important for the health. The safety of drinking water is affected by various contaminants which included chemical and microbiological. Such contaminants cause serious health problems.*

**Keywords :-** Water Sample, Physio chemical-analysis, TDS, Dissolved solid, Hardness, Ph, Chloride, Fluoride.

### INTRODUCTION

Water is a very useful source for domestic, industrial and agricultural purposes as well as in living beings. For good health purest form of water should be taken by humans. Some parameters are given to check the purity of tap water. Water becomes due to pollution from leaky underground tanks that store gasoline, leaky landfill, or when people apply too much fertilizer, herbicides or pesticides on their fields or lawns. When pollutants leak, spread or are carelessly dumped on the ground they can move through the soil. Some sources are contaminated to groundwater as well, such as industries would dump toxic wastes into ponds, river or swampy area, which is not realizing that the waste could get into someone's drinking water. Some agricultural areas have trouble with fertilizer, pesticides and herbicides from farm runoff that contaminated seeps into the drinking water.

### SAMPLING METHODS:

To assess the level of groundwater contamination, Sampling of groundwater is done from hand pumps and bore wells located in residential, as per the standard procedure. Good quality narrow mouth screw-capped polypropylene bottles of one-liter capacity were used to collect the sample. Bottles first washed with dilute nitric acid than thrice with DM water (Demineralised). Before sample collection bottles were rinsed thrice with water to be sampled and then samples were collected.

#### Sampling Sites:

Five locations were selected for taking samples, so that drawn sample represent the real groundwater quality of that area.

#### Labeling of the samples:

Every sample was coded adequately and mark code on sampling bottles by permanent marker at two places, recorded all the information regarding name of the sampling location, source and date & time of collection in field book to avoid any confusion and error.

#### Collection of Samples:

Before collection of sample the pipeline of bore wells / hand pumps were flushed for a sufficient period of time, so that actual sample can be collected which represents the actual quality of groundwater. The samples were collected from five spot and then mixed together. Sample bottles were rinsed thrice with the water to be collected and then filled completely to avoid encroachment of air bubble. Sample bottles screw-capped tightly and brought to the laboratory. The samples were preserved in refrigerator at 4°C.

## EXPERIMENTAL AND MATERIAL DETAIL

Various chemicals used for chemical examination of water. To check the water quality, five different sites were chosen for sample collection. Number of sites as per your choice (Atleast 2-3 sites should be selected for accurate result). Water samples can be collected in polystyrene bottle of 1L capacity. Before sampling, all the bottles should be washed thoroughly with the detergent, tap water and then distilled water. Chemical parameters were determined by using standard Data available as IS 10500:2012.

### Temperature and pH of water

Temperature of water samples taken at the time of collection were in the range of 24 to 26°C. The maximum permitted standard of drinking water is 25°C. The pH value of water samples collected from well and bore well water were in the range of 7.3 to 8.4.

### Total dissolved solids (TDS)

The maximum TDS for well water was found to be 473 mg/l and minimum was 192 mg/l and maximum TDS for bore well water was 765 mg/l and minimum was 189 mg/l.

### Electrical conductivity

The results reveal that obtained value was not accordance with standard value of drinking water.

### Total hardness

Maximum and minimum total hardness for well water was 250 mg/l and 160 mg/l and for bore well water 700 mg/l and 140 mg/l. These high values may be due to the addition of calcium and magnesium salts. Results revealed that bore well water is not suitable for drinking in terms of total hardness.

### COD and BOD

Chemical oxygen demands (COD) and biochemical oxygen demand (BOD) is an important parameters for oxygen required to degradation of organic matter. In this case results of both COD and BOD parameters were not agreement with standard data.

### Alkalinity

The alkalinity range set by WHO is 500 mg/L. Our results showed that alkalinity of both well and bore well water samples is not accordance with standard data.

## PHYSICO-CHEMICAL PARAMETERS DRINKING WATER

### Electrical conductivity

The reason that the conductivity of water is important is because it can tell you how much dissolved substances, chemicals, and minerals are present in the water. Higher amounts of these impurities will lead to a higher conductivity. The Drinking water conductivity is 200 to 800  $\mu\text{S}/\text{cm}$ .

### Total hardness

Total hardness is the sum of the calcium and magnesium concentrations, both expressed as calcium carbonate, in milligrams per liter (mg/L). You can determine your water's hardness based on these concentrations of calcium carbonate: below 75 mg/L - is generally considered soft. 76 to 150 mg/L - moderately hard.

### Chlorides

Chloride is a naturally occurring ion that is present in both fresh and salt water. Chloride is most commonly derived from dissolved salts such as sodium chloride or magnesium chloride. Chloride is essential in small amounts for normal cellular function in plants and animals.

### Colour

Colour is produced by suspended matter and dissolved matter. Colour is measured by TINTOMETER.

True Colour- Dissolved Solids

Apparent colour - Suspended Solids

## Taste and Odour

It may be due to presence of one or more of the following:

- (1) Domestic and industrial wastes and decomposing organic wastes.
- (2) Dissolved gases like carbon dioxide, hydrogen sulphide, methane etc.
- (3) Chemical compounds like phenol, sodium chloride, iron compounds, carbonates and sulphates of some elements
- (4) Odour concentration is measured as 'threshold odour number. This number is the dilution ratio at which the odour is hardly detectable. It is measured by instrument known as "Osmoscope".

## Turbidity

Turbidity is caused by particles suspended or dissolved in water that scatter light making the water appear cloudy or murky. JTU is used for groundwater.

## Temperature and pH of water

The maximum permitted standard of drinking water is 25°C. The pH value of water samples collected from well and bore well water were in the range of 6.5 to 8.5

## Total dissolved solids (TDS)

Water of high TDS is not suitable for use in boilers and hence restricted industrial use. The TDS of groundwater samples mg/L with an average value of 500 mg/L.

According to IS 10500:2012 limits of Characteristics of water are given below

| Characteristics                             | Acceptable limits | Permissible limits in Absence of Alternate source |
|---|-------------------|---|
| Ph Value                                    | 6.5-8.5           | No relaxation                                     |
| Turbidity, NTU                              | 1                 | 5   |
| Total Dissolve Solid mg/l                   | 500               | 2000  |
| Total Hardness (CaCo <sub>3</sub> ) mg/l    | 200               | 600   |
| Chlorine (cl) mg/l                          | 250               | 1000  |
| Florine(F) mg/l                             | 1                 | 1.5   |
| Calcium(Ca) mg/l                            | 75                | 200   |
| Nitrate (No <sub>3</sub> ) mg/l             | 45                | No relaxation                                     |
| Magnesium (Mn) mg/l                         | 30                | 100   |
| Manganese(Mn) mg/l                          | 0.1               | 0.3   |
| Iron(Fe) mg/l                               | 0.3               | No relaxation                                     |
| Total alkalinity (CacCo <sub>3</sub> ) mg/l | 200               | 600   |

## **DISCUSSION**

Physical parameters like Temperature, Odour, Taste & Colour was agreeable in Process and Municipal water. The general ISI standard for Drinking water's Turbidity is <0.1 NTU. Turbidity >5 NTU is considered unhealthy. In Different area of Municipal water the Turbidity ranging from 0.1 NTU to 0.5 NTU. In Naroda Municipal water, observed higher Turbidity than other area. The pH range of drinking water should far between 6.5 to 8.5 and municipal water pH observed 7 to 7.5. So it complied with the acceptance criteria of pH range & it was found to be healthy for human use. For Potable water, Dissolved carbon dioxide & Dissolved oxygen were found to be 6.4 and 33 (Average value of five different areas) respectively. TDS of water sample should be 1500 ppm as per IS Code. Minerals like Calcium, Magnesium, Chloride, Sulphate, Barium, and Copper are necessary for human body. Alkalinity & Total Hardness of potable water should less than or equal to 10 and 300 ppm respectively. Results were complied with the given limits of both tests. Water Temperature may be depending on the season, geographic location and sampling time. As water Temperature increases, it makes it more difficult for aquatic life to get sufficient oxygen to meet its need. Thermal pollution can cause shifts in the community structure of aquatic organisms. Turbidity of lake ranges from 4 NTU to 11 NTU. Some are naturally highly turbid but human activities have increased the levels of suspended solids in many habitats. The lake amount of Total dissolved solid recorded ranges from 668 ppm to 942 ppm. DO is the single most important gas for most aquatic organism. If the amount of free oxygen go below then 2.0 mg/l for few day in the lake containing aquatic organism it would lead the killing of most of the biota in the aquatic system.

## CONCLUSION

The values of water quality should follow the range of IS 10500:2012. For this, results are compared with standard parameters. Parameters such as Ph value, Turbidity, Conductivity, TDS etc. Freshwater is a finite and limited resource on Earth and increasingly much of it is polluted, by both pathogenic microbes and chemical contaminants. Demand for freshwater is increasing day by day, to fulfill the requirement in particular, water is used by examining various parameters. At the end of all we would say that, drinking water is a very important thing to our bodies' health. It is not only important for humans, but also all of the organisms need water to survive. Water makes up to 70 percent of our bodies' weight.

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