

# ASSESSMENT OF QUALITY OF DRINKING WATER IN DIFFERENT ZONES OF DELHI

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**Abstract** - The report outlines the water supply of drinking water and comparison of parameters of drinking water in various zones of Delhi as per defined in the IS code 10500: 2012, World Health Organization (WHO), Delhi Jal Board (DJB). Seven tests are performed taking up the physical, chemical, biological parameters into consideration. The parameters taken up provide a brief idea whether the quality of drinking water is potable or not and safe to drink or not. In this project we have conducted several tests on water samples collected from different zones of Delhi and observed that which zone of Delhi is under below the level of safety for drinking water and which zone of Delhi is safest for drinking water. We have also observed the overall average readings in form of graphs and result analysis.

**Key Words:** Water quality Index, Various meters, Turbidity, pH, DO, TDS etc.

## 1. INTRODUCTION

Drinking water is also known as potable water or better drinking water or intake able water which is safe to drink or to use for food preparation, without risk of health problems. In Delhi 2017, 90% of people had access to water suitable for drinking. Many consumers had access to tap water while another had access to wells or public taps or other water supplies. There is still use an unsafe drinking water source which may be contaminated by feces. Water with Contaminants can lead to various issues like:- Diarrhea, cholera, Typhoid, Psychological effects in human system, Blood Pressure, Less killing of microorganism. Diseases caused by Water Viral Infections like:- Polio virus, Infectious jaundice. It particularly leads in young children and pregnant women.

Our aim is to do this research paper that:

- To observe and test the parameters for drinking water as per IS 10500: 2012 in different zones of Delhi.
- Depending upon the test quality of water can be intake by the peoples or consumers is suitable for drinking or not.

- To determine that how does potable water relate to our health in different zones.
- How to overcome with diseases and what are their remedies.
- Whether there is a need of RO or Aquaguards or other water Purifiers.
- Zone 1 is North Zone, Zone 2 is West Zone, Zone 3 is East Zone, Zone 4 is South Zone.

## 2. MATERIALS AND METHOD

The physical, chemical and biological parameters are as follows:-

### i) Turbidity

It is the muddiness or lack of clarity of a water sample caused by large numbers of individual particles that are generally invisible to the naked eye, similar to smoke in air. The measurement of turbidity is a explanation test of water quality. A meter called Turbidimeters which is used as a water cleansing plant instrument to find out turbidity (in NTU) of untreated water and clear water after filtration.

### ii) pH value

It is a measure of the hydrogen ion concentration of a solution. Solutions having high concentration of hydrogen ions have a low pH and solution having low concentrations of H<sup>+</sup> ions have a high pH value.

### iii) Hardness

Water hardness is the conventional measure of the capacity of water to react with soap, hard water require very much more soap to produce lather. Hardness is most commonly expressed as milligrams (mg) of calcium carbonate equivalent (CaCO<sub>3</sub>) per litre. Water containing calcium carbonate (CaCO<sub>3</sub>) at concentrations below 60 mg/l is generally considered as soft; 60–120 mg/l, moderately hard; 120–180 mg/l, hard; and more than 180 mg/l, very hard. While hardness is cause by cations, it can also be discussed in

terms of carbonates (Temporary Hardness) and non-carbonates (Permanent Hardness).

iv) Total Solids & TDS (Total Dissolved Solids)

It is a measure of the suspended and dissolved solids in water. Suspended solids are those that can be retained on a water filter and are capable of settling out of the water column onto the stream bottom when stream velocities are low. Dissolved solids refer to any minerals, salts, metals, cations or anions dissolved in water. Total Dissolved Solids (TDS) contain inorganic salts (principally calcium(Ca), magnesium(Mg), potassium(K), sodium (Na), bicarbonates, chlorides (Cl), and sulphates) and some small amounts of organic matter that are dissolved in water.

v) Residual Chlorine

The presence of chlorine residual in drinking water indicates that enough amount of chlorine was added at first to the water to inactivate the bacteria and some viruses that cause diarrheal disease. The water is protected from recontamination during storage. The presence of free residual chlorine in drinking water is correlated with the absence of disease-causing organisms, and thus is a measure of the potability of water.

vi) DO (Dissolved Oxygen)

It is the quantity of gaseous oxygen (O<sub>2</sub>) dissolved in the water. Oxygen enters the water by direct absorption from the atmosphere, by rapid movement, or as a waste product of plant photosynthesis. Water temperature and the volume of moving water can affect dissolved oxygen levels.

**3. TESTING PROCEDURES**

i) Residual Chlorine test

Chlorides are found to occur in all the natural waters, and their quantity may vary widely. Chlorides in reasonable concentrations are not harmful for humans i.e. 0.2-0.3 mg/l.

ii) Hardness

The hardness usually caused by the presence of calcium and magnesium salts present in water.

iii) pH

It is the log of a reciprocal of hydrogen ions present in that water i.e.  $pH = \log_{10} \frac{1}{[H^+]}$ . It is measured by pH meter.

iv) Dissolved Oxygen

The amount of oxygen found dissolved in a given water at a given temperature and pressure. It is measured by DO meter.

v) Turbidimeter

Turbidity is caused in drinking water by divided suspended particles of clay, silt, sand or by organic materials. The permissible turbidity for drinking water is 5 to 10 units or below 5 units. It is measured by turbidity meter.

vi) TDS (Total Dissolved Solids)

It consists of mainly inorganic salts, small amount of organic matter and dissolved gases. It is computed by TDS meter.

vii) Total solids

These can be found by filtering the water sample and weighing the residue left on the filter paper. The total solids (T.S) in a given water up to 500mg/l.

It is calculated by concentration of Total solids =  $(M_2 - M_1 / 50 \times 1000)$ .

Where,

Mass of empty dish = M<sub>1</sub> gm

Mass of dish + dry residue = M<sub>2</sub> gm

Mass of filter paper = M<sub>3</sub> gm

Mass of filter paper + dry residue = M<sub>4</sub> gm

After getting readings we will compare the results with drinking water as per IS 10500: 2012, Delhi Jal Board, WHO.

**4. OVERALL RESULTS & COMPARISON**

Test Name	Our Observation	As per IS 10500:2012	As per WHO	As per DJB
pH	7.79	6.5-8.5	6.5-8	6.5-8
Turbidity	0.06	MAXIMUM 1 NTU	1-5	0.5-1
DO(Dissolved Oxygen)	7.02	6-8ppm	5-7ppm	6-8ppm
Residual Chlorine	0.04	0.2-1 mg/l	0.2-1 mg/l	0.20-0.50
Hardness	187	200-600 mg/l But safe drinking hardness is between 75-115 mg/l	75-110 mg/l	300-600
TDS	179.8	500-2000 mg/l	500-1500	500-1000
TS (Total Solids)	242.5	500-2000 mg/l	500-1500	500-1000

Table -2 Zone 2

Test Name	Our Observation	As per IS 10500:2012	As per WHO	As per DJB
pH	7.26	6.5-8.5	6.5-8	6.5-8

Turbidity	0	MAXIMUM 1 NTU	1-5	0.5-1
DO (Dissolved Oxygen)	5	6-8ppm	5-7ppm	6-8ppm
Residual Chlorine	0.04	0.2-1 mg/l	0.2-1 mg/l	0.20-0.50
Hardness	232	200-600 mg/l But safe drinking hardness is between 75-115 mg/l	75-110 mg/l	300-600
TDS	157.2	500-2000 mg/l	500-1500	500-1000
TS (Total Solids)	208.4	500-2000 mg/l	500-1500	500-1000

Table -3 Zone 3

Test Name	Our Observation	As per IS 10500:2012	As per WHO	As per DJB
pH	7.20	6.5-8.5	6.5-8	6.5-8
Turbidity	1.7	MAXIMUM 1 NTU	1-5	0.5-1
DO (Dissolved Oxygen)	7.52	6-8ppm	5-7ppm	6-8ppm
Residual Chlorine	0.02	0.2-1 mg/l	0.2-1 mg/l	0.20-0.50
Hardness	156	200-600 mg/l But safe drinking hardness is between 75-115 mg/l	75-110 mg/l	300-600
TDS	251	500-2000 mg/l	500-1500	500-1000
TS (Total Solids)	341	500-2000 mg/l	500-1500	500-1000

Table -4 Zone 4

Test Name	Our Observation	As per IS 10500:2012	As per WHO	As per DJB
pH	7.62	6.5-8.5	6.5-8	6.5-8
Turbidity	0	MAXIMUM 1 NTU	1-5	0.5-1

DO (Dissolved Oxygen)	6.4	6-8ppm	5-7ppm	6-8ppm
Residual Chlorine	0.10	0.2-1 mg/l	0.2-1 mg/l	0.20-0.50
Hardness	155	200-600 mg/l But safe drinking hardness is between 75-115 mg/l	75-110 mg/l	300-600
TDS	154.4	500-2000 mg/l	500-1500	500-1000
TS (Total Solids)	207.9	500-2000 mg/l	500-1500	500-1000

#### 4. ANALYSIS OF RESULTS

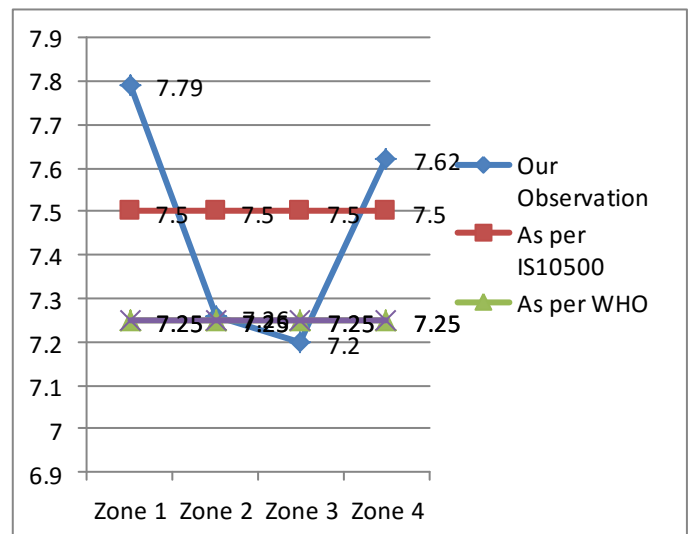


Chart-1: pH of Different zones

#### INTERPRATION OBTAINED

- 1) Lesser pH can cause tuberculation and corrosion of pipes and treatment tanks.
- 2) Higher pH (alkaline) produce incrustation, sediment deposit, difficulty in chlorination, psychological effects on human systems.
- 3) All Zones are safe but few localities like Seelampur, Laxmi Nagar, Shahdara has less pH cause acidic in nature which harmful to humans and may cause tuberculation like diseases.

4) Locality which may observe with high pH which is basic in nature may cause psychological effects on human systems.

2) Higher DO can cause corrosion in the supplying such Waters.

3) All Zones are safe but few localities like Seelampur, Laxmi Nagar, Shahdara has less pH cause acidic in nature which harmful to humans and may cause tuberculation like diseases.

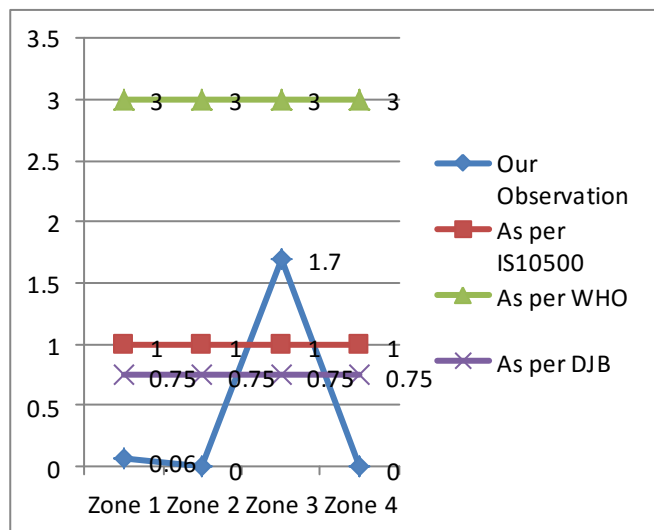


Chart-2: Turbidity of Different zones

**INTERPRATION OBTAINED**

- 1) Higher or excess turbidity can cause Aesthetic reasons, psychological effects etc.
- 2) It also affects filtration and disinfection processes.
- 3) Zones 3 is not safe but few localities like Seelampur, Laxmi Nagar, Shahdara has more turbidity psychological effects on human systems are takes place.

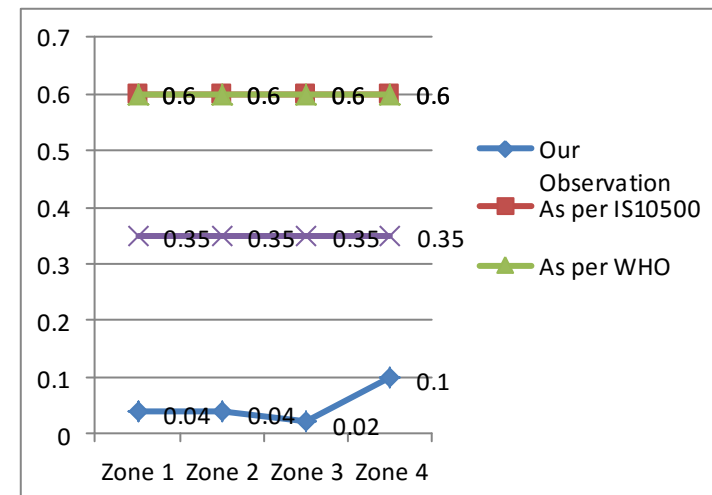


Chart-4: DO of Different zones

**INTERPRATION OBTAINED**

- 1) Lesser Residual chlorine can cause less purification and filtration of water causes diseases and less killing of Microorganisms.
- 2) Higher Residual chlorine can cause salty taste to water and causes high blood pressure and Heart attack.
- 3) All Zones are safe but few localities like Patel Nagar has more hardness or no residual chlorine which is unsafe for drinking because there is no purification and filtration of water takes place.

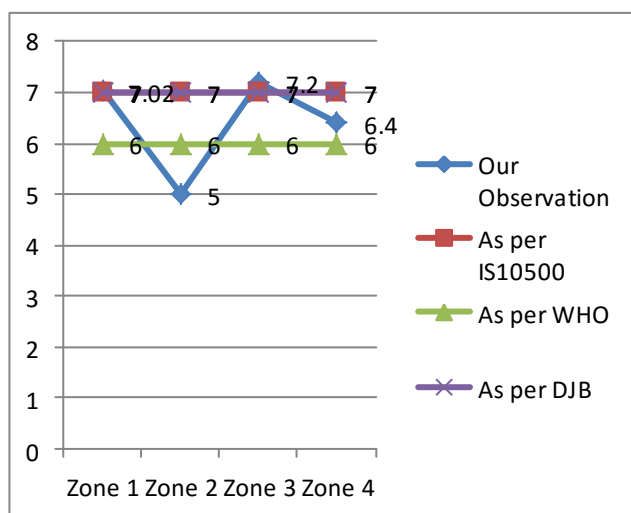


Chart-3: DO of Different zones

**INTERPRATION OBTAINED**

- 1) Lesser DO can cause and reduce i.e. the organic pollution takes place with more generations of microorganisms formation and causes diseases.

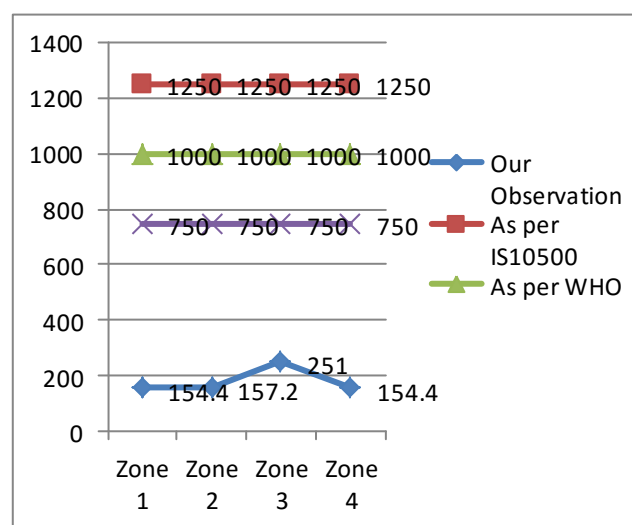


Chart-5: TDS of Different zones

### INTERPRATION OBTAINED

1) High contents may cause psychological affects and may also cause the growth of microorganisms which increases the infections and other water borne diseases.

2) Water with less content may cause diabetes and blood pressure fluctuations.

3) All zones is not very safe especially Zone 2 and Zone 4 because of less contents of TDS involved in it. It generally may cause diseases when migration takes place water parameters and the conditions may vary place to place.

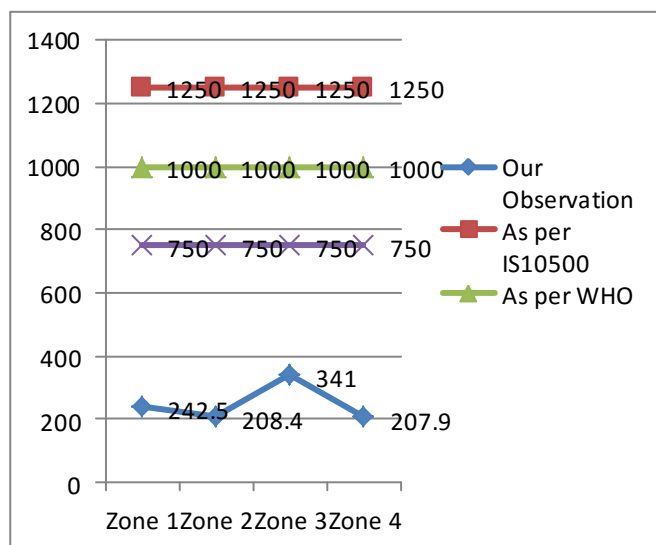


Chart-6: TS of Different zones

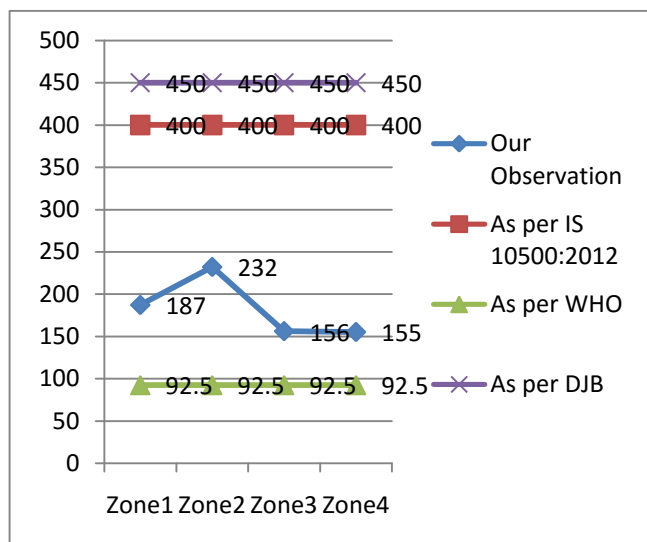


Chart-7: Hardness of Different zones

### INTERPRATION OBTAINED

1) Hardwater may cause soap consumption and making the food tasteless causing corrosion and incrustation of pipes.

2) Water with hardness upto 75ppm are considered as Soft and above 200ppm are considered as hard.

3) Zones2 is quite safe but few localities are not safe like Patel Nagar, Moti Nagar has more hardness.

### 5. CONCLUSIONS

Based on the Experimental result following points are summarized. To aware consumers that what parameters or kind of water they are drinking is it fit or not. On an overall average if we take of zones, East Zone is very harmful zone of drinking water, Secondly North Zone, West Zone and South Zone water is safe for drinking. Changes of quantities/parameters to be taken up in drinking water in all zones like North Zone Residual Chlorine is indicated to be less its value should be increase. West Zone - Hardness is more i.e. hard water supply takes place in this region can be balance. East Zone -Overall all parameters should be considered to check except pH because this zone is danger zone for drinking water. South Zone - Every parameter is similar as per codes and health organizations. But it is advised to drink water of moderate TDS because if migration takes place it causes diseases. From the above discussion it is identified that the use of toxic water can harm us. Excess of any quantity in water is bad/harmful as well as lack of any quantity in water is also bad/harmful. So it advised to make water potable in neutral parameter.

### 6. REFERENCES

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