1. Scope and Objectives

The chlorine demand test will be applied in water treatment and distribution systems

To decide chlorine injection dosage in post chlorination process to maintain necessary residual chlorine in water distribution system.

2. Principle

Chlorine reacts with inorganic and organic compounds, oxidizing and disinfecting the water. The difference between the applied chlorine dose and the residual chlorine (free + combined) after a given contact time is the **chlorine demand**.

Chlorine Demand=Chlorine Applied−Residual Chlorine

The chlorine demand of water will influence how much chlorine is consumed, and how much residual chlorine is remaining to protect the water from recontamination during storage and distribution. Understanding the chlorine demand of water is important, as it influences how much chlorine needs to be added to the water to ensure good disinfection.

3. Equipments and Materials

i. 1 L amber colored reagent bottles
ii. Pipettes
iii. Measuring cylinders
iv. DPD reagent
v. Chlorometer
vi. Chlorine stock solution (1000 mg/L available chlorine)

4. Procedure

A. Collection of water Sample

Collect Treated water sample before post chlorination (After sand filtration process before post chlorination)

B. Preparation of Stock Chlorine Solution

Prepare a 1000 mg (Bleaching powder) /L solution. (**Note**: Effective chlorine is 350mg/L (as Cl).

C. Preparation of Samples

Take the above mentioned sample 1000 mL each in airtight cap vial. Label each bottle with the applied chlorine dose.

D. Chlorine Application

Add the required chlorine dosage of 1000 mg/L solution to each vial.

Note: Inject 1.4, 2.8, 4.3, 5.6, 7.0, 8.4, 9.8, 11.2, 12.6, 14 mL as 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0mg/L (as Cl).

After gradually mixing the chlorine such that it is fully dispersed, allow the mixed solution to stand still in cool and dark place.

E. Contact Time

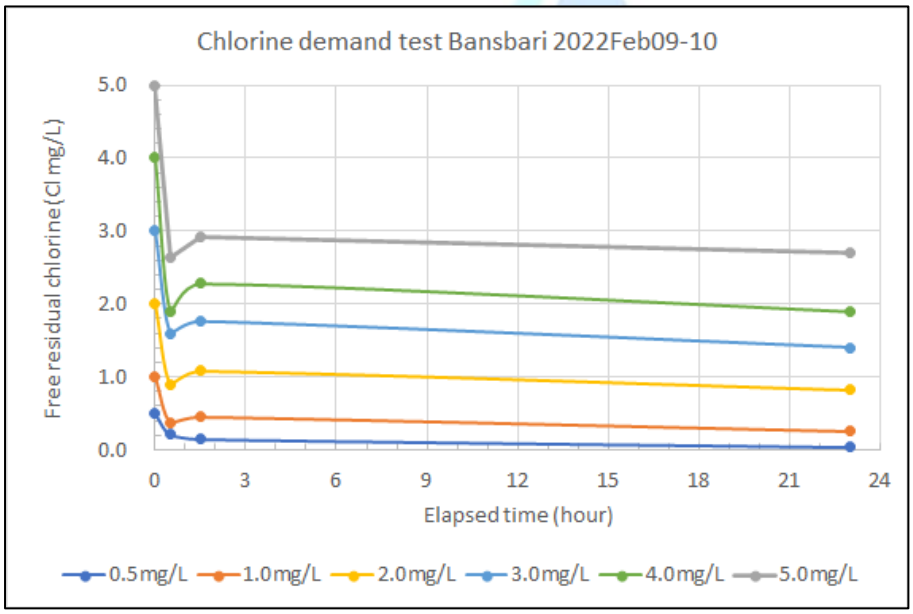
Keep the bottles in a dark place at room temperature (20–25 °C) for 24 hours

F. Residual Chlorine Measurement

Measure free residual chlorine after 0.5-hour, 1.5-hour, 3-hour and 24- hour using the DPD colorimetric method.

Plot a graph of Applied Chlorine vs Residual Chlorine. The curve will indicate the breakpoint chlorination point.

Note: Example of figure (Bansbari, 2022 Feb.)



G. Determine the appropriate chlorine injection rate (post chlorination) considering retention time in water distribution system.

H. Report to Water Purification Team.

I. Calculation

7. Chlorine demand for each applied dose is calculated as:

Chlorine Demand (mg/L)=Chlorine Applied (mg/L)−Residual Chlorine (mg/L)\

5. Precautions

- Avoid exposure of chlorine solution and samples to direct sunlight (causes chlorine loss).
- Chlorine solution should be freshly prepared daily.
- Glassware must be chlorine-free and rinsed with distilled water.
- Maintain constant contact time for all samples.

6. Reporting

- Report chlorine demand in **mg/L** for the specified contact time.
- Mention test conditions: pH, temperature, contact time.
- Indicate the chlorine dose required to achieve desired residual (usually >1 mg/L at reservoir)

7. References

1.APHA, AWWA, WEF (2017). *Standard Methods for the Examination of Water and Wastewater*, 23rd Edition. American Public Health Association, Washington, D.C.Section 2350: Chlorine Demand.

2. Principles and practices of drinking-water chlorination: a guide to strengthening chlorination practices in small-to medium sized water supplies.ISBN: 978-92-9022-536-2

Written By:	Sachita Dhital/Pranita Tuladhar/Ratna Bhatta	
Reviewed By:	Prem Paudyal	
Approved By:	Shailaja Adhikari	