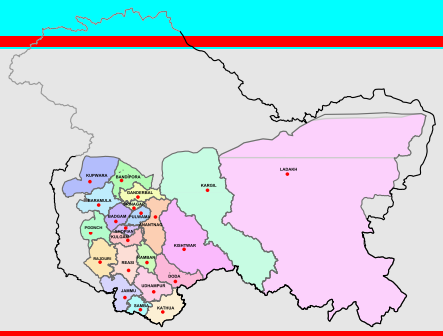


DRINKING WATER AND SANITATION MANUAL FOR GRAM PANCHAYAT IN J&K STATE

CCDU
J&K STATE SRINAGAR

Communication and Capacity Development Unit
State Water & Sanitation Mission
Govt. of J & K

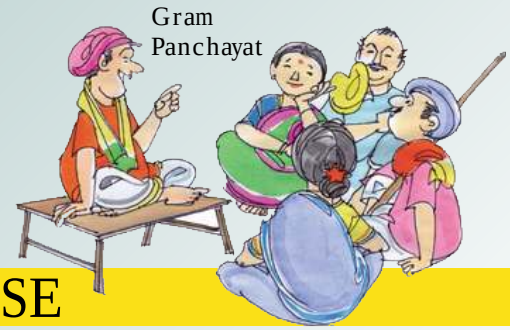
in association with

WEMTEP
Improvement in Continuum...
Technical Resource Center (TRC)
Srinagar Division (J & K State)

Taking Another step in Implementation of

National Rural Drinking Water Quality Programme

implementation in J & K State by CCDU,
Govt. of J&K in association with WEMTEP



PREPARATORY PHASE

Unsafe drinking water and poor environmental sanitation causes major health problems to the community. Safe drinking water must be free from bacteriological and chemical contamination. The water with such contamination may cause diseases like dirrhoea, jaundice etc. and other health problems like dental flourosis due to excess fluorides in the water.

To ensure good health for the people of J & K state in general and village areas in particular, there is a great need to introduce

WATER QUALITY MONITORING AND SURVEILLANCE PROGRAMME.

A community based management system like Gram Panchayat is required for information, education and communication for safe drinking water and sanitation in the villages. There is also an essential need to make village people aware of the ways to save the water sources like springs, nahar, nallah etc from being polluted at their end by regular monitoring. This will increase the availability of safe drinking water and reduce health problems.

For the people living in rural and village areas of J&K to get safe and enough drinking water and effective sanitation facilities is an important responsibility of Gram Panchayats to take the lead in achieving this through VWSCs to motivate,mobilize,educate and communities.Gram Sabha is the main platform for taking decisions and approve plans. This Drinking Water and Sanitation manual has been developed to serve as a quick reference guide for Gram Panchayats and Village

GRAM

GRAM PANCHAYAT

VWCS

HAND PUMP

PREPARATORY PHASE

PLANNING PHASE

IMPLEMENTATION PHASE

OPERATION AND MAINTENANCE PHASE

MONITORING PHASE

PREPARATORY PHASE

1) Call Gram Sabha meetings regularly.
2) Nominate, Constitute and appoint VWSC (Village Water & Sanitation Committee)
3) VWSC must attend meeting once in a month.
4) Hand pump operators & caretakers should also attend meetings.
5) Get the community people involved in Safe Drinking Water & Sanitation Programmes.
6) Through field surveys VWSC should collect information about the status of drinking water sources, availability, quality and sanitation.
7) It should cover water sources like local springs, piped water, storage tanks and existing

1	2	3	4	5	6	7
Call Gram Sabha meetings regularly.	Nominate, Constitute and appoint VWSC (Village Water & Sanitation	VWSC must attend meeting once in a month.	Hand pump operators & caretakers should also attend meetings.	Get the community people involved in Safe Drinking Water &	VWSC should collect information about the status of drinking	cover water sources like local springs, piped water, storage tanks and existing

PLANNING PHASE

1) After the survey & inspection, discuss and decide water sources, water availability, sustainability, operating and service improvement plans and their budget.
2) Water Budget means to assess the availability of water from different sources in summer as well as in winter, the demand of water and the gap between supply and demand.
3) In the situation of big gap between supply and demand, plan for additional sources, rain water harvesting and increasing existing sources of water.
4) Estimate the capacity of additional water which can be generated by rooftop rainwater harvesting and other means and their costs.
5) Plan for water safety as to get the area cleaned around hand pump by hand pump caretaker, raising and repair apron area for which VWSC will procure contractor.
6) Similarly plan that Asha workers, VWSC motivate people not to defecate near water sources, construct and use community and household toilets.
7) Plan that leaking pipelines are repaired and storage tanks are regularly cleaned.
8) Plan for operation, maintenance, monitoring and management of water sources, hand pumps, storage tanks, pipelines, toilets etc.
9) Prepare proposals for water availability, service improvement, operation etc for submitting to DWSM. The proposal should include basic information, scheme information, estimated investments, operation and maintenance.

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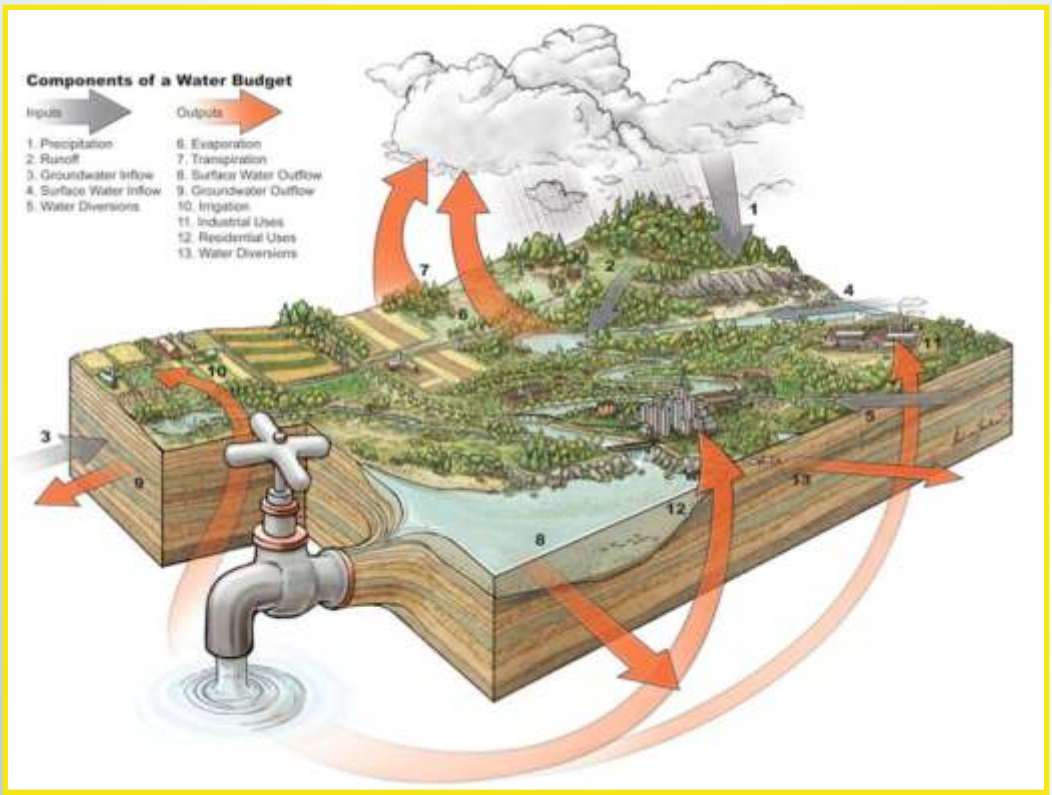
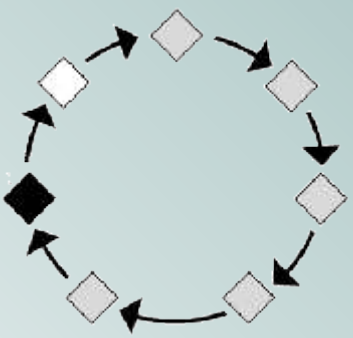
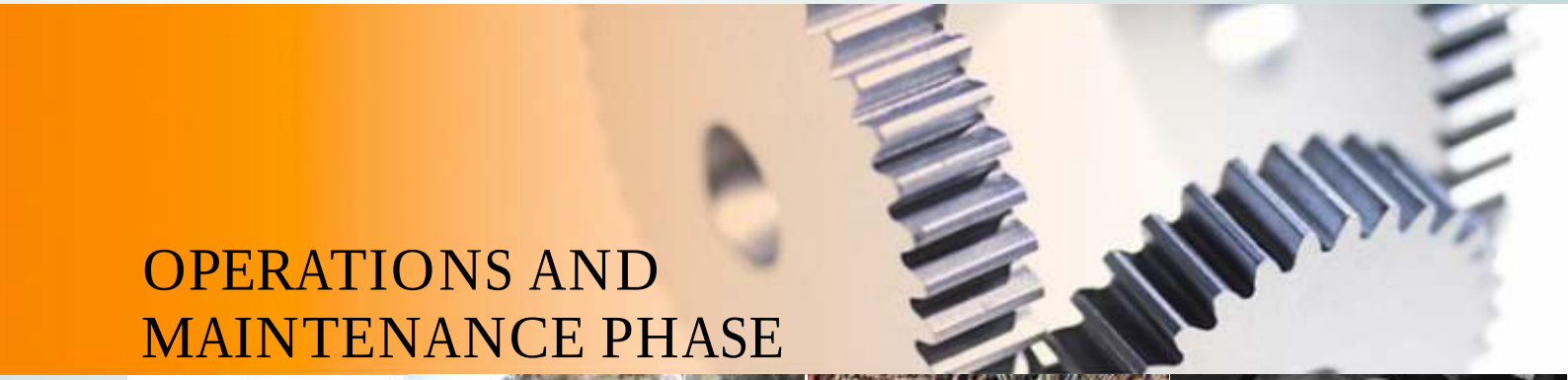




IMPLEMENTATION PHASE

1) Based upon Annual Action Plan, arrange for the contractors who will do the jobs.
2) Procure the materials like steel, cement, sand, pipes, hardwares etc ensuring quality of goods viz ISI mark and quality tested.
3) In big contracts, take at least three quotations.
4) Keep complete records of purchases, bills, receipts, quality certificates, payments and construction drawings etc.
5) Take the services of Chartered Accountant for preparing the audit report of all the



OPERATIONS AND MAINTENANCE PHASE

1) Keep your sources of water (springs, surface, run water, nallah, kul, nahar etc) clean and free from contamination due to garbage and waste water.
2) Regularly check that government water filter/treatment plants and functioning properly, Chlorination to be done as and when required.
3) Check and ensure proper operation and maintenance of hand pumps with the help of hand pump operators and mechanics. Ensure availability of required spare parts.
4) Stop any wastage of water by repairing leaking pipes.
5) Check and get storage tanks cleaned regularly.
6) Ensure construction, maintenance and use of public and house hold toilets.
7) Make arrangement for appropriate disposal of human excreta.
8) Motivate people to wash hands with soap and water properly before eating and after going to toilet.
9) Get the drinking water checked regularly through Field Test Kits and intimate the status of water quality to PHE Department.

BASIC WATER FACTS

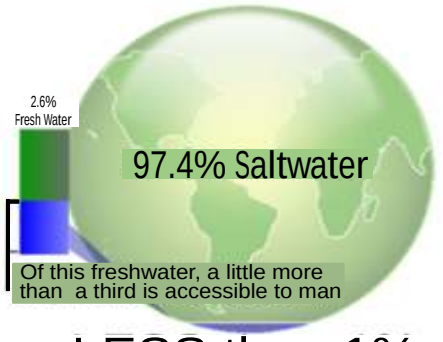
About 70% of the earth's surface is covered with water.

The fresh water available for human use is just 0.629%(Ground water, fresh water, Rivers).

And by polluting this small amount of water available for human use we are not only threatening our own survival but also the lives of other organisms

•DISTRIBUTION OF WATER ON EARTH

•Ocean	97.358%
•All ice caps/glaciers	2.003%
•Ground water	0.621%
•Fresh water lakes	0.009%
•Inland seas / salt lakes	0.008%
•Atmosphere	0.001%



LESS than 1%
of the World's water is available for human consumption

Some Facts About Water

- Of all the water on earth, only 2.5% is fresh water
- Fresh water is either groundwater (0.5%) or readily accessible water in lakes, streams, rivers, etc. (0.01%)
- 80% of the earth's water is surface water.
- The other 20% is either ground water or atmospheric water vapour.
- Approximately 66% of the human body consists of water
- The total amount of water in the body of an average adult is 37 litres.
- Human brains are 75% water, bones are 25% water and blood is 83% water
- A person can live about a month without food, but only about a week without water.
- A person must consume 2 litres of water daily to live healthily.
- Humans drink an average of 75,000 litres of water throughout their life.
- Groundwater supplies serve about 80% of the population, whereas up to 4% of usable groundwater is already polluted!
- Each day almost 10,000 children under the age of 5 in Third World countries die as a result of illnesses contracted by use of impure water.
- About 25,700 litres (6,800 gallons) of water is required to grow a day's food for a family of four.
- Over 70,000 different water contaminants have been identified.
- Water is one of India's most pressing problems — 80 percent of infectious diseases are water borne and 1.5 million pre-school children in India die every year from diarrhoea.
- Projections for 2025 indicate that the number of people living in water-stressed countries will increase to 3 billion – a six-fold increase.
- Today, 470 million people live in regions where severe shortages exist

DRINKING WATER PROBLEMS IN J&K

May. 2006

J&K State lack infrastructure as well as human resource development for monitoring water quality. The centrally sponsored Accelerated Rural Water Supply Programme (ARWSP) for J&K requires 1,60,000 water samples to be tested But not more than 200 tests could be conducted.

Community based WQ (Water Quality) testing; monitoring and surveillance programme has not been implemented in J&K. This has exposed people to dangerous waterborne communicable diseases.

Aug. 2007

Water (Ground water/Surface water) quality that still need to be analyzed in the J&K state, although state govt. envisage to constitute the committee at village level to conduct water tests on monthly basis, but, neither any committee has been formed for conducting tests to monitor water quality nor has the state provided the field kits a setting up of a laboratory at Zonal Level.

(Kashmir Monitor, Aug. 11. 2007)

Oct. 2008

Start-up of pilot project in four districts of J&K for field test kit based testing gets kickstarted.

Aug. 2009

Success of Pilot Project propelled the Replication in 10 districts.

May 2010

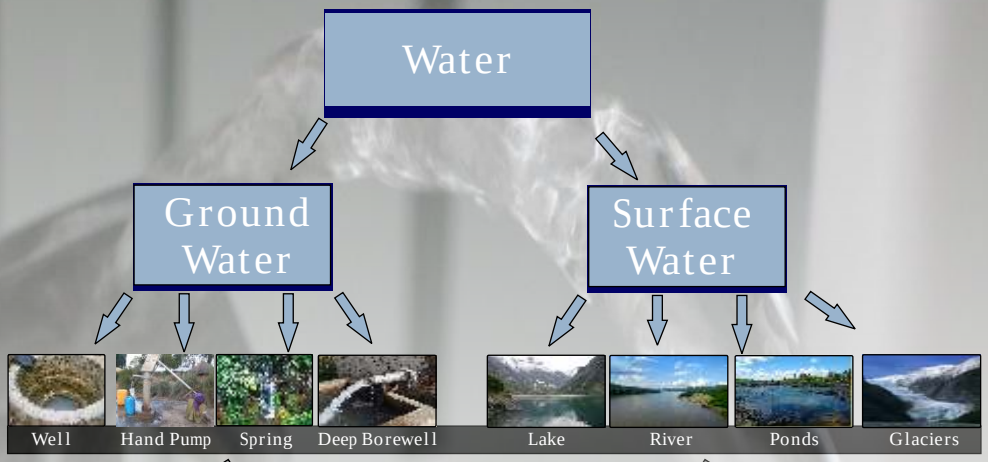
Completion of Replication of Pilot Project Successfully finishes start up Activities of National Rural Drinking Water Quality Monitoring and Surveillance Programme In J&K State In 14 Districts of J&K State. In terms of trained Coordinators and Key Coordinators J&K State holds 10th Rank among all states in India within One and half year of its initiation .Field Test Kit(FTK) based water quality test has been made for 2000 sources in the 14 districts paving the way for further increase in FTK based water testing and Quality Monitoring and Surveillance.

The prevalence of diarrhea in J&K is 32.8% compared to all India prevalence rate of 19.2%. The prevalence rate of diarrhea with blood is 4.1% whereas the all India average is 2.6%.

(State Plan Division, Planning Commission, GOI)

J&K shares 6.76% of the country size (geographical area) 2290 km perennial River length runs

General Way Of Water Contamination



CHEMICAL FERTILIZERS, PESTICIDES
RESTAURANT/HOTEL/HOSPITAL/DOMESTIC WASTE
URINE, FEACAL MATTER,CHEMICALS, OILS, DETERGENTS

Contamination

Some Major & Minor Likely Drinking Water Pollution Sources in J&K

Naturally occurring Rocks, soils and the effects of the geological setting and climate

Industrial sources and human dwellings Mining (extractive industries) and manufacturing and processing industries, sewage, solid wastes, urban runoff.

Agricultural activities Manures, fertilizers, intensive animal practices and pesticides

Water treatment or materials in contact with Coagulants, DBPs, piping materials drinking-water

Pesticides used in water for public health Larvicides used in the control of insect vectors of disease

Cyanobacteria Eutrophic water bodies

THE FOUR ROUTES OF WATER–RELATED INFECTION TRANSMISSION AND THE PREVENTIVE STRATEGIES APPROPRIATE TO EACH ROUTE

Transmission Route	Preventive Measures
Water Borne	•Improve quality of drinking water •Prevent casual use of other unimproved sources
Water Washed	•Increase water quantity used •Improve accessibility and reliability of domestic water supply •Improve hygiene
Water Based	•Contact with infected water need to be decreased •Reduce contamination of surface water by excreta
Water Related Insect Vector	•Improve surface water management •Destroy breeding sites of insects •Decrease need to visit breeding sites •Use mosquito netting

Pathogens Responsible For Different Disease

	Pathogens	Disease
Virus	Polio	Poliomyelitis
	Hepatitis A	Infective Hepatitis
	Rota virus	Diarrhoea
Bacteria	Salmonella typhi	Typhoid
	Vibrio cholerae	Cholera
	Campylobacter jejuni	Diarrhoea / Dysentery
	Yersinia enterocolitica	Diarrhoea / Dysentery
	Shigella	Dysentery
Protozoa	Entamoeba histolytica	Amoebiasis
	Giardia lambia	Giardiasis
Helminthes	Enterobias vermicularis	Thread worm
	Ascaris lumbricoides	Round worm

Drinking Water Quality Standards

Drinking Water Quality Standards In India

ICMR
(Indian Council of Medical Research)

CPHEEO
(Central Public Health Environmental Engineering Organization)

BIS
(Bureau of Indian standards)

World Health Organizations (WHO) Guidelines

Indian Standard Drinking Water Specifications IS 10500 : 1991

S. No	Substance / Characteristics	Requirement (Desirable limit)	Maximum permissible limit (In the absence of alternative source)
1	Colour (Hazen Units)	5	25 (Extended to this limit only if toxic subsatnce are not suspected, in absence of alternate source)
2	Odour	Unobjectionable	Unadjustable
3	Turbidity i.e. measure of clarity (NTU scale)	5	10
4	pH	6.5 to 8.5	No Relaxation
5	Total Hardness as CaCO3 (mg/l)	300	600
6	Iron, as Fe (mg/l)	0.3	1.0
7	Chlorides, as Cl (mg/l)	250	1000
8	Residual Chlorine (mg/l)	0.2	To be applicable only when water is chlorinated. Tested at consumer end. When protection against viral infection is required, it should be min.0.5 mg/lit.
9	Calcium (mg/l)	75	200
10	Nitrate as NO3 (mg/l)	45	No Relaxation
11	Fluoride, as F (mg/l)	1.0	1.5
12	Total alkalinity (mg/l)	200	600
13	Phosphate (mg/lit)	1.0	1.5

Bacteriological Examination

Water tested in accordance with IS 1622:1981 should have the following:

- Throughout any year, 95 % of samples should not contain any Coliform organism in 100 ml.
- No sample should contain E. coli in 100 ml.
- No sample should contain more than 10 coiliform organism per 100 ml.
- Coliform organisms should not be detectable in 100 ml of any two consecutive sample.

Need For Testing Drinking Water

Why Testing Of Drinking Water is Necessary

Effects on Health Of Your Family And Community

When Testing is Necessary?

- Family is having recurrent gastrointestinal illness
- Water is having bad taste
- Water is Hard
- Water appears Coloured, frothy or cloudy
- Water is staining plumbing, fixtures and laundry

When to Test Drinking Water

What if a Water Sample Found Not Conforming To The Required Standards ?

Look out and identify reasons!!!!

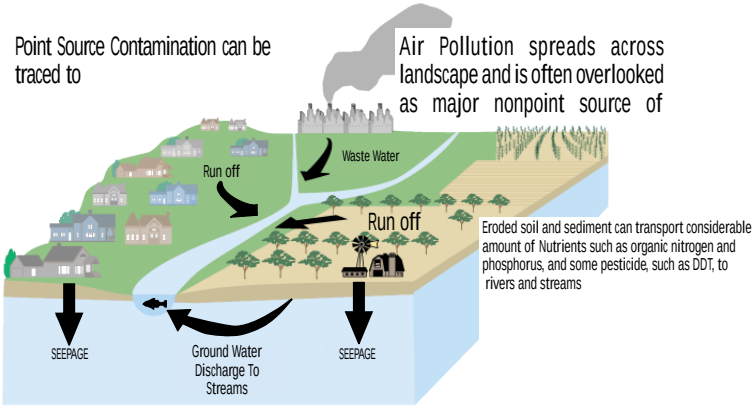
When To Test Your Water For a Specific Test?

Conditions or Nearby Activities	Recommended Test
Recurrent gastro-intestinal illness	Coliform bacteria
Household plumbing	Contains lead pH, lead, copper
Scaly residues, soaps don't lather	Hardness
Water softener needed to treat hardness	Manganese, iron
Stained plumbing fixtures, laundry	Iron, copper, manganese
Objectionable taste or smell	Hydrogen sulfide, Corrosion, Metals
Water appears cloudy, frothy or colored	Color, detergents
Corrosion of pipes, plumbing	Corrosion, pH, lead
Rapid wear of water treatment equipment	pH, corrosion
Nearby areas of intensive agriculture	Nitrate, pesticides, Coliform bacteria
Gas drilling operation nearby	Chloride, sodium, barium, strontium
Salty taste and seawater, or a heavily salted roadway nearby	Chloride, TDS, sodium

Water Quality Monitoring

The drinking water thus should be

- Free from pathogenic (disease causing) organisms
- Clear (i.e. low turbidity, little colour)
- Free from offensive taste or smell
- Free from chemicals that may cause corrosion of water supply system or stain clothes washed in it.
- Free from compounds that may have adverse effects on human health (harmful in the long term)
  ot saline



Objectives of Water Quality Monitoring

- To assess the impact of activities by man upon the quality of water and its suitability for required uses
- To determine the quality of water in its natural state which might be available to meet the future needs
- To keep under observation the sources and pathway of specified hazardous or harmful substances

Sanitary Measures

- Use appropriate way of disposal of solid waste
- Use appropriate place of disposal for solid waste

- Hygiene should be given Importance during food preparation
- Importance of personal hygiene particularly washing one's hands with soap should be strictly followed

- Public drinking water resources should be maintained
- Prevent stagnation/contamination of public drinking water resources

- Appropriate methods of waste water disposal should be adopted
- Appropriate place of waste water disposal should be chosen

- Importance of clean water and environment should be known

- Appropriate disposal of human excreta should be done
- Use of clean utensils for cooking and serving food

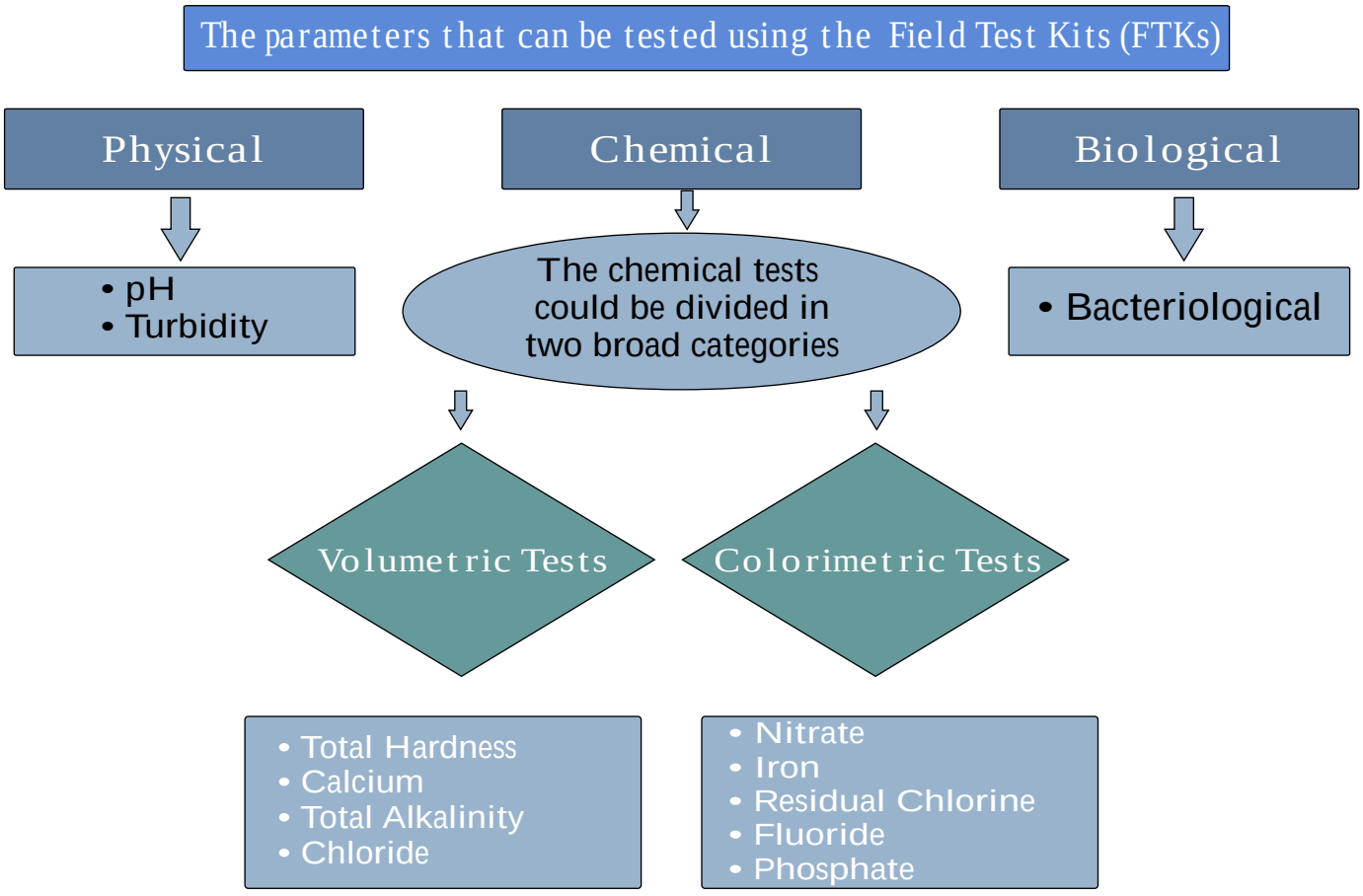
Drinking Water Analysis

Essential Parameters:
The Parameters that are Absolutely necessary to be within the safe permissible limits

- pH
- Turbidity
- Total Hardness
- Iron
- Chloride
- Residual Free Chlorine
- Fluoride

Desirable Parameters:
The parameters that would be useful to be tested to be within the safe permissible limits

- Calcium
- Nitrate
- Total Alkalinity

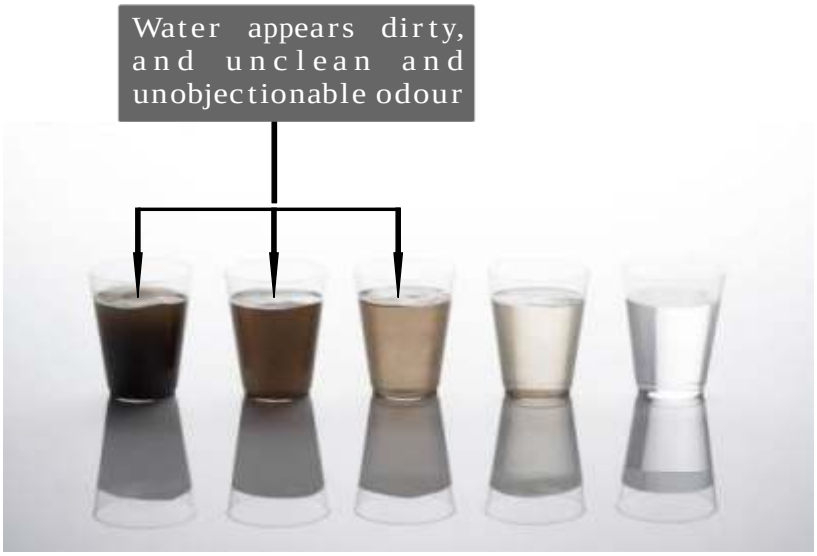


DRINKING WATER ANALYSIS

Physical Parameters

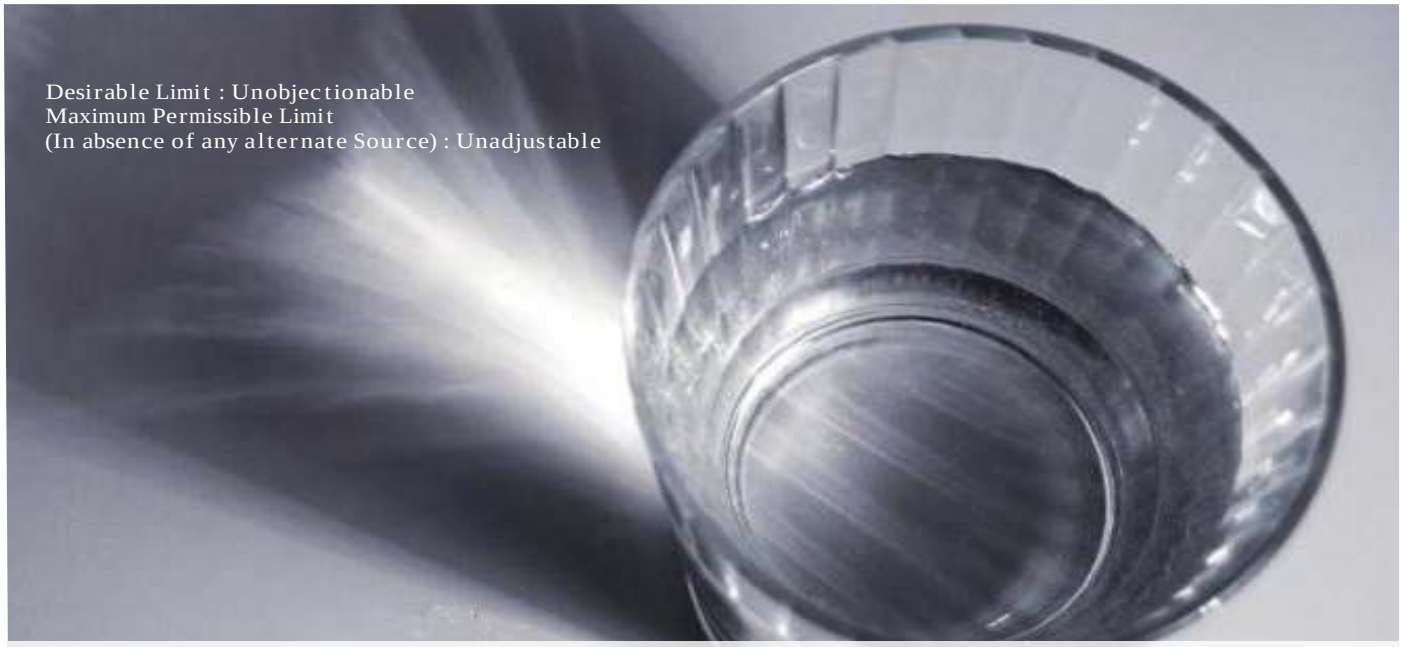
Colour And Odour

Colour The colour characteristic of drinking water can be observed with naked eyes. it should be free from any visible colored impurities



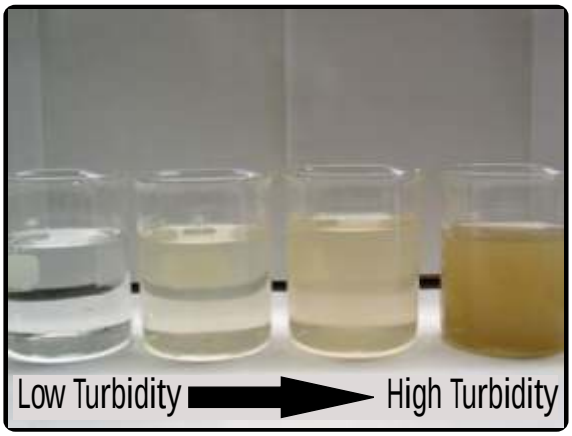
Desirable Limit : 5 Hazen Unit
Maximum Permissible Limit (In absence of any alternate Source) : 25 Hazen Unit

Odour The odour of drinking water can be observed by direct smelling. It should be free from any objectionable odour



Turbidity (NTU) And pH

Turbidity (NTU)



Desirable Limit : 5 NTU
Maximum Permissible Limit
(In absence of any alternate Source) : 25 NTU

Precautions:

- Shake vigorously the turbidity standards provided with the kit before use.
- Do not open standards ampoules.

Required Items:

I. Turbidity standard ampoule (10 & 25 NTU)
ii. Sample bottle (20 ml)
iii. Measuring cylinder

PROCEDURE

i. Take 20 ml sample water in a turbidity sample bottle & cap it.
ii. Shake the turbidity standards ampoules 10 and 25 NTU provided in the kit and keep them near the sample water bottle.
iii. Compare the appearance of water in all three bottles.
iv. Report the turbidity of sample water as
   a. Less than 10 NTU
   b. Between 10 and 25 NTU
   c. More than 25 NTU

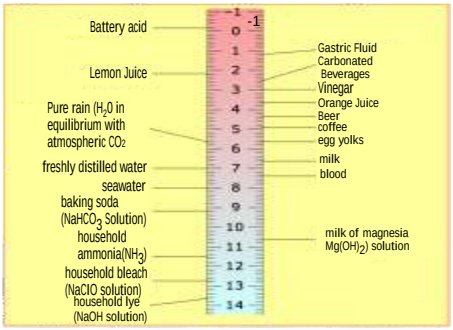
pH

Required Items:

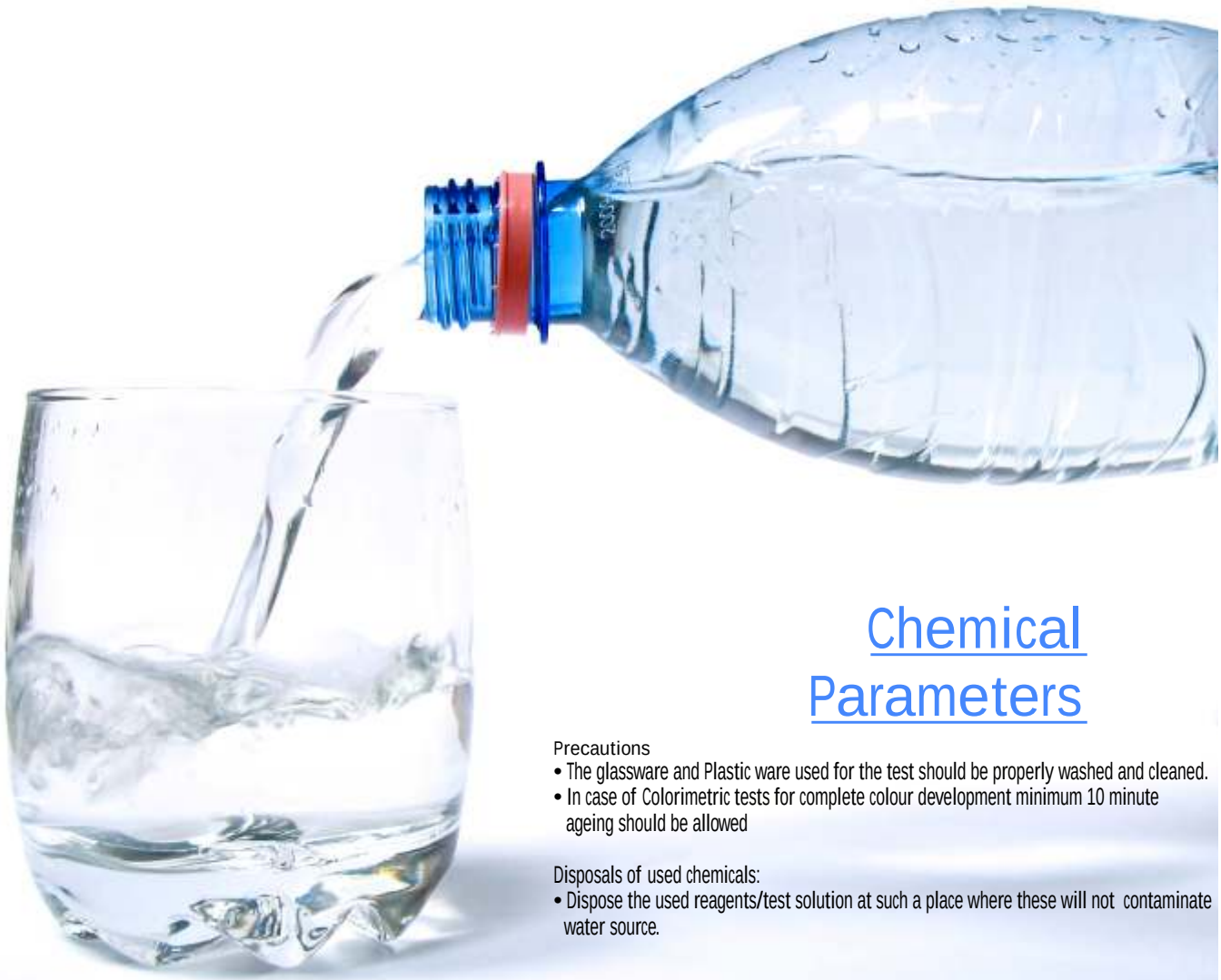
? • Beaker
? • pH Paper strip
• Sample water

Procedure

1. Take sample water in plastic beaker provided with the kit.
2. Take a small piece of pH paper about 1 cm) from pH Strip and dip it in the water taken in the beaker for 5 second and take out. The colour of the dipped portion of paper may change.
3. Compare the changed colour of the wet pH paper with the printed colour strip provided with pH paper booklet. Note the number printed on the matching colour. This will be the pH of a particular sample of water.



Desirable Limit: 6.5-8.5
Maximum Permissible Limit (In absence of any alternate Source) : No Relaxation



Chemical Parameters

Precautions

- The glassware and Plastic ware used for the test should be properly washed and cleaned.
- In case of Colorimetric tests for complete colour development minimum 10 minute ageing should be allowed

Disposals of used chemicals:

- Dispose the used reagents/test solution at such a place where these will not contaminate water source.

Total Hardness And Calcium

Total Hardness

Required Items:

- **Beaker**
- **Measuring cylinder**
- **test tubes**
- **Reagents bottles A,B & C**

Procedure

1. **Take sample water in 100 ml plastic beaker provide with the kit. Take 5 ml of the sample water in a cleaned test tube with the help of a measuring cylinder.**
2. **Add five drops of Hardness Reagent A to it and shake it well. Then, add a few particles of hardness Reagent B. Mix well to dissolve. If the water becomes blue then it indicates there is no hardness in the water. If the colour is wine red. Then it indicates hardness.**
3. **Now drop-wise add Hardness Reagent C, counting the number of drops and shaking after each addition, until the colour changes from wine red to blue. Immediately stop adding reagent C when the change in colour is observed**
4. **Calculate the Total hardness as following.**

   Total Hardness as ppm of $CaCO_3$ = 10 x Number of drops of Hardness reagent C.

5. **Report Total Hardness of the sample water in ppm or mg / litre of $CaCO_3$.**

Safety Measures

1. **The reagent A contains ammonia, Keep away form your nose, do not inhale.**
2. **If any reagent spills on body wash with plenty of water.**

Desirable Limit : 300 mg/lit. Maximum Permissible Limit (In absence of any alternate Source) : 600 mg/lit

Calcium

Required Items:

- Beaker,
- Measuring cylinder,
- test tubes
- Reagents bottles A, B & C

Procedure

1. Take 5ml of the sample water in a cleaned test tube with the help of measuring cylinder.
2. Add 3 drops of Calcium reagent A to it and shake. Then add a few particles of Calcium reagent B. Mix well to dissolve, if the water becomes pink, then it indicate presence of calcium in water.
3. Now, add drop wise calcium reagent C, counting the number of drops added and shaking after each addition, until the colour changes from pink to purple.
4. Stop adding calcium reagent C at the drop when the color of the solution just changes to purple.
5. Calculate the calcium contents as follows:

   Calcium contents of sample water in mg/I or PPM = 4x number of drops of calcium reagent C.

Safety Measures

1. The reagent A contents alkali. Keep away skin. If spills on body wash with plenty of water.

Desirable Limit : 75 mg/lit Maximum Permissible Limit (In absence of any alternate Source) : 200 mg/lit.

Total Alkalinity And Chloride

Total Alkalinity

Required Items:

- Beaker
- Measuring cylinder
- test tubes
- glass rod reagents bottles A & B
- Measuring cylinder

Procedure

1. Take sample water in 100 ml plastic beaker provide with the kit. Take 5ml of the sample water in a cleaned test tube with the help of a measuring cylinder.
2. Add to it two drops of Alkalinity Reagent A and shake well. The solution will turn yellow.
3. Add alkalinity Reagent B to it drop by drop counting the numbers of drops and shaking the test tube after each addition and observing the colour of the solution.
4. Stop adding Alkalinity Reagent B at the drop when the colour of the solution just changes to orange.
5. Calculate the total alkalinity content in ppm of $CaCO_3$.

No. of drops of alkalinity Reagent B x 10 =….. ppm Report Alkalinity concentration present in the sample water in ppm or mg/litre as $CaCO_3$.

Safety Measures:

1. The reagent B contains dilute acid, handle carefully Avoid contact with skin.
2. If spills on body or clothing wash with plenty of water.

Desirable Limit : 200 mg/lit Maximum Permissible Limit (In absence of any alternate Source) : 600 mg/lit.

Chloride

Required Items:

- Beaker test tubes,
- Reagents bottles A & B
- Measuring cylinder.

Procedure

1. Take sample water in plastic beaker provide with the kit. Take 5 ml of the sample water in a cleaned test tube with the help of a measuring cylinder.
2. Add two drops of Chloride Reagent A.
3. Then, add Reagent B drop by drop counting the numbers of drops and shaking the test tube or conical flask after each addition and observing the colour of the solution.
4. Stop adding chloride reagent – B at the drop when the solution just becomes Brick Red.
5. Calculate the Chloride content in ppm as following
   No. of drops of chloride reagent – B x 10 = ….ppm
6. Report Chloride concentration present in the sample water in ppm or mg / litre of chloride.

Safety Measures

1. The reagent B contains silver nitrate. Handle carefully. Avoid contact with skin, clothing & eyes.
2. Silver Nitrate causes blacking of the skin which is not harmful and disappears within 15 days.
3. If spilled on body wash with plenty of water.

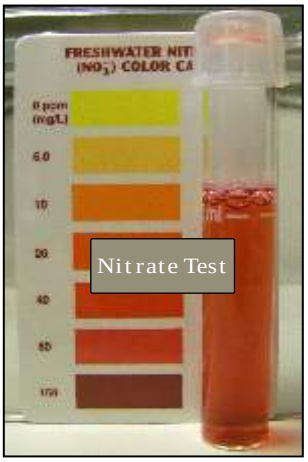
Desirable Limit : 250 mg/lit Maximum Permissible Limit (In absence of any alternate Source) : 1000 mg/lit

Nitrate And Iron

Nitrate

Required Items:

- Beaker
- Nitrate Reagent A (powder)
- Nitrate Reagent B (solution),
- Test tube,
- Dilute hydrochloric acid (HCl).
- Measuring cylinder



Procedure

1. Take 5 ml of the sample in a test tube with the help of a measuring cylinder.

2. Add two drops of dilute hydrochloric acid

3. Add one micro-spoonful of Nitrate Reagent A in to the sample. Dissolve it by the help of glass rod. Wait for 10 minutes.

4. Add six drops of Nitrate Reagent B in to the sample. Shake the content occasionally. Wait for 5 minutes and observe the colour. The solution may become pink or magenta if nitrates are present in water.

5. Compare the colour with standard nitrate colour chart provided with the Field Test Kit. This will be concentration of nitrate in the sample. Express the concentration as NO3 in mg / ltr or ppm.

Safety Measures

1. Handle carefully hydrochloric acid and other reagents.
2. If spilled on body or clothing's, wash with plenty of water.

Desirable Limit : 45 mg/lit | Maximum Permissible Limit (In absence of any alternate Source) : ----

Iron

Required Items:

- Beaker
- Test tubes
- Reagents Bottles A&B
- Measuring cylinder.

Procedure

1. Collect the water sample to be tested in the beaker. Take 5 ml of the sample water in a clean test tube with the help of a measuring cylinder.
2. Add 2 drops of Iron Reagent – A in it and shake it well. Wait for 5 minutes. Then add two drops of iron Reagent – B and again Mix well. Allow it to stand for 10 minutes for maximum colour development.
3. Compare the colour of water with colour chart provided with Field Test Kit (FTK). Note down the reading of the matching colour. This will be the concentration of iron present in the sample water in ppm or mg / ltr.
4. Report iron concentration in sample water in ppm of mg / ltr.

Safety Measures

1. The reagent used in this test are not harmful to skin.
2. If spilled on body, wash with plenty of water.

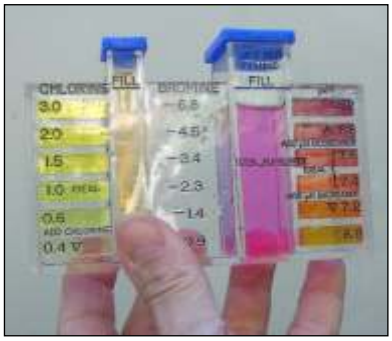
Desirable Limit : 0.3 mg/lit | Maximum Permissible Limit (In absence of any alternate Source) : 1.0 mg/lit.

Residual Chlorine And Fluoride

Residual Chlorine

Required Items:

- Beaker test tubes,
- Glass rod,
- Reagents Bottles
- Measuring cylinder.



Procedure

1. Take sample water in the plastic beaker provided with the kit. Take 5 ml of the sample water in a cleaned test tube with the help of a measuring cylinder.
2. Add 2-3 drops of Residual chlorine Reagent – A and shake. The colour of water will become yellow-green if residual chlorine is present in the sample.
3. Compare the colour with colour chart provided with this manual.
4. Note down the reading of the matched colour. This will be the concentration of Residual chlorine in mg/lit or ppm in the given sample of water.
5. Report Total Residual chlorine water in sample water in ppm or mg/ltr.

Safety Measures

1. The reagent contains dilute acid, avoid contact with skin and eyes.
2. If reagent gets spilled on body wash with plenty of water.

Desirable Limit : 0.2 mg/lit Maximum Permissible Limit (In absence of any alternate Source) : -----

Fluoride

Required Items:

- **Beaker**
- **test tubes**
- **Reagents bottles A**
- **Measuring cylinder**

Procedure

1. Collect the water sample to be tested in the beaker. Take 4 ml sample water in a clean test tube with the help of a measuring cylinder.

2. Add to it 1 ml of fluoride Reagent – A and mix well. Keep it for 5 minutes.

3. Match the colour of the test tube with fluoride colour chart supplied with this manual. Read the Fluoride concentration in mg/litre or ppm as given on the matching colour on the chart.

4. Report Fluoride concentration of the sample water in ppm or mg/litr.

Safety Measures

1. **The reagent contains hydrochloric acid. Handle carefully Avoid contact with skin.**
2. **If spilled on body or clothing wash with plenty of water.**

Desirable Limit : 1.0 mg/lit Maximum Permissible Limit (In absence of any alternate Source) : 1.5 mg/lit.

Phosphate

Required Items:

- Beaker test tubes
- Reagents bottles A & B
- Measuring cylinder

Procedure

1. Collect the water sample to be tested in the beaker. Take 5 ml of the sample water in a test tube with the help of a measuring cylinder.

2. Add one drops of Phosphate Reagent – A in it mix well & wait for 5 minutes. Then add one drop of Phosphate Reagent – B and again Mix well. Allow it to stand for 10 minutes for maximum colour development.

3. Compare the colour of water with Phosphate – P colour chart provided with the Field Test Kit (FTK). Note down the reading of the matching colour. This will be the concentration of Phosphate – P present in the sample water in ppm or mg / ltr.

4. Report Phosphate – P concentration in sample water in ppm or mg/ltr.

Safety Measures

1. The reagent contains acid. Avoid contact with skin clothing and eyes.

Desirable Limit : 1.0 mg/lit Maximum Permissible Limit (In absence of any alternate Source) : 1.5 mg/lit.

Microbiological Test

Required Items:

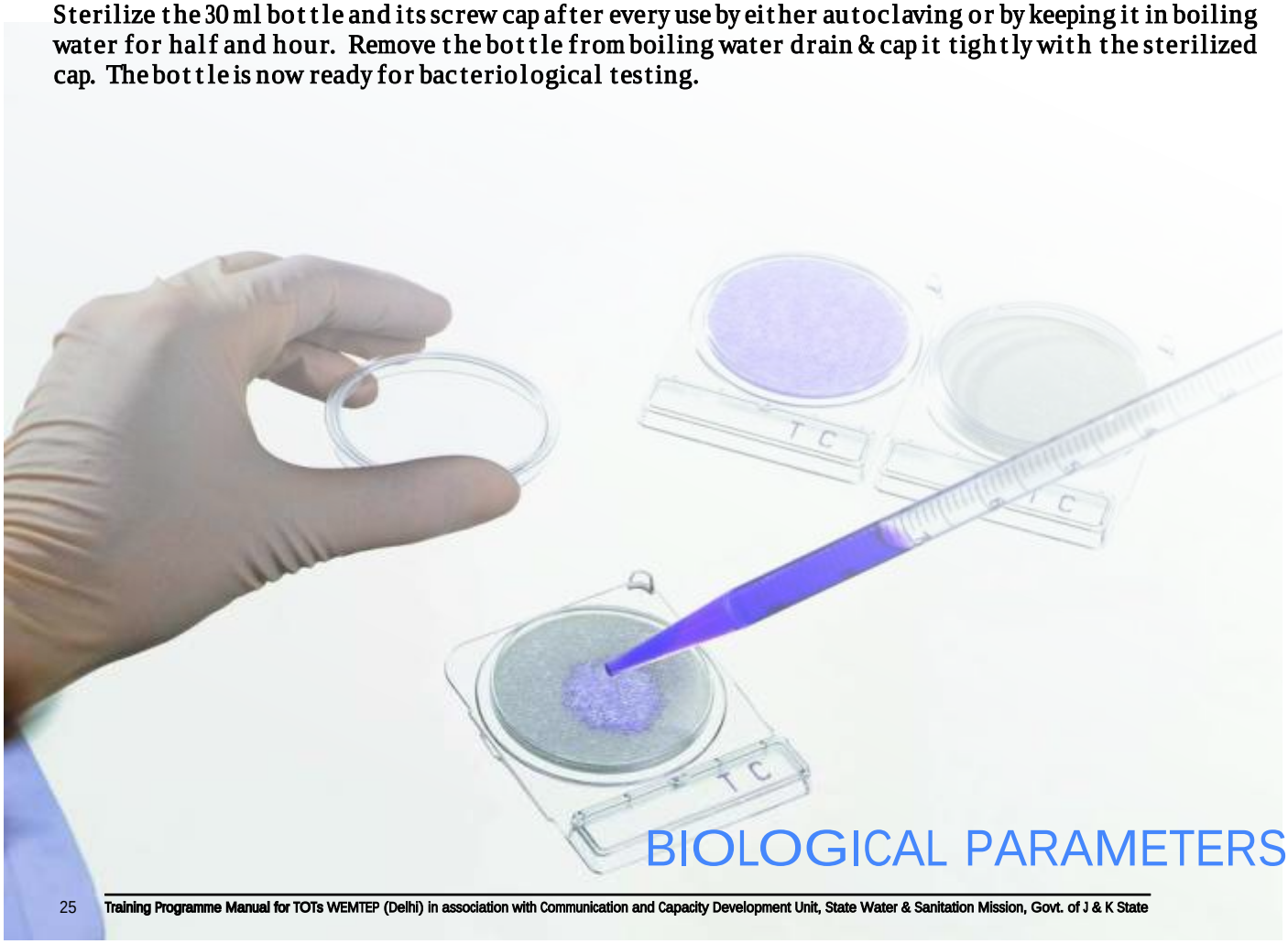
Sterilized Bottle, Sterilized test strip

Procedure

1. Wash hands using soap.
2. Fill 20 ml water to be tested in the sterlized bottle with the help of a strip in it and cap it securely. (The bottle supplied with the kit is pre-sterilized and contains sterilized test for first test). Shake it so that medium soaked in paper strip dissolves in water and solution will become yellow-brown.
3. Keep the bottle in oven at 350C for 24 hours or in pockets close to body so that it will remain at body temperature.
4. Observe the color of water after 24 hours.
5. If the colour remains unchanged, the water is safe for drinking.
6. If the color of water changes to block, it indicates presence of bacteria and is unsafe for drinking.
7. Throw the contents of glass bottle at safe place, wash with plenty of water and again sterilize it for next use.

Note:

Sterilize the 30 ml bottle and its screw cap after every use by either autoclaving or by keeping it in boiling water for half and hour. Remove the bottle from boiling water drain & cap it tightly with the sterilized cap. The bottle is now ready for bacteriological testing.



Microbiological Test (Cont.)

General & Health Effects of Chemical Parameters

Parameter	General & Health Effect
pH	Affects mucous membrane; bitter taste; corrosion; affects aquatic life
Turbidity	Undesirable taste
Calcium	Poor lathering and deterioration of the quality of clothes; incrustation in pipes; scale formation
Fluoride	Dental Fluorosis – Mottling of Teeth; Skeletal Fluorosis – Bone Structure is affected
Nitrate	Methemoglobinemia in infants
Iron	Poor or sometimes bitter taste, color and turbidity; staining of clothes materials; iron bacteria causing slime
Residual Chlorine	Unacceptable taste, color and turbidity (For small duration)
Phosphate	Increases pH of water
Hardness	Poor lathering with soap; deterioration of the quality of clothes; scale forming; skin irritation; boiled food become poor in quality
Chloride	Increases the residual chlorine, in long run may affect the blood circulation
Alkalinity	Boiled rice turns yellowish
Bacteria	Stomach related ailments

The Parameters And Relevant Technologies For Water Treatment

Parameters	TREATMENT/ TECHNOLOGIES
pH	soda ash; white vinegar / citric acid
Turbidity	Sand Filtration; Ion-Exchange ; Oxidation (Through - Chlorine or Potassium Permanganate
Calcium	Boiling; Reverse Osmosis
Fluoride	Activated Alumina; Distillation; Reverse Osmosis; Ion Exchange
Nitrate	Anion Exchange; Distillation; Reverse Osmosis
Iron	Chlorination
Residual Chlorine	Proper Calculation before dosing; Other factors (Temperature, pH Level , Turbidity) should also be considered
Total Hardness	Water Softener Ion Exchanger ; Reverse Osmosis; Zeolites; Lime-Soda Ash Treatment
Chloride	Reverse Osmosis; Distillation; Activated Carbon ; Electro-dialysis
Iron	Ion Exchange Technology; Oxidizing Filter; Green-sand Mechanical Filter; Catalytic filtration; Aeration
Phosphate	Use of Alum; Use of ferric sulphate and ferric chloride
Bacteria	Boiling followed by Filtration; Chlorination

Code for Intervention & Suggestion

Code	Interventions / Suggestions for Drinking Water Problems on Different Parameters
6.A	pH (6.5-8.5) The reason for the high pH of drinking water depends on the type of substances that it comes in contact with. This happens naturally or is sometimes man induced. In case the problem is in ground water the reason is the natural presence of minerals that it absorbs. On the other hard in case of surface water the reason is organic matter, minerals that it comes in contact with, thus if the problem persist in successive tests the reason should be worked out and only then a remedial action can be Planned.
6.B	Turbidity (5-10,NTU) The main cause of turbidity is the re-suspension of sediments due to the presence of inorganic particulate matter. Water with turbidity of less than 10 NTU is usually acceptable consumers thus; turbidity higher than this needs proper treatment. These include proper filtration, boiling of such water before consumption.
6.C	Calcium (75-100, mg/lit) The high amounts of calcium in the drinking water source are the natural presence of lime, gypsum, hypochlorite, calcium chloride in the rocks. The intervention suggested is boiling of water before consumption that causes excess of calcium to settle down.
6.D	Fluoride (1.0-1.5, mg/lit) The high amounts of fluoride in the drinking water were mainly due to the natural presence of it in the rocks and minerals. As it is highly toxic and harmful, the water source showing its presence should be immediately closed. Suggested treatment: Reverse osmosis, Distillation Chlorination. Another man-made reason be the presence of any industry that is manufacturing and using phosphate fertilizer. Thus, if the reason, the sewage of such industry should be checked from the entering in the source of drinking water (both ground as well as surface) in case there is no alternate source of water the technique suggested is defluoridation that includes treatment with phosphate to reduce fluoride to optimum levels.
6.E	Nitrate (45-100, mg/lit) If the amount of nitrate is exceeding the safe permissible limit the reason behind in the contamination of water source by organic nitrogenous substances that come in sewage and industrial waste the domestic sewage is high in nitrate due to the decayed plant material and animal matter. Nitrate coming from agricultural leachate is also cause of the major cause contaminating the drinking water sources. It could be controlled if the sewage is contaminating the supply water due to leakage at certain point it should be checked moreover the natural addition of nitrate from agricultural run-off should also be checked.

Code for Intervention & Suggestion(Cont.)

Code	Interventions / Suggestions for Drinking Water Problems on Different Parameters
6.F	Iron (0.3-1.0, mg/lit) The presence of Iron in the source were due to the rusting of supply pipes. Thus the content should be checked at the point of source as at the point of use. Another reason could be the natural presence of iron ores in the rocks like Hemetatite, and magnetite, Limonite and Iron pyrite. If this is the reason the source of supply be closed. Suggested treatment include the use of oxidizing filters and chlorination AC filters.
6.G	Residual Chlorine (0.2-, mg/lit) The result obtained must be temporary and in case the problem persists in successive test also the source of contamination should be worked out and thus remedial measured were suggested. The simplest way to reduce the high residual chlorine content is to reduce the amount of chlorine that added as part of treatment. At the point of use it could be removed by boiling water before consumption.
6.H	Phosphate (1.0-1.5, mg/lit) The high amount of phosphate were due to various reasons including – fertilizers, human and animal waste, detergent etc. Thus, if the source is being contaminated with these wastes, the source of contamination should be checked. Even then if the problem continues to persist the reason could the rocks that are naturally high in Phosphate.
6.I	Total Hardness (300-600, mg/lit) The Total Hardness of water is mainly of two types:- Permanent and Temporary. The permanent Total Hardness is due to the presence of salt of calcium sulphate and magnesium sulphate. If cold be treated by addition of sodium carbonates and Base Exchange process. On the other hard the temporary Total Hardness is due to the presence of calcium bicarbonates and (water softeners) bicarbonates and magnesium. It were treated by boiling addition of lime addition of sodium carbonate and per mutit process.
6.J	Chloride (250-1000, mg/lit) The high amount of chloride in drinking water could be due to reasons: - Natural as well as anthropogenic. The natural reasons included the presence of rocks that have high chloride content. The anthropologic sources includes sewage discharge irrigation drainage and contamination from refuse leachates. The main remedial action suggested should include the control addition of irrigation drainage in the water bodies bothground as well as surface. Suggested treatment: would include Reverse osmosis and distillation
6.K	Total Alkalinity (200-600, mg/lit) The presence of high total alkalinity is basically due to the presence of alkaline minerals. Suggested Treatment: Use soda Ash to reduce alkalinity.
6.L	Bacteriological (MPN) If the water sample shows the presence of bacteria, the intervention suggested is boiling of water before consumption. Addition of chlorine (chlorination), iodine, potassium permanganate and bleaching of the water before consumption. For large scale treatment use of membrane – filtration technique is recommended.

Sampling Methods

Since water quality study includes the estimation of physical ,chemical and biological parameters ,however for the correct and appropriate estimation of such parameters ,proper method of sampling and purity of the chemicals used in the analysis are equally important .As such accurate assessment of the concentration of pollutants present in water primarily depends upon the sampling method involved. For that reason special care is needed during water sampling for the analysis of all parameters.

The samples are generally of three-types.

A) Grab samples are those samples which are drawn from a fixed point .such samples reflect the existing physic-chemical condition in the system with respect to the time of the withdrawal of the sample.

b) Composite samples are those which are collected from various parts of the same system for examination, over a fairly extended period. Such samples reveal the overall characteristic but do not reflect the anoxic condition .

c) Diurnal samples are those which are drawn in the grab manner from the fixed sampling sites at regular time intervals in a single day.

METHODS OF WATER SAMPLING :-

The method of water sampling mainly depends on the nature of analysis to be carried out . Analysis may be broadly divided into physic-chemical, bacteriological and biological categories. The biological analysis includes the identification and quantitative estimation of Physico and Zoo plankton, benthos and other biota generally found in the aquatic ecosystem.

I. Water samples for chemical analysis.

The water samples are collected from a depth of 0.5m in case from open water bodies and in case of piped water supply system, from a tap, in thoroughly cleaned jar or natural glass containers of minimum 2.5 liters capacity , provided with double cap device. The samples are collected upto the top, without leaving any space so as to prevent the premature release of dissolved gases during the transit period.

ii. Water samples of bacteriological analysis.

The water samples are collected from 30 cm depth in case of open water bodies and for a public hydrant after sterilizing the tap for a few minutes with the help of a sprit lamp, prior to taking the samples from the same in properly sterilized neutral glass. Bottles of s120ml.capacity. To each of these sampling bottles, 0.1 ml of 30 percent sodium thiosulphate solution is added prior to subjecting it to the process of sterilization .The sample of water should not be collected upto the top. On the contrary, Some space must be left for the bacteria to survive. The collected water samples are brought to the laboratory from the field in the packed sampling box and the analysis should be taken up positively within 24 hours of collection.

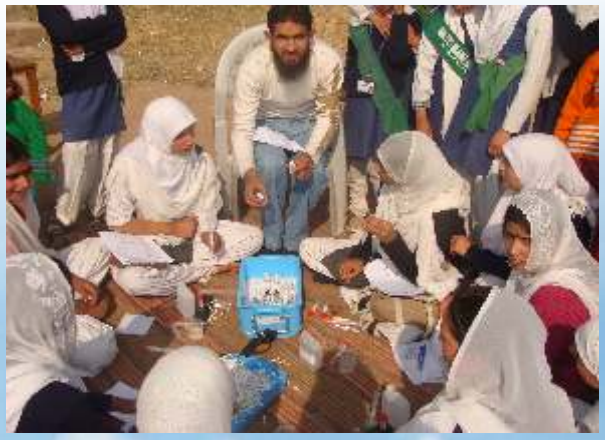
Water ArithMetic

S. No.		FRESH WATER	SALTWATER			
01	Total Water(%)	2.5	97.5			
		Ground Water	Iced and Permanent Snow Covers	Rivers and Lake Surface Water)	Permanent Frost	
02	Distribution of fresh water(%)	30.7	68.7	0.02	0.34	
02(a)	fresh water from total water(%)	0.77	1.71	0.0005	0.0085	
		Rivers	Lakes	Water within Living Organisms	Atmospheric Water Vapour	Soil Moisture
03	Distribution of Easily Acessible Surface water(%)	1	52	1	8	38
		Land	Population	Livestock	Water Resources	
04	India's Status in the World	2.4	16	20	4	

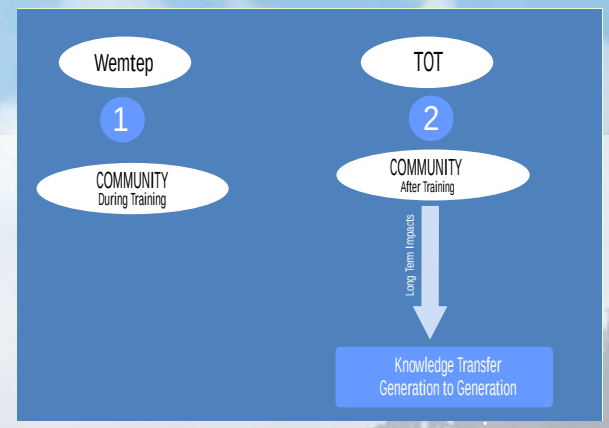
Source: - World water vision report extract in the article of "Standards In The Changing Global Water Management Landscape"

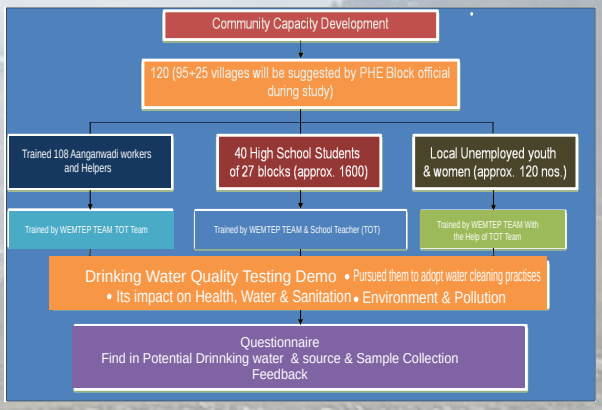
Our Achievements During the Program in J&K State

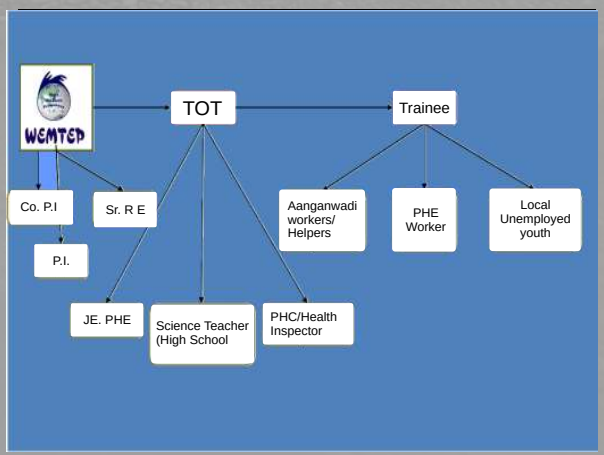
In 9 District out of 12 District Selected of total 22 district in J&K State



1. Trainings conducted at State Level: -
2. Trainings conducted at District Level: 77
3. Trainings conducted at Block Level: 56
4. Trainings conducted at Grassroots Level: 960
5. Trainings to District Level Officers: 11
6. Trainings to Block Level Officers: 245
7. Trainings to grassroot workers: 18,947
8. Total Trained persons in 14 districts: 20296
9. Distribution of Demo Kits: -
10. Distribution of Bacteriological Kits: -
11. No. of total tested sources: 3216
12. Four categorization of drinking water sources, first ever in the country have been developed: Not fit for drinking water sources (NFDWS), Potential Dangerous Drinking Water sources (PDDWS), Dangerous Drinking Water Sources (DDWS) and Safe Drinking Water Sources (SDWS).
13. Out of 3216 tested drinking water sources, Some drinking water sources have been found under NFDWS. Some of these have been banned and some were rectified with the help of PHED officials.
14. For effective assistance to the community, a helpline no. 0194-2484730







Our Mission and Purpose

Care More For Water...

"Will" Extraordinary Makes The Earth Prosperous

CCDU
J & K State

Communication and Capacity Developement Unit
State Water & Sanitation Mission
Govt. of J&K

In Association with

WEMTEP
Improvement in Continuum...

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