Clause 2.2.9 Quality Standards

The objective of Water Works Management is to ensure that the water supplied is free from pathogenic organisms, clear, palatable and free from undesirable taste and odour, of reasonable temperature, neither corrosive nor scale forming and free from minerals which could produce undesirable physiological effects. The establishment of minimum standards of quality for public water supply is of fundamental importance in achieving this objective. Standards of quality form the yardstick within which the quality control of any public water supply has to be assessed.

Sanitary inspections are intended to provide a range of information and to locate potential problems. The inspections allow for an overall appraisal of many factors associated with a water supply system, including the water works and the distribution system. Moreover such an appraisal may later be verified and confirmed by microbiological analysis, which will indicate the severity of the problem. Sanitary inspections thus provide a direct method of pinpointing possible problems and sources of contamination. They are also important in the prevention and control of potentially hazardous conditions, including epidemics of water borne diseases. The data obtained may identify failures, anomalies, operator errors and any deviations from normal that may affect the production and distribution of safe drinking water. When the inspections are properly carried out at appropriate regular intervals and where the inspector has the knowledge necessary to detect problems and suggest technical solutions, the production of good quality water is ensured.

The evolution of standards for the quality control of public water supplies has to take into account the limitations imposed by local factors in the several regions of the country. The Environmental Hygiene committee (1949) recommended that the objective of a public water supply should be to supply water "that is absolutely free from risks of transmitting diseases, is pleasing to the senses and is suitable for culinary and laundering purposes" and added that "freedom from risks is comparatively more important than physical appearance or hardness" and that safety is an obligatory standard and physical and chemical qualities are optional within a range. These observations are relevant in the development of a country-wide programs of protected water supply systems for communities big and small, making use of the available water resources in the different regions, with a wide variation in their physical, chemical and aesthetic qualities, that can be achieved by communities in due course within the limits of their financial resources. The Immediate need is for minimum standards consistent with the safety of public water supplies. Considering the standards prescribed in the earlier Manual and further development in the international standardization and the conditions in the country, the following guidelines are recommended.

Physical and Chemical Quality of Drinking Water

Sl. No.	Characteristics	*Acceptable	**Cause for Rejection
1	Turbidity (NTU)	1	10
2	Color Units on Platimum Cobalt scale)	5	25
3	Taste and Odour	unobjectionable	Objectionable
4	pH	7.0-8.5	<6.5 or >9.2
5	Total Dissolved solids (mg/l)	500	2000
6	Total Hardness (as CaC3) (mg/l)	200	600
7	Chlorides (as Cl) (mg/l)	200	1000
8	Sulphates (asSO4) (mg/l)	200	400
9	Fluorides (as F) (mg/l)	1	1.5
10	Nitrates (as NO3) (mg/l)	45	45
11	Calcium (as Ca) (mg/l)	75	200
12	Magnesium (as Mg) (mg/l)	<=30	150
If there are 250 mg/l of sulphates, Mg content can be increased to a maximum of 125 mg/l with the reduction of sulpnates at the rate of 1 unit per every 2.5 units of sulpates			
13	Iron (as Fe) (mg/l)	0.1	1
14	Manganese (as Mn) (mg/l)	0.05	0.5
15	Copper (as Cu) (mg/l)	0.05	1.5
16	aluminium (as Al)(mg/l)	0.03	0.2
17	Alkalinity (mg/l)	200	600
18	Residual Chlorine (mg/l)	0.2	>1.0
19	Zinc (as Zn) (mg/l)	5	15
20	Phenolic compounds (as Phenol) (mg/l)	0.001	0.002
21	Anionic Detergents (mg/l) (as MBAS)	0.2	1
22	Mineral Oil (mg/l)	0.01	0.03
TOXIC MATERIALS			
23	Arsenic (as As) (mg/l)	0.01	0.05
24	Cadmium (as Cd) (mg/l)	0.01	0.01
25	Chromium (as hexavalent Cr)(mg/l)	0.05	0.05
26	Cyanides (as Cd) (mg/l)	0.05	0.05
27	Lead (as pb) (mg/l)	0.05	0.05
28	Selenium (as Se) (mg/l)	0.01	0.01
29	Mercury (total as Hg) (mg/l	0.001	0.001
30	Polynuclear aromatic hydrocabons ((PAH)(µg/l)	0.2	0.2
31	Pesticides (Total, mg/l)	Absent	Refer to WHO guidelines for drinking water quality vol I - 1993
RADIO ACTIVITY+			
32	Gross Alpha activity (Bq/l)	0.1	0.1
33	Gross Beta activity (Bq/l)	1	1

Notes:

* The figures indicated under the column 'Acceptable' are the limits upto which water is generally acceptable to the consumers.

** Figures in excess of those mentioned under 'Acceptable' render the water not acceptable, but still may be tolerated in the absence of an alternative and better source but upto the limits indicated under column "Cause for Rejection" above which the sources will have to be rejected.

+ It is possible that some mine and spring waters may exceed these radio activity limits and in such cases it is necessary to analyze the individual radio-nuclides in order to assess the acceptability or otherwise for public consumption.

Bacteriological Guidelines

Table 2.3 recommended guidelines for Bacteriological quality

Organisms	Guideline value
All water intended for drinking	
Ecoli or thermotolerant coliform bacteria[b,c]	Must not be detectable in any 100-ml sample
Treated water entering the distribution system	
Ecoli or thermotolerant coliform bacteria[b]	Must not be detectable in any 100-ml sample
Total coliform bacteria	Must not be detectable in any 100-ml sample
Treated water in the distribution system	
Ecoli or thermotolerant coliform bacteria[b]	Must not be detectable in any 100-ml sample
Total coliform bacteria	Must not be detectable in any 100-ml sample. In case of large supplies, where sufficient samples are examined, must not be present in 95% of samples taken throughout any 12 month period.

b Although E.coli is the more precise indicator of faecal pollution, the count of thermo tolerant coliform bacteria is an acceptable alternative. If necessary, proper confirmatory test must be carried out. Total coliform bacteria are not acceptable indicator of the sanitary quality of rural water supplies, particularly in tropical areas where many bacteria of no sanitary significance occur in almost all untreated supplies.

c It is recognized that, in the great majority of rural water supplies in developing countries, faecal contamination is widespread. Under these conditions, the national surveillance agency should set medium term targets for progressive improvement of water supplies, as recommended in volume 3 of WHO guidelines for drinking water quality 1993.

Virological Quality

Drinking water must essentially be free of human enteroviruses to ensure negligible risk of transmitting viral infection. Any drinking-water supply subject to faecal contamination presents a risk of a viral disease to consumers. Two approaches can be used to ensure that the risk of viral infection is kept to a minimum: providing drinking water from a source verified free of faecal contamination, or adequately treating faecally contaminated water to reduce enteroviruses to a negligible level.

virological studies have shown that drinking water treatment can considerably reduce the levels of viruses but may not eliminate them completely from very large volumes of water. Virological, epidemiological, and risk analysis are providing important information, although it is still insufficient for deriving quantitative and direct virological criteria. Such criteria can not be recommended for routine use because of the cost, complexity, and lengthy nature of virological analysis, and the ract that they can-not detect the most relevant viruses.

The guideline criteria shown in table 2.4 are based upon the likely viral content of source waters and the degree of treatment necessary to ensure that even very large volumes of drinking water have negligible risk of containing viruses.

Ground water obtained from a protected source and documented to be free from faecal contamination from its zone of influence, the well, pumps, and delivery system can be assumed to be virus-free However, when such water is distributed, it is desirable that it is disinfected, and that a residual level of disinfectant is maintained in the distribution system to guard against contamination.

Table 2.4 Recommended Treatment for different water sources to produce water with negligible virus RIS

Type of Source	Recommended Treatment
Ground water	
Protected, deep wells; essentially free of faecal contamination	Disinfection[b]
Unprotected, shallow wells; faecally contaminated	Filtration and disinfection
Surface water	
Protected, impounded upland water; essentially free of faecal contamination	Disinfection
Unprotected impounded water or upland river; faecal contamination	Filtration and disinfection
Unprotected lowland rivers; faecal contamination	Pre-disinfection or storage, filtration, disinfection
Unprotected watershed; heavy faecal contamination	Pre-disinfection or storage, filtration, additional treatment and disinfection
Unprotected watershed; gross faecal contamination	Not recommended for drinking water supply

[b] Disinfection should be used if monitoring has shown the presence of E.coli or thermotolerant colirorm bacteria.

Table 15.1 Minimum sampling frequency and number from distribution system

Population Served	Maximum Intervals between successive sampling	Minimum No. of samples to be taken from entire distribution system
Upto 20,000	one Month	One sample per 5,000 of population per moth
20,000-50,000	two weeks	
50,001-100,000	four days	
More than 100,000	One day	One sample per 10,000 of population per month.