# Tolerance and Classification

As per ISI-IS: 2296-1982, the tolerance limits of parameters are specified as per classified use of water (Table 1,2,3,4,5 below) depending on various uses of water. The following classifications have been adopted in India.

## Class of Water

| Classification | Type of use |
|---|---|
| Class A | Drinking water source without conventional treatment but after disinfection |
| Class B | Outdoor bathing |
| Class C | Drinking water source with conventional treatment followed by disinfection. |
| Class D | Fish culture and wild life propagation |
| Class E | Irrigation, industrial cooling or controlled waste disposal |

# TOLERANCE LIMITS

## TABLE-1: TOLERANCE LIMITS FOR INLAND SURFACE WATERS, CLASS – A

| S. No. | Characteristic | Tolerance |
|---|---|---|
| (1) | (2) | (3) |
| (i) | pH | 6.5 to 8.5 |
| (ii) | Dissolved Oxygen, mg/l, | 6.0 |
| (iii) | Bio-chemical Oxygen Demand | 2.0 |
| (iv) | Total Coliform Organisms, MPN/100 ml, Max | 50 |
| (v) | Colour, Hazen units, Max | 10 |
| (vi) | Odour | unobjectionable |
| (vii) | Taste | Agreeable taste |
| (viii) | Total Dissolved Solids, mg/l, Max | 500 |
| (ix) | Total Hardness (as $CaCO_3$), mg/l ,Max | 300 |
| (x) | Calcium Hardness (as $CaCO_3$), mg/l, Max | 200 |
| (xi) | Magnesium (as $CaCO_3$), mg/1,Max | 100 |
| (xii) | Copper (as Cu), mg/l, Max | 1.5 |
| (xiii) | Iron (as Fe), mg/l,Max | 0.3 |
| (xiv) | Manganese (as Mn), mg/1,Max | 0.5 |
| (xv) | Chlorides (as Cl), mg/l,Max | 250 |
| (xvi) | Sulphate (as $SO_4$), mg/l ,Max | 400 |
| (xvii) | Nitrates (as $NO_2$), mg/1,Max | 20 |
| (xviii) | Fluorides (as F,) mg/l,Max | 1.5 |
| (xix) | Phenolic compounds(as $C_6H_5OH$), mg/l,Max | 0.002 |
| (xx) | Mercury (as Hg), mg/l ,Max | 0.001 |
| (xxi) | Cadmium (as Cd), mg/1,Max | 0.01 |
| (xxii) | Selenium (as Se), mg/l ,Max | 0.01 |
| (xxiii) | Arsenic (as As), mg/1,Max | 0.05 |
| (xxiv) | Cyanides (as CN), mg/l, Max | 0.05 |
| (xxv) | Lead (as Pb), mg/l, Max | 0.1 |
| (xxvi) | Zinc (as Zn), mg/l, Max | 15 |
| (xxvii) | Chromium (as$Cr^{6+}$ ), mg/l,Max | 0.05 |
| (xxviii) | Anionic detergents, (as MBAS), mg/l ,Max . | 0.2 |
| (xxix) | Poly-nuclear aromatic hydrocarbons (PAH), | 0.2 |
| (xxx) | Mineral oil, mg/l ,Max | 0.01 |
| (xxxi) | Barium (as Ba), mg/l ,Max | 1.0 |
| (xxxii) | Silver (as Ag), mg/l Max | 0.05 |
| (xxxiii) | Pesticides | Absent |
| (xxxiv) | Alpha emitters, µc/ml, Max | $10^{-9}$ |
| (xxxv) | Beta emitters, µc/ml, Max | $10^{-8}$ |

## TABLE- 2: TOLERANCE LIMITS FOR INLAND SURFACE WATERS, CLASS – B

| S. No. | Characteristic | Tolerance Limit |
|---|---|---|
| **(1)** | **(2)** | **(3)** |
| (i) | pH Value | 6.5 to 8.5 |
| (ii) | Dissolved Oxygen, mg/1,Max | 5.0 |
| (iii) | Biochemical Oxygen Demand (5 days at 20 °C), Max | 3.0 |
| (iv) | Total Coliform Organisms, MPN/100 ml, Max | 500 |
| (v) | Fluorides (as F)<mg/l, Max | 1.5 |
| (vi) | Colour, Hazen units, Max | 300 |
| (vii) | Cyanides (as CN), mg/l, Max | 0.05 |
| (viii) | Arsenic (as As), mg/l, Max | 0.2 |
| (ix) | Phenolic Compounds (as $C_6H_5OH$) mg/l, Max | 0.005 |
| (x) | Chromium (as $Cr^{6+}$), mg/l, Max | 1.0 |
| (xi) | Anionic detergents (as MBAS), mg/l, Max | 1.0 |
| (xii) | Alpha emitters, µc/ml, Max | $10^{-8}$ |

## TABLE - 3: TOLERANCE LIMITS FOR INLAND SURFACE WATERS, CLASS – C

| S.No. | Characteristic | Tolerance Limit |
|---|---|---|
| (1) | (2) | (3) |
| (i) | pH Value | 6.5 to 8.5 |
| (ii) | Dissolved Oxygen, mg/l Minimum | 4.0 |
| (iii) | Biochemical Oxygen Demand | 3.0 |
| (iv) | Total coliform organisms, MPN/100 ml, Max | 5000 |
| (v) | Colour, Hazen units, Max | 300 |
| (vi) | Fluorides (as F), mg/l ,Max | 1.5 |
| (vii) | Cadmium (as Cd), mg/l, Max | 0.01 |
| (viii) | Chlorides (as Cl), mg/l, Max | 600 |
| (ix) | Chromium (as $Cr^{6+}$), mg/l, Max | 0.05 |
| (x) | Cyanides (as CN), mg/l, Max | 0.05 |
| (xi) | Total Dissolved Solids, mg/l, Max | 1500 |
| (xii) | Selenium (as Se), mg/l, Max | 0.05 |
| (xiii) | Sulphates (as $SO_4$), mg/l, Max | 400 |
| (xiv) | Lead (as Pb), mg/l, Max | 0.1 |
| (xv) | Copper (as Cu),mg/l,Max | 1.5 |
| (xvi) | Arsenic (as As), mg/l, Max | 0.2 |
| (xvii) | Iron (as Fe), mg/l, Max | 50 |
| (xviii) | Phenolic compounds (as $C_6H_5OH$), mg/l, Max | 0.005 |
| (xix) | Zinc (as Zn), mg/l, Max | 15 |
| (xx) | Insecticides, mg/l, Max | Absent |
| (xxi) | Anionic detergents (as MBAS), mg/l, Max | 1.0 |
| (xxii) | Oils and grease, mg/l, Max | 0.1 |
| (xxiii) | Nitrates (as $NO_3$), mg/1,Max | 50 |
| (xxiv) | Alpha emititers, µc/mg, Max | $10^{-9}$ |
| (xxv) | Beta emitters, µc/ml, Max | $10^{-8}$ |

**TABLE- 4: TEOLERANCE LIMITS FOR INLAND SURFACE WATERS, CALSS – D**

| S.No. | Characteristic | Tolerance Limit |
|---|---|---|
| **(1)** | **(2)** | **(3)** |
| (i) | pH value | 6.5 to 8.5 |
| (ii) | Dissolved Oxygen, mg/l, Min. | 4.0 |
| (iii) | Free Ammonia (as N), mg/l, Max. | 1.2 |
| (iv) | Electrical Conductance at 25 °C, µS, Max | 1000 |
| (v) | Free Carbon Dioxide (as $C0_2$),mg/1, Max | 6.0 |
| (vi) | Oils and Grease, mg/l, Max | 0.1 |
| (vii) | Alpha emitters, µc/ml, Max | $10^{-9}$ |
| (viii) | Beta emitters, µc/ml, Max | $10^{-8}$ |

## TABLE- 5: TOLERANCE LIMITS FOR INLAND SURFACE WATERS, CLASS – E

| S.No. | Characteristic | Tolerance Limit |
|---|---|---|
| **(1)** | **(2)** | **(3)** |
| (i) | pH value | 6.0 to 8.5 |
| (ii) | Electrical Conductance at 25°C, µS, Max | 2250 |
| (iii) | Sodium Adsorption Ratio, Max | 26 |
| (iv) | Boron (as B), mg/l, Max | 2.0 |
| (v) | Total Dissolved Solids, (inorganic), mg/l, Max | 2100 |
| (vi) | Sulphates (as $SO_4$), mg/l, Max | 1000 |
| (vii) | Chlorides (as Cl), Mg/l, Max | 600 |
| (viii) | Sodium Percentage, Max | 60 |
| (ix) | Alpha emitters, µc/ml, Max | $10^{-9}$ |
| (x) | Beta emitters, µc/ml, Max | $10^{-8}$ |

# TEST CHARACTERSTICS FOR DRINKING WATERS

## IS — 10500:1991 (Amended)

| S. No. | Substance Characteristic | Require-ment* | Undesirable effect outside the desirable limit | Permissible Limit** |
|---|---|---|---|---|
| **A** | **Essential Characteristics** | | | |
| 1. | Colour, Hazen units, Max | 5.0 | Above 5.0, consumer acceptance decreases | 25 |
| 2. | Odour | Unobject-ionable | - | - |
| 3. | Taste | Agreeable | - | - |
| 4. | Turbidity, NTU, Max | 5.0 | Above 5.0, consumer acceptance decreases | 10 |
| 5. | pH Value | 6.5 To 8.5 | Beyond this range the water will effect the mucous membrane and/or water supply system | No relaxation |
| 6. | Total Hardness, (as $CaCO_3$) mg/l, Max. | 300 | Encrustations in water supply structure and adverse effect on domestic use | 600 |
| 7. | Iron (as Fe), mg/l, Max | 0. 3 | Beyond this limit taste/appearance are affected, has adverse affect on domestic uses and water supply structures, and promotes iron bacteria | 1.0 |
| 8. | Chlorides (as Cl), mg/l, Max | 250 | Beyond this limit taste, corrosion and palatability are affected | 1000 |
| 9. | Residual free Chlorine, mg/l, Minimum | 0.2 | - | - |
| **B** | **Desirable Characteristics** | | | |
| 10. | Dissolved Solids, mg/l, Max | 500 | Beyond this palatability decreases and may cause Gastro intestinal irritation | 2000 |
| 11 | Calcium (as Ca) mg/l, Max. | 75 | Encrustations in water supply structure and adverse effect on domestic use | 200 |
| 12. | Magnesium (as Mg) mg/l, Max | 30 | Encrustations in water supply structure and adverse effect on domestic use | 100 |
| 13. | Copper (as Cu), mg/l, Max | 0.5 | Astringent taste, discoloration and corrosion of pipes, fitting and utensils will be caused beyond this | 1.5 |
| 14. | Manganese (as Mn) mg/l, Max | 0.1 | Beyond this limit, taste/appearance are affected, has adverse effect on domestic use and water supply structure. | 0.3 |

| | | | | |
|---|---|---|---|---|
| 15. | Sulphates (as $SO_4$), mg/l, Max | 200 | Beyond this causes Gastro intestinal irritation when magnesium or sodium are present | 400 |
| 16. | Nitrate (as $NO_3$) mg/l, Max. | 45 | Beyond this methaemoglobinemia takes place. | 100 |
| 17. | Fluorides (as F), mg/l, Max | 1.0 | Fluoride may be kept as low as possible. High fluoride may cause fluorosis | 1.5 |
| 18 | Phenolic compounds (as $C_6H_5OH$), mg/l, Max | 0.001 | Beyond this, it may cause objectionable taste and odour | 0.002 |
| 19. | Mercury (as Hg), mg/l, Max | 0.001 | Beyond this, the water becomes toxic | No relaxation |
| 20. | Cadmium (as Cd), mg/l, Max | 0.01 | Beyond this, the water becomes toxic | No relaxation |
| 21. | Selenium (as Se), mg/l, Max | 0.01 | Beyond this, the water becomes toxic | No relaxation |
| 22. | Arsenic (as As), mg/l, Max | 0.2 | Beyond this, the water becomes toxic | No relaxation |
| 23. | Cyanides (as CN), mg/l, Max | 0.05 | Beyond this, the water becomes toxic | No relaxation |
| 24. | Lead (as Pb), mg/l, Max | 0.1 | Beyond this, the water becomes toxic | No relaxation |
| 25. | Zinc (as Zn), mg/l, Max | 5.0 | Beyond this limit, it can cause astringent taste and an opalescence in water | 15 |
| 26. | Anionic detergents (as MBAS), mg/l, Max | 0.2 | Beyond this limit, it can cause a light froth in water | 1.0 |
| 27. | Chromium (as $Cr^{6+}$), mg/l, Max | 0.05 | May be carcinogenic above this limit | No relaxation |
| 28. | Polynuclear aromatic hydrocarbons (as PAH), mg/l, Max | - | May be carcinogenic | - |
| 29. | Mineral Oil, mg/l, Max | 0.01 | Beyond this limit, undesirable taste and odour after chlorination take place | 0.03 |
| 30. | Pesticides mg/l, Max | Absent | Toxic | 0.001 |
| 31. | Alpha emitters, Bq/l, Max | - | - | 0.1 |

| | | | | |
|---|---|---|---|---|
| 32. | Beta emitters, pCi/l, Max | - | - | 1.0 |
| 33. | Alkalinity mg/l, Max | 200 | Beyond this limit, taste becomes unpleasant | 600 |
| 34. | Aluminum (as Al) mg/l, Max | 0.03 | Cumulative effect is reported to cause dementia | 0.2 |
| 35. | Boron mg/l, Max | 1.0 | - | 5.0 |

No sample should contain E. Coli in 100 ml.; No sample should contain more than 10 coliform organisms per 100 ml; and Coliform organisms should not be detectable in 100 ml of any two consecutive samples.

* Desirable limit

** in absence of alternate source