

WATER QUALITY STANDARDS

WATER QUALITY

Indian Standard for
Drinking Water- Specification
IS 10500: 2012

Technical terms

- BIS (Bureau of Indian Standards)
- Desirable limits
- Permissible limit
- PPM
- NTU
- Hazen Units

Organoleptic and physical parameters

Colour, Hazen Units	
IS 10500-2012	Acceptable: 5 Hz., Permissible: 15 Hz
Risks or effects	Visible tint, acceptance decreases
Sources	Tannins, Iron, Copper, Manganese, Natural deposits, organic waste
Treatment	Filtration, Distillation, Reverse osmosis, Ozonisation

Odour	
IS 10500: 2012	Agreeable
Risks or Effects	Rotten egg, musty, chemical smell
Sources	Chlorine, Hydrogen sulfide, Organic matter, Septic contamination, Methane gas
Treatment	Activated carbon, Air stripping, oxidation, Filtration

pH	
IS 10500-2012	Acceptable limit: 6.5-8.5, Permissible: No relaxation
Risks or effects	Low pH - corrosion, metallic taste High pH - bitter/soda taste, deposits
Sources	Natural
Treatment	Increase pH by soda ash Decrease pH with white vinegar / citric acid

Total dissolved solids, mg/l, Max	
IS 10500: 2012	Acceptable limit: 500 mg/l Permissible: 2000 mg/l
Risks or effects	Hardness, scaly deposits, sediment, cloudy coloured water, staining, salty or bitter taste, corrosion of pipes and fittings
Sources	Livestock waste, septic system Landfills, nature of soil Hazardous waste landfills Dissolved minerals, iron and manganese
Treatment	Reverse Osmosis, Distillation, deionization by ion exchange

Turbidity NTU Max	
IS 10500: 2012	Acceptable unit: 1 NTU Permissible limit: 5 NTU
Risks or effects	Cloudiness or haziness
Sources	High sediment deposition due to pollution and industrial activities like construction, mining, quarrying, agriculture, due to presence of organic matter such as phytoplankton
Treatment	Settling or filtration processes using sand filtration, settling tanks, and clarifiers.

Substances undesirable in excessive amounts

Aluminium (as Al), mg/l, Max	
IS 10500: 2012	Acceptable limit: 0.03 mg/l Permissible limit: 0.2 mg/l
Risks or effects	High risk associated with dialysis patients
Sources	Rock and soil leaching
Treatment	Portable Cation Exchange*** Distillation, Reverse Osmosis

Ammonia (as total ammonia-N), mg/l, Max	
IS 10500: 2012	Acceptable limit: 0.5 mg/l Permissible limit: No relaxation
Risks or effects	None proposed for human, but toxic for aquatic life
Sources	Disinfection with chloramines, wastes, fertilizers & natural processes
Treatment	Ion Exchange with zeolite Sodium alumino silicate zeolites Distillation

Barium (as Ba), mg/l, Max	
IS 10500:2012	Acceptable limits: 0.7 mg/l Permissible limits: No relaxation
Risks or effects	Difficulties in breathing, increased blood pressure, changes in heart rhythm, stomach irritation, brain swelling, muscle weakness, and damage to the liver, kidney, heart, and spleen.
Source	Mineral deposits Disposal of drilling wastes Smelting of copper Motor vehicle parts manufacturing
Treatment Point-of-Entry (POE) Point-of-Use (POU)	Cation Exchange Reverse Osmosis Distillation

Iron (as Fe), mg/l, Max	
IS 10500: 2012	Acceptable limit: 0.3 mg/l Permissible limit: No relaxation
Risks or effects	Brackish color, rusty sediment, bitter or metallic taste, brown-green stains, iron bacteria, discolored beverages
Sources	Leaching of cast iron pipes in water distribution systems Natural
Treatment	Oxidizing Filter , Green-sand Mechanical Filter

Manganese (as Mn), mg/l, Max	
IS 10500: 2012	Acceptable limit: 0.1 mg/l Permissible limit: 0.3 mg/l
Risks or effects	Brownish color, black stains on laundry and fixtures at .2 mg/l, bitter taste, altered taste of water-mixed beverages
Sources	Landfills Deposits in rock and soil
Treatment	Ion Exchange , Chlorination, Oxidizing Filter , Green-sand Mechanical Filter

Sulphate (as SO ₄), mg/l, Max	
IS 10500: 2012	Acceptable limit: 200 mg/l Permissible limit: 400 mg/l
Risks or effects	Bitter, medicinal taste, scaly deposits, corrosion, laxative effects, "rotten-egg" odor from hydrogen sulfide gas formation
Sources	Animal sewage, septic system, sewage By-product of coal mining, industrial waste Natural deposits or salt
Treatment	Ion Exchange , Distillation , Reverse Osmosis

Nitrate (as NO ₃), mg/l, Max	
IS 10500: 2012	Acceptable limit: 45 mg/l Permissible limit: No relaxation
Risks or effects	Methemoglobinemia or blue baby disease in infants
Sources	Livestock facilities, septic systems, manure lagoons, fertilizers Household waste water, fertilizers Fertilizers Natural Deposits
Treatment	Ion Exchange, Distillation, Reverse Osmosis

Chloride (as Cl), mg/l, Max

IS 10500: 2012

Acceptable limit: 250 mg/l
Permissible limit: 1000 mg/l

Risks or effects

High blood pressure, salty taste, corroded pipes, fixtures and appliances, blackening and pitting of stainless steel

Sources

Fertilizers, Industrial wastes Minerals, seawater

Treatment

Reverse Osmosis , Distillation, Activated Carbon

Fluoride (as F), mg/l, Max	
IS 10500: 2012	Acceptable limit: 1.0 mg/l Permissible limit: 1.5 mg/l
Risks or effects	Brownish discoloration of teeth, bone damage, skeletal damage
Sources	Industrial waste Geological
Treatment	Activated Alumina, Distillation, Reverse Osmosis, Ion Exchange

Total arsenic (as As), mg/l, Max	
IS 10500: 2012	Acceptable limit: 0.01 mg/l Permissible limit: 0.05 mg/l
Risks or effects	Weight loss; Depression; Lack of energy; Skin and nervous system toxicity
Sources	Previously used in pesticides (orchards) Improper waste disposal or product storage of glass or electronics, Mining Rocks
Treatment	Activated Alumina Filtration, Reverse Osmosis, Distillation, Chemical Precipitation, Ion exchange, lime softening

Total chromium (as Cr), mg/l, Max	
IS 10500: 2012	Acceptable limit: 0.05 Permissible limit: No relaxation
Risks or effects	Skin irritation, skin and nasal ulcers, lung tumors, gastrointestinal effects, damage to the nervous system and circulatory system, accumulates in the spleen, bones, kidney and liver
Sources	Septic systems Industrial discharge, mining sites Geological
Treatment	Ion Exchange, Reverse Osmosis, Distillation

Copper (as Cu), mg/l, Max	
IS 10500: 2012	Acceptable limit: 0.05 Permissible limit: 1.5
Risks or effects	Anaemia, digestive disturbances, liver and kidney damage, gastrointestinal irritations, bitter or metallic taste; Blue-green stains on plumbing fixtures
Sources	Leaching from copper water pipes and tubing, algae treatment Industrial and mining waste, wood preservatives Natural deposits
Treatment	Ion Exchange, Reverse Osmosis, Distillation

Cyanide (as CN), mg/l, Max

IS 10500: 2012

Acceptable limit: 0.05 mg/l
Permissible limit: No relaxation

Risks or effects

Thyroid, nervous system damage

Sources

Fertiliser, Electronics, steel,
plastics mining

Treatment

Ion Exchange, Reverse Osmosis,
Chlorination

Lead (as Pb), mg/l, Max	
IS 10500-2012	Acceptable limit: 0.01 mg/l Permissible: No relaxation
Risks or effects	Reduces mental capacity (mental retardation), interference with kidney and neurological functions, hearing loss, blood disorders, hypertension, death at high levels
Sources	Paint, diesel fuel combustion Pipes and solder, discarded batteries, paint, leaded gasoline Natural deposits
Treatment	Ion Exchange, Activated Carbon , Reverse Osmosis, Distillation

Mercury (as Hg), mg/l, Max	
IS 10500-2012	Acceptable limit: 0.001 mg/l Permissible: No relaxation
Risks or effects	Loss of vision and hearing, intellectual deterioration, kidney and nervous system disorders, death at high levels
Sources	Fungicides Batteries, fungicides Mining, electrical equipment, plant, paper and vinyl chloride Natural deposits
Treatment	Reverse Osmosis, Distillation

Zinc (as Zn), mg/l, Max	
IS 10500-2012	Acceptable limit: 5 mg/l Permissible: 15 mg/l
Risks or effects	Metallic taste
Sources	Leaching of galvanized pipes and fittings, paints, dyes Natural deposits
Treatment	Ion Exchange Water Softeners, Reverse Osmosis, Distillation

Total coliform bacteria	
IS 10500-2012	Nil/100ml
Risks or effects	Gastrointestinal illness
Sources	Livestock facilities, septic systems, manure lagoons Household waste water Naturally occurring
Treatment	Chlorination , Ultraviolet, Distillation, Iodination

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IS 10500-2012	Nil/100ml
Risks or effects	Gastrointestinal illness
Sources	Livestock facilities, septic systems, manure lagoons Household waste water Naturally occurring
Treatment	Chlorination , Ultraviolet, Distillation, Iodination

Health effects of chemical parameters

Parameter	BIS Guideline value (maximum allowable)	General and health effect
Total dissolved solids	2000 mg/l	Undesirable taste; gastro intestinal irritations; corrosion or incrustation
pH	6.5-8.5	Affects mucous membrane; bitter taste; corrosion; affects aquatic life
Alkalinity	600	Boiled rice turns yellowish
Hardness	600	Poor lathering with soap; deterioration of the quality of clothes; scale forming; skin irritation; boiled meat and food become poor in quality

Parameter	BIS Guideline value (maximum allowable)	General and health effect
Calcium	200 mg/l	Poor lathering and deterioration of the quality of clothes; incrustation in pipes; scale formation
Magnesium	100 mg/l	Poor lathering and deterioration of clothes; with sulfate laxative
Iron	0.3 mg/l	Poor or sometimes bitter taste, color and turbidity; staining of clothes materials; iron bacteria causing slime
Manganese	0.3 mg/l	Poor lathering and deterioration of clothes; with sulfate laxative
Aluminium	0.2 mg/l	Neurological disorders; Alzheimer's disease
Copper	1.5 mg/l	Liver damage; mucosal irritation, renal damage and depression; restricts growth of aquatic plants
Zinc	15 mg/l	Astringent taste; opalescence in water; gastro intestinal irritation; vomiting, dehydration, abdominal pain, nausea and dizziness

Parameter	BIS Guideline value (maximum allowable)	General and health effect
Ammonia	0.5 mg/l	Indicates pollution; growth of algae
Nitrite		Forms nitrosoamines which are carcinogenic
Nitrate		Blue baby disease (methemoglobineamia); algal growth
Sulfate		Taste affected; laxative effect; gastro intestinal irritation
Chloride		Taste affected; corrosive
Fluoride		Dental and skeletal fluorosis; non-skeletal
Phosphate		Algal growth

Parameter	BIS Guideline value (maximum allowable)	General and health effect
Arsenic	0.05 mg/l	Toxic; bio-accumulation; central nervous system affected; carcinogenic
Mercury	0.001 mg/l	Highly toxic; causes 'minamata' disease-neurological impairment and renal disturbances; mutagenic
Cadmium	0.003 mg/l	Highly toxic; causes 'itai-itai' disease-painful rheumatic condition; cardio vascular system affected; gastro intestinal upsets and hypertension
Lead	0.01 mg/l	Causes plumbism-tiredness, lassitudes, abdominal discomfort, irritability, anaemia; bio-accumulation; impaired neurological and motor development, and damage to kidneys

Parameter	BIS guideline value (Maximum allowable)	General and health effects
Chromium	0.05 mg/l	Carcinogenic; ulcerations, respiratory problems and skin complaints
Pesticide		Affects central nervous system
Detergent		Undesirable foaming