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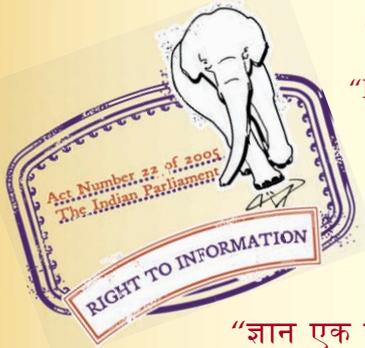
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IS 4251 (1967): Quality tolerances for water for processed food industry [FAD 25: Drinking Water]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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IS : 4251-1967
(Reaffirmed-1977)

Indian Standard

**QUALITY TOLERANCES FOR WATER FOR
PROCESSED FOOD INDUSTRY**

(Fourth Reprint JANUARY 1991)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

QUALITY TOLERANCES FOR WATER FOR PROCESSED FOOD INDUSTRY

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AMENDMENT NO. 1 APRIL 1981

TO

IS:4251-1967 QUALITY TOLERANCES FOR WATER
FOR PROCESSED FOOD INDUSTRY

Addendum

[Page 5, Table 2, Sl No. (xxi)] - Add the following new matter under respective columns after Sl No. (xxi):

(1)	(2)	(3)	(4)
xxii)	Cadmium (as Cd), mg/l, Max	0.01	See Note
xxiii)	Mercury (as Hg), mg/l, Max	0.001	See Note

NOTE - Methods of test for these characteristics are under preparation; till then methods of test as given in Standard Methods for the examination of water and wastewater. 1975. American Public Health Association; American Water Works Association; and Water Pollution Control Federation, USA, shall be followed.

**AMENDMENT NO. 2 AUGUST 2004
TO
IS 4251 : 1967 QUALITY TOLERANCES
FOR WATER FOR PROCESSED FOOD INDUSTRY**

(Page 3, clause 1.1) — Substitute the following for the existing clause

1.1 The standard prescribes the quality tolerances for water for use in the processed food industry for general operations, such as washing, flushing, boiler feed and indirect cooling. Where water is used as an ingredient in the processed food industry the quality tolerances shall be as per the desirable requirements in IS 10500 : 1991 'Drinking water – Specification (*first revision*)'. Special requirements for the individual food industries are also specified. Further since the quality of water required varies for different food industries, additional special requirements for individual food industry which are not covered in the standard, where required, shall be prescribed in the individual product standard.

(CHD 13)

Reprography Unit BIS, New Delhi, India

Indian Standard

QUALITY TOLERANCES FOR WATER FOR PROCESSED FOOD INDUSTRY

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 7 August 1967, after the draft finalized by the Water Sectional Committee had been approved by the Chemical Division Council.

0.2 In processed food industry, water is used for a number of purposes, such as processing, washing, flushing and general usage and also for boiler feed and cooling. The quality of water required varies for different processed food industries. This standard is intended to guide food processing industry in judging the suitability of a particular supply of water for that industry and in planning the type of treatment required for available supplies of water.

0.3 The requirements of water for boiler feed purposes are covered in IS: 1680-1960*.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS: 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 The standard prescribes the quality tolerances for water for use in the processed food industry. Special requirements for the individual food industries are also specified.

2. TOLERANCES

2.1 Taste — The water shall be free from any objectionable taste.

2.2 Bacteriological Tolerances — The water shall comply with the bacteriological tolerances given in Table 1, when tested according to

*Code of practice for treatment of water for land boilers.

†Rules for rounding off numerical values (*revised*).

TABLE 1 BACTERIOLOGICAL TOLERANCES

(Clause 2.2)

Sl. No.	CHARACTERISTIC	TOLERANCE	METHOD OF TEST, REF TO	
			Appendix	Cl No. in IS : 1622-1964*
(1)	(2)	(3)	(4)	(5)
i)	Coliform bacteria, MPN index per 100 ml	Less than 1	—	3.2
ii)	Standard plate count, per ml, <i>Max</i>	50 (Note 1)	—	5
iii)	Proteolytic and lipolytic organisms, combined count per ml, <i>Max</i>	5 (Note 2)	A	—

Note 1 — Not applicable in the case of cooling water and of hot water used in dairy industry.

Note 2 — Not applicable in the case of cooling water, hot water and for water used for general purposes in dairy industry.

*Methods of sampling and test for microbiological examination of water used in industry.

methods prescribed in IS : 1622-1964* and Appendix A of this standard. Reference to the relevant clauses of IS : 1622-1964* and Appendix to this standard is given in col 4 and 5 of the table.

2.3 Physical and Chemical Tolerances — The water shall comply with the physical and chemical tolerances given in Table 2 when tested according to methods given in IS : 3025-1964†. Reference to relevant clauses of IS : 3025-1964† is given in col 4 of the table.

2.4 Tolerances for Radioactivity — The level of radioactivity in the water shall be as prescribed in Table 3, when tested according to the method prescribed in 58 of IS : 3025-1964†.

2.5 Additional Tolerances for Specific Operations

2.5.1 For the operations mentioned in Table 4, the water shall also comply with the tolerances given in Table 4 when tested in accordance with methods prescribed in IS : 1622-1964* and IS : 3025-1964†. Reference to relevant clauses of IS : 1622-1964* and IS : 3025-1964† is given in col 6 and 7 of the table.

*Methods of sampling and test for microbiological examination of water used in industry.

†Methods of sampling and test (physical and chemical) for water used in industry.

TABLE 2 PHYSICAL AND CHEMICAL TOLERANCES

(Clause 2.3)

SL No.	CHARACTERISTIC	TOLLRANCE	METHOD OF TEST (REF TO CL No. IN IS : 3025-1964*)
(1)	(2)	(3)	(4)
i)	Colour (Hazen units), <i>Max</i>	20	5
ii)	Turbidity (units), <i>Max</i>	10	6
iii)	Odour	None	7
iv)	pH	6.5 to 9.2	8
v)	Total solids, mg/l, <i>Max</i>	1 000	10
vi)	Total hardness (as CaCO ₃), mg/l, <i>Max</i>	600	16
vii)	Sulphate (as SO ₄), mg/l, <i>Max</i>	200	20
viii)	Fluoride (as F), mg/l, <i>Max</i>	1.5	23
ix)	Chloride (as Cl), mg/l, <i>Max</i>	250	24
x)	Cyanide (as CN), mg/l, <i>Max</i>	0.01	27
xi)	Selenium (as Se), mg/l, <i>Max</i>	0.05	28
xii)	Iron (as Fe), mg/l, <i>Max</i>	0.3	32
xiii)	Magnesium (as Mg), mg/l, <i>Max</i>	75.0	34
xiv)	Manganese (as Mn), mg/l, <i>Max</i>	0.2	35
xv)	Copper (as Cu), mg/l, <i>Max</i>	1.0	36
xvi)	Lead (as Pb), mg/l, <i>Max</i>	0.1	37
xvii)	Chromium (as Cr ⁶⁺), mg/l, <i>Max</i>	0.05	38
xviii)	Zinc (as Zn), mg/l, <i>Max</i>	15.0	39
xix)	Arsenic (as As), mg/l, <i>Max</i>	0.2	40
xx)	Nitrate (as N), mg/l, <i>Max</i>	20	48
xxi)	Phenolic substances (as C ₆ H ₅ OH), mg/l, <i>Max</i>	0.001	54

*Methods of sampling and test (physical and chemical) for water used in industry.

TABLE 3 TOLERANCES FOR RADIOACTIVITY

(Clause 2.4)

SL No.	CHARACTERISTIC	TOLERANCE	METHOD OF TEST (REF TO CL No. IN IS : 3025-1964*)
(1)	(2)	(3)	(4)
i)	Alpha emitters, $\mu\text{c/ml}$, <i>Max</i>	10 ⁻⁹	58
ii)	Beta emitters, $\mu\text{c/ml}$, <i>Max</i>	10 ⁻⁸	58

*Methods of sampling and test (physical and chemical) for water used in industry.

2.5.2 In addition to the tolerances prescribed in Table 1 to Table 4, the water when used for the specific food industry mentioned, shall also comply with the tolerances given in Table 5 when tested according to methods prescribed in IS:1622-1964*, IS:3025-1964† and Appendix B to this standard. Reference to relevant clauses of IS:1622-1964*, IS:3025-1964† and to Appendix B is given in col 4, 5 and 6 of the table.

TABLE 4 ADDITIONAL TOLERANCES FOR SPECIFIC OPERATIONS

(Clause 2.5.1)

Sl. No.	CHARACTERISTIC	TOLERANCE FOR			METHOD OF TEST, REF TO CL NO. IN	
		Cooling	Washing, Flushing and General Purposes	Processing	IS: 1622-1964*	IS: 3025-1964†
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Total hardness (as CaCO ₃), mg/l, Max	30 (Note 1)	30 (Note 2)	—	—	16
ii)	Iron (as Fe), mg/l, Max	—	0.1	0.1	—	32
iii)	Manganese (as Mn), mg/l, Max	—	0.1	0.1	—	35
iv)	Slime-forming organisms	Absent	—	—	3.10	—

NOTE 1 — For waters which are recirculated and used. In once through and run to waste systems, carbonate hardness should be absent. The Langelier index is of value in finding out the suitability of the water for cooling and determining the degree of treatment required, but in applying it, it should be kept in mind that the free carbon dioxide content of the make-up water is practically all lost in the first pass.

NOTE 2 — Especially if used for washing with soap or other alkaline detergents.

*Methods of sampling and test for microbiological examination of water used in industry.

†Methods of sampling and test (physical and chemical) for water used in industry.

3. SAMPLING

3.1 Representative samples of the material shall be drawn as prescribed in IS: 1622-1964* and IS: 3025-1964†.

4. TEST METHODS

4.1 Tests shall be carried out according to methods given in Appendices A and B to this standard and in IS:1622-1964* and IS:3025-1964†. Reference to relevant method of test is made in Tables 1 to 5 against the characteristics.

*Methods of sampling and test for microbiological examination of water used in industry.

†Methods of sampling and test (physical and chemical) for water used in industry.

TABLE 5 ADDITIONAL TOLERANCES FOR INDIVIDUAL FOOD INDUSTRIES

(Clause 2.5.2)

Sl No.	INDUSTRY	CHARACTERISTIC	TOLERANCE	METHOD OF TEST, REF TO		
				Cl No. in IS: 3025-1964*	Cl No. in IS: 1622-1964†	Appendix
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Bakery:						
i)	Bread manufacture	a) Calcium	Uniformly high	33	—	—
		b) pH	Controlled to optimum	8	—	—
		c) Magnesium	Low	34	—	—
		d) Water of uniform quality preferred	—	—	—	—
ii)	Cracker and cake making	Total hardness (as CaCO_3), mg/l	Preferably below 30	16	—	—
iii)	Cleansing	Total hardness (as CaCO_2), mg/l	Preferably below 30	16	—	—
2. Canning:						
i)	Legumes (peas, beans, lentils, etc)	a) Hardness (as CaCO_3), mg/l, Max	75	16	—	—
		b) Alkalinity (as CaCO_3), mg/l, Max	50	13	—	—
		c) Iron (as Fe), mg/l, Max	0.2	32	—	—
ii)	Cooker	a) Carbonate hardness	Zero	17	—	—
		b) Alkalinity (as CaCO_3), mg/l, Max	50	13	—	—
iii)	Cleansing	Total hardness (as CaCO_3), mg/l	Preferably below 30	16	—	—
iv)	General	Iron (as Fe), mg/l, Max	0.2	32	—	—

*Methods of sampling and test (physical and chemical) for water used in industry.

†Methods of sampling and test for microbiological examination of water used in industry.

(Continued)

**TABLE 5 ADDITIONAL TOLERANCES FOR INDIVIDUAL
FOOD INDUSTRIES — Contd**

Sl. No.	INDUSTRY	CHARACTERISTIC	TOLERANCE	METHOD OF TEST, REF TO		
				Cl No. in IS: 3025-1964*	Cl No. in IS: 1622-1964†	Appendix
(1)	(2)	(3)	(4)	(5)	(6)	(7)
3.	Citrus fruit:		.			
	i) Washing fruits	citrus Soft water	—	—	—	—
	ii) Pectin, acid and syrup making	citric Total hardness (as CaCO ₃), mg/l	Preferably be- low 30	16	—	—
4.	Confectionery	a) Total solids, mg/l, Max	100	10	—	—
		b) Iron (as Fe), mg/l, Max	0.2	32	—	—
		c) pH	Appropriate adjustment	8	—	—
5.	Dairy:					
	i) Processing	Thermophilic bacteria	Absent	—	—	B
	ii) Hot water	a) Slime-forming organisms	Absent	—	3.10	—
		b) Total hardness (as CaCO ₃), mg/l, Max	30	16	—	—
6.	Edible oil refining:					
	Process water	Iron (as Fe), mg/l, Max	0.2	32	—	—
7.	Gelatin manufacture:					
	Process water	Demineralized water preferred so that ash content of gelatin is kept low	—	—	—	—
8.	Meat packing:					
	Cleansing and washing of meat for pickling	a) Soft water preferred to obtain a better colour	—	—	—	—
		b) Iron (as Fe), mg/l, Max	0.2	32	—	—

*Methods of sampling and test (physical and chemical) for water used in industry.

†Methods of sampling and test for microbiological examination of water used in industry.

(Continued)

**TABLE 5 ADDITIONAL TOLERANCES FOR INDIVIDUAL
FOOD INDUSTRIES — Contd**

Sl. No.	INDUSTRY	CHARACTERISTIC	TOLERANCE	METHOD OF TEST, REF TO		
				Cl No. in IS: 3025-1964*	Cl No. in IS: 1622-1964†	Appendix
(1)	(2)	(3)	(4)	(5)	(6)	(7)
9.	Starch and corn products manufacture:					
	Process water	a) Soft water preferred as hard water increases the ash content of starch and high magnesium content leads to cloudiness in corn	—	—	—	—
		b) Iron (as Fe), mg/l, Max	0.2	32	—	—
10.	Sugar refining	a) Iron (as Fe), mg/l, Max	0.2	32	—	—
		b) Total solids	Less than 500mg/l preferred as electrolytes cause inversion of sugar and yield of sucrose is decreased	8	—	—

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†Methods of sampling and test for microbiological examination of water used in industry.

APPENDIX A

[Table 1, Item (iii)]

METHOD FOR PROTEOLYTIC BACTERIA COUNT AND LIPOLYTIC BACTERIA COUNT

A-1. PROTEOLYTIC BACTERIA COUNT

A-1.0 Outline of the Method — The method consists in plating a known volume of the water or suitable decimal dilution of it with nutrient agar to

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which skimmed milk is added and then incubating at 37°C for 48 hours. The proteolytic colonies will show clear zones of proteolysis around the colony; these are counted. In order to differentiate a weak acid clearing by the acid-producing organisms from proteolysis, the plates are flooded with dilute hydrochloric acid. If clear zone remains, it confirms proteolysis.

A-1.1 Apparatus — The apparatus prescribed for standard plate count in 5.1 of IS : 1622-1964* shall be used.

A-1.2 Media and Reagents — In addition to the reagents prescribed for standard plate count in 5.2 of IS : 1622-1964*, the following reagents shall be required:

- a) *Skimmed Milk* — Take skimmed milk in suitable plugged tubes, flasks, or bottles, sterilize and keep.
- b) *Dilute Hydrochloric Acid* — (1 : 9).

A-1.3 Procedure — Prepare dilutions and plates as described under standard plate count in 5.4.1 and 5.4.2 of IS : 1622-1964*. Add 1 ml of sterile skimmed milk to the agar tube and mix just before pouring on into the petri dish containing the sample. Incubate at 37°C for 48 ± 3 hours. Remove the plate from the incubator and count colonies with adjacent zones of proteolysis. Flood the plate with dilute hydrochloric acid. Confirm the proteolysis by persistence of the clear zones.

A-1.3.1 After determining the colony count, report the result as proteolytic count per ml.

A-2. LIPOLYTIC BACTERIA COUNT

A-2.0 Outline of the Method — The method consists in plating a known volume of the water or a suitable dilution of it, with tributyrin agar (nutrient agar containing tributyrin) and incubating at 30°C for 3 days. The colonies of lipolytic organisms show clear zones around themselves.

A-2.1 Apparatus — The apparatus prescribed for standard plate count in 5.1 of IS : 1622-1964* shall be required.

A-2.2 Media and Reagents — In addition to the reagents prescribed for standard plate count in 5.2 of IS : 1622-1964*, the following reagent is required:

Tributyryn Agar — Dissolve 3 g of yeastrel (or meat extract) and 5 g of peptone in 1 000 ml of distilled water by passing steam. Take 25 g of shredded or powdered agar (if required, chop it up), wash in running water for 15 minutes, squeeze out the excess water and

*Methods of sampling and test for microbiological examination of water used in industry.

add to the yeastrel-peptone mixture. Add 2 g of tributyrin and emulsify in an efficient emulsifying machine at a temperature of 45° to 50°C. The emulsion shall show no microscopic globules and shall be stable. Adjust the pH value to 7.5 by addition of hydrochloric acid or sodium hydroxide after predetermination in a small portion, using phenol red as indicator. Place in tubes in 10-ml quantities and sterilize by steaming at 100°C for 30 minutes on each of three successive days.

A-2.3 Procedure — Prepare dilutions and plates as described under standard plate count in 5.4.1 and 5.4.2 of IS : 1622-1964*, pour 10 ml of tributyrin agar and proceed as in 5.4 of IS : 1622-1964*, but incubating the plates at 30°C for 72 ± 3 hours. Remove the plates from the incubator and count the colonies with well-defined clear zones extending at least 1 mm from the edge of the colony.

A-2.3.1 Determine the colony count and report as lipolytic bacteria count per ml.

APPENDIX B

(Table 5, Item 5)

METHOD FOR THERMOPHILIC BACTERIA COUNT

B-1. PROCEDURE

B-1.1 Carry out the procedure laid down for standard plate count in 5 of IS : 1622-1964*, except that use 15 to 18 ml of molten nutrient agar for each plate and incubate at 55°C for 48 ± 3 hours.

B-1.1.1 Report the colony count as thermophilic bacteria count per millilitre.

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