भारतीय मानक मसौदा

तरण तालों के लिए पानी की गुणता छूटें

(आई एस 3328 का दूसरा पुनरीक्षण)

Draft Indian Standard

Quality Tolerances for Water for Swimming Pools

(Second Revision of IS 3328)

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ICS 13.060.25

Water Quality for Industrial Purposes Sectional Committee, CHD 13	Last date of comments: **04 November 2025**

FOREWORD

(*Formal clauses will be added later*)

Swimming pools may be divided into natural pools and artificial pools. For the natural swimming pools, it is not possible to lay down uniform standards because of the considerable variability in the quality of such waters. The artificial pools are either of fill-and-empty type or of continuous circulation type. The fill-and-empty type of pools is not favoured now because of the attendant accumulation of impurities.

This standard is intended to assist public health bodies and other organizations in maintaining a level of quality of water in swimming pools considered safe from the point of view of health and hygiene.

This standard was first published in 1965. Based on the experience gained over the years, the concerned technical committee responsible for the formulation of this standard decided to revise it. In first revision, requirements for total dissolved solids and chlorides have been incorporated besides, giving reference to the latest method of tests.

In this revision, the following changes have been made:

a) The term 'Coliform Organisms' has been updated to 'Total Coliform Bacteria', and the test method IS 15185 has been included;
b) In Table 1, the values for *p*H, Total Alkalinity, Aluminium, Total Chlorine, Total Dissolved Solids, and Chloride have been modified. Additionally, new requirements have been introduced for Lead (Pb), Total Arsenic (As), Total Chromium (Cr), Zinc (Zn), Copper (Cu), Cadmium (Cd) Mercury (Hg), Calcium, Phosphate, and Nitrate (NO_3);

c) A new Note 1 regarding taste evaluation has been added and Note 2 concerning the frequency of testing has also been introduced;
d) The amendments issued to the previous version of the standard have been suitably incorporated; and
e) The reference clause has been updated.

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: 2022 'Rules for rounding off numerical values (*second revision)'.* The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Draft Indian Standard

QUALITY TOLERANCES FOR WATER FOR SWIMMING POOLS

(*Second Revision*)

1 SCOPE

This standard prescribes the quality tolerances for water used in swimming pools of continuous circulation type.

2 REFERENCES

The Indian standards listed in Annex A contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Indian standard are encouraged to investigate the possibility of applying the most recent editions of these standards listed in given Annex A.

3 TOLERANCES

3.1 Physical

3.1.1 *Clearness*

The water shall be clear odourless and colourless and shall be sufficiently clear at all times when the pool is in use to pass the following test:

> Place a black disc, 150 mm in diameter and fixed to a white background, on the bottom of the pool at the deepest point. The disc shall be clearly visible from the sidewalks of the pool at all distances up to 9 meters in a line drawn across the pool through the said disc.

3.2 Chemical

The water shall comply with the chemical tolerances prescribed in Table 1. Tests shall be carried out as prescribed in various parts of IS 3025. Reference to relevant clauses of this standard is given in col (4) of the Table 1.

3.3 Bacteriological

3.3.1 *Standard Plate Count*

The standard plate count of the sample, determined as prescribed in Annex B, shall be not more than 100 per millilitre.

3.3.2 *Total Coliform Bacteria*

When tested as prescribed in IS 1622 and IS 15185 the total coliform bacteria in swimming pool should be absent.

Table 1 Chemical Tolerances for Water for Swimming Pools
(*Clauses* 3.2 and 5.1)

Sl No.	Characteristic	Tolerance	Method of Test, Ref to IS
(1)	(2)	(3)	(4)
i)	*p*H value	7 to 8 (*see* Note 1)	IS 3025 (Part 11)
ii)	Total alkalinity (as $CaCO_3$), mg/l, *Max*	50 to 200 (*see* Note 1)	IS 3025 (Part 23)
iii)	Aluminium (as Al), mg/l, *Max*	0.05	IS 3025 (Part 55)
iv)	Total chlorine, mg/l		IS 3025 (Part 26)
	a) At inlet	0.5 to 1	

	b) FRC* at outlet	0.2 to 0.5	
v)	Oxygen absorbed in 4 h at 27 °C. mg/l , *Max*	1.0	IS 3025 (Part 63)
vi)	Total dissolved solids, mg/l, *Max*	1 000	IS 3025 (Part 16)
vii)	Chloride (as Cl), mg/l, *Max*	250	IS 3025 (Part 32)
viii)	Iron, mg/l, *Max*	0.1	IS 3025 (Part 53)
ix)	Lead (as Pb), mg/l, *Max*	0.01	IS 3025 (Part 47)
x)	Total Arsenic (as As,) mg/l, *Max*	0.01	IS 3025 (Part 37)
xi)	Total Chromium (as Cr), mg/l, *Max*	0.05	IS 3025 (Part 52)
xii)	Zinc (as Zn), mg/l, *Max*	5	IS 3025 (Part 49)
xiii)	Copper (as Cu), mg/l, *Max*	0.05	IS 3025 (Part 42)
xiv)	Cadmium (as Cd), mg/l, *Max*	0.003	IS 3025 (Part 41)
xv)	Mercury (as Hg), mg/l, *Max*	0.001	IS 3025 (Part 48)
xvi)	Colour, Hazen units, *Max*	10	IS 3025 (Part 4)
xvii)	Turbidity, NTU, *Max*	10	IS 3025 (Part 10)
xviii)	Odour	Agreeable	IS 3025 (Part 5)
xix)	Taste	Palatable (*see* Note 2)	IS 3025 (Part 7) and IS 3025 (Part 8)
xx)	Calcium, mg/l, *Max*	200	IS 3025 (Part 40)
xxi)	Phosphate, mg/l, *Max*	0.1	IS 3025 (Part 75)
xxii)	Nitrate (NO_3), mg/l, *Max*	45	IS 3025 (Part 34/Sec 1)

NOTES —

1) Too low an alkalinity and low *p*H are the most common causes of complaints of taste, odour and eye irritation. At *p*H lower than 7, there is an increased tendency for formation of dichloramine and nitrogen chlorides or similar compounds which cause eye irritation.
2) Test for Taste to be conducted only after safety of water has been established as per drinking water norm as per IS 10500.
3) PH, TDS, FRC measure daily basis and other parameter need to be cheaked in every month/ once the change the source the water also.

*FRC= Free Residual Chlorine

4 SAMPLING

4.1 Representative test samples of water shall be withdrawn as prescribed in IS 1622, IS 17614 (Part 1) and IS 17614 (Part 3).

5 TEST METHODS

5.1 Test shall be carried out as prescribed in IS 1622, IS 15185 and in Annex B. Reference to the relevant clauses of IS 1622 and Annex B, is given in co1 (4) of Table 1 and **3.3.1.**

ANNEX A

LIST OF REFERRED INDIAN STANDARDS

(*Clause* 2)

IS No.	*Title*
IS 1622 : 1981	Methods of sampling and microbiological examination or water (*first revision*)
IS 3025	Methods of sampling and test physical and chemical for water and waste water:
(Part 4) : 2021	Colour (*second revision)*
(Part 5) : 2018	Odour (*second revision*)
(Part 7) : 2017	Taste threshold (*second revision*)
(Part 8) : 2023	Taste rating (*second revision)*
(Part 10) : 2023	Turbidity (*second revision)*
(Part 11) : 2022/ ISO 10523 : 2008	*p*H value (*second revision*)
(Part 16) : 2023	Filterable residue total dissolved solids at 180 ^{o}C (*second revision)*
(Part 23) : 2023	Alkalinity (*second revision)*
(Part 26) : 2023	Chlorine Residual (*second revision*)
(Part 32) : 2023	Chloride (*first revision*) .
(Part 37) : 2023	Arsenic (*second revision*)
(Part 41) : 2023	Cadmium (*second revision*)).
(Part 42) : 2023	Copper (*second revision*)
(Part 47) : 2024	Lead (*second revision*)
(Part 48) : 2023	Mercury (*first revision*)
(Part 49) : 2023	Zinc (*second revision*)
(Part 52) : 2023	Chromium (*first revision*)
(Part 53) : 2023	Iron (*first revision*)
(Part 55) : 2023	Aluminium (*first revision*)

(Part 63) : 2023	Oxygen absorbed in 4 hours (*first revision*)
IS 7017 : 1973	Method for colorimetric determination of traces of heavy metals by dithizone
IS 10500 : 2012	Drinking Water — Specification (*second revision*)
IS 15185 : 2016/ISO 9308-1 : 2014	Water quality — Detection and enumeration of echerichia coli and coliform bacteria — membrane filtration method for water with low bacterial background flora (*first revision*)
IS 17614	Water quality sampling:
(Part 1) : 2025/ISO 5667-1: 2023	Guidance on the design of sampling programmes and sampling techniques (*first revision*)
(Part 3) : 2024/ISO 5667-3 : 2024	Preservation and handling of water samples (*first revision*)

ANNEX B

(*Clauses* 3.3.1 and 5.1)

DETERMINATION OF STANDARD PLATE COUNT

B-l APPARATUS

B-l.1 Dilution Bottles and Tubes

Bottles or tubes of resistant glass, preferably pyrex, closed with glass stoppers, rubber stoppers, or screw caps equipped with liners that do not produce toxic or bacteriostatic compounds on sterilization shall be used. Cotton plugs shall not be used as closures. Graduation levels shall be indelibly marked on the side of dilution bottle.

B-l.2 Autoclaves

Of sufficient size and shall keep uniform temperature within the chamber up to and including the sterilizing temperature of 121 °C. They shall be equipped with an accurate thermometer located so as to register the minimum temperature within the sterilizing chamber, a pressure gauge and properly adjusted safety valves.

B-l.3 Pipettes

1 ml, straight-sided delivery pipettes. The tips shall be unbroken.

B-l.4 Petri Dishes

Of 100 mm diameter and 15 mm depth. The bottom of the dishes shall be free from bubbles and scratches and shall be flat so that the medium shall be of uniform thickness throughout the plate.

B-l.5 Incubator

Maintaining a uniform and constant temperature of 35.0 ^{o}C ± 0.5 ^{o}C at all times in all parts. The use of water-jacketed or anhydric type with thermostatically controlled low-temperature electric heating units and equipped with mechanical means of circulating air shall be preferred. The incubators shall have sufficient space to accommodate the culture racks and plates, with at least 2.5 cm space between adjacent stacks and between walls and stacks. They shall be provided with accurate thermometers and a daily record of the temperature shall be maintained.

B-l.6 Colony Counter

An approved counting aid, such as Quebee colony counter. If such a counter is not available, then counting may be done with a lens giving a magnification of 1.5 diameters. In order to ensure uniformity of conditions during counting, illumination equivalent to that provided by the Quebee colony counter shall be employed.

B-2 REAGENTS

B-2.1 Buffered Dilution Water

Dissolve 34.0 g of potassium dihydrogen phosphate (KH_2PO_4) in 500 ml of distilled water, adjust to *p*H 7.2 with 1 M sodium hydroxide solution and make up to 1 litre with distilled water. Add 1.25 ml of the above solution to 1 litre of distilled water. Dispense in amounts that provide 99 ± 2 ml, or 9.0 ± 0.2 ml, after autoclaving for 20 minutes.

B-2.2 Tryptone Glucose Extract Agar Medium

Add 3 g of beef extract, 5 g of glucose, and 15 g of agar of each litre of distilled water. Heat to boiling until1 all ingredients are dissolved. Make up lost weight with hot distilled water. Adjust the reaction so that the *p*H reading after sterilization will be between 6.8 and 7.0. Bring to a boiling temperature, stirring vigorously. Make up lost weight with hot distilled water and clarify. Distribute to the desired containers and sterilize in the autoclave at 121°C. When the pressure reaches zero, remove the medium from the autoclave and cool quickly to avoid decomposition to sugars. Store the medium in a melted condition in a container which provides for maintenance of a temperature of 43 to 45°C.

B-3 STERILIZATION OF APPARATUS

B-3.1 Dilution Bottles or Tubes

Sterilize the bottles or tubes in the autoclave at 121 °C for 15 min after the temperature reaches 121 °C.

B-3.2 Petri Dishes

Wrap the petri dishes in kraft paper and sterilize in the hot-air oven at 160°C for one hour.

B-3.3 Pipettes

Place the pipettes in copper, stainless steel or aluminium cylinders with cover or individually wrapped in paper and sterilize in the hot-air oven at 160 °C for one hour.

B-4 PROCEDURE

B-4.1 Dilution

Fill the dilution bottles or tubes with proper amount of buffered dilution water so that after sterilization they contain the desired quantity with a tolerance of 2 percent. The exact amount of water to be placed in the bottle may be determined only by experiment with the particular autoclave in use. Only buffered dilution water is to be used for dilution. Tap water or distilled water shall not be used.

B-4.1.1 Shake the sample bottle vigorously 25 times. Transfer with a sterile pipette 10 ml, 1 ml or 0.1 ml of the sample to the proper dilution bottle, tube or petri dish as required. Shake each dilution bottle or tube vigorously 25 times after the addition of portion of the sample and before a second dilution or sample is removed.

B-4.2 Plating

The amount of the sample taken should be such as will give 30 colonies to 300 colonies on a plate. Ordinarily, it is not desirable to plate more than 1 ml of water in a plate; therefore, when the total number of colonies developing from 1 ml is less than 30, it is obviously necessary to record the result as observed, disregarding the general rule given above. Take 1 ml, 0.1 ml or other appropriate volume of the sample dilution for plating in petri dish. Add not less than 10 ml of liquefied tryptone glucose extract agar medium at a temperature of 43 °C to 45 °C to water in the petri dish. Flame the lips of all test tubes or flasks used for pouring the medium. Lift the cover of the petri dish just enough for the introduction of either pipette or the culture medium. Mix thoroughly the medium and sample and uniformly spread over the bottom of the petri dish by tilting and rotating the dish. Solidify all plates as rapidly as possible after pouring and place them immediately in the incubator. Not more 20 min shall elapse between plating and pouring.

B-4.3 Incubation

Incubation shall be done at 35.0 °C ± 0.5 °C Incubate for 24 h ± 2 h. Invert the glass covered petri dishes in the incubator. Place the dishes in the incubator as prescribed in **B-1.5.**

B-4.4 Counting

In determining the standard plate count, only such plates should be considered which show 30 colonies to 300 colonies except as provided in **B-4.2.** Counting shall be done with an approved counting aid **(B-1.6).**

B-4.4.1 If the same amount of water has been planted in 2 or more replicate plates and of these one shows colonies within the limits mentioned in **B-4.4** while others show less than 30 colonies or more than 300 colonies, the results recorded shall be the average of all the plates planted with this volume of sample.

B-4.4.2 In order to avoid fictitious accuracy and yet expense the numerical results by a method consistent with the precision of the technique employed, the recorded number of bacteria per millilitre shall be reported as follows:

Up to 100	To the nearest unit
More than 100	To the nearest 5 units

Counts shall be designated as the standard plate count at 35 °C.