SRI LANKA STANDARD 614 : 2013

UDC 663.6

SPECIFICATION FOR
POTABLE WATER
(First Revision)

SRI LANKA STANDARDS INSTITUTION

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Gr. 6

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Sri Lanka Standard
SPECIFICATION FOR POTABLE WATER
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FOREWORD

This standard was approved by the Sectoral Committee on Agricultural and Food Products and was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on 2013-08-28.

This standard is intended mainly to guide food processing industry in judging the suitability of a particular supply/source of water for that industry and in planning the type of treatment required for available supplies/sources of water.

This standard was first published in 1983 as two parts; namely; Part 1-Physical and chemical requirements and Part 2 - Bacteriological requirements. While reviewing this standard, it was considered desirable to amalgamate both parts into one comprehensive standard, for ease of reference to users.

This revision has been undertaken to take into account the uptodate information available about the nature and effect of various contaminants and also the new techniques for identifying and determining their concentrations.

In this revision, additional requirements for sodium, nickel and for biological requirements have been incorporated while the requirements for other parameters have been modified considering the results of water quality surveillance done in Sri Lanka and also the WHO Guidelines, wherever applicable. Details on methods of sampling and testing have been removed from this standard and are now covered in separate standards, reference to which have been made at appropriate places.

While revising this standard, the Committee had taken note of the limited testing facilities available in the country. Therefore, requirements specified in 4.2 and 4.4 should be examined either when a doubt arises or the potability of water from a new source is to be established.

Routine surveillance of drinking water supplies should be carried out by the relevant authorities to monitor the risk of specific pathogens and to define proper control procedures. The WHO Guidelines for Drinking Water Quality (latest edition) may be referred for specific recommendations on using a water safety approach incorporating risk identification. Precautions / care should be taken to prevent contamination of drinking water from chlorine resistant parasites such as *Cryptosporidium* species and *Giardia* species.

This standard is subject to the restrictions imposed under the Sri Lanka Food Act No. 26 of 1980 and the regulations framed thereunder, wherever applicable.

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 **SLS 102**. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

In revising this standard, the assistance derived from the World Health Organization's (WHO) Guidelines for drinking water quality (Fourth edition, 2011) and Guidelines for United States Environmental Protection Agency (USEPA) is gratefully acknowledged.

1 SCOPE

This standard prescribes the requirements, test methods and sampling procedure for ascertaining the suitability of water for drinking, culinary and food industry purposes irrespective of the water source, treatment or distribution system whether it is from a public or private supply.

2 REFERENCES

Analytical methods for drinking water and ground water US Environmental Protection Agency (USEPA)
SLS 102 Rules for rounding off numerical values
SLS 1461 Microbiological test methods for water
Part 1 Detection and enumeration of *Eschrichia coli* and coliform bacteria
Section 1 Membrane filtration method
Section 2 Most probable number method
Section 3 Reference method
SLS 1462 Methods for Sampling of water
Part 1 Guidance on the design of sampling programmes and sampling techniques
Part 2 Preservation and handling of water samples
Part 3 Guidance on sampling from lakes, natural and man- made
Part 4 Guidance on sampling of rivers and streams
Part 5 Guidance on sampling of drinking water from treatment works and piped distribution system
Part 6 Guidance on sampling of ground waters
Part 7 Guidance on the design and installation of groundwater monitoring points
Part 8 Guidance on sampling of drinking water distributed by tankers or means other than distribution pipes.
Part 9 Guidance on passive sampling in surface waters
Part10 Sampling for microbiological analysis
Standards Methods for the Examination of Water and Wastewater, 21st edition (2005) published by American Public Health Association, USA (APHA).

3 DEFINITIONS

For the purpose of this standard, the following definitions shall apply :

3.1 cyanobacteria: Bacteria containing chlorophyll and phycobilins, commonly known as "blue green algae."

3.2 cyanotoxin : A toxin secreted by certain cyanobacteria.

3.3 potable water : Water from any source with or without treatment complying with the requirements specified in this standard.

3.4 raw water : Water which has received no treatment whatsoever, or water entering a plant for treatment or further treatment.

4 REQUIREMENTS

4.1 Physical, organoleptic and chemical requirements

Potable water shall conform to the requirements given in Table **1, 2** and **3,** when tested in accordance with the methods given in the Columns **4** or **5** of relevant tables.

Table 1- Physical and organoleptic requirements

SI No. (1)	Characteristic (2)	Requirement (3)	Method of test (4)
i)	Colour, Hazen Units, (max.)	15	APHA 2120 B
ii)	Odour	Unobjectionable	Sensory evaluation [a)]
iii)	Taste	Unobjectionable	Sensory evaluation [b)]
iv)	Turbidity, NTU,* (max.)	2	APHA 2130 B
v)	pH at 25 ^{O}C ± 2 ^{O}C	6.5 to 8.5	APHA 4500-H^{+}B

[a)] *Test cold and when heated; Test at several dilutions (Alternative method -Threshold odour test,* APHA 2150 B*)*

[b)] *Test to be conducted only after safety has been established (Alternative method* APHA 2160 B, C*)*

* NTU *Nephelometric Turbidity Units*

Table 2- Chemical requirement

SI No.	Substance or Characteristic	Requirement mg/l (maximum)	Method of test	
			Referee method	Alternative method
(1)	(2)	(3)	(4)	(5)
i)	Aluminium (as Al)	0.2	APHA 3113 B	-
ii)	Ammonia;			
	Free ammonia (as NH_3)	0.06	Appendix A	-
	Albuminoid ammonia	0.15	Appendix A	-
iii)	Anionic detergents (as MBAS)	0.2	APHA 5540 C	-
iv)	Calcium (as Ca)	100	APHA 3500 Ca B	-
v)	Chloride (as Cl^-)	250	APHA 4500-Cl B	APHA 4110 B
vi)	Chemical Oxygen Demand (COD)	10	APHA 5220 B	-
vii)	Copper (as Cu)	1.0	APHA 3111 B	ICP-MS (APHA 3125,EPA 200.8)
viii)	Fluoride (as F^-)	1.0	APHA 4500-F^- C	APHA 4110 B
ix)	Free residual chlorine	1	APHA 4500-Cl G	-
x)	Iron (as Fe) [c)]	0.3	APHA3500-Fe B	APHA 3111B
xi)	Magnesium (as Mg)[d)]	30	APHA 3500-Mg B	-
xii)	Manganese (as Mn)[c)]	0.1	APHA 3111 B	ICP-MS (APHA 3125,EPA 200.8)
xiii)	Nitrate (as NO_3^-)	50	APHA 4500 -NO_3^- E	APHA 4110 B
xiv)	Nitrite (as NO_2^-)	3	APHA 4500 -NO_2^- B	APHA 4110 B
xv)	Nickel (as Ni)	0.02	APHA 3113 B	ICP-MS (APHA 3125,EPA 200.8)
xvi)	Oil and grease	0.2	APHA 5520 B	-
xvii)	Phenolic compounds (as C_6H_5OH)	0.001	APHA 5530 B & D	-
xviii)	Sodium (as Na)	200	APHA 3111 B	-
xix)	Sulphate (as SO_4^{2-})	250	APHA 4500 SO_4^{2-} E	APHA 4110 B
xx)	Total alkalinity (as $CaCO_3$)	200	APHA 2320 B	-
xxi)	Total dissolved solids, mg/l, (max.)	500	APHA 2540-C	-
xxii)	Total hardness (as $CaCO_3$), mg/l, (max.)	250	APHA 2340-C	-
xxiii	Total phosphates (as PO_4^{3-})	2.0	APHA 4500-PC	APHA 4110 B
xxiv)	Zinc (as Zn)	3.0	APHA 3111 B	-

[c)] Total concentration of Manganese (as Mn) and Iron (as Fe) shall not exceed 0.3 mg/l

[d)] Not more than 30 mg/l, if there is 250 mg/l sulphate. If there is less sulphate, magnesium upto 150 mg/l may be allowed

Table 3- Limits for toxic substances

SI No.	Characteristic	Limit mg/l (maximum)	Method of test	
			Referee method	Alternative method
(1)	(2)	(3)	(4)	(5)
i)	Arsenic (as As)	0.01	APHA 3114C	ICP-MS(APHA 3125, EPA 200.8)
ii)	Cadmium (as Cd)	0.003	APHA 3113B	ICP-MS(APHA 3125, EPA 200.8)
iii)	Chromium(as Cr)	0.05	APHA 3114C	ICP-MS(APHA 3125, EPA 200.8)
iv)	Cyanide (as CN)	0.05	APHA (4500-CN C; EPA 335.4)	APHA 4500-CN G APHA 4500-CN H
v)	Lead(as Pb)	0.01	APHA 3113B	ICP-MS(APHA 3125, EPA 200.8)
vi)	Mercury (as Hg)	0.001	APHA 3111B	ICP-MS(APHA 3125, EPA 200.8)
vii)	Selenium (as Se)	0.01	APHA 3114C	ICP-MS(APHA 3125, EPA 200.8)

4.2 Pesticide residues

Pesticide residues shall not exceed the guideline values specified in WHO Guidelines for Drinking Water Quality*. The analysis of pesticide residues shall be conducted preferably by an accredited laboratory using internationally established test methods (see **6**).

* *The latest edition should be used.*

NOTE *: Tests for Pesticide residues may not be necessary for routine analysis and carried out only if required or requested.*

4.3 Bacteriological requirements

The bacteriological requirements for potable water are based on the examination of several samples taken from the supply source under different conditions. The samples obtained as prescribed in 5, when examined by the methods given in **SLS 1461 Part 1/ Section 1 or Section 2 or Section 3**, shall comply with the following requirements:

4.3.1 *Treatment works and piped distribution systems*

4.3.1.1 *E. coli* or thermotolerant coliform bacteria** shall not be detectable in any 100 ml sample.

4.3.1.2 Total coliform bacteria shall not exceed 3 in any 100 ml sample.
Total coliform bacteria shall not be detectable in 100 ml of any two consecutive samples.

4.3.1.3 In the case of large supplies, where sufficient samples are examined total coliform bacteria shall not be present in 95 per cent of samples taken throughout any 12 month period.
In the remaining 5 per cent sample total coliform bacteria shall not exceed 10 per 100 ml.

4.3.2 ***Individual or small community supplies****

4.3.2.1 *E.coli* or thermotolerant coliform bacteria** shall not be detectable in any 100 ml sample.

4.3.2.1 Total coliform bacteria shall not exceed 10 in any 100 ml sample.

*** Although E.coli is the more precise indicator of faecal pollution, the count of thermotolerant coliform bacteria is an acceptable alternative. If necessary, proper confirmatory tests must be carried out.*
**** Individual or small community supplies include wells, bore holes and springs.*

NOTE : *Immediate investigation action must be taken if E. coli are detected.*

4.4 Biological requirements

4.4.1 The potable water shall be free from microscopic organisms such as algae, zooplanktons, flagellates, parasites and toxin producing organisms.

4.4.2 ***Cylindrospermopsin******

Based on health considerations, the concentration of anatoxin-a(S) in potable water shall not exceed 0.002 mg/l.

Referee method - LC-MS (Eaglesham et al 1999; Dell'Aversano et al 2004).
Alternative method - HPLC-PDA (Harada et al 1994; Torokne et al 2004).

4.4.3 ***Microcystins******

Based on health considerations, the concentration of microcystins (measured as MC-LR toxicity equivalents) in potable water shall not exceed 0.001mg/l.

Referee method - HPLC-UV/PDA (Lawton et al 1994: Meriluoto 1997).
Alternative methods - L*C* –MS (Zweigenbaum et al 2000; (Barco et al 2002; (Spoof et al 2003), ADDA – ELISA (Fisher et al 2001).

**** *Toxins of Cyanobacteria*

NOTE : *Examination for biological requirements may not be necessary for routine analysis and carried out only if required or requested.*

5 SAMPLING

5.1 For physical, organoleptic and chemical requirements

Representative samples of potable water shall be drawn as prescribed in **SLS 1462.**

The recommendations given in Part **1** of **SLS 1462** shall be used as the basis for a sampling programme, and the recommendations given in Part **2, 3, 4, 5, 6, 7, 8** and **9** of **SLS 1462** shall be used as the basis for implementing the sampling programme.

NOTE: *Sampling frequency should be increased at times of flooding or emergency operations and following repair work or interruptions to supply.*

5.2 For bacteriological and biological requirements

5.2.1 Representative samples of water shall be drawn as prescribed in Part **1** and Part **10** of **SLS 1462**.

5.2.2 In addition, the recommended minimum number of samples to be examined each month are given in Table **4**.

Table 4- Frequency of sampling for distribution networks

Type of water supply and population	Total number of samples per month
Point sources	Progressive sampling of all sources over 3- to 5- year cycles (maximum)
Piped supplies	
< 5000	01
5000-100 000	01 per 5000 population
>100 000 – 500 000	01 per 10 000 population plus an additional 10 samples
>500 000	01 per 50 000 population plus an additional 50 samples

5.2.3 Sample bottles for bacteriological testing shall be brought to the laboratory for testing within 12 h of sampling. If this is not possible, the samples shall be stored below 10 ^{o}C and transported to the testing laboratory within 24 hours.

6 METHODS OF TEST

6.1 Samples obtained as described in **5** shall be tested for the relevant requirements of this standard as prescribed in following publications and also in Appendix **A**.

1 Standards Methods for the Examination of Water and Wastewater , 21st edition (2005) published by the American Public Health Association, USA (APHA).
2 Analytical methods for drinking water and ground water US Environmental Protection Agency (USEPA) 2003.

6.2 Bacteriological tests shall be carried out according to methods given in sections **1**, **2** and **3** of **SLS 1461** Part **1**.

7 CRITERIA FOR CONFORMITY

The sample of potable water obtained for testing shall be considered as conforming to the requirements of this standard, when tested as in **6,** satisfies all the relevant requirements.

APPENDIX A
DETERMINATION OF FREE AMMONIA AND ALBUMINOID AMMONIA

A.1 REAGENTS

A.1.1 *Magnesium carbonate,* solid

A.1.2 *Permanganate solution,* alkaline

A.1.2.1 Dissolve 8 g potassium permanganate in distilled water, add 200 g of sodium hydroxide, dissolve and make up to one litre. Before using the solution, add an equal volume of distilled water, and then boil until the solution is restored to its original volume.

A.1.3 *Mercuric iodide,* alkaline solution (Nessler reagent)

A.1.3.1 Prepare a cold saturated solution of mercuric chloride – (a). Dissolve 35 g of potassium iodide in 100 ml, of distilled water – (b). Pour (a) into (b) until, after thorough agitation, a slight red precipitate remains permanent. Now add 120 g of sodium hydroxide and, when dissolved, dilute to one litre. Finally, add a little more of the mercuric chloride solution to produce a red colour. Set aside to clear.

A.1.3.2 The delicacy of the reagent appears to be increased by keeping for a few weeks before use, and it should be shaken occasionally.

A.1.4 *Distilled water,* ammonia - free

A.1.4.1 This can be prepared by re-distillation of distilled water after the addition of a few drops of dilute sulphuric acid. Alternatively, free ammonia may be removed by passing the distilled water through a bed of suitable ion-exchange resin (strong cation exchanger); if this method is adopted it is desirable to use an analytical grade of resin (a mixed cation and anion exchange resin is recommended) or a commercial deionization apparatus may be employed.

A.1.4.2 A further alternative is to treat the distilled water with sufficient hypochlorite to oxidize the ammonia (use an available chlorine base equal to at least 10 times the ammoniacal nitrogen content): excess of chlorine may then be dissipated by allowing the water to stand in direct sunlight. This method, while satisfactory, has the disadvantage that, even in strong sunlight, the excess of chlorine may persist for over a week.

A.1.5 *Ammonium chloride*, standard solution

A.1.5.1 Dissolve 3.82 g of ammonium chloride, dried at 100 °C, in distilled ammonia-free water and make up to one litre.
Dilute 10 ml, with ammonia-free water to 1 000 ml when required for use.

1 ml = 0.01 mg N

A.2 PROCEDURE

A.2.1 General procedure for determination of ammoniacal nitrogen by nesslerization

A.2.1.1 For the determination of ammonia by Nesslerization, 50-ml, Nessler cylinders of colourless glass and of uniform height of graduation are required.

A.2.1.2 To prepare standards place appropriate amounts of dilute standard ammonium chloride solution within the range of 0.3 ml to 3.0 ml into 50-ml Nessler cylinders and dilute to the mark with ammonia-free distilled water.

A.2.1.3 Place 50 ml of the unknown solution into a Nessler cylinder, add 2 ml of Nessler reagent and mix well. At the same time add 2 ml of Nessler reagent to each of the standards. Allow to stand 5 minutes and match.

A.2.1.4 Alternatively, permanent colour standards in a suitable colorimeter may be employed, provided such standards are checked frequently, using the dilute standard ammonium chloride solution to ascertain any correction which must be applied owing to variations in the Nessler reagent.

A.2.1.5 In all determinations of ammoniacal and albuminoid nitrogen care must be taken to avoid contamination of the solutions and the apparatus by fumes of ammonia derived from other operations in the laboratory.

A.2.1.6 The results calculated in terms of ammonia :

$$NH_3 = N \times 1.216$$

A.2.2 Determination of free ammonia

A.2.2.1 Use a 1ℓ distillation flask with a suitable condenser. Ensure that it is free from ammonia by distilling a little water in it until the distillate is ammonia-free.

A.2.2.2 Empty the flask and add 500 ml of the sample followed by approximately 0.2 g of magnesium carbonate. Distil over four 50-ml portions, commencing the distillation slowly. Add Nessler reagent to the portions and match as described above. If the content of free ammonia is expected to be high, however, collect the first 100 ml of distillate, mix and take an aliquot portion for ammonia determination ; and subsequent 50-ml portions of the distillate should then be tested according to the general procedure.

A.2.2.3 If the fourth 50-ml portion contains ammonia, distil over further portions until it is absent, and finally add ammonia-free distilled water to make up the volume of residue in the distillation flask to 300 ml.

A.2.3 Determination of albuminoid ammonia

A.2.3.1 Add 25 ml of alkaline permanganate solution to the 300 ml of boiling water left after the distillation of free ammonia. If desired, add some coarsely-ground ignited pumice to avoid bumping. Distil over four 50-ml portions, the total time of distillation being not less than 15 minutes or more than 25 minutes. Determine the ammonia in each portion as previously described.

A.2.3.2 If the content of albuminoid nitrogen is considerable it is more convenient to collect the first 100 ml of distillate and take an aliquot portion for ammonia determination, subsequent 50 ml portions of the distillate then being tested according to the general procedure.

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Printed at SLSI (Printing Unit)

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