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TOLERANCE LIMITS FOR INDUSTRIAL EFFLUENTS DISCHARGED INTO INLAND SURFACE WATERS

SRI LANKA STANDARDS INSTITUTION

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53, Dharmapala Mawatha,
Colombo 3,
Sri Lanka.

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SRI LANKA STANDARD
TOLERANCE LIMITS FOR INDUSTRIAL EFFLUENTS DISCHARGED INTO INLAND SURFACE WATERS

FOREWORD

This Sri Lanka Standard has been authorized for adoption and publication by the Council of the Sri Lanka Standards Institution on 1984-08-17 after the draft, finalized by the Drafting Committee on Industrial Effluents had been approved by the Chemicals Divisional Committee.

Inland surface waters in this standard refers to rivers, streams, lakes, impounded reservoirs irrigation channels, and include rivers liable to seasonal drying. The tolerance limits prescribed in this standard are intended to guide local authorities in framing rules regarding industrial effluents. In arriving at a decision on the tolerance limits, the authorities should give due consideration to the local conditions and in special cases may relax the limits or make them more rigid.

Tolerance limits for colour and odour have not been prescribed in this standard, but it is recommended that as far as practicable, colour and unpleasant odour should not be present in the industrial effluents.

With industrial growth and the establishment of industries which would discharge effluents into inland surface waters, this standard is expected to play a vital role in environmental protection.

The standard values given in this standard are in SI units.

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 test or analysis shall be rounded off in accordance with CS 102. The number of significant places retained in this rounded off value should be the same as that of the specified value in this standard.

In the preparation of this standard the assistance obtained from the publications of the Indian Standards Institution is gratefully acknowledged.

1 SCOPE

This standard prescribes tolerance limits and methods of sampling and test for industrial effluents discharged into inland surface waters.

2 REFERENCES

CS 102 Presentation of numerical values.

CS 124 Test sieves.

3 REQUIREMENTS

3.1 Industrial effluents, before they are discharged into inland surface waters, shall comply with the tolerance limits specified in Table 1.

3.1.1 These values are based on dilution of effluent by at least 8 volumes of clean receiving water. If the dilution is below 8 times, the permissible limits are multiplied by 1/8 of the actual dilution (see Note). No increase in the permissible limits for these determinants is to be allowed as a result of increased dilution of the effect beyond 1 : 8.

NOTE - For example if the effluent is diluted by 6 volumes of clean receiving water the permissible limits for the determinants specified in Table 1 shall be multiplied by 6/8.

3.1.2 If more than one metal is present at the same time percentage values are calculated for each metal from the actual concentration and the permissible limit. The sum of the percentage shall not exceed 100.

4 SAMPLING

4.1 General requirements of sampling

4.1.1 *Sample containers*

The samples shall be collected in clean glass Winchester Quart bottles with glass stoppers or plastic containers with plastic lids. The containers for various determinants shall be selected as in Appendix A.

4.1.2 *Sampling instruments*

If sampling instruments are used, they shall be cleaned and dried when used.

4.2 Collection of samples

The bottles shall be well rinsed with the effluents to be sampled before being filled. Having filled the bottle the stopper shall be rinsed with the effluents and inserted firmly. The bottle containing the sample shall be filled so that a small air bubble is present after closure to prevent leakage or even breakage arising from any subsequent changes in temperature.

As far as possible the bottle shall be filled direct from the source. Care shall be taken to prevent any external contamination during the process of sampling. Care shall be taken to take the samples in such a way as to maintain true proportion of suspended solids.

Except in case of collecting samples for testing oil and grease, where the sample is taken from the top 30 cm. The samples shall not be taken by skimming the top layer of effluents flow or scraping the bottom layer. A point about one third of the way from the bottom shall normally be selected for sampling.

4.3 Preservation of samples

4.3.1 The samples shall be kept at a low temperature (4 ± 1 °C) during the collection and thereafter. Storage at 3 °C to 4 °C in insulated ice box or refrigerator is the best way to preserve samples till the next day.

4.3.2 No single method of preservation is applicable for all the tests.

4.3.3 The method of preservation of samples for various determinants shall be selected as in Appendix A.

4.4 Time of test

4.4.1 The particle size of suspended solids, the temperature and pH measurement shall be carried out at once at the place of sampling.

4.4.2 If the tests are not to be carried out at once at the place of sampling, the sample shall be transported to the laboratory without delay. The samples shall be kept cool on transit.

4.4.3 The tests shall be carried out as soon as possible in any case within 48 hours of sampling unless specified otherwise in Appendix A.

4.5 Labelling

The label on the bottles shall bear the name of the sampling authority, details of the type of sample, place, date and time of sampling and preferably pH, temperature and odour of sample.

TABLE 1 - Tolerance limits for industrial effluents

Sl No. (1)	Determinant (2)	Tolerance limit (3)	Method of test (Ref. to publication in Clause 5 and relevant Appendix) (4)	Technique of the method (5)
i	Total suspended solids, mg/l, max.	50	1	Glass fibre filtration, 103 °C to 105 °C post washing of residue
ii	Particle size of total suspended solids	Shall pass sieve of aperture size 850 µm	Appendix B	-
iii	pH value at ambient temperature	6.0 to 8.5	1	Electrometry, by means of pH meter with glass electrodes (Reference method)
			2	Colorimetry, Winkler (Azide modification) method
iv	Biochemical Oxygen Demand (B.O.D.) mg/l max.	30	2	Incubation for 5 days at 20 °C (Reference method) Incubation for 3 days at ambient temperature (Routine method)
v	Temperature of discharge	Shall not exceed 40 °C in any section of the stream within 15 m down stream from the effluent outlet	2	Electrometric thermometer
vi	Oils and grease, mg/l, max.	10.0	1	Gravimetry, liquid extraction with trichloro-trifluoroethene

Table 1 continued

vii	Phenolic compounds (as phenolic OH^-) mg/l, max.	1.0	1	Colorimetry-chloroform extraction method
viii	Cyanides as (CN^-) mg/l, max.	0.2	1	Pyridine pyrazolone (or barbituric acid) colorimetric method
ix	Sulfides, mg/l, max.	2.0	1	Methylene blue method (Reference method)
			1	Titrimetric-Iodine method for levels greater than 1 mg per litre
x	Fluorides, mg/l, max.	2.0	1	Selective ion electrode method (Reference method)
			1	Colorimetry-Alizarin visual method
xi	Total residual chlorine mg/l, max.	1.0	1	Colorimetry-DPD (N,N diethyl para phenylene diamine)
xii	Arsenic mg/l, max.	0.2	1	Atomic absorption spectrophotometric method
xiii	Cadmium total mg/l, max.	0.1	1	Atomic absorption spectrophotometric method
			1,2	Colorimetric (Dithizone) method
xiv	Chromium total mg/l, max.	0.1	1	Atomic absorption spectrophotometric method (Reference method)
xv	Copper total, mg/l, max.	3.0	1	Atomic absorption spectrophotometric method (Reference method)
			1	Colorimetric (Bathocuproine) method
xvi	Lead, total mg/l, max.	0.1	1,2	Colorimetric (Dithizone) method. (Referance method)
			1,2	Atomic Absorption spectrophotometric method.

Table 1 continued

Sl No. (1)	Determinant (2)	Tolerance limit (3)	Method of test (Ref. to publications in Clause 5) (4)	Technique of the method (5)
xvii	Mercury total mg/l, max.	0.0005	1	Flameless Atomic Absorption spectrophotometric method
xviii	Nickel total mg/l, max.	3.0	1 1	Atomic absorption spectrophotometric method (Reference method) Colorimetric (Heptoxime) method
xix	Selenium total mg/l, max.	0.05	1	Atomic absorption spectrophotometric method
xx	Zinc total, mg/l, max.	5.0	1	Atomic absorption spectrophotometric method (Reference method)
xxi	Ammoniacal nitrogen, mg/l, max.	50.0	1	Nesslerization method
xxii	Pesticides	Undetectable	1	Gas chromatography
xxiii	Radio active material:			
	a) Alpha emitters μ c/ml,	10^{-7}	1	Proportional or scintillation counter
	b) Beta-emitters μ c/ml,	10^{-6}	1	Proportional or scintillation counter
xxiv	Chemical oxygen demand (C.O.D.) mg/l, max.	250	1	Dichromate reflux

Table 1 concluded

4.6 Point of sampling

If the composition of an effluent finally discharged by a factory, is to be ascertained, the point of sampling shall be the final outlet of the effluents treatment plant. If there is no treatment plant, it shall be the effluents outlet immediately outside the factory premises.

4.7 Frequency of sampling

4.7.1 When it is required to find out variation in the composition of an industrial effluent during a specified period individual samples shall be taken at short and appropriate intervals (every, 5, 10, 15 or 30 minutes) and analysed.

4.7.2 When it is required to study average condition over a cycle of operation or a period or during the daily working period of the industry individual samples shall be collected at appropriate time interval from the common channel or drain at a point where the flow of the effluent is likely to be most representative of the entire volume of effluents. The volume of the individual samples taken at a time shall depend on the volume of the effluents flowing at that time. The sampling interval shall depend upon the frequency of variation in the nature of the effluents and the volume of flow. (In most cases, collection of samples at every hour would be sufficient).

4.7.2.1 The individual samples shall be mixed together to form a composite sample and analysed.

5 METHODS OF TEST

5.1 Samples obtained as described in **4** shall be tested for the relevant requirements of the standard as prescribed in the following publications, and Appendix B.

1 American Public Health Association, American Water Works Association and Water Polution Control Federation (1980) Standard Methods for the Examination of Water and Waste Water; 15th ed. New York, APHA.

2 Global Environmental Monitoring Systems Water operational Guide. UNESCO/WHO 1978.

5.2 For certain determinants two test methods have been given in Table 1. The reference method shall be used in case of dispute.

APPENDIX A

SUMMARY OF SPECIAL SAMPLING OR HANDLING REQUIREMENTS

Sl No. (1)	Determinant (2)	Container (3)	Minimum sample size ml (4)	Method of preservation (5)	Maximum storage recommended (6)
i	Total suspended solids	P, G*	-	Refrigerate	7 days
ii	B. O. D.	P, G	1 000	Refrigerate	6 hours
iii	Temperature	P, G	-	Measure immediately	-
iv	Residual chlorine	P, G	500	Measure immediately	0.5 hours
v	Cyanides total	P, G	500	Add NaOH to pH >12, refrigerate in dark	24 hours
vi	Sulfide	P, G	100	Add 4 drops 2 N zinc acetate 100 ml, refrigerate	28 days
vii	Fluorides	P	300	Not required	28 days
viii	Metals:				
	a) General	P(A),G(A)**	-	For dissolved metal filter immediately add HNO_3 to pH <2	6 months
	b) Mercury	P(A),G(A)	500	Add HNO_3 to pH < 2	28 days$^+$
ix	Nitrogen:				
	a) Ammonia	P, G	500	Analyse as soon as possible or add H_2SO_4 to pH < 2 refrigerate	7 days

Continued Appendix A

Sl No. (1)	Determinant (2)	Container (3)	Minimum sample size ml (4)	Method of preservation (5)	Maximum storage recommended (6)
x	Organic compounds: a) Pesticides	G(S)$^{++}$ TFE lined cap		Refrigerate; add 100 mg $Na_2S_2O_3/l$ if residual chlorine is present	7 days
	b) Phenolic compounds	P, G	-	Refrigerate add H_2SO_4 to $pH < 2$	16 hours$^+$
xi	Oils and grease	G, wide mouth, calibrated	1 000	Add H_2SO_4 to $pH < 2$;refrigerate	24 hours
xii	Radioactive material	P, G	-	Add HNO_3 to $pH < 2$	16 hours$^+$
xiii	C.O.D.	P, G	100	Analyse as soon as possible or add H_2SO_4 to $pH < 2$	7 days

* *P : Plastic (Polyethylene or equivalent); G : Glass*

** *P (A) or G (A) : Rinsed with 1 + 1* HNO_3

\+ *Refer publication No. 1 given in Clause* **5** *for additional details, for determinations not listed, use glass or plastic containers ; preferably refrigerate during storage and analyse as soon as possible (Refrigerate : Storage at 4 °C in the dark).*

++ *G (S) : Glass, rinsed with organic solvents.*

Appendix A concluded

APPENDIX B

DETERMINATION OF PARTICLE SIZE OF SUSPENDED SOLIDS

B.1 PRINCIPLE

The particle size of suspended solids is determined by wet screening of the freshly drawn sample through the specified sieve.

NOTE - Since the suspended solids in the sample likely to coalesce on keeping the test should be carried out on the spot. Leaves, twigs and other wind blown debris, which are extraneous to the sample, should be removed.

B.2 APPARATUS

B.2.1 *Sieve,* 850 µm conforming to CS 124.

B.2.2 *Water bath,* diameter slightly bigger than that of the sieve.

B.3 PROCEDURE

Hold the sieve in one hand and with the other, pour gently on the mesh surface of the sieve one litre of the well mixed sample. Pour the sample in such a way that it covers the entire mesh surface. Fill the water bath with fresh water. Then holding the sieve on opposite sides with the two hands gently raise and lower the sieve through the water interface in the bath. Exercise care that while moving the sieve only half of its depth is dipped in the water and none of the solids is floated over the edge.

The suspended matter shall be considered passing through the sieve only if no residue is left on it.

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SRI LANKA STANDARDS INSTITUTION

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