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DRAFT ZANZIBAR NATIONAL STANDARD

Criteria for controlling pollution of marine coastal areas

ZANZIBAR BUREAU OF STANDARDS

First Edition

Foreword

This draft Zanzibar National Standard has been developed by Water Quality Standards Technical Committee (TCE1). In accordance with ZBS general procedures, this draft standard is presented to the public in order to receive any technical and editorial comment concerns.

Technical Committee Representatives

This Draft Zanzibar National Standard was prepared by Water Quality Standards Technical committee which consist of representatives from the following organizations:

State University of Zanzibar (SUZA)
Chief Government Chemist Agency (CGCLA)
Zanzibar Urban Municipal Council (ZUMC)
Zanzibar Environmental Management Authority (ZEMA)
Department of Environment (DoE)
Zanzibar Water Authority (ZAWA)
Tanzania Bureau of Standards (TBS)
Zanzibar Bureau of Standards-Secretariat

Zanzibar Bureau of Standard (ZBS)
P.O.Box 1136
Zanzibar
Tel: +255 24 2232225
Fax: +255 24 2232225
E-mail: info@zbs.go.tz
Web: www.zbs.go.tz

Introduction

Marine environment is intended to cover, in addition to the sea and oceans, creeks and tidal waters. Within the estuarine region, the marine environment will extend up to the low tide level; water above that point will fall in the region of inland surface waters. Marine coastal areas shall extend up to 5 km from the coast line. Pollution of marine coastal areas with sewage, effluents and wastes from the hinterland and from ships is vital problem associated with industrial development, growth of coastal towns and navigational activities in ports and harbours. This standard is being published in order to prevent such pollution, and to preserve the quality of marine coastal waters for bathing and recreation, propagation of fish and other marine life, salt manufacture, boating and navigation, commercial fishing, transport and dispersion of wastes, seaweed farming and aesthetic enjoyment.

The considerations for the regulations for disposing of wastes into the marine coastal areas and for determining the urgency for terminating disposal operations should include the following:

a) Present and future impact on the marine environment, human health, welfare and amenities,
b) Irreversibility of the impact of uncontrolled discharges,
c) Quality and quantity of pollutants involved, and
d) Location of disposal point, that is, length of pipeline, and its depth, and potential impact of the location relative to the uses of the receiving water.

High priority should be given to protecting the ecologically sensitive areas such as sea bed and the near-shore areas in which many marine organisms breed and spawn.

This standard is intended essentially to help the State governments, port trusts and the local authorities in laying down restrictions on the discharge of sewage and industrial effluents from adjacent areas, and of wastes from ships. Some of the discharges should be totally prohibited, as mentioned in the standard, and other discharges should be regulated to the extent that the composition of the coastal waters do not exceed the tolerance limits prescribed in this standard for the specified use of the waters. The standard is, therefore, intended to assist the Revolutionary Government of Zanzibar in deciding on the siting of industrial plants, the degree of concentration of industry at a given place and the mode of discharge of effluents. The authorities should bear in mind that concentration of industry can give rise to situations where although each industrial effluent complies with the relevant standard, the combined effect of all the effluents pollutes the coastal waters beyond limits given in this standard.

This standard should not be taken as laying down the specification for water suitable for the uses mentioned in Table 1 because such criteria depend on a number of factors. The suitability of an individual water for a certain area or purpose would also depend on the local conditions.

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 ZNS 94[1)]. 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 the preparation of this standard, the reference was made to the following sources:

IS 7967:1976 (Reaffirmed 2019), Criteria for controlling pollution of marine coastal areas

[1)] Rounding off numerical values.

Criteria for controlling pollution of marine coastal areas

1 Scope

This Zanzibar National standard lays down the criteria for controlling pollution of marine coastal areas caused by discharge of sewage, effluents and wastes from the hinterland and from ships.

This standard does not apply to waste disposal on the high sea.

2 Normative references

The following referenced documents are indispensable for the application of this Zanzibar National Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5667-9, *Water quality — Sampling — Part 9: Guidance on sampling from marine waters*

ISO 5667-16, *Water quality — Sampling — Part 16: Guidance on biotesting of samples*

ISO 6468, *Water quality – Determination of certain organochlorine insecticides, polychlorinated biphenyls and chlorobenzenes – Gas chromatographic method after liquid-liquid extraction)*

ISO 8199 , *Water quality — General requirements and guidance for microbiological examinations by culture*

ISO 9308-2, *Water quality — Enumeration of Escherichia coli and coliform bacteria — Part 2: Most probable number method*

ISO 11885, Water *quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES)*

ISO 17289, *Water quality — Determination of dissolved oxygen — Optical sensor method*

ISO 20042, *Measurement of radioactivity- Gamma- ray emitting radionuclides-General test method using gamma-ray spectrometry*

TCD 282:2021, *Bioassay method for evaluating acute toxicity for industrial effluents and wastewaters*

TCD 290-1:2021, *Methods of Sampling and Test (Physical and Chemical) for water and wastewater Part 1: Oil and grease*

TZS 1261/ (ISO 7887), Water *quality – Examination and determination of colour*

TZS 1131(Part 1) /ISO 11905-1, *Water Quality – Determination of nitrogen – Part 1: Method using oxidative digestion with peroxodisulfate*

TZS 1844/ISO 10523, *Water quality — Determination of pH*

TZS 1848/ISO 11969, *Water quality — Determination of arsenic — Atomic absorption spectrometric method (hydride technique)*

TZS 1850/ISO 12846, *Water quality — Determination of mercury — Method using atomic absorption spectrometry (AAS) with and without enrichment*

TZS 1851/ISO 14402, *Water quality — Determination of phenol index by flow analysis (FIA and CFA)*

TZS 1930 / ISO 5815-2, *Water quality — Determination of biochemical oxygen demand after n days (BODn) — Part 1: Dilution and seeding method with allylthiourea addition*

ZNS 308*, Water quality — Vocabulary*

ZNS 356 (Part I), Water*, sewage and Industrial effluents-Glossary of terms-Part 1*

3 Terms and definitions

For the purpose of this standard, the definitions given in ZNS 308 [2] and ZNS 356 (Part I) [3] shall apply.

4 Prohibitions

4.1 Discharges; given below shall be prohibited in marine coastal areas except under specified safeguards prescribed by the local authority:

a) uncontrolled discharge of night soil, sewage and industrial effluents;
b) solid wastes of domestic or industrial origin;
c) radioactive effluents and solid wastes;
d) sand, gravel washings and water containing heavy clay suspensions or ash;
e) unscreened organic suspended solids larger than 3 mm in diameter; and
f) solid wastes, oils, and night soil from ships

5 Tolerance limits for water quality after receiving discharges

5.1 Effluent discharge shall not be permitted if the composition of water in the marine coastal area exceeds tolerance limits for different uses prescribed in Table 1.

5.2 Radioactive Emitters — while no limits are being prescribed for the gross content of alpha and beta emitters in the marine coastal waters, it should be kept in mind that the concentration of some radioisotopes shall not be allowed to exceed maximum permissible levels if the water is used for shell fish culture, commercial fish culture and salt manufacture. These values are given in Table 2.

6 Sampling

6.1 For Coliform Bacteria Test — Representative samples shall be drawn as prescribed in ISO 8199 [4]

6.2 For Bio-assay Test — Representative samples shall be drawn as prescribed in ISO 5667-16 [5]

6.3 For Other Tests — Representative samples for the other tests given under Table 1 shall be drawn as prescribed in ISO 5667-9 [6].

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[2] Water quality — Vocabulary

[3] Water, sewage and Industrial effluents-Glossary of terms-Part 1

[4] Water quality — General requirements and guidance for microbiological examinations by culture

[5] Water quality — Sampling — Part 16: Guidance on biotesting of samples

[6] Water quality — Sampling — Part 9: Guidance on sampling from marine waters

Table 1: Tolerance limits for water quality after receiving discharges

S. No.	Characteristic	Tolerance limits		Method of test
		Bathing, Recreation, Shell Fish and Commercial Fish Culture, and Salt Manufacture	Harbour Water	
I.	Colour	No noticeable colour	No noticeable colour	TZS 1261 /(ISO 7887)
II.	odour	No noticeable offensive odour	No noticeable offensive odour	See Annex B
III.	Floating material	No visible floating matter of sewage or industrial waste origin	No visible floating matter	See Annex A
IV.	Suspended solids	No visible suspended solids of sewage or industrial waste origin	-	See Annex A
V.	pH value	6.5 to 8.5	6.5 to 9.0	TZS 1844/ISO 10523
VI.	Free ammonia (as N), mg/L, Max	12	-	ISO 11905-1
VII.	Phenolic compounds (as C_2H_5OH) mg/L, Max	0.1	-	***
VIII.	Dissolved oxygen, Min	40 percent saturation value or 3 mg/L	3mg/L	ISO 17289
IX.	Pesticides (chlorinated hydrocarbons) (as Cl^-), mg/L, Max	0.002	-	***
X.	Arsenic (as As) mg/L, Max	0.2	-	TZS 1848/ISO 11969
XI.	Mercury (as Hg), mg/L,Max	0.0003	-	TZS 1850/ISO 12846
XII.	Oil and greasy substances (sampled in 30 cm surface layer), mg/L, Max	0.1	10	TCD 290:2021
XIII.	Biochemical oxygen demand (5 days at 20^0C)	5	5	TZS 1930/ISO 5815-2
XIV.	Coliform bacteria, MPN index per 100 mL, Max	1000	2500	ISO 9308-2
XV.	Bio- assay test	Not less than 90 percent of test animals shall survive in 96-hour test		TCD 282 :2021

- No data

*** No reference method has been specified, hence currently no restriction on test methods as long as they give reliable results.

Table 2: Values for Radioactive Emitters

S.NO	RADIOISOTOPE	MAXIMUM PERMISSIBLE CONCENTRATION µCi/mL	Method of test
1.	Phosphorus 32	2×10^{-2}	ISO 20042
2.	Sulphur 35	$3 \times 1\ 0^{-4}$	
3.	Chromium 51	4×10^{-5}	
4.	Iron 59	5×10^{-6}	
5.	Nickel 63	2×10^{-5}	
6.	Zinc 65	4×10^{-6}	
7.	Strontium 89	3×10^{-6}	
8.	Strontium 90	3×10^{7}	
9.	Zirconium 95	1×10^{-6}	
10.	Ruthenium 106	2×10^{-7}	
11.	Silver 110	5×10^{-9}	
12.	Iodine 131	4×10^{-6}	
13.	Caesium 134	9×10^{-7}	
14.	Caesium 137	2×10^{-8}	
15.	Barium 140	3×10^{-1}	
16.	Cerium 144	1×10^{-1}	
17.	Radium 226	3×10^{-8}	
18.	Radium 228	8×10^{-9}	
19.	Natural uranium	2×10^{-6}	

Annex A

(Normative)

Determination of non-filterable residue (total suspended solids)

A.1 Principle

Non-filterable residue is determined by passing the sample through a weighed filter and drying the filter at 103-105°C or 179-181°C. Non-filterable residue is calculated from the increase in mass of the filter.

A.2 Apparatus

A.2.1 Filters — One of following may be used.

a) gooch crucible — 30 ml capacity with 2.1, 2.4 or 5.5 cm diameter (pore size 1.2 µm) glass fibre filter disc. (Whatman GF/C or equivalent);

b) crucible — Porous-bottom silica, sintered glass, porcelain, stainless steel or Alundum crucible with a maximum pore size of 5 µm;

c) glass fibre filter disc — (Whatman GF/C or equivalent) 2.1 to 5.5 cm in diameter, pore size 1.2 µm;

d) filtering apparatus — Depending on type of filter used;

e) drying oven - With a thermostatic control for maintaining; temperature up to 180 ± 2°C.

f) desiccator — Provided with a colour indicating desiccant; and

g) analytical balance — 200 g capacity and capable of weighing to nearest 0.1 mg.

A.3 Procedure

A.3.1 Preparation of Glass Fibre Filter Disc

Place the glass fibre filter on the membrane filter apparatus or insert into bottom of a suitable Gooch crucible with wrinkled surface up. While vacuum is applied, wash the dish with three successive 20 ml volumes of distilled water. Remove all traces of water by continuing to apply vacuum after water has passed through. Remove filter from membrane filter apparatus (or both crucible and filter, if Gooch crucible is used) and dry in an oven at 103-105°C for 1 hour. Transfer to a desiccator and weigh after half an hour. Repeat the drying cycle until a constant mass is obtained (mass loss is less than 0.5 mg in successive weighings). Weigh immediately before use. After weighing, handle the filter or crucible filter with forceps or tongs only.

A.3.2 If determinations are to be carried out at 180°C then the filter or crucible/filter shall be dried at 180°C.

NOTE 1: If fixed non-filterable residue is to be determined subsequently then silica, Alundum or porcelain filters should be used. These should be heated to 550°C in the furnace for at least 30 minutes, cooled in the desiccator and weighed.

A.3.3 Sample volume - In potable waters non-filterable residue is usually small. Relatively large volume of water is passed through filter so as to obtain at least 2.5 mg residue. For deciding volume to be taken, turbidity values may be taken into consideration. If turbidity values of a sample is less than 50 units, filter 1 litre sample and if turbidity value exceeds 50units, filter sufficient sample so that non-filterable residue is 50 to 100 mg.

A.3.4 Assemble the filtering apparatus and begin suction. Wet the filter with a small volume of distilled water to seat it against the fitted support.

A.3.5 Shake the sample vigorously and quantitatively transfer the predetermined sample volume selected according to 4.2 to the filter using a graduated cylinder. Remove all traces of water by continuing to apply vacuum after sample has passed through.

A.3.6 With suction on, wash the graduated cylinder filter non-filterable residue with portions of distilled water allowing complete drainage between washings. Remove all traces of water by continuing to apply vacuum after the wash water has passed through.

A.3.7 After filteration, transfer the filter along with contents to an oven maintained at either 103-105°C or 179-181°C for at least 1 hour. Cool in a desiccator and weigh. Repeat the drying cycle till constant mass is obtained. Alternatively, remove crucible and filter from crucible adapter, wipe dry from outside with filter paper and dry at 103-105°C or 179-181°C in an oven. Cool in a desiccator and weigh. Repeat the drying cycle till constant mass is obtained.

A.4 Calculation

Calculate the non-filterable residue from the following equation:

$$\text{Non} - \text{filterable residue, mg/L} = \frac{1000\text{M}}{\text{V}}$$

where,

M = mass in mg of non-filterable residue
V = volume in ml of the sample

A.5 Report

Report in whole numbers for less than 100 mg/l and to three significant figures for higher values. Report the temperature of determination.

A.6 Precision and accuracy

Precision of the method is about 5 percent. Accuracy cannot be estimated because the non-filterable residue as determined by this method is a quantity defined by the procedure followed.

Annex B
(Normative)
Determination of odour

B.1 Preparation of apparatus

Thoroughly clean the required number of wide-mouth glass-stoppered bottles of about one litre capacity. Rinse them with hydrochloric acid and render them completely odourless by repeated washing with odourfree distilled water, which can be prepared by passing distilled water through a column of granulated activated carbon.

B.2 Procedure

B.2.1 As soon as possible after collection of sample, fill a bottle (cleaned as in 3) half-full of sample, insert the stopper, shake vigorously for 2 to 3 s and then quickly observe the odour. The sample taken for observation of odour shall be at room temperature.

B.2.2 When it is desired to record the odour at an elevated temperature, make the observation after warming the sample in a clean stoppered bottle to about 60°C.

B.3 Interferences and precautions

B.3.1 The lab area used for testing should be clean and free from interfering odours. A room equipped with activated carbon filtered inlet air is ideal. Sample preparation and testing should be carried out in separate rooms.

B.3.2 Testers should not smoke, drink (except water) or eat food of pronounced taste before 30 minutes and during the test.

B.3.3 Testers should not use products that have strong smell such as body lotions, shaving creams, cosmetics, deodorants etc. on the day of the test.

B.3.4 Tester should not suffer from any ailment affecting perception of smell such as fever, cold, sinusitis etc.

B.3.5 Prolonged testing leads to olfactory fatigue. Thus taking adequate breaks is important. Frequent rest periods in fresh odour free air is required, preferably after 15 minutes of testing. 15 minutes is an average, the duration of testing depends on the intensity of odour.

B.3.6 Colour and turbidity of samples often incite a bias in the testers. In such instances, external masking of flask by painting the flasks opaque or covering them with opaque paper is necessary.

B.4 Report

B.4.1 Report the true odour of the sample at the mouth of the bottle as rotten egg, burnt sugar, soapy, fishy septic, aromatic, chlorinous, alcoholic odour or any other specific odour. In case it is not possible to specify the exact nature of odour, report as agreeable or disagreeable.

B.4.2 A suggested method of odour classification is shown in Annex A.

B.5 Suggested odour classification

The types of odours present in waste water vary widely. The type of odour shall be described by judging the degree of sweetness, pungency, smokiness and rottenness of the odour.

If the characteristic being judged is high in intensity, rate that characteristic as ‘100’; if medium, rate it as ‘50’; and if low, rate it as ‘0’.

NOTE 1: Intermediate ratings may be used but this practice is not recommended.

The odour class can be established by comparison with the perception levels of odour characteristics shown in table 1. Thus, if an odour is rated as ‘100’ in sweetness, ‘50’ in pungency, ‘0’ in smokiness, and ‘50’ in rottenness, the odour should be described as ‘estery’ or ‘alcoholic’. Reference to the chemical types that produce these odours will guide the operator in determining whether the odour should be reported as ‘estery’ or alcoholic’.

Table A.1: Odours classified by Chemical Type

Odour Characteristics				Odour Class	Chemical Types	Example
Sweetness	**Pungency**	**Smokiness**	**Rottenness**			
100	50	0 to 50	50	Estery	Esters, ethers, lower ketones	Lacquer solvents, most fruits, many flowers
100	50 to 100	0 to 100	50	Alcoholic	Phenols and cresols, alcohols hydrocarbons	Creosote, tare, smokes, alcohol, liquor, rose and spicy flowers, spices and herbs
50	50	0 to 50	50	Carbonyl	Aldehydes, higher ketones	Rancid fats, butter, stone fruits and nuts, violets, grasses and vegetables
50	100	0 to 50	50	Acidic	Acid anhydride, organic acids, sulphur oxide	Vinegar, perspiration, rancid oils, resins, body odour garbage
100	50 to 100	50 to 100	0 to 100	Halide	Quinone, oxides and ozone, halides, nitrogen compounds	Insecticides, weed killers, musty and mouldy odours, husks, medicinal odour, earth, peat
50	50	100	100	Sulphury	Selenium compounds, arsenicals, mercaptans, sulphides	Rotting fish meat, cabbage, onion, sewage
100	50	50	100	Unsaturated	Acetylene derivatives, butadiene, isoprene	Paint thinners, varnish, kerosene turpentine, essential oils, cucumber
100	50	0 to 50	100	Basic	Vinyl monomers, amines, alkaloids, ammonia	Faecal odors, manure, fish and shellfish, stale flowers such as lilac, lily, jasmine and honey-suckle