PCD 732:2025
ICS: 13.060.01

DRAFT ZANZIBAR NATIONAL STANDARD

Water for irrigation — Specification

ZANZIBAR BUREAU OF STANDARDS

First edition

Foreword

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

Technical Committee Representatives

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

Chief Government Chemist Agency (CGCLA)
Department of Environment (DoE)
Department of Irrigation
State University of Zanzibar (SUZA)
Zanzibar Building Agency (ZBA)
Zanzibar Urban Municipal Council (ZUMC)
Zanzibar Bureau of Standards (ZBS) – Secretariat

Zanzibar Bureau of Standards (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

This Zanzibar National Standard has been prepared in order to control the quality of water used for irrigation purposes. Within the growing agriculture industry in Zanzibar, it is accepted that good quality water is needed for maintaining viable production. This Zanzibar National Standard has been prepared in order to maintain the quality of required water for use by relevant stakeholders for irrigation.

In reporting the results of a test analysis made in accordance with this Zanzibar National Standard, if the final value, calculated or observed is to be rounded off, it shall be done in accordance with ZNS 94, Rounding off numerical values.

In the preparation of this Zanzibar National Standard assistance was drawn from the following documents;

IS 11624: 2009, *Guideline for quality of irrigation water* published by Indian Bureau of Standards

TZS 2067:2017, *Water for Irrigation - Specification*

Water for irrigation — Specification

1 Scope

This Zanzibar National Standard specifies the requirements, sampling and methods of test of water for irrigation purposes.

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 5667-4, *Water quality — Sampling — Part 4: Guidance on sampling from lakes, natural and man-made*

ISO 5667-6, *Water quality — Sampling — Part 6: Guidance on sampling of rivers and streams*

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

TZS 1844: 2016, *Water quality — Determination of pH.*

ASTM D 5907, *Standard test methods for filterable matter (total dissolved solids) and non-filterable matter (total suspended solids) in water*

TZS 1849:2016, Water quality — Determination of aluminium — Atomic absorption spectrometric methods

TZS 1846:2016, *Water quality — Determination of ammonium nitrogen — Method by flow analysis (CFA and FIA) and spectrometric detection*

TZS 1859:2016, *Water quality — Determination of nitrate — Part 3: Spectrometric method using sulfosalicylic acid*

TZS 1848:2016, *Water quality — Determination of arsenic — Atomic absorption spectrometric method (hydride technique)*

TZS 1863:2016, *Water quality — Determination of cobalt, nickel, copper, zinc, cadmium and lead — Flame atomic absorption spectrometric methods*

TZS 1858:2016, *Water quality — Determination of electrical conductivity*

TZS 1865:2016, *Water quality — Determination of chloride — Silver nitrate titration with chromate indicator (Mohr's method)*

TZS 1847, *Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES)*

TZS 1864:2016, *Water quality — Determination of chromium — Atomic absorption spectrometric methods*

TZS 1843:2016, *Water quality — Determination of fluoride*

ISO 6332, *Water quality — Determination of iron-spectrometric method using 1, 10-phenanthroline*

TZS 1852:2016, *Water quality — Determination of dissolved Li^{+}, Na^{+}, $NH4^{+}$, K^{+}, $Mn2^{+}$, Ca^{2+}, $Mg^{2+,}$ Sr^{2+} and Ba^{2+} using ion chromatography — Method for water and waste water*
TZS 1839:2016, *Water quality — Determination of manganese — Formaldoxime spectrometric method*

ISO/TS 17379-1, *Water quality — Determination of selenium — Part 1: Method using hydride generation atomic fluorescence spectrometry (HG-AFS)*

ISO 9964-1, *Water quality — Determination of sodium and potassium — Part 1: Determination of sodium by atomic absorption spectrometry*

ISO 9963-1, *Water quality — Determination of alkalinity — Part 1: Determination of total and composite alkalinity*

3 Terms and definitions

For the purpose of this Standard, the following terms and definitions apply:

3.1

Sodium Adsorption Ratio (SAR)
ratio between soluble sodium and soluble divalent cations (calcium and magnesium) in water or soil extracts that can be used to predict the relative activity of sodium ions in exchange reactions with soil

3.2

salinity
total quantity of salts in the irrigation water that is high enough to accumulate in the crop root zone to the extent that yields are affected

3.3

Electrical Conductivity (EC)
amount of total dissolved salts, or the total amount of dissolved ions in the water

4 Requirements

Water for irrigation shall comply with the requirements given in 4.1, table 1 and table 2. For guidance on use of the tables refer to specialists in irrigation.

4.1 The pH value of water shall be 6.5 – 8.4.

Table 1: Major Parameters of water for irrigation

Parameters	Degree of restriction of use			Test methods
	No Problem	Increasing problem	Severe problem	
Salinity (affects crop water availability)				
Electrical Conductivity (mS/cm)	<0.75	0.75 - 3.0	>3.0	TZS 1858:2016
Total Dissolved Solids(mg/L)	<450	450 - 2000	>2000	ASTM D 5907
Permeability/ Filtration (affects infiltration rate into soil) Electrical Conductivity (mS/cm)	>0.5	0.2 – 0.5	< 0.2	
Specific ion toxicity (affects sensitive crops)				
Sodium Adsorption Ratio (SAR)	< 3	3-9	> 9	ISO 9964/TZS 1852:2016
Chloride (Cl) (mg/l)	<142	142-355	>355	TZS 1865:2016
Boron (B) (mg/l)	< 0.75	0.75-2.0	>2.0	TZS 1847:2016
Miscellaneous effects (affects susceptible crops)				
NO3-N (or) NH4-N (mg/l)	< 5	5-30	>30	TZS 1846:2016
HCO3 (mg/l) [overhead sprinkling]	< 91.5	91.5-518.5	> 518.5	ISO 9963

NOTE 1: Most tree crops and woody ornamentals are sensitive to sodium and chloride sensitive crops.

NOTE 2: NO3 -N means nitrate nitrogen reported in terms of elemental nitrogen (NH4 -N and Organic-N should be included when wastewater is being tested.

Table 2: Maximum concentrations of trace elements in water for irrigation

Parameters	Long term use (mg/l)	Short term use (mg/l)	Methods (see clause 2)
Aluminum (Al)	5.0	20	TZS 1849
Arsenic (As)	0.10	2.0	TZS 1848
Beryllium (Be)	0.10	0.5	TZS 1847
Cadmium (Cd)	0.01	0.05	TZS 1863
Chromium (Cr)	0.1	1.0	TZS 1864
Cobalt (Co)	0.05	5.0	TZS 1863
Copper (Cu)	0.2	5.0	TZS 1863
Fluoride (F–)	1.0	15.0	TZS 1843
Iron (Fe)	5.0	20.0	ISO 6332
Lead (Pb)	5.0	10.0	TZS 1863
Lithium (Li)	2.5	2.5	TZS 1852
Manganese (Mn)	0.2	10.0	TZS 1839
Molybdenum (Mo)	0.01	0.05	TZS 1847
Nickel (Ni)	0.2	2.0	TZS 1863
Selenium (Se)	0.02	0.02	ISO 17379-1
Vanadium (V)	0.1	1.0	TZS 1847
Zinc (Zn)	2.0	10.0	TZS 1863

NOTE: The maximum concentration is based on water application rate which is consistent with good irrigation practices (10 000 m^3 per hectare per year). If the water application rate greatly exceeds this, the maximum concentrations should be adjusted downward accordingly. No adjustment should be made for application rates less than 10 000 m^3 per hectare per year. The values given are for water used on a continuous basis at one site.

5 Sampling

The sample of water taken for testing shall represent the water proposed to be used for Irrigation.
Sampling procedure shall be as per ISO 5667-4, ISO 5667-6 and ISO 5667-9 (see clause 2).

Bibliography

Inputs for water quality standards for irrigation established by Ministry of Water and Irrigation Tanzania, 2015.

RS 188:2013, *Water quality — Irrigation water — Tolerance limits* (First Edition) Published by Rwanda Bureau of Standards

