DRAFT TANZANIA STANDARD

Sodium hypochlorite used for disinfection of water intended for human consumption – Specification

For Stakeholder's comments only

TANZANIA BUREAU OF STANDARDS

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Foreword

This Draft Tanzania Standard is being developed by the Water Quality Technical Committee under supervision of the Chemical Division Standards Committee and it is in accordance with the procedures of the Bureau.

In the preparation of this Tanzania Standard assistance has been drawn from:

ANSI /AWWA B 300: 1980, *Standard for hypochlorite,* published by the American National Standards Institute/American Water Works Association.

BS EN 901: 1999, *Chemicals used for treatment of water intended for human consumption – Sodium hypochlorite,* published by European Community.

SANS 50901:1999 *Chemicals used for treatment of water intended for human consumption — Sodium hypochlorite* published by South African National Standard.

IS 11673 *Sodium Hypochlorite Solution — Specification Part 1 Household and Industrial Use* published by Bureau of Indian Standard (BSI).

In reporting the result of a test or analysis made in accordance with this Tanzania Standard, if the final value observed or calculated, is to be rounded off, it shall be done in accordance with TZS 4 (see clause 2).

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DRAFT TANZANIA STANDARD **CDC 6 (175) DTZS**

Sodium hypochlorite used for disinfection of water intended for human consumption — Specification

1 Scope

This Draft Tanzania Standard specifies requirements, sampling and test methods for sodium hypochlorite solution used in disinfection of water intended for human consumption.

2 Normative references

The following referenced documents are indispensable for the application of this document. The latest edition of the referenced document (including any amendments) applies;

TZS 59 /ISO 3696 *Water for analytical laboratory use – Specifications and test methods*

TZS 4 *Rounding off numerical values*

3 Terms and definitions

3.1. water intended for human consumption
all water either in its original state or after treatment, intended for drinking, cooking, food preparation or other domestic purposes, regardless of its origin and whether it is supplied from a distribution network, from a tanker, or in bottles or containers

4 Requirements

4.1 General requirements

4.1.1 Descriptions

4.1.1.1 *Chemical name;* Sodium hypochlorite

4.1.1.2 *Relative molecular mass;* 74.44

4.1.1.3 *Empirical formula;* NaOCl

4.1.1.4 *Chemical formula; NaClO* or NaOCl

4.1.2 Physical properties

4.1.2.1 Sodium hypochlorite solution shall be a clear, slightly yellow or slightly cloudy liquid and shall be miscible in all proportions with water.

4.1.2.2 Sodium hypochlorite solutions shall contain no soluble mineral or organic substances in a quantity that would be deleterious or injurious to anyone consuming water disinfected with acceptable quantities of the hypochlorite.

4.2 Specific requirements

The material, when tested according to the methods prescribed in Annexes A, B, and C shall comply with the specific requirements given in Table 1.

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Table 1 Specific requirements for Sodium hypochlorite.

S/N	Characteristic	Requirement	Method of test
i.	Available chlorine content, % wt /volume	0.5 - 1.0	annex A
ii.	Total free alkali (as NaOH) % weight by volume, *max*	1.2	annex B
iii.	Insoluble matter,% (*max*)	0.15	annex C
iv.	Iron (as Fe), ppm, max.	0.4	Annex D
v.	Neat pH range	9 - 12	

5 Packaging and Marking

5.1 Packing

Sodium hypochlorite shall be packed in a suitable airtight container that prevents it from deterioration of its quality during storage, transportation and handling.

5.2 Marking

The following information shall be legibly and indelibly marked on the container.

a) name and formula of product, 'SODIUM HYPOCHLORITE'(NaOCl).
b) name and address of the manufacturer.
c) the net volume of the contents.
d) the batch or code number.
e) the nominal available chlorine content.
f) dates of manufacture and best before.
g) the instruction for use and handling.
h) first aid instructions.
i) the words 'STORE IN A COOL DRY PLACE AWAY FROM DIRECT SUNLIGHT '.
j) hazard warning in symbol or words.

6 Sampling

Sampling for Sodium hypochlorite shall be done as per Annex E.

7 Testing

Methods of test for Sodium hypochlorite shall be as prescribed in the annexes.

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Annex A
(normative)
Method of determination of available chlorine content

A.1 Summary of method

The sample is added to an acidified solution of potassium iodide and the released iodine is titrated with standard sodium thiosulphate solution to the usual starch end point.

A.2 Reagents

A.2.1 Acetic acid, glacial.

A.2.2 Potassium iodide (KI), crystals, iodate free.

A.2.3 Sodium thiosulphate ($Na_2S_2O_35H_20$), Standard solution (0.1N).

Dissolve 25 g of Na_2SO_3 crystals in freshly boiled and cooled water and dilute to 1 L. The solution is more stable if the glass ware is cleaned with sulphuric-chromic acid and thoroughly rinsed with water. Standardize against potassium iodate (KIO_3) as follows: Weigh out accurately 3.567 g of dry KIO_3 and transfer to a 1 L volumetric flask. Dissolve with water, make up to the mark and mix thoroughly. This solution will be exactly 0.1000 N. To standardize the Na_2SO_3 solution, carefully pipette a 50 mL aliquot of the KIO_3 solution into a 250 mL Erlenmeyer flask and dilute to 100 mL with water. Add 1 g of KI crystals. When it is dissolved, add 15 mL of 1.0 N hydrochloric acid and titrate immediately with the $Na_2S_2O_3$ solution. When the solution becomes light yellow, add 1 mL of starch indicator solution and complete the titration to the disappearance of the blue colour. Standardize at least monthly. Calculate the normality of the $Na_2S_2O_3$ solution as follows:

$$\text{Normality, } N_1 = \frac{50 \times 0.1}{A}$$

where,

A is the value of $Na_2S_2O_3$ solution required for titration of KIO_3 solution, mL.
N_1 is normality of the $Na_2S_2O_3$

A.2.4 Mix 0.5 g of soluble starch with 5 mL of cold water and add to 95 mL of boiling water. Mix, cool and store in a sterilized bottle. Replace frequently or add 0.1% salicylic acid to minimize deterioration.

A.3 Procedure

Dissolve 2 to 3 g of KI crystals to 50 mL of water in a 250 mL Erlenmeyer flask. Add 10 ml of acetic acid. Then pipette the aliquot of sample into the solution keeping the tip of the pipette beneath the surface of the solution until drained. Titrate at once with 0.1 *N* $Na_2S_2O_3$ solution until the iodine colour is nearly gone then add 1 mL of starch indicator solution and complete the titration to the disappearance of the blue colour. Record the titration as A.

A.4 Calculations

A.4.1 Calculate the available chlorine, percent mass by volume as follows:

$$\text{available chlorine as Cl,\% g/L} = \frac{(AN_1\ X\ 35.46)\text{x}\ 100}{V}$$

A.4.2 Calculate the sodium hypochlorite content, percent mass by volume as follows:

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$$\text{Sodium hypochlorite (NaOCl),\% g/L} = \frac{(AN_1 \text{ x } 37.22)\text{x } 100}{V}$$

where,

A is the volume of $Na_2S_2O_3$ solutionrequired for titration of the sample, mL;

N_1 is the normality of the $Na_2S_2O_3$ solution; and

V is the volume of original sample in aliquot used, mL.

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Annex B
(normative)
Method of determination of sodium hydroxide content

B.1 Summary of method

A sample is added to a neutralised, mixed solution of barium chloride and hydrogen peroxide, which precipitates any carbonate and reduces the hypochlorite to chloride. The free alkali is then titrated with standard hydrochloric acid using phenolphthalein indicator.

B.2 Reagents

B.2.1 Barium chloride solution (100 g/L)

Dissolve 100 g of chemically pure barium chloride ($BaCl_2.2H_2O$) in distilled water and dilute to 1 L with distilled water. Filter the solution if turbid.

B.2.2 Hydrochloric acid, standard (0.1 N)

Prepare a 0.1 N solution of hydrochloric acid (HCl) and standardize against primary standard solution carbonate and methyl red mixed indicator.

B.2.3 Hydrogen peroxide, approximately 3%.

B.2.4 Phenolphthalein indicator solution (0.5 g/100 mL)

Dissolve 0.5 g of phenolphthalein in 60 ml of 95% ethyl alcohol and dilute to 100 L; with water.

B.2.5 Sodium hydroxide solution

Dissolve 4.0 g of chemically pure sodium hydroxide in distilled water and dilute to 1 L with distilled water.

B.3 Procedure

Place 50 mL of barium chloride solution and 30 mL of hydrogen peroxide in a 250 mL Erlenmayer flask (or 6.in porcelain dish), add 10 drops of phenolphthalein indicator solution and neutralize with sodium hydroxide solution. Introduce into this neutral mixture 10 mL of the liquid sample, shake or stir vigorously for 1 min and titrate the sodium hydroxide solution with 0.1 N hydrochloric acid until the pink colour disappears.

B.4 Calculation

Calculate the free alkali as NaOH as follows:

$$\text{Free alkali as NaOH, g/L} = \frac{LN_2 \text{ x } 40}{V}$$

where

L is the volume of hydrochloric acid solution used in the titration, mL;

N_2 is the normality of the hydrochloric acid solution; and

V is the volume of original sample used, mL

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Annex C
(normative)
Method for determination of insoluble matter

C.1 Apparatus

C.1.1 *Sintered crucible*

C.1.2 *Analytical Balance*

C.1.3 *Oven*

C.2 Procedure

Pour approximately 100 mL of the sodium hypochlorite solution into a tared 400 mL beaker placed on a laboratory platform balance and weigh to the nearest 0.1 g. Add 100 mL of distilled water (as per TZS 59), and mix thoroughly. Filter through a tared dry Sintered crucible. Wash the beaker and crucible with distilled water. Dry the crucible to a constant weight at 100-105°C.

C.3 Calculation

$$\text{Percent insoluble matter} = \frac{\text{Grams of residue}}{\text{Grams of sample}} X\ 100$$

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Annex D

(Normative)
Determination of Iron

F.1 Apparatus.

F.1.1 *Nessler Cylinders* — 50 ml capacity.

F.2 REAGENTS

F.2.1 Ammonium Persulphate

F.2.2 Butanolic Potassium Thiocyanate Solution

Dissolve 10 g of potassium thiocyanate in 10 ml of water. Add sufficient n- butanol to make up to 100 ml and shake vigorously till the solution is clear.

F.2.3 Standard Iron Solution A

Dissolve 0.702 2 g of ferrous ammonium sulphate
[$FeSO_4 \cdot (NH_4)_2 SO_4 \cdot 6H_2O$] in 100 ml of water (as per TZS 59), add 5 ml of 1: 5 (*v*/*v*) sulphuric acid and add dilute solution of potassium permanganate (0.2 percent, *m*/*v*) drop wise until a slight pink coloration remains after stirring. Dilute with water to 1 000 ml and mix thoroughly. One millilitre of this solution contains 0.1 mg of iron as Fe.

F.2.4 Standard Iron Solution B

Take 100 ml of the standard iron Solution A (*see* **F-2.3**) and dilute to 1 000 ml with water in a 1 000 ml volumetric flask. This dilute solution should be prepared fresh. One millilitre of this solution contains 0.01 mg of iron (as Fe).

F.3 PROCEDURE

F.3.1

Weigh 50.0 g of the material in a silica dish (capacity – 200 ml) and evaporate it almost to dryness over water bath. Dissolve the dry mass in 30 ml water, transfer quantitatively in a nessler cylinder of 50 ml capacity, add about 30 mg of ammonium persulphate and 15 ml of butanolic potassium thiocyanate solution. Make up to 50 ml, shake vigorously for about 30 s and allow the layers to separate. Carry out a control test in another Nessler cylinder using 2 ml of standard iron Solution B (*see* **F-2.4**). Compare the intensity of the colour produced in the butanol layers in the two cylinders.

F-3.2 The limit prescribed in Table 1 shall be taken as not having been exceeded if the intensity of colour produced with the material is not greater than that produced in the control test.

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Annex E

(Normative)

Sampling

D.1 The following sampling procedure shall be applied in determining whether a lot, submitted for inspection and test, complies with the relevant requirements of the specification.

D.2 Sampling from tankers

Take from four levels in the tanker or at four stages during filling of the tanker a composite sample of 500 mL. Divide this sample into two equal portions and place each portion in a sample bottle. Use one portion for the determination of the insoluble matter the available chlorine and the free sodium hydroxide contents.

D.3 Sampling from other containers

D.4 *Containers with a capacity of more than 1 L.*

From the lot, take at random the number of containers relative to the lot size as given in table 1. From each container so drawn take a sample 500 mL. Divide each sample into two equal portions and place each portion in a sample bottle. Use one portion of each sample for the determination of the available chlorine and the free sodium hydroxide contents and reserve the other portion for the determination of the sodium chlorate content.

D.5 *Containers with a capacity of 1 L or less*

From the lot, take at random the number of containers relative to the lot size as given in table 1. If the containers are packed in cartons, take at random the number of cartons relative to the lot size and from each carton so drawn take at random one container. Use half of the samples for the determination of the insoluble matter, available chlorine and the free sodium hydroxide contents.

D.6 The containers and the samples so taken shall be deemed to represent the lot.

D.7 Compliance with the specification

The lot shall be deemed to comply with requirements of the specification, if after sampling of the containers and testing of the samples taken in accordance with D.2, no defective is found.

Table 1 – Number of containers to be taken for sampling various lot sizes

Lot size number of containers	Sample size number of containers
1 to 4 5 to 50 51 to 100 101 to 500 501 to 1500 1501 and above	All 4 5 8 10 12

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