



DRAFT TANZANIA STANDARD

GDC 4 (1) DTZS Tableware-Ceramic Ware-Specification

DRAFT FOR PUBLIC COMMENTS

TANZANIA BUREAU OF STANDARDS

1. Scope

This draft Tanzania standard specifies requirements, method of sampling and test for ceramic ware.

2. Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6486-1:2019 Ceramic ware, glass ceramic ware and glass dinnerware in contact with food — Release of lead and cadmium — Part 1: Test method.

ISO 6486-2:1999 Ceramic ware, glass-ceramic ware and glass dinnerware in contact with food — Release of lead and cadmium — Part 2: Permissible limits.

IS 14179:1999 Methods of test for ceramic tableware.

3. Terms and definitions

For the purpose of this document, the following terms and definitions shall apply;

3.1 ceramic ware

ceramic articles which are intended to be used in contact with foodstuffs, e.g. food ware made of burnt clay, porcelain and earthenware, whether glazed or not

3.2 crazing (or Craze)

hair like cracking which occurs in fired glazes or other ceramic coatings due to critical tensile stresses

3.3 ceramic decoration colour

preparation consisting of coloured or colourless glass powder and inorganic pigments for coating of ceramics or glass by melting at temperatures above 450 °C

3.4 chipping resistance

ability of ceramic ware to resist the removal of any portion of its surface as a result of impacts

3.5 flatware

Ceramic ware which has an internal depth not exceeding 25 mm, measured from the lowest point to the horizontal plane passing through the point of overflow

3.6 glaze

ceramic coating matured to glassy state on a formed ceramic article, or the material or mixture from which the coating is made

3.7 hollowware

ceramic ware having an internal depth greater than 25 mm, measured from the lowest point to the horizontal plane passing through the point of overflow. Hollowware is subdivided into three categories based on volume:

- small: hollowware with a capacity < 1,1 L;
- large: hollowware with a capacity of ≥ 1,1 L;
- storage: hollowware with a capacity of ≥ 3 L;
- cups and mugs: small ceramic hollowware commonly used for consumption of beverages, e.g., coffee or tea at elevated temperature.

Note 1 to entry: Cups and mugs are vessels of approximately 240 ml capacity with a handle. Cups typically have curved sides whereas mugs have cylindrical sides.

3.8 thermal Shock

condition of stress brought about by a large temperature difference across a body or glaze

3.9 vitreous (Vitrified)

degree of vitrification evidenced by low water absorption

NOTE — The term 'vitreous' generally signifies less than 0.5 percent water absorption.

3.10 warpage

deviation from flatness

4. Requirements

4.1 General Requirements

4.1.1 The ceramic ware shall be totally glazed except in areas which are for support during firing, but such unglazed surfaces shall be smooth and polished. The glaze shall be even, free from cracks, and shall possess an impervious surface. It shall be free as possible from pinholes, blisters, iron spots, glaze jumps, glaze runs, waxy glaze and pitting.

4.1.2 The ceramic ware shall possess a good or high-pitched metallic ring whenever tapped with anything hard, of good workmanship, and free as possible from manufacturing defects like welts, chips, craze, specks, crawling or other imperfections detracting from the sight.

4.1.3 The ceramic ware with a lip and spout, it shall be of suitable design so that the liquid does not drip outside while pouring.

4.1.4 The handle when provided shall always be symmetrical and must be able to support the weight of ceramic ware and its content.

4.1.5 The materials used for the body and glaze shall be of a true porcelain mix. These are feldspar, silica and kaolin.

4.1.6 Types of decoration can either be over glaze, in-glaze, or underglaze and can be made of gold, platinum, or ceramic pigments and stains.

4.2 Specific Requirements

4.2.1 Ceramic decoration colour

4.2.1.1 The Ceramic decoration colour shall be highly resistant to acid with a maximum tolerance up to Grade No. 1 (see Table 1) when tested in accordance with the method given in Annex H.

4.2.1.2 The Ceramic decoration colour on the surface of the ware shall be highly resistant to alkali to Grade No. 2 (see Table 1) when tested in accordance with the method given in Annex H.

4.2.1.3 The Ceramic decoration colour on the ware surface shall be highly resistant to boiling water with a maximum tolerance up to Grade No. 1 (see Table 1) when tested in accordance with the method given in Annex H.

4.2.1.4 The Ceramic decoration colour on the ware surface shall be highly resistant to household detergent with a maximum tolerance up to Grade No. 1 (see Table 1) when tested in accordance the method given in Annex G.

Table 1- Grades based on chemical test result

Item	Grades			
	0	1	2	3
Surface luster	Unchanged	Slightly matte	Considerably matte	No luster
Color fading	Unchanged	Slightly fading	Considerably fading	Extreme fading

4.2.2 Limits release of Lead and Cadmium

The permissible limits for Lead and cadmium for ceramic ware, when tested in accordance with ISO 6486-1:2019, shall conform to the requirements given in Table 2.

Table 2-Permissible limits for Lead and cadmium release

Type of ware	Permissible limits (mg/l)	
	Lead Limit (Maximum)	Cadmium limit (Maximum)
Small hollowware	2	0.5
Large hollowware	1	0.25
Storage hollowware	0.5	0.25
Cups and Mugs	0.5	0.25
Cooking ware	0.5	0.05
Flatware	Permissible limits (mg/dm ²)	
	0.8	0.07

4.2.2 The ceramic ware shall conform to the requirements indicated in table 3.

Table 3-Requirements for Ceramic ware

Parameter	Requirement	Test method
Thermal shock , °C Minimum	160	Annex A
Chipping resistance, Nm Minimum	0.14	Annex B
Impact strength ,Nm Minimum	0.267	Annex C
Water absorption % ,Maximum	0.4	Annex D
Crazing	None of the test pieces show crazing	Annex E

4.2.3 Warpage

4.2.3.1 Out-of-Roundness

The out-of-Roundness of various items tableware shall not exceed 1% on the nominal diameter when measured in accordance with the method prescribed in F.1 of Annex F.

4.2.3.2 Edge- Warpage and Slope of Flatware

The edge-warpage and slope of the flatware shall not exceed 2 mm and 2° respectively when measured in accordance with the method prescribed in F.2 of Annex F.

4.2.3.3 Flatness of Dinner Plate

The eating surface of the plate shall be flat within 2 mm total indicator run out when measured in accordance with the method prescribed in in F.3 of Annex F.

4.2.4 Resistance to Detergents

When tested- by the method prescribed in Annex I, the test article shall not show any loss of gloss of the glaze when compared with the untested test specimen.

5. Packing and marking

5.1 Packing

The ceramic ware shall be packed as agreed between the supplier and the purchaser.

5.2 Marking

Each article of the ceramic ware shall be indelibly and legibly marked with the following information;

- a) Manufacturer's name and/or recognized trade mark.
- b) country of origin.
- c) The words 'FOR FOOD CONTACT', or the Food safety symbol as shown in Annex J.

6. Sampling

6.1 Lot

All the ceramic ware items of the same shape, size and material and belonging to the same batch of manufacture shall constitute a lot.

6.1.1 Each lot shall be tested separately for all the requirements of the specification. The number of pieces to be selected from each lot for this purpose shall be as given in Table 3.

6.1.2 The pieces shall be selected at random from each lot.

6.2 Number of Tests

6.2.1 Tests for all the requirements of workmanship, finish and visual assessment shall be done on samples selected as per col 2 of Table 3 and tests for the remaining characteristics shall be performed on the samples selected as per col 4 of Table 3.

6.3 Criteria for Conformity

6.3.1 An item not complying with one or more than one requirements shall be termed as defective.

6.3.2 For the lot to be accepted as conforming to the requirements of workmanship, finish and visual assessment, the total number of defectives shall not exceed the corresponding acceptance number as given in col 3 of Table 3.

6.3.3 The lot having been found satisfactory according to 6.4.2, shall be further tested for warpage, water absorption, resistance to detergents and resistance to boiling citric acid on the samples selected as per col 4 of Table I. Resistance to abrasion shall be tested on specially prepared unglazed tiles (see Annex H.2). All the tests shall pass for the lot to be found satisfactory according to these requirements.

6.3.4 The lot having been found satisfactory according to 6.4.3 shall then be tested for crazing resistance, impact strength and chipping resistance, and resistance to thermal shock.

6.3.4.1 The samples shall conform to all the tests for the lot to be accepted as conforming to the requirements of the specification.

Table 3 Scale of Sampling
(clause 6.1.1,6.2.1,6.3.2 and 6.3.3)

Lot Size	Permissible Number of Defectives	Sample Size
Up to 150	0	2
151 to 280	1	2
281 to 500	2	3
501 to 1200	3	3
1201 to 3200	5	4
3201 to 10000	7	5
10001 to above	10	5

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Annex A

(clause 4.2.2)

TEST FOR RESISTANCE TO THERMAL SHOCK

A.1 Principle

Thermal shock is measured by the difference between the upper temperature t_1 to which the specimens are heated and the lower temperature t_2 of the cold water-bath into which they are placed after heating. This is a test for tendency of crazing due to residual stresses after firing and not due to factors of moisture expansion.

A.2 Apparatus

A.2.1 Air-Oven

With a temperature range of 35 to 250°C and provided with an air stirrer or circulator to ensure uniformity of temperature. The oven shall have a thermostat capable of maintaining the temperature constant to ± 1 °C up to 180°C and ± 2 °C between 180 and 250°C. It shall also be provided with a thermometer capable of being read to an accuracy of ± 1 °C.

A.3 Reagent

A.3.1 Eosin Solution

0.5 percent (m/v) in water.

A.4 Procedure

A.4.1 Place three specimens in the air-oven previously heated to the upper temperature t_1 so that the difference ($t_1 - t_2$) is equal to 120°C, t_2 being the temperature of tap water in the cold water-bath. Maintain the samples in the oven at that temperature for 30 min. Then -remove the specimens from the oven, one at a time, by means of tongs with asbestos covered tips, completing the process of transference in $5 \pm 1-5$ for each article, and immerse the specimens for a specified period of not less than two minutes into the cold water-bath which has been maintained at temperature t_2 . After immersing in the cold water-bath, dry the specimens and then immerse in the eosin solution. Examine the test specimens after cleaning. The specimens shall be subjected to this test five times.

A.4.2 The specimens shall be considered to have satisfied the requirement of the test if there is no crazing of the glaze or cracking of the-ware indicated by coloured hair lines on the surface of any specimen.

Annex B

(clause 4.2.2)

TEST FOR CHIPPING RESISTANCE

B.1 Principle

This test is carried out to ensure that the ceramic ware withstands impacts encountered in normal day to day use without breaking or chipping.

B.2 Apparatus

B.2.1 Impact Tester

A suitable pendulum type impact tester

B.3 Procedure

B.3.1 This test shall be carried out on flat ware only. Place the plate or saucer on its foot between two cast iron blocks forming a 90° 'V' and adjust it in such a manner that when the hammer is hanging vertically the center of the impact face of the chipping hammer touches the edge of the test piece at the plane of the bisector of the angle of the 'V'. Strike the test piece at three equally spaced points on its periphery with the cylindrical end of the hammer with an impact force of 0.14 N.m.

B.3.2 The ware shall be considered as not conforming the test if the impact results in chipping of the edge so that fragments of glaze and body are removed.

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(clause 4.2.2)

TEST FOR IMPACT STRENGTH

C.1 Principle

This test is carried out to ensure that the ceramic ware withstands impacts encountered in normal day to day use without breaking or chipping.

C.2 Apparatus

C.2.1 Impact Tester

A suitable pendulum type impact tester.

C.3 Procedure

When testing a plate, saucer or platter, support the ware against three equally spaced 3 mm diameter steel balls so that when the hammer is hanging vertically the impact point of hammer touches the centre of the bottom of the test piece. When testing a cup or bowl, place the ware on its foot between two cast iron blocks forming a 90° 'V' whose sides are sufficiently high to support the upper edge of the cup or bowl and adjust it in such a manner that when the hammer is hanging vertically, its impact point touches the cup or bowl at its upper edge and on the plane of the bisector of the angle of 'V'. Strike the test piece with the spherical end of the hammer with an impact force impact of 0.267 N.m.

9.3.1.1 A ware such as a plate, saucer or platter shall be considered as not complying the test if it develops a rupture which appears as a hole through the body or as a body crack extending through its rim. A cup or bowl shall be also treated as not conforming if it develops a body crack extending into any portion of the foot or a portion of the body breaks away.

(clause 4.2.2)

TEST FOR WATER ABSORPTION

D.1 Principle

Water absorption of the sample is determined by the amount of water absorbed by boiling the sample in distilled water and finding the increase in the mass.

D.2 Test Pieces

Five test pieces from five different test samples are cut or broken to get a surface area of about 16 cm². At least two flat faces of the test pieces shall be glazed and other sides unglazed. The test samples shall be freshly cut or broken.

D.3 Procedure

Test pieces shall be dried at a temperature –between 110° and 120°C and then cooled to a room temperature in a desiccator. The test pieces shall be weighed accurately to the nearest 0.01 g and then put in vessel and evacuate the air maintaining the pressure at less than three centimeters of mercury for 1 introduce freshly boiled and cooled distilled water into the vessel maintaining the vacuum until the pieces are covered with water. Then admit air into the vessel normalizing the pressure and boil the pieces in distilled water for not less than 20 min. Cool, wipe the pieces with a damp soft cotton cloth to remove adhering surface water and weigh quickly.

Water absorption of the test pieces shall be calculated as follows:

$$\text{Water absorption, percent by mass} = (M_2 - M_1) / M_1 \times 100$$

where

M_2 = mass in g of the soaked test piece after boiling, and

M_1 = mass in g of the dry test piece.

(clause 4.2.2)

TEST FOR CRAZING RESISTANCE

E.1 Procedure

E.1.1 Fresh whole dry articles shall be subjected to the crazing test. They shall be placed loosely at room temperature on a suitable support at least 50 mm above water level in an autoclave which shall be of sufficient capacity and equipped with a safety valve, blow-off valve; thermometer, pressure gauge and heating arrangement or other means of sufficient capacity to ensure constant steam pressure within the autoclave. Sufficient amount of distilled water shall be taken in the autoclave. Slight water will remain after the test. Initially the blow-off valve shall be kept open until steam begins to escape thereby expelling most of the air. Also closing the blow-off valve, water shall be kept boiling and the steam pressure increased at a uniform rate until it reaches the pressure 5 kg/cm² within a period of 30 min or one and a half hour depending on the kind of the ware and hold it at the maximum pressure for 1 h. Sufficient heat shall be applied to maintain a constant steam pressure for the specified period.

E.1.2 The source of heat shall then be shut off and steam pressure released slowly in not less than 30 min by opening the blow off valve. The ware shall be allowed to cool to room temperature in the autoclave. The wares then shall be removed and tested for crazing by applying 0.5 percent eosin solution (*m/v*) in water or blue black fountain pen ink to the glazed surface. There should not be any hair like pattern after application of the dye or ink.

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(clause 4.2.2)

TEST FOR WARPAGE

F.1 Out-of-Roundness

The out-of-roundness of the ceramic ware shall be determined by use of a dial indicator. The sample, resting on its foot on a flat surface, shall be blocked in a manner to allow its rotation. The indicator plunger shall strike the outer rim edge of the sample from above at a 45° angle to a horizontal plane. The sample shall be rotated and the low and high readings taken. The difference between the two readings shall denote the out-of-roundness.

F.2 Edge Warpage and Slope for Flatware

Edge warpage and slope of items shall be determined as follows:

- a) Invert the sample and place it face down on a surface plate.
- b) Place a weight across the resting surface of the item to stabilize it in place.
- c) Attempt to insert a feeler gauge between the surface and any portion of the sample edge. The reading of the feeler gauge will indicate the warpage on the edge of the item.
- d) Remove the weight from the resting surface and replace it with an inclinometer.
- e) Determine the slope of the resting surface.

F.3 Flatness

The surface flatness of the eating area of the flatware shall be determined by using a dial indicator. The sample shall be adequately blocked and the indicator stabilized to prevent a distorted reading. The total runout (flatness) expressed in decimal value shall be the summation of the 'high (convex) and the low (concave) point encountered.

(clause 4.2.2)

TEST FOR RESISTANCE TO DETERGENTS

G.1 Principle

The ceramic ware articles are immersed into detergent solution at a temperature of 60°C for 48 h and loss of gloss of the glaze is compared visually against untested sample.

G.2 Reagent

G.2.1 Detergent

0.04 percent (m/v)

G.3 Procedure

Place fresh, clean whole article or piece in a suitable beaker. Add detergent solution so that the article is completely immersed and then cover with watch glass. Place the beaker in an air oven for 48 h at a temperature of 60°C. During the period of test, the concentration of the detergent solution shall be maintained by adding required amount of water periodically. At the end of the period, remove the test specimen, wash with water and dry. Compare the loss of gloss of glaze of the test specimen visually against untested sample.

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Annex H

(clause 4.2.1.1,4.2.1.2,4.2.1.3)

TEST METHOD FOR CERAMIC WARE DECORATION

H.1 Boiling water proof test

H.1.1 Principle

This test determines if fired pigment or luster is affected by boiling water.

H.1.2 Procedure

Leave the test piece at 100°C controlled water bath for 24 hours. Wash, dry and observe for changes in luster, color and peeling-off of pigments or gold.

H.2 Alkali proof test

H.2.1 Principle

This test determines if fired pigment or luster is affected by alkali.

H.2.2 Procedure

Dip the test piece into a 0.5% solution of sodium carbonate in a controlled water bath at 100°C for two hours. Wash, dry and observe for change in luster, color and peeling-off of pigments gold.

H.3 Acid proof test

H.3.1 Principle

This test evaluates the quality of design or decoration (gold or platinum) on the ware surface and if fired pigments of gold on the ware is affected by acid.

H.3.2 Procedure

Dip the test piece into a four percent solution of acetic acid. Soak at 25-55°C for 24 hours. Wash thoroughly with water, dry with cloth and observe for any change in luster, color and peeling-off of fired pigments or gold.

(clause 4.2.4)

TEST FOR RESISTANCE TO DETERGENTS

I.1 Principle

The tableware articles are immersed into detergent solution at a temperature of 60°C for 48 h and loss of gloss of the glaze is compared visually against untested sample.

I.2 Reagent

I.2.1 Detergent

0.04 percent (m/v)

I.3 Procedure

Place fresh, clean whole article or piece in a suitable beaker. Add detergent solution so that the article is completely immersed and then cover with watch glass. Place the beaker in an air oven for 48 h at a temperature of 60°C. During the period of test, the concentration of the detergent solution shall be maintained by adding required amount of water periodically. At the end of the period, remove the test specimen, wash with water and dry. Compare the loss of gloss of glaze of the test specimen visually against untested sample.

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Annex J

(Informative)

FOOD SAFETY SYMBOL

The international symbol for "food safe" material is a **wine glass** and a **fork symbol**. The symbol indicates that the material used in the product is considered safe for food contact. This includes food and water containers, packaging materials, cutlery etc. These can be made from a variety of materials including plastics, rubber, paper and metal. They also include materials used in processing equipment, such as coffee makers or production machinery as well as containers used for transport.



Figure 1: International Food safety symbol