DRAFT EAST AFRICAN STANDARD

Sanitary appliances (vitreous china) — Part 1: General requirements
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<td>13</td>
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<td>13</td>
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Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in the East African Community. It is envisaged that through harmonized standardization, trade barriers that are encountered when goods and services are exchanged within the Community will be removed.

The Community has established an East African Standards Committee (EASC) mandated to develop and issue East African Standards (EAS). The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the public and private sector organizations in the community.

East African Standards are developed through Technical Committees that are representative of key stakeholders including government, academia, consumer groups, private sector and other interested parties. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the Principles and procedures for development of East African Standards. XXXXXX.

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

The committee responsible for this document is Technical Committee EASC/TC EASC/TC: 037, Utensils, cutlery, Sanitary wares and fittings and domestic hardware.

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Sanitary appliances (Vitreous china) — Part 1: General requirements

1 Scope

This Draft East African standard covers general requirements relating to terminology, material and manufacture, glazing, defects, minimum thickness, tolerances, performance and methods of test for vitreous sanitary appliances.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1 blister
raised portion of the surface protruding not more than 1.0 mm above the surface and not greater than 3 mm in its maximum dimension

3.2 blemish
mark or a flaw that may spoil the appearance of the product

3.3 bubble
raised portion of the surface less than 1 mm maximum diameter

3.4 craze or crazing
fine cracks in the glaze

3.5 discolouration
coloured spot greater than 6 mm in its maximum dimension or a concentrated number of specks or spots to give the effect of a change in colour

3.6 dull finish
undeveloped glaze, slightly matt in appearance or a non-glossy finish on a visible surface
3.7
dunt
hair-line fracture extending through the body of the appliance

3.8
egg shell finish
uniform semi-matt glaze

3.9
exposed body
unglazed portion 1.5 mm or more in its maximum dimension

3.10
finish
texture and condition of a surface other than its colour

3.11
fire crack
fine shallow crack in the body, not covered with glaze. fire crack, where not on a visible surface, may not necessarily be detrimental

3.12
flushing surface
surface visible after installation and which becomes wet during the operation of the appliance

3.13
glazing
impermeable layer of vitreous ceramic material fired onto the surface

3.14
grouping
number of spots, blisters, pinholes or specks within any pottery square

3.15
kiln support marks
large unglazed surfaces resulting from blocks or pins necessary to support the appliance while firing but not visible after installation of the appliance

3.16
pinhole
hole in the body less than 1.5 mm in its maximum dimension

3.17
polishing mark
spot where some minor blemish has been ground off and surface polished, the area of the spot not exceeding the area of a 10 mm diameter circle

3.18
pottery square
square of dimensions 50x50 mm selected on the appliances for examining visual defects

3.19
projection
raised portion of not less than 6 mm in its maximum dimension on a visible surface

3.20
speck
area of contrasting colour less than 1 mm maximum dimension. (speck less than 0.25 mm maximum dimension do not constitute a defect unless sufficient in number to form a discolouration)
3.21 spot
area of contrasting colour on the visible surface more than 1 mm but less than 3 mm in maximum dimension

3.22 vitreous china
an enamel coating that is applied to ceramics, particularly porcelain, after they’ve been fired

3.23 visible surface
surface which after installation of the appliance is readily visible to an observer in a normal standing position

3.24 warpage
distortion of original shape during the manufacturing process

3.25 wavy finish
defect in the having the appearance of numerous runs in the glaze; irregular or mottled finish.

4 Material

The body of a sanitary appliance shall be essentially made from ceramic materials such as quartz and feldspar, subject to the requirements of clause 8. The vitreous glazing medium shall be fused to the body of the sanitary appliance to render the surface(s) of the sanitary appliance im pervious non-crazing to moisture giving a white or coloured finish.

5 Application of glazing

5.1 the vitreous glazing medium shall be thoroughly fused to the body. Subject to exceptions, given in 5.1.1, 5.1.2 and 5.1.3 all exposed surfaces of an appliance shall be uniformly glazed, shall be free from craze and discolouration and shall possess an impervious surface. It shall have a high gloss and be of such a thickness and opacity as to give a uniform colour and finish to the surface.

5.1.1 Surfaces coming into contact with walls and floors maybe without glaze.

5.1.2 On wash basins set away from walls, those portions of the rear aprons used for supporting the appliances in kilns; the backs of overflows and the undersides of outlet bosses maybe without glaze.

5.1.3 Appliances may have unglazed portions but the unglazed surfaces shall not be visible when the appliance is installed in the normal manner.

5.2 The materials used for making glaze shall not contain lead or a lead compound and shall also be non-asbestos containing material. In case of certain colouring oxides used for making coloured glaze, the lead content, if any shall not exceed 5 % of the weight of the glaze when tested as per method described in Annex A

6 Permissible blemishes or defects

6.1 Water closet pans, bidets, squatting pans, urinals, partition plates, pedestals, short pedestals and accessories

When examined from any point on the viewing circle as illustrated in Figure 1, the appliance shall not show, to the unaided eye of a trained observer, blemishes or defects in excess of those listed in Table 1.
**Figure 1 — Perspective view of viewing circle**

**Table 1 — Blemishes or defects permitted in Water closet pans, bidets, squatting pans, urinals, partition plates, pedestals, short pedestals and accessories**

<table>
<thead>
<tr>
<th>Location</th>
<th>Blemish</th>
<th>Maximum permitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>Wavy finish</td>
<td>None on all visible surfaces</td>
</tr>
<tr>
<td></td>
<td>Dunts</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>firecracks</td>
<td>None on visible surfaces</td>
</tr>
<tr>
<td></td>
<td></td>
<td>on non-visible surfaces: One, not longer than 6 mm</td>
</tr>
<tr>
<td>Warpages:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WC pan and bidets</td>
<td>Not more than 6 mm</td>
<td></td>
</tr>
<tr>
<td>Squatting pans</td>
<td>Not more than 6 mm for long pattern of 580 mm size</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not more than 10 mm for long patterns of 630 mm size and Orissa patterns of 580 mm and 630 mm sizes.</td>
<td></td>
</tr>
<tr>
<td>Other appliances</td>
<td>Not more than 1 mm per 100 mm; total warpage not more than 6 mm.</td>
<td></td>
</tr>
<tr>
<td>Accessories</td>
<td>Not to exceed 5 mm on any plane</td>
<td></td>
</tr>
<tr>
<td>Discolouration</td>
<td>None on all visible surfaces</td>
<td></td>
</tr>
<tr>
<td>Flushing surface and horizontal face of rims of WC pans, squatting pans, bidets and urinals</td>
<td>Spots, blisters and pinholes</td>
<td>A total of not more than three, no grouping. Pinhole limited to one each.</td>
</tr>
</tbody>
</table>
Bubbles and specks | Not over two in one pottery square, a total of not over four. For coloured appliances, a total not over two.
---|---
Visible surfaces other than above | Polishing marks | One only; none permitted for coloured appliances
Spots, blisters and pinholes | A total of not over five; not grouping. For coloured appliance no blisters are permitted and pinholes are limited to a total of two
Bubbles and specks | Not over three in one pottery square; a total of not over ten
Polishing marks | Two only. One permitted for coloured appliances

### 6.2 Wash basins, laboratory sinks and drinking fountains

When examined from a distance of 60 cm, the surface of the appliance shall not show to the unaided eye, blemishes or defects in excess of those listed in Table 2.

**Table 2 — Blemishes or defects permitted on wash basins, laboratory sinks and drinking fountains**

<table>
<thead>
<tr>
<th>Location</th>
<th>Blemish</th>
<th>Maximum permitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>Wavy finish</td>
<td>None on all visible surfaces</td>
</tr>
<tr>
<td></td>
<td>Dunts</td>
<td>None</td>
</tr>
</tbody>
</table>
| | Firecracks | None on visible surfaces  
On non-visible surfaces: One, not longer than 6 mm |
<p>| Warpages: | Warpage of slab out of horizontal plane not to exceed 6 mm on all sizes (warpage of backs of wash basins which are attached to the wall not to exceed 3 mm). |
| Wash basins and drinking fountains | Warpage not to exceed ±3% on all planes |
| Laboratory sinks | Not more than 1 mm per 100 mm; total warpage not more than 6 mm. |
| Service space, top of slab, inside of bowl, front of fascia | Spots, blisters and pinholes | A total of not over two, no grouping. For coloured appliances, no blisters are permitted and pinhole limited to one only |
| | Bubbles and specks | A total of not over four, no grouping. For coloured appliances, a total of not over two |
| | Discolouration | None on all visible surfaces |</p>
<table>
<thead>
<tr>
<th>Location</th>
<th>Blemish or defect</th>
<th>Maximum permitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>Warpage</td>
<td>Warpage of the flat back portion in case of cisterns not to exceed 5 mm and for bottom portion in case of coupled cistern not to exceed 3 mm</td>
</tr>
<tr>
<td></td>
<td>Dunts</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Firecracks</td>
<td>None on visible surfaces</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On non-visible surfaces: One, not longer than 6 mm</td>
</tr>
<tr>
<td></td>
<td>Discolouration</td>
<td>None on visible surfaces</td>
</tr>
<tr>
<td>Visible surface</td>
<td>Wavy finish</td>
<td>Not more than 2 500 mm$^2$ on the back ends only</td>
</tr>
<tr>
<td></td>
<td>Spots, blisters and pinholes</td>
<td>A total of not more than four, no grouping. However, a total; of not over one on covers. For coloured appliances, blisters and pinholes limited to one each, none on covers.</td>
</tr>
<tr>
<td></td>
<td>Bubbles and specks</td>
<td>Not over two in one pottery square, a total of not over six, including not over two on cover.</td>
</tr>
<tr>
<td></td>
<td>Polishing marks</td>
<td>Two only, none on cover; none permitted for coloured appliances</td>
</tr>
</tbody>
</table>

### 6.3 Flushing cisterns, auto cisterns and covers

When examined from a distance of 60 cm, the outer surface of the cistern and its cover when assembled shall not show, to the unaided eye, blemishes or defects in excess of those given in Table 3.

### Table 3 — Blemishes or defects permitted on flushing cisterns, auto cisterns and covers

<table>
<thead>
<tr>
<th>Location</th>
<th>Blemish or defect</th>
<th>Maximum permitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face of internal, back and side</td>
<td>Spots, blisters and pinholes</td>
<td>One only, on back or on either side; a total of not over three. For coloured appliances, no blisters are permitted and pinholes are limited to a total of two</td>
</tr>
<tr>
<td></td>
<td>Bubbles and specks</td>
<td>A total of not over four, no grouping</td>
</tr>
<tr>
<td></td>
<td>Polishing marks</td>
<td>Two only. One permitted for coloured appliances</td>
</tr>
</tbody>
</table>

### 6.4 Illumination during visual examination

When checking an appliance by visual examination, either in natural or artificial light, the uniform light intensity at the surface of the appliance shall be 300 lx when checked with a light meter. Artificial lighting when used,
shall be provided by one or more fluorescent lamps of colour temperature 6500K, positioned 2 m minimum above the top of the appliance. The appliance shall be positioned so that it is between the light source and the observer.

7 Minimum thickness and tolerances

7.1 The thickness at any point in an appliance shall not be less than 6 mm.

7.2 Except where otherwise specified in individual product standard, the following tolerances shall apply:
   a) On dimensions 75 mm and more; ±2% of the specified dimension or ±2mm whichever is greater;
   b) On dimensions less than 75 mm; ±5% of the specified dimension or ±2 mm whichever is greater;
   c) On the height of the flush outlet of P-traps, or horizontal outlets; ±5 mm and
   d) On all angles; ±3°

8 Performance requirements

8.1 Warpage

The appliance shall be considered to be within the warpage limits if a feeler gauge of thickness equal to the maximum warpage specified in Tables 1, 2 or 3 does not slide under the appliances without application of force, as detailed in 9.1.

8.2 Crazing

When tested in accordance with the procedure given in 9.2, none of the test pieces shall show crazing.

8.3 Water absorption

The average value of water absorption of the test piece when evaluated as given in 9.3 shall not exceed 0.5%. No individual result shall exceed 0.75%.

8.4 Modulus of rupture

8.4.1 The average modulus of rupture of ten samples when tested by the method described in 9.4 shall not be less than 60 Mpa.

8.4.2 Values taken for determination of the average shall not vary by more than ±20% of the average value. Values above or below 20% of the average may be discarded for the calculation of the average value.

8.4.3 If the fractured surface of the test pieces shows lamination, crack or a cavity at the centre or any other defect, those test pieces shall be rejected but minimum ten test pieces shall be available for working out the average value.

8.5 Chemical resistance

When tested by the method described in Annex B, none of the test pieces shall appear to the unaided eye to have suffered any loss of reflectivity of the glaze when compared with a control sample.
8.6 Resistance to staining

When tested by the method described in Annex C, no sample shall remain on either of the test piece.

9 Test procedures

9.1 Warpage

The appliance shall be placed face down on a flat surface, preferably a surface plate to ascertain the amount of deviation from the horizontal plane that exists at the edges of the appliance. If the appliance rocks, on two points, a horizontal plane shall be determined by placing the feeler gauge of thickness equal to the maximum warpage permitted for the appliance (see tables 1, 2, or 3) under one lower corner and forcing the appliance down on this gauge. If a second feeler gauge of the same thickness does not slide at any other point, the appliance shall be considered as not warped out of the horizontal plane and to be in conformity with the permissible warpage limits.

9.2 Crazing

9.2.1 Test pieces

Three test pieces each having, a surface area or not less than 250 cm² shall be broken from widely separated parts of the appliance. At least one major surface shall be glazed surface. Care shall be taken not to produce crack. Either in the body or in glaze; any such pieces shall be discarded. Surfaces other than major surfaces shall be unglazed and freshly broken. Alternatively, test pieces of surface area not less than 250 cm² and 10 mm minimum thickness with one major surface glazed may be separately made using the same body and glaze materials as used in the making of the appliance of the batch and put through the kiln along with the appliances. In the unglazed faces of the alternative pieces, grooves of 2 mm deep shall be cut with grinding wheels to expose the inside of the body.

9.2.2 Test procedure

The test pieces shall be placed for 10 hours or, for two periods of five hours each, in a vessel in an autoclave in which saturated steam is maintained at a pressure between 0.34 Mpa to 0.31 MPa. The test pieces shall be allowed to cool to room temperature inside the autoclave and afterwards soaked for 12 hours in a solution or dye to which a small quantity of wetting agent has been added. Examine the test pieces for crazing.

9.3 Water absorption test

9.3.1 Test sample

The test sample shall consist or three pieces, each having a surface area of approximately 100 cm², taken from widely separated parts of the appliance. At least one major surface shall be a glazed surface. Surfaces other than major surfaces shall be unglazed and freshly broken. Care shall, be taken not to produce cracks either in the body or in the glaze. Such test pieces with cracks shall be discarded. Alternatively, test pieces of the same surface area and 10 mm minimum thickness with one major surface glazed shall be separately made using the same batch and glaze materials as used in making of the appliances of the batch and put through the kiln along with the appliances. In the unglazed faces of the alternative pieces, grooves of 2 mm deep shall be cut with grinding wheels to expose the inside or the body.

9.3.2 Test procedure

The test pieces shall be dried to a constant mass at a temperature between 110°C and 115°C and then cooled to room temperature in a desiccator. The pieces shall be weighed to an accuracy of not less than 0.01 g and placed in a vessel from which the air can be removed, maintaining the pressure at less than 4.2 KPa for one hour. Cold freshly boiled distilled water shall then be admitted to the vessel without reducing the vacuum until the pieces are covered, Air is then admitted to the Vessel and the pieces removed and boiled in distilled
water for not less than 20 minutes. The piece shall then be allowed to cool and remain in this water for at least 12 h. The test pieces shall be wiped dry with a damp and smooth cloth in such a manner as to remove the surface water only and then weighed.

### 9.3.3 Evaluation of test pieces

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

\[ W = \frac{M_2 - M_1}{M_1} \times 100 \]

Where,

- \( W \) percentage of water absorption by mass
- \( M_1 \) mass of test piece after treatment, and
- \( M_2 \) mass of the dry test piece

### 9.4 Modulus of rupture

#### 9.4.1 Test pieces

Sample test bars shall be separately prepared, using the same body material as used in making, the appliance of a batch and shall be fired in the same kiln along with the appliances. They shall be square or circular in section and the cross-sectional area shall not be less than 150 mm\(^2\) and 150 mm long, and shall not be glazed.

#### 9.4.2 Test procedure

The modulus or rupture shall be determined by using at least 10 of these bars mounted on support 125 mm apart, and loaded rapidly (approximately 5 kg/s) at the mid-point.

#### 9.4.3 Evaluation of results

The modulus of rupture shall be calculated from the formula:

- For rectangular cross-section:
  \[ S = \frac{1.5PL}{bd^2} \]
- For circular cross-section:
  \[ S = \frac{8PL}{\pi D^3} \]

Where,

- \( S \) Modulus of rupture
- \( P \) Total load, N
- \( L \) Length of span, mm
- \( b \) Width of test bar to the nearest 0.1 mm
- \( d \) Depth of test bar to the nearest 0.1 mm
9.5 **Procedure for taking samples for test**

Samples for crazing, water absorption, and modulus of rupture tests shall be taken as follows:

a) In the case of tunnel kilns, two test pieces for crazing test and two test pieces for water absorption test shall be kept in one trolley during a shift of 8 h. A lot of 20 pieces shall be kept in the centre of the trolley or in different parts of the platform for purpose of carrying out modulus of rupture test on minimum of 10 pieces twice a week.

b) If the firing is done in intermittent kiln, the samples for all tests should be kept at least at 12 places. The samples after firing shall be collected and stored.

c) Number of samples as specified under each test shall be selected out of the test pieces obtained from a) and b) above.
Annex A
(normative)

Lead solubility test

A.1 General

A weighed quality of material (glaze) dried at 100 °C shall be shaken continuously for one hour (at room temperature) with 1 000 times its weight of dilute hydrochloric acid (50 % dilution, specific gravity 1.18).

Thereafter, it shall be allowed to stand for 1 h and then filtered. The lead salt contained in the clear filtrate shall be precipitated as lead sulphate. The weight of lead sulphate calculated as lead monoxide shall not exceed 5 % of the dry weight of the sample taken for the test.

Note  The test should preferably be conducted at the manufacturer’s premises.
Annex B
(normative)

Tests for chemical resistance

B.1 Control test piece size

The test sample shall consist of eight pieces each not smaller than 75 mm x 25 mm x 6 mm taken from the glazed part of the appliance. One piece placed in a desiccator and is used as a control piece.

B.2 Procedure

The other seven test pieces are partially immersed, one in each of the seven solutions listed in Table B.1. The strength of solution, length of time for immersion and the temperature shall be as stated in Table B.1. Solutions shall all be aqueous.

<table>
<thead>
<tr>
<th>Name of chemical</th>
<th>Strength of chemical, %</th>
<th>Time, h</th>
<th>Temperature °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic acid</td>
<td>10</td>
<td>16</td>
<td>100</td>
</tr>
<tr>
<td>Citric acid</td>
<td>10</td>
<td>16</td>
<td>100</td>
</tr>
<tr>
<td>Detergent</td>
<td>1)</td>
<td>48</td>
<td>60</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>2)</td>
<td>48</td>
<td>25-35</td>
</tr>
<tr>
<td>Sodium hydroxide</td>
<td>5</td>
<td>0.5</td>
<td>60</td>
</tr>
<tr>
<td>Sodium stearate</td>
<td>0.15</td>
<td>48</td>
<td>60</td>
</tr>
<tr>
<td>Sulphuric acid</td>
<td>3</td>
<td>16</td>
<td>100</td>
</tr>
</tbody>
</table>

1. This consists of an aqueous solution containing 0.04 % (wt/vol) of a condensation product of nonylphenol with 8-10 molecules of ethylene oxide.
2. This solution consists of equal volumes of water and hydrochloric acid of specific gravity 1.18.
Annex C
(normative)

Tests for resistance to staining and burning

C.1 Test piece size

The test sample shall consist of two pieces each not smaller than 75 mm x 25 mm x 6 mm taken from the glazed part of the appliance.

C.2 Test procedure

C.2.1 One of the test pieces is placed at room temperature, with a glazed surface level, uppermost, clean and dry. One spot, not less than 10 mm diameter, of each of the six chemicals listed in C.2.2 is then placed on the glazed surface and allowed to dry. Any residue is then removed with a clean cloth which has been moistened with distilled water only.

C.2.2 The chemicals are following:

a) 0.5 % aqueous solution of methylene blue

b) A solution of sodium hypochlorite 10 % - 14 % w/v available chlorine. A 10 % dilution is prepared for the test.

c) 3 % aqueous solution of hydrogen peroxide,

d) Amyl acetate

e) Carbon tetrachloride, and

f) 13 g of iodine in 1 l of ethanol

C.2.3 The other piece is placed at room temperature with a glazed surface level uppermost, clean and dry. A lighted cigarette is placed on the glazed surface and allowed to remain for 15 min. and then removed. The stained area is wiped with a clean cloth which has been moistened with distilled water only.
Bibliography
