DRAFT TANZANIA STANDARD

TBS/GTDC4 (6327) P3 – Blow Moulded polyolefin containers — Specification (Part 2: Over 5 litres up to and including 60 litres capacity).

1 Scope

This standard (Part 2) specifies tolerances on dimensions, performance requirements and methods of sampling and tests for free standing blow moulded containers, made from polyolefin, with capacities over 5 litres up to and including 60 litres and having an internal neck diameter not exceeding 75 mm.

This standard does not cover containers specifically intended for products classified as dangerous goods.

2 Normative references

The following referenced documents are indispensable for the application 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.

IS 2798 : 1998 Methods of test for plastic containers (first revision)

IS 7408:2000 Blow Moulded polyolefin containers — Specification.

IS 8747: 1977 Method of test for environmental stress crack resistance of blow moulded polyethylene containers.

IS 7028-1 Performance Tests for Complete, Filled Transport Packages, Part 1: Stacking Tests using Static Load

3.Terms and definitions

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

3.1 Blow Moulded Container

container formed from a parison of heat softened thermoplastics material by the application of pressure which forces it against the inside walls of a blow mould .

3.2 Brimful Capacity

volume of liquid held by the container when filled to the point of overflowing while standing on a level with all closures removed (see Fig.1)

3.3 Container Height to Neck Face

height of the highest point of the neck face of the finished empty container (see Fig.1)

3.4 Container Overall Height

height of finished empty container at its highest point excluding the closure (see Fig.1)

3.5 Container Overall Plan Dimensions

principal plan dimensions of the container, for example, the external diameter of a cylindrical container

3.6 External Neck Diameter

external diameter of the neck, excluding thread and / or prominences, measured as the mean of two perpendicular diameters avoiding the pan line

3.7 Internal Neck Diameter

minimum internal diameter of the neck whether it be parallel, tapered or internally threaded

3.8 Gross Capacity

total enclosed volume of the container including any space which may not be capable of being filled

3.9 Nominal capacity

volume of liquid the container is intended to hold at 27±2^{0}C

3.10 Neck Face.

upper most surface of the container neck (see Fig.1)

3.11 Neck Height

The perpendicular distance from the highest point of the plane including the neck face to the nearest point of the finished container shoulder along a line passing through:

a) in the case of screw threaded necks, the outermost edge of the thread; a feature below the thread of greater diameter than the thread is considered as a part of the container's shoulder;

b) in the case of plain cylindrical and internally threaded necks, the outermost diameter point excluding flash; and

c) in the case of neck having a bead and thread, or bead only. the outermost point of the bead

NOTE-A bead is separated from the container by a region of diameter smaller than that of the bead.

3.12 Thread Diameter

external diameter of the neck thread measured as the mean of two perpendicular diameter avoiding the part line

3.13 Fill point

vacuum space between nominal capacity and brimful capacity of the container

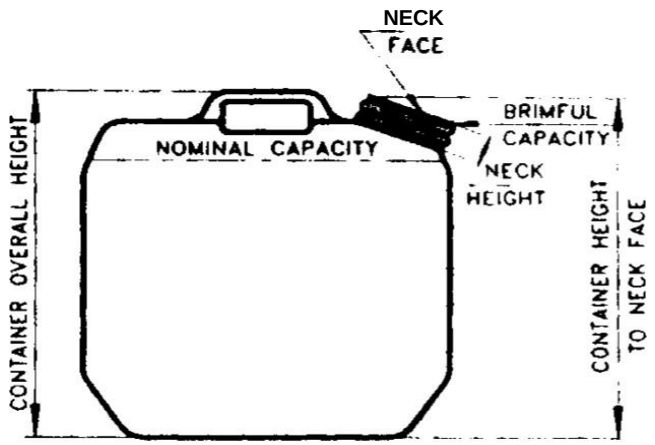

FIG. 1 CONTAINER DEFINITIONS

4 Capacity

A recommended range of nominal capacities for stock containers for liquid products, together with the corresponding minimum brimful capacities, is given in Table 1. When the container is filled to nominal capacity, the liquid level shall be below the bottom of the closure neck, with the container standing level on its base. Capacities shall not be measured within 48 h of production. The water used shall be at a temperature of 27 ± 2°C.

Table 1- Recommended Nominal Capacities / Brimful Capacities for Stock Containers

S/No.	Nominal Capacity (litres)	Minimum Brimful Capacity (litres)
1.	10	10.5
2.	20	21
3.	25	26.25
4.	30	31.5
5.	50	52.5
6.	60	63

6 Tolerances and dimensions

The tolerances and dimensions specified refer to finished empty containers. Dimensions of filled containers may show differences. All measuring equipment shall be capable of measuring to an accuracy of 10 percent of the agreed tolerance.

6.2 Container height to Neck Face

The tolerance on container height to neck face shall be ±1 percent compared to nominal value. The height shall be measured with accordance with method described in **Annex A.**

6.3 Container Overall Height

The tolerance on container overall shall be ± 1 percent, whichever is greater. The height shall be measured in accordance with the method described in **Annex B.1**.

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6.4 Neck Height

The tolerance on neck height shall be ± 2.0 percent. The neck height shall be measured in accordance with the method described in **Annex B.3**.

6.5 Neck and Thread Diameters

The tolerance on neck and thread diameters shall be ±1.25 percent compared to declared nominal value. These diameters shall be measured in accordance with the method described in **Annex B.4**.

6.6 Thread Diameters

The length of thread in contact between cap and neck shall be a minimum of 1 $^1/_2$ turns. The major and minor thread diameters shall each be measured in accordance with the method described in **Annex B.4**. The tolerance on thread diameters shall be as agreed to between the purchaser and the supplier.

6.7 Fill point

The fill point level shall be agreed upon between purchaser and supplier depending on the indented use of the container

7 Performance requirements

7.1 Drop Impact Strength

The container when subjected to the drop test by the method described in **Annex C** shall show no sign of rupture or leakage from the walls of the container .Slight deshaping of the body shall not render the container unacceptable in the test.

7.3 Stack Load Test

The containers shall not show any cracks or permanent bulging likely to reduce their strength, cause leakage or reduction in effectiveness of the closure or cause instability in stacks when tested in accordance with the method described **Annex D**.

7.4 Environmental Stress-Crack Resistance

The containers when tested in accordance with Method I of IS 8747 shall show no evidence of stress cracking or leakage after being kept in the oven for 48 h.

7.7 Ink Adhesion of Printed Containers

The printed matter on the containers when tested in accordance with the method described **Annex E** shall be still legible.

7.8 Product Resistance of Printed Containers

The printed matter on the containers when tested in accordance with the method described in **Annex F** shall be still legible.

7.9 Test for Compatibility

The containers shall be tested for determination of compatibility for an intended purpose as per the method described in **Annex G**.

8 Handle Strength

The handles and the containers shall remain intact and undamaged when tested in accordance with the method described in **Annex H**.

9 Closures

The closure shall be of a material as resistant to the product as is the container itself and shall correspond to the type and form of the container so as to ensure a good and leak proof fit when tested in accordance with the method described in **Annex I**. Thread closures shall be tightened to a torque as agreed to between the purchaser and the supplier.

10 Marking

The containers shall be legibly and indelibly marked with the following information

a) Manufacturer's name, initials or trade-mark.

b) Nominal capacity of the container in ml or litres.

c) Batch No. and year of manufacture.

d) Recyclable/non-recyclable symbol.

e) Plastic identification code.

11 Sampling

11.1 Samples of the container shall be drawn and conformity of the lot this specification as prescribed in clause 10.2. The container shall be type tested for the requirements given in clause 7.2 and 7.3. Any change in design, material or capacity makes it necessary for the new containers to be tested in accordance with all the tests specified. The tests given in clause 7.7 and 7.8 are applicable only to printed containers.

11.2 Scale of sampling

11.2.1 Lot

In consignment, all the containers of the same material drawn from a single batch of manufacture shall be grouped together to constitute a lot.

11.2.2 For ascertaining the conformity of the containers to the requirements of this standard, test shall be carried out separately for each lot. The number of containers to be sampled from a lot shall be in accordance with Table 2.

11.2.3 The containers shall be selected at random from the lot.

11.3 Number of tests and criteria for conformity

11.3.1 The number of tests and criteria for conformity shall be determined according to Table 3.

11.3.2 Drop Impact Strength and Stack Load Test

One set of sample containers as given in the test methods (7.2 and 7.3) shall be drawn from the lot and these shall be subjected to the respective tests. The sample shall pass the tests for acceptance of the lot in respect of drop impact and stacking requirements.

Table 2 -Scale of Sampling and Permissible Number of Defectives
(*Clauses* 11.2.2 and 11.3)

S/No.	Lot size	For Non-Destructive Tests		For wall Thickness Measurement, Sub-Sample size (Number of Containers to be Selected) (5)
		Sample size (Number of Containers to be Selected)	Permissible Number of Defective	
(1)	(2)	(3)	(4)	
1.	Up to 100	5	0	2
2.	101 to 300	13	1	2
3.	301 to 500	32	3	2
4.	501 to 1000	50	5	3
5.	Over 1000	80	7	5

Table 3- Number of tests and Criteria for Conformity
(*Clause* 11.3.1)

S/No. (1)	**Characteristics** (2)	**Clause Ref.** (3)	**Number of Tests** (4)	**Criteria for Conformity** (5)
1.	Brimful capacity	4	According to column 3 of table 4	The number of defective containers for one or more characteristics does not exceed the corresponding number given in column 3 of table 4
2.	Container mass	5		
3.	Dimensions	6.2,6.3,6.4,6.5,6.6,6.8, and 6.9		
4.	Closure leakage	7.1		
5.	Hydrostatic pressure	7.4		
6.	Wall thickness	6.7	According to column 5 of table 4	All the containers satisfy the relevant requirements

ANNEX A

(Clause 6.2)

MEASUREMENT OF CONTAINER HEIGHT TO NECK FACE

A1. Ascertain the container height to neck face by placing the empty container on a flat surface and measuring to the highest point on the neck face using a micrometer height gauge. The measurement shall be to an accuracy of 0.05 mm.

ANNEX B

(Clause 6.3,6.4,6.5,6.6)

MEASUREMENT OF DIMENSIONS

B.1 Overall Height

B..1.1 Apparatus

B..1.1.1 *Micrometre height gauge*

B..1.2 Procedure

Place the container on a surface plate and measure to the highest point on the container using a micrometre height gauge at two positions as follows:

a) Close to but avoiding the part line; and

b) At 90' to the position specified at (a).

B..1.3 Calculation

The height is recorded as the mean of the two readings. The accuracy or measurement shall be 0.1 mm.

B..2 **Diameter**

B..2.1 *Apparatus*

B.*.2.1.1 Vernier micrometer or circumference gauge*

B.2.2 Procedure

The container diameter shall be ascertained by either of the micrometer or circumference gauge method.

B..2.2.1 *Micrometer method*

By using a Vernier or micrometer, measure the diameter of the container at a specified height as follows:

a) Close to but avoiding the part line; and

b) At 90' to the position specified at (a).

The accuracy of measurement shall be 0.1 mm. The diameter is recorded as the mean of the two diameters at right angles.

B..2.2.2 *Circumference gauge method*

By using a circumference gauge, measure the circumference at a specified height.

Record the diameter as the circumference multiplied by 0.318.

*NOTE - The circumference gauge normally gives the mean diameter directly***.**

B.3 Measurement of Neck Height

B..3.1 *Apparatus*

B..*3.1.1 Micrometer depth gauge*

B..*3.2 Procedure*

Place the anvil of the depth gauge on the neck face, and move the instrument laterally until the spindle touches the outermost neck feature. See that the tip of the spindle is allowed to touch the container shoulder and read the scale.

B.3.3 *Calculation*

Record the neck height as the mean of the two readings taken at right angles at the neck face.

B.4 Measurement of Neck and Thread Diameters

B.4.1 *Apparatus*

B.4.1.1 *Micrometer or Vernier,* giving an accuracy of measurement of 0.02 mm.

B.4.2 *Procedure*

B..4.2.1 Measure the neck with a vernier or micrometer as follows:

a) Close to but avoiding the part line; and

b) At 90° to the position specified at (a).

B..4.3 *Calculation*

The diameter is recorded as the mean of the two diameters at right angles.

B.5 Measurement of Wall Thickness

B..5.1 *Apparatus*

B..*5.1.1 Micrometer/screw gauge,* fitted with ball point tips or dial calliper gauge fitted with spherical anvils giving an accuracy of measurement of 0.02 mm.

B..53 *Procedure*

The container wall thickness shall be ascertained by either of the methods indicated below.

B..5.2.1 *Micrometer method*

Cut the container horizontally into three pieces (top. Middle and bottom) with a pair of scissors or hacksaw blade. Measure the wall thickness with a micrometer or screw gauge fitted with ball point tip, at four places in each *section.* Take the average of four readings and report as wall thickness at top, middle and bottom.

B..5.2.2 Dial calliper gauge method

Measure the wall thickness with the help of dial calliper fitted with spherical anvils, Care shall be taken to avoid movement of the container during measurement as this may affect the reading obtained. The measurement shall be to an accuracy of 0.02 mm. Take the mean of three readings at any location (top, middle and bottom) as wall thickness.

ANNEX C

(Clause 7.2)

DROP IMPACT TEST

C.1 Principle

The drop test is used to measure the ability of the container to withstand rough handling while in a packed condition.

C.2 Equipment .

Any suitable equipment may be used provided that it conforms to the following requirements:

a) Permits accurate prepositioning of the container to assure an unobstructed fall from rest and impact at the specified places and in the desired direction;

b) Permits accurate and convenient control of the height of drop; and

c) Provides a solid surface of concrete to absorb all shock without deflection.

C.3 Drop Height

Unless specified otherwise in the container standard, the drop height of the containers up to 5 kg or 5 litres capacity shall be 1.2 m, for containers of 10 kg or 10 litres capacity 1 m and for containers of 15 kg or 15 litres capacity it shall be 0.5 m respectively.

C.4 Sample Size

The sample size shall be six containers, taken at random from a batch, divided into two sets of 3 each, designated as Set 1 and Set 2.

C.5 Procedure

C.5.1 Fill each containers to its nominal capacity with water at standard conditions as specified in the specification of the individual containers (in case, conditions have not been specified, it shall be taken as ambient conditions).

C.5.2 Close each container with its usual closure with the inner seal heat sealed to its mouth. Drop the containers under free fall condition in Set 1 squarely on their base on to a rigid flat horizontal surface of steel or smooth concrete as the dropping surface.

C.5.3 Drop the containers under free fall condition in Set 2 on their side (the body of the container being parallel to the impacting 'floor) onto the dropping surface.

C.5.4 The containers shall not rupture nor shall there be any leakage from the walls of the container. Slight deshaping of the body shall not render the containers unacceptable in the test.

NOTE - If the liquid to be packed is of high density, the material itself or a suitable material of similar density should be used instead of water.

C.6 ***Test at 0°C***

C.6.1. This test is normally carried out only for multi-tip containers for transport of hazardous goods liable to be subjected to low temperatures. The container shall be filled to the nominal capacity with a liquid at test temperature (for example, for polyethylene containers**,**12 percent methylated spirit in water or an ethylene glycol/water mixture is suitable). The filled containers shall then be chilled to a temperature in the range -4 to 0°C and stored at that range for at least 4 h.

C.6.2 The containers shall be subjected to drop test as per the procedure specified at G.5.

ANNEX D

(Clause 7.3)

STACK LOAD TEST

D.1 Principle

A force is applied to the top face of the package equivalent in magnitude to the total weight of identical packages stacked on top to a minimum stack height of 3 m. The duration is 24 h.

D.2 **Sample Size**

Four containers shall be used for each single test.

D.3 Procedure

Fill the containers with water at ambient temperature up to nominal capacity and close with the usual closure to the nominal torque (if the liquid to be packed is of high density, it should be used as the test medium).

Arrange the containers in a block at 2 x 2 on a rigid, level, flat surface. Apply a top load evenly distributed on a flat plate placed on the unsupported containers. The total superimposed load along with the load of the flat surface for different sixes of containers shall be as specified in the specifications of the individual container.

Examine the containers after 24 h of test period. The containers shall not show any cracks or permanent
buckling likely to reduce their strength, cause leakage or reduction in effectiveness of the closure or cause instability in stacks.

ANNEX F

(Clause 7.7)

TEST FOR INK ADHESION OF PRINTED CONTAINERS

F.1 Procedure

F.1.1 Apply two strips of 25 mm wide transparent pressure sensitive tape or cello tape to the printed area of container; one piece down the length of the container and the other round the circumference.

F.1.2 Press the tape firmly on to the container and leave it for 15 seconds.

F.1.3 Remove the tape by pulling slowly at about 1 cm/s from one end at about 90° to the container surface.

F.1.4 There shall be no significant removal of the print from the surface of the container and the print shall be legible to the naked eye after the test.

ANNEX G

(Clause 7.9)

TEST FOR COMPATIBILITY

G.1 General

This method is for determination of compatibility of plastics containers for an intended purpose. For specific application for packaging of food, pharmaceuticals and drinking water, further reference may be made to Standards on Specific Products.

G.2 Principle

Piece of plastics material with which the container is made are treated at an elevated temperature with the liquid which the container is intended to transport. Any changes in organoleptic characteristics, weight, dour or flavour, size, shape and colour that occur in the test specimens are noted. For dry products, the tests may be carried out only on the containers filled with the product as in I.4.2.

G.3 Test Specimens

G.3.1 *Material*

Three test pieces of approximately 15 cm x 15 cm size shall be cut from any convenient part of the container. Each test piece shall be cleaned, wiped and dried. It shall be measured for length, width and thickness to the nearest 0.05 mm and weighed to the nearest milligram.

G.3.2 *Container*

Six samples of specific container intended for packing of particular product shall be tested in accordance with the test procedure given at I.4.2

G.4 Procedure

G.4.1 *Testing of Material*

The liquid ,which is intended to be tilled in the container shall be introduced into a glass vessel and test pieces completely immersed, avoiding unnecessary contact with the other pieces or the walls of the glass vessel. Where the density of plastics material is less than that of the liquid, small weights, inert to the liquid, may be used to prevent the test pieces from either floating or curling. The test shall be carried out continuously over 28 days at a temperature of 50 f 2°C. The liquid and the test pieces shall be thoroughly agitated every 24 h.

After the required test period has elapsed, the test pieces shall be removed from the liquid, suitably cleaned, dried, weighed and measured as in I.3.1.

G.4.2 *Testing of Container*

In order to assess the compatibility of the container, the container shall be filled with **the** product to nominal capacity, sealed and capped in the manner intended and kept at a temperature of 50 f *PC* for a period of 28 days. At the end of this period the containers shall be examined for the following:

a) Visible cracks, if any;

b) Change in colour;

c) Change in weight; and

d) Change in shape.

G.5 Test Result and Interpretation

G.5.1 Any change in weight, dimensions or alterations in other characteristics (such as colour. Blooming, etc.) or any other deterioration in quality of the product shall be used by manufacturer and purchaser in reaching agreement as to the stability of the plastics material for its intended purpose.

G.5.2 *Further Testing*

Where, in the opinion of either the manufacturer or the purchaser, it is considered that further information on compatibility is required (for example at low temperature) further testing may be carried out on a sample container filled with liquid to be transported. Precise requirements shall be determined by agreement between the manufacturer and the purchaser.

I.5.3 The actual storage test shall be carried out at the room temperature for one-third of the anticipated shelf life period for the products that are not stable at the suggested temperature of 50±2°C.

ANNEX H

(Clause 8)

HANDLE PULL TEST

H.1 General
Two methods are prescribed, namely Method A and Method B.

H.2 **Sample Size**

Three containers shall be used for each single test.

H.3 **Method A**

H.3.1 ***Apparatus***
A suitable device to hold the container firmly in inverted position near the shoulder.

H.3.2 ***Procedure***

Fill the container to the nominal capacity with water and close in the normal manner. Fix the container in inverted position and attach weight equal to double the nominal capacity of the container through a hook. Keep for 24 h and examine for any damage to the handle or the hinges.

H.4 **Method B**

H.4.1 ***Procedure***

Fill one of containers with water to its nominal capacity and secure the closure. Attach a rope to the balance point of the handle of the container leaving 300 mm slack. Allow the container to fall freely for 30 cm. Subject the container to two further drops. There shall be no damage to the handle or the hinges.

ANNEX I

(Clause 7.1)

CLOSURE LEAKAGE

I.1 Procedure

I.1.1 Fill the container up to nominal capacity with coloured water or the material to be packed at ambient temperature, and close tight with the closure. Keep the container in an inverted position on a white blotting paper without any external support for at least 30 minutes. The container shall be examined for any leakage which would be evident from any visible stains on the blotting paper.

The method helps to determine the ability of a closure (on a container) to prevent leakage due to the transportational vibration.

I.2 Vibration Table

I.2.1 The vibration table, of sufficient size, rigidity and mass-carrying capacity, supported on a mechanism
that shall maintain the surface horizontal during vibration. The difference in surface level between the table extremities shall not exceed 10 mm.

The table may be equipped with:

a) low fences to restrict sideways and endways movement during testing;
b) high fences or other means of maintaining a superimposed load in position on the test container
during testing; and
c) means to simulate the method of restraining the container during transit

In addition, the apparatus shall meet the requirements and tolerance given in I.2.2.

I.2.2 ***Procedure***

I.2.2.1 Fill the container to its nominal capacity with the product or coloured water and close it with the usual **c**losure in the manner in which it is intended to be used.

I.2.2.2 Place the test container in the predetermined attitude on the vibration table (see I.2), with the centre of its lowest face or its centre of gravity as near as practicable within 10 mm of the centre of the table; if the container is not secured to the table it may be Fenced. If a superimposed load is required, the loading procedure shall comply with IS 7028 (Part 1).

I.2.2.3 Operate the table between 3,4 and 6 Hz for the predetermined period to give a peak acceleration in the range of 0.5 to 1.1 g. The movement shall be such that vertical component is approximately sinusoidal; a rotary movement of the table is acceptable.

NOTE - If instrumentation used to determine the vibration level, the accelerometer should be attached to the table near the container, but protected so that the test container shall not come into contact with it. For testing at 1.1 g, in place of instrumentation, the proper frequency setting may be determined by starting the vibration of the table at a frequency of about 2Hz. and steadily increasing the frequency until some portion of the container repeatedly leaves the table, to ensure that the container receives a continuing series of repetitive shocks.

I.2.2.4 At the end of the test period, the closure shall show no indication of leakage.