Doc. No.: PCD 21 (21920) WC
February 2023

BUREAU OF INDIAN STANDARDS

Draft Indian Standard

POLY (ETHYLENE TEREPHTHALATE) (PET) BOTTLES FOR PACKAGING OF ALCOHOLIC BEVERAGES — SPECIFICATION

(First Revision of IS 14537*)*

(ICS No. 55.100)

Plastics Packaging Sectional Committee, PCD 21	Last date for receipt of comment is **10 April 2023**

FOREWORD

(Formal clauses will be added later)

Poly (ethylene terephthalate) (PET) bottles/containers are becoming popular on account of their appearance, safety, non-fragility, light weight and good barrier properties against water vapour, carbon-dioxide and oxygen, excellent retention of organoleptic properties and ease of recyclability. IS 10106 (Part 1/ Sec 1): 1990 'Packaging Code: Part 1 Product packaging, Section 1 Foodstuffs and perishables' specifies the use of PET bottles for packaging of different types of alcoholic liquors. Also, IS 10171: 1999 'Guide on suitability of plastics for food packaging (*second revision*)' provides a comprehensive list of food items and packaging materials and formats therefor. Therein, it exclusively specifies the use of PET bottles for packaging of alcoholic beverages.

This Standard was originally published in 1998. This revision has been undertaken to incorporate editorial alignment, emerging considerations of recyclability of plastics, alignment with Regulations on Plastic Waste Management Rules. The major modifications in this revision are as follows:

- limits on specific migration in compliance with Food Safety and Standards (Packaging) Regulation have been specified;
- barrier properties have been introduced;
- additional capacities (pack sizes) have been added, to ensure that the pack sizes are in compliance with extant Regulations in India, reference was made to Legal Metrology (Packaged Commodity) Rules, 2011; and
- recyclability and other requirements on plastics in consonance with the Plastic Waste Management Rules, 2016 and their Amendments in 2018 and 2021.

Due to their continually increasing use for packaging of alcoholic drinks in India, this Indian Standard is being revised.

This Standard provides specifications for PET bottles for packaging of various types of Alcoholic beverages as covered by the Food Safety and Standards (Alcoholic Beverages) Regulations, 2018], Part 2 to Part 4 and reproduced herein.

DISTILLED ALCOHOLIC BEVERAGES:

Non-Carbonated:

Brandy or Grape brandy, Blended brandy, Country liquor or Plain country Liquor, Blended country liquors, Cashew fenny, coconut fenny, Gin, Liqueur or Cordial or Aperitif, Rum, White rum, Vodka, Whiskey, Malt or Grain whisky or Single malt blended whiskey, Pot distilled spirits.

Carbonated and Diluted:

Ready to Drink (RTD) beverages

NON-DISTILLED ALCOHOLIC BEVERAGES:

Non-Carbonated:

Wine and other fermented beverages **(**White grape wine, Red grape wine, Wine with carbon dioxide, Fruit wine (other than grape wine), Cider, Perry, Wine from other agricultural and plant sources)

Carbonated:

Beers (Regular beer, Strong beer, Regular draught beer, Strong draught beer)
Wines (Sparkling, Semi sparkling, Crackling)

The labelling shall be in accordance with:

- Part 5 (Specific Labelling Requirements for Alcoholic Beverages) of the Food Safety and Standards (Alcoholic Beverages) Regulations, 2018], and
- Rule 11(1)(a) of the Plastic Waste Management (Amendment) Rules, 2021

For generic requirements, Annex B may be referred.

Indian Standard for glass liquor bottles IS 1662 : 1974 Specification for glass liquor bottles (*second revision*)' IS 14407 : 1996 'Aluminium cans for beverages — Specification' has been separately published.

For the purpose of deciding whether a particular requirement of this Standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1 SCOPE

This standard prescribes the requirements and the methods of sampling and test for Poly (ethylene terephthalate) (PET) bottles for packaging of alcoholic beverages (distilled and undistilled).

2 REFERENCES

The standards listed in Annex A contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed in Annex A.

3 TERMINOLOGY

For the purpose of this Standard, the definitions given in IS 7408 (Part 1) and IS 7019 shall apply.

4 MATERIAL

4.1 PET bottle

The PET bottle shall:

4.1.1 Be made by one of the blow moulding processes for virgin food grade Poly (ethylene terephthalate) PET conforming to IS 13193.

4.1.2 Be without any additives for biodegradability or compostability.

4.1.3 use the pigments and colourants as per the lists prescribed in IS 9833.

4.1.4 Be made optionally with other materials such as inorganic coatings to form PET-Composite bottle, provided:

4.1.4.1 The other materials are less than 0.05 percent of the total weight of bottle when measured according to IS 13360 (Part 8/ Sec 8).

4.1.4.2 They do not render the PET-composite bottle non-compliant with applicable Indian Standards/ regulations for food contact

4.1.4.3 They do not impair the properties of the PET-Composite bottle in terms of the other requirements placed in the standard.

4.1.4.4 They do not impair the recyclability of the post-consumer PET-Composite bottles.

> **NOTE** — Bottles mentioned in this standard would mean PET bottles or PET-Composite bottles (*see* **4.1**) as the case may be.

4.2 Cap

4.2.1 *Cap Materials*

The bottles shall be provided with a roll-on pilfer-proof (ROPP) cap which shall be made either of:

4.2.1.1 *Aluminium*: Aluminium cap shall be made of annealed aluminium sheets coated inside with food grade lacquering complying with IS 8970.

4.2.1.2 Plastic such as High-Density Polyethylene (HDPE) or Polypropylene (PP) or it's combination with any other suitable plastic material (HDPE, Low Density Polyethylene – LDPE, PP)

4.2.1.3 Combination of plastics and metal can also be used.

4.2.2 *Cap Colourants*

Pigments and colourants used if any, in the cap, shall conform to IS 9833.

4.2.3 *Cap cladding (optional)*

Shrink sleeve made of plastics other than PVC, either printed or unprinted, may be used over the cap.

4.2.4 *Cap dimensions*

The diameter of the caps would depend on the diameter of the bore of the bottle which shall be agreed upon between the manufacturer and purchaser.

4.3 Wad

4.3.1 The wad shall be of natural cork board or pulp board or expanded polyethylene (EPE) or any other suitable food grade material compatible with the contents.

4.3.2 PVC or PVC-aided wads are not permitted.

4.4 Label

4.4.1 Label material may consist of one or more of the following materials:

4.4.1.1 Paper labels that may optionally be

- metallised;
- coated with finishing chemicals;
- coated with PE;
- laminated with PP; and
- any combination of the above.

4.4.1.2 Self-adhesive plastic labels made up of transparent or coloured polypropylene (PP) with minimum thickness of 50 microns and that are suitable for flexography, rotogravure or screen printing.

4.4.2 As an alternative to labels, plastic sleeves made of plastics other than PVC may be used.

4.4.3 Printing inks and coating chemicals shall comply with IS 15495.

4.4.4 Glue shall be non-toxic hot-melt or other adhesives that allows the label to be glued on the PET bottle during the entire shelf life. All glues shall be free from Bisphenol-A as tested as mentioned in ISO 18857 – 2.

5 WORKMANSHIP AND FINISH

5.1 The bottles and closures shall be manufactured in accordance with good manufacturing practices and shall be free from undesirable odour. The bottles shall be transparent (even if coloured), free from any flash and scratches.

5.2 Secondary packaging made of either corrugated fibre-board boxes or shrink-wrap for empty PET bottles may be used to prevent any kind of scratches & contamination during handling and transportation.

6 SHAPE AND DIMENSIONS

6.1 The shape and dimensions of the bottles shall be as agreed to between the purchaser and the supplier. The specified overall height and diameter shall be measured according to the methods given in **4.1** and **4.2** of IS 2798 respectively.

6.2 Tolerance

The tolerances on various dimensions shall be as follows:

Up to and including 100 mm	±0.5 mm
Over 100 mm and up to and including 200 mm	±1.0 mm
Over 200 mm	±1.5 mm

6.3 Wall Thickness

The minimum wall thickness of the bottle measured at any point according to the method given in 4.5 of IS 2798 shall be 0.20 mm. Mean of the readings at any location shall be taken as the wall thickness at that point.

7 NECK FINISH

7.1 Neck finish for PET bottles with ROSPP caps:

7.1.1 The bottles shall be pilferproof having roll-on threads of the following neck finish sizes conforming to IS 7511 (Part 4):

31.5, 30, 28, 25, 22, and 20 mm.

7.1.2 The dimensions for all neck finish sizes other than 20 mm are covered in IS 751l (Part 4). Dimensional details for 20 mm neck size are given hereunder Table 1.

Table 1
(*Clause* 7.1.2)
Dimensions of 20 mm ROSPP Neck Finish (in mm)

No. or Size	T		E		H		F		L		N	Angle	Thread Cutter Dia	Pitch
	Max	*Min*	*Max*	*Min*	*Max*	*Min*	*Max*	*Min*	*Max*	*Min*	*Max*			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
20	19.90	19.40	18.20	17.70	6.34	5.96	10.39	10.01	20.40	19.90	17.15	2.28	9.53	2.55

NOTE — Column headings T, E, H, F, L and N are explained with illustrations in Table 1 of IS 7511 (Part 4).

7.2 Neck Finish for PET bottles with Plastic caps:

7.2.1 Neck finishes for caps made of either HDPE or PP or its combination are 28/38 mm, 1031/47 mm, 1031/59 mm, 1040/58 mm.

8 CAPACITY (PACK SIZES)

8.1 Nominal Capacity

8.1.1 The bottles shall be of the following nominal capacities:

50, 60, 90, 180, 250, 375, 500, 600, 750, 1000, 1500, 1750 and 2000 ml.

8.1.2 For capacities other than those mentioned here, approval of concerned authorities needs to be obtained by the seller.

8.2 Brimful Capacity

8.2.1 The brimful capacities of the bottles shall be as agreed to between the purchaser and the supplier. The tolerance, on agreed capacities shall be as given in Table 2.

Table 2
(*Clause* 8.2.1)
Brimful capacities and their tolerances

Nominal Capacity, (ml)	Tolerance, ml
50	±3
60	± 3
90	±3

180	±3
250	± 4
375	± 4
500	± 5
600	±6
750	± 7
1000	± 10
1500	± 15
1750	± 20
2000	± 20

8.2.2 The brimful capacity shall be determined according to method given in 5 of IS 2798.

8.3 Fill Point Capacity

The fill point capacity when determined by filling the bottle with water up to the specified depth measured from the top sealing surface shall be within the tolerance specified under clause **8.2**.

9 MASS

The mass of the bottle shall be as agreed to between the purchaser and the supplier.

10 VERTICALITY

The variation in verticality when tested according to the method given in 7 of IS 2798 shall not be more than ±1.5 mm.

11 PERFORMANCE TESTS

11.1 Leakage Test

11.1.1 *Closure Leakage Test*

The bottle shall be filled to its nominal capacity with coloured water or the actual product, if necessary. After filling, the bottle shall be closed tightly as in the final form. The closed bottle shall then be kept upside down over a white blotting paper for 30 min. After 30 min, the bottle shall be examined for any leakage which would be evident from any visible stains on the blotting paper.

11.1.2 *Vibration Leakage Test*

The bottle filled with water at ambient temperature and closed tightly with the cap when subjected to vibration on a vibration table as per method given in 6.2 of IS 2798, shall not show any leakage through the closure after one hour of testing.

11.2 Drop Impact Test

The bottle with the cap when subjected to the drop test as per 8 of IS 2798 shall not show any sign of cracking, nor will it rupture nor shall there be any leakage from the walls of the bottle. Slight de-shaping of the body shall not render the bottle unacceptable in the test.

11.3 Stack Load Test

11.3.1 The bottles shall be of sound construction and shall not show any cracks or permanent buckling nor cause leakage or reduction in effectiveness of the closure or cause instability in stacks, when subjected to test according to method given in 9 of IS 2798.

11.3.2 The total superimposed load along with the load of the flat surface for different sizes of bottle shall be as given in Table 3.

Table 3
(*Clause* 11.3.2)

Details of Minimum Stack Load

Sl No.	Nominal Capacity (ml)	Stack Load for 4 bottles (N)	Load per Bottle (N)	Stack Load for 4 bottles (kgf)	Load per Bottle (kgf)
(1)	(2)	(3)	(4)	(3A)	(4A)
i.	50	20	5	2.04	0.51
ii.	60	24	6	2.45	0.61
iii.	90	36	9	3.67	0.92
iv.	180	72	18	7.34	1.84
v.	250	100	25	10.20	2.55
vi.	375	150	38	15.30	3.82
vii.	500	200	50	20.39	5.10
viii.	600	240	60	24.47	6.12
ix.	750	300	75	30.59	7.65
x.	1000	400	100	40.79	10.20
xi.	1500	600	150	61.18	15.30
xii.	1750	700	175	71.38	17.85
xiii.	2000	800	200	81.58	20.39

NOTES:

1. Column (3A) and (4A) are derived by using conversion factor of 1 N = 0.101972 kgf.
2. Units of measurement (N or kgf) to be decided between manufacturer and purchaser.

11.4 Storage Stability Test

This is a type test (typical test) for the determination of the composition of the alcoholic beverages upon storage.

11.4.1 The test conditions shall be both:

a) at 38 ± 1 °C and 90 ± 2 percent RH (accelerated conditions), and
b) at 27 ± 1 °C and 65 ± 2 percent RH (standard conditions).

11.4.2 The alcohol content and other chemicals shall be determined at the following test duration

a) at the initial stage,
b) at the end of 3 months under accelerated conditions, and
c) at the end of 12 months when tested under standard conditions.

11.4.3 The PET bottles shall be considered to have met the requirements of the test if:

a) alcohol content is not less than the minimum permissible limits and
b) other chemicals are not more than the maximum permissible limits prescribed in the relevant FSSAI requirements for alcoholic beverages.

11.5 Migration Test

11.5.1 Representative samples of bottle shall be subjected to overall and specific migration tests with simulant C^1 (10% ethanol v/v) or C^2 (50% ethanol v/v) as specified in Table 1 (4.1 of IS 9845) as per temperature – time specified in Table 2, 4.2 of IS 9845.

11.5.2 *Determination of Overall Migration*

The limit of overall migration when tested as prescribed in IS 9845 shall not exceed overall migration limit of 60 mg/kg or 10 mg/dm^2 with no visible colour migration.

11.5.3 *Determination of Specific Migration*

11.5.3.1 The specific migration is tested to determine the quantity of a specific substance that can migrate from a food packaging material or food container into food. Specific migration limits are usually expressed as mg/kg food.

11.5.3.2 The sample/simulants shall be prepared using the procedure described in IS 9845. The testing for detection of toxic substances shall be carried out as per method given in Table 4.

11.5.3.3 The limit of specific migration of all toxic substances when tested as prescribed in column 4 of Table 4 shall not release the substances in quantities exceeding the specific migration limits listed under Table 4.

Table 4
(*Clause* **11.5.3.2** *and* **11.5.3.3**)

Specific Migration Limits

Sl No.	Toxic Substances	Migration Limit, *Maximum* , mg/kg	Test Method
(1)	(2)	(3)	(4)
i)	Barium	1.0	IS 3025(Part 2)
ii)	Cobalt	0.05	-do-
iii)	Copper	5.0	-do-
iv)	Iron	48.0	-do-
v)	Lithium	0.6	-do-
vi)	Manganese	0.6	-do-
vii)	Zinc	25.0	-do-
viii)	Antimony	0.04	-do-
ix)	Phthalic acid, bis(2-ethylhexyl)ester (DEHP)	1.5	ISO 18856

11.5.4 In the case of coloured plastic materials, colour migrated to simulant shall not be apparent to the naked eye. If the colour migrated is clearly visible, such materials are not suitable, even though the extractive value is within the limit (*see* IS 9833).

11.6 Additional Properties

11.6.1 *Barrier Properties Test*

11.6.1.1 Sample of the PET bottles/ PET-Composite bottles shall be tested for the barrier properties.

11.6.1.2 PET bottles passing the storage stability tests shall be tested for water vapour transmission rate (WVTR) as per ISO 2528, oxygen transmission rate (OTR) as per ISO 15105-2 and Carbon dioxide transmission rate (COTR) as per ISO 15105-2.

11.6.1.3 The duration, temperature and RH conditions for testing the transmission rates shall be fixed and declared by the manufacturer of PET bottles. The values obtained shall be used as controlling specifications for further acceptance tests.

11.6.1.4 Barrier properties reflect the suitability of the PET container for providing the desired shelf life to the content. However, not all contents under the scope of this Standard may need this test. Also, contents that are susceptible to deterioration during storage have differing sets of tests. Hence for each of the contents, the respective Standard should be referred if available. In cases where Standards are not available, it is the responsibility of the supplier to ascertain that the PET container can maintain the safety of the content and its specifications (such as organoleptic properties, rancidity, coliform count, yeast & mould content) over its shelf life.

11.6.2 *ECO-Mark Criteria*

11.6.2.1 *General Requirement*

11.6.2.1.1 The product shall conform to the requirements for quality, safety and performance prescribed.

11.6.2.1.2 The manufacturer shall produce to BIS the consent clearance as per the provisions of Water (Prevention & Control of Pollution) Act, 1974 and Air (Prevention and Control of Pollution) Act, 1981 along with the authorization, if required under Environment (Protection) Act, 1986 and the Rules made thereunder while applying for the ECO-Mark. The manufacturer shall produce documentary evidence with respect to the compliance of regulation under Prevention of Food safety and Standards Act, 2005 and Drugs and Cosmetic Act, 1940 and Rules made thereunder, wherever necessary.

11.6.2.1.3 The product must display a list of critical ingredients in descending order of quantity present expressed as percent of the total. The list of such ingredients shall be identified by Bureau of Indian Standards.

11.6.2.1.4 The product packaging shall display in brief the criteria based on which the product has been labelled as 'Environment Friendly'.

11.6.2.1.5 The material used for product packaging shall be recyclable or biodegradable.

11.6.2.1.6 It shall also suitably mention that ECO-Mark label is applicable only to the packaging material that ECO-Mark label is applicable only to the packaging material/package, if content is not separately covered under ECO-Mark. It may be stated that ECO-Mark is applicable to the product or packaging material or both.

11.6.2.2 *Product Specific Requirements*

For the manufacture of these items one or more of the virgin material covered in following Indian Standards shall be used.

IS No.	*Title*
IS 10142 : 1999	Polystyrene (Crystal and high impact) for its safe use in contact with foodstuffs, pharmaceuticals and drinking water – Specification (*first revision*)
IS 10151 : 2019	Polyvinyl Chloride (PVC) and its copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water — Specification (*first revision*)
IS 10910 : 1984	Specification for polypropylene and its copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
IS 11434 : 1985	Specification for ionomer resins for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
IS 11704 : 1986	Specification for Ethylene Acrylic Acid (EAA) copolymers for their safe use in contact with foodstuffs, pharmaceuticals and drinking water
IS 12247 : 1988	Specification for Nylon 6 polymer for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
IS 12252 : 2017	Polyalkylene terephthalate (PET and PBT), their copolymers and list of constituents in raw materials and end products for

	their safe use in contact with foodstuffs and pharmaceuticals (*first revision*)

12 MARKING/ LABELLING

12.1 Each bottle shall be marked with the indication of the source of preform/ bottle producer.

12.2 Each bottle shall have a Label legibly marked with:

a) name of material (PET) along with recycling symbol, complying with IS 14534; (*as "symbol"*)

PET

b) nominal capacity in ml;
c) brand owner's name and/or his recognized trademark, if any;
d) any other information mandated by any other statutory authorities;
e) the ECO logo, if compliant; and
f) any other statutory requirements.

12.3 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the Bureau of Indian Standards Act, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

13 SAMPLING

13.1 The method of drawing representative sample from a lot and the determination of criteria of conformity of a lot to requirements of this specification shall be as prescribed in Annex C.

13.2 The method of drawing representative sample from a lot and the determination of its conformity with the requirements of this Standard shall be as prescribed in Annex C.

ANNEX A
(*Clause* 2)

IS No./ Other publications	**Title**
IS 2798 : 1998	Methods of test for plastic containers (*first revision*)
IS 3025 (Part 2) : 2019 / ISO 11885 : 2007	Methods of sampling and test (physical and chemical) for water and wastewater : Part 2 Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (*first revision*)
IS 4905:2015/ ISO 24153: 2009	Methods for random sampling
IS 7019 : 1998	Glossary of terms in plastics and flexible packaging, excluding paper *(second revision)*
IS 7408 (Part 1) : 2000	Blow moulded polyolefin containers: Part 1 Up to 5-litre capacity *(second revision)*
IS 7511 (Part 4) : 1986	Dimensions for neck finishes: Part 4 Roll-on threads pilferproof *(first revision)*
IS 8970 : 1991	Aluminium foil laminate for packaging — Specification *(first revision)*
IS 9833 : 2018	List of colourants for use in plastics in contact with foodstuffs and pharmaceuticals *(second revision)*
IS 9845 : 1998	Determination of overall 'migration of constituents of plastics materials and articles intended to come in contact with foodstuffs – Method of analysis (*second revision*)
IS 10142 : 1999	Polystyrene (Crystal and high impact) for its safe use in contact with foodstuffs, pharmaceuticals and drinking water – Specification (*first revision*)
IS 10151 : 2019	Polyvinyl Chloride (PVC) and its copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water — Specification (*first revision*)
IS 10910 : 1984	Specification for polypropylene and its copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
IS 11434 : 1985	Specification for ionomer resins for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
IS 11704 : 1986	Specification for Ethylene Acrylic Acid (EAA) copolymers for their safe use in contact with foodstuffs, pharmaceuticals and drinking water
IS 12247 : 1988	Specification for Nylon 6 polymer for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
IS 12252 : 2017	Polyalkylene terephthalate (PET and PBT), their copolymers and list of constituents in raw materials and end products for their safe use in contact with foodstuffs and pharmaceuticals (*first revision*)
IS 13193 : 1992	Polyalkylene terephthalates (PET and PBT) for moulding and extrusion
IS 13360 (Part 8/ Sec 8) : 2021/ ISO 3451-1 : 2019	Plastics – Methods of Testing Part 8 Permanence/ Chemical Properties Section 8 Determination of Ash – General Methods
IS 14534 : 2016	Plastics – Guidelines for the recovery and recycling of plastics waste *(first revision)*
IS 15495 : 2020	Printing ink for food packaging — Code of practice (*first revision*)

ISO 2528 : 2017	Sheet materials — Determination of water vapour transmission rate (WVTR) — Gravimetric (dish) method
ISO 15105-2 : 2003	Plastics — Film and sheeting — Determination of gas-transmission rate — Part 2: Equal-pressure method
ISO 18856 : 2004	Water quality — Determination of selected phthalates using gas chromatography/mass spectrometry
ISO 18857 – 2 : 2009	Water quality – Determination of selected alkylphenols – Part 2: Gas chromatographic mass spectrometric determination of alkylphenols, their ethoxylates and bisphenol A in non-filtered samples following solid-phase extraction and derivatisation

ANNEX B
(Informative)

B-1 GENERIC REQUIREMENTS

B-1.1 Material Requirements

B-1.1.1 All components of the PET containers that meet the requirements specified in the relevant section(s) of **4** at the approval stage shall be maintained in the same quality by the supplier in all subsequent supplies.

B-1.1.2 While specifications have been identified at various places, all components that come in contact with the contents of the containers, shall be in compliance with the appropriate Indian Standards for food contact materials (FCM) as available.

NOTE — The term 'components' is used above to mean PET bottle or its innovations, cap, wad, label, etc. some of which may or may not come in contact with the contents.

ANNEX C
(Clause 13*)*
SAMPLING

C-1 SCALE OF SAMPLING

C-1.1 Lot

In any consignment all the bottles of the same material, nominal capacity and drawn from a single batch of manufacture shall be grouped together to constitute a lot.

C-1.2 Scale of Sampling

For ascertaining the conformity of the lot to the requirements of this standard, tests shall be carried out for each lot separately. The number of bottles to be sampled from a lot shall be in accordance with Table 5.

Table 5
(*Clause* C -1.2)

Scale of Sampling and Acceptance Number for a few parameters

Sl No.	Lot size (No of bottles)	For Workmanship and Finish		For Closure Leakage Test and Vibration Leakage Test		For Overall Height, Diameter, Wall Thickness and Verticality	
		Sample Size	Acceptance Number	Sample Size	Acceptance Number	Sample Size	Acceptance Number
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i.	up to 500	13	1	5	0	2	0
ii.	501 to 1000	20	2	8	0	2	0
iii.	1001 to 3000	32	3	13	0	2	0
iv.	3001 to 5000	50	5	20	1	3	0
v.	5001 and above	80	7	32	2	5	0

NOTES:

1. "Acceptance Number" mentioned in Table 5 and in Clause C -2.1 and 2.4 refers to the number of acceptable failures for a given sample size.

2. For details on the significance of the columns and other parameters, paragraphs given in C -2 below may be referred.

C-1.3 The bottles shall be selected at random from the lot. To ensure the randomness of selection, methods given in IS 4905 may be followed.

C-2 CRITERIA FOR CONFORMITY

C-2.1 Visual Examination

The sample bottle selected as per col 2 of Table 5 shall be examined for manufacturing conditions *(see* **5***)*. Any bottles failing in one or more of the requirements shall be termed as defective. The lot shall be accepted under this head if the number of defective bottles in sample does not exceed the acceptance number given in col 3 of Table 5.

C-2.2 Overall height, diameter, Wall thickness and Verticality

The sample size given in col 6 of Table 5 shall be used for the measurement of each of the parameters, namely, overall height and diameter, wall thickness and verticality. No failure shall occur for acceptance of the lot under this clause, col 7.

C-2.3 Bottle Mass, Brimful Capacity and Fill Point Capacity

For the purpose of the captioned tests, 5 bottles for lot size up to 5000 and 10 bottles for lot size above 5000 shall be selected at random from the samples already drawn according to **C-1.3**. Each of the sample bottles shall be subjected to tests for brimful capacity (**8.2**), fill point capacity (**8.3**) and bottle mass (**9**). There shall be no failure, if the lot is to be accepted under these clauses.

C-2.4 Closure Leakage and Vibration Leakage Test

The number of sample bottles to be drawn shall be in accordance with col 4 of Table 5. Each of, the sample bottle shall be subjected to closure leakage and vibration Leakage test (**11.1.1** and **11.1.2***)* respectively. The number of failures shall not exceed the acceptance number given in col 5 of Table 5.

C-2.5 Drop Impact Test and Stack Load Test

One set of sample bottles as given in their test methods (**11.2** and **11.3**) 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.

C-2.6 Storage Stability Test, Migration Test and Tests for Barrier properties

PET bottles shall be approved after testing the Storage Stability (**11.4**), Migration (**11.5**) and Barrier properties (**11.6.1**) in the initial stage between the bottle manufacturer and the brand owner. These are type tests and are not routine tests. Thereafter these tests shall be performed every three years. This cycle of tests shall begin afresh, whenever there is a change in the material constituents of the bottles or the components thereof.