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BUREAU OF INDIAN STANDARDS
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भारतीय मानक मसौदा

तरल कीटनाशकों की पैकिंग के लिए पॉली (एथिलीन टेरेफ्थेलेट) (पीईटी) की बोतलें (5 लीटर क्षमता तक) – विशिष्टि

(IS 13123 *का दूसरा पुनरीक्षण*)

Draft Indian Standard

POLY (ETHYLENE TEREPHTHALATE) (PET) BOTTLES FOR PACKING OF LIQUID PESTICIDES (UP TO 5 LITRES CAPACITY) — SPECIFICATION

(*Second Revision of* IS 13123)

(ICS 55.100; 65.100)

Plastics Packaging Sectional Committee, PCD 21	Last date for receipt of comment is **26th April 2025**

FOREWORD
(*Formal clauses shall be added later*)

This standard was first published in 1991 covering packing of liquid pesticides in PET bottles with capacity up to1 litre and subsequently revised in 2000. In the first revision of the standard, the scope was extended to cover up to 5 litres capacity. Provision for induction sealing of the bottles was added and test method for determination of brimful capacity was included. Annexes A, B and C, which contain test methods for 'vibration test, stack-load resistance and drop test were deleted and reference is made to IS 2798: 1998 'Methods of test for plastics containers (*first revision*)' in view of the modifications to these test methods.

This (*second*) revision has been brought out to incorporate editorial alignment and compliance with various applicable regulations. The major modifications in this revision are as follows:

a) Title of the standard has been modified;
b) Test for storage stability has been incorporated;
c) Marking clause has been overhauled; and
d) Cross-references standards have been updated

Poly (Ethylene Terephthalate) (popularly known as PET) containers are commonly made by injection stretch blow moulding process. The biaxial orientation of PET molecules results in a product with enhanced mechanical and chemical properties which are useful for the packaging.

PET bottles are being widely used for the packaging of foodstuffs and pharmaceuticals. Their trials with the packaging of certain agro-chemicals had proved satisfactory for their basic compatibility of the material over their stipulated shelf-life and transport worthiness tests, carried out in the laboratory and in actual transhipment. On the basis of these trials reports, the committee agreed to permit PET bottles as packaging material for certain liquid pesticides.

Indian Standards have already been formulated for packaging pesticides in HDPE containers namely, IS 9754 : 1981 ‘Specification for high density polyethylene containers for packing of liquid pesticides (up to 1 litre capacity)’ and IS 12512 : 1989 ‘HDPE containers — For liquid pesticides — Capacity over 1 and up to 5 litres — Specification’.

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 tests for poly (ethylene terephthalate) (PET) bottles (up to 5 litres capacity) for packaging of liquid pesticides.

2 REFERENCES

The following standards 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 indicated below:

IS No.	*Title*
IS 2798 : 1998	Methods of test for plastics containers (*first revision*)
IS 4905 : 2015/ISO 24153 : 2009	Random sampling and randomization procedures (*first revision*)
IS 7019 : 1998	Glossary of terms in plastics and flexible packaging, excluding paper (*second revision*)
IS 7408 (Part 1) : 2000	Blow moulded polyolefin containers — Specification: Part 1 up to 5 litres capacity (*second revision*)
IS 8393 : 1977	Specification for roll seal pilferproof closures
IS 13193 : 1992	Polyalkylene terephthalate (PET and PBT) for moulding and extrusion — Specification

3 TERMINOLOGY

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

4 SIZES

4.1 Nominal Capacity

Poly (Ethylene Terephthalate) (PET) bottles shall be of the following nominal capacities:

100 ml; 250 ml; 500 ml; 1 000 ml; 3 000 ml and 5 000 ml.

4.2 Brimful Capacity

The minimum brimful capacity shall be as follows:

Sl No.	**Nominal Capacity (ml)**	**Brimful Capacity, *Min* (ml)**
(1)	(2)	(3)
i)	100	137
ii)	250	290

iii)	500	585
iv)	1 000	1 185
v)	3 000	3 300
vi)	5 000	5 500

4.2.1 The brimful capacity shall be determined by the method prescribed in **5** of IS 2798.

5 REQUIREMENTS

5.1 Material

5.1.1 The bottles shall be made by injection stretch blow moulding process from poly (ethylene terephthalate) (*see* IS 13193).

5.1.2 Recycled PET may be used provided the final bottle meets the requirements of IS 13193.

5.2 Cap and Plug

The bottles shall be provided with a cap, additionally with an insert plug or an induction sealing.

5.2.1 The cap shall be rollseal pilfer-proof type made of aluminium sheet or plastic of nominal size (diameter) 25 mm, 28 mm, 31.5 mm, 38 mm or 46 mm (*see* IS 8393).

5.2.2 The insert plug, wherever provided, shall be made of HDPE/LDPE/Nylon or of any other material which is compatible with the contents.

5.2.3 Induction seal with lamination of wax or polyethylene coated aluminium foil or metallized polyester film which facilitates induction sealing of aluminium foil or metallized polyester film onto the neck may also be used. The aluminium foil or metallized polyester film shall remain sealed to the neck as the cap is rotated for opening.

5.2.4 A wad shall be provided in the cap, if required. The wad facing shall be compatible with the product packed. The wad thickness shall be such as to provide effective sealing. The wad diameter shall be such that it is retained by the knurled portion of the cap.

5.3 Neck Finish

The bottle neck finish shall be such as to provide a leak-proof and pilfer proof closure system. The lip surface shall be smooth so as to facilitate effective induction sealing between the contact areas of the lip and laminated wad.

5.4 Mass

The mass of the bottles shall be as agreed to between the purchaser and the supplier. The tolerance on the agreed mass shall be ± 5 percent.

5.5 Dimensions

The dimensions of the bottle shall be as agreed to between the purchaser and the supplier. The tolerances on the specified diameter and overall height of the bottle shall be as follows:

Up to and including 100 mm	± 1.5 mm
Over 100 mm and up to and including 200 mm	± 2.0 mm
Over 200 mm	± 2.5 mm

5.5.1 *Wall Thickness*

The minimum wall thickness of bottle when measured by the method prescribed in **4.5** of IS 2798 shall be 0.25 mm.

5.6 Workmanship and Finish

The bottles and closures shall be manufactured in accordance with Good Manufacturing Practices and shall be free from any flash and scratches.

5.7 Performance Tests

5.7.1 *Leakage Test*

5.7.1.1 *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.

5.7.1.2 *Vibration Leakage Test*

The bottle filled with water at ambient temperature and closed tightly with the cap when subjected to vibration by the method prescribed in **6.2** of IS 2798 shall not show any leakage through the closure after 1 h of testing.

5.7.2 *Drop Impact Test*

The bottle with the cap when subjected to the drop test by the method prescribed in **8** of IS 2798 shall not show any sign of cracking. Slight deshaping of the body shall not render the bottle unacceptable in the test.

5.7.3 *Stack Load Test*

The bottle shall be of sound construction and shall have stack load resistance as given below:

Sl No.	Nominal Capacity (ml)	Stack Load (N)	Load per Bottle (kg)
(1)	(2)	(3)	(4)
i)	100	400	10
ii)	250	400	10
iii)	500	350	8.8
iv)	1 000	350	8.8
v)	3 000	480	12
vi)	5 000	800	20

The bottle when subjected to stack load test by the method prescribed in **9** of IS 2798 shall not show any leakage, cracks or permanent buckling after removal of the test load after 24 h.

5.7.4 *Storage Stability Test*

5.7.4.1 Storage stability test is meant to verify the suitability of the PET container for providing the desired shelf life to the content.

5.7.4.2 The Storage stability tests are generally conducted following the World Health Organization (WHO)/ Food and Agriculture Organization (FAO) Packaging guidance protocols.

5.7.4.2.1 Testing shall be done in 3 agro climatic zones.

5.7.4.2.2 Testing shall be done at a monthly interval upto the intended shelf life and at 15 day interval for 6 months thereafter.

5.7.4.2.3 Testing parameters generally include degradation assessment of the active ingredient, the physicochemical properties of the formulation, the impact on the thickness of the container, discoloration of the container, etc.

5.7.4.3 The exact testing conditions, parameters and acceptability criteria shall be decided between the purchaser and the supplier.

5.7.5 *Compatibility with Pesticides*

The suitability of PET bottles for packing of liquid pesticides shall be ascertained by subjecting them to compatibility test by the method prescribed in **12** of IS 2798.

6 MARKING

6.1 The bottle shall be marked with the manufacturer's name or initials and/or recognized trade-mark, if any.

6.1.1 The following sign shall be embossed on the side (and not on the bottom) of the PET bottles to prevent the reuse of these empty containers for storing edible items:

The sign shall be suitably supplemented with a line in Devnagari "जीवित को हानि" "DANGEROUS FOR HUMAN BEINGS & ANIMALS"

6.1.2 The following identification code for PET shall be embossed on the bottom of each container:

6.2 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.

7 SAMPLING

Sampling of bottles shall be drawn and the criteria for conformity is determined as prescribed in Annex A. The test given in **5.7.5** is a type test and the same is to be carried out on every new type or design of the bottles.

ANNEX A
(*Clause* 7)
SAMPLING

A-1 SCALE OF SAMPLING

A-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.

A-1.2 Scale of Sampling

For ascertaining the conformity of the lot to the requirements of this standard, test shall be carried out for each lot separately. The number of bottles to be sampled from a lot shall be in accordance with Table 1.

A-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.

A-2 CRITERIA FOR CONFORMITY

A-2.1 Visual Examination

The sample bottles selected as per col (3) of Table 1 shall be examined for neck finish (**5.3**), workmanship and finish (**5.6**). Any bottle 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 detective bottles in sample does not exceed the acceptance number given in col (4) of Table 1.

A-2.2 Brimful Capacity and Bottles Mass

For the purpose of above tests, five bottles for lot size up to 5 000 and 10 bottles for lot size above 5 000 shall be selected at random from the samples already drawn according to **A-1.3**. Each of the sample bottle shall be subjected to tests for brimful capacity (**4.2**) and bottle mass (**5.4**). There shall be no failure if the lot is to be accepted under this clause.

A-2.3 The sample bottles drawn according to col (5) of Table 1 shall be tested for closure leakage test, vibration test and stack load test. Any bottle showing leakage, crack or permanent buckling when subjected to tests shall be taken as defective. The number of defectives shall not exceed the acceptance number given in col (6) of Table 1, for the lot to be accepted as conforming to specification.

A-2.4 Drop Impact Test

A-2.4.1 For lot size up to 3 000, the sampling shall be as follows:

Take a total sample of sixteen bottles at random from a lot. Divide this sample into two sets of eight each, designated as Set 1 and Set 2. Leakage of water through cracks and closures after the test, shall be considered as a defect. However, slight denting shall not be taken as failure of the bottle in the test.

A-2.4.1.1 Each bottle of Set 1 shall be subjected to the drop impact test. If none of the bottles fail in the test, the lot shall be accepted. If only one bottle is found defective, the test shall be repeated on the second set of bottles (*see* **A-2.4.1**), otherwise the lot shall be rejected.

A-2.4.1.2 If in the second set none of the bottles are found defective then the lot shall be accepted as conforming to specification.

A-2.4.2 For lot size greater than 3 000, the sampling criteria shall be as follows:

Take a total sample of size twentysix bottles taken at random from a lot. Divide the sample into two sets of thirteen each, designated as Set 1 and Set 2.

A-2.4.2.1 Each bottle of Set 1 shall be subjected to the drop impact test. If none of the bottles are found defective, the lot shall be accepted. If one or two bottles fail in the test, the test shall be repeated on the second set (*see* **A-2.4**). If the number of defectives are three or more, the lot shall be rejected.

A-2.4.2.2 If the total number of bottles found defective in the first and the second set combined is four or more, the lot shall be rejected, else accepted as conforming to specifications.

A-2.5 The sub-sample of size given in col (7) of Table 1 shall be subjected to tests for dimensions and wall thickness. No failures shall occur for acceptance of the lot under this clause.

A-2.6 Stack Load Test

One set of sample bottles as given in the test method (**5.7.3**) shall be drawn from the lot and tested. The sample shall pass the test for acceptance of the lot in respect of stack load requirements.

Table 1 Scale of Sampling and Acceptance Number
(*Clauses* A-1.2, A-2.1, A-2.3 *and* A-2.5)

Sl No.	**Lot Size**	**For Visual Examination (Clauses 5.3 and 5.6)**		**For Tests (Clauses 5.7.1.1 and 5.7.1.2)**		**For Dimensions and Wall Thickness (Clauses 5.5 and 5.5.1) No. of Samples**
		Sample Size	**Acceptance Number**	**Sample Size**	**Acceptance Number**	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Up to 500	13	1	5	0	2
ii)	501 to 1 000	20	2	8	0	2
iii)	1 001 to 3 000	32	3	13	0	2
iv)	3 001 to 5 000	50	5	20	1	3
v)	5 001 and above	80	7	32	2	5