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भारतीय मानक मसौदा

लैमिनेटेड कोलैप्सिबल ट्यूब – विशिष्टि

(IS 12007 *का पहला पुनरीक्षण*)

Draft *Indian Standard*

LAMINATED COLLAPSIBLE TUBE — SPECIFICATION

(*First Revision of* IS 12007)

(ICS 83.140.20; 55.120)

Plastics Packaging Sectional Committee	Last date for comments:
PCD 21	**19th April 2025**

FOREWORD

(*Formal clauses to be added later*)

Plastics laminated tubes are recent entry in collapsible tube packaging and it provides packing media for many of the formulations, such as toothpastes, cosmetics, medicinal creams, and adhesives.

The standard was first published in 1987. The Committee decided to revise the standard based on the latest technology and requirements. Major changes in this revision are:

a) Requirement of overall migration and specific migration has been added for foodstuffs, pharmaceutical and drinking water contact application only
b) Method of test for bond strength and bursting test have been modified
c) Cross reference standard has been updated
d) Editorial changes have been done
e) Requirement of ECO mark has been deleted.
f) All amendments have been incorporated

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 teat, 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 dimensions, performance and testing requirements of fully collapsible multi-laminated plastics tubes with caps.

2 REFERENCE

The following standards contain provisions which through reference in the 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 agreement, based on the standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No./ Other Publication	*Title*
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	Random sampling and randomization procedures (*first 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*)
ISO 18856 : 2004	Water quality — Determination of selected phthalates using gas chromatography/mass spectrometry

3 TERMINOLOGY

For the purpose of this standard, the following definitions, as illustrated in Fig. 1, 2 and 3, shall apply.

3.1 Sleeve — Formed laminated web roll stock cut to a specific length and size; also called body.

3.2 Body Wall Thickness — Caliper thickness of laminated material.

3.3 Side Seam — Formed by radio frequency energy sealing under pressure of the outer and inner plastic layers that are overlapped.

3.4 RF Seaming — Seaming by radio frequency.

3.5 Shoulder — That portion of tube which integrates the neck section to the body.

3.6 Head Insert — A disc with a short neck, shaped to fit within the polyethylene shoulder and neck of the finished tube. It is made of urea formaldehyde or poly butylene-terephthalate (PBT) and acts as a barrier between the product and the shoulder and neck of the tube.

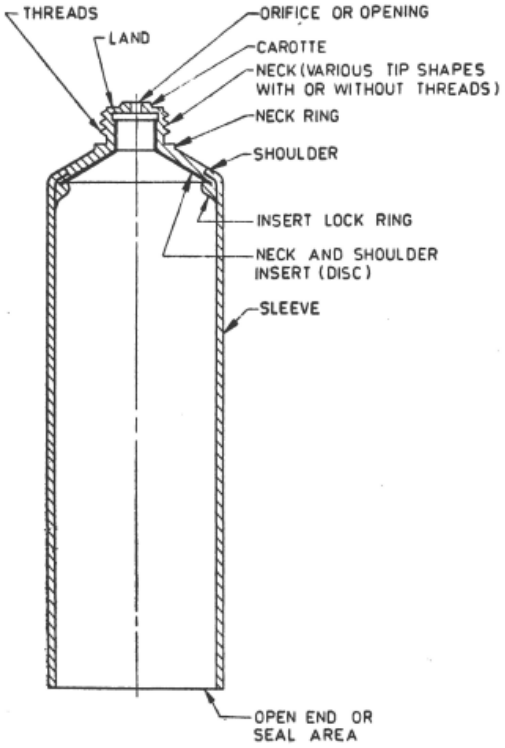

FIG.1 BASIC LAMINATED TUBE NOMENCLATURE

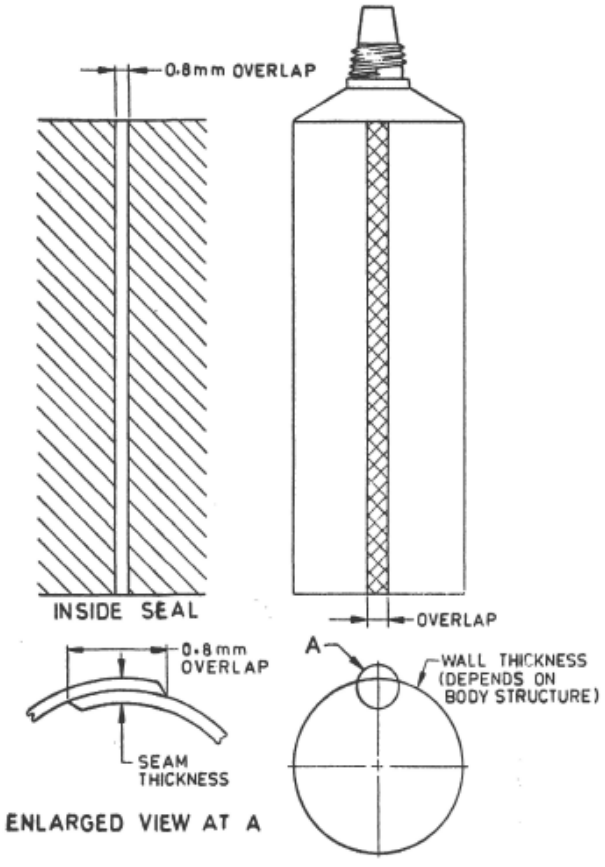

FIG. 2 DETAILS OF BODY SEAM

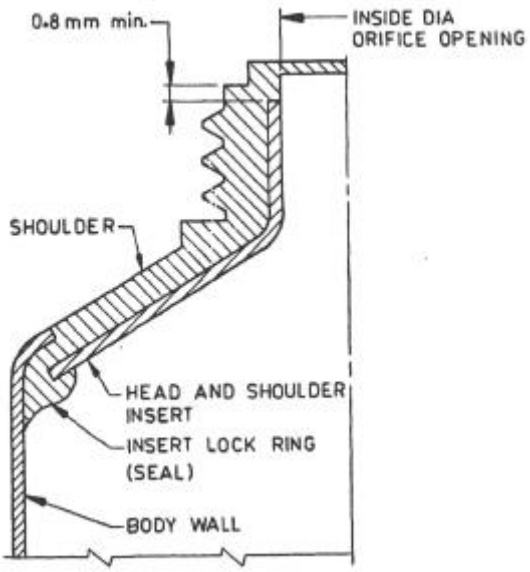

FIG. 3 HEAD AND SHOULDER INSERT LOCATION

3.7 Insert Lock Ring — The portion of head material which acts as a lock or sealing ring to the shoulder insert preventing it from pulling away from the shoulder and also acts as seal around the lip of the insert to prevent leakage of product between the shoulder insert and the plastic headed shoulder material thus preventing a permeating problem.

3.8 Land — Flat sealing surface on top of neck.

3.9 Neck Ring — An integrally moulded portion of the shoulder commonly seen as a ring at the bottom of the neck section.

3.10 Thread — An integrally moulded portion of the neck of screw type design to enable cap or closure to be fitted to tube.

3.11 Neck — The portion of the tube between the shoulder and the land or the top of the sealing surface.

3.12 Tip — Uppermost integral part of the neck.

3.13 Carotte — Portion of excess material left on the tube neck terminating at the orifice opening and trimmed off prior to capping.

3.14 Orifice — Opening in the neck section through which the product is dispensed.

3.15 Print — May be done by a suitable printing process.

3.16 Code Data — A series of letters and numbers imprinted into the sleeve at the seamer to identify exact date of manufacturing and line. Appears in the area of the tube between the seam and front panel copy. Valuable information to isolate production if needed.

3.17 Electric Eye Mark — The most commonly used is the square or rectangular shape, located near the open end or bottom of the tube for purpose of print orientation for sealing the bottom and to center the face or front panel. Also used for controlling the print position in relation to the cut length of the sleeve.

3.18 End Seal Area — At the open end of the tube which is sealed after being filled with the product.

3.19 Head Space — Refers to the length of the tube above the product fill before sealing, required to assure no contamination of the seal area by the product during sealing and also includes enough space for actual seal.

3.20 Cap — Moulded closure that is applied to neck of the tube.

3.21 Tube — Referred to as finished product.

3.22 Rondelle — An aluminium foil laminate embedded inside the shoulder to prevent flavour loss and to give enhanced shelf life.

4 MATERIAL

4.1 Tube — The tube shall he manufactured from laminates, which may comprise of three or more layers of various types of substrates for example, LDPE, aluminium foil, Ethylene Acrylic Acid (EAA) copolymer or any other possible combinations.

4.1.1 *Laminate Web Construction* — Laminate web comprising three or more layers which may consist of various substrates like aluminium foil, and other thermoplastics. Each substrate having its own properties. As such the layers directly in contact with the contents shall be compatible with the product to be packed which shall be decided after assessing the physical and chemical properties of product. Therefore, the laminate structure shall be decided by the buyer and seller suiting the application.

NOTE — Generally, the laminate having minimum thickness of 170 microns are used.

4.2 Caps — The caps may be made from moulding grade LDPE or HDPE, polypropylene or any other thermoplastics. The moulding pigments shall not be toxic and shall be compatible with the product packed.

4.3 Insert — The insert if required may be made from a suitable non-toxic plastics material.

4.4 Rondelle — The rondelles made of aluminium foil laminate of thickness as specified by the purchaser may be provided.

5 SHOULDER AND NOZZLE DIMENSIONS

5.1 Dimensions of the shoulder and the nozzle for different diameters of tubes shall be as agreed between seller and purchaser. Length of the tubes shall depend on the mass and bulk density of the product to be packed.

5.2 Tube Capacity — The capacity shall be specified in volume (ml) or net mass (g) of the contents to be packed.

6 TESTING

6.1 Visual Defects — The finished tubes shall be examined visually for the following defects:

6.1.1 *Critical Defects*:

a) Incorrect print design or colour;

b) Insect, hair, or other gross contamination on/ in tube or cap;

c) Open seam;

d) Gross foil exposure;

e) Open shoulder weld;

f) Hole or slit in tube or sleeve;

g) Incomplete head;

h) Blocked orifice, and

j) Stripped threads.

6.1.2 *Other Defects*:

a) Delamination;

b) Seam white line barely visible;

c) Seam melted on outside to point where the outer layers of polyethylene are pulled off or wrinkled;

d) Damaged ends;

e) Missing, cracked or badly chipped insert;

f) Flashing or pigtails in the orifice;

g) Poly strings inside or attached to tube;

h) Inside contamination; and

j) Outside contamination.

6.2 Leakage Test — The capped tube when tested by air at a pressure of 30 kPa shall not show any leakage in the area around the cap and shoulder. The details of the method are given in Annex A.

6.3 Bursting Test — The tube shall not burst at the side seam or the end seal when tested to bursting by applying air pressure as per the method given in Annex B.

6.4 Bond Strength Between Extruded Head and Sleeve — The bond strength between the extruded head and the sleeve, when tested as per the method detailed in Annex C, shall be good.

6.5 Inside Diameter of Tubes — Inside diameter of the tubes shall be determined by the method given in Annex D.

6.6 Outside Tubes Diameter — Shall be checked by Go/No Go gauges as per the method given in Annex E.

6.7 Copper Sulphate Test for Determination of Exposed Aluminium in Tubes — The tube when tested for any exposed aluminium surface by the method given in Annex F shall not show any brownish or red deposit on the surface.

6.8 End Seal Integrity Test — The end seal when tested as per the method given in Annex G shall be good.

6.9 Water Leakage Test — Tubes shall be filled with water and allowed to stand for l2 h. There shall be no leakage. A water soluble coloured dye may be added to the water to aid identification of the leak path.

6.10 External Decoration Test — Tubes shall be immersed for 24 hours at room temperature in a slurry of 10 percent of the relevant product in water. Only slight fading, lifting or softening of print shall be acceptable.

6.11 Product Compatibility Test — The compatibility of the tube material with the product to be packed into it shall be tested by the method given in Annex H.

6.12 Additional Requirements for foodstuffs, pharmaceuticals and drinking water Applications

When the tubes are used in contact with foodstuffs, pharmaceuticals and drinking water, requirements of overall migration and specific migration shall be met as per clause **6.12.1** and **6.12.2**.

6.12.1 *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.

6.12.2 *Determination of Specific Migration*

6.12.2.1 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.

6.12.2.2 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 1.

6.12.2.3 The limit of specific migration of all toxic substances when tested as prescribed in col (4) of Table 1 shall not release the substances in quantities exceeding the specific migration limits listed under Table 1.

Table 1 Specific Migration Limits
(*Clause* 6.12.2)

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

7 SAMPLING

7.1 Lot — The tubes manufactured from the same raw material and of the same dimensions manufactured under similar conditions shall constitute a lot.

7.2 Scale of Sampling — To ascertain the conformity of the lot to the requirements of the standard, tests shall be carried out for each lot separately. The number of tubes to be sampled from a lot shall be in accordance with Table 2.

7.3 The tube shall be selected at random from the lot and in order to ensure the randomness of selection, procedures given in IS 4905 may be followed.

8 INFORMATION TO BE SUPPLIED BY THE PURCHASER

8.1 When specifying the laminated collapsible tubes the requirements shall be stated in the following order:

a) Diameter,
b) Length, and
c) Orifice or nozzle diameter.

Table 2 Scale of sampling
(*Clause* 6.2)

Lot Size (1)	Sample Size (2)	Max. allowable Rejection No. (3)
Up to 1000	32	1
1001 to 3000	50	2
3001 to 10000	80	3
10001 to 35000	125	5
35000 and above	200	7

8.1.1 Full details of the caps used shall also be given.

9 PACKING AND MARKING

9.1 Packing — The tubes may be supplied in clean fibreboard or wooden cases with or without dividers.

9.2 Marking — The tubes shall be marked indelibly with following details:

a) Manufacturer's name;
b) Trade-mark;
c) Date of manufacture and batch no.; and
d) Any other information as required by the purchaser.

9.2.1 *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.

ANNEX A
(*Clause* 5.2)
LEAKAGE TEST FOR LAMINATED TUBES

A-1 APPARATUS

a) Air gun attached to 30 kPa supply;
b) Soft rubber cone fitted to air gun nozzle; and
c) Container for water.

A-2 PROCEDURE

Insert the soft rubber cone into the open end of the tube. Immerse the capped end of the tube into the water filled container. Press the trigger valve on the air gun applying pressure to the tube. Look for air bubbles in the area around the cap and shoulder.

A-3 OBSERVATIONS

A-3.1 If bubbles appear, visually examine the tube and determine the cause.

ANNEX B
(*Clause* 5.3)
BURSTING TEST

B-1 PROCEDURE

B-1.1 Seal the open end of the empty tube.

B-1.2 Remove the cap and connect the nozzle with appropriate neck-fitment to air supply line.

B-1.3 Apply air pressure to the tube at the rate of 70 kPa per 5s and continue raising the pressure till the pressure reaches 200 kPa.

B-1.4 Maintain this pressure for 15s. The tube or seal shall not show any bursting at the body or seals.

B-1.5 Raise the pressure further till the tube bursts. Observe the rupture of the tube. The tube passes the test if the body ruptures before the seal fails.

ANNEX C
(*Clause* 5.4)
BOND STRENGTH TEST FOR EXTRUDED AND SLEEVE

C-1 PROCEDURE

C-1.1 Take the Tube under inspection.

C-1.2 Cut vertically 15mm width strip up to the shoulder

C-1.3 Initiate peeling off the laminate strip from the shoulder, manually.

C-1.4 If the laminate strip tears off, indicates Bond strength is OK.

C-1.5 If the laminate strip completely separates off from the shoulder, it indicates bond strength between the laminate to tube shoulder is not OK.

FIG. 4 STRIP CUTTING

FIG. 5 STRIP TEARING OFF

ANNEX D
(*Clause* 5.5)
MEASUREMENTS OF INSIDE DIAMETER OF TUBE

D-1 APPARATUS — Mandrel of appropriate diameter for the tube size being tested.

D-2 PROCEDURE

D-2.1 Push the tube or sleeve over the mandrel and note the amount of force or pressure necessary.

D-2.2 Observe if the tube or sleeve fits too tight or loose over the mandrel.

D-3 OBSERVATION

D-3.1 For laminated tubes or sleeves there should be some frictional resistance, but not enough to buckle the wall. The fit should not be loose.

ANNEX E

(*Clause* 5.6)

METHOD OF MEASUREMENT OF OUTSIDE DIAMETER OF TUBE

E-1 PRINCIPLE — This method accurately determines the outside tube diameter using a Go/No Go gauge.

E-2 PROCEDURE

E-2.1 Push sample through the correct hole diameter on the gauge.

E-2.2 The tube should fit through the gauge with a small amount of effort. A no fit or extreme effort fit indicates that the tube does not meet specification.

ANNEX F

(*Clause* 5.7)

COPPER SULPHATE TEST FOR DETERMINATION OF EXPOSED ALUMINIUM IN TUBES

F-1 REAGENTS — Laminate test solution (20 percent copper sulphate solution by weight in Distilled water).

F-2 PROCEDURE

F-2.1 Fill the capped tube with appropriate copper sulphate solution to within 25 mm of the open end.

F-2.2 Place the tube in the support stand clamp and allow it to stand for 1 min.

F-2.3 Pour copper sulphate solution from the tube into test solution container.

F-2.4 Test solution should be replaced every two months.

F-2.5 Rinse the tube with tap water.

F-2.6 Cut the tube parallel with side seam and carefully examine the inside of the tube for a brownish red deposit.

F-2.7 Brownish, red deposit indicates exposed aluminium.

ANNEX G

(*Clause* 5.8)

END SEAL INTEGRITY TEST

G-1 PROCEDURE

G-1.1 Cut the sealed empty tube at least 50 mm below the seal and take a strip of 25 / 15 mm width.

G-1.2 Make two parallel cuts perpendicular to the seal at the corner of the seal.

G-1.3 Pull both strips until the sample fails.

G-1.3.1 If the seal is good, it will fail by fracturing the laminate, while the sealed interface remains unchanged. If the seal opens up by the pull the sealing is improper. A break should occur at the base of the seal next to the tube body or elsewhere in the body to ensure a good seal.

ANNEX H
(*Clause* 5.11)
PRODUCT COMPATIBILITY TEST

H-1 PRINCIPLE

H-1.1 The tube is brought in contact with the product to be packed and maintained at a fixed temperature and time. The tube is visually examined for any damage. With this test, a suitable control test in a stoppered neutral glass test tube may be carried out simultaneously.

H-2 PROCEDURE

H-2.1 Take ten tubes for testing. Fill the product in tightly stoppered tubes. Seal the open end of the tubes properly. Subject these tubes to 45 °C in an oven for a period of 72 h. After this period the tubes are allowed to cool to room temperature and then are carefully cut open lengthwise.

H-3 PRODUCT COMPATIBILITY

H-3.1 The contents of the tube should not show any discolouration, change in odour, gas formation or signs of decomposition compared to control sample kept in the sealed neutral glass test tube and subjected to identical conditions at the same time.

H-4 TUBE COMPATIBILITY

H-4.1 After the observation as above is recorded, the contents are washed from the spread open tube body with water at about 45 °C. The tube is dried with cotton wool avoiding rubbing and scratching.

H-5 REQUIREMENT

H-5.1 There shall be no visible signs of softening with scratching, blistering or delamination when the surface is examined in each tube.

NOTE — The test given in primarily meant to detect only gross incompatibility of tube material. The manufacturer and the purchaser are advised to conduct long term storage trials to examine the compatibility of the product with the tube material in a more realistic manner.