IS 15532 (2004): Plastics Crates for Fruits and Vegetables
[PCD 21: Plastics Containers]

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Indian Standard

PLASTICS CRATES FOR FRUITS AND VEGETABLES — SPECIFICATION

ICS 55.160; 67.080

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

November 2004

Price Group 3

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Plastics Containers Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

Plastic crates are widely used for carrying and storing of food and other consumer products. The usage covers the carrying and storing of soft drinks, beer, mineral water, wine, milk, fruits, vegetables, etc. The superiority of such crates lies chiefly in their economy (by way of saving in weight, no maintenance costs, longer life, less breakage than glass), functionality (easy to clean, no special surface protection, easy to stack, less noise, increased safety) and sales promotional aspects (bright colours, easy to print with names, monograms or advertising slogans, can be stacked for display). The surface of plastic crates is smooth and non-porous and consequently does not harbour bacteria. The corners and edges of a correctly designed crate are rounded; crevices in which dirt can accumulate are eliminated in the design of crates made from plastics. They are easily cleaned with steam or hot water and are detergent resistant. This ease of cleaning is particularly a vital factor in food handling and presentation.

In this standard high density polyethylene (HDPE) and polypropylene copolymer (PPCP) have been prescribed as a base raw material for the manufacturing of crates. These two polymers offer a number of advantages, which may include the following:

a) HDPE/PPCP are dimensionally stable plastics with high resilience factors. The stresses and impacts occurring in normal operations are absorbed by the material.

b) They do not affect foodstuffs or beverages because they are chemically inert and have no taste or smell and meet the requirements prescribed in the relevant standards published for food contact applications.

c) They can only be dissolved by a few solvents such as aromatic and halogenated hydrocarbons, when exposed to heat and attacked by highly oxidizing agents such as nitric acid, oleum or halogens. It is resistant to acids and alkalis in wide range of concentrations and temperatures. It is not affected by the synthetic detergents commonly used in the washing operations.

Considering the wide usage of crates for the various applications, the technical Committee has decided to formulate a separate standard on plastic crates for fruits and vegetables. Indian Standards namely, IS 11584 : 1986 'High density polyethylene (HDPE) crates for milk sachets' and IS 13289 : 1993 'Polypropylene/Impact copolymer (PPCP) crates for milk sachets' have already been published. It may not be possible to club this Indian Standard with above two standards as the level of requirements differs considerably and some additional requirements have been prescribed for these types of crates.

It is recommended that the plastic raw materials and the additives used for the crates shall meet the requirements of the relevant Indian Standards published for food contact applications as given in Annex A.

The composition of the Committee responsible for formulation of this standard is given in Annex J.

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 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

PLASTICS CRATES FOR FRUITS AND VEGETABLES — SPECIFICATION

1 SCOPE

This standard prescribes the requirements, methods of sampling and test for rigid and collapsible plastic crates for holding and transporting fruits and vegetables.

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 revisions, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standard indicated below:

IS No.	*Title*
4905 : 1968	Methods for random sampling
7328 : 1992	High density polyethylene materials for moulding and extrusion — Specification (*first revision*)
9833 : 1981	List of pigments and colourants for use in contact with foodstuffs, pharmaceuticals and drinking water
10951 : 2002	Polypropylene materials for moulding and extrusion (*first revision*)
14534 : 1998	Guidelines for recycling of plastics

3 REQUIREMENTS

3.1 The crates shall consist of a rigid or collapsible plastic container with base and side walls, either solid or perforated or its combination.

3.2 Material

The base raw material for crate shall be unpigmented plastic material preferably high density polyethylene (HDPE) conforming to the designation PE-MAN-A50D045/PE-MAN-A50D090 of IS 7328 or polypropylene copolymer (PPCP) grade PP-CM-95-030 Nat, PP-CM-95-060 and PP-CM-95-120 conforming to IS 10951. However, selection of the raw material for a specific type of crates shall be as agreed to between the purchaser and the supplier.

3.2.1 The colour of the crate shall be as agreed to between the purchaser and the supplier. However, the pigment/colour used shall not be metal based, shall comply with the list and limits of pigments and colorants prescribed in IS 9833 and shall have light fastened certificate from the manufacturer.

3.2.2 Adequate ultraviolet stabilizer (recommended quality and quantity) shall be added, if required for the application as agreed to between the purchaser and the supplier. Alternatively UV stabilized resins of HDPE or PPCP meeting the MFI and density requirements of **3.2** may also be used as agreed to between the purchaser and the supplier.

3.3 Shape, Dimensions and Design

3.3.1 The shape, dimensions and design of the crate shall be as agreed to between the purchaser and the supplier.

3.3.2 The crates within a given design shall be interchangeable and inter-stackable. The full capacity of the crate is calculated based on weight of equivalent volume of water.

3.4 Mass

The mass of the crate shall depend upon the material used; the capacity and the design selected and, therefore, shall be as agreed to between the purchaser and the supplier.

3.5 Appearance and Surface Finish

The inside and outside surface of the crate shall be of a smooth finish and free from edges including handle slot and shall have a handle slot of minimum dimensions of 95 mm × 25 mm for comfortable handling.

3.6 Dimensional Stability

Crates when tested in accordance with method prescribed in Annex B shall show no dimensional changes greater than 1.5 percent.

3.7 Confluence Line Strength

The confluence line (weld line) of the crate when tested in accordance with method prescribed in Annex C shall not show crack or breakages.

3.8 Mechanical Strength

3.8.1 *Compressive Strength (Resistance to Applied Load)*

The compression in the height of a crate when tested in accordance with the method described in Annex D

shall not exceed two percent of its original height. Residual compression after 24 h after removal of the test load shall be 0.8 percent or less.

3.8.2 *Resistance to Drop*

When a fully filled crate is tested in accordance with the method described in Annex E, no crack on the crate shall occur.

3.9 Resistance to Environmental Stress Cracking

Crates when tested in accordance with the method prescribed in Annex F shall show no surface cracking.

3.10 Handle Test

3.10.1 *Suspension Test*

The crates handle when tested in accordance with the method described in Annex G, shall not crack or break.

3.10.2 *Free-Fall Test*

The crate's handle when tested in accordance with the method described in Annex G shall not crack or break and shall be stackable with itself and with the new crates.

4 PACKING AND MARKING

4.1 Packing

The crates shall be packed as agreed to between the purchaser and the supplier.

4.2 Marking

Each crate shall be legibly and permanently marked with the following information:

a) Manufacturer's name or initial trade-mark, if any;
b) Month and year of manufacture;
c) Batch or Code number;
d) Recycling symbols of HDPE and polypropylene (*see* IS 14534); and
e) Any other markings as desired by the purchaser.

4.2.1 *BIS Certification Marking*

The crates may also be marked with the Standard Mark.

4.2.1.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act,* 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

5 SAMPLING

The method of drawing representative sample from a lot and the conformity of a lot to requirements of this standard shall be as prescribed in Annex H. The dimensional stability (*see* **3.6**) and environmental stress cracking resistance (*see* **3.9**) shall be type tests.

ANNEX A

(*Foreword*)

LIST OF INDIAN STANDARDS ON PLASTICS SUITABLE FOR USE WITH FOODSTUFFS, PHARMACEUTICALS AND DRINKING WATER

IS No.	*Title*
10142 : 1982	Styrene polymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
10146 : 1982	Polyethylene for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
10151 : 1982	Polyvinylchloride (PVC) and its copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
10910 : 1984	Polypropylene and its copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
11434 : 1985	Ionomers resins for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
11704 : 1986	Ethylene/acrylic acid (EAA) copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
12247 : 1988	Nylon-6 polymer for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
12252 : 1987	Polyalkylene terephthalates (PET & PBT) for their safe use in contact with foodstuffs, pharmaceuticals and drinking water
13576 : 1992	Ethylene methacrylic acid (EMAA) copolymers and terpolymers for their safe use in contact with foodstuffs, pharmaceuticals and drinking water
13601 : 1993	Ethylene vinyl acetate (EVA) copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water

ANNEX B

(*Clause* 3.6)

TEST FOR DIMENSIONAL STABILITY

B-1 Measure the height of the crate at four corners, and length and width at the top and bottom dimensions of the crate. Place the measured empty crate on its base in an air-circulated oven at 80 ± 2 °C for 30 min. Allow it to cool to ambient temperature by keeping it on its base. Repeat the measurements and calculate the percentage change in the dimensions of the crate.

ANNEX C

(*Clause* 3.7)

DETERMINATION OF CONFLUENCE LINE (WELD LINE)

C-1 Select a crate sample after curing for at least 22 h at 27 ± 5 °C. Drop a steel ball of 2 kg once from a height of 3 m on to the centre of each confluence line (weld line) after placing the crate in a horizontal position. Observe the breakage, cracks or any deformation on the crate.

ANNEX D

(*Clause* 3.8.1)

DETERMINATION OF COMPRESSIVE STRENGTH (RESISTANCE TO APPLIED LOAD)

D-1 Stack 6 empty crates one top of other. Put 5 kg load inside the top most crate for proper positioning. Measure the stack height.

D-2 Place 500 kg plate on top of the uppermost crate after removing the earlier placed 5 kg load. Allow the load to remain on the crate for 3 h. At the end of 3 h measure the stack height. Remove the load and measure the stack height after 24 h. The tests are to be conducted at 27 ± 5 °C.

ANNEX E

(*Clause* 3.8.2)

DETERMINATION OF RESISTANCE TO DROP

E-1 BOTTOM DROP TEST

E-1.1 Procedure

Load a crate with dummies of the specified load capacity of the crate. Drop the loaded crate in horizontal position from a height of 3 m on a steel plate. Drop the crate four times and observe the cracks, or breakage or deformation occurred on the crate. The test is not valid if full base of the crate is not impacted on each drop.

E-2 CORNER DROP TEST

E-2.1 Procedure

Fill a crate with the dummies of the specified load capacity of the crate. Drop the crate from 30 cm height. Repeat the drop with other corners from the same height. Observe the breakage, cracks on the crate.

Drop tests are to be conducted at 5 ± 1 °C and 27 ± 1 °C.

ANNEX F

(*Clause* 3.9)

DETERMINATION OF RESISTANCE TO ENVIRONMENT STRESS CRACKING

F-1 Prepare a two-percent solution of Teepole B 300 in water. Set the temperature of the solution in the tank at 80 ± 5°C. After achieving the temperature, submerge a crate in the tank so that it dips fully into the tank and record the time. Remove the crate after 6 h and check the sample for cracks.

ANNEX G

(*Clauses* 3.10.1 *and* 3.10.2)

HANDLE STRENGTH TEST

G-1 GENERAL

The crates are subjected to both suspension test and free fall test to ascertain the strength of the handle.

G-2 SUSPENSION TEST

Fill the crate with dummies to the specified load capacity of the crate. Ensure that the load is properly tied to the crates. Suspend the crate from one handle for 10 min with a canvass strap tied to the handle of the crate. Observe the handle after the test. The handle shall not crack or break.

G-3 FREE FALL TEST

Tie 450 mm length after tying canvass strap to the handle of the crate. Raise the crate with load up to the other end of the strap. Allow free fall of the crate (450 mm). Observe the handle after the test. The handle shall not crack or break and shall be stackable with itself and with the new crates.

ANNEX H

(*Clause* 5)

SAMPLING OF PLASTICS CRATES

H-1 LOT

H-1.1 All crates of the same type manufactured from the same material under similar conditions of productions shall be grouped together to constitute a lot.

H-1.2 Samples shall be tested from each lot separately for ascertaining conformity of the lot with respect to the requirements of this standard.

H-1.3 The number of crates to be selected from the lot depends on the size of the lot and shall be in accordance with col (2) and (3) of Table 1.

H-1.3.1 These crates shall be selected at random and in order to ensure the randomness of selection, procedure given in IS 4905 may be followed.

H-2 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

H-2.1 Characteristics given in **3.2, 3.3, 3.4** and **3.5.** All crates selected according to col (3) and (4) of Table 1 shall be examined for visual, dimensional and other requirements given in **3.2** to **3.5**. A crate failing to satisfy any of these requirements shall be considered as defective. The lot shall be deemed to have satisfied these requirements, if the number of defective crates found in the sample is less that or equal to the corresponding acceptance number given in col (4) of Table 1. The lot having been found satisfactory for these requirements shall be further tested under **H-2.2.**

H-2.2 Characteristics given in **3.7, 3.8** and **3.10**. For each of these characteristics, sufficient number of crates, to carry out tests given in col (5) of Table 1, shall be selected from those already examined and found satisfactory according to **H-2.1**. The lot shall be declared as conforming to the requirements of the standard, if no failure occurs under this clause.

Table 1 Scale of Sampling and Permissible Number of Defectives
(*Clauses* H-1.3, H-2.1 *and* H-2.2)

Sl No.	No. of Crates in the Lot	For Characteristics given in 3.2, 3.3, 3.4 and 3.5		For Characteristics given in 3.7, 3.8 and 3.10	
		Sample Size	Acceptance No.	Sample Size	Acceptance No.
(1)	(2)	(3)	(4)	(5)	(6)
i)	Up to 1 000	32	3	1	0
ii)	1 001 to 3 000	50	5	2	0
iii)	3 001 to 5 000	80	7	3	0
iv)	5 001 to 10 000	125	10	4	0
v)	10 001 and above	200	14	5	0

ANNEX J

(Foreword)

COMMITTEE COMPOSITION

Plastics Containers Sectional Committee, PCD 21

Organization	*Representative(s)*
Indian Institute of Packaging, Mumbai	SHRI RAJIV DHAR (***Chairman***) SHRI HARI IYER (*Alternate*)
Central Institute of Plastics Engineering & Technology, Chennai	SHRI D. H. RAIKER DR S. K. NAYAK (*Alternate*)
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Ministry of Food Processing Industries, New Delhi	SHRI R. GOPALAN SHRI R. K. BANSAL (*Alternate*)
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Nestle India Ltd, New Delhi	SHRI V. K. SOOD
Britannia Industries Ltd, Delhi	SHRI S. K. CHAKRABORTY DR K. L. GABA (*Alternate*)
Voluntary Organization in Interest of Consumer Education (VOICE), New Delhi	SHRI S. K. MATHUR SHRI H. WADHWA (*Alternate*)
New Delhi Municipal Council, New Delhi	DR G. S. THIND
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Member Secretary
SHRI H. S. SIDHU
Director (PCD), BIS

Bureau of Indian Standards

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

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