भारतीय मानक
Indian Standard

IS 7328 : 2020

[Superseding IS 3395 : 1997]

संकचन और बहिर्वेधन के लिए पोलीइथाइलीन सामग्री की विशिष्टि

(तीसरा पुनरीक्षण)

Specification for Polyethylene Material for Moulding and Extrusion

(Third Revision)

ICS 83.080.20

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली – 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI-110002
www.bis.gov.in www.standardsbis.in

September 2020 **Price Group 7**

FOREWORD

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

This standard was first published in 1974 and subsequently revised in 1992. Low density polyethylene (LDPE) manufactured by high pressure processes, which is highly branched (short and long chains) and has a density of 910 kg/m^3 to 925. Linear low density polyethylene (LLDPE) manufactured by low pressure processes, contain significant amounts of short chain branching and small amounts of long chain branching (when compared to low-density polyethylene) and normally has a density of 910 kg/m^3 to 940 kg/m^3. High density polyethylene (HDPE) manufactured by low pressure processes, containing very few short-chain branches has a density greater than 940 kg/m^3.

Earlier two separate Indian Standards, namely IS 7328 : 1992 High density polyethylene materials for moulding and extrusion and IS 3395 : 1997 Low density polyethylene (LDPE) and liner low density polyethylene (LLDPE) Materials for moulding and extrusions were published on the polyethylene materials.

The Committee decided to prepare single standard to make it user friendly. Thus, in this revision, IS 7238 and IS 3395 have been amalgamated. This standard constitutes the following major changes:

a) Title of the standard has been modified;

b) Designation system has been modified;

c) Reference of other publications have been incorporated; and

d) Additional requirements for coloured/compounded have been modified.

In this standard, a system of designation which may be used as the basis for specification has been introduced for LDPE, LLDPE and HDPE materials. The types are differentiated from each other by a classification system based on the appropriate levels of designatory properties, such as density, melt flow rate (MFR) and information about intended application, method of processing important properties, additives, colour, fillers and reinforcing materials. This revision does not provide engineering and performance data which may be required to specify a material for a particular application or method of processing.

The basic concept of type (product approval) and Acceptance (product identification) tests have been introduced to make this standard more meaningful. On the basis of type test the product identification criteria is derived and fixed and the values obtained for various accepted tests become the controlling specifications.

For the typical additional properties specified in **5.3.2** of this standard, the purchaser should establish his own correlation between the properties of the processed articles and the material properties required for their achievement. Test methods are available for some of the properties mentioned in **5.3.2** and the details of the same are given in Annex A for information.

Considerable assistance has been derived from ISO 17855-1 : 2014 Plastics — Polyethylene (PE) moulding and extrusion materials — Part 1: Designation system and basis for specifications issued by the International Organization for Standardization (ISO) while amalgamating the standard.

The standards contain clauses **5.2.1.1**, **5.2.1.2**, **5.3**, **5.4.1** and **5.4.2** which call for an agreement between the purchaser and supplier.

Requirements and methods of sampling and test for polyethylene plastic materials for the manufacture of plastic items used in contact with foodstuffs, pharmaceuticals and drinking water have been covered in IS 10146 : 1982 Specification for polyethylene for its safe use in contact with foodstuffs pharmaceuticals and drinking water.

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

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

SPECIFICATION FOR POLYETHYLENE MATERIAL FOR MOULDING AND EXTRUSION

(Third Revision)

1 SCOPE

1.1 This standard prescribes the requirements, methods of sampling and tests for low density polyethylene (LDPE), linear low density polyethylene (LLDPE), high density polyethylene (HDPE) materials and their compounds. It applies to materials ready for normal use in the form of granules, pellets or powder.

1.2 This standard is intended to be used for identification and characterization of low density polyethylene, linear low density polyethylene, high density polyethylene materials and their compounds on the basis of basic polymer parameters and recommended end uses.

1.3 Though this standard indicates the major end use(s), it does not impose any restriction, however it is no way guarantee the suitability of a particular grade under particular processing and end use conditions.

1.4 This standard is applicable to all polyethylene homopolymers and to copolymers of ethylene having a content of other 1-olefinic monomers of less than 50 percent (mass fraction) and a content of non-olefinic monomers with functional groups up to a maximum of 3 percent (mass fraction).

1.5 This standard does not apply to masterbatches and PE-UHMW (Ultra high molecular weight polyethylene).

2 REFERENCES

The Indian standards/ other publications listed in Annex A contain provisions which, through reference in this text, constitute provision of this standard. At the time of publication, the edition 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 2828 and the following shall apply.

3.1 Low Density Polyethylene (LDPE) — Polyethylene, manufactured by high pressure processes, which is highly branched (short and long chains) and has a density of 910 kg/m^3 to 925 kg/m^3.

3.2 Linear Low-Density Polyethylene (LLDPE) — Polyethylene, manufactured by low pressure processes, contain significant amounts of short chain branching and small amounts of long chain branching (when compared to low density polyethylene) and normally has a density of 910 kg/m^3 to 940 kg/m^3.

3.3 High Density Polyethylene (HDPE) — Polyethylene, manufactured by low pressure processes, containing very few short chain branching having a density greater than 940 kg/m^3.

3.4 Type Tests — For manufacturing of LDPE/LLDPE/HDPE materials and compound made there from, in process quality control / monitoring tests performed to prove conformity with the specification of the manufacturer (which may be of an internal/proprietary nature) should be construed as type tests.

3.5 Acceptance Tests — Tests carried out on samples taken from a lot/batch for the purpose for its acceptance.

4 DESIGNATION

4.1. Designation code of LDPE /LLDPE/HDPE and compound shall be done based on four and five data block, respectively.

4.1.1 *LDPE/LLDPE/HDPE Materials*

The designation system given in **4.2** into which the materials are classified according to method of processing, their designatory properties such as density and melt flow rate and certain other supplementary information shall be used. The designation system is only intended to indicate a broad classification and, in most circumstances, specific values of the designatory properties shall be required.

The designation shall consist of following information given in the order presented and shall be codified in different blocks as indicated below:

Data Block 1	For Indian Standard,
Data Block 2	For the material,
Data Block 3	This block has three fields for intended application or method of processing, performance additives and supplementary information deemed to be of importance by the producer with respect to the end applications
Data Block 4	For designatory properties, such as MFI and density

4.1.2 *Compound Thereof*

The designation system given in **4.2** into which the materials are classified according to method of processing, their designatory properties such as density and melt flow rate and certain other supplementary information shall be used. The designation system is only intended to indicate a broad classification and, in most circumstances, specific values of the designatory properties and other characteristics as given in **5** shall be required.

Data Block 1	For Indian Standard,
Data Block 2	For the material,
Data Block 3	This block has three fields for intended application or method of processing, performance additives and supplementary information deemed to be of importance by the producer with respect to the end applications.
Data Block 4	For designatory properties such as MFI and density
Data Block 5	For filler details.

4.2 Designation System Codification

4.2.1 *Data Block 1* — For Indian Standard.

4.2.2 *Data Block 2*

Code used for the identification of material and type of co-monomer used are as given below:

Symbol '1' for LDPE, '2' for LLDPE, '3' for HDPE, '4' for compounded material to be used. Co-monomer used in LLDPE/HDPE shall be identified with suffix symbols 'B' for Butene-1, 'H' for Hexene-1, 'O' for Octene-1 and 'P' for Propylene and 'Z' for any other co-monomer.

4.2.3 *Data Block 3*

Code used for the intended application or method of processing are as given below:

Code	*Applications*
A	Compounding
B	Blow moulding
C	Caps and closures
D	Thermoforming
E	Extrusion of profiles and sheet
F	Blown film
G	General use/general purpose
H	Extrusion coating/lamination
J	Cable and wire insulation and sheathing
K	CPE film (cast PE film)
L	Monofilament extrusion
M	Injection moulding
N	Drip lateral
P	Extrusion of pipes/ducts
Q	Compression moulding
R	Rotational moulding
S	Powder coating or sintering
T	Tape extrusion/raffia/yarn
V	Foam application
Z	Others

4.2.4 *Data Block 3*

Code used for the Additives and Supplementary Information are as given below:

Code	*Additives*
A	Barefoot grade without any additive
B	Stabilized with antioxidant
C	Heat aging stabilizer
D	UV stabilizer and antioxidant
E	No slip/No anti-blocking
F	Slip/No anti-blocking
G	No Slip/anti-block
H	Slip and anti-blocking
J	Mould release and/or antistatic agent
K	Lubricated or with polymer processing aid
L	Clarifier/nucleating agent
M	Suitable for insulation/sheathing with added antioxidant
N	Coloured/pigmented
O	Metal deactivator/acid scavenger
P	Special modified burning characteristics
Q	Natural (unpigmented)
R	UV stabilizer and antioxidant with carbon black
S	Expandable (foaming agent)
X	Cross linking Agent
T	Increased electrical conductivity
U	Pro-degradants
Z	Miscellaneous

4.2.5 *Data Block 4*

Designatory properties of material includes density and melt flow rate (MFR) or melt flow index (MFI).

4.2.5.1 *Density*

Density of the base polymer with additives and without fillers and reinforcing materials to be reported for LDPE/LLDPE/HDPE and shall be determined according to IS 13360 (Part 3/Sec 10)/ IS 13360 (Part 3/ Sec 11) / ASTM D 1505 / ASTM D 792 / ASTM D 4703.

The value of the density shall not differ from the nominal/agreed value by more than 3 kg/m^3 for HDPE/ LDPE and the value of the density shall not differ from the nominal/agreed value by more than 4 kg/m^3 for LLDPE.

For coloured/compounded material, the density used for the purpose of this standard shall be the density obtained on the base resin used for making colored/ compounded material.

4.2.5.1.1 *Sample preparation*

Sample shall be prepared according to IS 13360 (Part 2/Sec 1)/ ASTM D 4703/ **3.4.2** of ISO 17855-1/ **5.1.3** of IS 2530.

The density is classified by the following. Ten cells and coded by one figure, as specified in Table 1. The density will be codified as per tested value at 23 °C or 27 °C as per the above mentioned method followed.

In case the density of annealed specimen is reported, an additional character 'X' is to be suffixed (e.g. normal density code at 23 °C is A, annealed density code 23 °C will be AX) to the density code to differentiate from the usual sample preparation as per the test standard followed for density determination.

Table 1 Code for Density in Data Block 4

(*Clause* 4.2.5.1.1)

Density at 23 °C		Density at 27 °C	
Code	Density Range, Kg/m^3	Code	Density Range, Kg/m^3
(1)	(2)	(3)	(4)
A	≤ 916	K	≤ 916
B	>916 to ≤ 925	L	>916 to ≤ 925
C	>925 to ≤ 940	M	>925 to ≤ 940
D	>940 to ≤ 945	N	>940 to ≤ 945
E	>945 to ≤ 950	P	>945 to ≤ 950
F	>950 to ≤ 955	Q	>950 to ≤ 955
G	>955 to ≤ 960	R	>955 to ≤ 960
H	>960 to ≤ 965	S	>960 to ≤ 965
J	>965	T	>965

NOTES —

1 Density of compounded material will depend on the type and loading of its different ingredients. It can be determined based on the agreement between purchaser and supplier.

2 The producer will use the code for the nominal density value (usually the mid-point of the range or target value of the individual product specification) of respective grades while designating any grade.

4.2.5.2 *Melt flow rate (MFR) or Melt flow index (MFI)*

The test conditions used are coded by one letter, as specified in Table 2, in front of the cell code. The MFR or MFI is classified by eleven cells and coded by two figures as specified in Table 3.

Table 2 Test Conditions for Determination of MFR or MFI

(*Clause* 4.2.5.2)

Code	Temperature, °C	Nominal load, Kg
(1)	(2)	(3)
E	190	0.325
D	190	2.16
T	190	5.00
G	190	21.6

Table 3 Code for Melt FIow Rate (MFR) or Melt Flow Index (MFI) in Data Block 4

(*Clause* 4.2.5.2)

Code	MFI Range (g/10 min)
(1)	(2)
A	≤ 1.5
B	>1.5 to ≤ 3.0
C	>3.0 to ≤ 6.0
D	> 6.0 to ≤ 12.0
E	> 12.0 to ≤ 25.0
F	> 25.0 to ≤ 40.0
G	> 40.0 to ≤ 60.0
H	> 60.0

NOTES —

1 MFR or MFI of compounded material resin will depend on the type and loading of its different ingredients. It can be determined based on the agreement between purchaser and supplier.

2 The producer will use the code for the nominal MFI/MFR value (usually the mid-point of the range or Target value of the individual product specification) of respective grades while designating any grade.

4.2.6 *Data Block 5*

The type of filler or reinforcing material is coded by one letter and its physical form by a second letter as shown in Table 4. Subsequently the mass content may be given by 2 figures, as specified in Table 5.

Table 4 Code for Fillers and Reinforcing Material and their Physical Forms in Data Block 5

(*Clause* 4.2.6)

Code for Material		Code for Physical form	
Code	**Material**	**Code**	**Physical Form**
(1)	(2)	(3)	(4)
B	Boron	B	Powder, Dry blend
C	Carbon Black	F	Fibre
G	Glass	G	Granules
K	Chalk ($CaCO_3$)	H	Whiskers
L	Cellulose	S	Scales, Flakes
M	Mineral Metal	Z	Others
S	Organic Synthetics		
T	Talcum		
W	Wood		
Z	Others		

4.3 Coding Example

There will be no space or hyphen between two alphabets/number within a block except data block 1, but each data block will be mentioned and separated by a space or hyphen. The designatory code shall be formed as given below. Each data block is restricted with maximum number of letter/ numbers as mentioned below.

Data Block 1	IS 7328
Data Block 2	Maximum two character (1 character for polymer and 1 character for co-monomer),
Data Block 3	Maximum three character (1 character for application and 1 or 2 character for additives),
Data Block 4	Maximum four character (1 character for normal density/or 2 characters for a annealed density, 1 characters for MFI condition and 1 characters for MFI).
Data Block 5	Maximum four character (2 characters for reinforcing material and their physical form and 2 characters for mass content percentage)

Table 5 Code for Mass Content of Filler and Reinforcing Materials in Data Block 5

(*Clause* 4.2.6)

Code	Mass Content in Percentage (m/m)
(1)	(2)
05	≤ 7.5
10	> 7.5 to 12.5
15	> 12.5 to 17.5
20	> 17.5 to 22.5
25	> 22.5 to 27.5
30	> 27.5 to 32.5
35	> 32.5 to 37.5
40	> 37.5 to 42.5
45	> 42.5 to 47.5
50	> 47.5 to 55.0
60	> 55.0 to 65.0
70	> 65.0 to 75.0
80	> 75.0 to 85.0
90	> 85.0

Typical Example of Designatory Code:

Designation Code: IS 7328-2B-FBH-BDE-C05											
	IS 7328	2	B	F	B	H	BX	D	A	CB	05
Data Block 1	Indian Standard	LLDPE	Butene-1	Blown film	Antioxidant	Slip and anti-blocking	> 916.0 to ≤ 925.0 Kg/m³	At 190°C and 2.16 Kg load	≤ 1.5 g / 10 min	Carbon black (C) in powder form (B)	Mass content < 7.5%
Data Block 2	Material/polymer										
	Co-monomer										
Data Block 3	Application or processing method										
	Additives										
	Supplementary information/special additive										
Data Block 4	Annealed density at 23°C										
	Test condition of MFI										
	Code for MFI value										
Data Block 5	Fillers and reinforcing material and their physical forms										
	Mass content of fillers and reinforcing material										

NOTE — Data block 5 is additional requirement for compounded materials only.

4.3.1 *Typical Example of Designatory Code for LDPE / LLDPE / HDPE*

A low density polyethylene (1) for production of blown film (F) having additive formulation of antioxidant (B) and no slip and no antiblock (E) with density at 23°C is 918.0 kg/m³ (B) and melt flow rate of resin at 190° C/2.16 kg (D) is 0.50 g/10 minutes (A) shall be designated as:

Terminology	IS 7328	1	FBE	BDA
Data block	Block 1	Block 2	Block 3	Block 4
Designation code	IS 7328	1-FBE-BDA		

4.3.2 *Typical Example of Designatory Code for Compounds*

A linear low density polyethylene (with Butene -1 co-monomer, B) based compound (4) for injection moulding application (M) having antioxidant (B), antistatic agent (J), with density at 27°C, 927.0 kg/m³ (M) and melt flow rate (190°C/2.16 kg) (D) of 25 g/ 10 minutes (E) and having chalk (K) filler in powder form (B) of 22 percent (20) shall be designated as:

Terminology	IS 7328	4B	MBJ	MDE	KB20
Data block	Block 1	Block 2	Block 3	Block 4	Block 5
Designation code	IS 7328	4B-MBJ-MDE-KB20			

5 REQUIREMENTS

5.1 The material shall be uniform and free from foreign matter.

5.2 Property Requirements

5.2.1 *Minimum Requirements*

The minimum properties required to be measured for low density polyethylene, linear low density polyethylene, high density polyethylene and compounds are density and melt flow rate or melt flow index.

5.2.1.1 *Density*

Density of the material shall be as agreed between the purchaser and the supplier and shall be determined according to IS 13360 (Part 3/Sec 10)/IS 13360

(Part 3/Sec 11)/ASTM D 1505 / ASTM D 792/ASTM D 4703. Sample shall be prepared according to IS 13360 (Part 2/Sec 1)/ ASTM D 4703/ **3.4.2** of ISO 17855-1/ **5.1.3** of IS 2530.

The value of the density shall not differ from the nominal/agreed value by more than 3 kg/m^3 for HDPE/ LDPE and the value of the density shall not differ from the nominal/agreed value by more than 4 kg/m^3 for LLDPE.

For coloured material, the density used for the purpose of this standard shall be the density obtained on the basic uncoloured material.

For compounded material, the density will depend on the type and loading of its different ingredients. It can be determined based on the agreement between purchaser and supplier.

5.2.1.2 *Melt Flow Rate (MFR) / Melt Flow Index (MFI)*

The melt flow rate/melt flow index of the material shall be as agreed to between the purchaser and the supplier and shall be determined by the method prescribed in IS 13360 (Part 4/Sec l)/ ASTM D 1238. The value of melt flow rate shall be within ± 20 percent of the specified nominal melt flow rate, if this is one or above and shall be within ± 30 percent of the specified nominal melt flow rate, if this is less than one.

For Compounded material, the melt flow rate will depend on the type and loading of its different ingredients. It can be determined based on the agreement between purchaser and supplier.

5.3 Additional Requirements

5.3.1 Additional properties to be selected as per **5.3.2** for compounds or an article shall be determined by the characteristics required for processing and product property requirements.

NOTE — Purchaser should establish his own correlation between the properties of processed articles and the material property required for achieving the desired results.

5.3.2 *Typical Additional Properties*

The typical additional properties are as per the agreement between the purchaser and supplier. The typical additional properties to be measured along with recommended test methods are given in Table 6. Available ASTM/ ISO Standards may also be used for the determination of typical additional properties.

5.4 Additional requirement for Coloured/ Compounded Material

5.4.1 *Colour Bleeding*

Colour bleeding shall not occur when tested as per **12** of IS 2530 for coloured/compounded material. It can be determined based on the agreement between purchaser and supplier.

5.4.2 *Colour Fastness to Water*

The colour fastness to water shall be satisfactory when tested as per **13** of IS 2530 for coloured/compounded material. It can be determined based on the agreement between the purchaser and the supplier.

5.4.3 *Colour Fastness to Daylight*

The colour fastness to daylight shall be rated not less than No. 4 of eight standard patterns of blue dyed woollen fabrics as specified in IS/ISO 105-B01. The test shall be carried out as prescribed in **15** of IS 2530. For coloured/compounded material, it can be determined based on the agreement between purchaser and supplier.

5.4.4 In case coloured materials are used for food contact applications, it shall comply with the list and limits of the pigments and colorants prescribed in IS 9833.

5.4.5 *Carbon Black Content for Black Compound*

The carbon black content of weather resistant material when determined by the method prescribed in **10** of IS 2530, shall be not less than 2 percent and not more than 3 percent.

5.5.6 *Dispersion of Carbon Black for Black Compound*

The dispersion of carbon black shall be considered satisfactory if the material passes the test prescribed in IS 2530/ISO 18553.

5.4.7 For coloured material, the density used for the purpose of this standard shall be the density obtained on the basic uncoloured material.

When carbon black is used to confer weather resistance, the value of density shall be determined by subtracting a figure related to the level of carbon black present as indicated below:

Corrected density =

$$\text{Density of the black material} - 4.5 \times C$$

where

C = the numerical value of the percentage of carbon black in the material.

5.5 Special Requirements of Polymer Used for Molding or Extrusion Articles in Contact with Food Stuffs, Pharmaceutical and Drinking Water

5.5.1 All additives used in the material which is meant for usage in contact with foodstuffs, pharmaceuticals and drinking water are given in IS 16738 for guidance purpose.

5.5.2 When the products are used in contact with foodstuffs, pharmaceuticals and drinking water, its requirements with respect to the material shall also be met as per **3.3**, **3.4** and **3.5** of IS 10146.

Table 6 Typical Additional Properties and Recommended Test Methods for Compounded Material

(*Foreword* and *Clause* **5.3.2**)

Sl No.	Characteristic	Test Method, Ref to
(1)	(2)	(3)
i)	*Mechanical Properties*	
	a) Tensile strength at yield	IS 13360 (Part 5/ Sec 1)
	b) Tensile strength at break	
	c) Elongation at break	
	d) Elongation at yield	
	e) Flexural modulus	IS 13360 (Part 5/ Sec 7)
	f) Tear strength (elmendorf)	IS 13360 (Part 5/ Sec 23)
	g) Dart Impact strength	IS 13360 (Part 5/ Sec 6)
	h) Izod/Charpy impact strength	IS 13360 (part 5/ Sec 4) and IS 13360 (Part 5/ Sec5)
	j) Shore A or D hardness	IS 13360 (part 5/ Sec 11)
	k) Coefficient of friction (COF)	IS 13360 (Part 11/ Sec 1)
ii)	*Thermal Properties*	
	a) Heat deflection temperature	IS 13360 (Part 6/ Sec 3) and IS 13360 (Part 6/ Sec 17)
	b) Vicat softening temperature	IS 13360 (Part 6/ Sec 1)
	c) Brittleness temperature	IS 13360 (Part 6/ Sec 11)
	d) Oxidation induction time	Annex B of IS 4984
iii)	*Electrical Properties*	
	a) Surface resistivity	IS 3396
	b) Volume resistivity	
	c) Dielectric strength	IS 2584
	d) Dissipation factor	IS 4486
	e) Relative permittivity	
iv)	*Permeation Properties*	
	a) Water absorption	IS 13360 (Part 8/ Sec 1)
	b) Environmental stress crack resistance	IS 13360 (Part 8/ Sec 9)
	c) Volatile content	Annex C of IS 4984
	d) Gas permeability	IS 13360 (Part 8/ Sec 6)/ ASTM D 1434
	e) Oxygen gas transmission rate	ISO 15105-2
	f) Water vapour transmission rate	ISO 2528
v)	*Ageing properties*	
	a) Oven ageing	4 of IS 7016 (Part 8)
	b) Natural/artificial weathering	IS 15827
vi)	*Optical Properties*	
	a) Haze and/or luminious transmittance	IS 13360 (Part 9/ Sec 5)
	b) Specular gloss	IS 13360 (Part 9/ Sec 7)
	c) Transparency	IS 13360 (Part 9/ Sec 8)
	d) Yellowness index and/or whiteness Index	IS 13360 (Part 9/ Sec 9)/ ASTM E 313
	e) Colour fastness to daylight	IS 2530
	f) Colour bleeding	IS 13360 (Part 9/ Sec 10)

6 TESTS

6.1 Classification of Tests

6.1.1 *Type Tests (Product Approval)*

For the manufacturing of LDPE/LLDPE/HDPE materials and compound made there from, in process quality control / monitoring tests performed to prove conformity with the specification of the manufacturer (which may be of an internal /proprietary nature) should be construed as type tests.

The following shall constitute the type test (product approval):

a) Density (**5.2.1.1**), and

b) Melt flow rate or Melt flow index (**5.2.1.2**).

6.1.1.1 LDPE/LLDPE/HDPE Material and compound made there from shall be subjected to product type approval in accordance with details given in Annex B.

6.1.2 *Acceptance Tests (Product Identification)*

6.1.2.1 All the tests which the purchaser shall establish out of those listed in **5.3.2** by correlating the properties of the process article and the material properties required for their achievement.

6.1.2.2 The batch shall be accepted if the LDPE/ LLDPE/HDPE material is found to comply with the requirements of acceptance (Product identification) tests given in **6.1.2.1**.

7. PACKING AND MARKING

7.1 Packing

The material shall be packed in suitable form of packing, as agreed to between the purchaser and the supplier.

7.2 Marking

Each bag and/or unit package whichever is smallest in size tha t is being delivered to the customer shall be clearly marked with the following:

a) Name and type of the material,

b) Designation code

c) Net mass of the material,

d) Batch number/ Lot number,

e) Month and year of manufacture of the material, and

NOTE — Batch number/ Lot number should reflect Month and Year of Manufacture of the material. If not, it has to be printed separately as mentioned in (e).

f) Name of the manufacturer and trade mark; if any.

7.3 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.

8 SAMPLING

8.1 General

In drawing, preparing, storing and handling samples, the precautions and directions given in **8.1.1** to **8.1.6** shall be observed.

8.1.1 Samples shall not be taken in an exposed place.

8.1.2 The sampling instrument shall be of stainless steel or any other suitable material on which the material shall have no action. The instrument shall be clean and dry.

8.1.3 Precautions shall be taken to protect the samples, the materials being sampled, the sampling instrument and the containers for samples from adventitious contamination.

8.1.4 The samples shall be placed in a suitable clean, dry, air-tight, plastic/metal/glass container on which the material has no action. The sample container shall be of such a size that it is almost completely filled by the sample.

8.1.5 Each sample container shall be sealed air-tight with a stopper after filling and marked with full details of sampling, such as the date of sampling, the month and year of manufacture of the material, etc.

8.1.6 Samples shall be stored in such a manner that the temperature of the material does not vary unduly from the normal temperature.

8.2 Scale of Sampling

8.2.1 *Lot/Batch*

For continuous chemical processes like polymer production, the sampling shall be done from sealed bags/packages or other representative sampling points after proper homogenization of the material.

To get the representative samples from the entire lot/ batch, random sampling to be done from the entire lots / batches irrespective of the size of lot/batch. The number of sampling to be done as per Table 7 based on the quantity of the lot / batch.

Table 7 Number of Containers to be Selected for Sampling

(*Clause* 8.2.1)

Lot Size (MT)	Number of the Sealed Bag / Package for Sampling
(1)	(2)
Up to 600	3
> 600 to 1000	4
> 1000	5

Approximately 1 kg (or higher quantity required for testing) of sample collected from each of the above sealed bag in to a clean plastic bag to have approx. 3 kg composite sample. Proper mixing to be done for homogenisation of composite sample before testing.

Based on the requirement of testing, the portion of the composite sample will be stored properly in two containers as mentioned in clause **8.1.4**. Sample of the one container will be used for testing in front of inspection authority at manufacturer site/laboratory. The other sample container will be stored (maximum 6 months) and properly labelled as Reference sample for the testing in future if it is required in case of any dispute or other requirement.

8.3 Sampling Instrument

8.3.1 The sampling instrument made of stainless steel shall be as shown in Fig. 1. It shall be capable of taking samples from all points when inserted into the container / bag. In case of FFS bag (multilayer film sack) sampling may be done by opening the bag and collet the sample.

8.3.2 From each of the containers / bags selected, portions of the material shall be drawn with the help of the sampling instrument. The total quantity of the material collected from each container/bag shall be sufficient to conduct tests for the determination of the various characteristics as required.

8.4 Number of Tests

8.4.1 Tests for the determination of density and melt flow rate shall be conducted individually from a portion of composite samples, kept in the bottle/container.

8.4.2 Tests for the determination of the remaining characteristics shall be conducted on the remaining portion of composite samples if it is required as per agreement between purchaser and supplier.

8.5 Criteria for Conformity

a) Each of the test results for density and melt flow rate satisfies the corresponding requirements given in **5.2.1.1** and **5.2.1.2**.

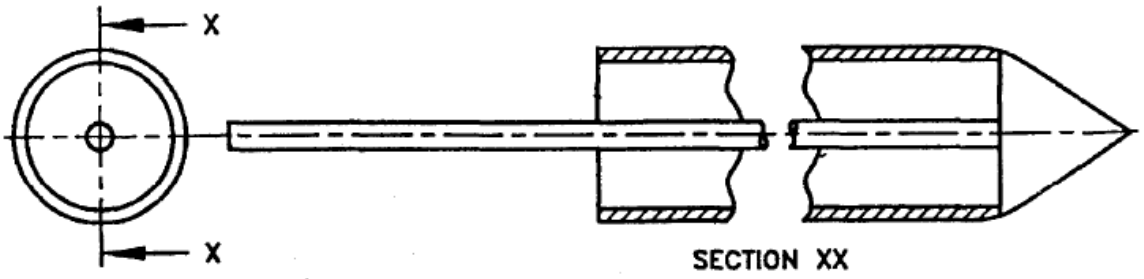

FIG. 1 SAMPLING INSTRUMENT

ANNEX A

LIST OF REFERRED INDIAN STANDARDS/ OTHER PUBLICATIONS

(*Clause* 2)

IS No./Other publications	*Title*
IS/ ISO 105-B01 : 2014	Textiles — Tests for colour fastness: Part B01 Colour fastness to light: Daylight
IS 2530 : 1963	Methods of test for polyethylene moulding materials and polyethylene compounds
IS 2584 : 1963	Method of test for electric strength of solid insulating materials at power frequencies
IS 2828 : 2019	Plastics — Vocabulary (*second revision*)
IS 3396 : 1979	Methods of test for volume and surface resistivity of solid electrical insulating materials (*first revision*)
IS 4486 : 1967	Recommended methods for the determination of the permittivity and dielectric dissipation factor of electrical insulating materials at power, audio and radio frequencies including metre wavelengths
IS 4984 : 2016	Polyethylene pipes for water supplies — Specification
IS 7016 (Part 8) : 1975	Methods of test for coated and treated fabrics: Part 8 accelerated ageing
IS 9833 : 2018	List of colourants for use in plastics in contact with foodstuffs and pharmaceuticals (*second revision*)
IS 10146 : 1982	Specification for polyethylene for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
IS 13360 (Part 2/Sec 1) : 2016	Plastics — Methods of testing : Part 2 Sampling and preparation of test specimens, Section 1 Plastics — Compression moulding of test specimens of thermoplastic materials (*first revision*)
IS 13360 (Part 3/Sec 10) : 2016	Plastics — Methods of testing: Part 3 Physical and dimensional properties, Section 10 Determination of density of non-cellular plastics — Immersion method, liquid pyknometer method and titration method
IS 13360 (Part 3/Sec 11) : 2016	Plastics — Methods of testing: Part 3 Physical and dimensional properties, Section 11 Determination of density of non-cellular plastics — Density gradient column method
IS 13360 (Part 4/ Sec l) : 2000	Plastics — Methods of testing: Part 4 Theological properties Section 1 Determination of the melt mass-flow rate (MFI) and the Melt volume-flow rate (MVR) of thermoplastics (*first revision*)
IS 13360 (Part 5/ Sec 1) : 2018	Plastics — Methods of testing: Part 5 Mechanical properties, Section 1 Determination of tensile properties — General requirements (*first revision*)
IS 13360 (Part 5/ Sec 4) : 2013	Plastics — Methods of testing: Part 5 Mechanical properties, Section 4 Determination of izod impact strength (*first revision*)
IS 13360 (Part 5/ Sec 5) : 2017	Plastics — Methods of testing: Part 5 Mechanical properties, Section 5 Determination of charpy impact properties — Non-Instrumented impact test (*first revision*)
IS 13360 (Part 5/ Sec 6) : 1999	Plastics — Methods of testing: Part 5 Mechanical properties, Section 8 Determination of impact resistance by the free-falling dart method — Staircase methods
IS 13360 (Part 5/ Sec 7) : 2017	Plastics — Methods of testing: Part 5 Mechanical properties, Section 7 Determination of flexural properties (*first revision*)

IS No./Other publications	*Title*
IS 13360 (Part 5/ Sec 11) : 2013	Plastics — Methods of testing: Part 5 Mechanical properties, Section 11 Determination of indentation hardness by means of durometer (shore hardness) (*first revision*)
IS 13360 (Part 5/Sec 23) : 1996	Plastics — Methods of testing: Part 5 Mechanical properties, Section 23 Determination of tear resistance of plastics film and sheeting — Elmendorf method
IS 13360 (Part 6/Sec 1) : 2018	Plastics — Methods of testing: Part 6 Thermal properties, Section 1 Determination of vicat softening temperature of thermoplastic materials (*second revision*)
IS 13360 (Part 6/Sec 3) : 2017	Plastics — Methods of testing: Part 6 Thermal properties, Section 3 Determination of temperature of deflection under load — General test method (*second revision*)
IS 13360 (Part 6/Sec 11) : 2004	Plastics — Methods of testing: Part 6 Thermal properties, Section 11 Determination of the brittleness temperature by impact
IS 13360 (Part 6/Sec 17) : 2017	Plastics — Methods of testing: Part 6 Thermal properties, Section 17 Determination of temperature of deflection under load — Plastics and ebonite (*second revision*)
IS 13360 (Part 8/Sec 1) : 1997	Plastics — Methods of testing: Part 8 Permanence/ chemical properties, Section 1 Determination of water absorption
IS 13360 (Part 8/Sec 6) : 1997	Plastics — Methods of testing: Part 8 Permanence/ chemical properties, Section 6 Determination of the gas transmission rate of films and thin sheets under atmospheric pressure — Manometric method
IS 13360 (Part 8/Sec 9) : 1997	Plastics — Methods of testing: Part 8 Permanence/ chemical properties, Section 9 Determination of resistance to environmental stress cracking (ESC) — Bent strip method
IS 13360 (Part 9/Sec 5) : 1999	Plastics — Methods of testing: Part 9 Optical properties, Section 5 Determination of haze and luminous transmittance of transparent plastics
IS 13360 (Part 9/Sec 7) : 2001	Plastics — Methods of testing: Part 9 Optical properties, Section 7 Determination of specular gloss of plastic films and solid plastics
IS 13360 (Part 9/Sec 8) : 2001	Plastics — Methods of testing: Part 9 Optical properties, Section 8 Determination of transparency of plastic sheeting
IS 13360 (Part 9/Sec 9) : 2001	Plastics — Methods of testing: Part 9 Optical propertiesm Section 9 Determination of yellow index of plastics
IS 13360 (Part 9/Sec 10) : 2018	Plastics — Methods of testing: Part 9 Optical properties, Section 10 Qualitative evaluation of the bleeding of colorants
IS 13360 (Part 11/Sec 1) : 1999	Plastics — Methods of testing: Part 11 Special properties, Section 1 Film and sheeting — Determination of coefficients of friction
IS 15827 : 2019	Cladding films for greenhouse/ polyhouse — Specifications (*first revision*)
IS 16738 : 2018	Positive list of constituents for polypropylene, polyethylene and their copolymers for its safe use in contact with foodstuffs and pharmaceuticals
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 17855-1 : 2014	Plastics — Polyethylene (PE) moulding and extrusion materials — Part 1: Designation system and basis for specifications
ISO 18553 : 2002	Method for the assessment of the degree of pigment or carbon black dispersion in polyolefin pipes, fittings and compounds

IS No./Other publications	*Title*	*IS No./Other publications*	*Title*
ASTM D 792 : 2013	Standard test methods for density and specific gravity (relative density) of plastics by displacement	ASTM D 1505 : 2018	Standard Test Method for Density of Plastics by the Density-Gradient Technique
ASTM D 1238 : 2013	Standard test method for melt flow rates of thermoplastics by extrusion plastometer	ASTM D 4703 : 2016	Standard Practice for Compression Molding Thermoplastic Materials into Test Specimens, Plaques, or Sheets
ASTM D 1434 : 1982	Standard test method for determining gas permeability characteristics of plastic film and sheeting	ASTM E 313 : 2015	Standard practice for calculating yellowness and whiteness indices from instrumentally measured color coordinates

ANNEX B

PRODUCT TYPE APPROVAL

(*Clause* 6.1.1.1)

B-1 LDPE/LLDPE/HDPE material and compound of a particular designation for which the product/type approval is required shall be subjected to the tests for density and melt flow rate (MFR) or melt flow index (MFI).

B-2 LDPE/LLDPE/HDPE material and compounds made there from of that particular designation successfully passing in these product / type approval tests shall be tested for other requirements (acceptance test/product identification tests) as stipulated in **6.1.2** which would be recorded, and these shall be the controlling specifications as long as there is no change in the grade designation of the LDPE/LLDPE/HDPE material, only acceptance test to be performed.

B-3 In the event of any change in the grade/designation of the LDPE/LLDPE/HDPE material and their compound, reapproval will be required and the type tests shall be carried out afresh and the controlling specifications for acceptance test redetermined and fixed.

B-4 When the proposed changes are such that it may not be expected to significantly affect the performance (satisfactorily passing the type tests) the certifying/ testing authority may at its discretion recommend waiving complete reapproval or may require only partial reapproval in order to determine the significance and acceptability of the proposed changes and to redetermined the controlling specification for acceptance tests.

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Plastics Sectional Committee, PCD 12

Organization	*Representative(s)*
Central Institute of Plastics Engineering & Technology (CIPET), Chennai	Prof (Dr) S. K. Nayak (***Chairman***)
Central Institute of Plastics Engineering & Technology (CIPET), Chennai	Dr S. N. Yadav
Borouge (India) Pvt Ltd, Mumbai	Shri Prashant Nikhade Shri Pavan Thakor (*Alternate*)
CSIR-Central Food Technological Research Institute (CFTRI), Mysore	Shri R. S. Matche
Shriram Institute for Industrial Research, Delhi	Dr P. K. Kaicker Dr R. K. Raina (*Alternate*)
3M Innovation Centre, Bengaluru	Shri Arun Awasthi
Indian Centre for Plastics in the Environment (ICPE), Mumbai	Shri T. K. Bandopadhyay Shri Arunava Guha (*Alternate*)
National Dairy Development Board (NDDB), Pune	Shri R. S. Lahane Shri S. K. Khandelwal (*Alternate*)
CSIR-Indian Institute of Toxicological Research (IITR), Lucknow	Dr V. P. Sharma Dr A. B. Pant (*Alternate*)
Reliance Industries Ltd (RIL), Mumbai	Shri Ajay Shah Shri S. V. Raju (*Alternate*)
Sabic Innovative Plastics, Bengaluru	Dr Sumanda Bandyopadhyay Shri Sunil Rauto (*Alternate*)
All India Plastic Industries Association (AIPIA), Delhi	Shri Ravi Kumar Aggarwal Shri P. P. Tuteja (*Alternate*)
Haldia Petrochemicals Limited, Kolkata	Shri Raj K. Datta Shri Suvomoy Ganguly (*Alternate*)
Ministry of Environment & Forests (MoEF), New Delhi	Shri Sharath Kumar Pallerla Shri Shard Sapra (*Alternate*)
Directorate General of Health Services, New Delhi	Dr Dhirsingh Shri Jaipal Singh (*Alternate*)
Indian Institute of Packaging (IIP), Mumbai	Dr Sanjay Chattopadhyay Dr Tanweer Alam (*Alternate*)
GAIL (India) Ltd, NOIDA	Dr Debashish Roy Shri Manish Khandelwal (*Alternate*)
CSIR- National Chemical Laboratory (NCL), Pune	Dr Harshawardhan Pol Dr Kadhiravan Shanmuganathan (*Alternate*)
Ministry of Defence (DMSRDE), Kanpur	Shri V. R. Choudhary Shri Joshy John (*Alternate*)
Indian Plastic Institute (IPI), Mumbai	Shri V. B. Lall Shri Mihir Banerji (*Alternate*)
Voluntary Organization in Interest of Consumer Education (VOICE), New Delhi	Shri M. A. U. Khan Shri H. Wadhwa (*Alternate*)

Organization	*Representative(s)*
All India Plastics Manufacturers Association (AIPMA), New Delhi	Shri Deepak Ballani
Consumer Education Research Centre (CERC), Ahmedabad	Shri Raju D. Desai Shri H. S. Tripathi (*Alternate*)
The Toy Association of India (TAI), New Delhi	Shri Rajesh Arora Shri R. K. Verma (*Alternate*)
Department of Chemicals & Petrochemicals, Min. of Chemicals & Fertilizers, New Delhi	Shri Dinesh Kumar
Organization of Plastics Processors of India, Mumbai	Shri Anup K. Ghosh
Plastindia Foundation, Mumbai	Dr E. Sundaresan Shri Hiten Bheda (*Alternate*)
Central Pollution Control Board, New Delhi	Dr A. B. Akolka Dr S. K. Nigam (*Alternate*)
National Committee on Plasticulture Applications in Horticulture (NCPAH), Ministry of Agriculture & Farmers Welfare, Govt. of India, New Delhi	Shri Anand Zambre Shri Krishna Kumar Kaushal (*Alternate*)
Indian Oil Corporation, R&D Centre, Faridabad	Dr G. S. Kapur Shri Dhananjay Sahoo (*Alternate*)
ONGC Petro Additions Ltd (OPAL), Gujarat	Shri Vivek Mehta
Chemical and Petrochemical Manufactures Association (CPMA) New Delhi	Shri Kamal Nanavaty
Consumer Association of India, Chennai	Shri G. Santhanarajan Shri M. R. Krishnan (*Alternate*)
Coca-Cola India Pvt, Ltd	Shri Sunil Adsule Shri Virendra Landge (*Alternate*)
Huhtamaki Paper Product Ltd, (HPPL), Mumbai	Shri Atindra N. Chaudhuri
HPCL-Mittal Energy Limited (HMEL), Noida	Shri Vineet Kumar Gupta Shri Alakesh Ghosh (*Alternate*)
Food Safety and Standards Authority of India (FSSAI), Delhi	Shri Chirag Gadi
Indian Pharmacopoeia Commission, Ghaziabad	Dr Jai Prakash Dr Manoj Kumar Pandey (*Alternate*)
Technical Training and Research Centre (TTRC), Lohia Group, Kanpur	Shri R. K. Dwivedi
IIT, Delhi	Shri Anup K Ghosh
Food Corporation of India (FCI), Delhi	Shri A. S. Arunachalam Shri A. K. U. B. Singh (*Alternate*)
Shivalik Agro-Poly Products Ltd, Mohali	Shri Pankaj Kumar Mahajan Dr G. D. Tyagi (*Alternate*)
BIS Director General	Shri N. K. Bansal, Scientist 'F' and Head (PCD) [Representing Director General (*Ex-officio*)]

Member Secretary

Shri Vijay Kumar Gupta
Scientist 'C' (PCD), BIS

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

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'.

This Indian Standard has been developed from Doc No.: PCD 12 (15312).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices:		*Telephones*
Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002	2323 7617, 2323 3841
Eastern	: 1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi, KOLKATA 700054	2337 8499, 2337 8561, 2337 8626, 2337 9120
Northern	: Plot No. 4-A, Sector 27-B, Madhya Marg, CHANDIGARH 160019	265 0206, 265 0290
Southern	: C.I.T. Campus, IV Cross Road, CHENNAI 600113	2254 1216, 2254 1442, 2254 2519, 2254 2315
Western	: Manakalaya, E9 MIDC, Marol, Andheri (East), MUMBAI 400093	2832 9295, 2832 7858, 2832 7891, 2832 7892

Branches : AHMEDABAD. BENGALURU. BHOPAL. BHUBANESHWAR. COIMBATORE. DEHRADUN. DURGAPUR. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. JAMMU. JAMSHEDPUR. KOCHI. LUCKNOW. NAGPUR. PARWANOO. PATNA. PUNE. RAIPUR. RAJKOT. VISAKHAPATNAM.

Published by BIS, New Delhi

AMENDMENT NO. 1 NOVEMBER 2021

TO

IS 7328 : 2020 SPECIFICATION FOR POLYETHYLENE MATERIAL FOR MOULDING AND EXTRUSION

(Second Revision)

(*First cover page, Hindi title*) — Substitute '*दूसरा पुनरीक्षण*' *for* '*तीसरा पुनरीक्षण*'

(*First cover page, English title*) — Substitute '*Second Revision*' *for* '*Third Revision*'

(*Foreword*, *Para* **1**, *line* 1) — Substitute 'Second Revision' *for* 'Third Revision'

(*Page* 1, *Title*) — Substitute '*Second Revision*' *for* '*Third Revision*'

(*Page* 6, *clause* **5.5.2**) — Substitute the following for the existing clause:

'**5.5.2** When the products are used in contact with foodstuffs, pharmaceuticals and drinking water, its requirements with respect to the material shall also comply with Annex D.'

(*Page* 10, *Annex* **A**) — Insert the following Indian Standards at the end of the list of referred Standards:

' 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*)'

(*Page* 13, *Annex* **C**) — Insert the following new Annex D after Annex C:

'ANNEX D

(*Clause* 6.4.2)

D-1 PIGMENTS AND COLOURANTS

In case the coloured material is used for food-packaging applications it shall comply with the list and limits of the pigments and colourants prescribed in IS 9833.

D-2 OVERALL MIGRATION

The material shall comply with the overall migration limits as detailed below when tested by the method prescribed in IS 9845.

a) 60 mg/kg, *Max* of the foodstuff; in the case of liquid foodstuffs or of simulants, the limit shall be 60 mg/l, *Max*. However, the value of the overall migration limit shall be equal to 10 mg/dm^2 of the surface of the material or article in the following cases:

   1) Containers or articles which are similar to containers or which in any case may be filled to a capacity less than 250 ml provided it is possible to calculate the surface area of contact with the foodstuff.

   2) Sheets, foils and other non-fillable articles for which ratio between the surface area of the material or article and the quantity of foodstuffs, in contact may not be calculated.

D-3 STORAGE AND CONTROL

D-3.1 Storage

Plastics materials intended for food contact use shall be stored separately from materials in closed, properly identified containers.

D-3.2 Control

An authorized person shall supervise and control the issue of plastics materials to the process or manufacturing area and shall maintain appropriate records of the issue of such materials.

D-3.3 Adequate standards of hygiene shall be maintained at all times and plant operators and store men shall be trained in proper hygiene practices.'

(PCD 12)

Publication Unit, BIS, New Delhi, India

AMENDMENT NO. 2 AUGUST 2022

TO

IS 7328 : 2020 SPECIFICATION FOR POLYETHYLENE MATERIAL FOR MOULDING AND EXTRUSION

(Second Revision)

(*Foreword*, *Para* 10) — Insert the following after para 10:

'Polyethylene manufacturing is a continuous process of polymerization and capable to produce numerous types of grades based upon melt flow index and density which are used by final converters for manufacturing extruded and moulded products (flexible films, raffia tapes, mono filaments, pipes, blow, injection, roto moulded products and various other products).

Since polymerization is a continuous process, during transition from one grade to another, there will be virgin polymer grades produced with broad melt flow index and density range with respect to declared specifications by respective resin manufacturers and will be classified as blending resins or grades. These grades are used as blends with other polymer grades by the converters in various applications without affecting performance in the intended end-use application.'

(*Page* 1, *clause* **3.1**) — Substitute the following for the existing:

'**3.1 Low Density Polyethylene (LDPE)** — Polyethylene, manufactured by high pressure processes, which is highly branched (short and long chains) and has a density of 910 kg/m^3 to 930 kg/m^3 at 23°C (908 kg/m^3 to 928 kg/m^3 at 27°C).'

(*Page* 1, *clause* **3.2**) — Substitute the following for the existing:

'**3.2 Linear Low-Density Polyethylene (LLDPE)** — Polyethylene, manufactured by low pressure processes, contain significant amounts of short chain branching and small amounts of long chain branching (when compared to low density polyethylene) and normally has a density of 910 kg/m^3 to 940 kg/m^3 at 23°C (908 kg/m^3 to 938 kg/m^3 at 27°C).'

(*Page* 1, *clause* **3.3**) — Substitute the following for the existing:

'**3.3 High Density Polyethylene (HDPE)** — Polyethylene, manufactured by low pressure processes, containing very few short chain branching having a density greater than 940 kg/m^3 at 23°C (greater than 938 Kg/m^3 at 27° C).'

(*Page* 1, *clause* **3.4**) — Delete.

(*Page* 1, *clause* **3.5**) — Delete.

Price Group 2

(*Page* 2, *clause* **4.2.3,** *code* Z) — Substitute the last row for code Z as follows:

Code	*Applications*
Z	Blending/Miscellaneous

(*Page* 5, *clause* **4.3**, *Typical Example of Designatory Code*) — Substitute 'Designation Code: IS 7328-2B-FBH-BXDA-C05' *for* 'Designation Code: IS 7328-2B-FBH-BDE-C05'.

(*Page* 5, *clause* **5.2.1.1**, *Para* 1) — Substitute the following for the existing para 1:

'Density of the material shall be designated as per table 1, based on the value as agreed between purchaser and supplier. It shall be determined according to IS 13360 (Part 3/Sec 10)/IS 13360 (Part 3/Sec 11)/ASTM D1505/ ASTM D792/ASTM D4703. Sample shall be prepared according to IS 13360 (Part 2/Sec 1)/3.4.2 of ISO 17855-1/5.1.3 of IS 2530.'

(*Page* 6, *clause* **5.2.1.1**, *Para* 4) — Insert the following after para 4:

'In case of resin or grade used for blending application, designation code of density in data block 4 shall be based on the actual tested value for density of particular batch/lot and 'intended application or method of processing' will be codified as 'Z' (*clause* **4.2.3**). The value of density may vary up to ± 8 Kg/m^3 from the measured/reported value.'

(*Page* 6, *clause* **5.2.1.2**, *Para* 1) — Substitute the following for the existing para 1:

'The melt flow rate/melt flow index of the material shall be designated as per Table 3, based on the value as agreed between purchaser and supplier. It shall be determined by the method prescribed in IS 13360 (Part 4/Sec l)/ASTM D 1238. The value of melt flow rate shall be within ± 20 percent of the specified nominal melt flow rate, if this is 1 or above and shall be within ± 30 percent of the specified nominal melt flow rate, if this is less than 1.'

(*Page* 6, *clause* **5.2.1.2**, *Para* 2) — Insert the following after para 2:

'In case of resin or grade used for blending application, designation code of melt flow index in data block 4 shall be based on the actual tested value for melt flow index of batch/lot 'intended application or method of processing' will be codified as 'Z' (*clause* **4.2.3**). The value of melt flow rate may vary up to ± 40 percent from the measured/reported value.'

(*Page* 6, *clause* **5.3**) — Substitute the following for the existing clause:

'**5.3 Additional Requirements for Compounded Materials**

5.3.1 Additional properties to be selected as per **5.3.2** for compounded material shall be determined by the characteristics required for processing and product property requirements.

NOTE — Purchaser should establish his own correlation between the properties of compounded materials and the material property required for achieving the desired results.

5.3.2 *Typical Additional Properties*

The typical additional properties as given in Table 6 shall be as agreed between purchaser and supplier based upon the requirements of end product properties.'

(*Page* 6, *clause* **5.5.6**) — Substitute the following for the existing clause:

'**5.4.6** *Dispersion of Carbon Black for Black Compound*

The dispersion of carbon black shall be considered satisfactory if the material passes the test prescribed in IS 2530/ISO 18553.'

(*Page* 6, *clause* **5.5.2**) — Insert the following after Clause **5.5.2**:

'**5.5.3** The requirements mentioned in **5.5.2** will remain valid as long as the chemical composition and manufacturing process remains the same. In case of any change in chemical composition and/or manufacturing processes, the requirements mentioned in **5.5.2** shall be tested.'

(*Page* 8, *clause* **6**) — Substitute the following for the existing clause: '**6 TESTS**

6.1 For product approval in the manufacturing of LDPE/LLDPE/HDPE materials and the compound made thereof, the following shall be tested:

a) Density (**5.2.1.1**), and

b) Melt flow rate or melt flow index (**5.2.1.2**).

6.2 Product Identification Tests for Compounded Materials

For the compounded materials to establish the end use application properties, the applicable requirement as listed in **5.3.2** shall be tested, by correlating the required properties of the compounded materials.'

(*Page* 12, *Annex* B) — Delete.

(*Amendment No*. 1, *Page* 2, *Annex* D) — Substitute '(*Clause* **5.5.2**)' *for* '(*Clause* **6.4.2**)'.

(*Amendment No*. 1, *Page* 2, *clause* **D-2**) — Insert the following para at the end:

'The sample preparation shall be as per the intended end-use of material.'

(PCD 12)

Publication Unit, BIS, New Delhi, India