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(Superseding IS 7328 : 2020 and IS 10146 : 1982)

BUREAU OF INDIAN STANDARDS

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भारतीय मानक मसौदा

मोल्डिंग और एक्सट्रूज़न के लिए पॉलीथीन (पीई) सामग्री — विशिष्टि

*(*आई. एस. 7328 का तीसरा पुनरीक्षण*)*

Draft *Indian Standard*

POLYETHYLENE (PE) MATERIAL FOR MOULDING AND EXTRUSION — SPECIFICATION

(*Third Revision of* IS 7328)

(ICS 83.080.20)

Plastics Sectional Committee, PCD 12	Last date for Comments **25 September 2025**

FOREWORD

(*Formal clauses to be added later*)

Low density polyethylene (LDPE) manufactured by high pressure processes, is highly branched (short and long chains) and has a density of 910 to 930 kg/m^3. 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, contains very few short-chain branches and has a density greater than 940 kg/m^3.

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, virgin polymer grades are 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.

(Superseding IS 7328 : 2020 and IS 10146 : 1982)

This standard was first published in 1974 and subsequently revised in 1992 and 2020.

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 linear low density polyethylene (LLDPE) materials for moulding and extrusions' were published for the polyethylene materials. The Committee responsible for the formulation of standard, during the second revision of this standard, has decided to amalgamate both the standards to make it user friendly. Further, during the second revision, designation system which may be used as the basis for specification has been introduced for LDPE, LLDPE and HDPE materials.

This revision (third) has been undertaken to incorporate all the requirements specified in 'IS 10146 : 1982 Specification for polyethylene and its copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water' in IS 7328. Further, this revision will supersede 'IS 7328: 2020 Specification for polyethylene material for moulding and extrusion' and 'IS 10146: 1982 Specification for polyethylene and its copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water'.

For the typical properties, 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 and the details of the same are given in Annex A for information.

During the preparation of this standard, 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).

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

1 SCOPE

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 LDPE, LLDPE, HDPE 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 homo polymers 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, PE-UHMW (Ultra high molecular weight polyethylene).

2 REFERENCES

The Indian standards/ other publications listed in Annex B 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 B.

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 930 kg/m^3 at 23°C (908 kg/m^3 to 928 kg/m^3 at 27°C).

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).

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).

4 DESIGNATION

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

4.1.1 *LDPE/LLDPE/HDPE Materials*

4.1.1.1 The designation system codification given in **4.2** into which the materials are classified according to method of processing, their designatory properties (density and melt flow index/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.

4.1.1.2 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 (MFI/MFR and density)

4.1.2 *Compound Thereof*

The designation system codification given in **4.2** into which the materials are classified according to method of processing, their designatory properties (density and melt flow index /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 (MFI/MFR 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*

4.2.2.1 Code used for the identification of material and type of co-monomer used shall be as given in Table 1.

Table 1
Code for identification of material and type of co-monomer used in Data Block 2
(*Clause* **4.2.2.1**)

Sl No.	***Code***	***Material Type***
(1)	(2)	(3)
i.	1	LDPE
ii.	2	LLDPE

iii.	3	HDPE
iv.	4	Polyethylene (PE) Compounds

4.2.2.2 *For compounds*, 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. In case of compounded material, co-monomer is an optional parameter.

NOTE – In caser of no co-monomer is being used, the suffix is to be left blank.

4.2.3 *Data Block 3*

4.2.3.1 *Code for Intended Application or Method of Processing*

Code used for the intended application or method of processing shall be as given in Table 2.

Table 2
Code for intended application or method of processing in Data Block 3
(*Clause* **4.2.3.1**)

Code	***Applications***
(1)	(2)
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	Blending/Miscellaneous

4.2.3.2 *Code for Additives and Supplementary Information*

Code used for the additives and supplementary information shall be as given in table 3.

Table 3
Code for additives and supplementary information in Data Block 3
(*Clause* **4.2.3.2**)

Code	***Additives***
(1)	(2)
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

NOTE — * Applicable only to compounds.

4.2.4 *Data Block 4*

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

4.2.4.1 *Density*

4.2.4.1.1 The density is classified by the nine cells at both (23 °C or 27 °C) and coded by one figure, as specified in Table 4. The density will be codified as per tested value at 23 °C or 27 °C.

4.2.4.1.2 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.

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

The test conditions used are coded by one letter, as specified in Table 5, in front of the cell code. The MFR or MFI is classified by eight cells and coded by two figures as specified in Table 6.

Table 4 Code for Density in Data Block 4
(*Clause* **4.2.4.1.1**)

Sl No.	***Density at 23 °C***		***Density at 27 °C***	
	Code	***Density Range, Kg/m³***	***Code***	***Density Range, Kg/m³***
(1)	(2)	(3)	(4)	(5)
i.	A	≤ 916	K	≤ 916
ii.	B	>916 to ≤ 925	L	>916 to ≤ 925
iii.	C	>925 to ≤ 940	M	>925 to ≤ 940
iv.	D	>940 to ≤ 945	N	>940 to ≤ 945
v.	E	>945 to ≤ 950	P	>945 to ≤ 950
vi.	F	>950 to ≤ 955	Q	>950 to ≤ 955
vii.	G	>955 to ≤ 960	R	>955 to ≤ 960
viii.	H	>960 to ≤ 965	S	>960 to ≤ 965
ix.	J	>965	T	>965

NOTES:

1. Density of compounded material will depend on the type and loading of its different ingredients.
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.

Table 5 Test Conditions for Determination of MFR or MFI
(*Clause* **4.2.4.2**)

Sl No.	***Code***	***Temperature, °C***	***Nominal load, Kg***
(1)	(2)	(3)	(4)
i.	E	190	0.325
ii.	D	190	2.16
iii.	T	190	5.00
iv.	G	190	21.6

NOTE – In case, if MFI/MFR cannot be measured at above mentioned conditions, the property can be measured at conditions agreed between purchaser and supplier. For such conditions, code Z shall be used. The conditions used to be declared by the manufacturer.

Table 6 Code for Melt FIow Rate (MFR) or Melt Flow Index (MFI) in Data Block 4
(*Clause* **4.2.4.2**)

Sl No.	***Code***	***MFI Range (g/10 min)***

(1)	(2)	(3)
i.	A	≤ 1.5
ii.	B	>1.5 to ≤ 3.0
iii.	C	>3.0 to ≤ 6.0
iv.	D	> 6.0 to ≤ 12.0
v.	E	> 12.0 to ≤ 25.0
vi.	F	> 25.0 to ≤ 40.0
vii.	G	> 40.0 to ≤ 60.0
viii.	H	> 60.0

NOTES —

1. MFR or MFI of compounded material resin will depend on the type and loading of its different ingredients.
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.

4.2.5 *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 7. Subsequently the mass content may be given by 2 figures, as specified in Table 8.

Table 7 Code for Fillers and Reinforcing Material and their Physical Forms in Data Block 5
(*Clause* **4.2.5**)

Sl No.	***Code for Material***		***Code for Physical form***	
	Code	***Material***	***Code***	***Physical form***
(1)	(2)	(3)	(4)	(5)
i.	B	Boron	B	Powder, Dry blend
ii.	C	Carbon Black	F	Fibre
iii.	G	Glass	G	Granules
iv.	K	Chalk ($CaCO_3$)	H	Whiskers
v.	L	Cellulose	S	Scales, Flakes
vi.	M	Mineral Metal	Z	Others
vii.	S	Organic Synthetics		
viii.	T	Talcum		
ix.	W	Wood		
x.	Z	Other fillers		

Table 8 Code for Mass Content of Filler and Reinforcing Materials in Data Block 5
(*Clause* **4.2.5**)

Sl No.	***Code***	***Mass Content in Percentage (m/m)***
(1)	(2)	(3)
i.	05	≤ 7.5
ii.	10	> 7.5 to 12.5
iii.	15	> 12.5 to 17.5
iv.	20	> 17.5 to 22.5
v.	25	> 22.5 to 27.5
vi.	30	> 27.5 to 32.5
vii.	35	> 32.5 to 37.5
viii.	40	> 37.5 to 42.5
ix.	45	> 42.5 to 47.5
x.	50	> 47.5 to 55.0
xi.	60	> 55.0 to 65.0
xii.	70	> 65.0 to 75.0
xiii.	80	> 75.0 to 85.0
xiv.	90	> 85.0

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

Typical Example of Designatory Code for resin:

Designation Code : IS 7328-2B-FBH-BXDA									
	IS 7328	2	B	F	B	H	BX	D	A
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**
Data Block 2	Material								
	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								

Typical Example of Designatory Code for compound:

Designation Code : IS 7328-4-FBH-BXDA-CB05											
	IS 7328	4	-	F	B	H	BX	D	A	CB	05
Data Block 1	Indian Standard	**Compound**	|	**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										
	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 compound 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/m^3 (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 CONDITIONING

Test specimens shall be conditioned for minimum 40 h in standard atmospheric condition of temperature 23 ± 2 °C and relative humidity of 50 ± 10 percent before performing the required tests. The conditioning may change as per applicable standard for testing of the respective properties. Test shall be conducted in the standard atmospheric condition as mentioned in the applicable test method.

6 REQUIREMENTS

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

6.2 Property Requirements

6.2.1 *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.

6.2.1.1 *Density*

a) Density of the material shall be designated as per table 4, 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.

b) Sample shall be prepared according to IS 13360 (Part 2/Sec 1)/ ASTM D2839/ ASTM D4703/ **3.4.2** of ISO 17855-1/ **5.3** of IS 2530. Sample shall be prepared using the methods given in respective test method standard.

c) 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.

d) 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.

e) 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' (*see* **4.2.3.1**). The value of density may vary up to ± 8 Kg/m3 from the measured/reported value.

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

a) The melt flow rate/melt flow index of the material shall be designated as per Table 6, 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/Subsec 1)/ IS 13360 (Part 4/Sec l/Subsec 2)/ASTM D1238. 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.

b) 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' (*see* **4.2.3.1**). The value of melt flow rate may vary up to ± 40 percent from the measured/reported value.

6.3 Additional requirement for Coloured/ Compounded Material

6.3.1 *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.

6.3.2 *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.

6.3.3 *Colour Fastness to Daylight*

The colour fastness to daylight shall be rated not less than No. 4 of eight standard patterns of blue dyed woolen 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.

6.3.4 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.

6.3.5 *Carbon Black Content for Black Compound*

The carbon black content of 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.

6.3.6 *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.

6.3.7 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:

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

where

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

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

6.4.1 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.

6.4.2 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 C.

6.4.3 The requirements mentioned in **6.4.2** 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 **6.4.2** shall be tested.

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 that 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*

8.2.1.1 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.

8.2.1.2 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 9 based on the quantity of the lot / batch.

Table 9 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

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

8.2.1.4 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 clean sampling instrument with adequate strength shall be used. 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 collect 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 **6.2.1.1** and **6.2.1.2**.

ANNEX A

Recommended test method for typical Properties

(*Foreword*)

Sl No.	Property	Method of Test, 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/ Sec 5)
	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 ISO 11357-6 ASTM D3895
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	Clause 4 of IS 7016 (Part 8)
	b) Natural/artificial weathering	IS 15827
vi)	*Optical Properties*	
	a) Haze and/or luminous 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)

ANNEX B
LIST OF REFERRED INDIAN STANDARDS/ OTHER PUBLICATIONS
(*Clause* **2**)

IS No./Other Publication	***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 2828 : 2019	Plastics — Vocabulary (*second revision*)
IS 9833 : 2018	List of colourants for use in plastics in contact with foodstuffs and pharmaceuticals (*second revision*)
IS 13360 (Part 2/Sec 1) : 2025 / ISO 293 : 2023	Plastics — Methods of testing : Part 2 Sampling and preparation of test specimens, Section 1 Plastics — Compression moulding of test specimens of thermoplastic materials (*second revision*)
IS 13360 (Part 3/Sec 10) : 2021 / ISO 1183-1 : 2019	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 *(first revision)*
IS 13360 (Part 3/Sec 11) : 2021 / ISO 1183-2 : 2019	Plastics — Methods of testing: Part 3 Physical and dimensional properties, Section 11 Determination of density of non-cellular plastics — Density gradient column method *(first revision)*
IS 13360 (Part 4/Sec 1/ Subsec 1) : 2018 / ISO 1133-1 : 2011	Plastics — Methods of testing: Part 4 Rheological properties, Section 1 Determination of melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics, Subsection 1 Standard method (*first revision*)
IS 13360 (Part 4/Sec 1/ Subsec 2) : 2018 / ISO 1133-2 : 2011	Plastics — Methods of testing: Part 4 Rheological properties, Section 1 Determination of melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics, Subsection 2 Method for materials sensitive to time-temperature history and/or moisture (*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 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

ASTM D 792-20	Standard test methods for density and specific gravity (relative density) of plastics by displacement
ASTM D 1238-10	Standard test method for melt flow rates of thermoplastics by extrusion plastometer
ASTM D 1505-18	Standard test method for density of plastics by the density-gradient technique
ASTM D2839-16	Standard practice for use of a melt index strand for determining density of polyethylene
ASTM D4703-16	Standard practice for compression molding thermoplastic materials into test specimens, plaques, or sheets

ANNEX C
(*Clause* **6.4.2**)

C-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.

C-2 OVERALL MIGRATION

The material shall comply with the overall migration limits as detailed below when tested by the method prescribed in IS 9845. The sample preparation shall be as per the intended end-use of material.

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.

C-3 STORAGE AND CONTROL

C-3.1 Storage

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

C-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.

C-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.