IS 3395 (1997): Low Density Polyethylene (LDPE) and Liner Low Density Polyethylene (LLDPE) Materials for Moulding and Extrusions [PCD 12: Plastics]

BLANK PAGE

भारतीय मानक

संचकन और बहिर्वेधन के लिए अल्प धनत्व पोलीइथाइलीन (एल डी पी ई) तथा रैखिक अल्प घनत्व पोलीइथाइलीन (एल एल डी पी ई) सामग्रियाँ — विशिष्टि

(दूसरा पुनरीक्षण)

Indian Standard

LOW DENSITY POLYETHYLENE (LDPE) AND LINEAR LOW DENSITY POLYETHYLENE (LLDPE) MATERIALS FOR MOULDING AND EXTRUSION — SPECIFICATION

(Second Revision)

ICS 83.080.20

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

October 1997 **Price Group 5**

FOREWORD

This Indian Standard (Second 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.

Low density polyethylene (LDPE) is prepared by polymerizing ethylene at high pressure and high temperature. It is a highly branched long chain thermoplastic polymer. Linear low density polyethylene (LLDPE) can be described as ethylene/ α-olefin copolymer with butene, hexene, 4-methyl pentene and octene being most common comonomers. Both LDPE and LLDPE resins are available with additives like antioxidants, slip, antiblock, processing aid, UV-stabilizer, antistat, tackifiers etc, in various proportions.

This Indian Standard was first published in 1965 covering the requirements of LDPE materials only which was subsequently revised in 1984. The scope of the standard in this revision has been extended to cover the requirements of linear low density polyethylene (LLDPE) moulding and extrusion materials also having similar property requirements to those of LDPE materials. Specification for high density polyethylene moulding and extrusion materials have been covered in IS 7328 : 1992 'High density polyethylene materials for moulding and extrusion — Specification'.

Polyethylene materials having density below 934.4 kg/m^3 are normally clasified as low density polyethylene (LDPE) and the density above 934.4 kg/m^3 are classified as high density polyethylene (HDPE). In this revision the requirements of linear low density polyethylene (LLDPE) materials have also been included and the density of LLDPE in some cases falling in the range of 934.4 to 940.4 (Code 40), it has become necessary to incorporate the density range 934.4 to 940.4 (Code 40) in this standard also though this range is covered in IS 7328:1992 'High density polyethylene materials for moulding and extrusion — Specification'.

In this revision a system of designation which may be used as the basis for specification has been introduced for LDPE and LLDPE 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.

Considerable assistance has been derived from ISO 1872-1 : 1993 'Plastics — Polyethylene (PE) moulding and extrusion materials — Part 1 Designation system and basis for specifications' issued by the International Organization for Standardization (ISO) while preparing this revised version of the standard.

In this standard, 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.

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

LOW DENSITY POLYETHYLENE (LDPE) AND LINEAR LOW DENSITY POLYETHYLENE (LLDPE) MATERIALS FOR MOULDING AND EXTRUSION — SPECIFICATION

(Second Revision)

1 SCOPE

1.1 This standard prescribes the requirements, methods of sampling and tests for low density polyethylene (LDPE) and linear low density polyethylene (LLDPE) moulding and extrusion materials having density 908.4 to 940.4 kg/m3 at 27°C (910.0 to 942.0 kg/m3 at 23°C). It applies to materials ready for normal use in the form of granule or powder.

1.2 This standard is intended to be used for identification and characterization of low density polyethylene and linear low density polyethylene materials 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 in no way guarantee the suitability of a particular grade under particular processing and end use conditions.

1.4 This standard does not cover masterbatches.

2 NORMATIVE REFERENCES

The Indian standards 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 Type Tests

Tests carried out to prove conformity with the specification. These are included for product/type approval of a given type, grade of low density polyethylene/linear low density polyethylene material.

3.2 Acceptance Tests

Tests carried out on samples taken from a lot passing type tests for the purpose of acceptance of the lot on batch to batch basis.

4 DESIGNATION

4.1 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.

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

Block 1	For Indian Standard,
Block 2	For the material,
Block 3	For intended application or method of processing, additives and supplementary information,
Block 4	For designatory properties, and
Block 5	For filler details.

4.2.1 The number and year of Indian Standard is IS 3395 : 1997.

4.2.2 Identification of the material by its symbol LDPE, that is low density polyethylene and LLDPE, linear low density polyethylene. Comonomer used in LLDPE shall be identified with suffix symbols 'B' for butene-1, 'H' for Hexene-1, 'O' for Octene-1 and 'P' for 4-methyl-pentene-'1 which are the usual comonomers used in linear low density polyethylene and 'Z' for any other comonomer.

4.2.3 *Intended Application or Method of Processing*

Information about intended application or method of processing shall be coded as follows:

Code	*Applications*
A	Adhesives
B	Blow moulding
C	Calendering
E	Extrusion of pipes, profiles and sheet
F	Extrusion of film and thin sheeting
G	General use
H	Extrusion coating/lamination
K	Cable and wire coating
L	Monofilament extrusion
M	Injection moulding
Q	Compression moulding
R	Rotational moulding
S	Powder coating or sintering
T	Tape manufacture
X	No indication
Y	Textile yarn
Z	Others

4.2.4 *Additives and Supplementary Information*

These shall be coded as below:

Code	*Additives*
A	Stabilized with antioxidant
B1	High slip/High anti-blocking
B2	High slip/Medium anti-blocking
B3	Medium slip/High anti-blocking
B4	Medium slip/Medium anti-blocking
B5	No slip/High anti-blocking
B6	No slip/Medium anti-blocking
B7	No slip/No anti-blocking
C	Coloured/Pigmented
D	Powder/Dry blend
E	Expandable
F	Special modified burning characteristics
G	Granules/Pallets with no additive other than 0.02 percent antioxidant
H	Heat aging stabilized
L1	Light and/or weather stabilized with UV stabilizer but no carbon black.
L2	Light and/or weather stabilized containing antioxidant and UV stabilizer but no carbon black
N	Natural (unpigmented)
Q1	Suitable for insulation/sheathing
Q2	Suitable for insulation/sheathing with added antioxidant
S	Lubricated or with polymer processing aid
T	Improved transparency
W1	Weather resistant containing only carbon black
W2	Weather resistant containing antioxidant and carbon black
X	Cross linkable
Y	Increased electrical conductivity
Z	Antistatic

4.2.5 *Designatory Properties*

These include density and melt flow rate (MFR).

4.2.5.1 *Density*

Refers to the density of the base polymer with additives and without fillers and reinforcing materials. The density is classified by the following six cells and coded by two figures, as specified in Table 1. The test conditions used for determining the density are coded by one letter specified below:

Code	*Temperature*,°C
A (Ambient conditions)	27
C (Controlled conditions)	23

Table 1 Code For Density
(*Clause* 4.2.5.1)

Code	Density Range, kg/m^3	
	at 27°C	at 23°C
(1)	(2)	(3)
14	≤ 914.4	≤ 916.0
18	>914.4 to 919.4	>916.0 to 921.0
23	>919.4 to 923.4	>921.0 to 925.0
27	>923.4 to 928.4	>925.0 to 930.0
33	>928.4 to 934.4	>930.0 to 936.0
40	>934.4 to 940.4	>936.0 to 942.0

4.2.5.2 *Melt flow rate (MFR)*

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

Table 2 Test Conditions for Determination of Melt-Mass-Flow Rate
(*Clause* 4.2.5.2)

Code	Temperature	Nominal Load
	°C	kg
(1)	(2)	(3)
E	190	0.325
D	190	2.16
T	190	5.00
G	190	21.6

Set of conditions T is used only for materials having an MFR less than 0.1 g/10 minutes when tested under set of conditions D. Set of conditions G is used only for materials having an MFR 0.1 g/10 minutes when tested under set of conditions T. Set of conditions E is used for materials having an MFR 100 g/10 minutes when tested under set of conditions D.

Table 3 Codes for Melt Flow Rate (MFR)
(*Clause* 4.2.5.2)

Code	MFR Range g/10 minutes.
(1)	(2)
000	≤0.10
001	>0.10 to 0.20
003	>0.20 to 0.40
006	>0.40 to 0.80
012	>0.80 to 1.50
022	>1.50 to 3.00
045	>3.0 to 6.0
090	>6.0 to 12.0
200	>12.0 to 25.0
400	>25.0 to 50.0
700	>50.0

4.2.6 *Fillers or Reinforcing Materials and Their Nominal Content*

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 Coding System for Fillers and Reinforcing Materials and Their Physical Form
(*Clause* 4.2.6)

Code	Material	Code	Form
(1)	(2)	(3)	(4)
A	Asbestos	B	Balls, Beads, spheres
B	Boron		
C	Carbon	D	Powder, Dry blend
G	Glass	F	Fibre
K	Chalk ($CaCO_3$)	G	Granules
L	Cellulose	H	Whiskers
M	Mineral, Metal		
S	Organic synthetic	S	Scales, Flakes
T	Talcum		
W	Wood	X	Not specified
Z	Others	Z	Others

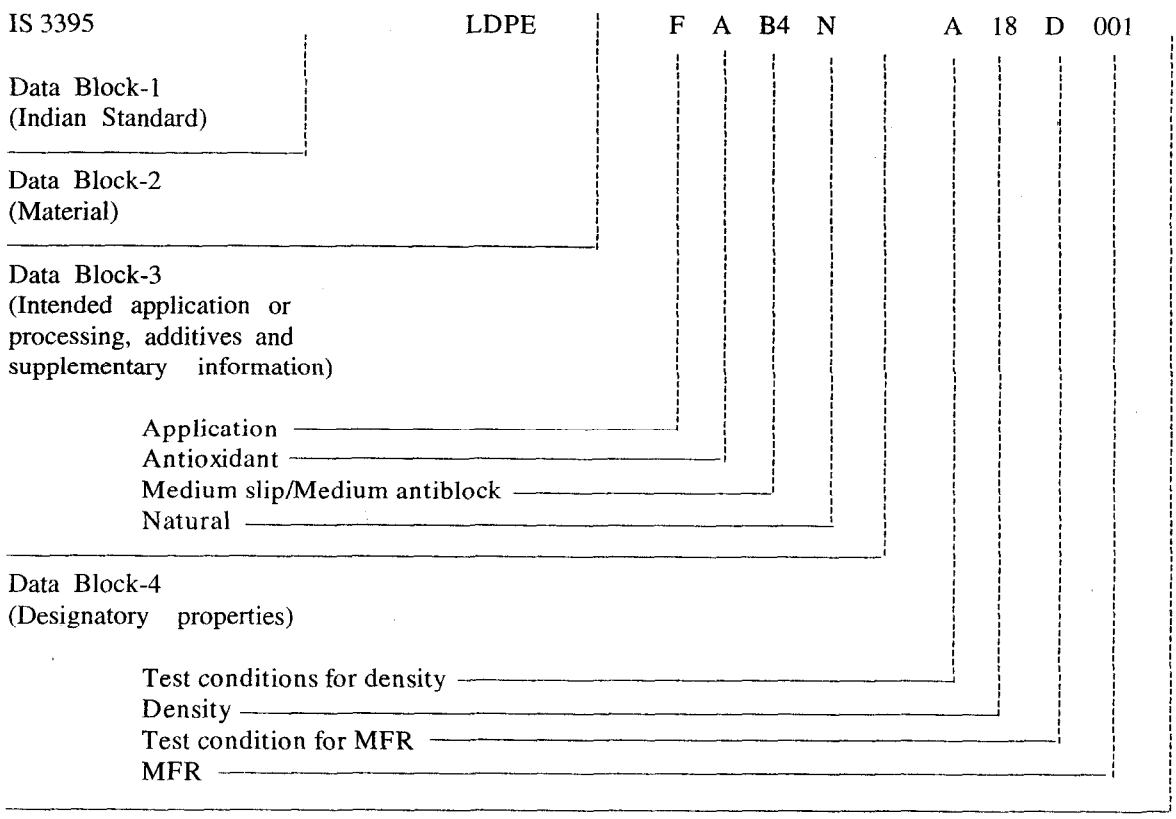
Table 5 Coding System for Mass Content of Filler and Reinforcing Materials
(*Clause* 4.2.6)

Code	Mass Content, percent (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

4.3 Coding Example

4.3.1 A low density polyethylene (LDPE) for production of film (F) having additive formulation of antioxidant (A), medium slip/medium anti-block (B4), natural [not coloured (N)] with density at 27°C (A) 919.0 kg/m^3 (18) and melt flow rate

(190°C/2.16 kg) (D) of 0.20 g/10 minutes (001) shall be designated as:



4.3.2 A linear low density polyethylene (LLDPE) based on butene-1 (B) comonomer for injection moulding application (M) having antioxidant (A), pigment (C), with density at 27°C (C) 924.0 kg/m^3 (23) and melt flow rate (190°C/2.16 kg) (D) of 25 g/10 minutes (200) and having chalk (K) filler in powder form (D) of 22 percent (20) shall be designated as:

IS 3395	LLDPE B	MAC	C 23 D 200	KD 20
(Block-1)	(Block-2)	(Block-3)	(Block-4)	(Block-5)

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 and linear low density polyethylene are density and melt flow rate.

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 1)/ISO 1183.

The value of the density shall not differ from the nominal/agreed value by more than 2 kg/m^3 for the range 908.4 to 940.4 kg/m^3 at 27° C (910.0 to 942.0 at 23°C).

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

5.2.1.2 *Melt flow rate (MFR)*

The melt flow rate 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 1)/ISO 1133. The value of melt flow rate shall be within ± 20 percent of the specified melt flow rate, if this is one or above and shall be within ± 30 percent of the specified melt flow rate, if this is less than one.

5.3 Additional Requirements

5.3.1 Other properties to be selected shall be determined by the characteristics required for processing and the characteristics required of the processed article.

5.3.2 *Typical Additional Properties*

a) *Mechanical Properties*
   i) Tensile strength at yield
   ii) Tensile strength at break
   iii) Elongation at break
   iv) Flexural modulus
   v) Tear strength (Elmendorf)
   vi) Dart Impact strength
   vii) Izod/Charpy impact strength
   viii) Shore A or D hardness
   ix) Coefficient of Friction(COF)

b) *Thermal Properties*
   i) Heat Deflection temperature
   ii) Vicat softening temperature
   iii) Brittleness temperature
   iv) Oxidation Induction time

c) *Electrical Properties*
   i) Surface resistivity
   ii) Volume resistivity
   iii) Dielectric strength
   iv) Dissipation factor
   v) Relative Permittivity

d) *Permanence Properties*
   i) Water absorption
   ii) Environmental stress crack resistance
   iii) Volatile content
   iv) Gas permeability
   v) Oxygen gas transmission rate
   vi) Natural weathering
   vii) Water vapour transmission rate

e) *Optical Properties*
   i) Haze and luminious transmittance
   ii) Specular gloss
   iii) Transparency
   iv) Yellowness index
   v) Colour fastness to daylight
   vi) Colour bleeding

5.4 Carbon Black Content

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 Dispersion of Carbon Black

The dispersion of carbon black shall be considered satisfactory if the material passes the test prescribed in Annex B of IS 7328.

5.6 Special Requirements for Foodstuffs, Pharmaceuticals and Drinking Water Applications

All additives used in the material which is meant for usage in contact with foodstuffs, pharmaceuticals and drinking water shall meet the requirements specified in IS 10141.

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 IS 10146.

5.7 Special Requirements for Coloured Granules

5.7.1 *Colour Bleeding*

Colour bleeding shall not occur when tested as per **12** of IS 2530.

5.7.2 *Colour Fastness to Water*

The colour fastness to water shall be satisfactory when tested as per **13** of IS 2530.

5.7.3 *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 686. The test shall be carried out as prescribed in **15** of IS 2530.

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

6 TESTS

6.1 Classification of Tests

6.1.1 *Type Tests (Product Approval)*

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

a) Density (5.2.1.1), and
b) Melt flow rate (5.2.1.2).

6.1.1.1 LDPE/LLDPE Material shall be subjected to product type approval in accordance with details given in Annex C.

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 proposed article and the material properties required for their achievement.

6.1.2.2 The batch shall be accepted if the LDPE/LLDPE 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 delivered in suitable form of packing, as agreed to between the purchaser and the supplier.

7.2 Marking

Each container and package 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,
e) Month and year of manufacture of the material, and
f) Indication of the source of manufacture and trade mark; if any.

7.3 BIS Certification Marking

The containers and packages may also be marked with the Standard Mark.

7.3.1 The use of the Standard Mark is governed by the provisions of the *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 Standard Mark may be granted to manufacturers may be obtained from the Bureau of Indian Standards.

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, sheet metal or 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*

In a single consignment, all the containers of the same type of the material and drawn from a single batch of manufacture shall constitute a lot. If a consignment is known to consist of different batches of manufacture or of different sizes of containers, the containers belonging to the same batch and size shall be grouped together and each such group shall constitute a separate lot.

8.2.2 For ascertaining the conformity of the material in a lot to the requirements of the specifications, tests shall be carried out for each lot separately. The number of containers (n) to be selected from a lot (N) shall be in accordance with Table 6.

Table 6 Number of Containers to be Selected for Sampling
(*Clause* 8.2.2)

Lot size (N)	No. of Containers to be Selected (n)
(1)	(2)
Up to 3	Each Container
4 to 15	3
16 to 50	4
51 to 100	5
101 to 300	7
301 to 500	10
501 to above	15

8.2.2.1 These containers shall be selected at random from the lot. For the purpose, reference may be made to IS 4905.

8.3 Preparation of Test Sample and Referee Sample

8.3.1 *Sampling Instrument*

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.

8.3.2 From each of the containers selected, portions of the material shall be drawn with the help of the sampling instrument. For this purpose, the material shall be taken from different points, at least 75 mm away in the case of small containers. The total quantity of the material collected from each container shall be sufficient to conduct tests for the determination of the various characteristics and shall be not less than 1.5 kg.

8.3.3 Out of these portions, a small but equal quantity of the material shall be taken out and mixed thoroughly to form a composite test sample. The composite test sample thus formed shall be divided into three equal parts and transferred to separate bottles which are then sealed air-tight and labelled with all the particulars of sampling given under **8.1.5**. One of these bottles shall be marked for the purchaser, one for the supplier and third for the referee.

8.3.4 The remaining portion of the material from each container shall be divided into three equal parts and each part shall be transferred to separate bottles which are then sealed air-tight with stoppers and labelled with all the particulars of sampling given under **8.1.5**. The material in each such sealed bottle shall constitute an individual test sample. These individual test samples shall be grouped into three sets in such a way that every set has a test sample representing each container selected. One of the three sets shall be marked for the purchaser, one for the supplier and the third for the referee.

8.3.5 *Referee Samples*

Referee sample shall consist of the composite test sample and a set of individual test samples marked for the purpose and shall bear the seals of the purchaser and the supplier. It shall be used in case of dispute between the two.

8.4 Number of Tests

8.4.1 Tests for the determination of density and melt flow rate shall be conducted individually on each of the samples in the set of individual samples.

8.4.2 Tests for the determination of the remaining characteristics shall be conducted on the composite samples.

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**.

b) The test results on the composite sample for the remaining characteristics satisfy the corresponding requirements given in **5.3** to **5.7** and **6.1.2.1**.

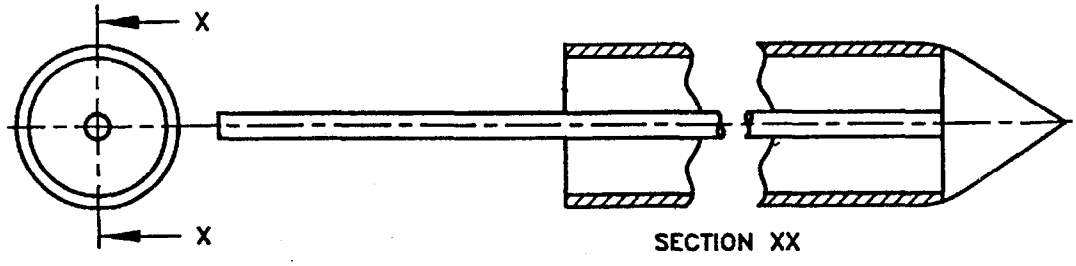


FIG. 1 SAMPLING INSTRUMENT

ANNEX A

(*Foreword* and *Clause* 5.3.2)

INDIAN STANDARDS AVAILABLE ON TYPICAL ADDITIONAL PROPERTIES

Property		Test Method
a) *Mechanical Properties*		
i)	Tensile strength at yield	IS 13360(Part 5/Sec 1) ISO 527-1
ii)	Tensile strength at break	IS 13360(Part 5/Sec 1) ISO 527-1
iii)	Elongation at break	IS 13360(Part 5/Sec 1) ISO 527-1
iv)	Flexural modulus	IS 13360(Part 5/Sec 7) ISO 178
v)	Tear strength (Elmendorf)	IS 13360(Part 5/Sec 23) ISO 6383-2
vi)	Dart Impact strength	IS 2508
vii)	Izod/Charpy impact strength	i) IS 13360(Part 5/Sec 4) ISO 180 ii) IS 13360(Part 5/Sec 5) ISO 179
viii)	Shore A or D hardness	IS 13360(Part 5/Sec 11)
ix)	Coefficient of friction (COF)	IS 2508
b) *Thermal Properties*		
i)	Heat deflection temperature	i) IS 13360(Part 6/Sec 3)ISO 75-1 ii) IS 13360(Part 6/Sec 17) ISO 75-2
ii)	Vicat softening temperature	IS 13360(Part 6/Sec 1)
c) *Electrical Properties*		
i)	Surface resistivity	IS 3396
ii)	Volume resistivity	IS 3396
iii)	Dissipation factor	IS 4486
v)	Relative Permittivity	IS 4486
d) *Permeance Properties*		
i)	Water absorption	IS 13360(Part 8/Sec 1) ISO 62
ii)	Environmental stress crack resistance	IS 13360(Part 8/Sec 9) ISO 4599
iii)	Gas permeabilty	IS 13360(Part 8/Sec 8) ISO 2556
e) *Optical Properties*		
	Colour bleeding	IS 13360(Part 9/Sec 4) ISO 183

ANNEX B

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
686 : 1985	Methods for determination of colour fastness of textile materials to daylight
2508 : 1984	Low density polyethylene films
2530 : 1963	Methods for test for polyethylene moulding materials and polyehtylene compound
2828 : 1964	Glossary of terms used in the plastic Industry
3396 : 1979	Methods of test for volume and surface resistivities of electrical insulating materials (*first revision*)
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
4905 : 1968	Methods for random sampling
7328 : 1992	High density polyethylene materials for moulding and extrusion
9833 : 1981	List of pigments and colourants for use in plastics in contact with foodstuffs, pharmaceuticals and drinking water
10141 : 1982	Positive list of constituents of polyethylene in contact with foodstuffs, pharmaceuticals and drinking water
10146 : 1982	Polyehtylene for its safe use in contact with food stuffs, pharmaceuticals and drinking water.
13360	Methods of testing plastics
(Part 3/Sec 1) : 1995 ISO 1183 : 1987	Physical and dimensional properties, Section 1 Determination of density and relative density of non-cellular plastics
(Part 4/Sec 1) : 1995 ISO 1133 : 1991	Rheological properties, Section 1 Determination of the melt mass-flow rate (MFR) and the Melt volume-flow rate (MVR) or thermoplastics
Part 5 (Sec 1) : 1996 ISO 527-1 : 1993	Mechanical properties Determination of tensile properties—General principles
(Sec 4) : 1996 ISO 180 : 1993	Determination of Izod impact strength
(Sec 5) : 1996 ISO 179 : 1993	Determination of charpy impact strength
(Sec 7) : 1996 ISO 178 : 1993	Determination of Flexural properties
(Sec 11) : 1992	Determination of indentation hardness of plastics by means of durometer (Shore hardness)
(Sec 23) : 1996 ISO 6383-2 : 1983	Determination of tear resistance of plastics film and sheeting — Elmendorf Method
Part 6	Thermal properties, Section 1
(Sec 1) : 1992	Determination of vicat softening temperature of thermoplastics materials
(Sec 3) : 1997 ISO 75-1 : 1993	Determination of temperature deflection under load — General test method
(Sec 17) : 1997 ISO 75-2 : 1993	Determination of temperature deflection under load — Plastics and Ebonite
(Part 8)	Permanence/Chemical properties,
(Sec 1) : 1997 ISO 62 : 1980	Determination of water absorption
(Sec 8) : 1997 ISO 2556 : 1974	Determination of gas transmission rate of film and thin sheets under atmospheric pressure — Manometric method
(Sec 9) : 1997 ISO 4599 : 1986	Determination of resistance to environmental stress cracking (ESC) — Bent strip method
(Part 9/Sec 4) : 1997 ISO 183 : 1976	Optical properties, Section 4 Qualitative evaluation of the bleeding of the colorants

ANNEX C

(*Clause* 6.1.1.1)

PRODUCT TYPE APPROVAL

LDPE/LLDPE material of a particular designation for which the product/type approved is required shall be subjected to the tests for density and melt flow rate (MFR).

LDPE/LLDPE material of that particular designation successfully passing in these product/type approval tests shall for other requirements (Product identification tests) as stipulated in **6.1.2.1** 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 material, as fixed.

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

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 redetermine the controlling specification for acceptance tests.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act,* 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

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 Handbook' and 'Standards: Monthly Additions'.

This Indian Standard has been developed from Doc: No. PCD 12 (1373).

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 : 323 01 31, 323 33 75, 323 94 02

Telegrams : Manaksanstha
(Common to all offices)

Regional Offices :	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002	323 76 17, 323 38 41
Eastern : 1/14 C. I.T. Scheme VII M, V. I. P. Road, Maniktola, CALCUTTA 700054	337 84 99, 337 85 61, 337 86 26, 337 91 20
Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022	60 38 43, 60 20 25
Southern : C. I. T. Campus, IV Cross Road, CHENNAI 600113	235 02 16, 235 04 42, 235 15 19, 235 23 15
Western : Manakalaya, E9 MIDC, Marol, Andheri (East), MUMBAI 400093	832 92 95, 832 78 58, 832 78 91, 832 78 92

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. PATNA. PUNE. THIRUVANANTHAPURAM.

Printed at Printograph, New Delhi, Ph : 5726847