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IS 7328 (1992): High Density Polyethylene Materials for Moulding and Extrusion [PCD 12: Plastics]

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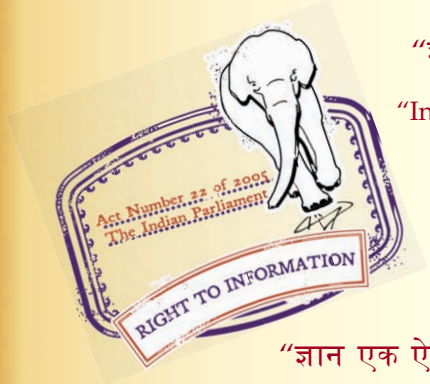

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Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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(पहला पुनरीक्षण)

Indian Standard

HIGH DENSITY POLYETHYLENE MATERIALS FOR MOULDING AND EXTRUSION — SPECIFICATION

(First Revision)

Third Reprint JULY 2000

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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August 1992

Price Group 4

AMENDMENT NO. 1 MARCH 2002
TO
IS 7328 : 1992 HIGH DENSITY POLYETHYLENE MATERIALS FOR MOULDING AND EXTRUSION — SPECIFICATION

(First Revision)

(*Page* 7, *clause* A-4) — Substitute '1 000' *for* '100' in the formula.

(PCD 12)

Reprography Unit, BIS, New Delhi, India

FOREWORD

This Indian Standard (First 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.

The production of high density polyethylene (HDPE) commenced in India in 1968 and the demand for HDPE has been growing at a very fast rate. Due to a number of favourable inherent properties such as high impact strength, light mass, resistance to chemicals including many of corrosive nature, relatively low permeability coefficient and also due to its good melt flow characteristics during processing, high density polyethylene articles and containers have been able to replace glass as well as tin-plates. HDPE is also being used for the manufacture of films, monofilaments and stretched film tapes for woven sacks. Due to its long term behaviour under stress, it is being used extensively for pipes for drinking water supply, sewage/drainage, irrigation corrosive effluents, transport of chemicals and fuel gas. HDPE pipes are also light in weight and comparatively easy to install.

This standard was first published in 1974. In this revision method for determination of carbon black dispersion in high density polyethylene materials has been included as Annex B. Special requirements for Type EW (erstwhile PB), Type F, Type L and Type Y have been deleted, as the same shall be considered in separate standards like IS 10889 : 1984 'High density polyethylene films'.

No attempt has been made to specify all the properties of polyethylene that may be of importance in a particular application, and in many cases it will be necessary for the user to state his own special requirements in addition to those covered by this standard.

The properties of a polyethylene material may be changed by the incorporation of additives such as pigments and antistatic agents. It is essential that the values quoted for selected properties are related to the material in the form in which it is supplied.

Properties determined according to the methods used in this standard may not be necessarily identical to those obtained using specimens of different dimensions and/or prepared by different procedures. The values obtained for the properties of a product depend on the compound, the test method and the state of anisotropy which in turn depends on the conditions of processing and subsequent treatment, if any.

This standard establishes a system of designation for HDPE materials which may be used as the basis for specifications. The types are differentiated from each other by a classification system based on the appropriate levels of the designatory properties:

a) Density, and

b) Melt Flow Rate (MFR).

and information about intended application, method of processing important properties, additives, colour, films and reinforcing materials.

It is not intended to imply that materials having the same designation give necessarily the same performance. This revision does not provide engineering and performance data or data on processing conditions which may be required to specify a material for a particular application or method of processing. If such additional properties are required, they shall be determined in accordance with the test methods prescribed in IS 2530 : 1963 'Methods of test for polyethylene moulding materials and polyethylene compounds'.

Since the values for density and melt flow index (rate) are to be agreed upon by the purchaser and the supplier, the requirement for yield stress and elongation at break has been deleted in this revision. The values for these two properties also may be obtained from the supplier, if required.

Requirements and the methods of sampling and test for low density polyethylene moulding and extrusion materials have been covered in IS 3395 : 1984 'Low density polyethylene materials for moulding and extrusion (*first revision*)'.

(*Continued on third cover*)

Indian Standard

HIGH DENSITY POLYETHYLENE MATERIALS FOR MOULDING AND EXTRUSION — SPECIFICATION

(First Revision)

1 SCOPE

1.1 This standard prescribes the requirements and the methods of sampling and test for high density polyethylene (HDPE) materials for moulding and extrusion. It applies to materials ready for normal use in the form of powder, granules, and to materials unmodified by colourants, additives, films, etc.

1.2 This standard does not cover masterbatches.

2 NORMATIVE REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of the standard. At the time of publication, the editions 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 indicated below:

IS No.	*Title*
686 : 1985	Methods for determination of colour fastness of textile materials to day light (*first revision*)
2530 : 1963	Methods for test for polyethylene moulding materials and polyethylene compound
2828 : 1964	Glossary of terms used in the plastic industry
3395 : 1984	Low density polyethylene materials for moulding and extrusion (*first revision*)
10141 : 1982	Positive list of constituents of polyethylene in contact with foodstuffs, pharmaceuticals and drinking water
10146 : 1982	Polyethylene for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
10889 : 1984	High density polyethylene films

3 TERMINOLOGY

3.1 For the purpose of this standard, the definitions given in IS 2828 : 1964 and the following shall apply.

3.1.1 *Type Tests*

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

3.1.2 *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 (product identification).

4 DESIGNATION

4.1 The designation system given in **4.2** into which the materials are classified according to methods of processing, their designation properties that is 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 informations given in the order presented and can be codified in different blocks such as:

Block 1	For Indian Standard;
Block 2	For the material;
Block 3	For application and additives;
Block 4	For resin properties; and
Block 5	For filler details.

4.2.1 The number and year of this standard is IS 7328 : 1992.

4.2.2 Identification of the plastics material by its symbol PE that is polyethylene.

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	Coating
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 yarns

4.2.4 *Additives and Supplementary Information*

These shall be coded as below:

Code	*Additives*
A	Processing stabilized
B	Anti-blocking
C	Coloured/Pigmented
D	Powder; dry blend
E	Expandable
F	Special/modified burning characteristics
G	Pellets, granules; materials with no additives other than up to 0.02% antioxidants
H	Heat-ageing stabilized
K	Loss angle not greater than 300 rad
L	Light and/or weather stabilized, containing antioxidants/UV stabilizers but NOT carbon black
N	Natural (Unpigmented/not coloured)
P	Impact modified
Q	Suitable for insulation/sheathing with added anti-oxidant where loss angle is unimportant
R	Moulding release agent
S	Lubricated
T	Improved transparency
W	Weather resistant containing antioxidants 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*

For the purpose of this designation, the density shall always refer to the base polymers. The density is classified by the following five 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
C (Controlled conditions)	23°C

Table 1 Code for Density

Code	Density Range, kg/m³	
	at 27°C	at 23°C
(1)	(2)	(3)
40	> 934.4 to 940.4	> 936 to 942
45	> 940.4 to 946.4	> 942 to 948
50	> 946.4 to 952.4	> 948 to 954
57	> 952.4 to 958.4	> 954 to 960
62	> 958.4	> 960

NOTE – Codes 14, 18, 23, 27 and 33 have been reserved for polyethylene (LDPE) materials having density below 934.4 kg/m³.

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 11 cells and coded by three figures, as specified in Table 3.

Table 2 Code for Test Conditions Used in Determining Melt Flow Rate (MFR)

Code	Temperature, °C	Nominal Load, kg
(1)	(2)	(3)
D	190	2.16
T	190	5.00
G	190	21.60

Table 3 Codes for Melt Flow Rate (MFR)

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 3.0
045	> 3.0 to 6.0
090	> 6.0 to 12
200	> 12 to 25
400	> 25 to 50
700	> 50

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 two figures, as specified in Table 5.

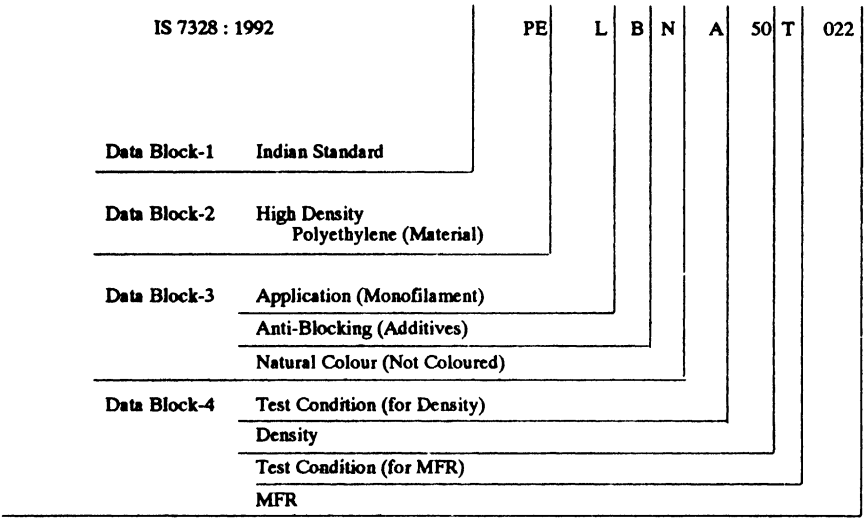
Table 4 Coding System for Fillers and Reinforcing Materials and Their Physical Form

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; ground
L	Cellulose	H	Whiskers
M	Mineral; metal		
S	Organic Synthetic	S	Scales; flakes
T	Talcum		
W	Wood	X	Not Specified
Z	Others	Z	Others

4.3 Coding Example

4.3.1 A high-density polyethylene (PE) material for production of monofilament (L) having additive formulation for anti-blocking (B) and natural colour (N) (not coloured) with density at 27°C (A) of 948 kg/cm³ (50) and a melt flow rate (MFR) — 190/5.00 (T) of 2.0 gm/10 min (022) shall be designated as:

IS 7328 : 1992 PE LBN A5OTO22



4.3.2 A high-density polyethylene (PE) material for blow moulding (B) without special additives, with a Conventional density at 23°C (C) of 952 kg/m³ (50) and a melt flow rate (MFR) — 190/21.6 (G) of 0.5 g/10 min (006) and with calcium carbonate filler (K) in powder form (D) with 30 percent mass content (30) shall be designated as:

IS 7328 : 1992 PE B C50G006 K 30D

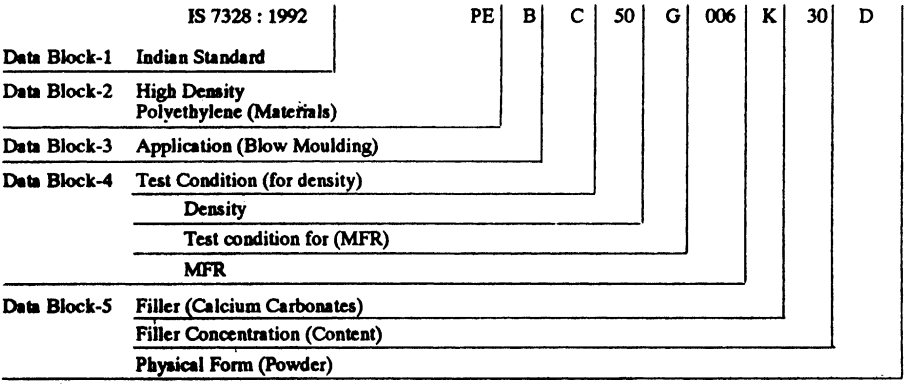


Table 5 Coding System for Mass Content
(*Clause* 4.2.6)

Code	Mass Content, % (m/m)
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
60	> 55 to 65
70	> 65 to 75
80	> 75 to 85
90	> 85

5 REQUIREMENTS

5.1 Description

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 polyethylene materials are density and melt flow rate.

5.2.1.1 *Density*

The density of the material shall be as agreed to between the purchaser and the supplier and shall be determined by the method prescribed in Annex A.

The value of the density shall not differ from the nominal/agreed value by more than 2 kg/m³ for the range 910 to 940 kg/cm³; and for the density range 941 to 967 kg/cm³ the value of the density shall not differ from the nominal/agreed value by more than 3 kg/m³.

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

5.2.1.2 *Melt flow rate (MFR)*

The melt flow rate (MFR) of the material shall be as agreed to between the purchaser and the supplier and shall be determined by the method prescribed in 7 of IS 2530 : 1963. 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.

NOTE – The purchaser should establish his own correlation between the properties of the processed article and the material properties required for their achievement.

5.3.2 Typical additional properties to be measured are as follows:

a) *Mechanical properties*

i) Tensile stress at yield, MPa;
ii) Tensile stress at break, MPa;
iii) Tensile elongation at yield, %;
iv) Tensile elongation at break, %;
v) Tensile elastic modulus, MPa;
vi) Flexural modulus at 1% strain, MPa;
vii) Izod impact resistance versus temperature KJ/m²;
viii) Charpy impact resistance versus temperature KJ/m²;
ix) Ball indentation hardness, MPa; and
x) Rockwell hardness.

b) *Thermal properties*

i) Deflection temperature under load, °C;
ii) Vicat softening temperature (VST), °C; and
iii) Brittleness temperature, °C.

c) *Electrical properties*

i) Surface resistance, ohm;
ii) Volume resistivity, ohm-cm;
iii) Electric strength, kV/mm;
iv) Dissipation factor, Tan δ; and
v) Relative permittivity.

d) *Other properties*

i) Water absorption, mg;
ii) Effects of liquid chemicals including water, % change;
iii) Environmental stress cracking (not applicable to all grades); and
iv) Resistance to stress cracking (not applicable to all grades).

e) *Ageing properties*

i) Natural weathering, and
ii) Artificial light weathering; colour changes.

5.4 Carbon Black Content

The carbon black content of weather resistance material when determined by the method prescribed in 10 of IS 2530 : 1963 shall be not less than 2.0 percent and not more than 3.0 percent.

5.5 Dispersion of Carbon Black

The dispersion of carbon black shall be considered satisfactory, if the material passes the tests as prescribed in Annex B. The method given in 16 of IS 2530 : 1963 may also be followed. However, in case

of dispute the method given in Annex B shall be the referee method.

5.6 Anti-Oxidants

5.6.1 *General Limitations*

When required, stabilization shall be achieved by the addition of anti-oxidants. The anti-oxidants shall for materials in contact with foodstuffs or potable water be one or more selected from **3.4.2.1**(b) of IS 10141 : 1982 and individual maximum, wherever stipulated in the positive list of anti-oxidants [**3.4.2.1**(b) of IS 10141 : 1982] shall be valid but the aggregate contents of anti-oxidants shall be limited to 1.5 percent, *Max* by mass of the finished resin.

5.6.2 *Contact with Foodstuffs, Pharmaceuticals and Drinking Water*

Where 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 : 1982.

5.7 Special Requirements for Coloured Grannules

5.7.1 *Colour Bleeding*

Coloured bleeding shall not occur when tested as per **12** of IS 2530 : 1963.

5.7.2 *Colour Fastness to Water*

The colour fastness to water shall be satisfactory when tested as per IS 2530 : 1963.

5.7.3 *Colour Fastness to Day Light*

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 : 1985. The test shall be carried out as prescribed in **15** of IS 2530 : 1963.

5.7.4 In case coloured material is used for food contact application, it shall comply with the list and limits of the pigments and colourants prescribed in IS 9833 : 1981.

6 TESTS

6.1 Classification of Tests

6.1.1 *Type (Product Approval Tests)*

The following shall constitute type (product approval) tests:

a) Density (*see* **5.2.1.1**).
b) Melt flow rate (index) (*see* **5.2.1.2**).

6.1.1.1 The high density polyethylene material shall be subjected to product type approval in accordance with the details given in Annex C.

6.1.2 *Acceptance (Product Identification) Test*

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 processed article and the material properties required for their achievement.

6.1.2.2 The batch shall be accepted if the high density polyethylene materials are 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) Year and month of manufacture of the material;
f) Indication of the source of the manufacture; and
g) Trade-mark, if any.

7.2.1 The containers and packages may also 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 from 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 manufacturer 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 specification, 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

Lot Size	No. of Containers to be Selected
(1)	(2)
N	n
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 and above	15

8.2.2.1 These containers shall be selected at random from the lot and in order to ensure the randomness of selection, random number tables shall be used. In case such tables are not available, the following procedure may be adopted:

Starting from any container in the lot, count them in one order at 1, 2, 3, ..., etc, up to r and so on, where r is the integral part of N/n. Every rth container thus counted shall be withdrawn from the lot to give a sample for test.

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, small 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 from any surface in the case of large containers and 25 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 quantity of which shall be not less than 1.5 kg. 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 **8.1.6**. 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 **8.1.6**. 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.

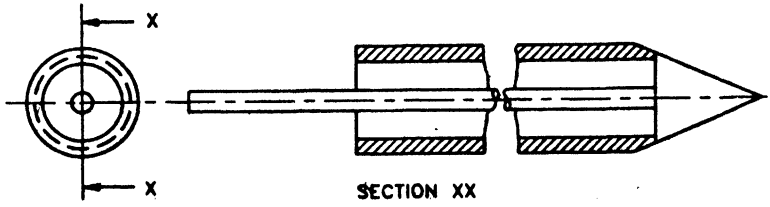


FIG. 1 SAMPLING INSTRUMENT

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.

ANNEX A
(*Clause* 5.2.1.1)

DETERMINATION OF THE DENSITY OF POLYETHYLENE

A-0 GENERAL

Outline of the Method

The density is determined by the buoyancy method by finding the mass in air and in butyl acetate.

A-1 NUMBER OF TESTS

The test is carried out in duplicate.

A-2 APPARATUS

A-2.1 Heated Press

Steam or electrical.

A-2.2 Analytical Balance

A-2.3 Butyl Acetate (Laboratory Grade)

A-2.4 Thermometer

A-2.5 Hydrometer

A-2.6 Beaker

Tall form of 250-ml capacity.

A-3 PROCEDURE

A-3.1 Preparation of the Press Plate

A 4-mm thick plate is prepared with spacer frame; 50 g polyethylene granule is weighed and placed in the spacer (100 × 120 mm) of the spacer frame. After filling the spacer the material is covered with the highly polished chrome plated sheet and then finally with the cover plate, care being taken to avoid displacement of the granules. This assembly is placed on the press, previously heated to 180°C. The material is heated at this temperature for 10 minutes under contact pressure and cooled. During the cooling the pressure is slowly increased to 100 kgf/cm². The cooling lasts for approximately 5 minutes.

A-3.2 Determination of the Density of Butyl Acetate

The density of the butyl acetate is accurately determined by means of hydrometer. The temperature is also noted down.

A-3.3 Determination of the Density of the Specimen

The weighing pan of the balance is replaced by small holding clamp and with a fine nylon wire for hanging the specimen. The balance is so adjusted that the pointer is exactly at '0' when the hanging wire is already attached to the pan. From the 4 mm thick press plate, about 4 cm square piece is cut out. The edges of the specimen are trimmed with a blade to remove fibres. The mass of the piece is accurately determined in air and also in butyl acetate (to an accuracy of 0.1 mg). The weighing is to be done in an air-conditioned room maintained at 27 ± 2°C. The specimen as well as the butyl acetate must have been conditioned in the air-conditioned room for at least an hour prior to weighing.

A-4 CALCULATION

$$\text{Density of polyethylene, kg/m}^3 = \frac{a \times \rho_{BAC}}{a_1 - a_2} \times 100$$

where

a_1 = mass in g of the specimen in air,
a_2 = mass in g of the specimen in butyl acetate, and
ρ_{BAC} = density of butyl acetate.

In case the testing is done at a temperature other than 27°C the value obtained for the density of the polyethylene should be corrected by 0.4 units per degree centrigrade, the correction being subtracted in case the temperature is lower and added in case the temperature is higher.

A-5 REMARKS

A-5.1 The accuracy of the hydrometer should be counter-checked by determining the density of butyl acetate by specific gravity bottles.

In this simplified method, the buoyancy of the air, buoyancy of the hanging wire and the formation of the solvent film around the wire are neglected. However, results as accurate as 0.3 units can be obtained.

ANNEX B

(*Foreword and Clause* 5.5)

DETERMINATION OF CARBON BLACK DISPERSION IN HIGH DENSITY POLYETHYLENE MATERIALS

B-0 GENERAL

B-0.1 Outline of the Method

Carbon black dispersion is determination of microto microtome cut section of compression moulded sheet.

B-1 PROCEDURE

B-1.1 Preparation of Compression Moulded Sheet

4 mm thick compression moulded sheet made as per A-3.1 for density determination shall be used for carbon black dispersion.

B-1.2 Specimen Preparation

Approximately 50 × 20 mm. Prepare a few 10 micron sections of the moulded sheet on a microtome cutter.

B-1.3 Dispersion Observation

Place three uniform specimens of microtome cut sections on a clear microscope slide and cover them by another similar slide. Examine the specimens through a microscope at a magnification of 200 ± 10 with a field view of 1 ± 0.1 mm diameter. Compare each specimen with the photomicrograph shown in Fig. 2 in respect of number and size of agglomerates. Note shall also be made of any lack of uniformity of the background.

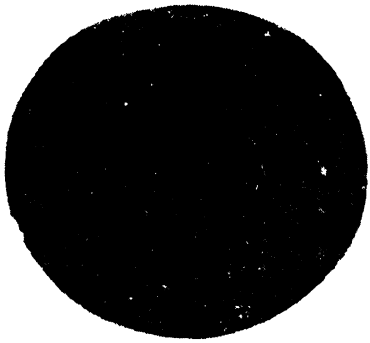


FIG. 2 A PORTION OF CARBON BLACK DISPERSION AS SEEN WITH A FIELD OF VIEW OF 1 mm UNDER 200 MAGNIFICATION

B-2 REPORTING

B-2.1 The carbon black dispersion in the material under test shall be considered to be satisfactory, if the specimens show a uniform background free from white streaks and if the number and size of agglomerates in the specimens are not greater than those shown in Fig. 2.

ANNEX C

(*Clause* 6.1.1.1)

PROCEDURE FOR PRODUCT/TYPE APPROVAL

C-1 The high density polyethylene materials shall be approved if they are found to comply with the requirements of tests given in 6.1.1.

C-2 Accordingly, the high density polyethylene materials 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).

C-3 HDPE materials of that particular designation successfully passing in these product/type approval tests shall be tested for other requirements (Product identification tests) as stipulated in 6.1.2.1 which would be recorded and these shall be the controlling specification as long as there is no change in the grade designation of the HDPE materials, as fixed.

C-4 In the event of any change in the grade/designation of the HDPE material reapproval will be required and the type tests shall be carried out afresh and the controlling specifications for acceptance test redetermined and fixed.

C-5 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 and to fix.

(*Continued from second cover*)

The designation of polyethylene prescribed in the standard corresponds substantially with that prescribed in ISO/R 1872/1 — 1986 'Plastics — Polyethylene (PE) and ethylene copolymer thermoplastic — Part 1 : Designation' issued by the International Organization for Standardization and in Doc 88/36146 'Draft Specification for polyethylene (PE) moulding and extrusion materials (Draft Revision of BS 3412 : 1976)' issued by the British Standards Institution.

The standard contains clauses **5.2.1.1** and **5.2.1.2** which call for an agreement between the purchaser and supplier.

In this standard, the basic concept of Type (product approval) and Acceptance (product identification) test has been introduced to make this standard more meaningful. On the basis of Type test (product approval) the product indentification criteria (through acceptance test) is derived and fixed and the values obtained for various accepted tests become the controlling specifications.

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 draft standard.

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