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भारतीय मानक मसौदा

मोल्डिंग और एक्सट्रूज़न के लिए पॉलीप्रोपाईलीन (पीपी) सामग्री — विशिष्टि

[आई. एस. 10951 *का तीसरा पुनरीक्षण*]

Draft Indian Standard

POLYPROPYLENE (PP) MATERIALS FOR MOULDING AND EXTRUSION — SPECIFICATION

(*Third Revision of* IS 10951)

(ICS 83.080.20)

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

FOREWORD

(*Formal clause to be added later*)

Polypropylene (PP) is member of the polyolefin family, since its monomer, propylene, is an unsaturated hydrocarbon and belongs to a class of chemical compounds called olefins. Because the monomers of polypropylene (propylene) and polyethylene (ethylene) are so similar, the polymers have many of the similar properties. However, there are several major differences, including density (polypropylene's is lower), service temperature (polypropylene's is higher), rigidity (polypropylene is more rigid), resistance to environmental stress cracking (polypropylene's resistance is higher), and susceptibility to oxidation (polypropylene is worse than polyethylene). Polypropylene is characterized by good mechanical properties, excellent chemical and thermal as well as electrical properties and aesthetic appeal in applications such as clear films. Its lower cost per unit weight and high yield on a volume basis, due to the low density, offers considerable economic advantage to the converter and end-user. Polypropylene may be processed by extrusion, injection moulding, and blow moulding. It may be further processed by compression moulding and thermoforming. This standard does not provide engineering and performance data which may be required to specify a material for a particular application or method of processing.

Polypropylene manufacturing is a continuous process of polymerization and capable to produce numerous types of grades based upon Melt Flow Index (MFI) or Melt Flow Rate (MFR) which are used by final converters for manufacturing extruded and moulded products (flexible films, raffia tapes, mono filaments, pipes, blow, injection, roto moulded products and various other products).

Since polymerization is a continuous process, during transition from one grade to another there will be virgin polymer grades produced with broad Melt Flow Index (MFI) or Melt Flow Rate (MFR) range with respect to declared specifications set by respective resin manufacturer 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.

This standard was originally published in 1984 and subsequently revised in 2002 and 2020.

In the first revision the following changes were made:

a) The title and scope have been modified.

b) The designation system has been thoroughly revised to align the same as far as possible with the corresponding ISO standard. The types are differentiated from each other by a classification system based on the appropriate levels of designator properties, such as flexural modulus Izod impact strength, melt flow rate (MFR) and information about intended application, method of processing important characteristics, additives, colour, fillers and reinforcing materials.

c) 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 acceptance tests become the controlling specifications.

In the second revision, the following changes were made:

a) Title of the standard has been modified;
b) Designation system has been modified;
c) Sampling procedures have been modified; and
d) Reference of other publications have been incorporated.

This revision (third) has been undertaken to incorporate all the requirements specified in ‘IS 10910 : 1984 Specification for polypropylene and its copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water’ in IS 10951. Further, this revision will supersede ‘IS 10951 : 2020 Specification for polypropylene (PP) material for moulding and extrusion’ and ‘IS 10910 : 1984 Specification for polypropylene and its copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water’.

During the preparation of this standard, assistance has been derived from ISO 19069-1 : 2015 ‘Plastics — Polypropylene (PP) moulding and extrusion materials — Part 1: Designation system and basis for specifications’ and ISO 19069-2 : 2016 ‘Plastics — Polypropylene (PP) moulding and extrusion materials — Part 2: Preparation of test specimens and determination of properties’ issued by the International Organization for Standardization (ISO).

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.

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 designation system, requirements, methods of sampling and tests for polypropylene (PP) thermoplastics material and their compound. It applies to the material ready for normal use in the form of powder, granules or pellets and to materials unmodified or modified by additives, fillers, etc.

1.2 This standard is applicable to all propylene homopolymers and to copolymers of propylene with a content of other 1-olefins of less than 50 percent (m/m), as well as blends of polymers containing at least 50 percent (m/m) of aforementioned polymers.

1.3 It is not intended to imply that materials having the same designation give necessarily the same performance. This standard does not provide engineering data, performance data or data on processing conditions which may be required to specify a material for a particular application and/or method of processing. If such additional properties are required, they should be determined in accordance with the test methods specified in Annex A**,** if suitable.

1.4 This standard does not cover master batches.

2 REFERENCES

The Indian standards listed in Annex B 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 listed in Annex B.

3 DESIGNATION

3.1 The designation system is given in **3.2** into which the materials are classified according to method of processing, their designator property, i.e. melt flow rate. Additionally, certain other supplementary information i.e. flexural modulus and Izod impact strength shall be used for polypropylene (PP) compounds. The designation system is only intended to indicate a broad classification. In most circumstances specific values of the designatory properties and other characteristics as given in **6** shall be required.

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

3.2.1 *Designation Code for Polypropylene Material*

Data Block 1	For Indian Standard
Data Block 2	Identification of the resin by its symbol and information about the composition of the polymer (*see* **3.4**)
Data Block 3	Position 1: Intended application or method of processing (*see* **3.5**). Positions 2 to 3: Important characteristics, additives and supplementary information (*see* **3.5**). 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	Designatory properties (*see* **3.6**)

3.2.2 *Designation Code for Polypropylene Compounds*

Data Block 1	For Indian Standard
Data Block 2	Identification of the Compounds by its symbol and information about the composition of the polymer (*see* **3.4**)
Data Block 3	Position 1: Intended application or method of processing (*see* **3.5**). Positions 2 to 3: Important characteristics, additives and supplementary information (*see* **3.5**).
Data Block 4	Designatory properties (*see* **3.6**).
Data Block 5	Fillers or reinforcing materials and their nominal content (*see* **3.7**).
Data Block 6	For the purpose of specifications, an optional sixth block may be added containing additional information

There will be no space or hyphen between two alphabets/number within a block except block 1 (for Indian Standard), but each block will be separated by a space or hyphen. Each block is restricted with maximum number of letter/numbers as mentioned in **3.9**.

3.3 Data Block 1 — For Indian Standard.

3.4 Data Block 2

In this block, type of material represented by one numeric code as given in Table 1. Additional information on the composition of the polymers also given in Table 1.

Table 1
Code for Identification of Polymer and Additional Information on the Composition in Data Block 2
(*Clause* 3.4)

Sl No.	Code	Type of Material	Additional Information on the Composition of Polymer
(1)	(2)	(3)	(4)
i.	1	Propylene homopolymers	—
ii.	2	Polypropylene random copolymers or terpolymers	Thermoplastic propylene random copolymer containing another olefinic monomer (or monomers) having no functional group other than the olefinic group, copolymerized with propylene
iii.	3	Polypropylene impact co-polymers	Thermoplastic propylene impact copolymer consisting of two or more phases of either a propylene plastic H "1" or a propylene plastic R "2" and rubber phases composed of propylene and another olefinic monomer (or monomers) having no functional group other than the olefinic group, added *in-situ* or physically blended with the propylene plastic matrix.
iv.	4	Polypropylene based Compounds	—

3.5 Data Block 3

In this block, information about intended application and/or method of processing is given in position 1 and important characteristics, additives and supplementary information is given in positions 2 and 3. Code for position 1 is given in Table 2A and Code for position 2 and 3 is given in Table 2B.

Table 2A Code for Position 1 in Data Block 3
(*Clause* 3.5)

Sl No.	Code	Intended Application and/or Method of Processing
(1)	(2)	(3)
i.	A	Compounding
ii.	B	Blow moulding
iii.	C	Nonwoven
iv.	D	Thermoforming
v.	E	Extrusion of profiles and sheet
vi.	F	BOPP film (biaxially oriented PP film)
vii.	G	General use/purpose
viii.	H	Extrusion coating/lamination
ix.	J	Battery containers
x.	K	CPP film (cast PP film)

xi.	L	Mono and multifilament filament yarn
xii.	M	Injection moulding
xiii.	N	TQPP film (tubular quench PP film)
xiv.	P	Extrusion of pipes/ducts
xv.	Q	Compression moulding
xvi.	R	Rotational moulding
xvii.	T	Tape extrusion/raffia
xviii.	Z	Blending/Miscellaneous

Table 2B Code for Position 2 and 3 in Data Block 3
(*Clause* 3.5)

Sl No.	Code	Characteristics, Additives and Supplementary Information
(1)	(2)	(3)
i.	A	Barefoot grade without any additive
ii.	B	Stabilized with antioxidant
iii.	C	Heat aging stabilizer
iv.	D	UV stabilizer and antioxidant
v.	E	No slip/no anti-blocking
vi.	F	Slip/no anti-blocking
vii.	G	No Slip/anti-block
viii.	H	Slip and anti-blocking
ix.	J	Mould release and/or antistatic agent
x.	K	Lubricated or with polymer processing aid
xi.	L	Clarifier/nucleating agent
xii.	M	Suitable for insulation/sheathing with added antioxidant
xiii.	N	Coloured/pigmented*
xiv.	O	Metal deactivator/acid scavenger
xv.	P	Special modified burning characteristics
xvi.	Q	Natural (unpigmented)
xvii.	R	UV stabilizer and antioxidant with carbon black*
xviii.	S	Impact modifier
xix.	X	Cross linking agent*
xx.	T	Increased electrical conductivity
xxi.	U	Pro-degradants
xxii.	V	Peroxide for visbreaking
xxiii.	Z	Miscellaneous

NOTE — * Applicable only to compounds.

3.6 Data Block 4

a) In this data block, 3 alphabets shall be used, first one for MFR/MFI, second one for flexural modulus and third one for Izod impact strength.

b) For Polypropylene materials (symbol 1, 2 and 3) and Polypropylene compounds (symbol 4), MFI Code to be mentioned as per designatory code in Table 3 (*see* **3.6.1**). For polypropylene compounds (symbol 4), flexural modulus (as per Table 4, **3.6.2**) and Izod impact strength (as per Table 5, **3.6.3**) to be mentioned as additional properties.

3.6.1 *Melt Mass Flow-Rate (MFR) or Melt Flow Index (MFI)*

The possible values of melt flow rate are divided into seven ranges, each represented by a one-alphabet code as specified in Table 3.

Table 3 Codes and Ranges for Melt Mass Flow Rate (MFR) in Block 4
(*Clause* 3.6.1)

Sl No.	Code	MFR at 230°C, 2.16 kg (g/10 min)
(1)	(2)	(3)
i.	A	0.01 to ≤ 6.0
ii.	B	>6.0 to ≤ 10.0
iii.	C	>10.0 to ≤ 16.0
iv.	D	>16.0 to ≤ 30.0
v.	E	> 30.0 to ≤ 50.0
vi.	F	> 50.0 to ≤ 80.0
vii.	G	> 80.0

NOTES:

1 MFR or MFI of polypropylene compounds 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.
3. In case, if the Melt Flow Rate (MFR) cannot be measured under the specified conditions of 230 °C and a 2.16 kg load, alternative suitable conditions, as agreed between purchaser and supplier may be used. The conditions used to be declared by the manufacturer.
4. In case, if the melt flow rate (MFR) of the compounded material cannot be determined, the MFR of base resin shall be declared.

3.6.2 *Flexural Modulus*

The possible values of flexural modulus are divided into six ranges, each represented by a one-alphabet code as specified in Table 4.

Table 4 Codes and Ranges for Flexural Modulus in Block 4
(*Clause* 3.6.2)

Sl No.	Code	Range of Flexural Modulus (MPa)
(1)	(2)	(3)
i.	A	≤ 400
ii.	B	> 400 to ≤ 800

iii.	C	> 800 to ≤ 1200
iv.	D	> 1200 to ≤ 2000
v.	E	> 2000 to ≤ 3500
vi.	F	> 3500

3.6.3 *Izod Impact Strength*

The possible values of notched Izod impact strength are divided into seven ranges, each represented by one alphabet code as specified in Table 5.

Table 5 Codes and Ranges for Izod Impact Strength in Block 4
(*Clause* 3.6.3)

Sl No.	Code	Izod Impact Strength, J/m	Code	Izod Impact Strength, KJ/m^2
(1)	(2)	(3)	(4)	(5)
i.	A	≤ 30	G	≤ 3
ii.	B	> 30 to ≤ 60	H	> 3 to ≤ 6
iii.	C	> 60 to ≤ 120	J	> 6 to ≤ 12
iv.	D	> 120 to ≤ 200	K	> 12 to ≤ 20
v.	E	> 200 to ≤ 300	L	> 20 to ≤ 30
vi.	F	> 300 to ≤ 500	M	> 30 to ≤ 50
vii.	N	> 500	P	> 50

3.7 Data Block 5

In this block, the type of filler and/or reinforcing material is represented by a single code in position 1 and its physical form by a second code in position 2, as specified in Table 6. Subsequently (without a space), the mass content shall be given by a one digit (in case of < 9.5 percent) or two-digit (in case of ≥ 9.5 percent) number (Round figure) in positions 3 and/ or 4.

Table 6 Code for Fillers and Reinforcing Materials in Block 5
(*Clause* 3.7)

Sl No.	Code	Material	Code	Form
(1)	(2)	(3)	(4)	(5)
i.	B	Boron	B	Beads, spheres, balls
ii.	C	Carbon	D	Powder
iii.	G	Glass	F	Fiber
iv.	K	Calcium carbonate	G	Ground
v.	L	Cellulose	H	Whiskers
vi.	M	Mineral, metal, mineral fillers	Z	Others
vii.	S	Synthetic, organic		
viii.	T	Talc		
ix.	W	Wood		

x.	Z	Other fillers		

3.8 Data Block 6

Indication of additional requirements in this optional block is a way of transforming the designation of a material into a specification for a particular application. This may be done for example by reference to a suitable published Indian standard.

a) These materials may be further defined by their chemical symbol. In the case of metals (M), it is essential to indicate the type of metal by means of its chemical symbol.

b) Mineral fillers shall be designated more precisely if a symbol is available. Mixtures of materials and/or forms may be indicated by combining the relevant codes using the sign "+" and placing the whole between parentheses. For example, a mixture of 25 percent glass fiber (GF) and 10 percent mineral powder (MD) would be indicated by (GF25+MD10).

3.9 Coding Examples

There will be no space or hyphen between two alphabets/number within a block except block 1 (for Indian Standard). But each block will be mentioned and separated by a space or hyphen. The designatory code shall be formed as per below table. Each block is restricted with maximum number of letter/ number as mentioned below.

Data Block 1	IS 10951
Data Block 2	Maximum one character (1 character for Polymer),
Data Block 3	Maximum three characters (1 character for application and 1 or 2 character for additives),
Data Block 4	Maximum three characters (1 character for MFI and 2 characters for flexural and Izod)
Data Block 5	Maximum four characters (2 characters for reinforcing material and their physical form and 1 or 2 characters for mass content percentage)
Data Block 6 (Optional)	Maximum eleven characters (Combination of different reinforcing material with dosing percentage and separated by Plus sign including the Bracket in beginning and end as per clause **3.8**)

Typical example of designatory code for PP resin:

Designation Code : IS 10951-1-MJC-B						
	IS 10951	1	M	J	C	B

<table>
<tr><td rowspan="4">Data Block 1</td><td rowspan="2">Indian Standard</td><td rowspan="2">Propylene homopolymers</td><td rowspan="3">Injection molding</td><td rowspan="3">Antistatic agent</td><td rowspan="3">Heat ageing stabilizer</td><td rowspan="4">> 6 to ≤10 g/10 min</td></tr>
<tr></tr>
<tr><td>Data Block 2</td><td colspan="2">Material</td></tr>
<tr><td rowspan="2">Data Block 3</td><td colspan="3">Application or processing method</td></tr>
<tr><td colspan="4">Additives</td></tr>
<tr><td>Data Block 4</td><td colspan="6">Supplementary information / special additive</td></tr>
<tr><td>Data Block 4</td><td colspan="6">MFI at 230 °C at 2.16 kg load</td></tr>
</table>

Typical example of designatory code for PP compound:

Designation Code : IS 10951-4-MJC-BDE-GF16-(25TD+12CF)											
	IS 10951	4	M	J	C	B	D	E	GF	16	25TD+12CF
Data Block 1	Indian Standard	Compound	Injection molding	Antistatic agent	Heat ageing stabilizer	> 6 to ≤10 g/10 min	> 1200 to ≤ 2000 MPa	> 200 to ≤ 300 J/m	Glass Fiber as reinforcing agent	16.4% loading of Glass fiber	25.1% Talc Powder (TD) and 11.9% Carbon Fiber(CF)
Data Block 2	Material										
Data Block 3	Application or processing method										
	Additives										
	Supplementary information / special additive										
Data Block 4	MFI at 230 °C at 2.16 kg load										
	Flexural modulus										
	Izod Impact										
Data Block 5	Fillers and reinforcing material and their physical forms										
	Mass content of fillers and reinforcing material										
Data Block 6	Combination of different reinforcing materials with dosing percentage (optional)										

NOTE — Data block 4 (flexural and izod impact), block 5 is additional requirement for polypropylene compounds only and data block 6 is optional requirement for polypropylene compounds only.

3.9.1 *Example of Polypropylene Resin*

A polypropylene homopolymers (1) intended for film extrusion (F), which is stabilized with antioxidant (B) and additionally slip and antiblock (H) is added having melt flow rate of 10 g/10 min (B), shall be designated as:

Data Block	Block 1	Block 2	Block 3	Block 4
Terminology	IS 10951	1	FBH	B
Designation code	IS 10951	1-FBH-B		

3.9.2 *Example of Polypropylene Compound*

A propylene compound (4) for injection moulding application (M), with nucleating agent (L) and impact modifier (S) having a melt flow rate of 3.5 g/10 min (A), flexural modulus of 1200 MPa (C) and an impact strength of 225 J/m (E). This is also modified with 15 percent talc (T) in powder form (D), which would be designated as:

Data Block	Block 1	Block 2	Block 3	Block 4	Block 5
Terminology	IS 10951	4	MLS	ACE	TD15
Designation code	IS 10951	4-MLS-ACE-TD15			

4 PREPARATION OF TEST SPECIMEN FOR POLYPROPYLENE COMPOUND

It is essential that specimens are always prepared by the same procedure (injection moulding), using the same processing conditions as given in **4.2**. The procedure to be used for each test method is indicated in Table 7.

4.1 Treatment of the Material before Moulding

Before processing, no pretreatment of the material sample is normally necessary.

4.2 Injection Moulding

Injection moulded specimens shall be prepared in accordance with ASTM D4101 using the conditions specified in Table 7.

Table 7 Conditions for Injection Moulding of Test Specimens
(*Clause* **4, 4.2**)

Sl No.	**MFR (g/10min)**	***Melting resin temperature (°C)**	**Mold temperature (°C)**	**Average melting resin speed (mm/min)**	**Pressure keeping time (s)**	**Injection Pressure and Speed**	****Total cycle time (s)**	**Back Pressure (MPa)**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i.	<1.0	250 – 270 (*see* note 1)	60 ± 3	200 ± 100	20	Note 2	45	0.7
ii.	1.0-1.5	250	60 ± 3	200 ± 100	20		45	0.7
iii.	1.6-2.5	240	60 ± 3	200 ± 100	20		45	0.7
iv.	2.6-4.0	230	60 ± 3	200 ± 100	20		45	0.7

v.	4.1-6.5	220	60 ± 3	200 ± 100	20		45	0.7
vi.	6.6-10.5	210	60 ± 3	200 ± 100	20		45	0.7
vii.	10.6-17.5	200	60 ± 3	200 ± 100	20		45	0.7
viii.	17.6-30.0	190	60 ± 3	200 ± 100	20	Note 3	45	0.7
ix.	>30.0	190	60 ± 3	200 ± 100	20		45	0.7

NOTES:

1. Should be raised in 5°C increments from 250°C until the part weight of the entire shot is equivalent to the part weight of 1 to 5 g/10 min material.
2. Use the single stage pressure. Injection speed and pressure shall be set to produce equal part weights (including sprue and runners ± 2 percent) regardless of MFR.
3. Injection and hold pressure shall be specified by manufacturer. In this range, injection and hold pressure may be set different pressures.

* Melting resin temperature. It is to be measured at accuracy of ± 3 °C.

** The total moulding cycle time shall be 45 (s) consisting of Injection(20s), cooling(20s), Mould open (5s).

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 polypropylene materials and polypropylene compounds is melt mass flow rate (MFR) or melt flow rate (MFI). The flexural modulus and Izod impact strength is additional requirement for the polypropylene compounds.

6.2.1.1 *Melt mass-flow rate (MFR)*

a) The melt mass flow rate of the material shall be designated as per Table 3, based on the value as agreed to between the purchaser and the supplier. It shall be determined by the method prescribed in IS 13360 (Part 4/Sec 1/Subsec 1)/ IS 13360 (Part 4/Sec 1/Subsec 2)/ASTM D1238 at 230 °C with a load of 2.16 kg. The value of melt flow rate shall be within ± 20 percent of the

specified nominal melt flow rate, if this is 1 g/10 min or above and shall be within ± 30 percent of the specified nominal melt flow rate, if this is less than 1 g/10 min.

b) In case of resin or grade used for blending applications, designation code of MFI in data block 4 will be based on the actual tested value for MFI or MFR of batch/lot and 'intended application or method of processing' will be codified as 'Z' (Clause 3.4). The value of melt flow rate may vary up to ± 40 percent from the measured/reported value.

6.2.1.2 *Flexural modulus*

The flexural modulus of the material shall be designated as per Table 4, based on the value as agreed to between the purchaser and the supplier. It shall be determined by the method prescribed in IS 13360 (Part 5/Sec 7)/ASTM D790. The value of flexural modulus shall be within ± 20 percent of the specified flexural modulus, if this is 1 200 MPa or above and shall be within ± 30 percent of the specified flexural modulus, if this is less than 1 200 MPa.

6.2.1.3 *Izod impact strength*

The Izod impact strength of the material shall be designated as per Table 5, based on the value as agreed to between the purchaser and the supplier. It shall be determined by the method prescribed in 13360 (Part 5/ Sec 4)/ASTM D256. The value of Izod impact strength shall be within ± 20 percent of the specified Izod impact if this is less than 120 J/m and shall be within ± 30 percent of the specified Izod impact strength if this is 120 J/m or above.

6.3 Special Requirements for Foodstuffs, Pharmaceuticals and Drinking Water Applications

6.3.1 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 only.

6.3.2 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.

6.3.3 The requirements mentioned in **6.3.2** shall 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 **6.3.2** needs to 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 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/Batch*

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

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

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

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

8.3 Sampling Instrument

8.3.1 The sampling instrument made of stainless steel 8. 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.

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 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

Each of the test results for melt flow rate, flexural and izod impact satisfies the corresponding requirements given in **6.2.1.1**, **6.2.1.2** and **6.2.1.3**.

(Superseding IS 10951 : 2020 and IS 10910 : 1984)

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 yield strength, MPa	IS 13360 (Part 5/Sec 1)
	b) Elongation at yield, percent	and
	c) Tensile strength at break, MPa	IS 13360 (Part 5/Sec 2)
	d) Elongation at break, percent	
	e) Charpy impact strength, KJ/m^2	IS 13360 (Part 5/Sec 5)
	f) Hardness – Rockwell, R	IS 13360 (Part 5/Sec 13)
	– Shore, D	IS 13360 (Part 5/Sec 11)
ii)	Thermal Properties	
	a) Melting temperature, ºC	IS 13360 (Part 6/Sec 10)
	b) Temperature of deflection under load, ºC	IS 13360 (Part 6/Sec 3) IS 13360 (Part 6/Sec 17)
	c) Vicat softening temperature, ºC	IS 13360 (Part 6/Sec 1)
	d) Flammability, mm/min	IS/IEC 60695-11-10
	e) Ignitability (Oxygen index), percent	IS 13360 (Part 6/Sec 19)
iii)	Electrical Properties	
	a) Relative permittivity	IS 4486
	b) Dissipation factor	IS 13360 (Part 7/Sec 1)
	c) Volume resistivity	
	d) Surface resistivity	IS 2071 (Part 1)
	e) Dielectric strength	IS 2584
iv)	Other properties	
	a) Water absorption	IS 13360 (Part 8/Sec 1)
	b) Density	IS 13360 (Part 3/Sec 10)/ IS 13360 (Part 3/Sec 11)

ANNEX B

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS/ OTHER PUBLICATIONS

IS No./Other Publication	*Title*
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 13360 (Part 5/Sec 4) : 2021 / ISO 180 : 2019	Plastics — Methods of testing: Part 5 Mechanical properties, Section 4 Determination of izod impact strength (*second revision*)
IS 13360 (Part 5/Sec 7) : 2022 / ISO 178 : 2019	Plastics — Methods of testing: Part 5 Mechanical properties, Section 7 Determination of flexural properties (*second revision*)
IS 16738 : 2018	Positive list of constituents for polypropylene, polyethylene and their copolymers for its safe use in contact with foodstuffs and pharmaceuticals
ASTM D256-24	Standard test methods for determining the izod pendulum impact resistance of plastics
ASTM D 790-17	Standard test methods for flexural properties of unreinforced and reinforced plastics and electrical insulating materials
ASTM D 1238-10	Standard test method for melt flow rates of thermoplastics by extrusion plastometer
ASTM D4101-17	Standard classification system and basis for specification for polypropylene injection and extrusion materials

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 also 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:

i) 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.

ii) 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 storemen shall be trained in proper hygiene practices.