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IS 14535 (1998): Recycled plastics for the manufacturing of products - Designation [PCD 12: Plastics]



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“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक
उत्पादों के निर्माण के लिए
पुनःप्रक्रमित प्लास्टिक्स — पदनाम

Indian Standard
RECYCLED PLASTICS FOR THE
MANUFACTURING OF PRODUCTS —
DESIGNATION

ICS 83.080.01

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

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Price Group 2

FOREWORD

This Indian Standard 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.

Over the last few years plastics have become an indispensable part of our life. They have taken over from glass, metal and paper as the material of choice in most sectors. With rapid increase in consumption of plastics and diversification of the products applications, the volume of plastics wastes have grown phenomenally over the last few years. The volume of plastics waste is expected to grow at a rate of 40 percent of the annual plastics consumption, approaching the figure of 2 million tonnes per annum at the end of the century.

The plastics waste contributes to the solid waste system by about 4 percent by weight and possibly twice by volume. Since the major portion of waste goes to landfill, the amount of plastics in the solid waste stream is considered as a contributing factor to the increasing waste burden because of its nonbio-degradable nature. Recycling has become a vital element in integrated waste management. This approach ensures a sizeable decrease in the amounts of plastics wastes going into landfill by efficient and cost effective use of residual value in plastics for useful products and non-critical applications thus helping conserve precious resources.

These considerations led the committee to formulate specification for designating recycled plastics material being used for manufacturing of various products.

**AMENDMENT NO. 1 MARCH 2002
TO
IS 14535 : 1998 RECYCLED PLASTICS FOR THE
MANUFACTURING OF PRODUCTS — DESIGNATION**

(Page 2, clause 4.1.5.1) — Substitute '285' for '210' against PET.

(PCD 12)

Reprography Unit, BIS, New Delhi, India

Indian Standard

RECYCLED PLASTICS FOR THE MANUFACTURING OF PRODUCTS — DESIGNATION

1 SCOPE

1.1 This standard is intended to be used for the identification and classification of the recycled plastics material on the basis of its basic properties and applications.

1.2 This standard applies to recycled plastics material ready for normal use without any further modifications.

1.3 Though some modifications and test methods have been provided in this standard any specific modification and the relevant test method which may be necessary in some specific applications shall have to be agreed upon between the purchaser and the supplier.

1.4 Though this designation system is only indicative of a broad classification of the recycled material, the absolute value of the test results may be provided which shall be agreed to between the purchaser and the supplier.

2 NORMATIVE REFERENCES

The following standard contain provisions which, through reference in this text, constitute provisions of this 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
2530 : 1963	Method of test for PE moulding materials and polyethylene compounds
2828 : 1964	Glossary of terms used in the plastic industry
7019 : 1982	Glossary of terms in plastics and flexible packaging, excluding paper (first revision)

IS No.

Title

13360 (Part 4/ Sec 1) : 1995/ 4 Rheological properties, Section ISO 1133 : 1991 1 Determination of the melt mass—Flow rate (MFR) and the melt volume — Flow rate (MVR) of thermoplastics

14534 : 1998 Guidelines for recycling of plastics

3 TERMINOLOGY

For the purpose of this standard the definitions given in IS 2828, IS 7019 and IS 14534 shall apply.

4 CLASSIFICATION

The recycled polymer material shall be colourfast when tested by the method prescribed in Annex A and shall be classified on the basis of its characteristics. A combination of numerals and alphabets shall be used to identify them. The designation system shall consist of 8 blocks such as:

Block 1	— Indian Standard
Block 2	— Identification of plastics by its recycling symbol
Block 3 (alphabets)	— Source of waste or scrap
Block 4 (2 numerals)	— Material detail
Block 5 (alphabets and 1 numeral)	— Density
Block 6 (alphabets and 2 numerals)	— Melt Flow Rate (MFR)
Block 7 (alphabets and 2 numerals)	— Filler detail and ash content (percentage)
Block 8 (alphabets)	— Physical form

4.1 Identification

4.1.1 The manufacturers of plastics end products from either virgin or recycled plastics shall mark the symbol at the time of processing in order to help the reproducers to identify the basic raw material. The symbols (*see also* 6.1 of IS 14534) defined by Society of the Plastics Industry (SPI), USA are as follows:



PET

HDPE

V

LDPE

PP

PS

OTHER

NOTE — PET — Polyethylene terephthalate, HDPE — High density polyethylene, V — Vinyl (PVC), LDPE — Low density polyethylene, PP — Polypropylene, PS — Polystyrene and Other means all other resins and multi-materials like ABS (Acrylonitrile butadiene styrene), PPO (Polyphenylene oxide), PC (Polycarbonate), PBT (Polybutylene terephthalate), etc.

IS 14535 : 1998

While marking the symbol 7, the respective basic raw material like ABS, PPO, PC, PBT, etc and mixed shall be indicated below the symbol.

4.1.2 The coding system for source of waste or scrap shall be as follows:

- A — Resin (like plant waste)
- B — Blow moulded products
- C — Pipe, profile
- D — Films/sheets products
- E — Cable and wire
- F — Laminated products
- G — Injection moulded products
- H — Compression moulded products
- J — Rotational moulded products
- K — Tapes/filament/fabric/strapping
- L — Mixed plastics
- M — Machine waste
- N — Others

4.1.3 Material details in respect of additives, colourants shall be defined as follows:

- 00 — Made from natural scrap without any colourant(s) or additive(s) added further
- 01 — Made from natural scrap with additional colourant(s) and/or additive(s)
- 10 — Made from mixed coloured scrap without any colourant(s) and/or additive(s) added further
- 11 — Made from mixed coloured scrap with additional colourant(s) and/or additive(s)

4.1.4 The coding system for density when determined by the method prescribed in Annex B shall be as follows:

- d1 — ≤ 0.925
- d2 — $> 0.925 \leq 0.940$
- d3 — $> 0.940 \leq 1.00$
- d4 — > 1.00

4.1.5 The coding system for Melt Flow Rate (MFR) when determined by the method prescribed in IS 13360 (Part 4/Sec 1)/ISO 1133 using the temperature and weight specified in 4.1.5.1 shall be as follows:

- M01 — < 1
- M02 — 1-6
- M03 — 7-12
- M04 — 13-25
- M05 — > 25

4.1.5.1 Melt flow rate is the weight of the material extruded in 10 minutes through a standard orifice (2.095 mm diameter) under specified temperature and weight. The recommended temperature and weight are indicated below:

Material	Temperature (°C)	Weight (kg)
Acetals	190	2.16
Acrylics	230	3.8
ABS	200	5.0
Cellulose ester	190	2.16
Nylon	235	5.0
Polyethylene	190	2.16
Polycarbonate	300	1.2
Polypropylene	230	2.16
Polystyrene	190	5.0
PET	210	2.16
PVC compounds	185	20.0

NOTES

1 The Melt Flow Rate (MFR) of any other material shall be determined at temperature and weight as decided by the supplier but at any one of the above conditions.

2 Moisture sensitivity can significantly influence flow rate results for some material. Appropriate material specifications shall be referenced for specific pre-drying or sample handling.

3 In case of those polymers for which the MFR measurement is unreliable, appropriate property (ex. IV in case of PET) can be specified.

4.1.6 The coding system for the filler material shall be as follows.

4.1.6.1 Filler material

- B — Boron
- C — Carbon
- G — Glass
- K — Chalk (Calcium Carbonate)
- L — Cellulose
- M — Metals
- T — Talc
- W — Wood
- X — No filler
- Z — Others

4.1.6.2 The coding system for the Ash Content (percent) when determined by the method prescribed in Annex C shall be as follows:

- 00 — < 1
- 01 — 1 to 10
- 02 — 11 to 20
- 03 — 21 to 30
- 04 — 31 to 40
- 05 — 41 to 50
- 06 — > 50

The ash content of the material shall be within ± 5 percent of what is specified in the designation.

NOTE — If the filler is carbon black, the determination of ash content shall be done in accordance with 10 of IS 2530.

4.1.7 The Coding system for the physical nature of material shall be as follows:

- G — Granules, and
- S — Scales, flakes.

4 D00d1M02T01G

Data Block 1 Indian Standard	4	D	00	d1	M02	T01	G
Data Block 2 Identification of Plastics by its recycling Symbol — Low Density Polyethylene (LDPE)							
Data Block 3 Source (Film and sheets)							
Data Block 4 Material [Natural scrap without any pigments(s) or additional(s) added further]							
Data Block 5 Density							
Data Block 6 MFR							
Data Block 7 Filler material and ash content (percent)							
Data Block 8 Physical form (granules)							

4.2 Coding Example

A recycled plastics material designated as 4 D00d1M02T01G is recycled low density polyethylene material made from film and sheet waste. This recycled material is made out of natural scrap without any colorants or additive(s) added further. The density of this material is less than 0.925 and MFR is of the range 1-6. This material is containing talc and the ash content in the range of 1-10 percent. This material is supplied in the form of granules.

ANNEX A (Clause 4)

DETERMINATION OF COLOUR FASTNESS TO WATER

A-1 TEST SPECIMEN

A-1.1 Specimen

The final recyclate.

A-1.2 Weight of Specimen

10 g of recyclate.

A-1.3 The test specimens shall be free from any external contamination.

A-2 PROCEDURE

Put the specimen in a 250-ml beaker. Cover the specimen with approximately ten times its weight of distilled water. Keep the granules in the boiling water for 1 h. Examine the water for discoloration by comparing it against a white background with a sample of distilled water.

A-3 REPORT

If the water is free from colour, it shall be reported that the colour fastness of the material to the water is satisfactory.

ANNEX B

(Clause 4.1.4)

DETERMINATION OF DENSITY

B-1 APPARATUS

B-1.1 Beakers — 500 ml, 1 000 ml.

B-1.2 Measuring Cylinder — 500 ml.

B-1.3 Glass Stirrer

B-1.4 Test Specimen

B-1.4.1 The test specimen shall be the final recycle material.

B-1.4.2 The test specimen shall be free from any external contamination, holes or air traps.

NOTE — If the material is in the powder form, the test specimen shall be made by compressing the powder into a suitable size.

B-2 SOLVENT

B-2.1 Methanol — pure grade.

B-2.2 Distilled Water

B-3 PROCEDURE

Take 3 clean beakers. Mix methanol and water in the proportion given in Table 1 to get required density.

Table 1 Methanol and Water Proportions
(Clause B-3)

Specific Gravity (30/30°C) (1)	Part by Volume of	
	Methanol (2)	Water (3)
0.925	51.8	48.2
0.940	43.1	56.9
1.000	00.00	100.0

Stir the solution for 1 minute. Transfer the solution to three 500-ml beakers and mark them to 1, 2 and 3. Maintain the solution at a constant temperature of 30°C. After 15 minutes, introduce 3-4 test samples to the first column. Observe after 5 minutes whether the test specimen has floated or sunk.

If the sample has sunk in the first column, introduce the test specimen to the second column and maintain the solution at a constant temperature of 30°C. Observe whether the test specimen has floated or sunk.

If the sample has sunk in the second column, introduce the test specimen to the third column and maintain the solution at a constant temperature of 30°C. Observe whether the test specimen has floated or sunk.

B-4 REPORT

Report the density in accordance with the coding system depending on in which column the sample floats or sinks.

NOTE — When introducing the sample care must be taken to avoid any air bubble is getting stuck on the sample.

ANNEX C

(Clause 4.1.6.2)

DETERMINATION OF ASH CONTENT

C-1 APPARATUS

C-1.1 Muffle Furnace

C-1.2 Silica Crucible — of 150-ml capacity.

C-1.3 Balance — accuracy ± 10 mg.

C-2 TEST SPECIMEN

50 g — The test specimen shall be free from any external contamination.

C-3 PROCEDURE

Take a clean crucible. Heat it for 50 minutes on burner, cool it to room temperature in dessicator for 20 minutes and weigh the empty crucible. Weigh accurately 50 g of the sample in the crucible. Place the sample in the furnace for 1 h for 360°C. Increase the furnace temperature to 800°C and keep the sample further for 2 h. Remove the crucible from the furnace and cool to room temperature in a dessicator and weigh it to find the amount of residue.

NOTE — If the filler is carbon black the determination of ash content shall be done in accordance with 10 of IS 2530.

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