



Designation: D 787 – 96

Standard Specification for Ethyl Cellulose Molding and Extrusion Compounds¹

This standard is issued under the fixed designation D 787; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers requirements for plasticized ethyl cellulose thermoplastic compounds suitable for injection molding and extrusion. It does not include special materials compounded for special applications.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 The following precautionary statement pertains only to the Test Methods portion, Section 10 of this specification. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

NOTE 1—There is no equivalent or similar ISO standard.

2. Referenced Documents

2.1 ASTM Standards:

- D 256 Test Methods for Determining the Pedulum Impact Resistance of Notched Specimens of Plastics²
- D 569 Test Method for Measuring the Flow Properties of Thermoplastic Molding Materials²
- D 570 Test Method for Water Absorption of Plastics²
- D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing²
- D 638 Test Method for Tensile Properties of Plastics²
- D 648 Test Method for Deflection Temperature of Plastics Under Flexural Load²
- D 759 Practice for Conducting Physical Property Tests of Plastics at Subnormal and Supernormal Temperatures³
- D 785 Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials²

¹ This specification is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.15 on Thermoplastic Materials.

Current edition approved April 10, 1996. Published July 1996. Originally published as D 787 – 44 T. Last previous edition D 787 – 81 (1995).

This edition includes the addition of an ISO equivalency statement and a Keywords section, the elimination of superfluous references to user/seller agreements, and the removal of specific requirements relating to Federal/Military procurement. Some references to *specimens* were changed to *samples* in keeping with normal usage within ASTM materials standards.

² *Annual Book of ASTM Standards*, Vol 08.01.

³ Discontinued, see 1982 *Annual Book of ASTM Standards*, Vol 08.01.

- D 792 Test Methods for Specific Gravity (Relative Density) and Density of Plastics by Displacement²
- D 883 Terminology Relating to Plastics²
- D 1505 Test Method for Density of Plastics by the Density-Gradient Technique²
- D 1897 Practice for Injection Molding Test Specimens of Thermoplastic Molding and Extrusion Materials²
- D 1898 Practice for Sampling of Plastics²
- D 3892 Practice for Packaging/Packing of Plastics⁴

3. Terminology

3.1 Terms in this specification are in accordance with Terminology D 883.

4. Classification

4.1 This specification covers two types and eleven grades of ethyl cellulose molding and extrusion compounds as classified in accordance with Table 1. Type I materials are general purpose and Type II are characterized by improved resistance to impact, especially at low temperatures. The grades are classified in accordance with their physical properties as specified in Table 1.

5. Ordering Information

5.1 Purchase orders for, or inquiries about, the materials described in this specification shall identify the following:

5.1.1 The number of this specification and the required type and grade chosen from Table 1, for example, D 787 Type 1, Grade 1.

5.1.2 Supplementary requirements in accordance with this specification if necessary.

5.1.3 Color and opacity within the limits defined in 6.4.

5.1.4 Particle form and size if choice is available.

5.1.5 Such other requirements as may be agreed between the seller and the purchaser.

6. Materials and Manufacture

6.1 Materials supplied under this specification shall be ethyl cellulose plastics in the form of pellets unless otherwise specified.

6.2 Material supplied in these forms shall be as uniform in composition and size and as free of contamination as can be achieved by good manufacturing practice.

⁴ *Annual Book of ASTM Standards*, Vol 08.02.



TABLE 1 Detailed Requirements for Molded Test Specimens

NOTE 1—ft·lbf/in. × 53.3378660 = joules per metre. Megapascals (MPa) = newtons × 10⁶ per metre squared.

Property	Type I							Type II				Test Methods
	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	
Specific gravity, unpigmented, max at 23/23°C (73.4/73.4°F)	1.13	1.13	1.12	1.12	1.11	1.10	1.12	1.12	1.11	1.11	1.10	D 792
Hardness (Rockwell) R scale, min	110	110	105	105	100	95	105	80	75	75	50	D 785
Tensile strength at 23°C, min: MPa psi	44.8 6500	41.4 6000	38.1 5400	33.0 4800	31.0 4500	24.2 3800	27.6 4000	24.1 3500	20.7 3000	20.0 3300	15.9 2900	D 638
Impact strength (Izod), min at 23°C (73.4°F): J/m of notch ft·lbf/in. of notch	90.7 1.7	90.7 1.7	106.7 2.0	106.7 2.0	117.3 2.2	149.5 2.8	186.7 3.5	213.5 4.0	293.4 5.5	213.5 4.0	320.3 6.0	D 256
at -40°C (-40°F): J/m of notch ft·lbf/in. of notch	26.7 0.5	26.7 0.5	26.7 0.5	26.7 0.5	26.7 0.5	26.7 0.5	53.4 1.0	64.1 1.2	80.1 1.5	53.4 1.0	80.1 1.5	D 758
Deflection temperature, min: at 1820-kPa (264-psi) fiber stress: °C °F	82 180	77 170	71 160	66 150	60 140	49 120	66 150	77 170	71 160	60 140	49 120	D 648
at 455-kPa (66-psi) fiber stress: °C °F	94 200	88 190	82 180	77 170	71 160	66 150	82 180	82 180	82 180	77 170	— —	
Water absorption (24-h immersion), max %	1.7	1.5	1.4	1.2	1.1	1.0	1.3	1.5	1.5	1.5	1.5	D 570
Weight loss on heating (72 h at 82°C), max %	0.3	0.4	0.6	0.8	1.5	1.8	2.0	1.2	2.0	2.0	2.0	D 787

6.3 These materials may contain colorants in the nominal amounts ordinarily employed, but such additives shall not alter the ability of the materials to meet the specified properties.

6.4 The color and transparency or opacity of items fabricated under the conditions recommended by the manufacturer of the material shall be comparable within commercial match tolerances to the color and transparency or opacity of samples submitted in advance by the manufacturer and approved by the purchaser.

7. Physical Requirements

7.1 Test specimens of the material shall conform to the requirements prescribed in Table 1.

7.2 Molded specimens for those tests requiring them shall be prepared as described in Section 10.

7.3 Flow temperature of a given compound shall be within ± 5°C of the flow temperature designated in the contract or order.

7.4 Conformance to the requirements of this specification shall be determined by means of the tests identified in Section 11 unless otherwise specified.

8. Sampling

8.1 The material shall be sampled in accordance with Sections 9 to 12 of Practice D 1898. Adequate statistical sampling prior to packaging shall be considered an acceptable alternative.

8.2 For sampling purposes, a batch or lot shall be considered a unit of manufacture as prepared for shipment and may consist of a blend of two or more production runs of material.

9. Number of Tests

9.1 Routine testing of each batch or lot shall be limited to properties designated in Table 1 of this specification.

9.2 One set of samples for those tests that are designated (Section 11), shall be considered sufficient for testing the batch or lot. The average results of those samples shall comply with the requirements prescribed in this specification.

10. Specimen Preparation

10.1 Requirements in Table 1 are based on injectionmolded specimens 3.2 mm (1/8 in.) thick. Machined specimens from compression-molded blanks or extruded strips may be used provided it can be shown that the results are comparable.

10.2 Prior to molding ethyl cellulose, the material should be dried to a moisture content of 0.2 % or less. Material spread in a tray to a maximum depth of 51 mm (2 in.) and exposed in a circulating-air oven at 76.5 to 88°C (170 to 190°F) for 3 h should be satisfactory. Control the injection molding condition on cycle in accordance with Practice D 1897, using a material temperature of 10 to 25°C (13 to 45°F) below the level that causes discoloration of the plastic. Mold temperatures of 48 to 71°C (120 to 160°F) have been found desirable. As a rule, thin section molding and the higher flow temperature compounds require the higher mold temperature.

11. Test Methods

11.1 Determine the properties defined by this specification in accordance with the following methods:



11.1.1 Unless otherwise specified, all tests shall be performed in the standard laboratory atmosphere as defined by Practice D 618.

11.1.2 Unless otherwise specified, molded test specimens shall be conditioned in accordance with Procedure A of Practice D 618.

11.1.3 *Flow Temperature*—Procedure A of Test Method D 569.

11.1.4 *Rockwell Hardness*—Procedure A of Test Method D 785.

11.1.5 *Specific Gravity*—Method A of Test Methods D 792, or Test Method D 1505.

11.1.6 *Tensile Strength*—Test Method D 638, Type I test specimen, 5.0-mm (0.2-in.)/min testing speed.

11.1.7 *Impact Strength (Izod)*—Method A of Test Methods D 256, and Practice D 759. Specimen size: 63.5 mm (2½ in.) long, by 12.7 mm (½ in.) wide, by 3.2 mm (⅛ in.) thick.

11.1.8 *Deflection Temperature*—Test Method D 648. Condition test specimens in accordance with Procedure B of Practice D 618.

11.1.9 *Water Absorption*—Test Method D 570, 2424-h immersion. Condition in accordance with Test Method D 570.

11.1.10 *Weight Loss on Heating*—Condition test specimens, 50.8 mm (2 in.) in diameter or 50.8 mm wide by 63.5 mm (2½ in.) long by 3.2 mm (⅛ in.) thick, for 48 h over anhydrous calcium chloride at $23 \pm 1^\circ\text{C}$ ($73.4 \pm 1.8^\circ\text{F}$). Weigh three specimens and then place them in a circulating-air oven for 72 h at $82 \pm 1^\circ\text{C}$ ($180 \pm 1.8^\circ\text{F}$). Support the specimens flatwise

on a screen in the oven. Upon removal from the oven, cool the specimens in a desiccator over anhydrous calcium chloride to $23 \pm 1^\circ\text{C}$ ($73.4 \pm 1.8^\circ\text{F}$). Then weigh the specimens and calculate the percentage weight loss on heating on the basis of the conditioned weight.

12. Inspection

12.1 Inspection of the material shall be as described in Sections 7 and 8.

13. Rejection

13.1 If any failure occurs, the materials may not be certified to this specification.

14. Packaging and Package Marking

14.1 *Packaging*—The material shall be packaged in standard commercial containers, so constructed as to ensure acceptance by common or other carriers for safe transportation to the point of delivery.

14.2 *Package Marking*—Shipping containers shall identify the material and its supplier, the batch or lot number, its type, and the quantity contained.

14.3 All packing, packaging, and marking provisions of Practice D 3892 shall apply to this specification.

15. Keywords

15.1 cellulose; ethylcellulose; extrusion; molding; plasticized; specification

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org).