



Designation: **D 4673 – 9802**

An American National Standard

Standard Classification System for Acrylonitrile–Butadiene–Styrene (ABS) Plastics and Alloys Molding and Extrusion Materials¹

This standard is issued under the fixed designation D 4673; 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 classification system covers only ABS materials and ABS alloys suitable for injection molding and extrusion. Some of these compositions may also be suitable for compression molding. Recycle ABS and alloys will be addressed in a separate standard.

1.2 This classification system is not intended for the selection of materials, but only as a means of calling out materials to be used in the manufacture of parts. Materials are to be selected by personnel with expertise in the plastics field where the economics, the environment to be encountered, the inherent properties of the materials, the part design, the part performance required, and the manufacturing process to be employed all enter into the selection.

1.3 The properties included in this classification system are those required to identify the compositions covered. There may be other requirements necessary to identify particular characteristics important to specialized applications. These will be agreed upon between the user and the supplier by using the suffixes given in Section 5.

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

1.5 The following precautionary caveat pertains only to the test methods portion, Section 12, of this classification system: *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—This classification system and ISO 2580 are technically equivalent for those tests contained in both standards.

2. Referenced Documents

2.1 *ASTM Standards:*

¹ This classification system is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.15 on Thermoplastic Materials.

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*A Summary of Changes section appears at the end of this standard.

- D 256 Test Method for Determining the Pendulum Impact Resistance of Notched Specimens 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 790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials²
- D 883 Terminology Relating to Plastics²
- D 1003 Test Method for Haze and Luminous Transmittance of Transparent Plastics²
- D 1525 Test Method for Vicat Softening Temperature of Plastics²
- ~~D 1898 Practice for Sampling of Plastics²~~
- ~~D 1999 Guide 1999 Guide for the Selection of Specimens and Test Parameters for International Commerce²~~
- ~~D 2584 Test Method 3641 Practice for Ignition-L Molding Test Specimens of Cured Reinforced Resins Thermoplastic Molding and Extrusion Materials³~~
- ~~D 3641 Practice for Injection Molding Test Specimens of Thermoplastic Molding and Extrusion Materials³~~
- ~~D 3892 Practice 3892 Practice for Packaging/Packing of Plastics³~~
- D 4000 Classification System for Specifying Plastic Materials³
- ~~D 5630 Test Method for Ash Content in Plastics⁴~~
- E 105 Practice for Probability Sampling of Materials⁵
- 2.2 ISO Standards:⁶
 - ISO/DIS 75 Plastics and Ebonite—Determination of Temperatures of Deflection under Load
 - ~~ISO/DIS 178 Plastics—Determination of Flexural Properties~~
 - ISO 18079 Plastics—Determination of Izod Charpy Impact Strength of Rigid Materials
 - ISO 291 Plastics—Standard Atmosphere for Conditioning and Testing
 - ISO/DIS 294 Plastics—Injection Moulding Test Specimen of Thermoplastics Materials
 - ISO 306 Plastics—Determination of Vicat Softening Temperature
 - ISO/DIS 527, Parts 1 and 2, Plastics—Determination of Tensile Properties
 - ISO 2580 Acrylonitrile/Butadiene/Styrene (ABS) Moulding and Extrusion Materials, Part 2
 - ISO 3167 Preparation and Use of Multipurpose Test Specimen

3. Terminology

3.1 *Definitions*—Definitions of technical terms used in this classification system are in accordance with Terminology D 883.

4. Classification

4.1 ABS materials, based on three or more monomers, are grouped rather than rigidly classified. These groups are then subdivided by class and then grades. In cases in which a resin may be classed into more than one group, the supplier will determine the specific callout(s). Table ABS has both ASTM procedure method and ISO procedure versions for callout under the preferred test system.

TABLE ABS ASTM/ISO Values, Requirements, Natural Color Only⁴

NOTE 1—For property test parameters, see Section 12.

Group	Description	Class	Description	Grade	Description	Tensile	Flexural	Izod Impact		Softening, Test Method D 1525, °C, 120°/h	Temperature or ISO 306, °C, 50°/h
						Strength, MPa, ^B Test Method D 638/ISO 527	Modulus, MPa, Test Methods Flexural D 790/ISO 178 Tensile ISO 527	Izod J/m ² , ^C Test Method D 256	Charpy kJ/m ² , ^D ISO 179		
04	Molding	4	medium impact	4		45	2700	-40	-5	-90	-85
01	Molding	1	medium impact	1		45	2600	40	-	90	85
				2		40	2400	125	15	-90	-85
				2		40	2400	125	6	90	85
				3		40	2200	150	20	-90	-85
				3		40	2200	150	8	90	85

² Annual Book of ASTM Standards, Vol 08.01.

³ Annual Book of ASTM Standards, Vol 08.02.

⁴ Available from American National

⁴ Annual Book of ASTM Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036., Vol 08.03

⁵ Annual Book of ASTM Standards, Vol 14.02

⁶ Available from American National Standards Institute, 25 W. 43rd St., 4th Floor, New York, NY 10036.

TABLE Continued

Group	Description	Class	Description	Grade	Description	Tensile	Flexural	Izod Impact		Charpy	Softening	Tempera-
						Strength, MPa, ^β Test Method D 638/ ISO 527	Modulus, MPa, Test Meth- ods Flex- ural D 790/ ISO Tensile ISO 527	J/m, ^α Test Method D 256	kJ/m ² , ^δ ISO 1480 179				Test Method D 1525, °C, 120°/h	ture or ISO 306, °C, 50°/h
				4		35	2200	-80	40	-90	-85	
				4		35	2200	80	5	90	85	
				5		32	1600	-70	-9	-90	-85	
				5		32	1600	70	3	90	85	
				0	other							
		2	high impact	4		35	2400	200	25	-90	-85	
		2	high impact	1		35	2100	200	13	90	85	
				2		35	2000	250	30	-90	-85	
				2		35	2000	250	16	90	85	
				3		30	1700	275	35	-90	-85	
				3		30	1700	275	19	90	85	
				4		30	1700	325	40	-90	-85	
				4		30	1700	325	25	90	85	
				5		25	1500	400	50	-90	-85	
				5		25	1500	400	30	90	85	
				6		30	1600	184	23	-90	-85	
				6		30	1600	184	12	90	85	
				0	other							
		3	high heat	4		45	2300	100	40	115	110	
		3	high heat	1		45	2300	100	5	115	110	
				2		40	2000	125	15	110	105	
				2		40	2000	125	6	110	105	
				3		40	2400	125	15	105	100	
				3		40	2400	125	6	105	100	
				4		35	2000	150	20	105	100	
				4		35	2000	150	10	105	100	
				5		35	2400	-80	40	105	100	
				5		35	2100	80	3	105	100	
				6		34	1700	-65	-8	-98	-93	
				6		34	1700	65	2	98	93	
				7		32	1800	-50	-6	105	100	
				7		32	1800	50	-	105	100	
				0	other							
		4	plating ^E	4		45	2600	150	20	105	100	
		4	plating ^E	1		45	2500	150	8	105	100	
				2		40	2700	-80	40	105	100	
				2		40	2600	80	3	105	100	
				3		40	2200	200	25	100	-95	
				3		40	2200	200	13	100	-95	
				4		35	2000	200	25	-95	-90	
				4		35	2000	200	13	95	90	
				5		34	2200	-80	40	-93	-88	
				5		34	2200	80	3	93	88	
				0	other							
		5	clear ^F	4		40	2300	-80	40	-85	-80	
		5	clear ^F	1		40	2300	80	3	85	80	
				0	other							
		6	additive FR ^G	4		40	2200	200	25	-85	-80	
		6	additive FR ^G	1		40	2200	200	13	85	80	
				2		40	2000	150	20	-85	-80	
				2		40	2000	150	8	85	80	
				3		35	2500	-80	40	-90	-85	
				3		35	2400	80	3	90	85	
				4		30	2000	150	20	-90	-85	
				4		30	2000	150	8	90	85	
				5		25	1800	-80	40	-85	-80	
				5		25	1800	80	3	85	80	
				0	other							
02	Extrusion	0	other	0	other							
		4	medium impact	4		50	2700	-80	40	-95	-90	
02	Extrusion	1	medium impact	1		50	2600	80	3	95	90	
				2		45	2400	-80	40	-90	-85	
				2		45	2400	80	3	90	85	
				3		40	2200	150	20	-90	-85	
				3		40	2200	150	8	90	85	
				4		40	2000	-80	40	-90	-85	

TABLE Continued

Group	Description	Class	Description	Grade	Description	Tensile Strength, MPa, ^B	Flexural Modulus, MPa, Test Methods Flex- ural D 790/ ISO 178	Izod Impact, J/m, ^C Test Method D 256	Charpy Impact, kJ/m ² , ^D Test Method ISO 179	Softening, Test Method D 1525, °C, 120°/h	Temperature or ISO 306, °C, 50°/h
						Method D 638/ ISO 527	ISO 527	Method D 256	ISO 179		
				4		40	2000	80	3	90	85
				5		35	2200	125	15	-90	-85
				5		35	2200	125	6	90	85
				0	other						
		2	high impact	4		35	2400	200	25	-90	-85
		2	high impact	1		35	2400	200	13	90	85
				2		35	2200	325	40	-90	-85
				2		35	2200	325	25	90	85
				3		30	2000	275	35	-90	-85
				3		30	2000	275	19	90	85
				4		30	2000	360	45	-90	-85
				4		30	2000	360	28	90	85
				5		25	1800	400	50	-90	-85
				5		25	1800	400	30	90	85
				6		25	1800	440	55	-90	-85
				6		25	1800	440	34	90	85
				0	other						
		3	FR	4		40	2300	280	35	-90	85
		3	FR	1		40	2300	280	19	90	85
				2		35	2000	275	35	-90	85
				2		35	2000	275	19	90	85
				3		35	2000	210	30	-85	80
				3		35	2000	210	17	85	80
		0	other	0	other						
03	Alloys ABS/PVC	4		4		50	2800	80	40	100	-95
03	Alloys ABS/PVC	1		1		50	2700	80	5	100	95
				2		40	1800	200	25	-90	-85
				2		40	1800	200	13	90	85
				3		40	1800	275	35	-80	-75
				3		40	1800	275	19	80	75
				4		35	2000	400	50	-70	-65
				4		35	2000	400	30	70	65
				5		50	2100	440	55	110	105
				5		50	2100	440	34	110	105
				6		35	2000	475	60	-70	-65
				6		35	2000	475	38	70	65
				7		45	2400	200	25	-80	-75
				7		45	2400	200	13	80	75
				0	other						
				0	other						
04	Alloys ABS/PC	4	medium impact	4		55	2200	360	45	115	110
04	Alloys ABS/PC	1	medium impact	1		55	2200	360	28	115	110
				2		55	2400	325	40	110	105
				2		55	2400	325	25	110	105
				3		50	2200	275	35	120	115
				3		50	2200	275	21	120	115
				4		45	2100	275	35	110	105
				4		45	2100	275	21	110	105
				5		40	1900	70	9	105	100
				5		40	1900	70	3	105	100
				0	other						
		2	high impact	4		55	2500	400	50	125	120
		2	high impact	1		55	2400	400	30	125	120
				2		50	2300	400	50	115	110
				2		50	2300	400	30	115	110
				3		50	2200	475	60	125	120
				3		50	2200	475	39	125	120
				4		48	2100	275	35	110	105
				4		48	2100	275	21	110	105
				5		45	2000	255	32	119	114
				5		45	2000	255	19	119	114
				0	other						
		3	high heat	4		60	2400	275	35	140	135
		3	high heat	1		60	2400	275	21	140	135
				2		55	2500	400	50	130	125
				2		55	2400	400	30	130	125

TABLE Continued

Group	Description	Class	Description	Grade	Description	Tensile	Flexural	Izod-Impact		Softening, Test Method D 1525, °C, 120°/h	Temperature or ISO 306, °C, 50°/h
						Strength, MPa, ^B Test Method D 638/ISO 527	Modulus, MPa, Test Method D 790/ISO 527	Izod, J/m, Test Method D 256	Charpy, kJ/m ² , ^D ISO 179		
				3		55	2000	500	40	125	120
				3		55	2000	500	41	125	120
				4		50	2300	360	45	135	130
				4		50	2300	360	28	135	130
				5		45	2400	600	75	130	125
				5		45	2100	600	50	130	125
				6		45	2000	325	40	128	123
				6		45	2000	325	25	128	123
				7		45	2000	325	40	149	144
				7		45	2000	325	25	119	114
				0	other						
		4	plating	4		50	2300	440	55	130	125
		4	plating	1		50	2300	440	36	130	125
				2		45	2200	400	50	120	115
				2		45	2200	400	30	120	115
				3		45	2400	360	45	140	105
				3		45	2100	360	28	110	105
				0	other						
		5	additive FR	4		60	2500	425	45	140	105
		5	additive FR	1		60	2400	125	6	110	105
				2		55	2500	200	25	140	105
				2		55	2400	200	13	110	105
				3		55	2500	400	45	90	85
				3		55	2400	400	30	90	85
				4		50	2000	440	55	140	105
				4		50	2000	440	36	110	105
				5		45	2400	275	35	140	105
				5		45	2100	275	21	110	105
				6		40	2000	440	55	140	105
				6		40	2000	440	36	110	105
				0	other						
		0	other	0	other						

^AAll cell values are minimums.

^BMPa × 145 = psi.

^CJ/m × 18.73 × 10⁻³ = ft-lbf/in.

^DkJ/m² × 0.476 = ft-lbf/in.². Test configuration 1aE.

^EPlating grades are those specifically recommended for plating or sputtering applications.

^FClear ABS has a light transmission of 70 % minimum. It may be tested using Test Method D 1003.

^GSpecific flammability requirements shall be specified by the user.

NOTE 2—An example of this classification system is as follows:

The designation ABS0111 would indicate:

ABS = acrylonitrile-butadiene-styrene,

01 (group) = injection-molding resin,

1 (class) = medium impact, and

1 (grade) = requirements given in Table ABS.

4.1.1 To facilitate the incorporation of future or special materials, the “other/unspecified” category (0) for group, class, and grade is shown in Table ABS. The basic properties can be obtained from Cell Table A, B, and C as they apply.

4.2 Reinforced and lubricated versions of the ABS materials are classified in accordance with Table ABS and Cell Table A. Table ABS specifies the unreinforced material and Cell Table A specifies the properties by either ASTM or ISO procedures after the addition of reinforcements or lubricants at the nominal level indicated.

4.2.1 A single letter shall be used for the major reinforcement or combination, or both, along with two digits that indicate the percentage of addition by mass, with the tolerance as tabulated below:

Symbol	Material	Tolerance
C	Carbon- and graphite-fiber reinforced	± 2 %
G	Glass-reinforced	± 2 %
L	Lubricants (for example, PTFE), graphite, silicone and molybdenum disulfide	depends on material and process—to be specified
M	Mineral-reinforced	± 2 %

R

Combinations of reinforcements or fillers, or both

± 3 % for the total reinforcement

NOTE 3—This part of the system uses percent of reinforcements or additives, or both, in the callout of the modified basic material. The types and percentages of reinforcements and additives should be shown on the supplier’s technical data sheet unless this information is proprietary in nature. If necessary, additional callout of these reinforcements and additives can be accomplished by the use of the suffix part of the system as described in Section 8.

4.2.2 Specific requirements for reinforced, filled, or lubricated materials shall be shown by a six-character designation. The designation shall consist of the letter A and the five digits comprising the cell numbers for the property requirements in the order in which they appear in Cell Table A.

CELL TABLE A Reinforced ABS/Alloys
(For property test parameters, see Section 12.)

Designation Grade	Property	Cell Limits											
		0	1	2	3	4	5	6	7	8	9		
1	Tensile strength, MPa ^A , min												
	Test Method D 638	unspecified	40	50	60	70	80	90	100	110	110	^B	
	ISO 527, 1, 2	unspecified	40	50	60	70	80	90	100	110	110	^B	
2	Flexural modulus, MPa, min												
	Modulus, MPa, min												
	Test Methods D 790	unspecified	3000	4000	5000	6000	7500	9000	11 000	15 000	15 000	^B	
	Test Methods D 790 Flexural	unspecified	3000	4000	5000	6000	7500	9000	11 000	15 000	15 000	^B	
	ISO 178	unspecified	3000	4000	5000	6000	7500	9000	11 000	15 000	15 000	^B	
	ISO 527 Tensile, chord	unspecified	3000	4000	5000	6000	7500	9000	11 000	15 000	15 000	^B	
3	Izod impact, min												
	Impact, min												
	Test Method D 256, J/m ^C	unspecified	30	45	60	75	90	105	120	140	140	^B	
	Test Method D 256, Izod, J/m ^C	unspecified	30	45	60	75	90	105	120	140	140	^B	
	ISO 180, kJ/m ^{2D}	unspecified	2	3	4	5	6	7	8	9	10	12	15
	ISO 179, Charpy, kJ/m ^{2D}	unspecified	2	3	4	5	6	7	8	9	10	12	15
4	Heat deflection temperature, °C, min												
	Test Method D 648	unspecified	65	85	90	95	100	105	110	115	115	^B	
	ISO/DIS 75	unspecified	65	85	89	94	98	103	108	112	112	^B	
5	To be determined	unspecified	...	...	...	...	...	...	...	...	...	...

^AMPa × 145 = psi.

^BSpecific value appears on drawing or contract, or both.

^CJ/m × 18.73 × 10⁻³ = ft·lbf/in.

^DkJ/m² × 0.476 = ft·lbf/in.². Test configuration 1aE.

CELL TABLE B Unreinforced ABS
(For property test parameters, see Section 12.)

Designation Grade	Property	Cell Limits											
		0	1	2	3	4	5	6	7	8	9		
1	Tensile strength, MPa ^A , min												
	Test Method D 638	unspecified	20	25	30	35	40	45	50	55	55	^B	
	ISO 527, 1, 2	unspecified	20	25	30	35	40	45	50	55	55	^B	
2	Flexural modulus, MPa, min												
	Modulus, MPa, min												
	Test Methods D 790	unspecified	1400	1600	1800	2000	2200	2400	2600	2800	2800	^B	
	Test Methods D 790, Flexural	unspecified	1400	1600	1800	2000	2200	2400	2600	2800	2800	^B	
	ISO 178	unspecified	1400	1600	1800	2000	2200	2400	2600	2800	2800	^B	
	ISO 527, Tensile, chord	unspecified	1400	1600	1800	2000	2200	2400	2600	2800	2800	^B	
3	Izod impact, min												
	Impact, min												
	Test Method D 256, J/m ^C	unspecified	30	100	150	200	250	300	350	400	400	^B	
	Test Method D 256, Izod, J/m ^C	unspecified	30	100	150	200	250	300	350	400	400	^B	
	ISO 180, kJ/m ^{2D}	unspecified	1	5	10	15	20	22	25	30	35	40	^B
	ISO 179, Charpy, kJ/m ^{2D}	unspecified	1	5	9	13	19	22	25	30	35	40	^B
4	Softening temperature, °C, min												
	Test Method D 1525	unspecified	75	90	95	100	105	110	115	120	120	^B	
	ISO 306	unspecified	70	85	90	95	100	105	110	115	115	^B	
5	To be determined	unspecified	...	...	...	...	...	...	...	...	...	...

^AMPa × 145 = psi.

^BSpecific value appears on drawing or contract, or both.

^CJ/m × 18.73 × 10⁻³ = ft·lbf/in.

^DkJ/m² × 0.476 = ft·lbf/in.². Test configuration 1aE.

4.2.2.1 Although the values listed are necessary to include the range of properties available in existing materials, users should not infer that every possible combination of the properties exists or can be obtained.

4.2.3 When the grade of the basic material is not known, or is not important, the use of “0” grade classification shall be used for reinforced materials in this system.

NOTE 4—An example of this classification for a reinforced ABS is as follows:

The designation ABS 120G30A55130 indicates:

- ABS 120 = Acrylonitrile-butadiene-styrene, molding resin, high impact
- G30 = Glass reinforced at 30 % nominal level,
- A = Cell Table A, property requirements,
- 5 = 80 MPa tensile strength, min,
- 5 = 7500 MPa flexural modulus, D 790, or tensile modulus, chord, ISO 527, min,
- 1 = 30 J/m Izod or 2 kJ/m² Charpy impact strength, min,
- 3 = 90°C heat deflection temperature, D 648, 89°C, ISO 75 min, and
- 0 = unspecified.

If no properties are specified, the designation would be ABS 120G30A00000.

4.3 Cell Table B has been incorporated into this classification system to facilitate the classification of special materials where Table ABS or Cell Table A does not reflect the required properties of ABS material. Cell Table B shall be used in the same manner as Cell Table A.

NOTE 5—An example of a special material using this classification system is as follows:

The designation ABS 210B54220 would indicate the following, with the material requirements from Cell Table B:

- ABS 210 = Acrylonitrile-butadiene-styrene, extrusion resin, medium impact,
- B = Cell Table B property requirements,
- 5 = 40 MPa tensile strength, min,
- 4 = 2000 MPa Flexural modulus, D 790, or tensile modulus, chord, ISO 527, min,
- 2 = 100 J/m Izod impact or 5 kJ/m² Charpy impact strength, min,
- 2 = 90°C vicat softening point, D 1525 or 85°C, ISO 306, min, and
- 0 = unspecified.

NOTE 6—Mechanical properties of pigmented or colored ABS or alloy materials can differ from the mechanical properties of natural ABS or alloy material, depending on the choice and concentration of colorants. The main property affected is ductility, as illustrated by a reduction in Izod impact strength and tensile-elongation values. If specific properties of pigmented ABS or alloy materials are necessary, prior testing between the materials supplier and end user should be initiated.

CELL TABLE C Unreinforced ABS Alloy
(For property test parameters, see Section 12.)

Designation Grade	Property	Cell Limits										
		0	1	2	3	4	5	6	7	8	9	
1	Tensile strength, MPa ^A , min											
	Test Method D 638	unspecified	30	35	40	45	50	55	60	65	<i>B</i>	
2	Flexural modulus, MPa, min											
	Modulus, MPa, min	unspecified	30	35	40	45	50	55	60	65	<i>B</i>	
2	—Test Methods D 790	unspecified	4600	4800	2000	2200	2400	2600	2800	3000	<i>B</i>	
	—Test Methods D 790, Flexural	unspecified	1600	1800	2000	2200	2400	2600	2800	3000	<i>B</i>	
	—ISO 478	unspecified	4600	4800	2000	2200	2400	2600	2800	3000	<i>B</i>	
	—ISO 527, Tensile, chord	unspecified	1600	1800	2000	2200	2400	2600	2800	3000	<i>B</i>	
3	Izod impact, min											
	Impact, min	unspecified	100	200	300	350	450	500	550	600	<i>B</i>	
3	—Test Method D 256, J/m ^C	unspecified	100	200	300	350	450	500	550	600	<i>B</i>	
	—Test Method D 256, Izod, J/m ^C	unspecified	10	20	30	40	45	50	60	70	<i>B</i>	
	—ISO 180, kJ/m ^{2D}	unspecified	5	13	22	28	36	41	46	50	<i>B</i>	
	—ISO 179, Charpy, kJ/m ^{2D}	unspecified	5	13	22	28	36	41	46	50	<i>B</i>	
4	Softening temperature, °C, min											
	Test Method D 1525	unspecified	70	80	90	100	110	120	130	140	<i>B</i>	
	ISO 306	unspecified	65	75	85	95	105	115	125	135	<i>B</i>	
5	To be determined	unspecified	...	...	...	...	...	...	...	...	...

^AMPa × 145 = psi.

^BSpecific value appears on drawing or contract, or both.

^CJ/m × 18.73 × 10⁻³ = ft-lbf/in.

^DkJ/m² × 0.476 = ft-lbf/in.², Test configuration 1aE.

4.4 Cell Table C has been incorporated into this specification to facilitate the classification of ABS alloy materials where Table ABS or Table B do not reflect the necessary properties. Cell Table C shall be used in the same manner as Cell Table A or B.

NOTE 7—An example of an ABS alloy using this classification system is as follows: The designation ABS 0420C4665 would indicate the following, with the material requirements from Cell Table BB:

- ABS 0420 = Acrylonitrile-butadiene-styrene polycarbonate alloy, high impact,
- C = Cell Table C property requirements,
- 4 = 45 MPa tensile strength, min, Test Method D 638 or ISO 527, 1 and 2,

- 6 = 2600 MPa flexural modulus, in Test Methods D 790 or tensile modulus, chord, ISO-178-527,
- 6 = 500 J/m Izod impact strength, min, Test Method D 256, ~~or 50~~ or 41 ~~Izod~~ Charpy impact strength, min, ISO-180; 179, and
- 5 = 110°C vicat softening point, 120°C/h or 105°C at 50°C/h.

5. Suffixes

5.1 When additional requirements are needed that are not covered by the basic or cell table requirements, they shall be indicated through the use of suffixes. The suffixes that may be used are listed in the Suffix Symbols and Requirements table of Classification D 4000.

6. Basic Requirements

6.1 Basic requirements from property or cell tables, as they apply, are always in effect unless these requirements are superseded by specific suffix requirements, which always take precedence.

7. General Requirements

7.1 The material composition shall be uniform and shall conform to the requirements specified herein. Specification changes due to the effects of colorants shall be noted by both the materials supplier and the end user and, where necessary, shall be covered by suffixes.

8. Detail Requirements

8.1 Test specimens and testing parameters for the materials shall conform to the requirements prescribed in Table ABS, Cell Table A, B, and C, and suffix requirements as they apply.

8.2 For the purpose of determining conformance, all specified limits for a specification (line callout) based on this classification system are absolute limits.

NOTE 8—Specimen dimensions and specific test procedure requirement for ISO test methods may be found in Guide D 1999 or in referenced ISO Standards.

9. Sampling

9.1 The materials shall be sampled in accordance with the sampling procedure prescribed in Practice ~~D E 189805.~~ E 189805. Statistical sampling that satisfies the requirements of Section 13 shall be considered as an acceptable alternative. A lot of resin shall be considered as a unit of manufacture as prepared for shipment and may consist of a blend of two or more production runs or batches of material.

10. Specimen Preparation

10.1 The test specimens shall be molded by the injection process using procedures from Practice D 3641 or ISO 294 as a guide. It is recommended that resin should be dried from 2 to 4 h at 80°C for ABS resins or 100°C for ABS/PC alloy resins.

NOTE 9—Moisture levels should typically be 0.1 % or less for injection molding and 0.05 % or less for extrusion to avoid surface defects.

10.1.1 The following conditions shall be used for molding specimens using procedures from Practice D 3641:

	General ABS	Additive FR ABS
Melt temperature	250 ± 5°C	220 ± 5°C
Mold temperature	55 ± 5°C	55 ± 5°C
Injection velocity	200 ± 100 mm/s	200 ± 100 mm/s
	High Heat ABS Reinforced ABS	ABS/PC Alloy Reinforced Alloy
	255 ± 5°C	270 ± 10°C
	55 ± 5°C	80 ± 10°C
	200 ± 100 mm/s	200 ± 100 mm/s

NOTE 10—ISO 2580 conditions are as follows: 250°C melt ±2°C, 60°C mold at ±2°C, and 200 ± 100 mm/s injection velocity flow front for general grades, 220°C melt for FR grades and 270°C melt for high heat grades with no changes in mold temperature or injection velocity.

NOTE 11—The average injection velocity may be calculated using the following formula:

$$\frac{\pi d^2 Va}{4ns} \quad (1)$$

where:

- d = screw diameter,
- Va = screw advance speed,
- n = number of cavities, and
- s = cross-sectional area.

10.2 The use of test specimens from the gate end of the mold shall be avoided.

11. Conditioning

11.1 Test specimens shall be conditioned in the Standard Laboratory Atmosphere in accordance with Procedure A of Practice D 618 with the exception that specimen do not need to be in racks or hung separately or ISO 291 after Practice D 618. Shorter times of conditioning the test specimen may be used if it is demonstrated that no significant differences in data occur before when performing the required tests. The minimum conditioning time shall be 24 h for periodic-check inspection.

11.2 Conduct tests in the standard laboratory atmosphere of $23 \pm 2^\circ\text{C}$ and $50 \pm 5\%$ relative humidity in accordance with Practice D 618, unless otherwise specified.

12. Test Methods

12.1 The tensile strength at yield shall be determined on a Type I (ASTM) or Type I a or b (ISO 527) or the universal test bar (ISO 3167) injection-molding molded specimen tested at 5 mm/min ABS ~~and 50 mm/min ABS/PC alloy~~ for Test Method D 638 or 50 mm/min for ISO ~~527 for 527~~, ABS ~~and alloys~~. ABS/PC alloys shall be tested at 50 mm/min for both Test Method D 638 and ISO 527 methods.

12.2 The ~~flexural~~ modulus shall be determined on an injection molded specimen 12.5 by 3.2 mm using 50 ± 1 mm span, tangent, at 1.3 mm/min for flexural modulus, Test Methods ~~D 790 or 10 by 4 mm, 50 mm span, chord, D 790, or Type I a or b (ISO injection molded specimen, chord modulus, at 2 1 mm/min for ISO 178-527.~~

12.3 For ~~Izod~~ impact, all specimens shall be taken from the dead end (opposite gate) of a straight-sided bar or the middle of a Type I tensile bar for D 256, Izod or from center of multipurpose test specimen (ISO 3167) for Charpy impact, ISO 179.

12.4 All specimens for thermal testing, either deflection temperature under load or vicat softening temperature, shall be unannealed.

12.5 The vicat softening point shall be determined for a 1 kg load, 12.5 by 3.2 mm injection molded specimen at $2^\circ\text{C}/\text{min}$ for Test Method D 1525 or 50 N load, 10 by 4 mm injection molded specimen at $50^\circ\text{C}/\text{h}$ for ISO 306.

12.6 The heat-deflection temperature shall be determined for a 1.82 MPa load on a 3.2 mm (Test Method D 648) or 4 mm (ISO 75) thickness unannealed specimen. Testing may be run either edgewise or flatwise.

12.7 The glass content of glass-reinforced materials shall be determined in accordance with Test Method ~~D 2584~~. D 5630.

13. Certification And Inspection

13.1 Inspection and certification of the material supplied with reference to a specification based on this classification system shall be for conformance to the requirements specified herein.

13.2 Lot-acceptance inspection shall be the basis on which acceptance or rejection of the lot is made. The lot-acceptance inspection shall consist of those tests that ensure process control during manufacture: melt viscosity, impact, or composition, as they apply.

13.3 Periodic-check inspection shall consist of the tests specified for all requirements of the material under this classification system. The inspection frequency shall be adequate to ensure that the material is certifiable in accordance with 13.4.

13.4 Certification shall be that the material was manufactured, sampled, tested, and inspected in accordance with this classification system and that the average values meet the requirements at a confidence level of 95 %.

13.5 A report of the test results shall be furnished when requested. The report shall consist of the results of the lot-acceptance inspection for the shipment and the results of the most recent periodic-check inspection.

14. Packaging and Marking

14.1 For packing, packaging, and marking, the provisions of Practice D 3892 apply.

15. Keywords

15.1 ABS; ABS/PC; ABS/PVC alloys; classification system; line callout; plastics

SUMMARY OF CHANGES

This section identifies the location of selected changes to this classification system. For the convenience of the user, Committee D20 has highlighted those changes that may impact the use of this classification system. This section may also include descriptions of the changes or reasons for the changes, or both.

D 4673 – 02:

- (1) Changes were made in ISO test procedures being used from notched Izod and flexural modulus to Charpy impact and tensile modulus (chord). Corresponding changes in table values were made. Call outs remain the same.
- (2) Obsolete references were replaced by test methods better suited for material added. Practice D 1898 was replaced by Practice E 105; and Test Method D 2584 was replaced by Test Method D 5630.
- (3) General improvements in clarity of conditioning, test specimen, and test method conditions.
- (4) Revised Footnote D in all Tables.

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