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INTERNATIONAL
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SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J1717

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Submitted for recognition as an American National Standard

INTERIOR AUTOMOTIVE PLASTIC PART TESTING

Foreword—This Document has not changed other than to put it into the new SAE Technical Standards Board format.

This document is intended to be used for interior automotive plastic parts in lieu of SAE J1345, Automotive Plastic Parts Specification.

The basis for creation of this SAE Recommended Practice was the existence of variation in testing requirements of finished plastic interior parts within the automotive industry. Considerable benefit to the industry could be obtained if guidelines were developed and adhered to with regards to standardizing:

a. Minimum testing required to predict in-vehicle performance of plastic parts
b. Test methods to evaluate plastic part performance

TABLE OF CONTENTS

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1. ***Scope—***SAE J1717 is an advisory document suggesting minimum recommended testing, appearance evaluation, and protocol for specifying the recommendations with regard to Singular Unassembled Automotive Interior Trim Parts.

1.1 **Purpose—**The purpose of this SAE Recommended Practice is to:

a. Standardize the testing and appearance evaluation requirements for interior unassembled plastic parts for the automotive industry
b. Standardize the associated test and appearance evaluation methods
c. Provide a method for specifying these requirements by the use of a simple line call-out designation

2. ***References***

2.1 **Applicable Publications—**Testing shall be performed in accordance with current ISO, SAE, ASTM, or test methods detailed in this procedure. The following documents are required to perform the testing specified in SAE J1717.

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J1545—Instrumented Color Difference Measurement for Exterior Finishes, Textile, and Colored Trim
SAE J1885—Accelerated Exposure of Automotive Interior Trim Components Using a Controlled Radiance Water Cooled Xenon-Arc Apparatus

2.1.2 ASTM PUBLICATIONS—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 523—Standard Test Method for Specular Gloss
ASTM D 3029—Impact Resistance of Rigid Plastic Parts by means of a Tup (Falling Weight)

3. ***Definitions***

3.1 **Automotive Industry—**Includes passenger cars, vans, and trucks.

3.2 **User—**The individual utilizing this document to specify component performance requirements.

3.3 **Singular Unassembled Automotive Interior Plastic Trim Parts—**Intended to describe plastic parts, as molded, and/or after painting, used for interior components.

3.4 **In-Vehicle Performance—**The performance of plastic parts after final assembly into a vehicle and exposure to in-service or other specified environment.

3.5 **CHMSL—**Central High-Mounted Stop Light

3.6 **PRNDL—**Transmission Detent Indicator (Park, Reverse, Neutral, Drive, Low)

3.7 **IP—**Instrument Panel

3.8 **HVAC—**Heating Ventilation and Air Conditioning

3.9 **Escutcheons—**Enclosure trim

4. Recommended Appearance Evaluation and Testing of Singular Unassembled Interior Plastic Molded Parts

4.1 The recommended appearance evaluation and testing for specific components as reference should be selected from the following:

Appendix A—Appearance as Molded
- A1—Color
- A2—Gloss
- A3—Surface/Grain

Appendix B—Dimensional Stability at Service Temperature
Appendix C—Dimensional Stability After Hot/Cold Cycling
Appendix D—Cold Impact
- D1—Pendulum Method
- D2—Gardner Method (alternate method)

Appendix E—Color and Gloss Retention

5. Evaluation and Test Equipment

5.1 The following test equipment and documentation is required to perform the testing specified in this document.

A—Appearance as Molded or After Painting
- A1—Color Match to Master
  - Color Standard
  - MacBeth Spectralight* (or equivalent)
  - Color Analyzer (adjustable to SAE J1545)
  - Procedure—SAE J1545-Appendix A1
- A2—Gloss Match to Master
  - Gloss Master
  - Glossmeter (60 degree)
  - MacBeth Spectralight* (or equivalent)
  - Procedure—ASTM D 523—Appendix A2
- A3—Surface/Grain to Master
  - Grain Standard
  - MacBeth Spectralight* (or equivalent)
  - Procedure—Appendix A3

B—Dimensional Stability at Service Temperature
- Forced-air oven
- Measurement and scribe tools
- Dimensional Coordinate Machine (CCM) or equivalent measuring devices
- Procedure—Appendix B

C—Dimensional Stability After Hot/Cold Cycling
- Forced-air oven
- Cold environmental chamber
- Measurement and scribe tool
- Dimensional Coordinate Machine (CCM) or equivalent measuring devices
- Procedure—Appendix C

D—Cold Impact
- Pendulum impact tester
- Gardner impact tester (modified)
- Cold environmental chamber
- Procedure—ASTM D 3029-Appendix D

E—Color and Gloss Retention
- Atlas CI35, CI65, CI65A Weatherometers
- Glossmeter (60 degree)
- MacBeth Analyzer (adjustable to SAE J1545)
- MacBeth Spectralight* (or equivalent)
- Procedure—SAE J1885—Appendix E

6. *Line Call-outs*

6.1 A line call-out, which is a part performance specification, shall contain:

a. This document identification number (SAE J1717)
b. The requirement code options as shown in Figure 1, paragraph 5.2, used in conjunction with this component call-out in Section 6.

6.2 Table 1 is intended to provide guidance for creating consistent SAE J1717 line call-out codes.

6.3 Maximum service temperatures are selected to represent the interior temperature profile in the area of the vehicle in which the component is located.

6.4 Figure 1 is an example of a line call-out for SAE J1717 (A123, B85, C85, D20, E600).

This Line Call-out would, for example, indicate:

SAE J1717	Appearance evaluation and testing of unassembled interior molded parts.
A123	Evaluate the appearance as molded or after painting for: 1 = color 2 = gloss 3 = surface/grain
B85	Dimensional stability as molded, at +85 °C
C85	Dimensional stability after Hot/Cold Cycling: Hot temperature: +85 °C Cold temperature: -29 °C
D20	Cold Impact, 2.0 Joules at -29 °C
E600	Color and gloss retention after 600 kJ/m of xenon arc exposure.

FIGURE 1—LINE CALL-OUT EXAMPLE

TABLE 1—LINE CALL-OUT CODES

Parameter	Procedure	Options	Comments
APPEARANCE, as molded or after painting	Appendix A	A1	Color
		A2	Gloss
		A3	Grain
		A12	Color-Gloss
		A13	Color-Grain
		A23	Gloss-Grain
		A123	Color-Gloss-Grain
DIMENSIONAL STABILITY, at service temperature	Appendix B	B75	Select numerical suffix that is closest to the maximum (heat) inservice temperature (C)
		B85	
		B95	
		B100	
		B110	
DIMENSIONAL STABILITY, following hot/cold cycling	Appendix C	C75	Select numerical suffix that represents the maximum (heat) inservice temperature (C)
		C85	
		C100	
		C110	
			Cold temperature standardized at –29 °C
COLD IMPACT (as molded)	Appendix D	D XXX	Cold impact temperature standardized at –29 °C
COLD IMPACT (following heat aging)		DH XXX	Heat aging temperature to be same temperature as selected for call-out B and C previously
Color impact temperature standardized at –29 °C			XXX times 0.1 = Joules of impact energy
COLOR AND GLOSS RETENTION	Appendix E	E XXX	XXX = kJ/m of exposure energy

6.4.1 NOTE—With reference to A123 in Figure 1, SAE J1717 is not intended to provide a means of detailing specific appearance requirements (color, gloss, grain values). The user must specify these requirements by other means.

6.4.2 SAE J1717 is primarily intended to provide direction for evaluation of color, gloss, and grain before and after environmental testing.

6.5 Color and gloss retention may, at user discretion, be demonstrated in plaque form in lieu of part evaluation.

7. Recommended Line Call-outs for Interior Components—Table 2.

TABLE 2—COMPONENT LINE CALL-OUTS

Systems	Components	Recommended Call-outs
Instrument Panels	Grilles/Outlets	SAE J1717 (A123, C___)
	IP Retainers	SAE J1717 (C___, DH___)
	HVAC Ductwork	SAE J1717 (C___)
	Glove Box Door	SAE J1717 (A123, B___, D___)
	Glove Trim Box	SAE J1717 (B___)
	Trim Plates	SAE J1717 (A123, B___, E___)
	Speaker Grilles	SAE J1717 (A123, B___, C___, E___)
Center Console	Housing	SAE J1717 (A123, C___)
	Bin	SAE J1717 (B___)
	Lid	SAE J1717 (A123, B___, D___, E___)
	PRNDL-Trim Plate	SAE J1717 (A12)
	PRNDL-Trim Lens	SAE J1717 (A1)
	PRNDL-Indicator	SAE J1717 (A1)
Overhead Console	Housing	SAE J1717 (C___)
	Lamp Lenses	SAE J1717 (A1)
	Switch Buttons	SAE J1717 (A1)
Rear Seat Mirror	Mirror Housing	SAE J1717 (C___)
Seat	Seat Back	SAE J1717 (B___, C___)
	Tilt Handle	SAE J1717 (A123)
	Seat Trim	SAE J1717 (A123, E___)
Interior Door	Door Panel	SAE J1717 (A123, B___, C___, D___, E___)
	Escutcheons	SAE J1717 (A123, E___)
	Arm Rest Retainer	SAE J1717 (B___, C___)
	Handles	SAE J1717 (A123)
	Map Pockets	SAE J1717 (A123, B___, C___, D___, E___)
Sidewall Trim	Pillar Moldings	SAE J1717 (A123, B___, E___)
	Garnish Moldings	SAE J1717 (A123, B___, E___)
	Sill Plates	SAE J1717 (A123, C___, D___, E___)
	Rear Qtr Panels	SAE J1717 (A123, B___, D___)
	Lamp Housings	SAE J1717 (B___)
	Lenses	SAE J1717 (A1)
Rear Shelf	Speaker Grilles	SAE J1717 (A123, C___, E___)
	CHMSL	SAE J1717 (A123, B___, E___)
	Storage Bin	SAE J1717 (A123, B___)

Note—The spaces in the line call-outs above indicated by _____ require values to be specified by user in accordance with Table 1.

PREPARED BY THE SAE PLASTICS COMMITTEE

APPENDIX A

APPEARANCE AS MOLDED OR AFTER PAINTING

A.1 Color (Match to Master)

A.1.1 A color standard, color master, or a numerical number reference value, must be available to perform color matching.

A.1.2 A visual color match shall take place under a MacBeth Spectralight*, or equivalent viewing equipment. The visual match shall be conducted under the following light conditions:

a. Lab conditions shall be 23 °C ± 2 °C and 50% ± 5% relative humidity.
b. North Sky Daylight (7500 K ± 200 K) with intensity of 100 to 120 ft-c (light meter). Also, the ultraviolet source shall be used to exaggerate the optical effects of the color pigmentation and resins.
c. Horizon Sunlight (2300 K) and Minus Red (4400 K).

A.1.3 Visual assessment shall be performed as molded, after painting or after environmental testing. Describe any change in color or lightness. Visual color discrepancies may include both gloss and surface defects. Report any visual variation when comparing part to color master.

A.1.4 A Color Analyzer may be used to display color measurements and trends. It is required that the color equipment meet the requirements of SAE J1545. SAE J1545 specifies the uniform color space CIELAB 1976 (L*a*b*scale), 10 degree standard observer, illuminant D65, specular included. The following uniform color space tolerances are suggested, when comparing an unexposed part to the color master.

a. DL* (lightness) = ±1.0
b. Da* (green-red) = ±0.5
c. Db* (blue-yellow) = ±0.5
d. DE* (difference) = <1.0

A.1.5 The customer may specify the area of the part that will be measured for color. If not specified, perform five color measurements using the color analyzer across the entire surface of the part. Average these five measurements to determine the actual color values.

A.1.6 While the Color Analyzer will present useful data trends and displays, the visual assessment of the part to the color master shall be used as the preferred method to qualify color.

A.2 Gloss (Match to Master)

A.2.1 A 60 degree glossmeter shall be used to perform the gloss measurement. The user will supply a gloss master or a numerical gloss value to evaluate the appearance of the part surface.

A.2.2 The gloss measurements shall be performed as described in ASTM D 523.

A.2.3 The gloss measurement shall be performed under the following lab conditions:

a. Lab conditions shall be: 23 °C ± 2 °C and 50% ± 5% relative humidity

A.2.4 In order to achieve accurate and repeatable results, the following should be observed:

a. Flat surfaces are required for gloss measurements.
b. Master and part should be similar in color and lightness.
c. Measurements shall be taken free from ribs, knit lines, and other obstructions on parts.

A.2.5 There shall be a visual match between the master and the part under test. It is suggested that gloss evaluation be performed using a MacBeth Spectralight* or equivalent viewing equipment. The visual match shall be conducted under the following light conditions:

a. North Sky Daylight (7500 K ± 200 K) with intensity of 100 to 120 ft-c (light meter). Also, the ultraviolet source shall be used to exaggerate the optical effects of the color pigmentation and resins.
b. Horizon Sunlight (2300 K) and Minus Red (4400 K).

A.2.6 The preferred method of performing gloss measurements will be to take five readings representative of the entire part surface. Average these five glossmeter readings.

A.2.7 The tolerance and angle of measurement shall be as follows:

a. Angle of measurement—60 degrees
b. Gloss tolerance—±1.0 gloss unit

A.3 Surface/Grain (Match to Master)

A.3.1 A grain master is required to perform the grain/surface evaluation. The grain master will be supplied by the user.

A.3.2 It is suggested that the grain/surface match be evaluated under a MacBeth Spectralight*, or equivalent viewing equipment. The grain/surface match shall be conducted under the following light conditions:

a. North Sky Daylight (7500 K ± 200 K) with intensity of 100 to 120 ft-c (light meter). Also, the ultraviolet source shall be used to exaggerate the optical effects of the color pigmentation and resins.
b. Horizon Sunlight (2300 K) and Minus (4400 K).

A.3.3 If parts are of right/left configuration, both sides must be evaluated. Consideration shall also be given to the direction of the grain when comparing parts to the grain/surface master.

A.3.4 It is recommended that acceptable sample parts be retained for future grain/surface referencing.

APPENDIX B

DIMENSIONAL STABILITY AT SERVICE TEMPERATURE

B.1 Testing shall be performed using a forced-air oven, large enough to permit the part to be fixtured and tested in the proper in-vehicle orientation.

B.1.1 Simple part fixturing is acceptable provided the key attachment points are consistent with the assembly and intent of the part. Report the position of exposure. Care must be used to prevent warp or sag in the as-fixtured position.

B.1.2 The parts shall be dimensionally checked before and after the oven exposure. The test conditions are:

a. Oven temperature—As specified in line call-out
b. Tolerance—±2 °C from line call-out
c. Test duration—4 h
d. Room conditions—23 °C ±2 °C and 50% ± 5% RH

B.1.3 Following oven exposure, the parts should be allowed to cool at room temperature for 30 min before measuring.

B.1.4 The preferred method of measurement is to use a Coordinate Measuring Machine (CMM). Average the dimensional change of five critical measurement points.

B.1.5 The alternate method of measurement can be performed using calibrated verniers, rule, and sharp scribe.

a. Etch three scribe lines in the direction of flow. If possible (on flat areas), position the scribe lines in center and at both ends of the part.
b. Etch three scribe lines 90 degrees across the direction of the flow. If possible (on flat areas), place a scribe line in center and at both ends of part.

B.1.6 Measure and average the dimensional change of the six measurement points prior to exposure and compare results from same measurement points following the oven exposure.

B.1.7 A check fixture is also an acceptable method for checking dimensional stability. Following the dimensional stability testing, the part shall comply to the fixture dimensions.

B.1.8 Acceptable dimensional stability test results shall be less than 0.5% change (averaged) from before the oven exposure and following the oven exposure.

APPENDIX C

DIMENSIONAL STABILITY AFTER HOT/COLD CYCLING

C.1 The Dimensional Stability testing shall consist of three cycles. The hot and cold chambers shall be large enough to permit a complete part or assembly to be tested in the in-vehicle position. Observe the position of exposure. Care must be used to prevent warp or sag in the as-fixtured position.

C.1.1 Observe the following test conditions:

a. Hot temperature—As specified in line call-out
b. Cold temperature— −29 °C
c. Tolerance—±2 °C from line call-out
d. Test duration—Three cycles
e. Room conditions—23 °C ±2 °C and 50% RH ± 5% RH

C.1.2 Each one cycle shall consist of the following:

a. 4.0 h at hot temperature (line call-out)
b. 0.5 h at room temperature
c. 4.0 h at cold temperature (−29 °C)
d. 0.5 h at room temperature

C.1.3 When the test continuity is interrupted due to end of shift, weekends, or holidays, samples shall be left at the ambient lab temperature.

C.1.4 Simple part fixturing is acceptable provided the key attachment points are consistent with the assembly and intent of the part. The part shall be tested in the in-vehicle position or assembly position. Additional mounting information may be included in the part drawing.

C.1.5 The preferred method of measurement is to use a Coordinate Measuring Machine (CMM). Average the dimensional change of five critical measurement points.

C.1.6 The alternate method of measurement can be performed using calibrate verniers, rule, and sharp scribe:

a. Etch three scribe lines in the direction of flow. If possible (on flat areas), position the scribe lines in center and at both ends of the part.
b. Etch three scribe lines 90 degrees across the direction of the flow. If possible (on flat areas), position a scribe line in center and both ends of part.
c. Measure and average the dimensional change of these six measurement points.

C.1.7 A check fixture is also an acceptable method for checking dimensional stability. Following the temperature cycling, the part shall comply to the fixture dimensions.

C.1.8 Acceptable dimensional stability test results shall be less than 0.5% change (averaged) from before the cycling exposure and following the cycle exposure.

APPENDIX D

COLD-IMPACT TESTING, AS MOLDED OR FOLLOWING ENVIRONMENTAL CONDITIONING

D.1 Pendulum impact is the recommended method for performing the cold impact testing referenced in this SAE J1717 document. This method was selected to promote industry-wide consistency in determining the amount of energy to evaluate fracture resistance of the molded interior part.

D.1.1 It is suggested that the pendulum testing be performed inside a cold environmental chamber. Figure D1 for the suggested configuration of the pendulum impact tester.

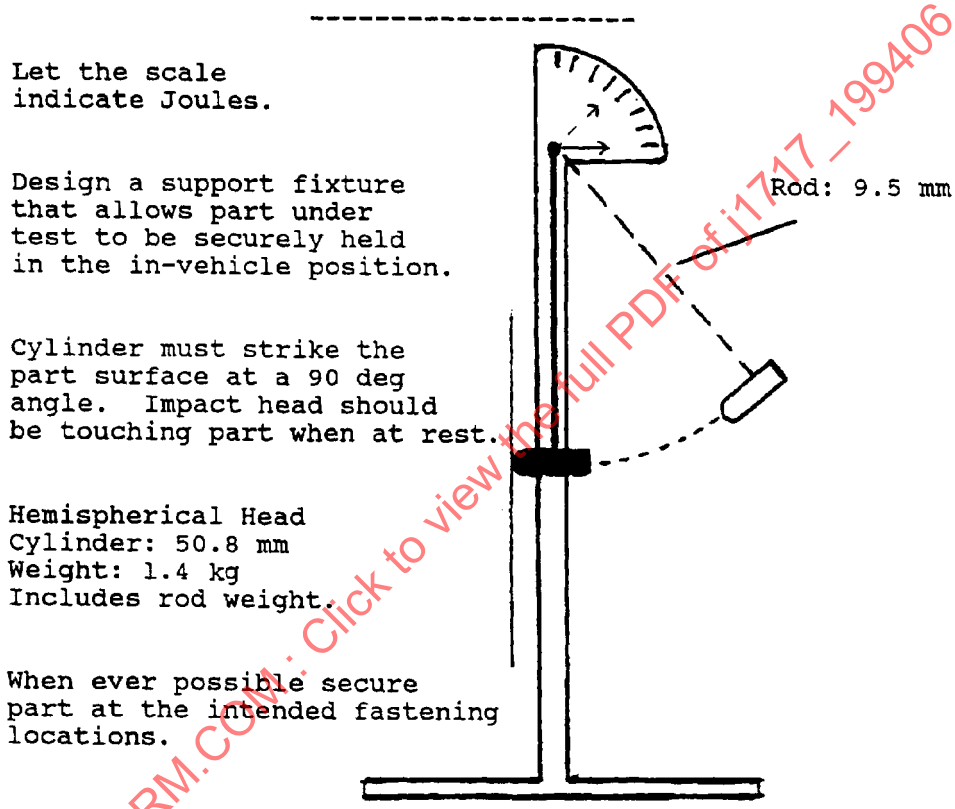

FIGURE D1—PENDULUM TEST FIXTURE

D.1.2 The Pendulum test is performed with the spherical impact head being swung in an arc into the molded part. The molded part must be secured at the intended fastening location during this test.

D.1.3 Caution must be used to prevent corrosion or rust buildup following extended cold environmental testing from interfering with the pendulum (pivot) operations.

D.1.4 Design a support fixture that allows the part, or that portion of the part under test, to be securely held in the in-vehicle position for testing. The actual mating part or mating assembly may be used for mounting purposes. Secure part at intended fastening location.

D.1.5 The acceptable method is to perform a minimum of three strikes at the location specified by the user. This may be verbal or the information may be included in the part drawing. If no location is identified, the three strikes will be performed at different areas across the part surface, being careful that one impact area does not interfere with another.

D.1.6 Always perform the impact testing on the outside or exposed side of the part.

D.1.7 Standard Operating Procedure

a. Adjust base (clamping fixture) so that the cylinder is touching the part surface when at rest. Cylinder must be 90 degrees to part surface.
b. Note position of scale (pointer).
c. Return striker (back swing) to the distance which will equal the desired impact energy when it strikes the part.
d. Release striker. Prevent multiple impacting, do not allow striker to bounce on part.
e. Conversion(s):

1. in-lb x 0.113 = Joules
2. Joules x 8.85 = in-lb

D.1.8 Following impact, visually examine the impacted and reverse sides of part. It is expected that no cracks or breakage should occur. Report any evidence of part of grain damage to the user.

D.2 Gardner Impact, ASTM D 3029, Method G (Falling Weight) (Alternate Method)

D.2.1 The Gardner impact is an alternate test method. When the part size or part configuration will not permit the pendulum impact test to be used, a Gardner impact tester (modified) as described in this section and ASTM D 3029 will be used.

D.2.2 The Gardner impact tester shall be modified to the following test configuration Figure D2:

a. Head/striker diameter—05.8 mm
b. Nose radius—25.4mm
c. Head/striker weight—0.45 kg
d. Support ring/well—75 mm
e. Test temperature— −29 °C ± 2 °C
f. Impact energy—As specified in line call-out

D.2.3 When the part cannot be tested, a portion of the part or a test plaque 125 mm square or 125 mm diameter may be used. The 0.45 kg/50.8 mm diameter head/striker will be vertically dropped, with the head striking the part at a 90 degree angle.