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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3510A

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Superseding AMS 3510

Submitted for recognition as an American National Standard

COATING, ABRASION RESISTANT
For Polycarbonate Parts

1. SCOPE:

1.1 Purpose:

This specification covers the optical and abrasion resistance requirements for coatings applied to polycarbonate plastic surfaces.

1.2 Application:

This coating has been used typically for improving abrasion resistance of flying helmet visors and other transparent polycarbonate plastic parts, but usage is not limited to such applications.

1.3 Safety - Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications:

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

AMS 3611 Plastic Sheet, Polycarbonate, General Purpose

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM D 1003 Haze and Luminous Transmittance of Transparent Plastics
ASTM D 1044 Resistance of Transparent Plastics to Surface Abrasion
ASTM D 3359 Measuring Adhesion by Tape Test
ASTM G 23 Operating Light- and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Nonmetallic Materials

2.3 U.S. Government Publications:

Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-2073-1 DOD Materiel, Procedures for Development and Application of Packaging Requirements

3. TECHNICAL REQUIREMENTS:

3.1 Material:

Shall be an optically clear finish, compatible with polycarbonate resin which, when applied, meets the requirements of 3.2.

3.2 Properties:

The applied coating shall conform to the following requirements; tests shall be performed on coated parts, where practical, or on witness specimens (4.5.1) coated with the parts and in accordance with specified test methods, insofar as practicable:

3.2.1 Abrasion Resistance: The increase in haze shall not exceed 6% and the decrease in luminous transmittance shall not exceed 4%, measured in accordance with ASTM D 1003, Method A, on specimens abraded as in 4.5.2.

3.2.2 Coating Adhesion: The coating, tested in accordance with ASTM D 3359, Method B, shall not exhibit loss of adhesion from the as applied value after environmental exposure as in 3.2.3 and 4.5.3

3.2.3 Weather Resistance: Coated specimens shall not exhibit yellowing or crazing, determined in accordance with ASTM G 23, Type E, Method 1, for not less than 100 hours.

3.3 Quality:
(R)

The coating, applied to polycarbonate plastic surfaces, shall be smooth, uniform, and free from pin holes, sags, runs, bubbles, heavy edges, handling defects, scratches, foreign materials, and other imperfections detrimental to usage of the coating.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:
(R)

The vendor of the coating shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the coating conforms to the requirements of this specification.

4.2 Classification of Tests:

Tests for all technical requirements are acceptance tests and preproduction tests and shall be performed prior to or on the initial shipment of a coated part to a purchaser, on each lot, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.3 Sampling and Testing:
(R)

Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient coated parts or witness specimens as in 4.5.1 shall be taken at random from each lot to perform all required tests. The number of determinations for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three.

4.3.1.1 A lot shall be all parts and witness specimens coated in a continuous operation using the same batch of coating material and presented for vendor's inspection at one time. An inspection lot shall not exceed 200 parts.

4.3.1.2 (R) When a statistical sampling plan has been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1 and the report of 4.6 shall state that such plan was used.

4.3.2 For Preproduction Tests: As agreed upon by purchaser and vendor.

4.4 Approval:

4.4.1 Sample coated parts shall be approved by purchaser before parts for production use are supplied unless such approval be waived by purchaser. Results of tests on production parts shall be essentially equivalent to those on the approved sample parts.

4.4.2 Vendor shall use coating material, manufacturing procedures, processes, and methods of inspection on production parts which are essentially the same as those used on the approved sample parts. If necessary to make any change in coating material or method of application, vendor shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and, when requested, sample coated parts, witness specimens, or both. Production parts coated by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods:

Shall be as follows:

4.5.1 Witness Specimens: Shall be prepared in suitable quantity and size from AMS 3611 polycarbonate plastic sheet, and shall be coated with the parts they represent.

4.5.2 Abrasion Resistance: Measure and record the haze and luminous transmittance of coated specimens in accordance with ASTM D 1003, Method A, before and after abrasion testing. Specimens shall be abraded in accordance with ASTM D 1044, except that the test shall be run for only 50 cycles.

4.5.3 Humidity Test:

4.5.3.1 The chamber and accessories shall be constructed and arranged to avoid condensate dripping on the test specimens. The chamber shall be trap-vented to the atmosphere to prevent the buildup of total pressure. Relative humidity shall be determined by the dry bulb-wet bulb thermometer comparison method or an equivalent method. When readout charts are used, they shall be capable of being read with a resolution within 0.6 °C (1 °F). When the wet bulb control method is used, the wet bulb and tank shall be cleaned and a new wick installed at least every 30 days. The air velocity flowing across the wet bulb shall be not less than 900 feet per minute (4.6 m/s). Provisions shall be made for controlling the flow of air throughout the internal chamber test space where the velocity of air shall not exceed 150 feet per minute (0.76 m/s). Steam or distilled, demineralized, or deionized water having a pH value between 6.0 and 7.2 at 23 °C ± 1 (73 °F ± 2) shall be used to obtain the specified humidity.

4.5.3.2 Prepare coated polycarbonate specimens or use actual parts if flat surface areas are appropriate for subsequent required testing. After completion of required drying or baking operations, store the coated test specimens at room temperature for 24 hours ± 0.5. Suspend the specimens in the humidity chamber, which is at ambient temperature, in a manner which ensures that each test specimen hangs free, not touching the chamber surfaces or other specimens. Gradually raise the temperature in the chamber to 65 °C ± 1 (149 °F ± 2) and to a relative humidity of 95% ± 4 over 2 hours ± 0.25. Maintain these conditions of temperature and relative humidity for 6 hours ± 0.5. Reduce the temperature in the chamber to 30 °C ± 1 (86 °F ± 2) over 16 hours, maintaining the relative humidity at not less than 85%. Repeat the complete cycle five times over not less than 120 hours. Remove the test specimens from the chamber at the end of the last cycle, blow dry with clean, filtered air, and perform the adhesion test (3.2.2) within 45 minutes.