

## PROCEDURES FOR LABORATORY ACCELERATED EXPOSURE OF AUTOMOTIVE MATERIALS GM9125P

**1 SCOPE.** This standard describes the laboratory procedures used to determine the resistance to degradation of automotive materials when subjected to artificial light sources. It describes exposures to sunshine carbon arc, xenon arc, fluorescent ultraviolet light and condensation apparatus, and a twin carbon arc. Material specifications will determine which light source shall be used.

### 2 EQUIPMENT REQUIRED.

2.1 Sunshine Carbon Arc Weather-Ometer, Type E. (Available from The Atlas Electric Devices Company, 4114 N. Ravenswood Ave., Chicago, IL 60613)

2.2 Fluorescent Ultraviolet Light and Condensation Apparatus. (QUV Tester: Available from The Q-Panel Company, 26200 First St., Cleveland OH 44145; UVCON Tester: Available from Atlas Electric Devices, 4114 N. Ravenswood Ave., Chicago IL 60613)

2.3 Twin Carbon Arc, Model DMC. (Available from The Atlas Electric Devices Company, 4114 N. Ravenswood Ave., Chicago, IL 60613) equipped with the following:

2.3.1 Fishtail spray nozzles #19-4503-01-FT-12.

2.3.2 Cam #60, #81, or #11.

2.3.3 Spray shield #19-4620-00.

2.3.4 Specimen holders #CD-LSR, or equivalent.

### 3 OPERATING CONDITIONS.

3.1 Sunshine Carbon Arc Weather-Ometer, Type E.

3.1.1 The apparatus shall be operated without a water spray with an air temperature of  $60 \pm 2$  C measured at a point  $25 \pm 5$  mm outside the specimen rack and midway between the top and bottom surfaces. The temperature sensing element shall be shielded from radiation. Additional description is given in ASTM G53. Cycles and filters shall correspond to the requirements specified in FMVSS 209.

3.2 Fluorescent Ultraviolet Light and Condensation Apparatus.

NOTE: The following sample preparation IS NOT used for paint and coatings exposure. Contact the applicable engineering activity for correct procedure.

3.2.1 Specimens will be applied to 75 x 300 mm cold rolled steel (CRS) panels painted with DuPont LSL 92699642 white. Panels shall be painted using production oven bake schedules and production primers. Specimens will be attached with either production adhesives, production fasteners, or enameled copper wires. Test specimens will be 75 x 75 mm and mounted simulating production methods.

3.2.1.1 All holes or edges on panels should be sealed to prevent contamination of test samples.

3.2.2 Procedure. All test specimens and test apparatus will be controlled per ASTM G53. The exposure condition will be varied from the ASTM method as follows:

3.2.2.1 Cycle:

8 h of UV at 70 C  
4 h of condensation at 50 C

3.2.2.1.1 The test apparatus is run continuously, 24 hours a day, 7 days a week.

3.2.2.2 A minimum of 6 specimens representing the same sample will be prepared and exposed.

3.2.2.3 The specimens will be started at the beginning of the UV cycle.

3.2.2.4 The specimens will be removed at the end of the condensation cycle.

3.2.2.5 One specimen will be removed each week for a period of 6 weeks (or at complete failure if less than 6 weeks) and evaluated.

3.2.3 A record will be kept with each set of samples exposed giving the following information:

Laboratory request number.  
Source of apparatus used.  
Cycle.  
Date started, date ended, hours exposed.  
Results of exposure.

3.3 Controlled Irradiance Water Cooled Xenon-Arc Apparatus.

SAE J1885 - Accelerated exposure of automotive interior trim components using a controlled irradiance water cooled xenon arc apparatus" is to be used in place of the interior cycle.

SAE J1960 - Accelerated exposure of automotive exterior materials using a controlled irradiance water cooled xenon arc apparatus is to be used in place of the exterior cycles.

Copies of the above test procedures can be obtained from: The Society of Automotive Engineers, Inc. 400 Commonwealth Drive, Warrendale, PA 15096-0001.

3.4 Twin Carbon Arc Weather-Ometer.

3.4.1 To obtain consistent results when using the Weather-Ometer method, it is necessary that the following operating conditions be followed:

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3.4.1.1 Arc Current. The current as indicated on the control panel ammeter should be 15 to 17 amperes. Allow the Weather-Ometer to run 15 to 20 minutes before adjusting amperage. Each arc is provided with a voltmeter and ammeter for the purposes of indicating electrical status of the arc.

3.4.1.2 Arc Voltage. The voltage across the arc should read between 140V and 145V when the ammeter is reading 15 amperes and the power line voltage should be 208V to 250V. The use of a voltage regulator is recommended as the radiant output in the most effective spectral region changes approximately 3% for each 1% in line voltage.

3.4.1.3 Carbons. Change carbons after each daily cycle using the length specified on the carbon instruction plate. Care must be taken to see that one of the carbons is the solid type and the other is the cored type.

3.4.1.4 Black Panel Temperature. Temperature measurement and control shall be based on the black panel thermometer unit. The panel with the thermometer attached shall be supported in the specimen drum or rack in the same manner as the test specimens so that it will be subjected to the same influence. The black panel temperature shall be read through the window in the test chamber without opening the door during the light cycle. The black panel temperature shall be maintained between 86 C and 89 C unless otherwise specified. This reading shall be taken after one hour into the light cycle.

3.4.1.5 Water Spray Operation.

3.4.1.5.1 Indirect Spray. Under no circumstances shall the water strike the specimen. A shield shall be mounted between the vertical spray unit with its 4 nozzles and the specimen drum. The specimen water spray shall be operated at a pressure of 69 kPa to 105 kPa measured at the nozzles. The cam employed for the duration of the light and water period shall be cam spray with no light.

3.4.1.5.2 Direct Spray. A shield shall be mounted between the vertical spray unit and the globes. The specimen water spray shall be operated at a pressure of 69 kPa to 105 kPa measured at the nozzles. The cam employed for the condition shall be either #81, #11, or as specified.

3.4.1.6 Globe. The globes used to enclose both carbon arcs should be Pyrex #9200-PX. Use water to clean the globes after each daily cycle (for maximum uniformity and good correlation, a schedule of approximately 20 h per day is recommended); the dry and polish. Use the globes where flat edges are free of cracks, nicks, or chips so that a good seal is found around the carbon arc assembly. Replace the globes after 2000 h if chipped or cracked or when pronounced cloudiness occurs.

3.4.1.7 Weather-Ometer Requirements. In order to obtain the conditions and results required by this method, it is

necessary that the following equipment changes be made to the Weather-Ometer.

3.4.1.7.1 Both arc lamps shall be mounted in the number two or center hole of the lamp hanger shank.

3.4.1.7.2 Air deflector disc located beneath the arc lamps shall be 205 mm in dia.

3.4.1.7.3 Both specimen spray and drum cooling spray shall be off during the light portion of the test cycle (indirect spray only).

3.4.1.7.4 Equipment blower motor shall be off during the light off portion of the test cycle and on only during the light on portion of the test (indirect spray only).

3.4.1.7.5 An approximate 2.5 minute read period (no light, no spray) shall be provided after the dark portion of the test cycle and before entering the light on portion of the cycle (cam #81 indirect spray only).

3.4.1.8 Test Procedure.

3.4.1.8.1 Cut the specimen 68 mm in width and 125 mm in length, or as directed in the specification.

3.4.1.8.2 Place specimen in holding frame and insert in the Weather-Ometer drum slot to a point where the 2 hooks on the front of the holding frame rest on the top of each drum slot side rail.

3.4.1.8.3 Start the machine at the beginning of the light cycle.

3.4.1.8.4 Expose for the specified hours required in the specification.

3.4.1.8.5 At the end of the specified exposure time, remove the specimen from the specimen holder and compare the exposed area with an unexposed sample for any change in hue (color tone), brightness, or saturation (purity). Also, note if there is any stiffening of the specimen due to backing material or finishes used.

NOTE: Use a sample which has not been in the Weather-Ometer to compare to the exposed area.

3.4.1.8.6 Report the degree of fading in CIELAB units as outlined in SAE J1545.

Visual assessment.

None: No change in hue, lightness, or saturation.

Slight: A change in lightness and/or saturation which can be determined only upon close examination but no change in hue.

Noticeable: A change in lightness and/or saturation which can easily be seen and/or a change in hue.

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Severe: An extreme change in lightness, saturation and/or hue.

3.5 Outdoor Testing. Refer to GM9163P.

**4 SAFETY.** This method may involve hazardous materials, operations and equipment. This method does not propose to address all the safety problems associated with its use. It is the responsibility of the user of this method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

**5 GENERAL INFORMATION.** This specification was originated by CPC in 7/86, revised from FBTM 30-2. The latest revisions include:

Rev	Date	Description	Div
C	11/89	Revised 3.3 Deleted Appendix	CPC
D	7/91	Revised 2.2	