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Method for Evaluating the Paintable Characteristics of Automotive Sealers

RATIONALE

Design Authorities may determine that this document is no longer to be used for New Design. This determination should be made by each Design Authority.

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1. ***Scope***—This SAE Recommended Practice sets forth a method for testing and evaluating the paintable characteristics of automotive sealers. This document contains three samples preparation procedures:

Method #1: Topcoat over cured primer and cured sealer
Method #2: Topcoat over cured sealer
Method #3: Topcoat over uncured sealer

2. ***References***

2.1 Applicable Publications—The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated the lastest revision of SAE publications shall apply.

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

ASTM D 3359-78—Method for Measuring Adhesion by Tape Test
ASTM G 53—Recommended Practice for Operating Light- and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials

3. ***Definitions***—In addition to the adhesive characteristics of a paint film, there are a large number of undesirable conditions that may arise due to a paint-sealer incompatibility. The following is a partial list of these undesirable conditions and the tester should take note of these in general and any others specifically requested.

3.1 Alligatoring—A uniform distribution of surface cracking in a symmetrical pattern resembling the skin of an alligator.

3.2 Black Lining—Dark lines that appear along the tops of ridges in the sealer due to paint flowing down the sides of the ridges.

3.3 Blistering—Raised areas on the paint's surface due to volatile substances coming out of the sealer after the topcoat has started to "cure".

3.4 **Blushing—**A lightening of the paint's hue due to moisture in the air, moisture in the sealer, or poor hiding power of the topcoat.

3.5 **Cracking—**Separations in the topcoat film before or after baking. Cracking can be caused by shrinkage of the paint film during the bake cycle, swelling of the sealer after the topcoat has started to cure, or sliding of the uncured paint film on the uncured sealer due to incompatibility.

3.6 **Cratering—**Round depressions in the paint's surface, usually due to contaminants in the paint or on the surface being painted.

3.7 **Discoloring—**A change in the absolute color of the topcoat usually due to a chemical interaction between the topcoat and the sealer.

3.8 **D.O.I.—**Distinctness of Image

3.9 **Dulling—**A reduction in the level of gloss, or D.O.I., of the topcoat, usually due to an interaction between the topcoat and the sealer beneath.

3.10 **Fish Eyes—**Circular areas devoid of topcoat caused by the wet paint "drawing" in on itself due to surface contaminants such as oil or silicones or a general incompatibility of paint and sealer.

3.11 **Metal Flake Re-orientation—**A uniform change, over the sealer, in the apparent color of a metallic topcoat. This difference is independent of the configuration of the sealer bead. It appears to be related to light reflecting off the metallic flakes which have shifted their relative positions from that of the rest of the panel, probably the result of floating, or vertical pigment separation, due to currents set up in a Benard cell.

3.12 **Metal Flake Mottling—**A puddling of the metallic and non-metallic pigments in a topcoat giving it a blotchy appearance.

3.13 **Pinholing—**Small holes, the size of a pinpoint, in the surface of the topcoat that result when small bubbles burst as the paint cures.

3.14 **Popping—**Usually refers to a fairly uniform distribution of small blisters caused the volatilization of entrapped solvent beneath a topcoat that has started to cure. The volatile material can be from the sealer coated or from a layer of paint that is excessively thick.

3.15 **Running—**A movement or flowing of wet topcoat over the sealer caused by a paint-sealer incompatibility or an excessive application of topcoat.

3.16 **Seedy Appearance—**A paint-sealer incompatibility causing pigment flocculation leading to a surface that is spotted with raised "grainy" looking particles.

3.17 **Soft Paint—**A paint film that has not achieved its specified hardness. This can be caused by the migration of plasticizers, into the topcoat, from the sealer, or by the sealer chemically retarding the topcoat's curing system.

3.18 **Staining—**A discoloring of the topcoat due to a sealer-topcoat interaction.

3.19 **Tacky Topcoat—**A more severe form of "soft paint" in which the sealer has interferred with the topcoat curing mechanism to the degree that fingerprints can be left on the paint's surface.

3.20 **Yellowing—**A particular form of staining in which a yellowish stain appears, usually associated with light color topcoats.

3.21 Wrinkling—A paint-sealer incompatibility which causes the topcoat's surface to cure at a different rate resulting in the formation of ridges. These ridges can vary in absolute size but generally are uniform in size on any one particular panel.

4. Principal of Methods—This SAE test specification is to be used as a method for evaluating the performance of automotive primers and/or topcoats when applied over "cured" or "uncured" sealers. This specification includes a list of the needed test equipment, application and baking parameters, and a glossary of terms describing undesirable characteristics that should be noted by the tester.

This specification covers the performance and quality of an automotive topcoat when applied over a sealer, along with the integrity of bond between the paint and the sealer. It does not cover sealer performance characteristics, such as sealer to substrate bonding, nor does it include a procedure governing the actual spraying of the topcoat.

It is assumed that the tester is well versed in the techniques of spraying automotive topcoat, but if this information is needed, it is available from paint suppliers.

5. Equipment and Supplies

a. Mechanical convection oven (gas fired recommended for curing paint)
b. Spray equipment, including compressor
c. Paint as specified
d. Ample supply of test panels as specified
e. Sealer to be coated
f. Q.U.V. Cabinet (per ASTM G 53)
g. Sealer template - 150 mm x 25 mm x 1 mm (6 in x 1 in x 0.040 in)
h. Hacksaw blade (24 teeth/25 mm)
i. Adhesive tape as specified in ASTM D 3359-78

6. Paint Sample Conditioning—Prior to spraying primer or paint, certain thermal, mechanical, and dilution parameters must be met.

6.1 Mechanical Conditioning—Before spraying primer or paint, it must be thoroughly agitated per manufacturer's instructions to insure a homogenous distribution of the various pigments.

6.2 Thermal Conditioning—The paint should be sprayed at the proper temperature and humidity (per manufacturer's instructions) to prevent various undesirable conditions, such as blushing, running, popping, etc.

6.3 Viscosity Conditioning—To ensure atomization, the viscosity of the paint must be in the range as stated by the manufacturer.

7. Sealant Sample Conditioning—Mechanical conditioning of the sealer may be required of the tester to evaluate the leveling characteristics in conjunction with its paintability. This should be done as required.

8. Test Sample Preparation—In the following procedures, primers should have a wet film applied equivalent to 0.6 to 1.2 dry mils unless otherwise specified. Topcoat systems shuld be applied at a thickness equivalent to 1.5 to 2.0 dry mills with metallics being applied at the lower end of the spectrum and solid colors at the higher end unless otherwise specified.

The application of base coat/clear coat requires a color coat equivalent to 0.6 mils to 1.2 mils dry, or as specified. Again, metallic colors should be applied at the lower end of the spectrum, and solid colors toward the higher end. Clear coat should be applied within 5 min of the color coat at a thickness equivalent to 0.8 mils to 1.0 mils dry, or as specified.

8.1 Method #1—This method involves spraying primer over uncured sealer, baking the panel at the prime bake, spraying topcoat over the baked panel, and baking the panel at the topcoat bake.

8.1.1 Take the required number of panels (type as requested) and apply by means of a template, the sealer to be tested. Scrape one end, 50 mm, with hacksaw blade to evaluate leveling properties.

8.1.2 Store sealer panels in a vertical position prior to painting, unless requested otherwise.

8.1.3 Apply primer to a wet film thickness resulting in 0.7 to 1.0 dry mils of primer, or as specified.

8.1.4 Air dry wet panels in the vertical position at the temperature and humidity recommended by the primer manufacturer.

8.1.5 After recommended air dry time, evaluate the panels for undesirable characteristics, such as fish eyes, primer flowing off sealer, etc.

8.1.6 Bake primer panels in an air circulating oven for 30 min at 150 °C (300 °F), or as specified.

8.1.7 Evaluate baked panels for undesirable characteristics such as tacky film, popping, etc.

8.1.8 Condition panels to room temperature and apply topcoat to a wet film thickness equivalent to 1.5 to 2.0 dry mils, or as specified. There should be two sets of topcoat panels prepared. One set with white and one with light blue or silver metallic.

8.1.9 Air dry panels for recommended period at recommended temperature and humidity in the vertical position, and record any adverse developments.

8.1.10 Bake topcoated panels in air circulating oven for 17 min at 130 °C (265 °F) for lacquers, 30 min at 150 °C (300 °F), or as specified.

8.1.11 Evaluate baked panels for undesirable characteristics and record the results.

8.2 Method #2—This method involves applying sealer to a primed panel, baking the panel at the prime bake, spraying topcoat over the baked panel, and baking the panel at the topcoat bake.

8.2.1 Take the required number of panels (type as requested) and apply, by means of a template, the sealer to be tested. Scrape one end, 50 mm, with hacksaw blade to evaluate leveling properties.

8.2.2 Bake panels in an air circulating oven in the vertical position for 30 min at 150 °C (300 °F), or as specified.

8.2.3 Condition panels to room temperature and apply topcoat to a wet film thickness equivalent to 1.5 to 2.0 mils dry, or as specified. There should be two sets of topcoat panels prepared. One set with non-metallic white and one with light blue or silver metallic.

8.2.4 Air dry panels for recommended period at recommended temperature and humidity in the vertical position and record any adverse developments.

8.2.5 Bake topcoated panels in an air circulating oven for 17 min at 130 °C (265 °F), for lacquers, 30 min at 150 °C (300 °F), or as specified.

8.2.6 Evaluate baked panels for undesirable characteristics and record the results.