

Technical Report: CREATIVE RESINS EUROPE

Technical characterization of liquid paint materials:
GLASSPAINTS

OBJECTIVE

The aim of this work is to evaluate and to check the ASTM rules about resins "Glasspaints". Before the application of these rules, samples have undertaken an ageing process. Specifically, for the painting of the samples were used A part, B part and pigment with a proportion of 15% of the total mix. The following ASTM rules were applied:

- **ASTM D660-93:** "Standard Test Method for Evaluating Degree of Checking of Exterior Paints".
- **ASTM D661-93:** "Standard Test Method for Evaluating Degree of Cracking fo Exterior Paints".
- **ASTM D662-93:** "Standard Test Method for Evaluating Degree of Erosion of Exterior Paints".
- **ASTM D714-87:** "Standard Test Method for Evaluating Degree of Blistering of Paints".
- **ASTM D3359-97:** "Standard Test Method for Measuring Adhesion by Tape Test".

AGEING PROCESS OF THE SAMPLES

The ageing process was made in a chamber with saline ambient during **1000 hours at 70 °C**.

At the end of the 1000 hours the glasses were taken away.

RESULTS:

1. ASTM D660-93

The rule ASTM D660-93 evaluates the degree of checking of exterior paints, without reference to the preparation of the sample. Checking is defined as the phenomenon manifested in paint films by slight breaks in the film that do not penetrate through the last applied coating. Where precision is necessary in evaluating a paint film, checking may be described as visible



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(as seen with the naked eye) or as microscopic (as observed under a magnification up to ten diameters).

Many types of checking are recognized, of which some are:

Irregular pattern type, Line and short parallel type, Switch type, Crow foot type, Mosaic type, Shrinkage type, Short, random type, Sigmoid type.

ASTM D-660 states a method based on comparison with some standards to determine the degree of checking. This comparison may be visual (with naked eye) or with a microscope.

Visual comparison

Through the visual comparison it is observed that **does not appear in either aging sample.**

Microscopic comparison

For this purpose a microscopic model Leica DM1000 was used.

Through the visual comparison it is observed that **does not appear in either aging sample.**

2. ASTM D661-93

ASTM D661-93 covers the evaluation of the degree of cracking of exterior paints, without reference to the preparation of the sample. Cracking is defined by ASTM D661-93 as the phenomenon manifested in paint films by a break extended through to the surface painted. Where this difficult to determine, the break should be called a crack only if the underlying surface is visible.

Three types of cracking are recognized:

- **Irregular pattern type:** Cracking in which the breaks in the film are in no definite pattern.
- **Line type:** Cracking in which the breaks in the film are generally arranged in parallel lines, usually either horizontal or vertically.
- **Sigmoid type:** Cracking in which the breaks in the film form a pattern consisting of curves meeting and intersecting, usually on a relatively large scale.

To determine the degree of cracking ASTM D661-93 establishes a visual comparison.

• Conclusions

Through visual comparison **it is observed no cracking in the samples.**



3. ASTM D662-93

The rule ASTM D662-93 covers the evaluation of the degree of erosion of exterior paints by comparison with photographic standards, without reference to the preparation of the sample. Erosion is defined as the phenomenon manifested in paint films by the wearing away of the finish to expose the substrate or undercoat. The degree of failure is dependent on the amount of substrate or undercoat visible.

● Conclusions

Through visual comparison of the aged, **it is observed no erosion in the samples.**

4. ASTM D714-87

The rule ASTM D714-87, without reference to the preparation of the sample, employs photographic standards to evaluate the degree of blistering that may develop when paint systems are subjected to conditions which will cause blistering.

A phenomenon peculiar to painted surfaces is the formation of blisters relative to some system weakness. This test method provides a standard procedure of describing the size and density of the blisters.

In the photographic standards two main characteristics of blistering can be observed:

1) Size: Reference standards have been selected for four stops as to size on a numerical scale from 10 to 0, in which nº 10 represents no blistering.

2) Frequency: Reference standards have been selected for four steps in frequency at each step in size, designated as follows:

Dense (D)

Medium dense (MD)

Medium (M)

Few (F)

● Conclusions

Through visual comparison of the aged samples, **it is observed no blistering in the samples.**



5. ASTM D772-86

The rule ASTM D772-86 covers the evaluation of the degree of flaking (scaling) of exterior paints by comparison with photographic standards, without reference to the preparation of the sample.

Flaking is defined as the phenomenon manifested in paint films by the actual detachment of pieces of the film itself either from its substrate or from paint previously applied. Flaking is generally preceded by cracking or checking or blistering, and is the result of loss of adhesion, usually due to stress-strain factors coming into play.

• Conclusions

Through visual comparison of the aged samples, **it is observed no flaking in the samples.**

6. ASTM D3359-97

This test method covers procedures for assessing the adhesion of coating films to substrates by applying and removing pressure-sensitive tape over cuts made in the film. Two kinds of test methods are described by this rule:

- Test method A: This test method is primarily intended for use at job sites.
- Test method B: This test method is more suitable for use in the laboratories.

These test methods are used to establish whether the adhesion of a coating to a substrate is at a generally adequate level. They do not distinguish between higher levels of adhesion for which more sophisticated methods of measurement are required.

The test method employed was test method B because (as it is said before) is more suitable for use in the laboratories. The procedure is described as follows:

- 1) Select an area (of the paint) free of blemishes and minor surface imperfections, place on a firm base, and make parallel cuts as follows:
 - 1.1.- Space the cuts about 2 mm. apart and make six cuts.
 - 1.2.- Make all cuts about 20 mm. long. Cut through the film to the substrate in one steady motion using just sufficient pressure on the cutting tool (scalpel, knife, sharp razor blade or other cutting device) to have the cutting edge reach the substrate.
- 2) After making the required cuts, brush the film lightly with a soft brush to remove any detached flakes or ribbons of coatings.
- 3) Make the additional number of cuts at 90° to and centered on the original cuts.



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- 4) Brush the area as before.
- 5) Remove two complete laps of tape and discard. Remove and additional length at a steady (not jerked) rate and cut a piece about 75 mm long.
- 6) Place the center of the tape over the grid and in the area of the grid smooth into place by a finger. To ensure good contact with the film rub the tape firmly.
- 7) Within 90 or 120 s of application, remove the tape by seizing the free end and rapidly (not jerked) back upon itself at as close to an angle of 180 ° as possible.
- 8) Inspect the grid area for removal of coating from the substrate or from a previous coating. Rate the adhesion in accordance with the scale illustrated in fig. 6 of the appendix.

● **Conclusions**

Through visual comparison **it is observed no erosion in the samples.**

OVERALL CONCLUSION

The painted samples undertook an ageing process at 70 °C during 1000 hours in a chamber with saline ambient.

The following rules were applied to the ageing samples:

- ASTM D660-93
- ASTM D661-93
- ASTM D662-93
- ASTM D714-87
- ASTM D772-86
- ASTM D3359-97

Through visual comparison (in some cases with microscopic) with the standards defined by the rules it has been showed no checking, no cracking, no erosion, no blistering and no flaking and good adhesion in the samples.

In Burgos on February 12, 2009

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