

**PAINT COATINGS
RESISTANCE TO BIOLOGICAL ATTACKS**

Page 1/11

NO USE RESTRICTION*This is a translation, the French original shall be used in all cases of litigation**Date of translation : 17/08/1998***1. OBJECT AND FIELD OF APPLICATION**

The object of this méthode is to assess the resistance of a paint coating to the action of a reagent simulating attacks from a biological source (for example the action of bird droppings).

2. PRINCIPLE

The test consists of subjecting a paint coating to an artificial ageing cycle, depositing a reagent simulating biological attacks, then drying and dissolving it.

This test is expanded by an adhesion test carried out by means of an adhesive tape on the paint coating portion where the reagent has been deposited.

The deterioration observed is graded in relation to a classification consisting of 7 typical photographs.

3. EQUIPMENT AND REAGENTS**3.1 CONDITIONED ENCLOSURE**

At $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and $50\% \pm 5\%$ relative humidity.

3.2 CLIMATIC ENCLOSURE

Automatically regulated for temperature and humidity, capable of reproducing the ageing cycle defined in paragraph 5.1.1.

3.3 WEATHEROMETER

With a Xenon arc lamp in conformity with méthode d'essai D27 1389.

3.4 VENTILATED OVEN

Used in a laboratory, set to $60^{\circ}\text{C} \pm 1^{\circ}\text{C}$.

3.5 COLD ENCLOSURE OR FREEZER

Which can drop to a temperature of $-18^{\circ}\text{C} \pm 2^{\circ}\text{C}$.

3.6 BALANCE

Accurate to one hundredth of a gram.

3.7 ABSORBENT COTTON WOOL**3.8 POLYETHYLENE BAGS**

Identical to those used in méthode d'essai D47 1165.

3.9 SOLDERING GUN FOR POLYETHYLENE

3.10 DROPPING TUBE

Of 3 millilitres, disposable, in flexible polyethylene from PROLABO, reference 01146671.

3.11 ADHESIVE TAPE

25 or 50 mm wide with an adhesion between 600 and 750 g/cm when it is measured in conformity with norme NF X 41-022.

3.12 GUM ARABIC

Supplied by DETA/MXT/PEI/ARF/VELIZY.

3.13 GUM ARABIC SOLUTION

- Weigh $10 \text{ g} \pm 0,1 \text{ g}$ of gum arabic (3.12) using the balance (3.6).
- Dissolve the gum arabic in $10 \text{ g} \pm 0,1 \text{ g}$ of drinking water.
- Homogenise the solution and leave to rest for a minimum of 3 days in a closed flask, before use.

Note : *The age of this solution is important and must be recorded in the test report. It must be between 3 and 7 days.*

4. PREPARATION OF TEST SPECIMENS

- The dimensions of the test specimens must be such that they can be fitted onto the Weatherometer (3.3) supports, see méthode d'essai D27 1389.
- It must be possible for the test to be carried out in at least two different locations on the test specimen 10 millimetres apart and 10 millimetres from the edge.
- The type of substrate, its surface preparation, the conditions of application and drying of paint films must correspond to the use of the products to be examined.
- The designation of each layer of paint coating must be recorded and indicated in the test report.
- For test specimens produced in a laboratory, the thickness of each paint coating layer must be recorded and indicated in the test report.
- For test specimens taken from the component, the total thickness of the paint coating must be recorded and indicated in the test report.
- The surface of the test specimen must be clean and free from defects.

Provide between 5 and 10 test specimens for the test.

5. METHOD OF OPERATION

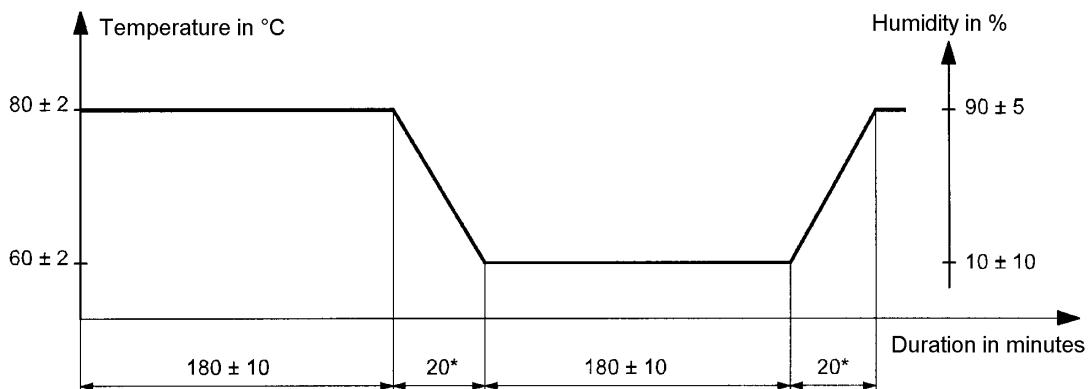
5.1 AGEING OF TEST SPECIMENS

The test specimens must be subjected to an ageing cycle consisting of four stages as described below.

5.1.1 FIRST STAGE

Carry out 5 test cycles in humid heat and in dry heat in the climatic enclosure (3.2).

Diagrammatic example of a cycle :



* Tolerance of 0 to + 40 minutes.

5.1.2 SECOND STAGE

Carry out 105 hours of testing by Weatherometer (3.3). The equipment is programmed in radiation cycles defined as follows :

- Radiance $0,4 \text{ W/m}^2$ with a wavelength of 340 nm. Internal and external quartz filters.
- Permanent radiation, without spraying.
- Temperature on the black plastic panel : $80^\circ\text{C} \pm 3^\circ\text{C}$.
- If necessary, complete the spare places on the test specimen holders with fictitious test specimens.

5.1.3 THIRD STAGE

- Carry out 5 test cycles in humid heat and in dry heat in the climatic enclosure (3.2). This stage is identical to that described in paragraph 5.1.1.
- Remove the test specimens from the climatic enclosure (3.2).
- Leave the test specimens to dry for 24 hours at ambient temperature in the enclosure (3.1).

5.1.4 FOURTH STAGE

A period of 72 hours (week-end) may separate this stage from the previous one. The test specimens must then remain in the enclosure (3.1).

- Cut out and weigh a strip of absorbent cotton wool (3.7) of 180 x 500 mm and 45 g \pm 5 g in mass.
- Deposit a maximum of 3 test specimens over the first third of the length of the cotton wool strip.
- Fold the second third of the cotton wool strip over the test specimens.
- Place 3 other test specimens and cover with the last third of the cotton wool strip.
- Introduce the assembly into a polyethylene bag (3.8).
- Add a mass of industrial water equal to 10 times that of the cotton wool taking care to spread it evenly.
- Expel the air out of the bag by smoothing it with the hand.
- Close the bag hermetically with the soldering gun (3.9).

To ensure a perfect sealing, introduce the assembly into a second bag which must be soldered as previously indicated.

- Place this cataplasm in the ventilated oven (3.4) for 48 h \pm 30 min.
- Remove the cataplasm from the oven.

Note : *Any unsealed bag must entail the rejection of the test specimen it contains.*

- Cool the test specimen by rinsing in industrial water.
- Wipe the test specimen rapidly.

5.2 DEPOSIT OF GUM ARABIC SOLUTION (3.12)

Within 5 to 30 minutes following the end of the fourth stage, deposit onto the test specimen two circular drops of the gum arabic solution (3.13) using the pipette (3.10). The volume of each drop is 0,5 ml with a surface of 1 to 2 cm² approximately.

5.3 DRYING THE SOLUTION (3.13)

- Place the test specimens in the ventilated oven (3.4) for 24 h \pm 30 minutes.
- Ensure that they are laid down flat to avoid the solution (3.13) from draining before drying.

5.4 COLD THERMAL SHOCK

Remove the test specimens from the oven (3.4), leave to cool at ambient temperature in the enclosure (3.1) then place in the cold oven (3.5) for 3 hours \pm 15 minutes.

5.5 REDISSOLVING THE GUM ARABIC AFTER DRYING

- Remove the test specimens from the enclosure (3.5).
- Redissolve the gum arabic by placing the test specimens for approximately one hour in a beaker containing water at $40^{\circ}\text{C} \pm 5^{\circ}\text{C}$.
- Wipe the test specimens rapidly.

5.6 ADHESION TEST

- Within 5 to 60 minutes after drying, apply progressively a piece of adhesive tape (3.11) at the locations marked by the gum arabic, rubbing lightly with the finger so that no air bubble remains trapped between the tape and the paint film.
- Then firm the tape by exerting an equal pressure over the whole surface.
- Peel the tape immediately at angle of 90° with a rapid continuous movement taking care to proceed in the same way for all test specimens.

6. EXPRESSION OF RESULTS

- Examine the paint coating and classify according to the size of the defect.
- The grading is carried out on a scale from 0 to 5 by comparing typical photographs shown in the appendix.
- In the case of a multi-layer system, record the interface at which the flaking appears.
- The results may possibly be compared to those obtained with a reference film.

Note : *Grading from photocopies or scanning of typical photographs is not authorised. Prints of typical photographs may be obtained simply on request from DETA/QSG/DTE/NRM/Sochaux, telephone 36887.*

7. ACCURACY

7.1 REPEATABILITY

The absolute difference between 2 individual results obtained in repeatability conditions must not exceed 1 grading point.

7.2 REPRODUCIBILITY

The absolute difference between 2 individual results obtained in reproducibility conditions must not exceed 1 grading point.

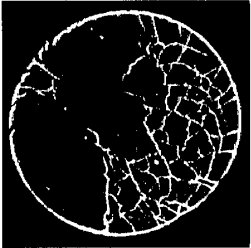
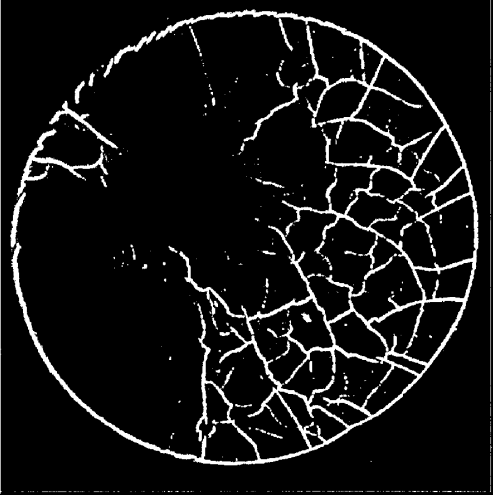
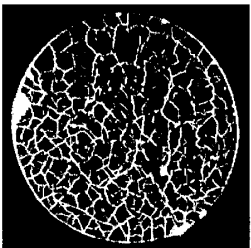
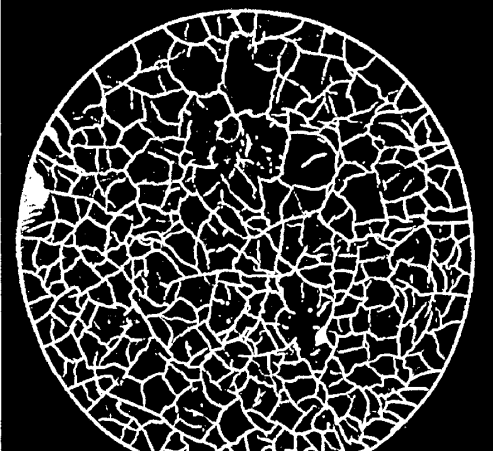
8. TEST REPORT

As well as the results obtained, the test report must indicate :

- the reference to this méthode,
- the grading of each drop from each test specimen,
- the designation of each layer of paint coating examined,
- the thickness of each paint coating layer for test specimens produced in a laboratory or the total thickness of the paint coating for test specimens taken from a component.
- the date and conditions for producing the test specimen,
- the age of the solution (3.13),
- the operating details not specified in the method as well as any possible incidents likely to have affected the results.

Appendix (1/4)

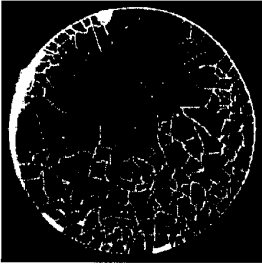
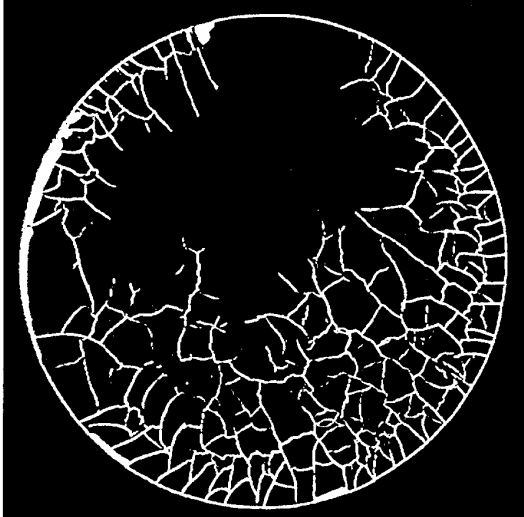
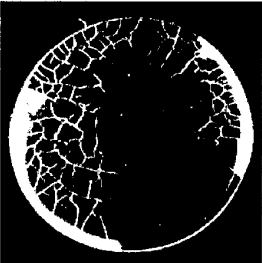
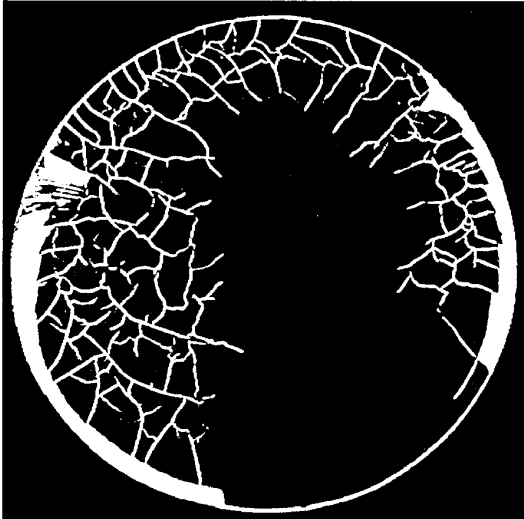
GRADING SCALE

GRADING	PHOTOGRAPH SCALE 2	IMAGE DETECTED BY MICROSCOPE
0	No attack of the paint coating	
1	Slight staining of the paint coating without detachment	
2		
2,5		

Photographic prints of these pictures are reserved for user departments and will be issued on request.

Appendix (2/4)


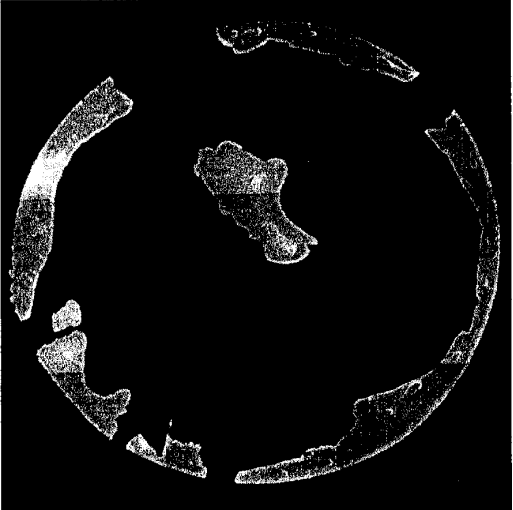

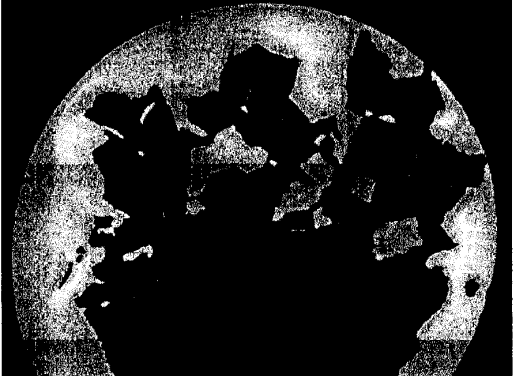
GRADING SCALE

GRADING	PHOTOGRAPH SCALE 2	IMAGE DETECTED BY MICROSCOPE
3		
3,5		

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Appendix (3/4)



GRADING SCALE

GRADING	PHOTOGRAPH SCALE 2	IMAGE DETECTED BY MICROSCOPE
4		
4,5		

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Appendix (4/4)

GRADING SCALE

GRADING	PHOTOGRAPH SCALE 2	IMAGE DETECTED BY MICROSCOPE
5		

Photographic prints of these pictures are reserved for user departments and will be issued on request.

9. RECORDS AND REFERENCE DOCUMENTS

9.1. RECORDS

9.1.1. CREATION

- OR : 23/01/1997 – CREATION OF THE NORME.

9.1.2. SUBJECT OF THE MODIFICATION

- A : 12/11/1997 – MODIFICATIONS TO § 3., 4. AND 5.
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9.2. REFERENCE DOCUMENTS

9.2.1. PSA DOCUMENTS

9.2.1.1. Normes D27 1389

9.2.1.2. Others

9.2.2. EXTERNAL DOCUMENTS AFNOR NORME NF X 41-022

9.3. EQUIVALENT TO :

9.4. CONFORMS TO :

9.5. KEY WORDS