

**COLOURED MATERIALS  
VISUAL COMPARISON OF COLOURS  
IN A LIGHT CHAMBER**

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**NO USE RESTRICTION***This is a translation, the French original shall be used in all cases of litigation**Date of translation : 04/09/2003***1. OBJECT AND FIELD OF APPLICATION**

The object of this méthode is to define the conditions to be observed when visually comparing the colour of a coloured material to that of a colour standard (or a sample of the original material).

It applies to all coloured materials, in particular :

- to all finish paints applied to bodywork, may they be normal or with special effects,
- to soft trim materials (textiles, etc.),
- to plastic parts self coloured or paint coated.

It is used :

- to check the conformity of a coloured part against the corresponding colour standard,
- to determine whether a coloured element has changed colour during ageing, for example, by exposure to light or by a bleed test.

**2. PRINCIPLE**

The coloured or painted part, placed next to the standard of same colour, is submitted to a light from a luminous source.

Then compare visually the coloured impressions received.

Make the same comparison in artificial light under an incandescent lamp to detect the metamerism.

If necessary, make a comparison in ultraviolet light (or black light) to show up the fluorescence.

**3. EQUIPMENT****3.1. INSPECTION CHAMBER**

Room insulated from the outside light with interior faces (floor, walls, ceiling) coated with a neutral grey matt finish.

The light coming from various sources must be filtered through a diffuser screen which does not alter their spectral characteristics.

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### 3.2. LIGHT SOURCES

Use the equipment from the GAMAIN Company of the type :

- “FUNCTIONAL COMPACT 3 keys” of 1800 lux,
- or “FUNCTIONAL MEDIUM 3 keys” of 2500 lux,
- or any other equipment, for example from the MACBETH Company complying with the technical clauses defined below.

#### 3.2.1. DAYLIGHT

Also designated as “white light”, this is illuminant D<sub>65</sub> defined by the International Lighting Commission. Its rays reproduce fairly faithfully those of average daylight, including those in the near ultraviolet. Its colour temperature is 6500 K (see AFNOR norme X 08-000).

#### 3.2.2. ARTIFICIAL LIGHT

This is illuminant A on the rays dispensed by incandescent lamps, with a colour temperature of 2850 K (see AFNOR norme X 08-000).

#### 3.2.3. BLACK LIGHT

The light called “black” is an ultraviolet light of 365 nm wavelength.

#### 3.2.4. MAINTENANCE

The light sources must be cleaned regularly. The duration of their use must remain in conformity with the limits recommended by the supplier.

For information, change :

- incandescent lamps when they are worn out (they seldom last beyond 1000 hours),
- fluorescent tubes every 3500 hours for lighting divided into 500 switching-on times, each switching-on is considered as 3 hours of ageing; once this period of 3500 hours has been exceeded, replace all the light sources and re-check the lighting.

### 3.3. COLOUR STANDARDS

Colour standards are :

- steel sheet plates (or any other support) coated with paint,
- sheets of plasticised polyvinyl chloride (PVCp), rigid plastic slabs, moulded parts painted or not, cloths or carpets, composite materials, etc.

Colour standards must be kept away from light. Avoid contact of the right side with other materials likely to damage the standards, such as coloured cardboard or PVCp sheets. Avoid also marking compressible materials such as velours, carpets and felts by crushing.

Colour standards must be handled with care without placing the fingers on the right side : take hold of them by the edge, by the reverse side or by the support card onto which they may be clipped.

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## 4. OBSERVER

Because of the considerable variations in colour vision found in the whole of the population, it is necessary to check the quality of the colour vision of the observer and its relationship to the group of normal trichromates. This check is carried out by means of inspection methods such as the “Farnsworth test” (see norme NF T 30-061).

In all cases, the observer must refrain from wearing tinted glasses when carrying out an examination.

## 5. PREPARATION OF TEST SPECIMENS

The test specimens submitted for comparison must be of the same dimensions, or of dimensions as close as possible.

Clean them if necessary in order to remove all dirt. In the case of a pile surface, brush it in order to equalise the sheen.

In the case where there is a difference of sheen between the standard and the test specimen, moisten the surface of the areas to be compared (water, greasy substance) in order to equalise the sheen.

If the difference in mattness is significant (for example aged test specimen with a surface condition showing actual degradation), it is sometimes necessary to abandon the colour inspection.

In the case of parts that have been subjected to a thermal treatment, the examination is carried out at  $23^{\circ} \pm 2^{\circ}\text{C}$  (that is to say approximately 2 hours after stoving).

## 6. METHOD OF OPERATION

Eliminate from the field of observation and its vicinity any object likely to disturb visual inspection (standards or test specimens of another colour, clothes of the observer to be covered with a grey overall).

### 6.1. DAYLIGHT

Switch on the “daylight” lighting defined in paragraph 3.2.1.

#### 6.1.1. PAINTS

Apply the paint to the support in the conditions provided by the documents.

##### 6.1.1.1. Non metallic paints

Observe the colour of the test specimen in comparison with the corresponding colour standard by placing them side by side on the front edge of the test specimen support plate provided for this purpose (see appendix 1).

##### 6.1.1.2. Metallic or pearlescent paints

Operate as previously observing nevertheless the test specimens on the whole length of the support plate in order to detect a possible difference in colour due to goniometric phenomena.

##### 6.1.1.3. Paints that have been subjected to an ageing and showing chalking

Look for the observation angle which best reduces the contrast due to the sheen in order to be aware only of the contrast of the two colours.

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### 6.1.2. OTHER CASES

Place side by side the test specimen to be examined and the corresponding colour standard on an observation plane at an angle of approximately 30° above the horizontal plane (see diagram in Appendix 2). Compare them in this position and continue the comparison rotating the observation plane from + 30° to – 30° around a horizontal axis. Return to the original position.

Rotate the test specimens by a quarter of a revolution in their own plane. Restart the comparison as previously. Carry out the same comparison after a second, then a third quarter of a revolution carried out in the same direction. Note the mean result of these comparisons.

In the case of a material presenting an anisotropic aspect (for example corduroy, close-cut carpet, slab moulded in a given grain, metallic effect of paints), orientate the test specimen and the colour standard in the same way. When the test specimen examined or the colour standard have their surface texture modified in relation to the initial condition (for example velours crushed by a cover in the area protected from light, or paint that has been subjected to chalking in the area exposed to light ...), look for the angle of observation which best reduces the contrast due to the sheen in order to be aware only of the contrast between the two colours.

Switch off the “daylight” lighting.

### 6.2. ARTIFICIAL LIGHT

Switch on the incandescent lamps defined in paragraph 3.2.2. and carry out the same comparisons under this light. This second observation which is added to the previous one, enables the “metamerism” phenomenon to be detected.

Switch off the “artificial light” lighting.

### 6.3. BLACK LIGHT

If the installation allows it, switch on the “black light” defined in paragraph 3.2.3. and carry out the same comparisons under this light. This third observation enables any fluorescence phenomenon to be detected. Switch off the “black light” lighting.

### 6.4. MULTIPLE INSPECTIONS

It is permitted to examine successively materials of similar colours, for example a series in shades of blue. On the other hand, if it is necessary to examine successively different colours, it is necessary to :

- start with neutral, light then dark shades,
- continue with brighter shades,
- finish with red shades.

The observer must allow himself a visual rest when passing from one to another colour : a few minutes are generally sufficient. He may also rest his sight by looking at neutral grey.

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## 7. EXPRESSION OF RESULTS

Indicate whether the colour of the test specimen examined is :

- conform,
- at the acceptable limit,
- unacceptable,

according to the differences observed between the test specimen and the corresponding colour standard (or the test specimen and the sample of the original material).

In the case of an unacceptable colour, indicate how the colour is distinguished from that of the colour standard (or that of the sample of the original material).

- difference in intensity or luminance (lighter, darker),
- difference in tonality (redder, yellower),
- difference in saturation (brighter or less bright in the same tonality),
- contrast compared to the grey scale in accordance with NF ISO 105-A02 and NF ISO 105-A03 or contrast compared to that of other test specimens that have been subjected to the same ageing.
- presence of metamerism (two test specimens are metameric if they are identical under one illuminant and different under another,
- presence of fluorescence (that is to say emission of visible radiations under the influence of invisible radiations, for example ultraviolet).

Note also any difference in surface condition (brightness).

## 8. TEST REPORT

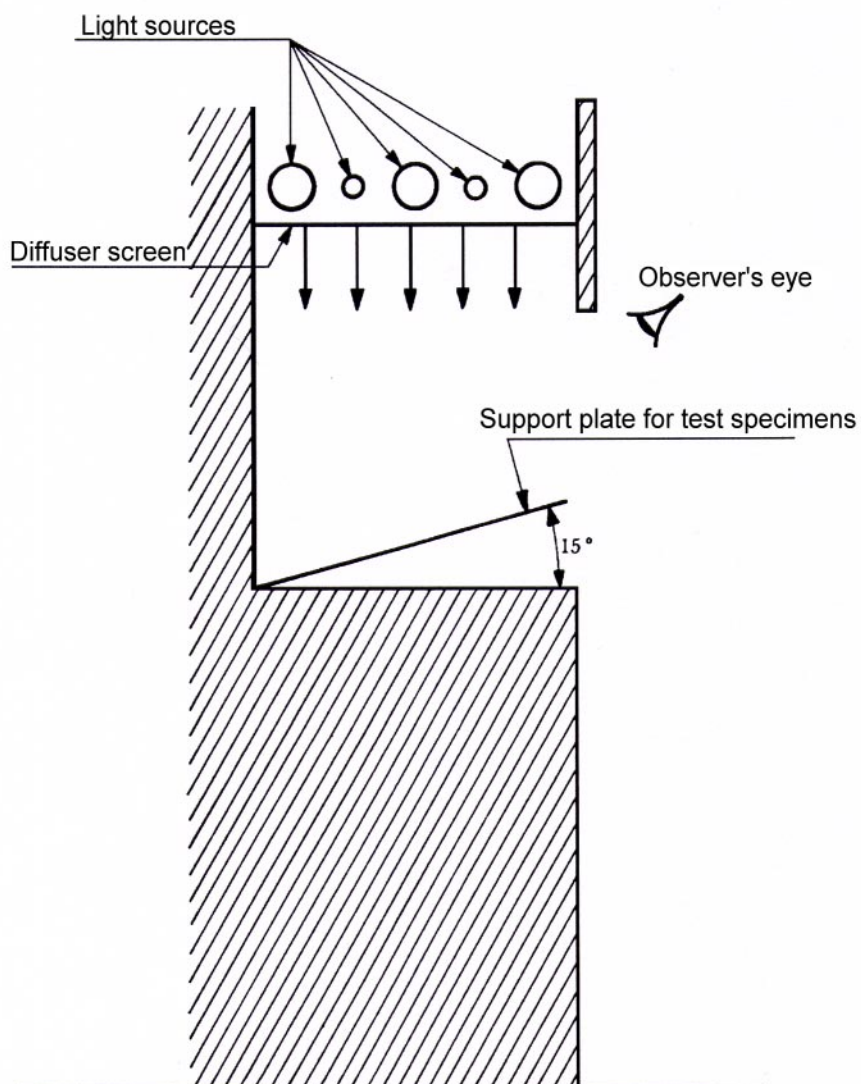
As well as the results obtained, the test report must indicate :

- the reference to this méthode,
- the source (s) of light chosen,
- the results of comparisons in daylight and in artificial light,
- the possible fluorescence phenomenon in relation to the colour standard,
- the operating details not specified in the method as well as any incidents likely to have affected the results.

## APPENDIX 1

## EXAMPLE OF A LIGHT CHAMBER INSTALLATION

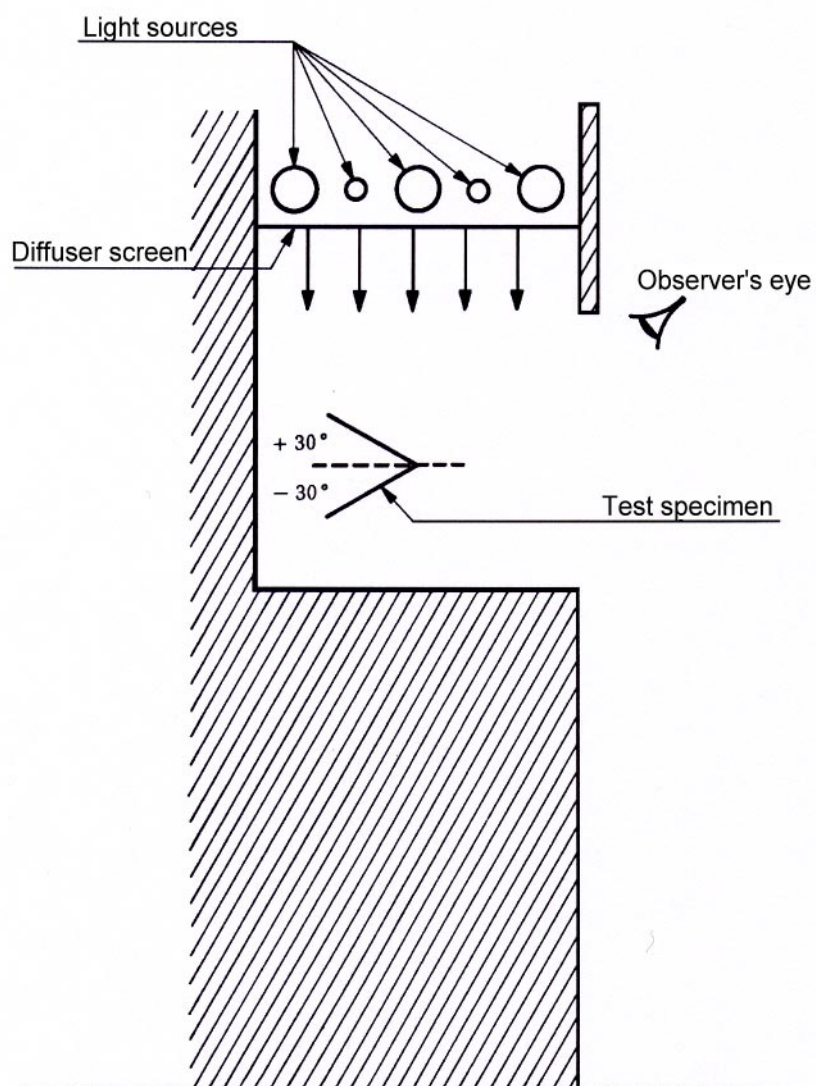
## PAINTS



## APPENDIX 2

## EXAMPLE OF A LIGHT CHAMBER INSTALLATION

## OTHER CASES



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## 9. RECORDS AND REFERENCE DOCUMENTS

### 9.1. RECORDS

#### 9.1.1. CREATION

- OR : 01/10/1979 – CREATION OF THE METHODE D'ESSAI.

#### 9.1.2. SUBJECT OF THE MODIFICATION

- D : 03/07/1996 – INTRODUCED INTO IDEM (*French only*)
- E : 03/12/1997 – CORRECTION OF THE INTRODUCTION INTO IDEM AND FOREWORD DELETED.

### 9.2. REFERENCE DOCUMENTS

#### 9.2.1. PSA DOCUMENTS

##### 9.2.1.1 Normes

##### 9.2.1.2. Others

#### 9.2.2. EXTERNAL DOCUMENTS

NFT30-061(04/1981), NFX08-000(12/1975), ISO105-A02(08/1988), ISO105-A03(08/1988).

### 9.3. EQUIVALENT TO :

REN1343

### 9.4. CONFORMS TO :

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### 9.5. KEY-WORDS