



Designation: D 5383 – 02

## Standard Practice for Visual Determination of the Lightfastness of Art Materials by Art Technologists<sup>1</sup>

This standard is issued under the fixed designation D 5383; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This practice covers a method for exposing specimens of colored art materials indoors to sunlight coming through a closed window. A card containing eight Blue Wool References<sup>2</sup> is exposed simultaneously. Blue Wool References<sup>2</sup> 3, 6, and 7, are used as controls in determining when to remove test specimens from exposure and rate them. Test specimens are rated by assigning each specimen the number of the Blue Wool Reference that shows the same amount of color change.

1.2 This practice may be used to indicate art materials that will change color within a few months or years in normal indoor exposure and those that will remain unchanged for a period of years. It is not rigorous enough to verify that materials will remain unchanged for more than fifty years in a home or office environment. A major consideration in developing this method was to keep it simple and short enough to be performed without instrumentation in a comparatively short length of time.

1.3 This practice shall only be used to evaluate the lightfastness of art materials not conforming to Specifications D 4302, D 5098 or D 5067 and when it is not feasible to use Test Methods D 4303. Practice D 5398, which is a simpler method, may be used by artists to evaluate the lightfastness of their own materials.

1.4 This practice is not suitable for evaluating materials with a high oil content such as artists' oil, resin oil or alkyd paints.

1.5 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:

- D 4302 Specification for Artists' Oil, Resin Oil and Alkyd Paints<sup>3</sup>
- D 4303 Test Methods for Lightfastness of Pigments Used in Artists' Paints<sup>3</sup>
- D 5067 Specification for Artists' Watercolor Paints<sup>3</sup>
- D 5098 Specification for Artists' Acrylic Emulsion Paints<sup>3</sup>
- D 5398 Practice for Visual Evaluation of the Lightfastness of Art Materials by the User<sup>3</sup>
- E 284 Terminology of Appearance<sup>4</sup>

#### 2.2 Other Standards:

- ISO/R 105-B Textiles Tests for Colour Fastness Part B: Colour Fastness to Light and Weathering<sup>5</sup>
- British Standard 1006 Group B Methods for Colour Fastness of Textiles and Leathers<sup>6</sup>

### 3. Terminology

3.1 The definitions included in Terminology E 284 are applicable to this practice.

#### 3.2 Definitions of Terms Specific to This Standard:

- 3.2.1 *bloom, n*—a cloudy coating, sometimes appearing on colored pencil drawings due to migration of wax to the surface, that can be made transparent by gentle polishing.
- 3.2.2 *fugitive color, n*—colorant that changes color in a few days or weeks, or that bleaches white in less than 18 months, when exposed behind glass to sunlight.
- 3.2.3 *glazing, n*—the transparent glass or plastic sheet placed in front of a picture when it is framed.
- 3.2.4 *Substrate, n*—the white, pH neutral paper or board on which the art materials are applied.

### 4. Summary of Practice

4.1 This practice uses as controls three of the eight ISO Blue Wool References developed for use with ISO/R 105-B and British Standard 1006 Group B.

<sup>1</sup> Precision and Bias This practice is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.57 on Artists Paints and Related Materials.

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<sup>2</sup> The Blue Wool Reference Card is available from Talas, Division Technical Library Service, 213 W. 35th St. New York, NY 10001-1992.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 06.02.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 06.01.

<sup>5</sup> International Organization for Standardization, ISO/R 105-B is available from the American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

<sup>6</sup> British Standard 1006 can be obtained from British Standards Institute, Linford Wood, Milton Keynes MK14 6LE, United Kingdom.

4.2 Specimens are made from the colored materials to be tested and attached to a backing panel along with a card containing the eight Blue Wool References.

4.3 One half of each colored specimen and of the Blue Wool Reference are covered, shielding that half of the specimens and references from light. The test specimens and references are exposed to sunlight through a closed window.

4.4 When Blue Wool Reference 3 shows a color change, the colored specimens are examined visually and any that also show a color change are noted. The cover is replaced and exposure continued until the exposed and unexposed halves of Reference 3 reach a specified contrast and Reference 6 also shows a color change. Three observers rate each specimen by assigning it the number of the Blue Wool Reference that shows a similar color change. The three numbers assigned to a specimen are averaged and this average determines in which of four broad lightfastness categories the specimen belongs.

4.5 If it is necessary to determine which materials have excellent lightfastness, continue exposure until Reference 7 shows a color change. Remove the panel from exposure and examine only the specimens that had not changed color at the time Reference 6 faded. Those specimens that still show no color change are placed in the fifth and highest lightfastness category.

NOTE 1—Depending on the test location, the time of year, and the number of cloudy days, it will take from a few days to two months of exposure in a window facing south to reveal fugitive materials that will either bleach white or radically change color in a few years when displayed in a normal home environment. It will take from 4 to 18 months of exposure to determine materials that will show, under normal room conditions, various degrees of color change, and those that will remain unchanged, for a long period of time.

**5. Significance and Use**

5.1 Artists have available to them a wide variety of art materials such as markers, colored pencils, pastels, colored inks and airbrush colors. Many of these materials are manufactured for temporary artwork and may contain pigments and dyes that fade in a relatively short time. Product labels and manufacturers’ literature do not always supply the information necessary to distinguish products that are stable to light from those that are not. This practice makes it possible to check the general lightfastness of coloring materials to be used in works of art; however, Test Methods D 4303 must be used if color measuring instruments and appropriate lightfastness testing apparatus are available. This practice may also be used to evaluate other types of colored materials for lightfastness.

**6. Materials**

6.1 *Backing Panel*, that is resistant to warping when placed on its edge and exposed to light and heat passing through window glass. Foamcore board, particle board, hardboard, or plywood are suitable.

6.2 *Substrate*, of white, non-coated, acid-free (pH 7 to 9), medium weight, 2.5 to 63.5 kg (72 to 140 lb.) paper or museum board. Depending on the material being tested, a pH neutral foam board may be suitable. It is desirable for the surface of the substrate to be similar to that customarily used with the materials being tested; however, it must be possible to com-

pletely cover the substrate with an even coat of the colors. Rough watercolor paper is not suitable.

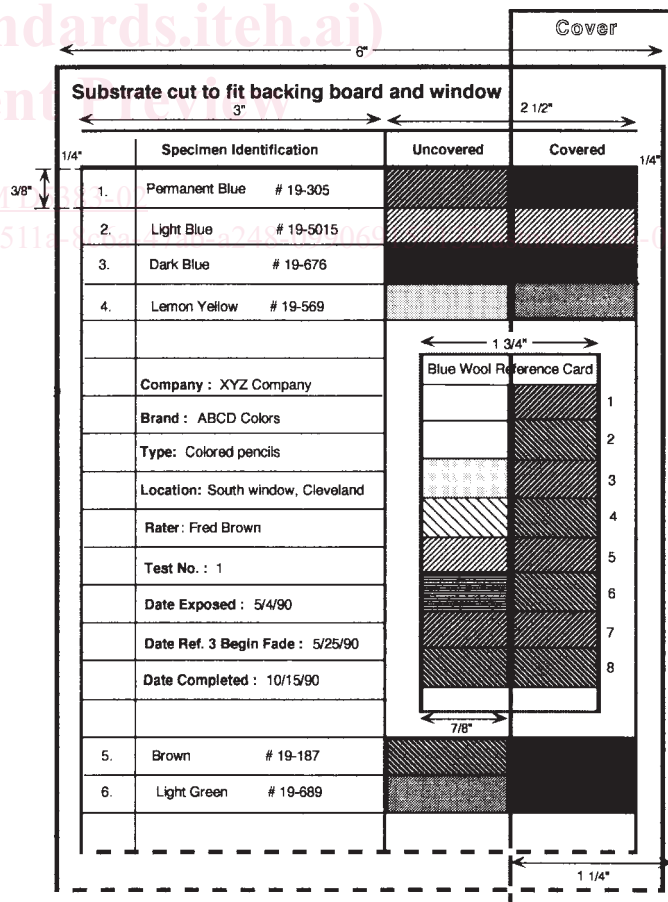
6.3 *Blue Wool Reference Card*,<sup>2</sup> contains bands of the eight Blue Wool References glued to a card 44.5 by 127 mm (1¾ by 5 in.). Each Blue Wool Reference from 1 to 8 takes approximately twice as long to fade as the reference immediately preceding it. The card must be kept in complete darkness until time for the test. It should be wrapped in an opaque covering and stored in a drawer at normal room temperature.

6.4 *Colored Art Materials*, to be tested.

6.5 *Specimen Cover*, made from stiff material such as heavy gage aluminum; stainless steel; stiff, opaque plastic; or wooden strips. The cover shall be at least 32-mm (1¼-in.) wide and as long as the backing panel. It is used to protect one half of each art material specimen and one half of the Blue Wool Reference Card from light (see Figs. 1 and 2). The side of the cover that touches the art material specimens should be chemically inert to prevent interaction with, or migration of substances onto the test specimens.

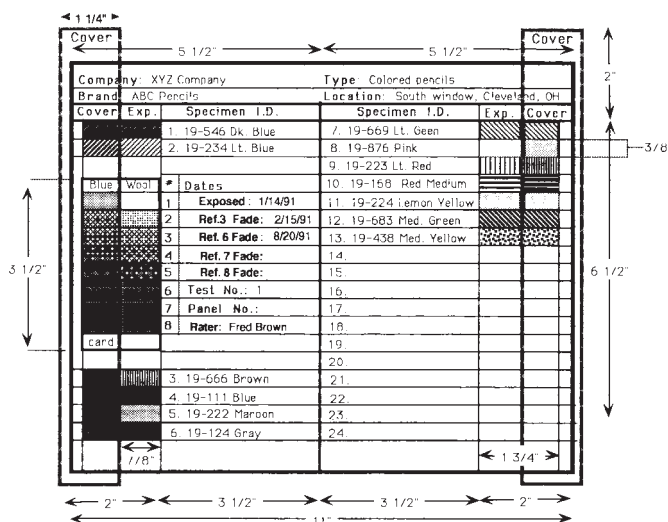
6.6 *Tape*, to fasten the specimen support to the backing board and to fasten the specimen cover over the specimens and the Blue Wool Reference Card. Duct or electrical tape is suitable since it is designed to withstand heat.

6.6.1 *Optional Metal Clamps or Wing Nuts*, to hold the cover more tightly against the specimen, may be used. This



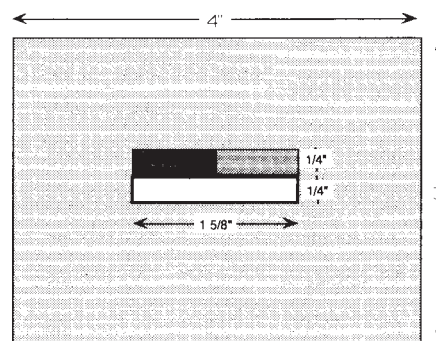
NOTE 1—1 in. = 25.4 mm (exact).

**FIG. 1 Suggested Layout for Lightfastness Test Panel**



NOTE 1—1 in. = 25.4 mm (exact).

**FIG. 2 Example of Two-Cover Layout That Fits on an 8 1/2 by 11 in. sheet**



NOTE 1—Side 2 is the same as the Gray Mask.

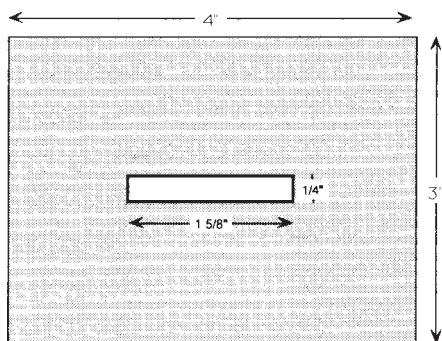
**FIG. 4 Side 1 of Mask II with the Slot and Two Blue Color Chips**

will exclude light better making a sharper edge between the exposed and unexposed sections of the specimens for easier visual judgments.

6.7 *Mask I*, shall be made of stiff, neutral gray paper, approximately Munsell Value 6.5 (reflectance 36.2 %), with a slot, 6.4 by 41.3 mm (1/4 by 1 5/8 in.) See Fig. 3. This is slightly smaller than an individual Blue Wool Reference. It is used to isolate a specimen when looking for a color change to prevent color changes in neighboring specimens from affecting the decision.

6.8 *Mask II*, shall be made of stiff paper of the same neutral gray and with the same size slot as in Mask I. Side 1 shall have two blue chips mounted adjacent to the slot. One chip shall be Munsell 7.0 PB 4.0/13.0, matching the unexposed Blue Wool Reference 3. The second chip shall be Munsell 5.0 PB 6.0/4.0, the color of the exposed half of the Blue Wool Reference when the test is complete (see Fig. 4). Side 1 of Mask II is used to determine when Reference 3 has faded sufficiently for the second rating (see 8.5.1). Side 2 is used to isolate the individual Blue Wool References when they are being compared with a test specimen isolated with Mask I.

6.9 *Soft Clean Artists' Brush*, to be used to dust off Blue Wool References and specimens following exposure.



**FIG. 3 Mask I Containing a Slot Just Smaller Than the Blue Wool References**

**6.10 Report and Instruction Sheets.**

6.10.1 A form to record the materials being tested, the date of exposure, the date Reference 3 begins to fade, materials that also show a color change at that time, and the date Reference 6 shows a color change (see Fig. 5 for an example).

6.10.2 A set of instructions, such as is shown in Fig. 6, to be given to the three observers.

6.10.3 Three copies of a form, such as is shown in Fig. 7, to be used by the observers in recording their evaluation of the test specimens.

6.10.4 A final rating form to record and average the observers' ratings and list the lightfastness category for each material (see Fig. 8 for an example of a suitable form).

Manufacturer:		Test Number:			
Brand:		Board Number:			
Type of Material:		Dates - Exposed:			
Location:		Rating 1, Ref. 3 fades:			
Rater:		Rating 2, Ref. 6 fades:			
Date rated:		Rating 3, Ref. 7 fades:			
No.	Specimen Identification Number and Name	Rating 1 Ref. 3 Fades	Rating 2 Ref. 6 Fades	Rating 3 Ref. 7 Fades	Comments
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
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**FIG. 5 Example of Technician's Record Sheet**