

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

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**RECONFIRMATION**

**OF**

**AS/NZS 1580.601.1**

**Paints and related materials—Methods of test  
Method 601.1: Colour—Visual comparison**

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**RECONFIRMATION NOTICE**

Technical Committee CH-003 has reviewed the content of this publication and in accordance with Standards Australia procedures for reconfirmation, it has been determined that the publication is still valid and does not require change.

Certain documents referenced in the publication may have been amended since the original date of publication. Users are advised to ensure that they are using the latest versions of such documents as appropriate, unless advised otherwise in this Reconfirmation Notice.

Approved for reconfirmation in accordance with Standards Australia procedures for reconfirmation on 30 May 2013.

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The following are represented on Technical Committee CH-003:

Australasian Corrosion Association  
Australian Paint Approval Scheme  
Australian Paint Manufacturers' Federation  
Australian Pipeline Industry Association  
Institution of Professional Engineers New Zealand  
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## NOTES

# Australian/New Zealand Standard®

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## Paints and related materials—Methods of test

### Method 601.1: Colour—Visual comparison

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#### PREFACE

This Standard was prepared for the Joint Australia/New Zealand Standards Committee CH/3, on Paints and Related Materials by the Subcommittee on Methods of Colour Measurement to supersede the edition of AS 1580.601.1.

This Standard provides a test procedure for assessment of colour matching in the test light booth described in AS 4004, *Lighting booths for visual assessment of colour and colour matching*. It also provides information on the selection of colour assessment operations. This edition is substantially the same as the 1992 edition but includes information on light booth maintenance in Appendix C and a note in Clause 9 cautions against the wearing of strongly coloured clothing.

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#### FOREWORD

The visual evaluation of colour differences in the matching of similar materials may sometimes be carried out satisfactorily under one light source and one set of illuminating and viewing conditions. The variety of light sources available frequently makes it necessary to evaluate colour matches under more than one light source, although for many purposes evaluations under daylight and incandescent lamplight may be adequate. Natural daylight has long been the favourite source but, because of the variability of natural daylight in both quantity and quality, artificial daylight of specified intensity and spectral composition is preferable.

This method specifies a procedure for colour comparison using two sources of illumination in the light booth specified in AS 4004. It gives a quality of colour match as a numerical rating, with a corresponding descriptive standard name for five grades of colour conformity. The method is simple, reliable and reproducible, using the eye as the criteria of colour acceptability with panel separation as the variable determining an acceptable match, and the spacing giving the required rating.

This method should, however, only be performed in a standardized and rated lighting booth to permit colours to be assessed at different locations using booths that are of a similar rating category.

It should be noted that the test procedure of this method is generally used to compare the colour of paint films that are sufficiently thick to give complete hiding of the substrate. For translucent and semi-transparent paint systems, the colour will depend on the film thickness and the colour of the substrate. Comparisons can only be carried out when these factors are appropriately controlled in the test specimen.

## METHOD

**1 SCOPE** This Standard sets out a method of assessing colour in a test light booth.

**NOTES:**

- 1 Appendix A provides guidelines for the selection and rating of persons who may be involved in colour assessment.
- 2 Appendix B provides information on metameric matches.

**2 REFERENCED DOCUMENTS** The following documents are referred to in this Standard:

AS

2310 Glossary of paint and painting terms

4004 Lighting booths for visual assessment of colour and colour matching

CIE

51 A method of assessing the quality of daylight simulators for colorimetry

**3 DEFINITIONS** For the purpose of this Standard, the definitions in AS 2310 and those below apply.

**3.1 Fluorescence**—the property exhibited by certain substances whereby light is absorbed at one wavelength band of the invisible spectrum and this energy is then re-emitted as a band of light at other frequencies in the visible spectrum.

**3.2 Metamerism**—the phenomenon exhibited by two surfaces which appear to be the same colour when viewed under one light source (e.g. daylight) but which do not match when viewed under a different light source (e.g. incandescent lamp).

**4 PRINCIPLE** A coated test specimen is compared for colour match against a colour reference standard, when viewed within a test light booth specified by AS 4004.

**5 APPARATUS** The apparatus below is required.

**5.1 Light booth** The test light booth, meeting the requirements of AS 4004, shall have the following general characteristics:

- (a) **Viewing area**—not less than 300 mm × 200 mm.
- (b) **Daylight simulator**—equivalent to the D<sub>65</sub> illuminant, described in CIE 51, with an illuminance in the range of 1000 to 5000 lx.
- (c) **Incandescent light source**—of temperature 2200 to 2900 K with an illuminance within 30 percent of that of the daylight simulator.
- (d) **Colour of walls**—of neutral grey, having a value of L\* not less than 50 and not greater than 75, and a value of C\*<sub>AB</sub> not greater than 4.0.

**5.2 Colour reference**

**5.3 Test panel**—not smaller than 100 mm × 50 mm.

**6 SPECIMEN PREPARATION** Specimens for assessment shall be prepared in accordance with the appropriate product Standard or specification. For maximum precision of colour difference evaluation, materials being compared should have the same gloss and texture.

**7 LIGHT BOOTH MAINTENANCE** The booth shall be inspected after each 100 h of operation to ensure that the reflectors, bulbs, filters and diffusing glass are kept clean, and the electric lamp is replaced at nominated intervals, or when the illuminance falls below a specified level.

A record shall be kept of all checks of illumination, cleaning procedures, and lamp replacements.

NOTE: Appendix C provides further information on light booth maintenance.

**8 SELECTION OF OBSERVERS** The observer or observers shall have normal colour vision and should have passed either the Ishihara or the standard pseudoisochromatic test for colour vision deficiency (see Appendix A). Where Grade 1 or 2 matches are required, it is preferable for the observer to have better than average colour vision. The assessment of colour is a subjective process which often requires the use of more than one observer. Where disputes arise five observers may be employed, where three of these may be unskilled (see Note 3) in the use of colour.

NOTES:

- 1 Appendix A provides guidance on the selection and rating of observers.
- 2 Appendix D contains additional information on the conduct and interpretation of colour matching.
- 3 Observers skilled in the use of colour, such as colour matchers, are sometimes over-critical in their assessment of colour differences.

**9 PROCEDURE** The test procedure shall be as follows:

- (a) Place the test panel and the reference colour standard side by side in the same plane in the light booth at a distance, usually between 15 cm and 50 cm from the light source, so that the required intensity of illumination at the film face is achieved.
- (b) View the surfaces perpendicularly, from a distance of 500 mm to 700 mm with the light falling on them at about 45° to the perpendicular. It may also be helpful to tilt glossy specimens to about 10° below the horizontal away from the observer, and to view them at about 45° to the perpendicular.

NOTE: The viewer should avoid wearing strongly coloured clothing which may influence the colour assessment.

- (c) Compare the colour of the test film with that of the reference colour standard, first under 'daylight' illumination and then under 'incandescent' illumination, except where the latter illumination is not required to check for metamerism.
- (d) Determine the rating of the colour match, by reference to Table 1.
- (e) Test for metamerism, by switching to the incandescent light source.
- (f) Test for fluorescence, by switching to the ultraviolet (UV) light source, if fitted.

**10 REPORT** The following information shall be reported:

- (a) Method by which full hiding power of the substrate was achieved, or for samples of less than full hiding, a description of the substrate and the method of film application.
- (b) The quality of the colour match under the daylight simulator as rated in accordance with Table 1.
- (c) For a Grade 1 or Grade 2 match, whether metamerism was present.
- (d) Whether fluorescence was observed.
- (e) The make, model, lighting levels and classification of the light booth.
- (f) The identity of the observer by code or name, and where available, the observer's colour proficiency rating.
- (g) When appropriate, the manner in which the colour of the test specimen differs from that of the colour reference (e.g. too light, too much red).
- (h) Reference to this Australian/New Zealand Standard, i.e. AS/NZS 1580.601.1.

**TABLE 1**  
**CLASSIFICATION OF DEGREES OF COLOUR MATCH AS**  
**DETERMINED BY UNAIDED VISUAL INSPECTION**

| Rating | Descriptor               | Explanatory notes                                                                                                                                                                                                                 | Typical application                                                                                                                                                 | Minimum recommended booth category |
|--------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| 0      | Exact match              | Colour of test sample indistinguishable from that of reference sample when viewed under any lighting condition. The boundary between the test and reference samples cannot be visually detected on the basis of colour difference | This quality of match is rarely achieved in practice and there are no commercial situations that could justify the specification of such a quality                  | BC<br>+<br>incandescent source     |
| 1      | Critical match           | A small, just perceptible colour difference can be seen when the samples are held in contact, but it cannot be detected when the samples are separated by 5 mm (see Note 1). See Note 2 where metamerism is present               | The difference is small enough to be tolerable in any critical object where the two colours are used together such as is frequently required in automotive topcoats | BC<br>+<br>incandescent source     |
| 2      | Close match              | When separated by 5 mm (see Note 1) a small colour difference can be seen, but it is undetectable when the separation is increased to 25 mm. See Note 2 where metamerism is present                                               | Two paints, showing only close match, if applied to the wall of a room would not be distinguished if separated at a corner                                          | DD<br>+<br>incandescent source     |
| 3      | Approximate match        | When separated by 20 mm (see Note 1) a small colour difference may be seen, but is undetectable when the separation is increased to 100 mm. Metamerism may or may not be present                                                  | —                                                                                                                                                                   | Not specified                      |
| 4      | Crude match (poor match) | Difference is readily detectable even when separation is much greater than 100 mm (see Note 1)                                                                                                                                    | Intended to indicate no more than a nominal match of the hue (and perhaps brightness)                                                                               | Not specified                      |

**NOTES:**

- The separation distances specified apply to viewing distances of 500 mm to 700 mm from the specimens.
- Metameric match* The nature of the colour difference of a pair of samples changes with a change in the observation conditions. If the materials being assessed contain a fluorescent agent, then a light booth of higher grading for UV may be necessary (i.e. a BD booth may need to be upgraded to BB). The changed conditions could be the viewing angle, the lighting conditions or even the person making the assessment.  
 Usually the change relates to the lighting/illumination type e.g. from daylight ( $D_{65}$ ) to artificial (A). The colour might match under  $D_{65}$  but show a difference under A. Alternatively, a colour difference under one illuminant might change in direction (or magnitude) under the second illuminant e.g. from redder under  $D_{65}$ , to greener under A.  
 Colour matches of Grade 1 or Grade 2 which are metameric should be Graded 1M or 2M. The metamerism may be qualified by the terms 'slightly' or 'severely'.
- Observation conditions* Colour matches of Grade 0 or Grade 1 must be carefully assessed under well-controlled conditions for reproducible conclusions to be drawn on the colour quality. These assessments must be performed in a colour matching booth of Grade A or Grade B rating.