International Standard 105/B

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Textiles — Tests for colour fastness — Part B : Colour fastness to light and weathering

Textiles — Essais de solidité des teintures — Partie B : Solidité des teintures à la lumière et aux intempéries

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 105/B was prepared by Technical Committee ISO/TC 38, *Textiles*.

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General information on colour fastness to light

When in use, textiles are usually exposed to light. Light tends to destroy colouring matters and the result is the well-known defect of "fading", whereby coloured textiles change colour, usually becoming paler and duller. Dyes used in the textile industry vary enormously in their resistance to light, and it is obvious that there must be some method of measuring their fastness. The substrate also influences the light fastness of a dye.

This International Standard cannot satisfy completely all the interested parties (who range from dye manufacturers and the textile industry to wholesale and retail traders and the general public) without becoming technically involved and possibly difficult to understand by many who have a direct interest in its application.

The following non-technical description of the test has been prepared for the benefit of those who find the detailed technicalities of the standard difficult to understand. The method is to expose the pattern being tested and to expose also, at the same time and under the same conditions, a series of light fastness standards which are pieces of wool cloth dyed with blue dyes of different degrees of fastness. When the pattern has faded sufficiently, it is compared with the standards and if it has behaved, for instance, like Standard 4[1)], then its light fastness is said to be 4.

The light fastness standards must cover a wide range since some patterns noticeably fade after exposure for 2 or 3 h to bright summer sunshine, although others may with stand several years' exposure without change, the dyes in fact outliving the cloth to which they have been applied. Eight standards have been chosen, Standard 1 being the most fugitive and Standard 8 the most resistant. If it takes a certain length of time for Standard 4 to fade under certain conditions, then the same amount of fading will occur on Standard 3 in approximately half that time, or on Standard 5 in approximately twice that time, provided that the conditions are the same.

It is necessary to ensure that different people testing the same material will fade it to the same extent before assessment against the simultaneously faded standard. The ultimate users of dyed textiles differ widely in what they consider to be "faded articles" and therefore patterns under test are faded to two different degrees which adequately cover most opinions and make assessment more reliable. These required degrees of fading are defined by reference to a collection of standard contrasts (grey scale 5 equals no contrast, grey scale 1 equals large contrast). Thus the use of the grey scale enables fading to be taken to defined extents, and the blue standards enable the light fastness to be rated.

This general principle of assessing on the basis of moderate and severe fading is complicated, however, by the fact that some patterns on exposure undergo a slight change very rapidly indeed but do not change further for a long time. These slight changes are such that under normal conditions of use they would seldom be observed, but in certain cases they become important, as the following example shows.

> Some curtain material is exposed so as to produce a moderate degree of fading and it is found that Standard 7 has faded to the same extent; the general light fastness of the fabric is therefore 7. A retailer has a length of this fabric in his window and on it is a cardboard ticket indicating the price. After a few days the ticket is removed and careful examination reveals the place where it has been resting because the surrounding cloth has changed shade slightly on exposure to light.

The important factor about this slight change is that it can only be detected when there is a sharp boundary between the exposed and unexposed areas, and these conditions rarely occur during normal use. The magnitude of this slight change would be given as an additional assessment in brackets. Thus a rating for a test could be 7 (2), indicating a slight initial change equivalent to the first perceptible fade of Standard 2, but otherwise a high light fastness of 7.

A further unusual colour change is also catered for, namely photochromism. This effect is shown when a dye changes colour rapidly on exposure to strong light but on removal to a dark place the original colour returns more or less completely. The extent of photochromism is determined by a special test included in this International Standard and is shown in the rating by a number following the letter P within brackets; for example 6 (P2) means a photochromic effect equal to a grey scale 2 contrast but permanent fading equal to that of Standard 6.

Finally, there are many patterns which change hue on prolonged exposure to light; for example, a yellow may become brown, or a purple may become blue. In the past there have been many arguments as to whether such patterns could be said to have faded or not. The technique used in this International Standard is unambiguous on this point; it is visual contrast on exposure which is being measured, whether it be loss of colour or change in hue; in the latter case, however, the kind of change is included in the assessments. For example, consider two green patterns which, on exposure, change in appearance at the same rate as Standard 5; one becomes paler and finally white, while the other becomes first a greenish blue and finally a pure blue. The former would be rated "5" and the latter "5 bluer". In this instance also, the technique used in this International Standard tries to present as complete a picture of the behaviour of a pattern on exposure as is possible without becoming excessively complicated.

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1) The designations of the light fastness standards referred to here are those of the European set (see section B01, sub-clause 4.1.1). The principles explained are equally valid for the American set (see section B01, sub-clause 4.1.2).

B01 Colour fastness to light : Daylight

0 INTRODUCTION

This method replaces those given in ISO/R 105/I, part 11, and ISO 105/VI, part 2, by combining the two methods. Certain editorial changes have been made but no significant changes in the technical content of either of the two methods are made. The two previous methods essentially differed only in the blue wool standards used and this difference is reflected in the present text. Consolidation of the two methods will eliminate the confusion of having two methods to evaluate the same property.

1 SCOPE AND FIELD OF APPLICATION

1.1 This method is intended for determining the resistance of the colour of textiles of all kinds and in all forms to the action of daylight.

1.2 If there is a possibility of the sample being photochromic, then the test for photochromism shall be applied, additionally (see section B05).

2 PRINCIPLE

A specimen of the textile is exposed to daylight under prescribed conditions, including protection from rain, along with eight dyed wool standards. The fastness is assessed by comparing the change in colour of the specimen with that of the standards.

3 REFERENCES

ISO 105 :

Section A01, *General principles of testing.*

Section A02, *Grey scale for assessing change in colour.*

Section B05, *Detection and assessment of photochromism.*

4 STANDARDS AND APPARATUS

4.1 Standards

Two sets of Blue Wool Standards may be used. The two sets of standards are not interchangeable.

4.1.1 Standards 1 to 8

Blue Wool Standards developed and produced in Europe are identified by the numerical designation 1 to 8. These standards are blue wool cloths dyed with the dyes listed in the table. They range from 1 (very low light fastness) to 8 (very high light fastness) (see 9.1).

TABLE – **Dyes for Blue Wool Standards 1 to 8**

Standard	Dye – Colour Index – Designation[1)]
1	CI Acid Blue 104
2	CI Acid Blue 109
3	CI Acid Blue 83
4	CI Acid Blue 121
5	CI Acid Blue 47
6	CI Acid Blue 23
7	CI Solubilized Vat Blue 5
8	CI Solubilized Vat Blue 8

1) The Colour Index (Third edition) is published by the Society of Dyers and Colourists, P.O. Box 244, Perkin House, 83 Gratton Road, Bradford BD1 2JB, West Yorks., United Kingdom.

4.1.2 Standards L2 to L9

Blue Wool Standards developed and produced in America are identified by the letter L followed by the numerical designation 2 to 9. These eight standards are specially prepared by blending varying proportions of wool dyed with CI Mordant Blue 1 (Colour Index, 3rd Edition 43830), and wool dyed with CI Solubilized Vat Blue 8 (Colour Index, 3rd Edition 73801), so that each higher numbered standard is approximately twice as fast as the preceding standard (see 9.2).