



Test Methods for the Colour Fastness of Leather & Dyes

Contents

Colour Fastness of Dyed Leather

1. Grey scale for assessing change of colour
2. Grey scale for assessing staining
3. Fastness to light: Xenon
4. Fastness to mild washing
5. Fastness to machine washing
6. Fastness to dry cleaning solutions
7. Fastness to migration into plasticized PVC
8. Fastness to perspiration
9. Fastness to rubbing
10. Fastness to water
11. Fastness to water spotting

Dyes

1. Solubility of powder dyes
2. Stability of dyes to: acid, alkali and hard water

Valid from: February, 2004	Version: 01	Page 1 of 16
Approved by: Campbell Page, Global R&A	Responsible: Sabine Dickhaut-Güdemann, Global R&A	

Test Methods for the Colour Fastness of Leather & Dyes

Introduction

There are a number of test methods regularly used for colour fastness and for dyes. To have an overview as to what is involved with these tests, we have put them all together in a simple summary form. For detailed aspects of these tests, you are strongly recommended to refer to the listed International (ISO), European (EN) and International Leather Technologists (IULTCS, www.iultcs.org) test methods.

Questions about leather test methods?

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Valid from: February, 2004	Version: 01	Page 2 of 16
Approved by: Campbell Page, Global R&A	Responsible: Sabine Dickhaut-Güdemann, Global R&A	

Test Methods for the Colour Fastness of Leather & Dyes

Grey Scale for Assessing Change in Colour

EN ISO 105-A02

This Grey Scale is for assessing changes in colour of leather in colour fastness tests, for example, wash fastness, perspiration fastness, etc.

The scale consists of nine pairs of grey colour chips each representing a visual difference and contrast.

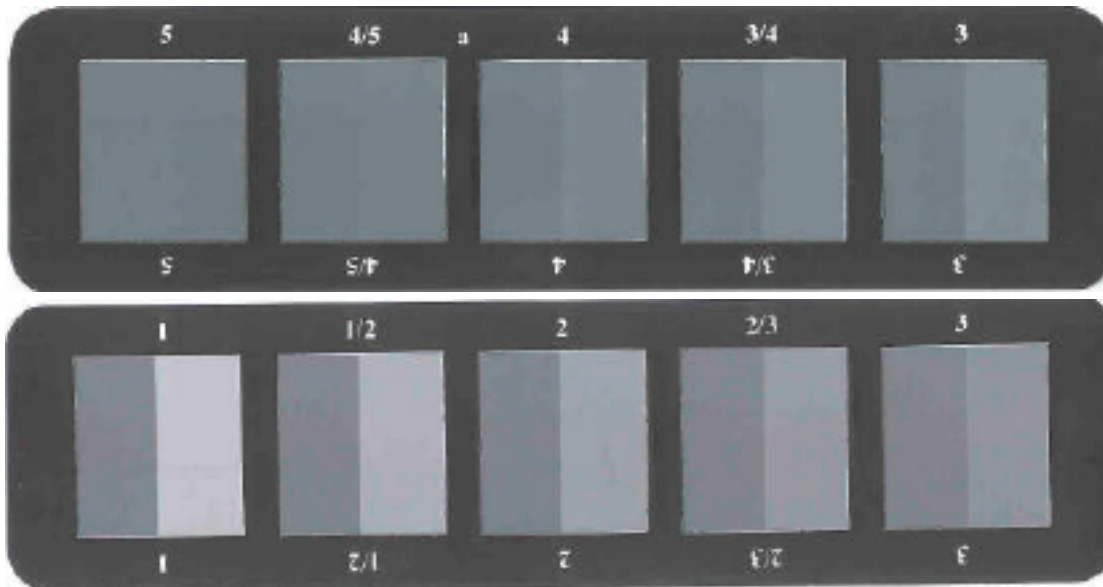
The fastness rating goes step-wise from:

Note 5 = no visual change (best rating)

to Note 1 = a large visual change (worst rating).

The grey scale has the 9 possible values:

5, 4-5, 4, 3-4, 3, 2-3, 2, 1-2, 1.



It is now quite common to measure the Grey Scale change in colour instrumentally. This is made using a suitable reflectance spectrophotometer according to the test method procedure, EN ISO 105-A05.

Valid from: February, 2004	Version: 01	Page 3 of 16
Approved by: Campbell Page, Global R&A	Responsible: Sabine Dickhaut-Güdemann, Global R&A	

Test Methods for the Colour Fastness of Leather & Dyes

Grey Scale for Assessing Staining

EN ISO 105-A03

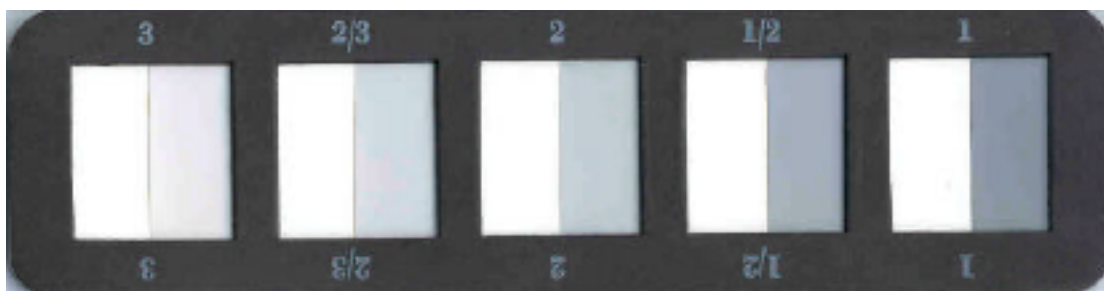
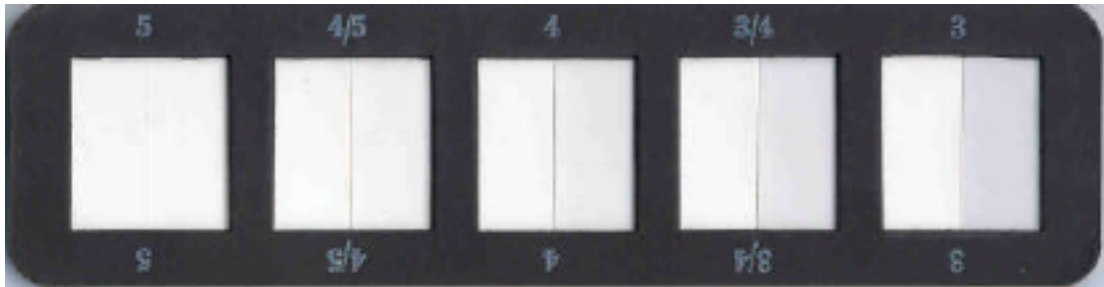
This Grey Scale is for assessing the degree of staining caused by a dyed leather in colour fastness tests. For example, the staining of wool and cotton fabrics in the wash fastness, perspiration fastness, etc. The scale consists of nine pairs of grey colour chips each representing a visual difference and contrast.

The fastness rating goes step-wise from:

Note 5 = no visual change (best rating)
to Note 1 = a large visual change (worst rating).

The grey scale has the 9 possible values:

5, 4-5, 4, 3-4, 3, 2-3, 2, 1-2, 1.



It is now quite common to measure the Grey Scale for assessing staining instrumentally. This is made using a suitable reflectance spectrophotometer according to the test method procedure, EN ISO 105-A04.

Test Methods for the Colour Fastness of Leather & Dyes

Colour Fastness of Leather to Light: Xenon Lamp

EN ISO 105-B02

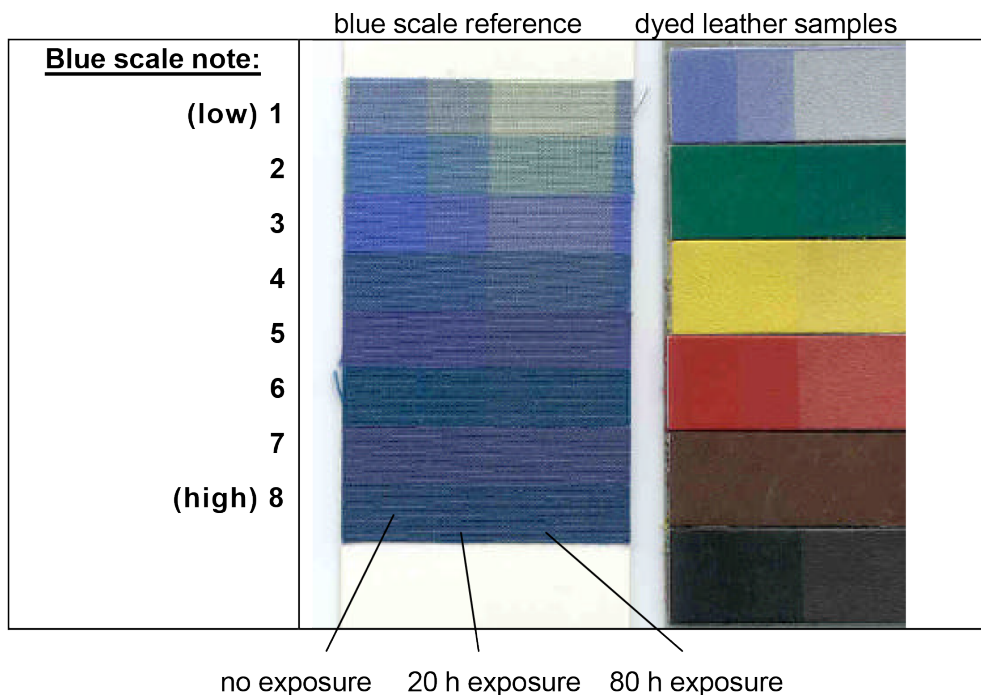
This method is intended for determining the resistance of the colour of leather to the action of a standard artificial light source. The Xenon lamp has an emission wavelength profile close to daylight.

In most (but not all) dye supplier's pattern cards, the values reported are for dyeing on full grain chrome leather. It should be clearly understood that the light fastness rating obtained for dyed leather will change significantly depending on the type of leather and amount of dye applied.

Method

The side to be tested of the leather sample is exposed to light from a Xenon Lamp, under controlled conditions, along with eight blue dyed wool standards (blue scale). The light fastness is assessed by comparing the fading of the leather with the fading of the blue standards. The fading is typically made in 2 exposure times to better assist the evaluation. The exposure time can be varied depending on the lamp intensity and the blue scale level required. To measure up to a maximum blue scale level 3 an exposure of 20h and 80h (as below) is often sufficient for a quick checking of the light fastness rating.

Important: for measuring the light fastness in the blue scale 3 – blue scale 6 range, exposure times of 144h and 280h are necessary.



For simulating high temperature light fastness as occurs in automobiles, the test procedure EN ISO 105-B06 or DIN 75202 (FAKRA) should be used.

Test Methods for the Colour Fastness of Leather & Dyes

Colour Fastness of Leather to Mild Washing

EN ISO 15703 / IUF 423









Fastness of the colour of leather to hand washing is the resistance to washing under mild domestic laundering in water. In washing leather, not only changes in colour can occur in the leather, but coloured substances may bleed from it and may stain adjacent textile materials.

Method

The samples of dyed leather in contact with undyed textiles, e.g. multi-fibre strips or wool and cotton, are agitated in a neutral solution of a synthetic detergent (5g/l sodium lauryl sulphate) for 30 min. at 30°C. The samples are rinsed and dried.

The change in colour of the leather specimen (N) compared with the original sample (Tq) and the staining of the textiles are assessed with standard Grey Scales.

(CA = acetate, CO = cotton, PA = polyamide, PES = polyester, PAC = Polyacrylic, WO = wool)

Tq	N	CA	CO	PA 6.6	PES	PAC	WO
							
rating	2	4-5	2-3	3-4	4-5	4-5	4-5



Test Methods for the Colour Fastness of Leather & Dyes

Colour Fastness of Leather to Machine Washing

EN ISO 15702 / IUF 435

Fastness of the colour of leather to machine washing is the resistance to washing under domestic machine laundering in water. In washing leather, not only changes in colour can occur in the leather, but coloured substances may bleed from it and may stain adjacent textile materials.

Method

The samples of dyed leather in contact with undyed textiles, e.g. multi-fibre strips or wool and cotton, are agitated in a solution of a standard wash detergent (4g/l ECE Colour Fastness Test Detergent 77) for 30 min. at 40°C. The samples are rinsed and dried.

The change in colour of the leather specimen (N) is compared with the original leather sample (Tq) and the staining of the textiles are assessed with standard Grey Scales.

(CA = acetate, CO = cotton, PA = polyamide, PES = polyester, PAC = Polyacrylic, WO = wool)

Wash Fastness 40°C / 30 min.							
Tq	N	CA	CO	PA	PES	PAC	WO
rating	4	5	3-4	4-5	5	5	5



Test Methods for the Colour Fastness of Leather & Dyes

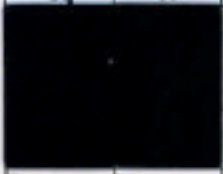
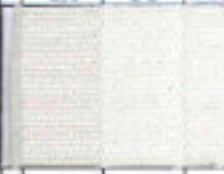






Colour Fastness of Small Samples to Solvents

EN ISO 11643 / IUF 434

This method is intended only for determining the resistance of the colour and the finish of leather to solvents. It does not cover the suitability of dry cleaning processes for complete leather garments.

Method

A sample of the dyed leather, together with accompanying undyed textiles, is agitated for 30 min. at 30°C in a perchloroethylene solvent, then squeezed and dried. The change in colour of the leather specimen (N) is compared with the original leather sample (Tq) and the accompanying textiles are assessed with the standard Grey Scales. (CA = acetate, CO = cotton, PA = polyamide, PES = polyester, PAC = Polyacrylic, WO = wool)

dry cleaning fastness							
Tq	N	CA	CO	PA	PES	PAC	WO
							
rating	4	4	3-4	3-4	3	3	2



Test Methods for the Colour Fastness of Leather & Dyes

Colour Fastness of Leather to Migration into polymeric material

EN ISO 15701 / IUF 442

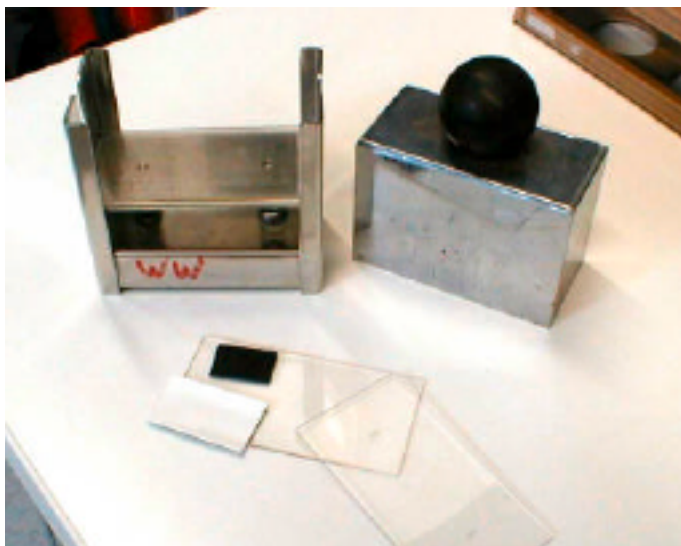
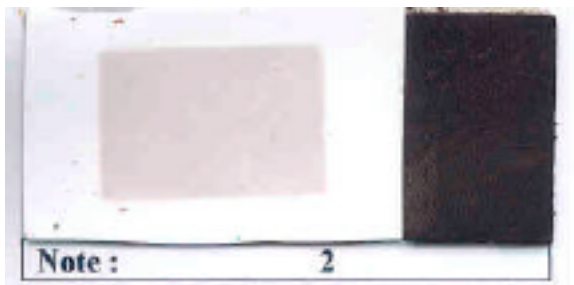
The colour fastness in respect of migration into polymeric material is typically tested using plasticised poly(vinyl chloride) – PVC. The method assesses the transfer of colour from coloured leather to white plasticised PVC at 50°C.

Method

The side of the leather sample to be tested is placed on a white pigmented sheet of plasticised PVC and the composite specimen is exposed to heat under pressure in an appropriate apparatus for 16 h at 50°C.

The degree of staining of the white PVC is assessed using the grey scale for staining. In addition, if the colour of the stain is different from that of the dyed leather then the colour of the stain should be reported.

Other polymeric materials can be used but a consistent quality for testing purposes is very difficult to obtain, for this reason PVC is used.



Valid from: February, 2004	Version: 01	Page 9 of 16
Approved by: Campbell Page, Global R&A	Responsible: Sabine Dickhaut-Güdemann, Global R&A	

Test Methods for the Colour Fastness of Leather & Dyes

Colour Fastness of Leather to Perspiration

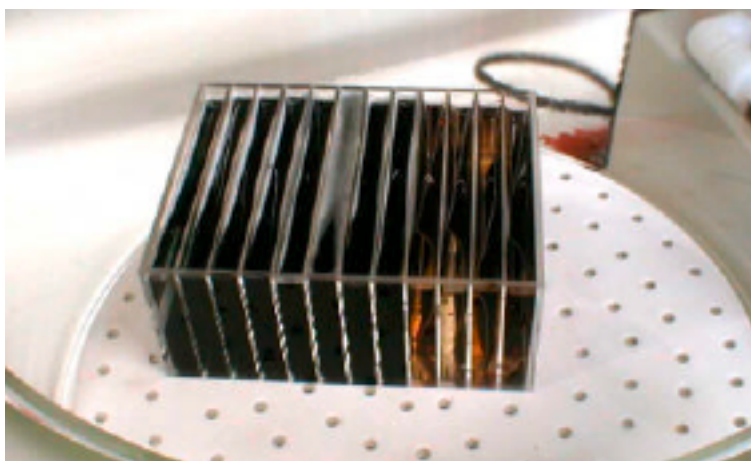
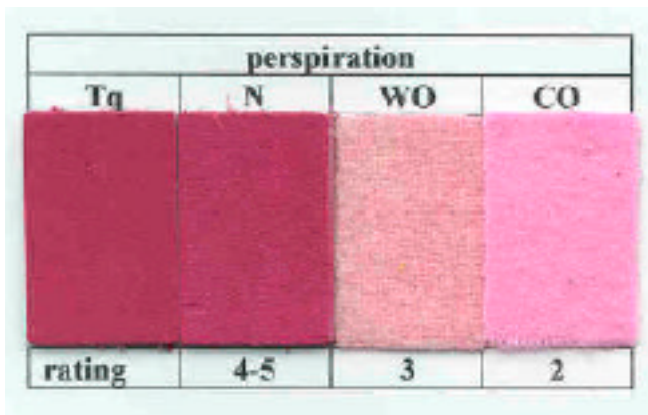
EN ISO 11641 / IUF 426

By fastness of colour of leather to perspiration is meant its resistance to the prolonged action of an artificial perspiration solution.

Method

Samples of leather and textile fabrics, e.g. a multi-fibre strip or pieces of wool (WO) and cotton (CO), are thoroughly wetted out separately in an artificial perspiration solution. The textiles are placed on the side of the leather specimen to be tested and the composite specimen is then placed between glass plates under pressure for 3 hours at 37°C. The specimen and the textile pieces are dried.

The change in colour of the dyed leather (N) compared with the original leather sample (Tq) and the staining of the textiles are assessed with the standard Grey Scales. Normally a multi-fibre fabric strip is used to measure the staining, but for a quick assessment of the staining using cotton (CO) (direct dyes cause staining) and wool (WO) (acid dyes cause staining) can be used.



Test Methods for the Colour Fastness of Leather & Dyes

Colour Fastness of Leather to Rubbing

EN ISO 11640 / IUF 450

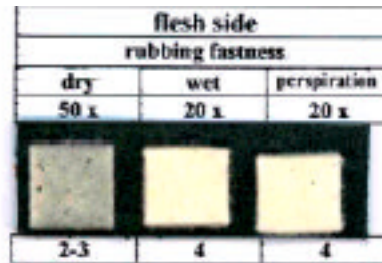
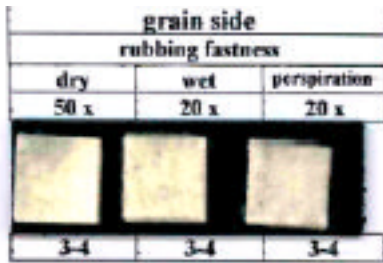
This method is intended for determining the transfer of colour and the behaviour of the surface of a leather on rubbing with an undyed wool felt.

The felt may become coloured through transfer of any kind of coloured matter, e.g. finish, pigment, dyestuff and buffing dust.

Method

The side of leather to be tested is rubbed with pieces of standard wool felt under a given pressure with a given number of forward and backward motions. The wool felts can be either dry, wetted out in water or wetted with a solution of artificial perspiration at pH 8.

The change in colour of the felt and of the leather are assessed with a standard Grey Scales. Any other visible change or damage of the surface of the leather should be also reported.



Test Methods for the Colour Fastness of Leather & Dyes





Colour Fastness of Leather to Water

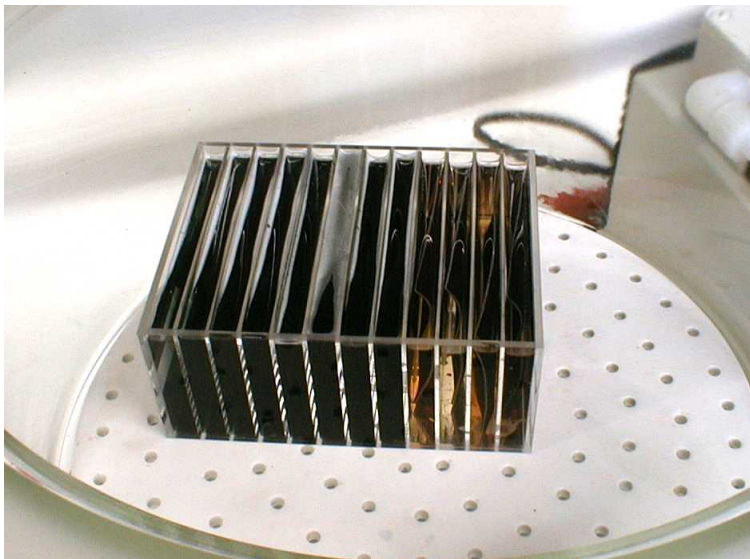
EN ISO 11642 / IUF 421 / VESLIC C 4210

The colour fastness of leather to water is the resistance to the prolonged action of water.

Method

Pre-wetted pieces of wool (WO) and cotton (CO), or multi-fibre fabric strips, are placed on the test surface of the dyed leather sample, which has been thoroughly wet out in water. The composite specimen is then placed between glass plates under pressure for 3 hours at 37°C. The specimen and the textile are dried. The change in colour of the leather specimen (N) is compared with the original leather sample (Tq) and of the textile are assessed with standard Grey Scales.

water fastness			
Tq	N	WO	CO
			
rating	4-5	4-5	4-5



Test Methods for the Colour Fastness of Leather & Dyes

Colour Fastness of Leather to Water Spotting

EN ISO 15700 / IUF 420

The colour fastness of leather to water spotting is the resistance to the action of water drops on dyed leather surfaces.

Method

A sample of leather has 2 water drops placed on the surface. One drop is dried after 30 min. with absorbent paper and the other left for 16h.

The change of colour of the leather is evaluated using the change of colour Grey Scale. Any other changes to the leather surface should be noted.



Valid from: February, 2004	Version: 01	Page 13 of 16
Approved by: Campbell Page, Global R&A	Responsible: Sabine Dickhaut-Güdemann, Global R&A	

Test Methods for the Colour Fastness of Leather & Dyes

Dyes

1. Solubility of powder dyes

The solubility of leather powder dyes in water is measured at 60°C. This is an internal TFL test method.

Method

An exact amount of dye is pasted with a small amount of deionised water. The rest amount of deionised water is added with stirring. The solution is heated to at least 90°C with stirring and kept at this temperature for approx. 2 minutes.

The solution is allowed to cool to 60°C and then filtered at 60°C with a pre-heated vacuum filter using a fast qualitative filter paper.

The filter paper is inspected for any undissolved residue. If a residue is present then the method is repeated at a lower concentration.

Result

There should be no significant residue of undissolved particles at the specified solubility concentration.

General Comments

In the tannery application there are several factors that can influence the solubility of the dye are the float temperature and pH, as well as the other chemicals in the float and the water hardness.

Valid from: February, 2004	Version: 01	Page 14 of 16
Approved by: Campbell Page, Global R&A	Responsible: Sabine Dickhaut-Güdemann, Global R&A	

Test Methods for the Colour Fastness of Leather & Dyes

2. Stability of dyes to:

- acid (IUF 202 & IUF 203)
- alkali
- hard water (IUF 205)

The stability and colour fastness of dyes to acid, alkali and hard water is sometimes reported by dye suppliers.

Methods

Acid

A 5 g/l solution of dye is prepared. 2 samples of this solution (each 10ml) are warmed to 60°C and acidified as follows:

- 0.5ml of 10% formic acid and
- 0.5ml of 10% sulphuric acid.

The stability and change in colour of the solutions are evaluated using a

5, 4, 3, 2, 1 scale (5 = very good, 1= very poor) in comparison with an unacidified solution. To help with the evaluation some drops are spread on a filter paper and after drying assessed.

Alkali

Same procedure as for the acid, but made with a 10% ammonia solution (or sodium carbonate).

Hard Water

A 2 g/l solution of dye is prepared and tested at room temperature for its stability in water of 3 differing degrees of hardness, namely 0°dH, 20°dH and 40°dH (dH = German degrees of hardness).

1 ml of the dye solution is added to each of the 19ml hard water solutions. After 10 minutes and 1 hour any propensity to flocculate or precipitate is noted and evaluated using a 5, 4, 3, 2, 1 scale (5 = very good, 1= very poor).

(20°dH = 200 mg CaO/l = 360 mg CaCO₃/l)

Valid from: February, 2004	Version: 01	Page 15 of 16
Approved by: Campbell Page, Global R&A	Responsible: Sabine Dickhaut-Güdemann, Global R&A	

3. General comments relating to impact of pH, hard water and cationic fixing agents on dye stability

Acid pH

Practically all leather dyes are stable down to pH 3.5. However, at very low pH values, like pH 2.5, some dyes in water are not stable and some can change colour considerably. Important note, once a dye is bound to the leather it is less susceptible to undergoing a change colour at low pHs.

Alkaline pH

At high pH values some dyes change colour, for example, Acid Black 210 can be noticeably greener at alkaline pH values.

Hard water

Some dyes are not stable in very hard water. In areas of very hard water the dyes are best dissolved in soft water before addition to the drum.

Additional care must be taken when using sequestering agents for water softening or inhibiting metal staining in vegetable tannages/retannages. If they are used in the same bath as dyes, they could remove Fe from iron complex brown dyes.

Cationic fixing agents

Cationic fixing agents can complex with the anionic dyes typically used to colour leather, causing a precipitate in the application drum. The cationic fixing agent is best applied to the coloured leather in a fresh float at the end of the wet treatment process.