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Leather tests at a glance

Leather is infinitely variable depending on the type of hide, fibre structure, tannage and grain surface. It is therefore essential to fully understand any leather before using it in order to avoid any problems in either manufacture or in wear. Needless to say, there is a large number of tests that can be applied, some appropriate for many end uses and some more limited. There can also be more than one test method to determine the same basic property. It is therefore important to know which ones to use.

STRENGTH

Strength can be measured by either tear or tensile tests. Tear strength is good as it takes thickness into account and is therefore a useful guide to quality. In the Baumann test, a slot is cut in the sample piece which is then torn apart and the maximum load recorded. Satra's Star-burst method measures both tear and deformation properties by forcing a steel ball through an eight-spoke cut in the sample until it ruptures across its full width.

GRAIN CRACK

A lastometer test will predict the risk of grain crack at lasting. It is like the Star-burst test but with a smaller metal ball and no cuts in the sample. Pressure is applied until cracking of the grain occurs. The load and distension recorded gives a measure of the leather's resistance.

WATER RESISTANCE

Water-resistant footwear should have all components tested for absorption and leakage. The Maeser

test is a demanding dynamic method where the leather is flexed while in contact with water, reproducing the flexing strains of walking. The Bally pentrometer test is less demanding but can also measure water uptake.

WATER VAPOUR PERMEABILITY

Leather has the ability to transmit water vapour and so prevent build-up of perspiration next to the skin. While unfinished leather has high permeability, this can be substantially reduced by surface finishes depending on what they are made from and how much is applied. The Nice-Mitton test measures the weight gain of a desiccant within a container sealed using the leather under test and classifies it from very high to low permeability. As leather's perceived comfort is also influenced by its absorptive capacity, it is advisable to assess real comfort potential by using a combined permeability and absorption test.

COLOUR FASTNESS

This relates to whether there is any tendency to change colour and/or transfer colour from the leather to any material in contact with it. Surface colour fastness of unfinished leather is dependent on the type of dye used and the amount needed to achieve the required shade. Leather collagen has a limited number of sites to which dye can be chemically fixed so, generally, the deeper the shade the greater the tendency to shed colour. Water and perspiration fastness is assessed by placing wetted fabrics of different fibre composition in contact with the leather and recording the amount of colour that is transferred.

LIGHTFASTNESS

Leathers can fade or otherwise change colour on exposure to light. Lightfastness is determined by exposure to a xenon arc which reproduces the spectrum of natural daylight. Light fastness is also affected by the type of dye and the quantity that is present. Lower concentrations and pastel shades are particularly prone to fading. Pigment finishes have better lightfastness although this can be impaired if a dye with low lightfastness is added to aid colour matching or provide aesthetic effect.

FLEX RESISTANCE

Flexing in wear can damage the surface of finished leathers through cracking or crazing and, sometimes, delamination (blistering, flaking and peeling). The Satra vamp flex test accurately reproduces the flexing strains to which uppers are subjected in wear. The Bally flexometer uses an unusual flexing action which, while rather severe in some respects, remains effective in assessing possible finish failure.

WET AND DRY RUB FASTNESS

Shoe uppers are frequently subjected to mild abrasion in wear which may spoil the surface finish. The circular rub test reproduces this and determines both colour change and the amount of finish lost. The fastness of a finish is determined by the binder and amount of pigment used to produce it.

SCUFF RESISTANCE

Footwear intended for industrial and other rough usage is subject to a variety of different forms of abrasion requiring three separate tests. The Martindale abrasion test represents prolonged mild abrasion and is carried out under dry and wet conditions. The chisel scuff test is severe and represents accidental scuffing and snagging. The drum abrasion/snag test represents severe prolonged abrasion and falls between the other two in terms of severity.

FINISH ADHESION

A finish that becomes detached is more serious. The load needed to do this can be determined by bonding the finished surface to a rigid substrate and measuring the load needed peel it off. Results can however be misleading for lightly finished grain leathers where rub fastness and flex tests are usually sufficient for finish durability and adhesion. Heavier and stronger finish films do however need direct assessment of adhesion strength.

PATENT LEATHER

Patent leathers are prone to heat induced cracking during processing and delamination in wear at raw edges, scuff sites or flex cracking. A Zwik lastability test will reproduce the strains that occur during lasting and heat setting. Test pieces should contain a

row of stitch holes as cracking often occurs along lines of stitching in wear. A further test involves loosening the coating and, if possible, peeling it from the base leather. If the film is stronger than the adhesion there is a risk of finish peeling problems in wear.

OTHER TESTS

There are many others depending on leather type and end use including, for example, shape retention to measure the effectiveness of heat setting and adhesion properties for stuck-on production. Most footwear specifications now stipulate maximum levels of restricted chemicals with some, such as azo-dyes, part of environmental legislation. Hence there is also an increasing range of analytical tests which must be routinely carried out.

Pipiness is a coarse surface wrinkling that can appear during production. It is an inherent characteristic of some leathers which an inappropriate lining material and/or laminating method can aggravate so it is best measured beforehand. If the leather has such a loose fibre structure that it shows signs of piping at this stage, it is unlikely that it can be laminated to a lining without an unacceptable level of disfigurement. Suede and nubuck can be also problematic. Low substance suede splits are at high risk of tearing while coloured suedes and nubucks require a high dye loading that can cause staining of wearers' hose, feet and clothing.

POINTS TO WATCH

Because leather is a natural material, there are a number of factors to take into account when testing. Care must be taken with the number of samples and from where on the skin they are taken. Results from one batch of hides cannot necessarily be applied to others of ostensibly the same material. Tanners have quality systems restricting variability to tight limits but some variation in final product performance is inevitable. Moisture content affects physical properties so that if it is increased, grain crack resistance is also likely to increase. Pre-conditioning samples is therefore essential and test results without it, other than for on-going in-factory quality control, cannot be entirely trusted. 