LEATHER NATURALLY

MODERN COW LEATHER PROCESSING – Version 1.1

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PROPERTIES OF A GOOD SHOE LEATHER

Shoe and boot leather comprises the widest range of leathers globally. There is a vast diversity of color, texture, gloss, thickness, embossing and surface appearance. The surface ranges from full grain aniline, to corrected grain, semi-pigmented and fully pigmented. Many types of splits are also used as suede or finished split, including the PU-covered split that is very fashionable for the white sports shoes and trainers.

The main categories are based on thickness: women's shoes are made with thin leathers of 1.0 mm to 1.4 mm; men's shoes with 1.4 mm to 2.2 mm.

The unique properties of leather give it many advantages, properties such as water vapor permeability and water absorption, which make leather a great choice for foot comfort and hygiene. No other material has the same abilities. Shoe leather **can be cleaned and repaired easily** to restore its natural beauty and characteristics. As it ages, leather molds to the shape of the foot like no other material, adding an even higher level of comfort. Leather shoes are also compatible with **high tech waterproof membranes** and **can be fully waterproofed** for outdoor use**.**

PROPERTIES OF A GOOD SHOE LEATHER 2

The leather used to make shoes needs to be adaptable around the different methods of construction, eg, white leather needs to be compatible with high temperatures, vulcanization materials or PU injection processes; boot leather **must have the correct elasticity and strength to be lasted**; cemented leathers need the proper amount of extractables for strong adhesion, and pull up leather must maintain its characteristics after construction.

Many leathers have touch up treatments to adjust color, gloss, surface and feel.

PROPERTIES OF A GOOD SHOE LEATHER 3

These are typical shoe leather parameters

The type of leather, processing and finishing define the parameters and need to be properly adjusted for each type of construction and for the size of the shoe. Leather thickness, temper, oil content and moisture are the important variables that can affect the mechanical and physical properties of the leathers (see Test Methods section for more details).

Tear strength	**Stitch tear strength**	**Burst strength**	**Slot tear resistance**	**Heat fastness**	**Light fastness**	**Dye migration**

Water-proofness	**Soil resistance**	**Finish adhesion**	**Water absorption**	**Flex resistance**	**Water vapor permeability**	**Elongation**

PROPERTIES OF AUTOMOTIVE LEATHER

Automotive leather is the most durable material for car interiors as it is easy to clean, easy to maintain and is biodegradable.

Over the last two decades the demand for automotive leather has increased substantially as it is valued as a sustainable material.

Automotive leather is **used for different car interior components such as seat covers, head rests, door panels, steering-wheel, dashboard and gear shift.**

Leather properties and requirements differ, depending on usage, and that includes the use of chrome tanning or chrome-free leathers. Automotive leathers **usually range from 1.1 to 1.3 mm thick.**

The main types of automotive leathers are:

SMOOTH LEATHER NAPPA

Lightly finished = they are **known as 'full-grain'** leathers with a softer and more natural feel.

EMBOSSED ARTICLES

Full finishing = they are **heavy coated** with a more uniform surface pattern and are normally less soft to the touch.

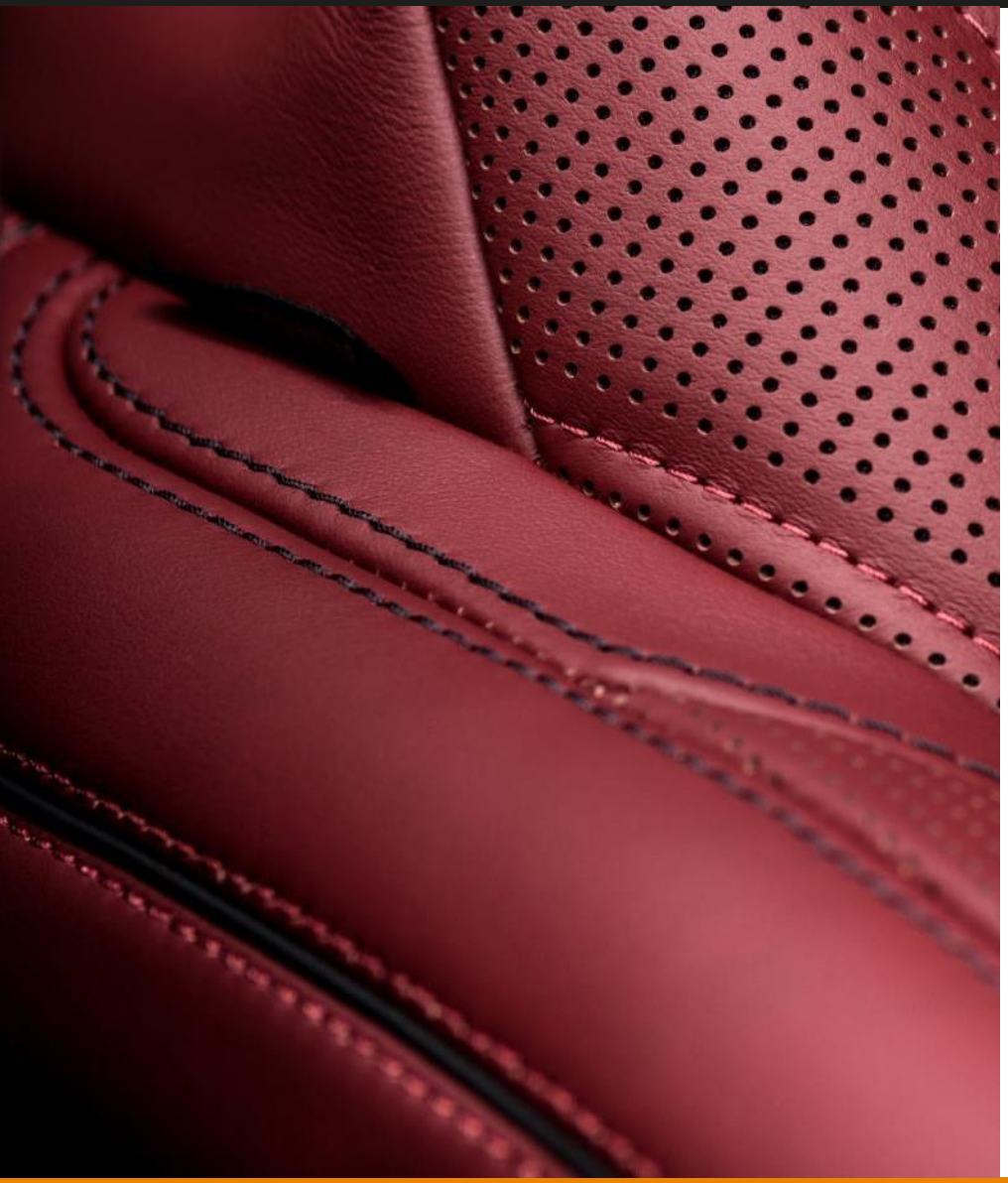
Important property:

DURABILITY

Automotive leathers can vary widely when it comes to **surface structures** or the type of **feel,** from **dry** to **smooth, waxy** or **silky.** They may vary on **gloss** and **color** depending on the carmaker or model. But there is one pattern all automobile leathers follow and that is **durability.** No other car interior stands for **durability** and **luxury** as much as leather does.

Eg, Ford's Model T can still be admired with its original leather seating, as can many other classic cars.

PROPERTIES OF AUTOMOTIVE LEATHER 2



Other leather variations include:

PERFORATED LEATHER

Perforation is a matrix of holes in regular intervals on the surface of the leather. Leather car seats are perforated to allow better breathability through the pigmentation and to allow moisture to be released more effectively and reduce sweating. **Perforations also support the effect of seat heating or seat cooling systems.**

LAMINATED (backing)

Laminated leather means coating or glueing something to the back. This backing can be made with a different type of leather, but also with films, foams or linings. The lamination is done for protective reasons, to reinforce the leather and to reduce leather stretching that could lead to ‘bagginess’.

Each OEM (Original Equipment Manufacturer) sets their proprietary physical and chemical specifications; they are continually updating and making the specs more and more difficult to achieve. The most common properties are VOCs (Volatile Organic Compounds), fogging, smell, specific weight, light fastness, ageing resistance, wet and dry, perspiration resistance, etc.

The important physical properties are tear strength, scuffing resistance, abrasion and flex resistance.

Technical challenges: dimensional stability and resistance to soiling (denim dye transfer, sunscreen, coffee spills)

Flammability test is also a requirement measuring the burn rate of the leather along a horizontal plane. Typically, the burn rate will be required to be below 80 mm/min.

PROPERTIES OF UPHOLSTERY LEATHER

Customers see leather as a desirable natural material with a higher value than alternative upholstery coverings.

Modern upholstery leathers are **extremely comfortable, durable** and **easy to maintain. They** are invariably based on bovine hides as these offer the size, substance and longevity required.

Leather is the most responsible and sustainable choice for upholstery and is the original performance material. It is a diverted by-product of the meat industry, meaning the hides do not go to waste. And leather's unique strength and long lifespan help it to outperform the alternatives available on today's market.

Several standards exist for upholstery leathers, such as: ISO, CEN, National Standards outside the EU, retailer specs, in-house specs, specific national requirements/legislation.

Requirements fall into several broad categories:

PHYSICAL	CHEMICAL	FASTNESS	FLAMMABILITY	CLEANING	OTHERS
Strength-tear, tensile, abrasion wear. Permeability and absorption. Seam holding and buttoning. Bagging/ deformation. Flex cracking/cold crack	Restricted Substances List (RSL)	Light – Xenon Arc, water-rubbing test, fogging, dye transfer-staining	Is a legal requirement in some markets such as the UK and USA (varies by state). Methods and techniques vary	Soiling test, solvents and detergents	Faults, area measurement, ageing, odor, labeling (eg, coated leather). Emissions (VOCs)

Performance levels may be determined by:

a) LEGAL REQUIREMENTS

CEN have established a category for furniture in the European Community's Eco-Label awards. The award's criteria aim to promote a **reduction in the environmental impact of furniture manufacture** such as: reduction in the use of hazardous substances, reduction of pollutant emissions and the quality of the effluent from tannery. Indoor air quality is an environmental concern because a furniture manufacturer may use the wrong adhesive or the wrong finish and this can affect the VOCs.

b) LEATHER TYPES

Aniline, Semi-Aniline, Pigmented, Nubuck, Suede

c) END-USE (FITNESS FOR PURPOSE)

Occasional (less demanding), light domestic, heavy domestic, contract and hospitality (more demanding), private aviation and high-end automotive refurbishment

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Over the years there has been a clear trend of extending leather upholstery into mass transport, such as on airplanes and sea-liners.

PROPERTIES OF UPHOLSTERY LEATHER 2

A good quality piece of furniture will have full or corrected grain leather or upholstery grade suede throughout.

Finishes vary from pure aniline to pigmented and possess a variety of characteristics. End use selection is dependent upon client preference.

Pure aniline and waxed or oiled finishes have become a standard in all project types, bringing the leather's natural characteristics and patina into the interior, regardless of its level of use. Top selection is highly valued to accentuate natural characteristics, particularly for aniline leathers. When clients prefer a leather less likely to patina, they may choose a more consistent semi-aniline or pigmented finish.

EXAMPLES OF GENERAL NON-RESIDENTIAL APPLICATIONS

Corporate task chair – typically semi-aniline or pigmented

Executive chairs or conference room – all types, depends on owner/designer preference

Lobby or lounge pieces – have more budget dollars and are open to all finish types including specialty leather options, depending on preference

Hospitality and residential – all types, regardless of traffic level, depends on owner/designer preference

Aviation – private or corporate **j**ets use semi-aniline or pigmented leather on seats, and whatever they like on accent areas, lower sidewalls, bulkheads, etc. Commercial airlines use heavily pigmented and sometimes bonded or even faux products

Vertical use – upholstered headboards or wrapped leather wall panels are sometimes used in a range of projects. These can be padded, stitched, quilted or directly glued to a substrate and then attached to the frame or wall

LEATHER CUTTING

Leather is a natural product, which means it does not have a uniform outer contour, there are variations and not all areas are of the same quality or grain pattern. The art of cutting leather lies in the optimal area yield, while taking all these aspects into consideration. **A cutter must check the leather on both sides for defects.** These can be discoloration or damage such as scarring or insect bites. Cutting lines must be chosen so that the finished objects have a similar grain pattern**. Always mindful of waste, a cutter must also select the better parts of the leather that will make the premium parts of the article** (vamp for shoes and seats and upholstered armrests).

For automotive and furniture upholstery current technologies include slitting knives, manual cutting, die press techniques and laser cutting. **Die cutting in conjunction with electro-mechanical technology has grown significantly** over recent years for several reasons: it is flexible, offers high production speeds, enables complex geometric cutting, customization, and it creates less waste. Altogether, these advantages make die cutting more and more economically attractive for leather cutting applications.

There are various machines for cutting leather and, with the aid of lasers, it is possible to detect the external contours of the leather and mark up any areas of damage. **Computer programs then calculate the optimal cutting.** The leather is then aligned correctly on the cutting table against a light template taken from the scanning of the outer contour. The leather is then sucked on to the table by vacuum and the cutting automatically performed by a knife or high-pressure water jet.

COLOR MANAGEMENT
in the tannery

LEATHER NATURALLY

Color is one of the most important parameters for leather

Standard swatches are made to be the color and article reference.
Color can be visually compared to the standard in a calibrated light source.

White light temperatures can be selected for proper visual color comparison on the light cabinet.

International color standards can be used as reference.

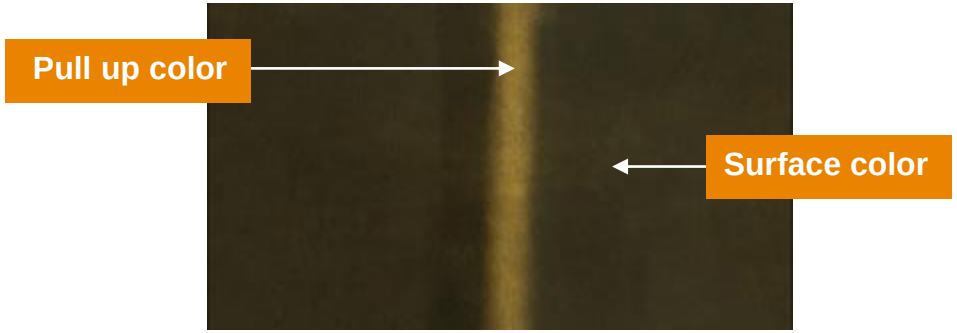
COLOR MANAGEMENT
in the tannery 2

Color can also be measured by spectrophotometers where color is measured and expressed in a color space, eg, CIELAB. This way the color can be measured and compared to the stored standard and transmitted and stored digitally

LAB SPECTROPHOTOMETER

PORTABLE SPECTROPHOTOMETER FOR USE IN THE TANNERY

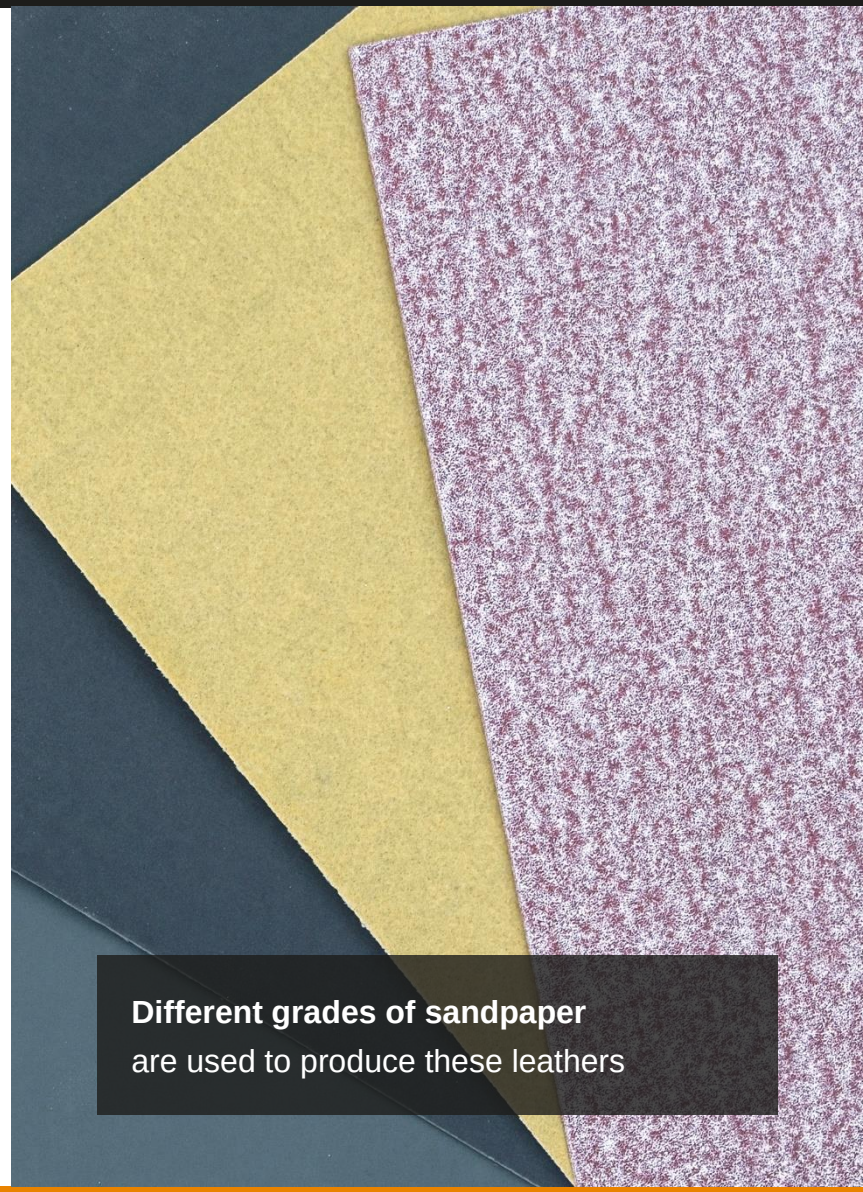
PULL UP LEATHERS HAVE A DIFFERENT COLOR WHEN FOLDED (PULL UP COLOR). SURFACE AND PULL UP COLOR NEED TO MATCH



MAIN TYPES OF LEATHER

Full Grain	Leather with the grain (surface) intact
Snuffed Grain*	Leather with light sanding on the surface to uniformize and reduce defects
Corrected Grain*	Leather with heavier sanding on the surface to reduce defects It can be finished, oiled/waxed or impregnated to make box leather
Nubuck	Type of corrected grain leather with deep coarse buffing that has no finish but can be oiled/waxed
Split	Leather from the lower split part of the leather, sanded Can be unfinished, finished or oiled/waxed
Suede	Leather from the lower split part of the leather, sanded, not finished Can have wax/oils or other superficial treatments
PU Split	Leather from the lower split part of the hide coated with a polyurethane (PU) film less than 0.15 mm thick

*** Top Grain** leathers can have **Snuffed** or **Corrected Grain**



Different grades of sandpaper
are used to produce these leathers

THANK YOU FOR YOUR ATTENTION