

**HIDES AND SKINS IMPROVEMENT**  
**HANDBOOK: TRAINER'S MANUAL**

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## 1. Introduction

One of the most valuable exports of many developing countries is hides and skins. Hides are, therefore a valuable source of income to the livestock owner. If properly cured, the value of the hides is often 3% to 10% of the value of the whole animal.

Unfortunately, the livestock owner rarely obtains the full value of the hide or skin that he might, because usually his hide or skin is badly flayed, badly cured, badly damaged by horn pokes, brand marks and by insects, and the methods employed in marketing the hide or skin are unsatisfactory.

It is important to remember that most hides and skins eventually become leather of one kind or another. To become leather, hides and skins must be tanned, and it is after tanning that any damage done to a hide either during the life of the animal, or after it is dead, will be revealed most clearly.

What the tanner wants by way of a good hides or skin must, therefore, be the producers' main consideration.

### 1.1. General Structure of Hides and Skins

While the term hides refer to those obtained from large animals like cattle, horses, buffalo, camels etc, the term skins refer to those of smaller animals like goats, sheep, pigs etc. The structure of hides and skins vary depending on its genus, species of animal, region, climate etc. Cattle, horse, buffalo, goat and sheep belong to mammalian class and the anatomical structure of these hides and skins are more or less similar though they differ very much in their leather making quality.

This is mainly because of the differences in the relative amounts of the component tissues and their arrangement in different types of skins and in different places in the skin.

### 1.2. The Epidermis

It is a thin top layer covering about 1 – 2% of the total thickness of the entire skin. Hair is the typical epidermal structure and is entirely a product of epidermis. The epidermis consists of two layers of cells namely the outer horny layer and the inner layer rests on the corium and consists of the living cells, being nourished by blood vessels of corium. Being fed, the cells grow and push the older ones to the top and these cells get flattened and dehydrated and become outer scaly and horny layer. This process goes on continuously. This layer also consists of fat glands, sweat glands, hooves, horns, nails etc. The cells of the epidermis dip into the body of corium and form a hair follicle, in which the hair grows. The hair consists of protein-keratin in the form of cells dead and resistant at the tip and living and easily destroyed at the root.

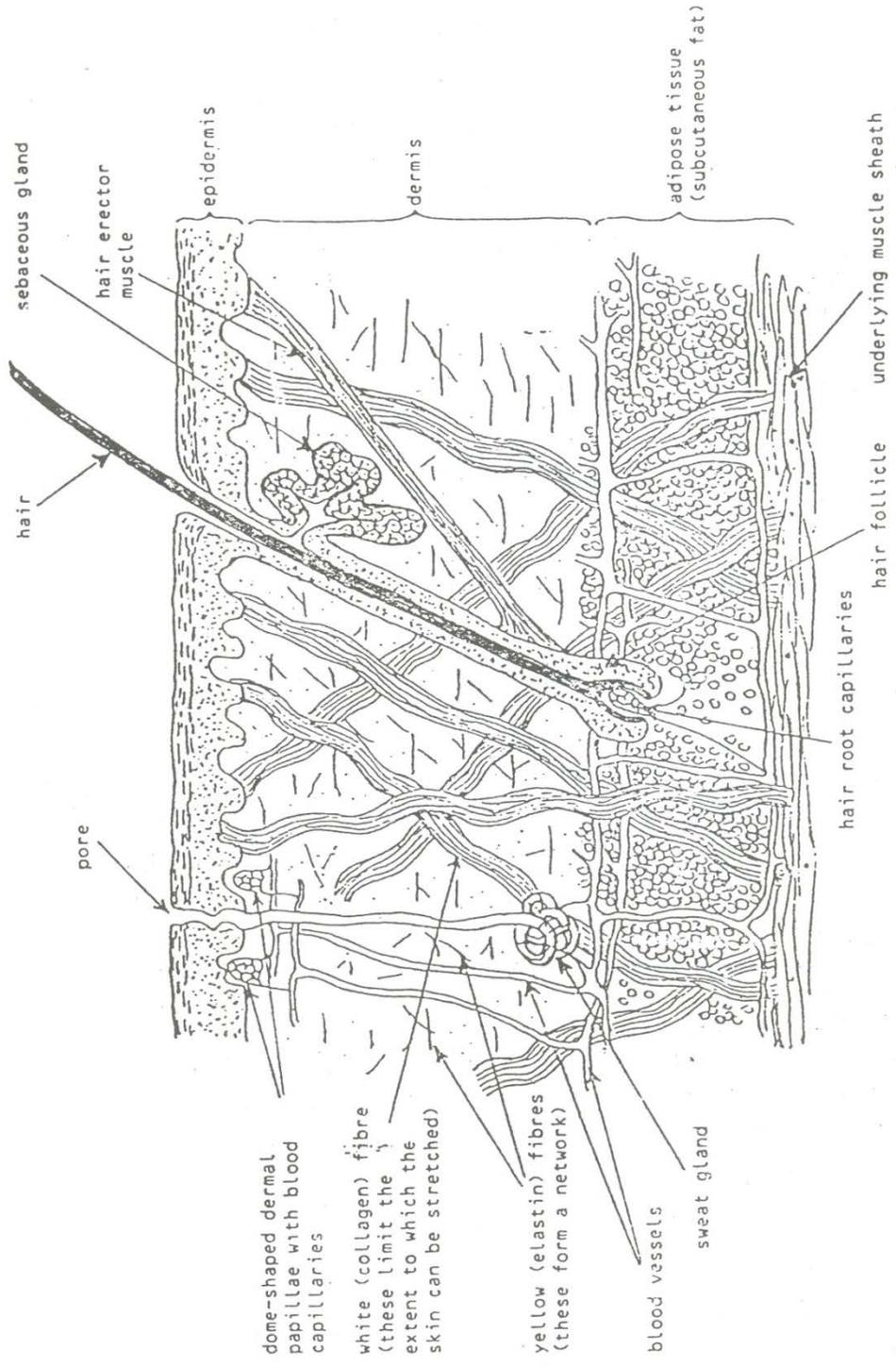
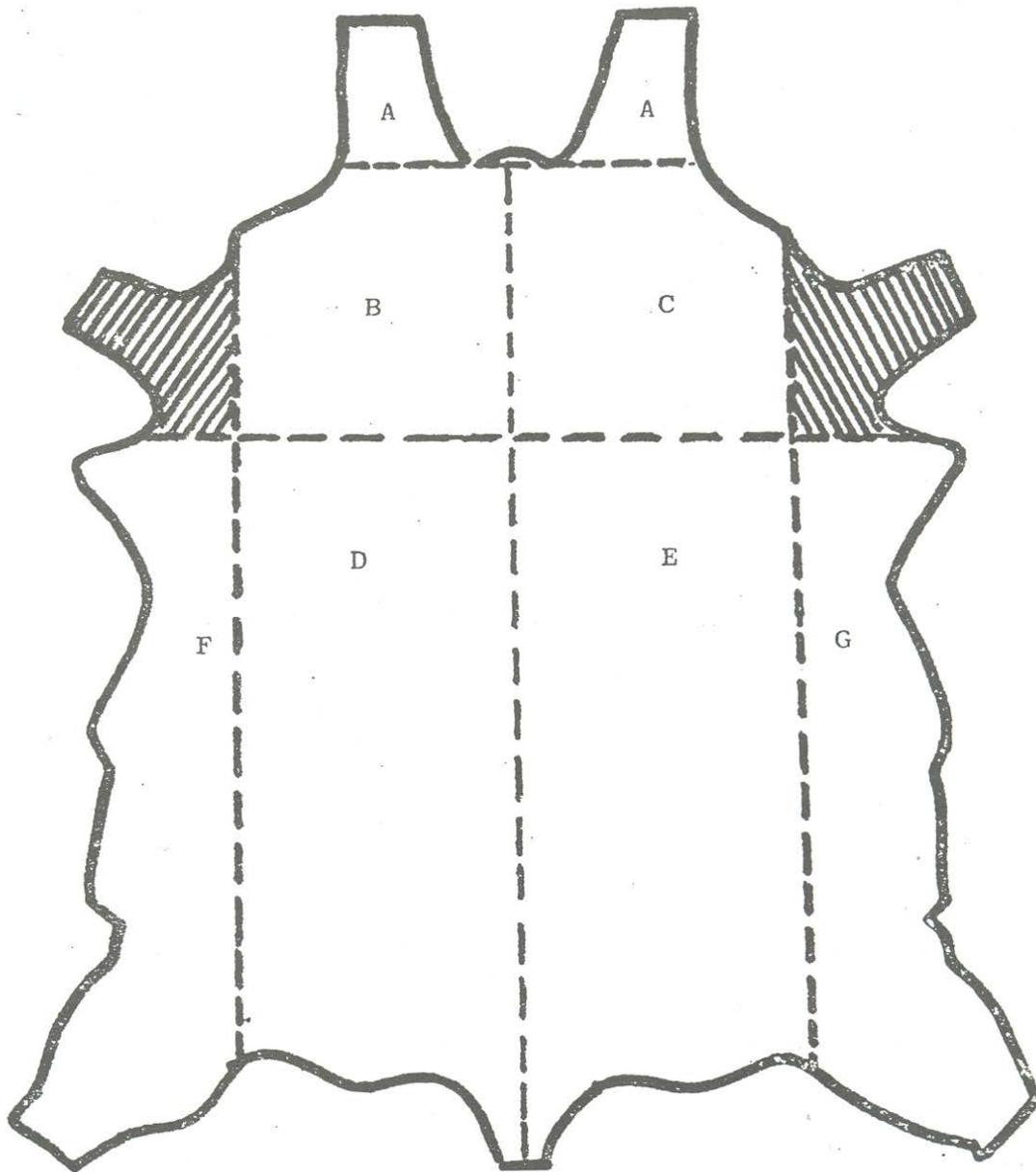


Fig. 1: Diagram showing the main components of the mammalian skin

(By courtesy of Jean H. Elliot)



HEAD ..... A  
 SHOULDER .... B+C  
 BEND ..... D or E  
 BELLY ..... F or G  
 SIDE ..... A+B+D+F or  
                   A+C+G

CROP..... A+B+D or  
                   A+C+E  
 BACK .... B+D or CE  
 CROUPON D+E  
 DOSSET .. B+C+D+E+A  
 CULATTA  D+E+F+G

(F and G includes shaded area except for culatta)

Fig.2. Subdivisions of a hide.

### 1.3. Erector Pili Muscle

This is attached to each hair follicle by elastic fibers.

It passes just below the sebaceous gland (fat gland) and extends to the grain membrane. When this muscle contracts, the hair stands on its end. Sweat gland: (Sudoriferous) these are lined with epidermis and discharge sweat from the skin through the pores of the grain surface. These glands control the rise of temperature of the body by causing evaporation of the perspiration produced by heat.

### 1.4. Fat Gland or Sebaceous Gland

These are located at the side of the hair follicles and connected to them by means of capillary ducts through which the oily matter of the glands flows, when the erector pili muscle contract. These glands maintain the body temperature by covering the body with a film of oil and thus regulating the surface evaporation water. The epidermis, hair, fat and sweat glands are removed from the hides and skins during the beam house operations. It is therefore understandable that the upper corium or grain layer or papillary layer consisting of a number of cavities after liming will make the grain particularly sensitive to tanning and finishing operations.

### 1.5. Corium

This is the main layer of the hide or skin consisting of about 98% of its thickness. In structure, corium is different from epidermis and it consists of fibers which occur in bundles. The fibers of corium consists mostly of collagen forming a three dimensional weave. The fibers are composed of extremely fine fibrils and the fibrils in turn are again composed of micelles. These micelles are the ultimate units of the fibrous structure. Corium itself is divided into two layers (a) grain or papillary layer (b) corium or reticular layer.

The grain layer is also called the thermostat layer as it keeps the body temperature through sweat and fat glands and sometimes called corium minor. This upper layer of corium occupies about 10 – 25% of its entire thickness. The epidermal appendages like hair-follicle, fat and sweat glands and the erector pilli are all in this layer. It is of great importance that no damage is done to the grain surface in removing the epidermis. When these are removed, a smooth layer is revealed known as Hyaline layer which gives the characteristic grain surface of leather.

The corium proper or the reticular layer just below the grain layer constituting about 75 – 90% of the total thickness is having a netlike woven structure made of thicker and longer fibers. The angle at which they are woven can indicate the properties of resultant leather.

Flesh or adipose tissue: a layer appended to the bottom of corium is called flesh or adipose layer. It is the loose connecting tissue lying between the hide or skin and the actual body of the animal. At the time of flaying, a part of this tissue remains attached to the hide or skin. Although this layer exists in all the flayed hides and skins, this is removed during the tanning operations and it is not part of the hide.

## **2. Damages Affecting the Value of Hides and Skins**

### **2.1. Damage to Hide in the Live Animal**

Branding is one of the worst causes of hide damage. The worst branding is the branding for ornamentation often seen on the most valuable parts of the hide.

The places on the hide where branding should be done are the cheeks, below the point of the shoulder on the forelegs, and below the point of the stifle on the hind legs, and the ears.

Scratches may be caused by wire, horns or thorns, and may often be unavoidable. Horn rakes can be eliminated by the dehorning of calves.

Yoke callouses in draught animals may also sometimes injure the hide while wounds very often leave scars which result in blemishes to the finished leather.

Whip lash marks are often found on hides from working oxen; they also cause permanent damage to the hide.

Tick bites leave small but distinct blemishes which appear either as small holes in the leather, or as small scars. Such hides are described as “ticked” hides and are of inferior quality. Only regular dipping or spraying to control the ticks will keep the hide free of this damage.

The most important skin diseases affecting the hide directly are ring worm, mange, streptothricosis, lumpy skin disease are cow pox. These diseases cause damage to the finished leather in various ways including circular depressed patches, pin-point depressions and scars and putrefied areas. Dipping and spraying are the main control measures employed for these.

Other diseases such as rinderpest and East Coast fever in which high temperatures are a feature, will also affect the hide. If high temperatures do not extend beyond 3 – 4 days, changes in the hide will not, however, be noticeable. Nutritional diseases and conditions, including the presence of worms, and malnutrition, etc., also result in hides of inferior quality.

A suspected anthrax carcass should not be flayed.

“Fallen” hides, or hides taken off dead animals, if quickly and properly treated will be of some value even if not first grade. If an animal is sick and is obviously going to die, it should be killed, in which case its hide will be of more value than if left on the animal until it dies.

## **2.2. Damage during Killing and Flaying**

Bruising occurs from blows or bad throwing on the killing floor while bad bleeding of an animal will lead to putrefaction in the hides.

Dragging a carcass along the ground will also obviously injure the hide since blood, manure, stomach, contents, dirt, etc., on the hide, will all hasten deterioration.

Sheep skins, if badly pulled off a carcass, will be liable to damage from “strain” in which the fibers of the skin are broken.

Bad shape from distortion and badly placed cuts when flaying are not corrected by the tanners.

“Scores” are cuts made into the hides which do not penetrate completely. This damage is generally done during flaying and when pointed knives are used in fleshing. Gouge marks are caused during the removal of meat, and will be avoided if proper knives or scrapers are used, and if fleshing tables are smooth.

Cuts cause heavy losses each year to hides and skins, and are generally due to delay in flaying, the flaying of a cold carcass, the use of pointed knives, lack of skill, and carelessness and unsuitable surroundings in which flaying is done.

Tanning enlarges cuts in the finished leather.

## **2.3. Damage after Flaying**

“Hairslip”

“Hairslip” is a common type of damage and is due to delay between flaying and preservation, leaving uncured hides folded for more than a few hours, not having the hide or skin free of objects during curing and exposing the dry hide to wetness. To prevent hairslip the following measures should be taken:

- i. Hides must be preserved immediately after flaying;
- ii. Uncured hides should not be folded or left in bundles and if carried should be transported on a pole;
- iii. Hides should not touch any object while drying;
- iv. Dry hides must always be properly protected.

## **Putrefaction**

Putrefaction will occur in hides as a further step in deterioration if “hairslip” has not been checked.

The worst cause of putrefaction is the method of “ground drying”, still often practiced by many stockowners. This method entails the drying of the hides in the sun after pegging them to the ground.

Ground-dried hides are bad because

- a) Where the hide touches the ground, putrefaction sets in;
- b) Although hard on the outside, they are often soft inside;
- c) They are often excessively dry, being as hard as boards. Cracks then develop during folding;
- d) They often split along the various layers of the hide;
- e) Due to over-heating, fat on the hide melts and spreads into the hide;
- f) Rain collects in puddles on the hide, and causes unevenness texture.

The best method of curing hides and skins is the suspension method wet salting which will be described; even with this method, however, certain damage can be done to the hide.

## **Damage in suspension Drying**

When the hide is being stretched, care must be taken that all the supporting ropes and thongs (ropes made of hide or skin) are uniformly tight – otherwise distortion of the hide takes place.

Hides must not be over-stretched, otherwise they will become thin and “spread”.

Vermin are often the cause of damage to hides, pieces being bitten off, etc. The drying equipment or area should be surrounded with wire or a thorn bush. Frames should be hung from trees.

## **2.4. Damage after Drying**

Beetles are the cause of considerable losses each year in hides and skins. Beetles hide in the cracks and crevices of wood, so that hide stores should be built of stone or brick, with a smooth plaster finish. Insecticides should also be used whenever hides have to be stored for more than ten days.

White ants may attack hides and skins but this can be prevented by storing them on wooden slatted platforms not less than 15 cm above the concrete floor level preferably suspended from the roof. They should not touch the walls at any point.

Rats and mice which may also cause damage can be kept down by traps, poison and cats.

Cement floors, on which hides and skins may be stretched, cause staining. Stacking on platforms will avoid this.

The wetting of hides after they have been dried may cause damage. To avoid this hide should be immediately opened out and dried again.

### **Damage during Roping and Transport**

If hides are too loosely baled, or too tightly baled, or if wire should be used in place of rope or binding iron and sacking, damage will result.

Wetting of hides and skins and the rubbing of bundles together while in transit, will both cause damage.

### **Fraudulent Practices**

Some unscrupulous persons sometimes soak ground dried hides and stretch them on frames, selling them as suspension dried.

Weight may sometimes be added to hides by smearing their flesh side with mud, etc., or soaking them a day or two before sale.

Scores and gouge marks are sometimes covered with clay, while parasitic and pox marks may be painted over.

Used hides, which are of practically no value, may be offered for sale.

## **3. Flaying**

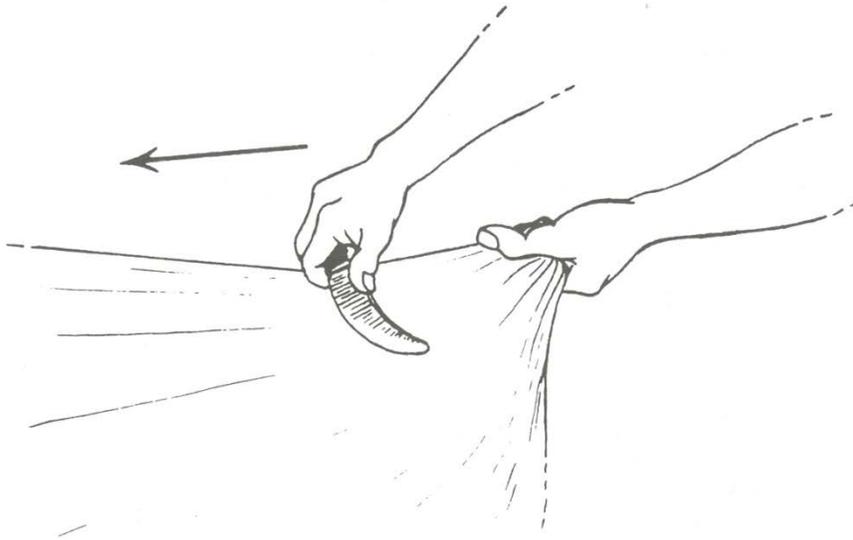
### **3.1. Cattle**

The value of the hide depends to a very great extent on the flaying. To flay properly the following points must be observed.

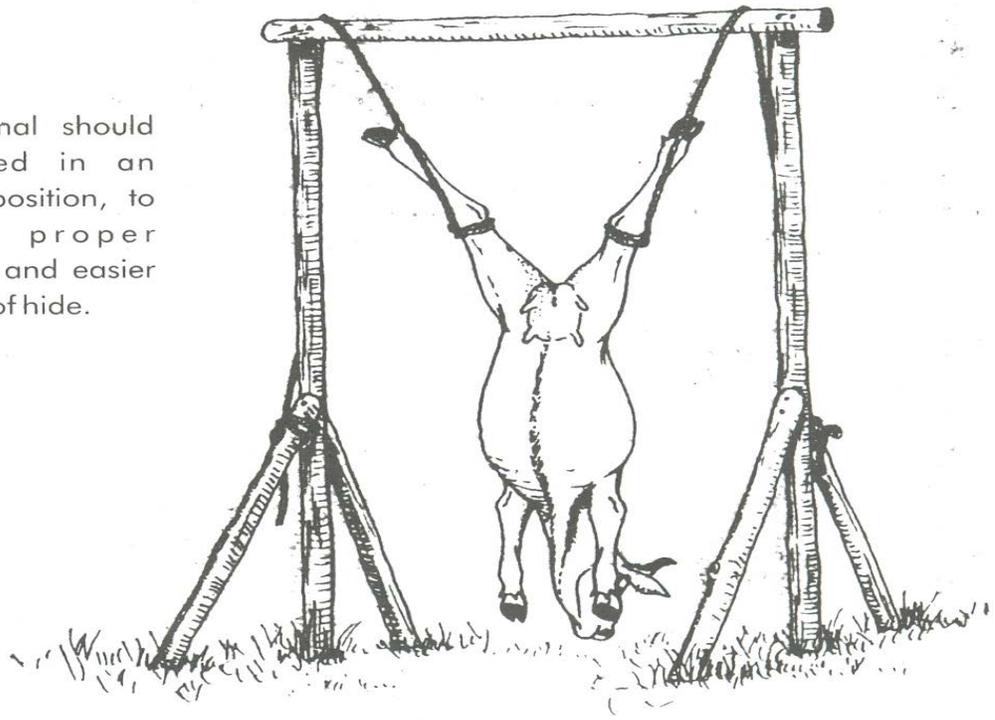
- i) a proper and sharp knife should be used;
- ii) the knife should be held properly;
- iii) the correct ripping cuts should be made;
- iv) the carcass should be flayed immediately after slaughter;
- v) the carcass should be kept steady;
- vi) the hide should be kept free of blood and manure;

- vii) cutting, gouging or scoring should be avoided;
- viii) the hide or skin should be pulled or beaten off whenever possible;
- ix) long cuts with the knife should be made, not short ones.

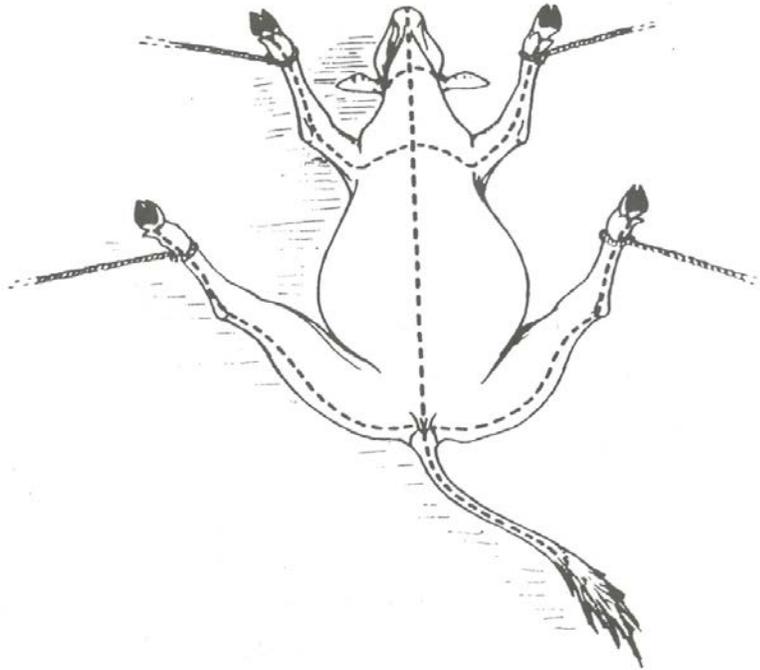
A proper flaying knife is one with a curved blade more than 15 cm long with a rounded, blunt tip.



The animal should be flayed in an upright position, to ensure proper bleeding and easier removal of hide.



The drawn ripping lines ensures the production of a hide with a proper shape.



In the ripping of the carcass, the following cuts must be used/

- i) one long, straight incision on the centre belly line, from neck to anus;
- ii) two incisions around the hocks;
- iii) two incisions on the forelegs around the knees;
- iv) two straight and downward cuts on the inside of the inside of the forelegs from the knees to the breast bone;
- v) two similar cuts on the back of the hind legs starting from the hocks and finishing at the anus.

Flaying then consists of pulling the hide away with one hand and cutting with the other. When the bellies are sufficiently flayed, the carcass should be hoisted and the remaining hide pulled off.

The tail is flayed by one long incision on the inside to remove the tail bones and then the hide is pulled down.

The fat around the hump must be carefully cut away.

Evisceration of the carcass should not take place until the hide is off.

The custom of cutting up the meat and putting it on the hide should not be followed.

In flaying, the knife should be used as little as possible. Sheep and goat skins need only a very few cuts.

In some places, wooden or brass mallets are used to beat the hide or skin off the carcass.

The mask or face skin should always be saved and taken off with the hide. Ears must be cut off.

### **3.2. Sheep and Goats**

The pre-slaughter care of sheep and goats and their killing is very much the same as for cattle.

The ripping cuts for sheep and goats are:

- i) one long, straight incision from the jaw to the anus, on the centre of the belly;
- ii) four circular cuts around the shanks;
- iii) two cuts on the inside of the forelegs, from the shank to the breastbone;
- iv) two cuts on the back of the hindlegs from shank to anus.

It is better as a rule not to make all the ripping cuts, but to pull the skin off unopened. Such skins are called "cased". The skin is peeled off the carcass (which is hung up) like a glove, the knife being used as little as possible.

Cased skins must always be opened up for drying, washing, etc.

## **4. Washing and Fleshing**

Hides and skins should always be well washed immediately after flaying. They should not be washed in a container, but water run over them.

After washing, all loose tissue and meat left on during flaying should be removed.

This must be done carefully, the following points being noted:

- i) fleshing must be done immediately after flaying and washing;
- ii) the hide should be put on a perfectly smooth table;
- iii) if a table is not available a smooth log may be used, the hide may be hung over a horizontal pole, or laced into a frame;
- iv) a very sharp knife or scraper should be used;

- v) a little meat left on will not matter, but cuts made trying to get it off, do matter;
- vi) to remove hump flesh, the hump should be filled with grass, etc., so that the flesh stands out on the hump.

## 5. Trimming and Lacing

So as to suspend a hide or skin, holes have to be cut all round it in which strings or reims (ropes made from hide or skin) can be inserted.

A large hide may require up to 34 holes. Either a knife may be used or a No. 12 punch. The holes should be about 2 – 3 cm from the edge and symmetrically placed.

To lace the hide into a frame, the hide is first suspended by two ropes from the top pole, then tied down to the bottom one by two more ropes attached to the tail piece.

In this way a straight central line will show whether the hides have been symmetrically hung.

Lacing should be done by two workers, one on each side, and each ensuring that their ropes have the same tension. The ropes should not be too tight.

In hide sheds, hides are hung flesh side towards each other so that one stick will stretch two humps.

When lacing on a wire rack, the hide is placed over the top wire exactly along the backbone line, and the tail and shoulder of the head (if they are dried together), are stretched first.

The laces are stretched to the pegs in the same way as is done on a frame.

## 6. Preservation of Hides and Skins

The basic idea of curing or preservation is to keep the hides and skins in good condition without putrefaction until they are processed in tanneries. Being proteinous in nature, hides and skins are liable to attacks by bacteria or mould which leads to putrefaction especially in hot and humid conditions. Dust, dirt, soil, water, blood, fodder etc. act as continuous source of infection apart from the transmission of micro-organisms by air, insect, or contact with diseased animals. On the weight of a hide or skin, it will have about 60% natural moisture, and it is very ideal condition for bacteria to thrive. The proteinous matter is hydrolyzed by bacteria leading to loss of hide substance resulting in poor quality leather.

By curing, we are creating conditions whereby the bacteria is made ineffective as we need very drastic conditions for destroying the bacteria. The type of curing depends very much on the weather conditions, availability of materials,

location of tanneries, and so on. For instance, it is not advisable to have drying techniques during rainy season and the obvious method is by salting. In all the techniques, the natural water is removed so that the low percentage of moisture make the bacteria ineffective and as soon as this condition is reversed, bacteria become active again. The hydrolysis proceeds then as: proteins/proteases/peptones/peptides and amino acids. Further action on amino acids result in ammonia, carbon dioxide, amines etc. as breakdown products. Ammonia being the most common, the smell of liberated ammonia had been considered to be one of the criteria for evaluating the quality of cured stock.

In tropical countries, it is advisable to do curing within four hours of flaying and of course this time is directly linked with the outside temperature. When transporting the raw hides or skins to curing yard, they should be sent in closed carts without exposing to sun and without rolling them. In the abattoir itself, the hides and skins should not be exposed to sun before being preserved. In drying, it can be with frame or without frame, in the sun or shade. In salting, it is wet salting or dry salting or brining. There are more recent techniques based on scientific developments but still not universally applied.

The important factors to be taken into account while deciding the type of preservation to be adopted are:

- a) point of application of the treatment and for how long preservation is required.
- b) Methods of application and any extra equipment and handling involved.
- c) The cost-effectiveness of the treatment for the period of preservation likely to be needed. The effect of salt and other chemicals in causing pollution also has to be taken into accounts.

If the raw material is to be exported, the preservation must be long term in its effect whereas if the raw material is for local processing with short distance transport for the point of origin, short-term protection is adequate. If a tannery receives its raw stock in smaller quantities from several small abattoirs delivering over a period, longer-term protection is necessary.

## **6.1. Air Drying**

Drying of hides and skins can be done in different ways. The techniques are drying on the ground, drying by suspension (frame drying), drying by suspension over cords or wires and tent and parasol drying. Drying depends on the temperature, relative humidity and movement of air.

For instance, a skin can be dried in three hours in dry atmosphere. Relative humidity is the amount of moisture in the air at a certain temperature, expressed as the percentage of the amount of water it would contain if fully saturated at that temperature. So, if the air is dry, relative humidity is lower and

vice versa. A fresh skin placed in warm surroundings will dry very much more rapidly if the air is moving than it is still. Even if the atmosphere is moist but moving, it will dry a damp skin. It is therefore a bad practice to hang up skins in an enclosed space with solid walls where air currents cannot have free access, and this leads to putrefaction. Air currents are always welcome in drying of hides and skins even if it is slightly warmer in the open. If a hide or skin does not dry in 2-3 days, there are chances for putrefaction.

#### 6.1.1. **Suspension or Frame Drying**

This can be practiced in different ways depending on local conditions and availability of hides and skins. The best way is to do frame drying in sheds. While frame drying in the open is cheaper, it is better to have sheds where one has organized slaughter but the sheds are to have suitable cross ventilation as otherwise it will spoil the raw material. In these sheds, regular frames made of wood or metal pipes are permanently fixed.

For hides from larger breeds of cattle, the frame should be 9 ft x 10 ft. and for smaller breeds, 9 ft x 8 ft. is sufficient. The minimum distance between two frames should be one foot to allow air circulation and to permit an operator to pass between two frames. Large frames meant for hides can be adopted for skins also, using four skins in the metal frame. In suspension drying, sun is not very dangerous, provided the temperature of the hide does not reach the point of degradation of collagen. Sun dried hides and skins should be removed to the shade before they are over dried which makes them crack when folded and it becomes very difficult to soak these stock in the tanneries. Sheep skins are very sensitive to heat damage. The sheds afford facilities for close supervision, protection from theft and damage from vermin. The drying sheds will have three portions namely.

1. Working place with a sloping floor where hides and skins are prepared on tables prior to suspension.
2. Prying space: This is calculated taking into account seven days needed for drying. So, for 10 hides daily or 40 skins daily, you need 70 frames.
3. Store: Which will have slatted wooden platform raised six inches on the floor.

The good points about suspension drying are:

1. It allows free flow of air on both sides of the hide or skin.
2. The rain drains off the surface and does not collect in puddles on the hide.
3. The sun's rays strike obliquely not directly.

4. It permits the hide to cool off rapidly since heat is lost through surfaces.
5. Neither hairslip or putrefaction sets in as there are no folds nor points of contact between the hide and any solid object. But during rainy season, due to still air and high relative humidity, a large percentage of hides get putrefied and to some extent skins also while frame dried.

Other advantages of frame drying are:

1. Better grading possibilities as every cut, bruise or parasite damage shows up better on a dry hide.
2. Dried hides and skins can be stored for a longer duration than salted hides.
3. Transportation is cheaper as the weight is only half of the salted hides.
4. Corrosion is avoided as in case of salted hides, the containers and vehicles get corroded. The main problems are: Difficulty in soaking back involving extra cost and often in losing hide substance leading to holes, uneven shape by improper stretching during drying and loss of area by the cuts for lacing and consequent trimming. One has to make sure the hides and skins are not overstretched as it affects the structure of the hides and skins and the method of stretching and securing to the frame is called lacing. The best material to be used are the strips from waste hides. Ropes are used very commonly. Often the slits made by knives are very long and much inside the hide or skin wasting a good percentage of raw materials. It is better to use a punch for lace holes.

## 6.2. Ground Drying

This method, in which hides or skins are placed directly on the ground, is the worst possible technique to apply. It can produce dried material of the most appalling quality and, consequently of the poorest value to the producer. Because of the lack of air circulation underneath, moisture is trapped under the hide or skin and, in tropical areas the sun is sufficiently powerful to encourage bacterial attack or to cause physical damage which is irreparable. Much of the damage caused at this stage may not be fully realized until an attempt is made to produce leather from the unpromising material made by this method of drying. A simple instance of the difficulties which result from ground drying is the marked tendency for such hides or skins to crack when folded because of their hardness and inflexibility.

### 6.3. Hides and Skins Drying Sheds

For a capacity of about 1200 cattle hides and 2000 sheep and goat skins a year, the sheds will measure 10 x 14m and will have a cement floor and corrugated iron roof. The sides will be open and protected by strands of barbed wire with the exception of a line of corrugated iron sheets at the top and further corrugated iron sheets protecting the area which hides and skins are scored. There will be 48 wooden frames for drying measuring 3 x 3 in, fixed at a height of 0.5m from the floor, and a distance of 30cm between frames. The frames will be arranged in two rows with an aisle 1m wide den the middle. There will be an area for the washing of hides and skins, tables for preparation and wooden horses for drainage. A cement wall 2m high will separate the wet area from the drying area. The storage area will be protected by corrugated iron but windows will be provided to ensure circulation of air.

### 6.4. Salting

#### 6.4.1. Wet Salting Technique

The hide or skin is spread on floor or iron floor wooden pallet and salt is uniformly applied on the flesh side with common slat to the extent of 30 to 40% on the green weight. The second hide is now spread on the first one with flesh side up and salt applied in the same manner. A pile of about 100 hides may be made or approximately to a height of one meter. The salt draws out water from the hides and skins and the brine so formed is allowed to drain out along with brine dissolved blood, lymph and other soluble proteins. The pack is allowed to cure for about five days and then it is opened up and put in another pile with top hide going to the bottom and applying additional salt wherever necessary. Again the hides remain for five days in pile. They are taken out, extra salt removed from the flesh side and keep the grain side clean. Two hides may be kept grain to grain and folded along the four and bundled to be dispatched to tanneries.

In this technique also, the bacteria is not destroyed but a condition is created where they become ineffective. Salt draws out about 20% of the water from hide or skin. Some salt is absorbed by the hide to the extent of 13 to 17% and the rest flows out. In all, the weight loss compared to green hide will be about 10 to 20%. In case of smaller skins, the percentage of salt used on green weight is higher. Either rock salt or sea salt of lake salt can be used and should have a sodium chloride content of 94 to 95%. The salt should not be too fine or too coarse. If too much powdered, the salt flows out as brine and is not absorbed to the desired extent. The suggested size is two to three millimeter grain. Rock salt is the most ideal salt for curing. But, sea salt is most commonly used and the main disadvantages are the formation of red heat which makes the flesh side of the hide red through the action of

halophilic bacteria (salt loving) and other organism which have salt is used without any additives, the storing capacity of hides is rather poor. In order to counteract the bad effects of common salt and to make the curing more long lasting a variety of chemicals are mixed with salt before application. For 100 parts of salt by weight, the proportions of various preservatives are:

Sodium fluoride	2 parts
Sodium silicofluoride	2 “
Sodium Penta Chlorophenate	0.2 “
Zinc Chloride	0.5 “
Mixture of two parts of soda ash and one part of naphthalene powder	
Para chloro meta meta creso	10.2 to 0.5% part
Topane WS (I.C.I)	0.5 parts
Preventhol liquid I (Bayer)	0.5 “

Some of the above additives act as a denaturing agent as salt is scarce in many places and has to be protected from pilferage. Liquid paraffin, phenolic chemicals, coloured salts either give bad smell or colour or taste to make it non-edible: Addition of 12 boric acid and 0.5% naphthalene to salt before curing has proved extremely useful in preventing red heat.

It is always necessary, the hides are piled on pallets which is six inches above ground level, which will allow free flow of brine and also free flow of air as one has to avoid heat being developed at the bottom of the pile. There should be drainage channels for the waste liquids to flow out. The pallets may have a small gradient between the front and back.

Under humid conditions, wet salted hides can be kept for about two to three months, whereas if the salt is mixed with preservatives and applied, storage can be up to six months. During the bundling of hides, extra salt is removed and it is not a good practice to re-use the salt as it contains lot of bacteria. But they can be re-used if mixed with fresh salt and preservatives as mentioned above. As the cost of salt is an important aspect in this technique one has to compromise various factors.

Where price of salt is very high and not available in required quantities. The additional cost is definitely made by better quality and hence higher price. Again, the tanneries spend much less in soaking expenses compared with dry hides. Transportation of wet salted stock is more expensive compared to dry ones and wet slated stock can be stocked for; much lesser time only compared to dry ones. Hides will need special care and handling during preparation, storage and

transportation. The disadvantages are made up very much by the better quality of leather and increase in area in leather compared to dry ones.

As regards the space for salting, preparation of the hide is the same in all types of curing. For salting, we need covered sheds with wooden pallets and drainage to protect from sun and rain, at the same time allowing free flow of air. After the first piling for five days, hides are removed to a ventilated room with pallets for second piling. There should be a clear area for removing salt from the flesh side possibly by mild beating on small concrete pillar with curved top. The grain side should be cleaned by brush. In the same location, the hides are bundled and in another room stored for dispatch. Store room should be well protected, ventilated and provided with pallets. In case of skins also, the technique is the same. If there is likely to be a very short period (not exceeding 3 days) between salting and putting the salted raw stock into further processing, the level of salt can be reduced to about 25% on green weight and only one salting will be required.

#### 6.4.2. **Dry Salting**

This technique is very much similar to wet salting but the hides and skins are dried after the initial salting which gives the advantage of both drying and salting. This technique is especially suited for preparing stock for export purpose, at the same time overcoming the problems of wet salting. The initial operations are the same as in wet salting, however, salting has to be done without any delay after flaying. As soon as the brine has drained off, the hides are dried in the air with flesh side up on the ground. So, the main requirement is a big drying area. Drying can be done with advantage by hanging them on wire or rope. The quantity of salt used is 10% less than in wet. With rains, air drying of salted hides may present considerable difficulties. In this period, a mixture of one part of common salt to four parts of anhydrous sodium sulphate is very often used to speed up drying. Dry-salted goods do not require protection from beetles but are very susceptible to damage by wetting. Care is necessary during transport.

Quick dry salting can be easily practiced by butchers or farmers who handle only small number of hides. The salt is applied and hide is folded with flesh side in and bringing in from all four sides. Hide remains in folded condition for two days and taken out and dried.

#### 6.4.3. **Brining**

This technique popular in South America uses saturated (33%) brine solution for initial treatment. Green fleshed and washed hides are soaked in brine for 24 hours. Water comes out of hides and dilutes brine. The reduced concentration of brine is restored by addition of fresh salt. After brining, the hides are taken out and piled to drain off.

Then hides are wet salted using 20% salt on weight of hide. These cured hides are called Frigorificos. Used brine can be reused several times after boiling, filtering and allowing to settle. These hides are well preserved and can be kept for long periods and considered to be the best cured hides.

### **6.5. Re-Use of Salt**

It has been the practice in some countries to recover and re-use salt swept from hides or skins before these are shipped or sold, sometimes after mixing with fresh slat. While it may be possible to adopt this practice with satisfactory results if the place where the salt is recovered is particularly clean, it must be recognized that the risk of contamination of fresh raw stock in this way, is very low.

In the very nature of the operation of salting, the area in which it is carried out may not be very clean and more probably, it is soiled, when it falls on the ground with blood, manure or remnants of skin tissue. Salt which has become contaminated in that way is likely to permit the development of chromogenic halophilic bacteria which are capable of producing reducing enzymes or other deleterious metabolites. Furthermore, it is not always possible to introduce satisfactory antiseptic agents to offset this risk.

Consequently, in the light of the strong possibility of introducing contamination which would defeat the whole object of hide and skin improvement, there can only be a recommendation not to re-use salt.

If salt is either considered too costly for economic use or is not readily available, way should be examined of dealing with the situation by some other approach, not by re-use of salt.

### **6.6. No-Salt and Los-Salt Treatments for Preservation**

The most obvious and well-known method available to producers of hides and skins in developing countries is clearly that of air drying by suspension. Providing this is carried out which due regard for the hazards of heat damage by excessive exposure to hot sunshine or of wetting by rain or other sources of water, very satisfactory dried hides can be produced. Because of the severe damage frequently attributable to ground drying, this method of drying is to be avoided at all costs and is certainly not to be regarded as a satisfactory alternative to either salting or suspension drying.

In the developed countries, where it has been stated that the use of large quantities of salt can give serious cause for concern with regard to potential pollution of potable water supplies, the use of many alternative chemical treatments has been studied very thoroughly. Recent reviews of this subject

indicate that such techniques can be successful but often only for a limited period and they could be adversely affected by tropical conditions.

Extensive laboratory studies and field trials have been undertaken using mixtures of various chemicals including boric acid in the absence of salt. Periods of preservation of short duration, say 4 – 6 weeks at ambient temperature in southern Africa, for example, could be long enough to cover the period of transport involved between the point of origin and the tannery.

Low-salt techniques for curing have included using only 10% of salt on green weight together with 0.5 to 1.0% of antiseptic on the same basis. Antiseptics used have included boric acid, Merpin TKE, Nercolan GLO and Vantoc CL.

### **6.7. Storage of Wet Salted Hides and Skins**

Some precautions are necessary in storage of wet salted hides and skins, especially if there is delay in dispatching or processing in the tanneries. The care is more necessary when the atmospheric temperature goes up. These hides and skins are to be stored on pallets and without mixing with dried hides and skins and the piles should not be more than 1 to 1½. Hides and skins should be bundled only just prior to transportation and as soon as they are received in the tanneries they should be opened in the tanneries. In case of skins, bundling should be done loosely and extra preservative may be mixed with the salt for additional protection especially during summer. If there is more than one month delay in processing, the hides and skins should be handled in the tannery stores. Hides and skins should never be left in the lorry, except when they are actually being transported.

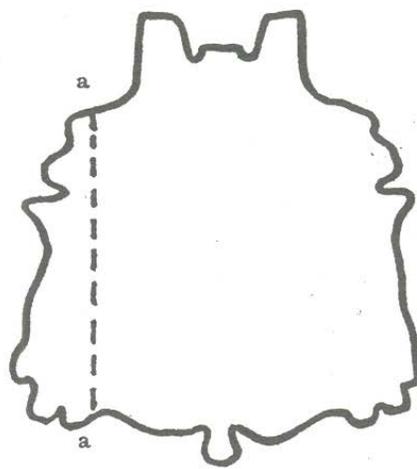
## **7. Folding and Baling**

If the dried hides are required either for export by land, by air or by sea, or even if they are needed to be transported for an appreciable distance within the country of origin, presentation in terms of baling and folding after grading is important for good marketing of hides and skins.

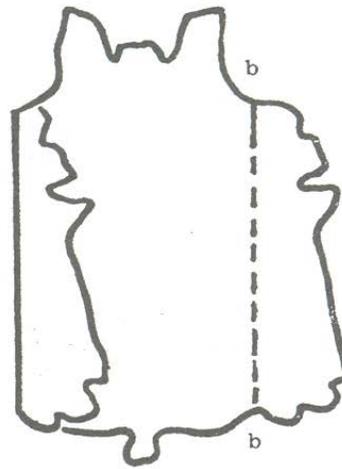
The same pattern of folding can be applied to dried or salted hides and skins but greater care must be exercised with dried hides which are more liable to crack on folding. The practical difference is that folds need to be made without undue haste the dried goods being less flexible than salted stock are more prone to development of cracks if folded too rapidly or put under excessive pressure.

Wet salted hides, for example, can be folded without difficulty until they form a small “parcel” only about 45 cm x 60 cm in area and 10 – 12 cm thick.

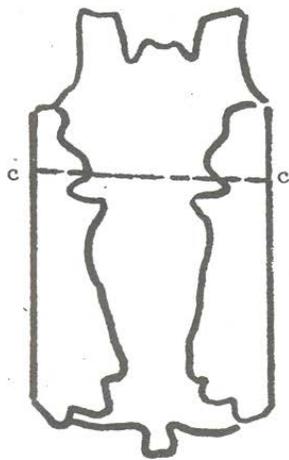
Dried hides and skins (with extra care) and salted stock can be folded in the following sequence (Fig. 18) (for purpose of explanation, reference will be made only to hides).



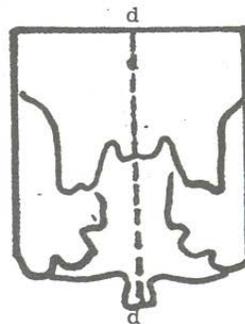
First fold



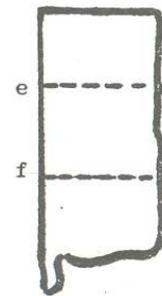
Second fold



third fold



Fourth or final fold



Optional fold

- i. Wet-salted stock should be shaken free of excess salt before folding begins; dry-salted stock may not need this to be done and dried stock is ready for folding.
- ii. The hide, freed of excess salt, where this is applicable, is spread out flat on a clean area of floor or on a large table with the flesh side down. In salted hides, 2 hides may be kept grain to grain and then folded.
- iii. With the aid of either a light metal or wooden rectangle or a sheet of waterproof plywood measuring 1.8 m x 1.2 m, the first fold is made by placing the pattern symmetrically on the hair side of the hide so that its lower edge roughly coincides with that of the tail end of the hide while the long sliders are parallel with, and equidistant from the back-bone line. The centre

point of the upper, shorter side will be on the backbone line at the neck end and that of the lower, shorter side will be on the backbone line at the tail end.

- iv. First fold – the belly area to the left of the pattern is folded over to the right to lie on top of the pattern which is then withdrawn from under the folded area without disturbing it. The pattern is next replaced in its original position but with the first fold now beneath it, the left outside edge of the fold coinciding with the left, longer side of the pattern.
- v. Second fold – the corresponding area the right of the pattern is folded similarly. The pattern is then with-drawn and placed on top of both folds so that its longer sides now coincide with the outer, straight edges of the two folded areas. The lower, shorter side of the pattern is next moved down to a point approximately 60 cm below the roof of the tail, i.e. its upper, shorter side is about that distance from the neckline and the area of hide within that of the pattern is roughly 1.2 m x 1.2 m.
- vi. Third fold – the shoulder/neck area of the hide is now folded down over the upper, short side of the pattern which is then withdrawn carefully and replaced on the hide so that one long side of the patter lies along the backbone line, the pattern, as a whole, projecting to the right of the backbone line.
- vii. Fourth fold – the partly folded area of hide to the left of the backbone line is folded over to the right to lie over the longer, left side of the pattern which is finally withdrawn. The right, longer edge of the new fold should now coincide with that of the hide beneath it.

This degree of fold is as far as is normally applied to dried or dry-salted stock; as mentioned above, it is possible with wet-salted stock, with greater flexibility, to continue folding to produce a parcel by folding the hide, after the fourth fold, in equal thirds so that the hide is further reduced in area.

The method of folding just described refers to the hide being folded, in effect, flesh side out. It has to be said, at this point, that there are two schools of thought regarding the best way to fold, flesh side out or hair side out. It is usually true that penetration by any extraneous material more readily penetrates the hide from the flesh side, therefore it is argued that there is more risk of damage to the hide unless it is folded hair side out. The counter-argument is that the risk of spillage causing such damage can be greatly reduced by suitable wrapping of the bale. Also, hides folded hair side out are as much at risk in a similar way, with the particular problem of direct damage to the grain having to be anticipated. Since grain damage is more likely to lead to down-grading of either raw stock or the leather produced from it and, in the event of flesh damage (unless it penetrates fully to the grain) it will normally be possible to remove any damage showing on the flesh side by shaving or splitting at any one of several stages in the leather processing.

When sheep or goat skins are being folded, these smaller skins can be folded in a similar manner, but there is no need to use a pattern as it is possible to judge the best lines of folding by eye. In general terms, the first two folds are made rough one-fifth of the full width of the skin and parallel to the backbone line, the third fold is made about two-fifths of the distance from the neck end to the tail folded toward the tail at right angles to the backbone and the fourth fold is made along the line of the backbone. But commonly, they are folded along the backbone with flesh side out.

When dried or dry-salted stock has been folded as described above, the next step in preparation for transport can be undertaken. This can be done by passing heavy twine or strong plastic type twice round a group of about 10 hides or an equivalent weight of skins, in both directions, to produce a very firmly tied bale. The plastic tape frequently used for baling a variety of goods is extremely strong and being about 1 cm wide does not so readily mark the wrapped goods as may narrower or harder binding material. It is normally applied with mechanical aid, e.g. with a baling device which also draws the tape taut around the bale and finally clamps it securely. Wire has been used for baling but this may cause several problems, e.g. by cutting into the folded goods and, possibly, making permanent stains. If wire has to be used, sacking or some similar material must be pieced between the wire and the baled stock. In the interest of avoiding the ill effects of some adverse contacts during transportation and also of avoiding marking by the baling material, the groups of hides and skins could be wrapped overall with hessian, open weave poly propylene sacking or similar material before application of the binding material.

### **7.1. Packing for Export**

A clean pallet, measuring 1.2 m x 1.2 m should be covered with a sheet of hessian approximately 1.8 m wide and 6 m long (to allow 2.4 m to overlap on both sides of the pallet). This will allow a load of about 48 hides (nearly one ton in weight at 50 lbs each) to be build up on the pallet and still permit the load to be wrapped.

If wet-salted hides, for example, are folded to the size described under folding and baling it is possible to pack these in seven or eight layers of six (made of two parallel lines of three folded hides) alternately at right angle to the adjacent layer or layers. This techniques assists in making the load stable on the pallet.

The hessian covering should finally be brought around the sides of the stack, overlapped on top and folded in at the two free sides. This can then be secured with the aid of a mechanical binder using several passes of plastic strip.

Mounted on pallets, in this way, loads of up to one ton in weight are relatively easy to move and to stow on board ship with the aid of a fork-lift truck at the dockside without disturbing either the load or its wrapping.

## 8. Storage

When hides are not to be dispatched for sale within a few days, they should be treated with an insecticide.

Insecticides can be of two kinds, liquids such as solutions of arsenic in water, or powders such as D.D.T., gammexane, pyrethrum, derris or naphthalene, etc.

Solutions of arsenic for this purpose are similar to those used in dipping tanks, and if no other means of treating them are available, the hides may be dipped in the dipping tank.

Although arsenication is generally used for dry hides, it is better to use it for the uncured hides.

Great care must be taken in the use of arsenic, since it is a deadly poison and must always be kept under lock and key.

Other commercial dips are preferable and should be diluted in accordance with the instructions for preparing normal strength dip solution (often 1 : 300).

Sodium silicofluoride may be used as a spray in the proportion of 0.5 kg to 10 liters of water, if it is available.

If powders such as gammexane are used, they should be mixed with an inert powder such as diatomite using a machine to mix them. If pyrethrum is grown locally, it can be dried and ground into a powder, and dusted over hides and floors, etc.

During the wet season, hides stored for a long time should be taken out into the sun occasionally, to prevent the formation of moulds, which are not affected by insecticidal dips or powders.

Baling prior to export can be carried out solely by hand, but there is a risk that the ties may not remain secure with much handling. As already indicated, in connection with the use of plastic binder tape, several types of power-operated and manual presses, as well as devices for secure application of binding material, are available. Particularly in climates with low relative humidities, these mechanical aids are advantageous because they can be used to exert just sufficient pressure to enable firm and tidy bales to be produced without cracking along the folds. They are made in a range of sizes, capacities, powers and styles, to meet the nature of the work for which they are intended. One such press is fitted with a stopping device which automatically shuts off the pressure when the bale is compressed to the required extent and holds it at that point while the fastening material is applied.

## 9. Quality Checks on Salted Stocks

It is essential to conduct a few quick and simple tests to make sure the hides have been properly salted and their quality is being maintained during storage.

### 9.1. Heat Damage

Some degree of heat damage can occur as a result of high temperatures or through prolonged transit in hot weather. A cured hide, for example, may not appear to be damaged and may not have an odour of breakdown but will have reduced resistance to a screwdriver, large nail or pencil pushed against any site of damage.

### 9.2. Other Signs of Damage

Salted stock should be carefully inspected at intervals and checked for odour, red heat or hair slip. It is good plan to retain carefully small samples or any suspect stock in case of claims for poor quality.

### 9.3. Salt Level

Assuming the total ash determined on salted stock is all salt, the ashing of a known weight of material on which moisture content is also determined, should give a value of not less than 27% ash (expressed on the amount of water remaining in the cured hide, i.e. its water content determined on drying) to indicate good to excellent cure. This relates to the need to achieve, as nearly as possible, saturation in respect of salt in the water in the hide, i.e. not less than about 26%. Hide moisture contents and brine saturation give an indication of the effectiveness of salt curing.

## 10. Grading and Classification

In commerce, it is necessary to have a standard system by which the value of a hide or skin can be determined. This is directly related to its leather making characteristics mainly the yield and quality. This standard system is essential both for the smaller and buyer and in hides and skins trade, this system is based on various quality grades taking and weight range. In some countries, there are only I, II, and III grades and rejects, but in some other countries, they have IV grade also. In general the principle of grading is same in all countries, though there will be slight variation from country to country.

### 10.1. Faults and Defects

For the purpose of this standard, faults and defects are distributed in five groups:

- 10.1.1. Natural defects caused by diseases and parasites on the living animal: anthrax, scars, ringworm, tumors, or ticks, lice, warble, etc.
- 10.1.2. Mechanically caused defects by the living animal: brands, bruises, scratches, wounds, wire damage, etc.
- 10.1.3. Dirt, dung, urine stains, sand, seeds, etc.
- 10.1.4. Flaying defects: cuts, scores, corduroy, holds, grain cracks, pulling machine damage, etc..
- 10.1.5. Curing and storing defects.

## **10.2. Grading Norms of Hides**

For the purposes of this standard, the classification shall be done according to the following four grades:

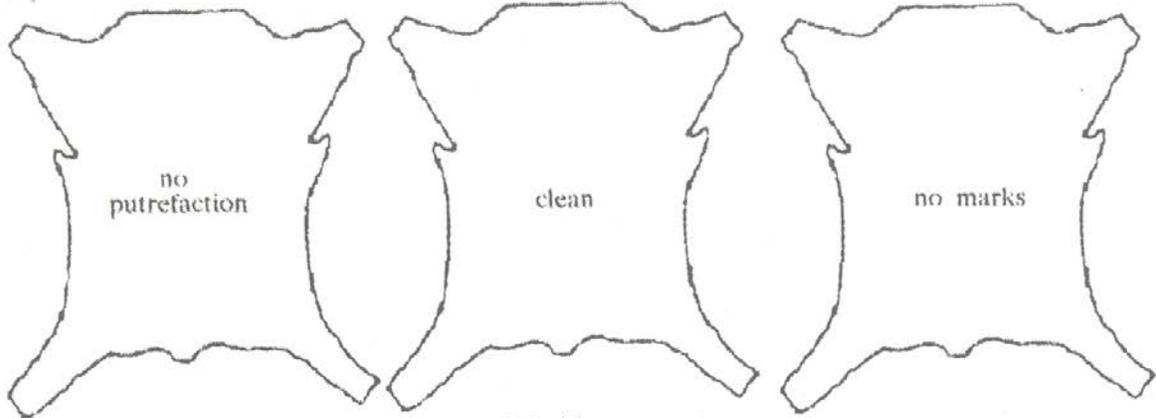
### 10.2.1. First Grade

The first grade shall be done according to the following requirements:

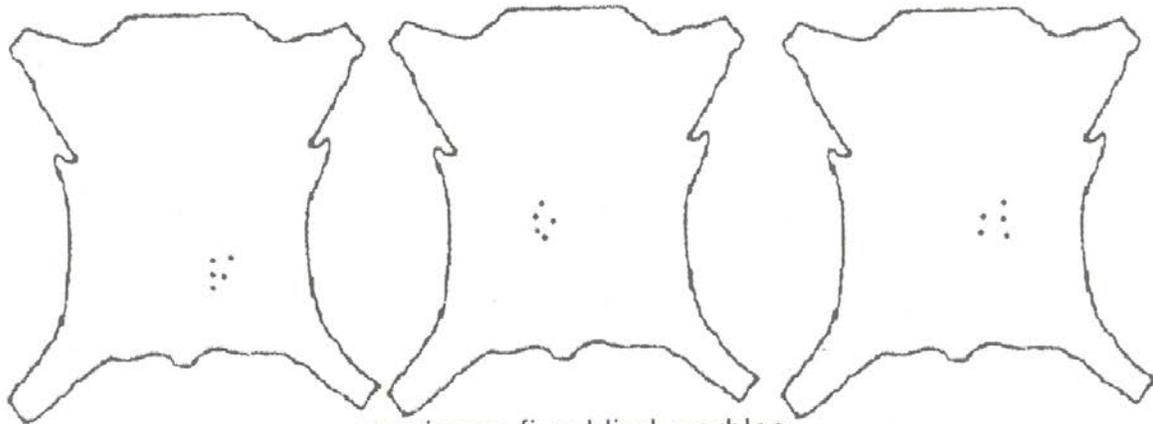
- Hide of good pattern, clean and well cured, NO SIGN OF PUTREFACTION,
- Free of defects in the butt and neck area, except for a maximum of 5 blind warbles,
- With only a few score marks or one hole in the bellies,
- Without brand marks.

FIRST GRADE

Putrifaction Dirt Brand Marks

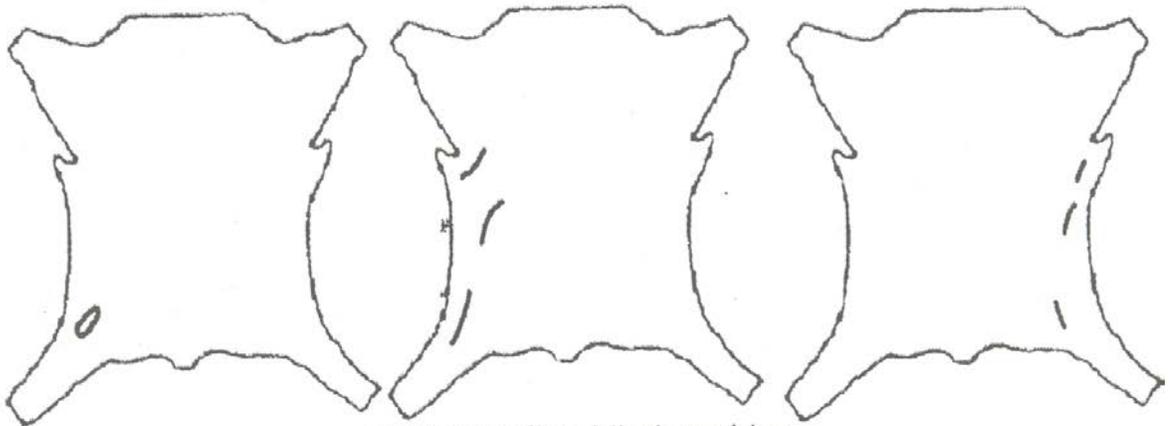


Warbles



maximum five blind warbles

Score Marks Holes

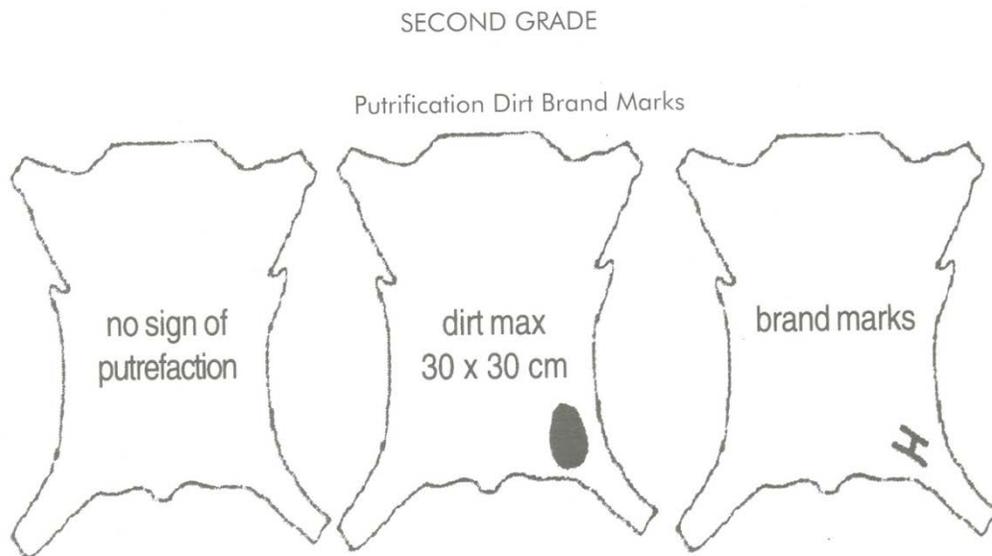


maximum five blind warbles

### 10.2.2. Second Grade

The second grade shall be done according to the following requirements:

- Hide of good pattern and well cured, NO SIGN OF PUTREFACTION,
- With few small holes or cuts or other defects from group one and two in the butt,
- With moderate number of defects from groups one, two – except for brands and four in bellies and neck,
- With ONE brand which is wholly within 18 cm of the perimeter of the hide,
- With a maximum of ten open warbles or twenty blind warbles,
- With dung and urine stain not more than an area of 30 x 30 cm on each of the hind shanks.



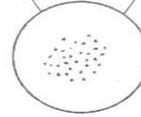
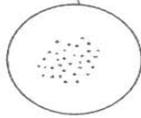
SECOND GRADE

**WARBLES**

Maximum of  
ten  
open warbles

Maximum of  
twenty  
blind warbles

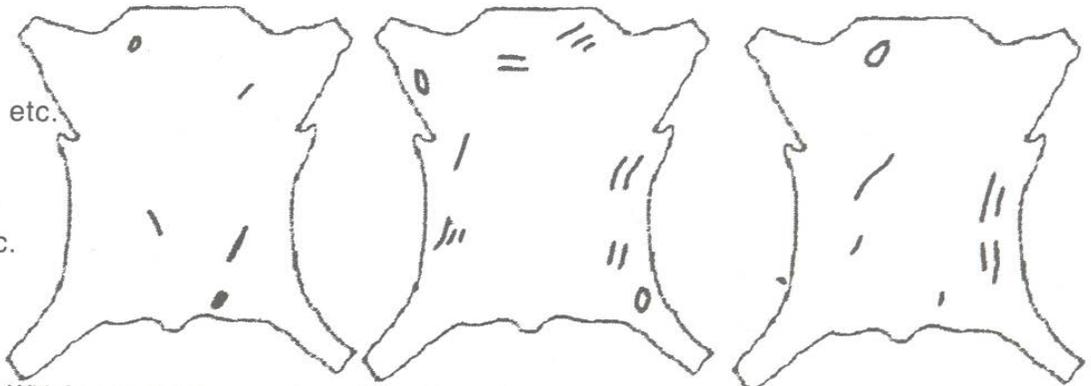
Maximum of  
twenty  
blind warbles



SCARS  
TICKS  
RINGWORM, etc.

BRUISES  
SCRATCHES  
WOUNDS, etc.

FLAY CUTS



With few small holes or cuts or other defects from group one and two in the butt.

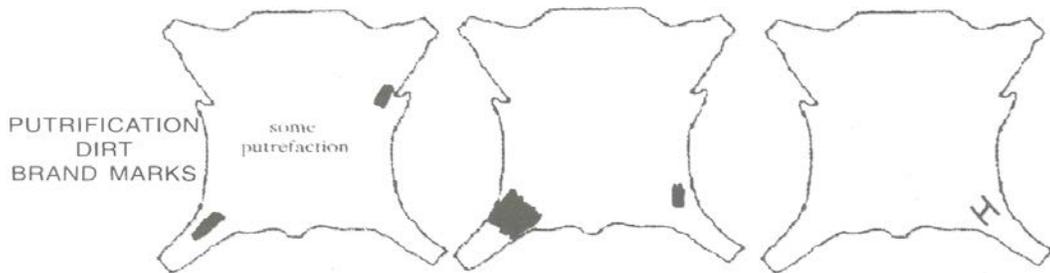
With moderate number of defects from group one, two - except for brand - and four in bellies and neck.

### 10.2.3. Third Grade

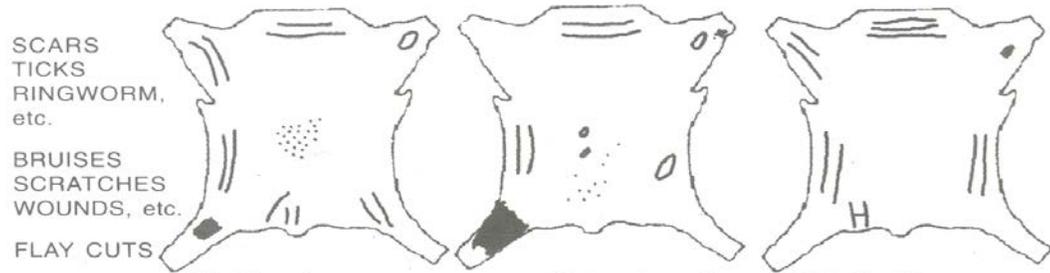
The third grade shall be done according to the following requirements:

- Hide of poor pattern or spoiled,
- With some putrefaction defects,
- With defects from group one, two – except for brands and four up to 30% of the hide area,
- With a brand of which any portion is more than 18 cm from the perimeter of the hide,
- With more than ten open warbles and 20 blind warbles,
- With more during and urine stain than acceptable for grade 2.

#### THIRD GRADE



With defects from group one, two - except for brands - and four up to 30% of the hide area.

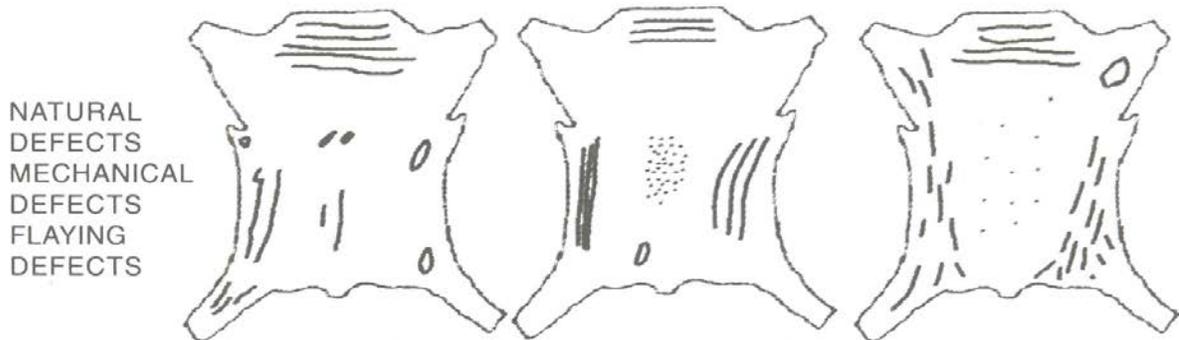
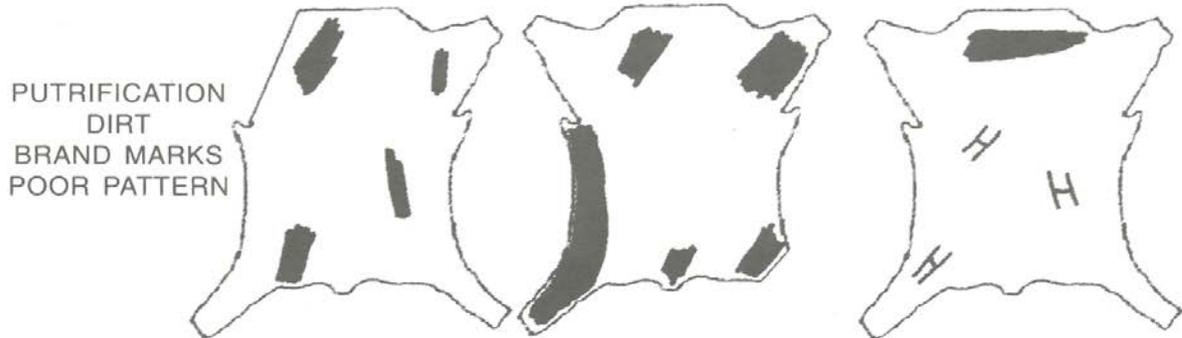


With defects from group one, two - except for brands - and four up to 30% of the hide area.

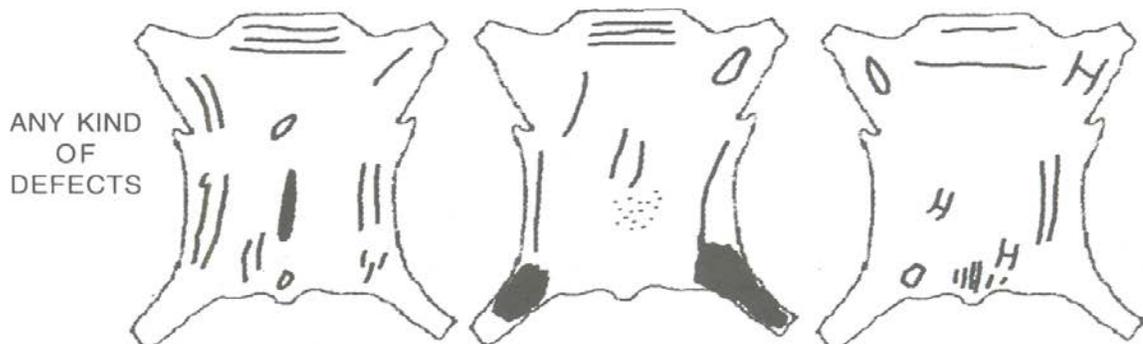
#### 10.2.4. Fourth Grade

The Fourth grade shall be made according to the following requirements:

- Very poor pattern or very spoiled hide
- With any kind of defects covering up to 50% of the hide area.



Any kind of defect covering up to 50% of the hide area.



Any kind of defect covering up to 50% of the hide area.

## 11. Terms and Definitions

### Natural Defects

The following terms and definitions shall apply to natural defects:

**Warble Holes** shall mean scar formed after the: healing of the warble hole.

**Grain Damage** shall mean any damage to the grain side of the hide or skin whatever its origin or nature, causing depreciation of the hide or skin. Such depreciation can be caused in a variety of ways; sores or abscess, various diseases (man-ge, small-pox, warts, ring worm and the like) the aftermath of blisters, hide or skin troubles, horn rake, rubbed hind-quarters or rubbed neck, goad pricks, branding iron burns, corrosive paints, various scratches (brambles, barbed wire, damage caused during transportation or dragging cockle, curry-comb marks, whip and collar and yoke lashes rope marks) scaring or gashes as a result of surgery, dog bites and the like.

**Dung or Traces of Urine** shall mean soiling by dung or urine which has corroded or burnt the grain side of the hide or skin.

**Ticky Hide or Skin** shall mean hide or skin having holes or unhealed scars on the grain caused by ticks.

**Hollows or Sagging** shall mean fault due to a too loose structure of the dermal padding giving the appearance of separation between the hair side and the flesh side of the hide or skin.

**Cockle** shall mean defect appearing on sheep skin after the removal of the wool and tanning in the form of a cluster of circles from 5 to 8 mm in diameter, connected to each other or otherwise and the design of which forms a sinuous but always symmetrical pattern perpendicular to the backbone.

**Wrinkle** shall mean defects appearing on the grain side of sheep skin after removal of the wool and tanning, in the form of fine ridges perpendicular to the backbone. On the flesh side of wooled skins, it could also appear in the form of ridges perpendicular to the back bone but very much deeper. This defect is caused by folds in the skin of the living animal and mostly encountered in rams.

**Faulty Shearing** shall mean scars left by the shearer on sheep skins at the time the animal is sheared.

### Flaying Defects

The following terms and definitions shall apply to flaying defects:

**Hole** shall mean a complete perforation of a hide or skin accidentally made by a knife or flaying appliance.

**Gash** shall mean a cut made into the dermis of the hide or skin by a knife or flaying appliance without there being an actual perforation.

**Gouge** shall mean thinning of the hide or skin caused by a knife or flying appliance, without there being an actual perforation.

**Grain Burst** shall mean tearing of the hair side of the hide or skin during flaying whatever the process of flaying used.

**Siding or Corduroying** shall mean a series of shallow generally parallel streaks appearing on the hide or skin as a result of poor flaying.

**Poor Pattern** shall mean cutting in which the extreme outside edge of the hide or skins is not symmetrical within a rectangle caused by bad opening cuts or by distortion during drying by uneven tension.

**Badly Shaped shanks** shall mean shanks cut off along a line which is not perpendicular to its longitudinal axis.

**Hand-Hole** shall mean a cut made at the edge, of the hide or skin in order to facilitate flaying.

**Chaps and Fine Cracks** shall mean bursting of the superficial or upper layer on the grain side of sheep skins, caused by excessive stretching of the skin at the time of flaying.

### **Preservation Defects**

The following terms and definitions shall apply to preservation defects:

a) Defects visible on the grain side of a hide or skin

**Heating** shall mean beginning of putrefaction of the hide or skin revealed by a premature loosening of the hair.

**Moth Damage** shall mean a spot on the grain surface of an air-dried hide or skin which is eaten out by larvae of moth.

b) Defects visible on the flesh side of a hide or skin

**Salt Spots** shall mean small cavities of white or light brown colour which are heavily encrusted in the hide or skin due to improper salting.

**Red Spots** shall mean discoloured areas varying from pink to brick red due to improper salting.

**Purple Spots** shall mean discoloured areas ranging from purple to very deep blue, and revealing a deterioration of the sub-cutaneous and dermal layers due to improper salting.

**Beetle Damage** shall mean a spot on the flesh side of a dry hide or skin which is eaten out by larvae of dermistidae resulting in channels or through holes.

- c) Defects appearing of the grain side of the hide, or skin during the process of tanning.

**Grain Pitting** is the process by which small outbreaks in the hide or skin appear on the grain side leaving an empty space in the form of a crater after tanning.

**Round Spots** shall mean rings of a thickness of 2 to 3 mm and an outside diameter of 10 mm appearing after removal of the hair.

#### **Other Defects**

**Ball-Drying** shall mean drying of hides and skins in an unstretched form.

**Fallen Hide or Skin** shall mean a hide or skin obtained from an unbled or improperly bled carcass with its flesh side appearing purple red in colour.

**Scraginess** shall mean thinness and friability of hides and skins as a result of prolonged starvation producing dry and flabby leather in tanning.

**Horny Spot** shall mean a spot on a hide or skin which is burnt out by the sun in the course of drying.

**Smoked Spot** shall mean a partially tanned hide or skin due to smoke drying resulting in hides or skins which do not rehydrate during the soaking process and become fragile and brittle after processing.

#### **Remarks Relating to Preservation Defects**

##### **Description of the Defects**

The following additional description is provided to facilitate the recognition of defects which occur during preservation:

**Salt Spots on the Flesh Side:** already perfectly visible on the flesh inside of the salted hide or skin these spots reveal themselves still more clearly following the alkaline treatment which the hides, or skins undergo at the time the hair is removed and liming. If, the hides or skins are treated with lime the spots become yellowish brown; if the hides or skins are treated with sodium sulphide, they appear dark green.