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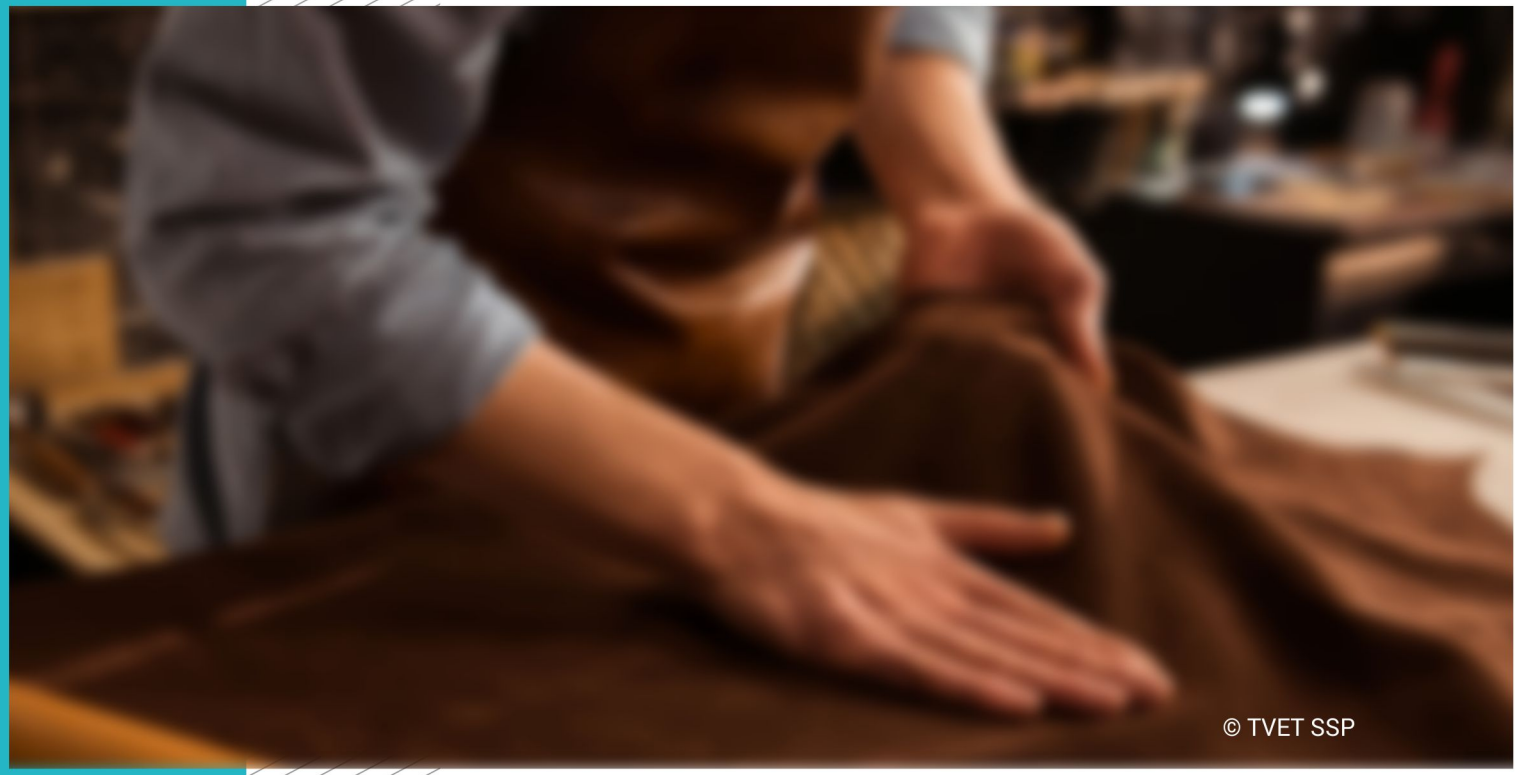
LEATHER PROCESSING TECHNOLOGIST



LEARNER GUIDE

National Vocational Certificate Level 3

Version 1 - September, 2019

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LEATHER PROCESSING TECHNOLOGIST

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Introduction

The Leather industry is a highly labour intensive industry; labour is extensively employed in the initial stages of the Leather tanning process while greater skills are required at the finishing stage. This Course is designed to focus the need, importance and understanding of Leather tanning & processing industry as per the current competitive environment. Companies can maintain a strategic competitive advantage and produce more valued goods after better processing of leather. Increasing demand for skilled, efficient and effective employees has created demand for this course.

This course will enable functional and technical skills for leather processing technologist. The material is taught as leather processing mechanical operator, tanning technician, leather processing & finishing and quality perspective with an emphasis on where and how specific tools can be used to improve the overall performance in the leather processing.

The main elements of your learner's guide are:

- **Introduction:**
  - This includes a brief description of your guide and guidelines for you to use it effectively
- **Modules:**
  - The modules form the sections in your learner's guide
- **Learning Units:**
  - Learning Units are the main sections within each module
- **Learning outcomes**:
  - Learning outcomes of each learning units are taken from the curriculum document
- **Learning Elements:**
  - This is the main content of your learner's guide with detail of the knowledge and skills (practical activities, projects, assignments, practices etc.) you will require to achieve learning outcomes stated in the curriculum
  - This section will include examples, photographs and illustrations relating to each learning outcome
- **Summary of modules**:
  - This contains the summary of the modules that make up your learner's guide
- **Frequently asked questions**:
  - These have been added to provide further explanation and clarity on some of the difficult concepts and areas. This further helps you in preparing for your assessment.
- **Multiple choice questions for self-test**:
  - These are provided as an exercise at the end of your learner's guide to help you in preparing for your assessment.

LEATHER PROCESSING TECHNOLOGIST

Module-6

LEARNER GUIDE

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Modules

Module 6: Carryout Pre-Pelt Operation

Objective of the module: The aim of this module to develop advanced knowledge, skills and understanding to carryout pre-pelt operations

Duration: 100 Hours **Theory:** 20 Hours **Practical:** 80 Hours

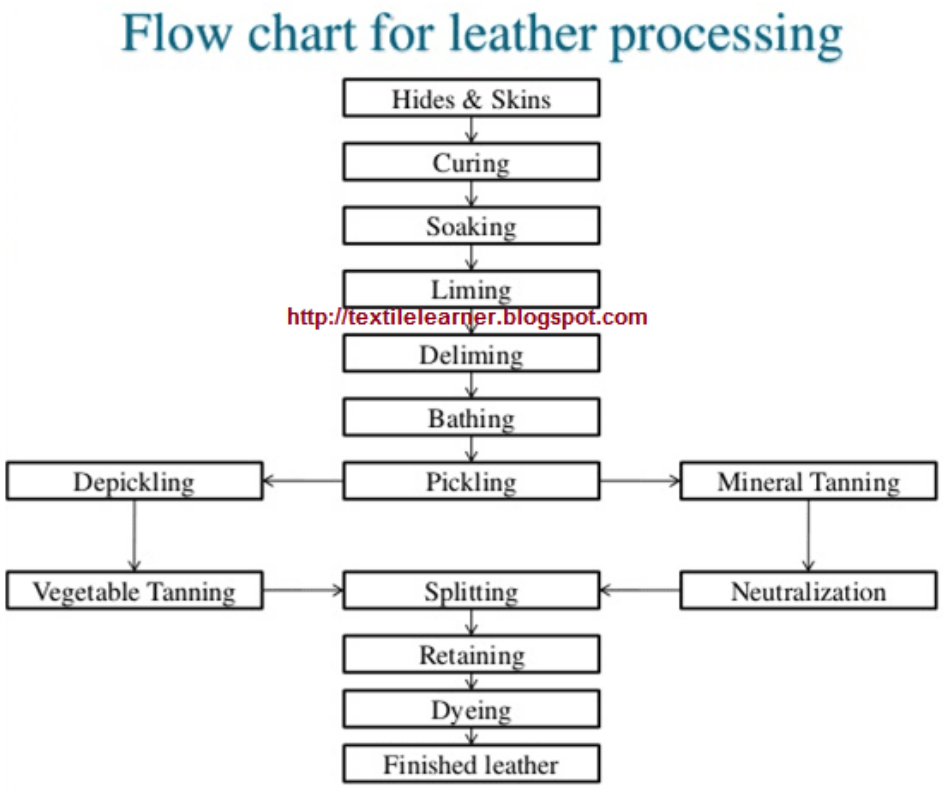
Learning Unit	Learning Outcomes	Learning Elements	Materials Required
LU1: Perform Hide/skin Inspection	**The trainee will be able to:** Receive Raw hide/skin from Supplier Trim hide/skin Segregate Hide/skin as per size Grade Hide/skin according to quality Tag graded Hide/skin	Define hide/skin Define sources of hide/skin Define morphology of hide/skin Define histology of hide/skin Describe trimming Describe hide/skin defects Describe sizing Describe grading of hide/skin	Computer with Multimedia Hide Skin Knife – 8” Safety helmet & glasses Safety Gloves Safety Shoes Mask Pallets Apron (Rubber) Digital Weight Balance
LU2:Preserve Hide/skin	**The trainee will be able to:** Prepare Storage Area Apply Preserving agent as per Hide/skin condition Pile Hide/skin flesh to flesh or grain to grain	Explain requirement of storage area Explain preservation Types of preservation Methods of preservation Types of preserving agents Explain grain side and flesh side of hide/skin	Computer with Multimedia Hide Skin Safety Gloves Safety Shoes Mask Pallets

			Apron (Rubber) Digital Weight Balance Pit Persevering Agents
LU3:Prepare Pre-PELT Recipe	**The trainee will be able to:** Assess Hide/Skin Condition Weigh the weight of Hide/skin Develop Pre-PELT Recipe according to requirement	Determine hide/skin condition Define parameters of skin/hide conditions Define types of Chemicals used in pre pelt operation Define uses of chemicals used in pre pelt operation Explain properties of chemical used pre pelt operation Explain method of preparing pre-pelt recipe Define compositions of pre-pelt recipe	Computer with Multimedia Hide Skin Digital Weight Balance Pen Paper Calculator
LU4:Soak Hide	**The trainee will be able to:** Receive Hide/skin from Storage Area Select Vessel for Soaking according hide/skin requirement Perform washing Perform Soaking as per Pre-Pelt recipe Check pH value of float and condition of hide/skin as per Pre-Pelt recipe	Introduction to vessels: ○ Pit ○ Paddle ○ Drum Explain washing Procedure of washing Define soaking Describe purpose of soaking Describe desalting before soaking process Explain quality of water Explain soaking and causes of soaking defects	Computer with Multimedia Hide Skin Safety Gloves Safety Shoes Mask Pallets Apron (Rubber) Digital Weight Balance Pit Paddle Drum Pallet Jack

		Explain procedure of soaking Explain pH and its parameters Explain precautionary & remedial measures of soaking Define procedure of checking pH values Define parameters of rehydration	Plastic Containers pH value measuring instrument
LU5:Perform Painting on skin	The trainee will be able to: Prepare Painting mixture as per pre-pelt recipe Apply Painting mixture on the flesh side of skin Pile skin flesh to flesh side as per Pre-Pelt recipe Remove hair from skin	Explain painting Describe Purpose of painting Describe painting mixture Importance of painting Method of applying painting mixture Explain methods of removing hair Explain precautionary & Remedial measures of painting	Computer with Multimedia Hide Skin Safety Gloves Safety Shoes Mask Pallets Apron (Rubber) Digital Weight Balance Pit Paddle Drum Pallet Jack Plastic Containers Jute Brush Painting mixture
LU6: Perform Un-hairing & Liming	The trainee will be able to: Arrange Liming agent & auxiliaries as per pre-pelt	Define unhairing Describe purpose of unhairing Explain liming	Computer with Multimedia Hide Skin

	recipe Mix Liming agent & auxiliary as per pre-pelt recipe Execute Un-hairing & liming as per pre-pelt recipe Check Pelt condition as per requirement	Describe purpose of liming Importance of un-hairing & liming Explain un-hairing & liming techniques Un-hairing & Liming methods according to equipment used; ○ Pit liming ○ Paddle liming ○ Drum liming Liming defects Classification of liming defects Explain precautionary & remedial measures of un-hairing & liming	Safety Gloves Safety Shoes Mask Pallets Apron (Rubber) Digital Weight Balance Pit Paddle Drum Pallet Jack Plastic Containers Liming & un-hairing agents & auxiliaries Baume Meter pH value measuring instrument

Examples and illustration:



LU1

Hide / Skin

A hide or skin is an animal skin treated for human use. The word "hide" is related to the German word **"haut"** which means skin. The industry defines hides as "skins" of large animals e.g. ... Common commercial hides include leather from cattle and other livestock animals, buckskin, alligator skin and snake skin.

Morphology of hide/skin:

Structure of Hides and skins are classified in two parts.

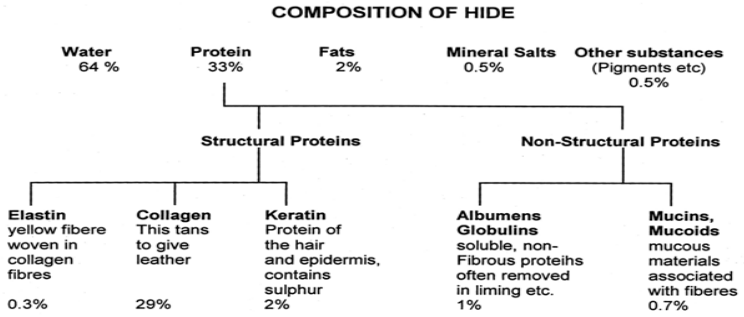
(1) Anatomical structure
(2) Chemical structure

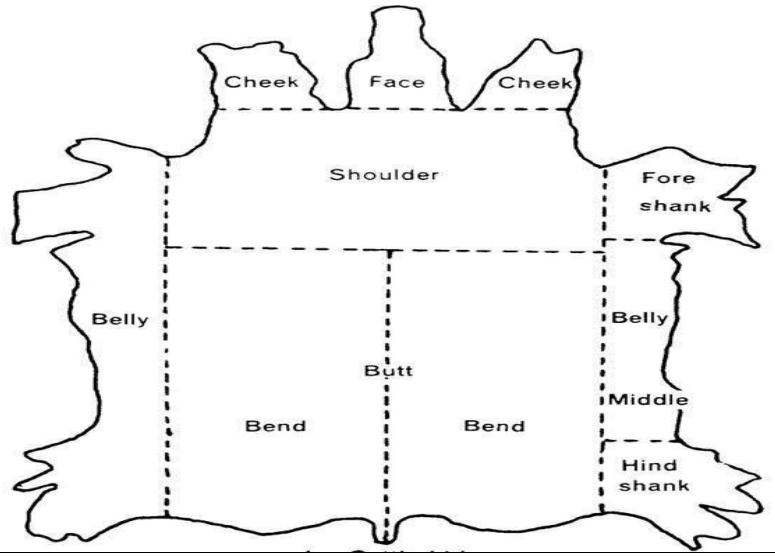
Anatomical Structure:-

The hides and skins are mainly consists of three layers.

(i) Epidermis or Outer Layer
(ii) Dermis or Corium Layer
(iii) Hypodermis or Flesh layer

Chemical Structure:-



Trimming: All the unusable parts of the leather hides are trimmed off and the hides are run through a machine which smooth the leather edges to a uniform level with tolerances	

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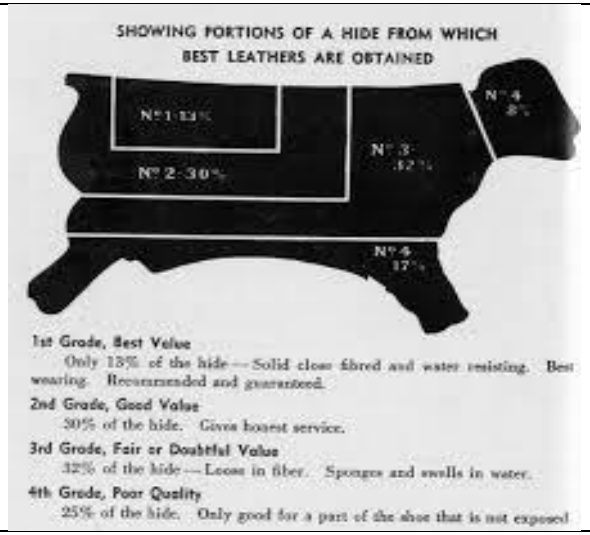
Hide/skin defects:

Imperfections causing an unusual aspect and/or an alteration of the natural properties Physical/mechanical damages: caused through mechanical means

(a) ante-mortem (on the farm, during transport)

(b) post mortem (at market, during storage)

Sizing & Grading Classification of Skins For the purposes of processing the classification shall be done according to the grades & sizes. Sizing the skin / hide measures mostly in sq.ft. and grading mostly divided into 4 types 1st 2nd 3rd and 4th grade according to their defects	

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LU2

Preservation of skin / hide

Fresh animal skin cannot be processed immediately in the tannery, it is stored and preserved in order to halt decay. This must be done quickly to prevent bacterial growth, which usually begins approximately 2 hours after slaughter. Bacteria can destroy the skin (putrefaction) and render it unusable for making leather. Common methods of preservation are salting, drying and freezing.

Salting The salting preservation method primarily drains the skin. It is essential that the salt (chemical: sodium chloride) is fresh. Sufficient salt is required to completely saturate the skin so as to stop any bacterial growth. For this reason, the raw hide / skin has to be salted with 40 - 50% salt in relation to the skin weight. The process involves sprinkling the skin with solid salt (dry salting) or by treating the skin with salt solutions (wet salting).	

Drying

The simplest and oldest preservation process is drying. The skin is thus stretched in the dry air in such a way that air can flow around the hide from all sides. The skins should dry quickly, but never at too high temperatures (not above 30 ° C) and never in direct sunlight or next to a radiator, since this leads to irreversible damage of the skin collagen! Dried leathers are hard.

LU3

Prepare pre-pelt recipe:

Skin /hide conditions:

Initial condition of hide/skins which came from grading after sorting of skin/hide, either is damaged from Fleshing Cutes or other cuts. further recipe will be created according to the initial conditions.

Parameters of hide/skin condition depends on:

- Type of skins to be processed.
- Notice down if any anti mortem and post mortem defects of skin/ hide.

Chemicals used in pre pelt operations:

There are following processes involved in pre-pelt processes e.g. Soaking, Painting and un-hairing & liming.

So different chemicals are use for different processes it includes:

- Detergent - to remove the dust, dung, and salt
- Biocides – to avoid bacterial growth in skin/hide
- Sodium sulphide - speeds up unhairing and alkaline swelling
- Sodium hydrosulphide and arsenic sulphide - speeds up unhairing only(not alkaline swelling)
- Caustic soda-sodium hydroxide - causes increased swelling only.
- Sodium carbonate - mild alkali, reacts with lime to give caustic soda.

- **General recipe of pre pelt operation**

Pre Pelt Operation					
Process	**Chemicals**	**%**	**Time**	**pH**	**Remarks**
Soaking	Water	250-500			Soaking is done according to the preservation method and condition of skin.
	Detergent	1-1.5			
	Biocide	0.1-0.3	60-90 min	8.0-8.5	Run 20 min then run 10 min in each hour then leave over night (if required)
Painting (Optional for skins only)	Sodium sulfide	2-3			
	Lime	4-6			Made a mixture of both chemicals with water to set a Be^{o} 12-16 according to the skin condition and thickness. Apply on flesh side of the side and fold for 2-3 hrs. then remove the wool
Unhairing and	Sodium sulfide	3-4			

liming					According to the skin / hide
	lime	4-6			According to the skin / hide Run 15 min then run 05 min in each hour leave over night (may be two days according to condition)

LU4

Soaking

The first process consists of soaking the skins in water, the aim being to allow them to reabsorb any water which may have been lost after flaying, in the curing process or during transport. This absorbed water re-hydrates any dried inter-fibrillary protein, loosening its cementing action on the fibres. The collagen fibres and keratin cells of the hair and epidermis also take up water and become more flexible. Due to the water returning to interfibrillar spaces the fibers may slip one against the other and an adequate plumpness is imparted to the hide.

Wet salted hides may be soaked for 8-20 hours. The amount of water used ranges from 3 to 5 times the weight of hides (6-7 times for dried skins). Satisfactory soaking is judged by cleanliness and absence of salt.

This process is not simple, because putrefying bacteria may act as soon as there is surplus water or curing agent is washed out.

LU5

Painting

The washed or soaked skins are piled to drain off surplus water and then painted, or sprayed on the flesh side with a "paint" which may be made from approximately 50 parts hydrated lime, 50 parts water and 20 parts sodium sulphide (fused).set the concentration with Be^{o} meter is around 12-16 according to the condition of skin. The sodium sulphide and lime dissolves in the water and penetrate through the corium and dissolve the keratin cells which enclose the hair roots. The process may take 2-3 hours depending on thickness of the skin, tightness of fiber structure, and amount of fat and flesh left on the skin. Green fleshing before painting can be good.

Green fleshing is a method of giving some mechanical action. May be done by hand by scraping the flesh with a curved knife

on a wooden beam or by a fleshing machine. Apart from the squeezing action loose fat, flesh or muscle tissue is removed, aiding entry of water from the flesh side. It also flattens and stretches the skin and has a cleaning action.

Advantages of the process:
-strong alkali (lime) and sodium sulphide prevent putrefaction therefore give better skins than sweating.
-with reasonable control, hair loosening is reliable.
-unhairing is quicker and owing to shortage of water in painted skins, the strong alkali cannot cause undue swelling, buckling and distortion of the skin.
-the amount of paint can be varied over the area of the skin, giving more to thicker backbone and less to thinner, loose flanks and bellies.

Disadvantages of the process:
-requires more labour
-wool yield is less (owing to the disintegration of wool roots)
lime and sodium sulphide damage hair and wool, causing a harshness to the touch or weakening of strength and eventually complete disintegration. This action is a function of sulphide concentration.

LU6

Unhairing & Liming

When the hair is of little value and the hides are of a quality which will not suffer from the process, they may be drummed in a relatively strong sodium sulphide solution, for example: 150 % water on hide wt. At 25 ^{o}C, 2-4 % sodium sulphide. After 2 hours the hair and epidermis are reduced to a pulp (lapa), which can be washed off, and the hides are well swollen and reduced by replacing part of sodium sulphide with sodium hydrosulphide. 3-5 % lime is often added to the sulphide solution.

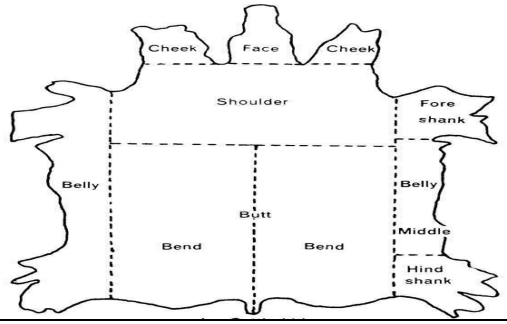
Usually sulphide or hydrosulphide is used adjusted to pH 12.6-13 at a liquor concentration of about 0.2 % caustic soda. As the temperature increases to 28-30 C less swelling occurs giving a finer flatter grain and although hydrolysis of the skin occurs this is slower and can be controlled by time (6-8 hours).

Temperature: temperature control is important. An increase from 20-30 ^{o}C in the liming temperature will halve the time required for loosening the hair; more significantly, it will double the rate of solution of collagen.

Note: For further recipes and detailed procedures and mechanism of tanning and its types is provided through handouts and searched from the hand book sharp house & light leather and also from internet resources.

For more detailed information, please visit: Link: https://shodhganga.inflibnet.ac.in/bitstream/10603/75047/14/14_chapter%206.pdf
Also Visit: http://www.iloencyclopaedia.org/part-xiv/leather-fur-and-footwear/item/872-tanning-and-leather-finishing

VIDEOS:

	Video Link
	**Carryout Pre-Pelt Operation** https://youtu.be/R9oul2P7Fqc https://www.youtube.com/watch?v=gY32A_Exgoo https://www.youtube.com/watch?v=jx0WwBAsVSw https://www.youtube.com/watch?v=PYCvBADKSu4

LEATHER PROCESSING TECHNOLOGIST

Module-7

LEARNER GUIDE

National Vocational Certificate Level 3

Version 1 - September, 2019

Module 7: Carryout Post-Pelt Operation

Objective of the module: The aim of this module to develop advanced knowledge, skills and understanding to carryout post pelt operation

Duration: 100 Hours **Theory:** 20 Hours **Practical:** 98 Hours

Learning Unit	Learning Outcomes	Learning Elements	Materials Required
LU1:Prepare Post-Pelt recipe	**The trainee will be able to:** Assess PELT condition Weigh the PELT weight Develop Post-Pelt recipe as per requirement	Explain pelt condition Define parameters of pelt conditions Define types of Chemicals used in post pelt operation Define uses of chemicals used in post pelt operation Explain properties of chemical used post pelt operation Explain method of preparing post-pelt recipe Define compositions of post-pelt recipe	Computer with Multimedia Hide Skin Digital Weight Balance Pen Paper Recipe sheet Calculator
LU2:Perform De-liming	**The trainee will be able to:** Receive Pelt from Fleshing area Arrange De-Liming agent & auxiliaries as Post-Pelt recipe Execute De-Liming Examine De-Liming by cross-section	Define de-liming Explain de-liming process/techniques Explain purpose of de-liming Importance of de-liming Define washing Describe de-liming process parameters	Hide Skin Drum Digital Weight Balance Calculator De-liming Chemicals and auxiliaries

		Explain cross section Explain precautionary & remedial measures of de-liming process	
LU3:Perform Bating	**The trainee will be able to:** Arrange Bating agents as per post-pelt recipe Execute Batting as per post-pelt recipe Perform Washing as per post-pelt recipe	Explain bating Purpose of bating Procedure of bating Factors effecting bating process Temperature pH bating agents Explain bating tests Explain procedures of bating tests Explain precautionary & remedial measures of bating process	Hide Skin Drum Digital Weight Balance Calculator Batting Chemicals and auxiliaries
LU4:Perform Degreasing	**The trainee will be able to:** Arrange degreasing agent & auxiliaries as post-pelt recipe Execute Degreasing as per Post-pelt recipe	Define degreasing Purpose of degreasing Standard limits of degreasing Techniques of degreasing	Hide Skin Drum Digital Weight Balance

	Perform washing as per Post-pelt recipe	○ Aqueous degreasing ○ Combination degreasing ○ Solvent degreasing ○ Enzymatic degreasing Explain precautionary & remedial measures of degreasing process	Calculator Degreasing Chemicals and auxiliaries
LU5: Maintain Post-Pelt Register	**The trainee will be able to:** Record Post-pelt operation entries in register Record damages during Post-pelt operation	Introduction to machine register Define procedure of recording entries in register Importance of register	Computer Multimedia Record Registers

LU1

Prepare pre-pelt recipe:

Skin /hide conditions:

Initial condition of hide/skins which came from grading after sorting of skin/hide, either is damaged from Fleshing Cutes or other cuts. further recipe will be created according to the initial conditions.

Parameters of hide/skin condition depends on:

- Type of skins to be processed.
- Notice down if any defects occurs during Pre pelt operations.

Chemicals used in post pelt operations:

There are following processes involved in post-pelt processes e.g. Deliming, Bating and Degreasing.

So different chemicals are use for different processes it includes:

Deliming Agents are use for Remove lime from skin/hide for further processing.
Sodium metabisulphite is used in deliming for make leather smooth and bleaching effects.
Enzymes are use for making leather soft and removing extra materials like fats, proteins etc.
Degreasing Agents: For removing of natural grease from leather we use degreasing agents.

Post pelt recipe should include time, temperature, ph value processing time and float/ water how much should be used and time is the great factor for making pre pelt recipe.
It include the process name, chemicals or agents used in the process, time, temperature pH value should be consider for making pre-pelt recipe.

General recipe of post pelt operation

Tanning Process					
Process	**Chemicals**	**%**	**Time**	**pH**	**Remarks**
Deliming	Water	100-150			
	Ammonium Sulphate	1-1.5			
	Sodium meta bi sulfide	0.8-1.0	60-90 min	8.0-8.5	Check pH by cross section through phenolphthalein indicator color indicates pink to

					colorless.
Bating	Enzyme	1-1.5	60 min		Adjust temperature at 38-40 for favorable action of enzymes
Degreasing	Combination Degreasing agent (as required)	2-3	60-90 min		According to the skin
Washing	Surfactant /detergent/ salt (as required)	2-3	60-120		Washing agent according to the skin condition thorough washing / batch washing. 3-4 times

LU2

Deliming

After liming, the lime or other alkali in the skin is no longer required, and in most cases it has detrimental effect on subsequent tannage. With chrome tanning it gives a hard green inflexible leather and prevents proper tannage, whilst with vegetable tanning it also slows down or reduces tannage and gives a dark color.
Washing: The easiest way of removing the lime is to put the skins into a paddle or drum and to run them, whilst a continuous flow of cold clean water is fed in. Washing readily removes undissolved lime from the surface, and some dissolved lime held between the fibres. Some of the lime or other alkali such as caustic soda, is chemically held by fibres (about 0.4 % on the weight of skin) and this is only very slowly removed by washing.

Deliming agents:

Ammonium Sulphate

Ammonium chloride

Sodium Meta bi Sulfide

Process and Techniques:

The process is similar to liming and other process but deliming should be carried out in drums instead of paddle and pits because large amount of running is require for it.

Washing after Deliming:

Washing after deliming is an important step in which max amount of lime will be remove from cross-sections.

Parameters:

The parameters include:

Temperature should be around 35 C

Float of process should be minimum as penetrations of chemicals should be more.

pH: pH of the bath should be 8 to 8.5

Check through Cross section: cross section checking will be with the help of indicator like, phenolphthalein.

Precautionary & remedial of deliming:

Process should be carried out with appropriate float in the drum otherwise result will not be seen.

Proper feeding and handling of drums should be consider to avoid damages.

LU3

Bating

Additional removal of protein material loosened by liming is achieved by enzymatic digestion- the operation of bating. Based on sterile enzymes (origins :pepsin and trypsin in dog dung and fowl droppings were used once upon a time; causing a soft smooth and silky grain) .

Two main types:

pancreatic bates: digestive enzymes from pancreatic glands.

bacterial bates: digestive enzymes of bacteria.

Procedure:
The hides and skins are delimed to a pH of 8.0-8.5 and washed. This is the degree of alkalinity at which most enzymes show greatest digestive power. The goods are then usually treated in 150-200 % water at 37 ^{0}C with a 1-2 % addition of the powdered enzyme mixture. It is important to maintain the pH and temperature accurately, as slight variations give great loss of bating power.

When slight flattening of the grain or increase in flexibility is required the time of bating is short (ie.1 hr).Longer bating times are necessary for extreme stretch and suppleness.
Care should be taken not to immerse skins directly from bating to cool water or remains of the erector pili muscles will contract giving "goose pimple" effect.

Enzyme is not used up by the process and old bate liquors can be as strong as fresh ones. There also is the probability of contamination or infection by other putrefying bacteria.
Most important points to control:
pH of the skin (alkalinity on the cross section of the skin), temperature and time.

Bating Test: Normally after completion of bating the skin's porosity should be checked and also it is check by thumb press which indicate the emptiness of skin. In case of large hides its slipperiness should be maximum by putting it on the floor.

Precautionary & remedial measure of bating:

Process should be carried out with appropriate float in the drum otherwise result will not be seen.

Proper feeding and handling of drums should be considered to avoid damages.

Temperature should be around 40 for maximizing the actions of bates into the skins.

LU4

Degreasing

After deliming and bating the pelt may have natural fat contents, to remove these fat contents all from pelt degreasing should be carried out.

Excessive amounts of grease may interfere with uniform penetration of tan or dye, show difficulties or greasy patches in the finished leather.
Degreasing is particularly important before chrome tannage, where chrome salts can react with some greases to produce chrome soaps.
A small amount of wetting agent may be added to the degreasing agent (5 % non ionic wetting agent). It is more usuall to wash the skins in a drum with a 5 % salt solution at 27 ^{0}C for approx.30 mins. Salt solution must be used as water alone would result in acid swelling. This washing is repeated until wash solution remains clear. Many skin greases or fats are semi-solid cold (20 ^{0}C) and even at the maximum temperature of 38 ^{0}C permissible on raw skins to avoid heat damage or shrinkages, such fats or greases are still only melted to a viscous pasty mass (particularly if they contain water in oil emulsion).

Procedure:

The process is similar to liming and other process but Degreasing should be carried out in drums instead of paddle and pits because large amount of running is require for it.

Standard limits of degreasing Process:

After degreasing the ideal grease or fat content of pelts should be around 2-4% of the weight of skin

Techniques of Degreasing:

Aqueous degreasing is carried out in float with degreasing agents (Surfactants/ detergents)

Combination degreasing is carried out with the help of normal degreasing agents and solvents inside the bath

Solvent Degreasing: is carried out with the only use of solvents (e.g. kerosene oil)

Enzymatic Degreasing: it is carried out by the use of enzymes like lipase etc. for removal of maximum fat contents

Washing after Degreasing:

Washing after degreasing is an important step because grease will only be removed by several washing.

Precautionary & remedial measures of degreasing:

Process should be carried out with appropriate float in the drum otherwise result will not be seen. Choose appropriate type degreasing agent according to the condition of skin/hide.

Proper feeding and handling of drums should be considered to avoid damages.

LU5

Introduction to register:

After Completion of every process their records should be maintained in registered for further enquires and processes.

Procedure of recording entries in register:

The Record Entries should normally be carried out by writing number of skins/hides is processed and number of damaged skins/hides if any occurs should be maintained. Who has done the process and how much time has spent for completion of process.

Note: For further recipes and detailed procedures and mechanism of tanning and its types is provided through handouts and searched from the hand book sharp house & light leather and also from internet resources.

For more detailed information, please visit: Link: https://en.wikipedia.org/wiki/Leather_production_processes

Also Visit:

VIDEOS:

	Video Link
	**Carryout** https://youtu.be/R9ouI2P7Fqc https://www.youtube.com/watch?v=QaLJND5fVFE https://www.youtube.com/watch?v=_NTrjVv5-yI&t=2s

LEATHER PROCESSING TECHNOLOGIST

Module-8

LEARNER GUIDE

National Vocational Certificate Level 3

Version 1 - September, 2019

Module 8: Carryout Tanning

Objective of the module: The aim of this module to develop advanced knowledge, skills and understanding to carryout tanning

Duration: 100 Hours **Theory:** 20 Hours **Practical:** 80 Hours

Learning Unit	Learning Outcomes	Learning Elements	Materials Required
LU1:Prepare Tanning recipe	**The trainee will be able to:** Assess pelt condition Weigh the pelt Develop Tanning recipe as per requirement	Introduction of tanning Define parameters of pelt conditions Define types of Chemicals used in tanning operation Define uses of chemicals used in tanning operation Explain properties of chemical used tanning operation Explain method of preparing tanning recipe Define compositions of tanning recipe	Computer with Multimedia Hide Skin Digital Weight Balance Pen Paper Recipe sheet Calculator
LU2:Perform Pickling	**The trainee will be able to:** Select vessel for Pickling as tanning recipe Execute Pickling as per recipe Examine Pickling by pH value & cross-section as per Tanning recipe	Define pickling Purpose of pickling Explain pickling process Explain pH values as per type of tanning Define precautionary & remedial measures of pickling	Hide Skin Drum Digital Weight Balance Calculator Pickling Chemicals and auxiliaries
LU3:Perform	**The trainee will be able to:**	Define tanning	Hide

Tanning	Arrange Tanning agents as per Tanning recipe Execute Tanning as per Tanning recipe Examine Tanning by cross section	Purpose of tanning Classification of tanning Vegetable tanning Chrome tanning Other tanning Explain mechanism of tanning Explain assessment method of tanning Define precautionary & remedial measures of tanning	Skin Drum Digital Weight Balance Calculator Tanning Chemicals and auxiliaries
LU4:Perform Basification	**The trainee will be able to:** Arrange Basification agent and auxiliaries as per Tanning recipe Execute Basification as per Tanning recipe Assess Leather Basification as per Tanning recipe Pile Tanned Leather for ageing	Explain basification Purpose of basification Describe assessment method of leather basification Explain ageing Explain purpose of ageing Define precautionary & remedial measures of basification	Hide Skin Drum Digital Weight Balance Calculator Basification Chemicals and auxiliaries
LU5: Perform Grading	**The trainee will be able to:** Grade Tanned leather as per quality Tag graded Tanned leather	Explain Grading Explain Purpose of grading Explain classification of grades	Hide Skin Table with upword light Tagging material

LU6: Maintain Tanning register	**The trainee will be able to:** Record Tanning operation entries in register Record Graded Leather in register	Introduction to machine register Define procedure of recording entries in register Importance of register	Computer Multimedia Record Registers

LU1

Tanning

The conversion of pelt to leather is called as tanning. In other words the conversion from impuritisible to puritisible condition of leather is called as tanning by intruding many tanning agents into the process.

Prepare Tanned recipe:

Pelt conditions:

Initial condition of pelt which came from grading after sorting of skin/hide, either is damaged from Fleshing Cuts or other cuts. further recipe will be created according to the initial conditions and also the type of pelts will be used according to articles.

Parameters of pelt condition depends on:

- Type of pelts to be processed.
- Notice down if any defects occur during Pre pelt an post pelt operations.

Chemicals used in Tanning operations:

There are following processes involved in post-pelt processes like: pickling, Tanning and Basifications.

So different chemicals are use for different processes it includes:

- Tanning agents (e.g. chrome, vegetables, synthetic etc.)
- Acid for making the pH ideal for tanning.
- Salt for preservation of hide/skin
- Strong alkali for fixation of tanning agents like chrome tanning.
- Anti-fungal which is used for inhabiting the fungus onto the skin usually appear after tanning in warehouses.

Tanning Agents are use for tanning the leather and make leather prevents from bacterial attacks.

Acid is used for making the pH ideal for leather tanning normally chrome tanning is done at 2.5 pH.

Salts: is used for preserving the leather and used as a buffer for tanning process

Strong Alkali (like sodium bi carbonate) is used for fixation of tanning into the leather

Anti-fungal: is used for inhabiting fungus growth into the skin. Specially during storage

Properties of chemicals use in Tanning operations like for Salts, acids, tanning agents and tanning fixing agents like alkali sodium bi carbonate etc. is for making tanned leather

Tanning recipe should include time, temperature, ph value processing time and float/ water how much should be used and time is the great factor for making tanning recipe.

It include the process name, chemicals or agents used in the process, time, temperature pH value should be consider for making pre-pelt recipe.

General recipe of tanning (Chrome)

Consider a pelt weight of skin/hide for tanning processes chemicals

Tanning Process					
Process	**Chemicals**	**%**	**Time**	**pH**	**Remarks**
Pickling	Water	80-100			
	Salt	8-10	10-15 min		Adjust concentration with Be^{o} of 8.
	Sodium Formate	0.8-1.0	15-20 min		For masking and gradually decrease the Ph
	Formic Acid	1	30 min		Dilute in water in ratio (1:5) and add
	Sulphuric Acid	0.8-1.0	90-120	2.5-2.8.	Dilute in water in ratio (1:10)

			min		and add in at least 4 installment each installment after 15 min then run 30 min
Chrome Tanning	Basic Chromium sulphate (33% basicity)	6-7	120-150		Add in two equal installment for avoiding chrome patches Check the penetration by cross section
Basification	Sodium Bi Carbonate	1.0-1.5	120-150	3.8-4.2	Dilute in water in ratio (1:10) and add in at least 4 installment each installment after 15 min then run 30 min
	Fungicide (Optional)	0.1-0.3	20-30		Fungicide is required if leather is go to longtime storage area Drain the float and pile the leather for at least 48 hrs of ageing process.

LU2

Pickling

After completing pre and post pelt operations the leather should be prepare for the main process is for tanning and oftenly prepare the leather for storage picking process is to be considered in industry, by adding salts and acids in it.

Process and Techniques:

The process is similar to other process but Pickling can be carried out in drums paddle and pits because large amount of water and time running is require for it, but special need is to be consider for the tanning process. If not proper tanning is performed then the skin/hide would be destroyed and there is not any recovery method for it.

Picking Process:

Pickling is done in fresh float by adding first salt into the drum for skins which acts as a buffer and also for preservation agents, after that small amount of acid particularly strong acids like formic and sulphuric acid should be used.

pH value as per types of tannings:

The pH value will be different for different type of tanning like:

For Chrome Tanning pH should be around 2.5 to 2.8

For vegetable Tanning pH should be around 3.8 to 5

For Synthetic Tanning pH should be around 4 to 6 due to its alkaline nature.

Note. acids will always be used in all pickling process in order to maintain pH

Precautionary & remedial measures of Pickling:

Process should be carried out with Less amount of float in the drum otherwise tanning could not be completed. Proper Be^{o} of salt to avoid acid socks. Proper feeding and handling of drums should be considered to avoid damages.

LU3

Tanning

After completion of proper pickling tanning is carried out for making leather from pelts of hide/skins.by adding different tanning agents into the leather process the most commonly use tanning agents is chrome tanning due to its shrinkage tempreture and other is vegetables and synthetic tanning agents etc.The tanning process converts the protein of the raw hide or skin into a stable material, which will not putrefy and is suitable for a wide variety of purposes.There is a vast array of tanning methods and materials.

Classification of tannage

Vegetable Tans: extracted from plant leaves, barks, fruits, roots of plants or trees etc. , consist of large polyphenol molecules with some acidic groups and numerous secondary functions(dipole or hydrogen bond). The acidic groups may combine with the basic groups of the protein displacing the water of hydration. Vegatable tannage could be considered as replacing water molecules by vegetable tan molecules. Generally acid conditions (low pH) favor vegetable tan fixation in

increasing the ionization of the protein basic groups. Relatively dense, firm or solid leather is produced. The color is pale brown and generally darkens in daylight. Removal of tan by water depends on finishing treatment, it washes out *very* slowly. Characteeristic uses are sole leathers, upholstery and bags, shoe lining leathers, book binding leathers, belts, and straps.

Synthetic Tans: may be of various chemical structure, usually synthetic tanning materials. It is common for them to be made water soluble by the sulphonic acid group. This group is highly ionized and has strong attraction for the protein basic group with a consequent dehydrating effect. Usually low pH gives faster under greater tan fixation. Syntans with high secondary functions will have more pronounced effect and give fuller leather (replacement syntans), those with greater proportion of sulphonic groups give a thinner less flexible leather (auxiliary syntans). The color is paler than vegetable tans, may darken in daylight. Does not washout with water. Uses are white leathers and specialty leathers.

Minneral Tannages: the basic salts of chromium, zirconium and aluminum behave in a rather different way. Their initial fixation is on the acid groups of the protein where they displace some of the bound water, but they may form cross links between adjacent acid groups, which will stabilize the wet hydrated skin structure. The dehydration effect of these tannages and the quantity fixed is less than with vegetable tannages and therefore the shrinkage and hardening on drying is more pronounced. Invariably some type of oil is applied to the wet fibres before drying. Its effect on softening the dried leather should be more pronounced on chrome leather than on vegetable tanned leather. Very soft leather is produced. The color is white for aluminum and zirconium but pale green or blue for chromium tannage. Little change in daylight. Chromium tan does not wash out but aluminum can wash out. Characteristic uses for chrome leathers are shoe upper leathers, gloving and clothing leathers, some sole and belting leathers. Uses for alum tans are gloves, fur-skins.

Aldehyde Tannages: formaldehyde, gluteraldehyde or the aldehydes produced in chamois tannage, combine with basic groups of the protein and form cross links with basic groups on adjacent molecules in the wet protein. Quite small amounts of aldehyde are sufficient to produce a significant effect. Low pH reduces fixation. Soft leather is produced. Color after tannage is white, goes whiter in sunlight. It does *not* wash out. It is water absorbent. Uses are water washable gloves and clothing.

Oil Tannage: A very old way of imparting properties of finished leather to skins. Oil tanned leathers are light, soft, air-permeable, and resistant to washing. Usually cod liver oil used. It is not sensitive to pH and has dull yellow color that bleaches in sunlight. Oil tan does not wash out and is very water absorbent. Uses are wash leathers and washable gloves.

It is common to give “combination tannages” using two or more types . Vegetable tans are often added to chrome leathers to improve fullness or firmness in flanks or grain, whilst the bulk of syntans are used in conjunction with other tannages to give a whiter leather or to speed up the tannage.

Procedure:

The process is similar other process but in tanning time has a great factor for making good quality leather and all the process is carried out in drums, paddle and pits because it has to be make sure about the tanning is completed.

Mechanism of Tanning:

The tanning is mainly working on collagen fibers in the skin which is the main protein in the leather so it is highly recommend that after completion of tanning cross section should be check properly.

Assessment of Tanning:

Tanning is assesses firstly by checking cross-section and then after completion of process it can be access by different test like for chrome tanning chrome content of both leather and float should be examined.

Precautionary & remedial measures of tanning:

Process should be carried out with appropriate float in the drum otherwise result will not be seen.

Proper feeding and handling of drums should be considered to avoid damages.

LU4

Basifications

After Completing Tanning in tanning bath the tanning chemicals should be fixed into the leather by adding mostly alkali and strong alkali and Often with weak acids particularly in synthetic and other tanning agents.

Assessment of Basification:

The assessment of basification is normally be carried out by checking pH value of the final float either by pH paper or by PH Meter and also check how much tanned liquor is clear.

Ageing:

After tanning the leather is placed in some place like in the wooden horse or in wooden trays for rest the skin for completion of tanning process which is the some bio chemical process will be completed after drum operations in the rest condition.

Precautionary & remedial measures of Basification:

Process should be carried out with appropriate float in the drum otherwise result will not be seen.

Proper feeding and handling of drums should be considered to avoid damages.

End pH has so much mean for basifications it should be according the end result.

LU5

Grading

Grading is carried out after tanning process which separates the leather which will need according to the final articles.

Usually grading is done by the grades from 1 to 12, 12 is low quality leather

And similarly as the numbers goes down the leather will be high quality leather.

LU6

Introduction to register:

After Completion of every process their records should be maintained in registered for further enquires and processes.

Procedure of recording entries in register:

The Record Entries should normally be carried out by writing number of skins/hides is processed and number of damaged skins/hides if any occurs should be maintained. who has done the process and how much time has spent for completion of process.

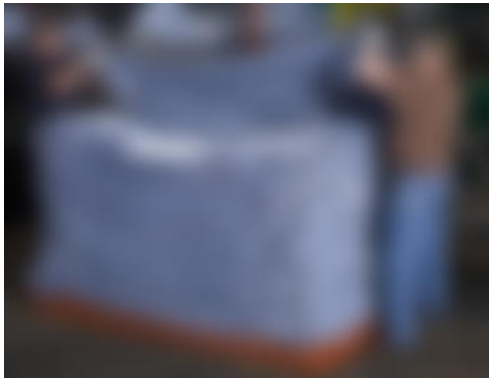
Note: For further recipes and detailed procedures and mechanism of tanning and its types is provided through handouts and searched from the hand book sharp house & light leather and also from internet resources.

For more detailed information, please visit: Link: https://www.leather-dictionary.com/index.php/Pickling
Also Visit: https://cuerodesign.com/do-you-want-to-know-why-italian-leather-is-still-the-best/
And: https://www.worldofleathers.com/leather-guide-and-info/what-is-the-best-tanning-leather-process/
https://ashlandleather.com/blogs/inside-ashland/factory-walkthrough-pt-1
https://leatherpanel.org/content/grading-hides-and-skins-quality

VIDEOS:

	Video Link
	Perform Pickling https://youtu.be/R9oul2P7Fqc https://youtu.be/-qn5R8dKcss https://www.youtube.com/watch?v=_NTrjVv5-yI&t=3s

	
	**Perform Tanning** https://youtu.be/-qn5R8dKcss https://www.youtube.com/watch?v=mslu1Oev4ZY
	Perform Basification https://www.youtube.com/watch?v=SQp11Y0v6M0 https://www.youtube.com/watch?v=WVL_sh_GPiY

	
 	**Perform Grading** https://www.youtube.com/watch?v=xvSxAwPPAOo https://www.youtube.com/watch?v=m08WNdizlJA https://www.youtube.com/watch?v=t4vT_OdDNKc

Module Summary

Following is the sequence of the modules for Leather Tanning Technician (NVQF Level 3).

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 1: Apply Work Health and Safety Practices (WHS) **Aim:** This unit describes the skills to work with safety and participate in hazard assessment activities, follow emergency procedures and participate OHS practices in process	**LU1.** Implement safe work practices at work place **LU2.** Participate in hazard assessment activities a work place **LU3.** Follow emergency procedures at workplace **LU4.** Participate in OHS consultative processes	6	24	30

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 2: Identify and Implement Workplace Policy and Procedures **Aim:** This unit describes the skills and knowledge required to develop and implement a workplace policy & procedures and to modify the policy to suit changed circumstances. It applies to individuals with managerial responsibilities who undertake work developing approaches to create, monitor and improve strategies and policies within workplaces and engage with a range of relevant stakeholders and specialists.	**LU1.** Identify workplace policy & procedures **LU2.** Implement workplace policy & procedures **LU3.** Communicate workplace policy & procedures **LU4.** Review the implementation of workplace policy & procedures	4	16	20

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 3: Communicate at Workplace **Aim:** This unit describes the performance outcomes, skills and knowledge required to develop communication skills in the workplace. It covers gathering, conveying and receiving information, along with completing assigned written information under direct supervision.	**LU1.** Communicate within the organization **LU2.** Communicate outside the organization **LU3.** Communicate effectively in workgroup **LU4.** Communicate in writing	6	24	30

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 4: Perform Computer Application Skills **Aim:** This unit describes the skills and knowledge required to use spreadsheet applications, prepare in page documents, develops familiarity with Word, Excel, Access, PowerPoint, email, and computer graphics basics. It applies to individuals who perform a range of routine tasks in the workplace using a fundamental knowledge of spreadsheets, Microsoft office and computer graphics in under direct supervision or with limited responsibility	**LU1.** Prepare In-page documents as per required information **LU2.** Prepare Spreadsheets as per required information **LU3.** Use MS Office as per required information **LU4.** Perform computer graphics in basic applications **LU5.** Create Email account for communications	8	32	40

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 5: Manage Personal Finances **Aim:** This unit of competency describes the outcomes required to manage develop, implement and monitor a personal budget in order to plan regular savings and manage debt effectively.	**LU1.** Develop a personal budget **LU2.** Develop long term personal budget **LU3.** Identify ways to maximize future finances	6	24	30
Module 6: Carryout Pre-PELT Operation **Aim:** After successful completion of this module, the student is competent in performing pre-pelt operation according to professional standards and by respecting safety and health regulations	LU1: Perform Hide/skin Inspection LU2: Preserve Hide/skin LU3: Prepare Pre-PELT Recipe LU4: Soak Hide LU5: Perform Painting on Skin LU6: Perform un-haring & liming	20	80	100

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 7: Carryout Post-PELT Operation **Aim:** After successful completion of this module, the student is competent in performing post-pelt operation according to professional standards and by respecting safety and health regulations	LU1: Prepare Post-Pelt recipe LU2: Perform De-liming LU3: Perform Bating LU4: Perform Degreasing Maintain Post-Pelt Register	20	80	100
Module 8: Carryout Tanning Aim: After successful completion of this module, the student is competent in performing tanning operation according to professional standards and by respecting safety and health regulations	LU1: Prepare Tanning recipe LU2: Perform Pickling LU3: Perform Tanning LU4: Perform Basification LU5: Perform Grading Maintain Tanning Register	20	80	100

Frequently Asked Questions

1. What is Competency Based Training (CBT) and how is it different from currently offered trainings in institutes?	Competency-based training (CBT) is an approach to vocational education and training that places emphasis on what a person can do in the workplace as a result of completing a program of training. Compared to conventional programs, the competency based training is not primarily content based; it rather focuses on the competence requirement of the envisaged job role. The whole qualification refers to certain industry standard criterion and is modularized in nature rather than being course oriented.
2. What is the passing criterion for CBT certificate?	You shall be required to be declared “Competent” in the summative assessment to attain the certificate.
3. What are the entry requirements for this course?	The entry requirement for this course is 8th Grade or equivalent.
4. How can I progress in my educational career after attaining this certificate?	You shall be eligible to take admission in the National Vocational Certificate Level-3 in Leather Products Development Technician (Pattern Maker). You shall be able to progress further to National Vocational Certificate Level-4 in Leather Products Development Technician (Computerized Pattern Designer); and take admission in a level-5, DAE or equivalent course. In certain case, you may be required to attain an equivalence certificate from The Inter Board Committee of Chairmen (IBCC).
5. If I have the experience and skills mentioned in the competency standards, do I still need to attend the course to attain this certificate?	You can opt to take part in the Recognition of Prior Learning (RPL) program by contacting the relevant training institute and getting assessed by providing the required evidences.
6. What is the entry requirement for Recognition of Prior Learning program (RPL)?	There is no general entry requirement. The institute shall assess you, identify your competence gaps and offer you courses to cover the gaps; after which you can take up the final assessment.
7. Is there any age restriction for entry in this course or Recognition of Prior Learning program (RPL)?	There are no age restrictions to enter this course or take up the Recognition of Prior Learning program

8. What is the duration of this course?	The duration of the course work is 1,510 hrs. (11 months)
9. What are the class timings?	The classes are normally offered 25 days a month from 08:00am to 01:30pm. These may vary according to the practices of certain institutes.
10. What is equivalence of this certificate with other qualifications?	As per the national vocational qualifications framework, the level-4 certificate is equivalent to Matriculation. The equivalence certificate can be obtained from The Inter Board Committee of Chairmen (IBCC).
11. What is the importance of this certificate in National and International job market?	This certificate is based on the nationally standardized and notified competency standards by National Vocational and Technical Training Commission (NAVTTC). These standards are also recognized worldwide as all the standards are coded using international methodology and are accessible to the employers worldwide through NAVTTC website.
12. Which jobs can I get after attaining this certificate? Are there job for this certificate in public sector as well?	You shall be able to take up jobs in the leather products making companies in the functions of cutting, stitching and finishing of leather gloves and garments.
13. What are possible career progressions in industry after attaining this certificate?	You shall be able to progress up to the level of supervisor after attaining sufficient experience, knowledge and skills during the job. Attaining additional relevant qualifications may aid your career advancement to even higher levels.
14. Is this certificate recognized by any competent authority in Pakistan?	This certificate is based on the nationally standardized and notified competency standards by National Vocational and Technical Training Commission (NAVTTC). The official certificates shall be awarded by the relevant certificate awarding body.
15. Is on-the-job training mandatory for this certificate? If yes, what is the duration of on-the-job training?	On-the-job training is not a requirement for final / summative assessment of this certificate. However, taking up on-the-job training after or during the course work may add your chances to get a job afterwards.
16. How much salary can I get on job after attaining this certificate?	The minimum wages announced by the Government of Pakistan in 2019 are PKR 17,500. This may vary in subsequent years and different regions of the country. Progressive employers may pay more than the mentioned amount.
17. Are there any alternative certificates	There are some short courses offered by some training institutes on this subject.

which I can take up?	Some institutes may still be offering conventional certificate courses in the field.
18. What is the teaching language of this course?	The leaching language of this course is Urdu and English.
19. Is it possible to switch to other certificate programs during the course?	There are some short courses offered by some training institutes on this subject. Some institutes may still be offering conventional certificate courses in the field.
20. What is the examination / assessment system in this program?	Competency based assessments are organized by training institutes during the course which serve the purpose of assessing the progress and preparedness of each student. Final / summative assessments are organized by the relevant qualification awarding bodies at the end of the certificate program. You shall be required to be declared “Competent” in the summative assessment to attain the certificate.
21. Does this certificate enable me to work as freelancer?	You can start your small business of stitching leather garments, gloves of other products. You may need additional skills on entrepreneurship to support your initiative.

Test Yourself

Module

1. What is purpose of liming?

2. Amonia sulphat is used in de-liming process.
    a. True
    b. False

3. What are the types of un-hairing?

4. Chemical used for un-hairing is?
    a. Sodium Sulphate
    b. Sodium Sulphide
    c. Sodium Suilphite
    d. Sodium Metubisulphide

5. Ideal Temperature for bacterial activity is.
    a. 25C
    b. 30C
    c. 38C
    d. 28C

6. What are the types of vessels used in pre pelt operations?

7. Completion of de-liming process in leather is check through phenolphthalein indictor
    a. True
    b. False

8. Liming can be performed in paddle only.
    a. True
    b. False

9. Liming only removes unwanted skin after un-hairing?
    a. True
    b. False

Module

1. Why we performed batting in post pelt operations?

2. _____ is used as strong acid in pickling
    a. HCL acid
    b. Sulfuric acid
    c. Nitric Acid
    d. Oxalic Acid

3. What will be the pH value for chrome tanning in pickling?
    a. 1.8
    b. 2.8
    c. 3.8
    d. 4.8

4. What are the types of degreasing?

5. State types of enzymes used in bating process

6. What are the types of vessels used in Post pelt operations?

7. Completion of de-liming process in leather is check through phenolphthalein indictor
    a. True
    b. False

8. Liming can be performed in paddle only.
    a. True
    b. False

9. How many types of chemicals are used in degreasing?
    a. 2
    b. 3

c. 4
d. 5

Module

1. What is the suitable pH of pickled pelt for chrome tanning?
    a. 1.5-2.0
    b. 2.5-3.0 (Correct Answer)
    c. 4.0-4.5
    d. 5.5-6.0

2. Formic acid is used in which process of Leather Processing?
    a. Batting
    b. Neutralization
    c. Tanning
    d. Pickling (Correct Answer)

3. Which of these are strong acid?
    a. Acetic acid
    b. Oxalic acid
    c. Formic acid
    d. Sulfuric acid (Correct Answer)

4. What is the basicity of chrome required for tanning?
    a. 25%
    b. 33% (Correct Answer)
    c. 40%
    d. 60%
5. Which chemical is commonly used for masking of chrome tanning?

a. Hydrochloric acid
b. Chromium Oxide
c. Sodium formate (Correct Answer)
d. None of these

6. What is the purpose of pickling?

7. Write down four types of tanning?

8. What is the final pH of wet blue leather?

9. Why ageing is essential after tanning?

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