HFDC

Safety Manual

Haryana Forest Development Corporation Limited
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Preface

Purpose of introducing the captioned SAFETY **MANUAL** is multifold. Haryana Forest Department Corporation Limited is a profit oriented public undertaking. The Government of Haryana has declared HFDC as an approved source for supply of round and sawn timber, wooden furniture, fire wood, wooden crates and barbed wire.

To keep the corporation an enviable, progressive and quality ensuring enterprise, it is imperative to ensure safety precautions to be observed at all levels of its various operations. Observance of these precautions, enlisted and explained in the manual, beign right from procurement of timber by felling trees, their conversion, stacking in the forest / sale depots, getting it auctioned the produce and handing over the same after completing all the official process and receiving payment.

The corporation has also engaged in manufacturing of qualitative wooden furniture to meet out the demand of government departments, universities, colleges, institutions and for the public. To produce qualitative furniture, it is being ensured that the timber used in the manufacturing of furniture is free from all defects attaining the required characteristics of good timber after passing through the process of seasoning. The same parameters are also applicable as far as the manufacturing and production of other products is concerned.

This manual will be read and followed in conjunction with other relevant technical notes issued from time to time. The guidelines contained in the manual, must percolate to all concerned staff to carry out the activities of procurement of trees, their conversion into logs and timber for auctioning it and manufacturing of required products.

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Chapter-1

Introduction

The Haryana Forest Development Corporation Limited was incorporated on 7th December, 1989 under the Companies Act, 1956, as a wholly owned Government Company with the main purpose of assuring reasonable prices to the farmers for their standing trees and other forest produce and also to ensure the welfare of farming community and development of forest based industries.

Main Objectives

The main objectives of the Company as per Memorandum and Articles of Association are as under:

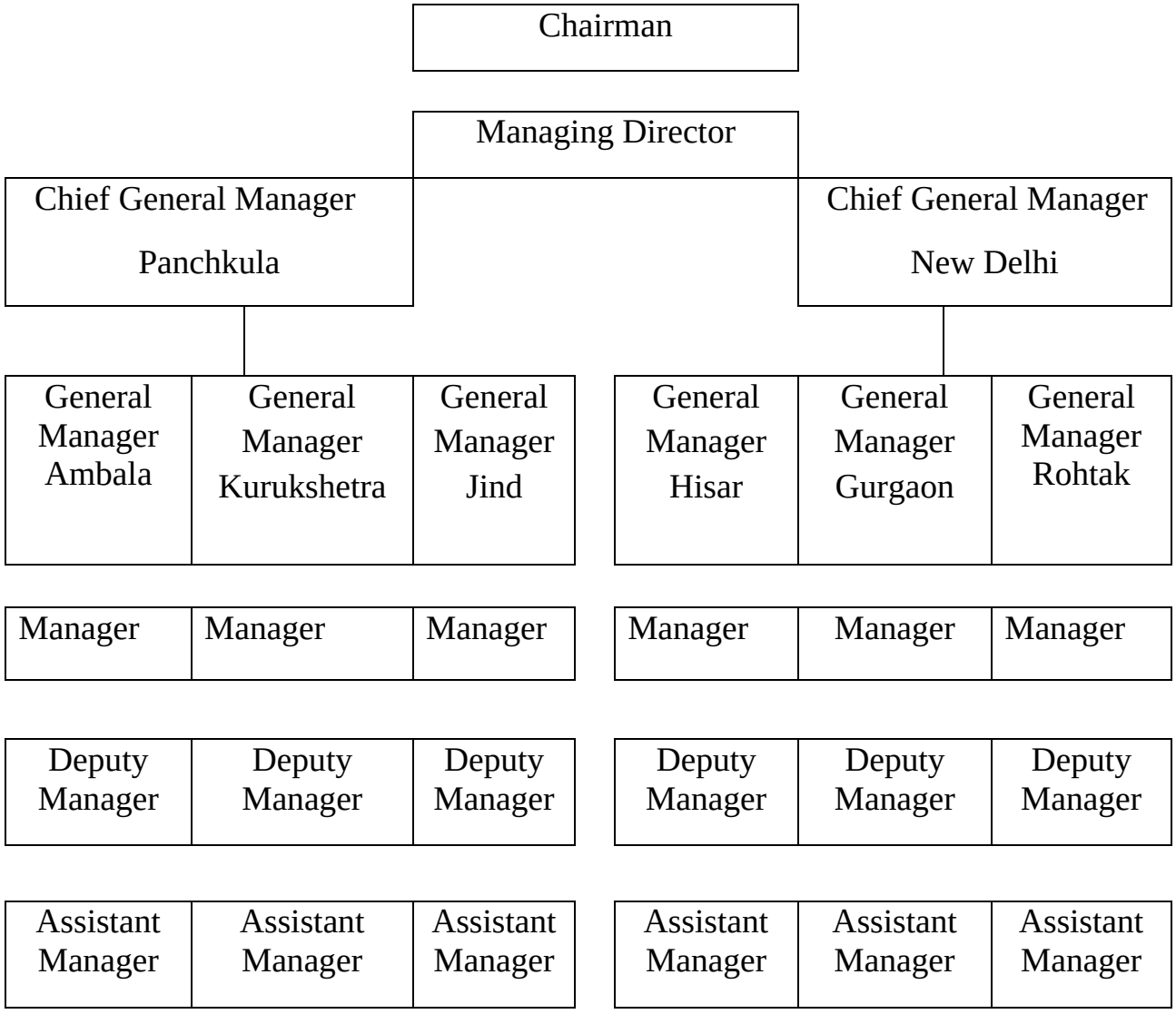
- To assure reasonable prices to the farmers for their standing trees and other forest produce.
- To generate employment opportunities in rural areas.
- To increase financial status of farming and labour community.
- To promote development of forest based and allied industries.
- To stabilize timber and fuel wood prices in open market.
- To protect the forest producer from exploitation of the middlemen and safeguard the interest of the consumers by undertaking proper and scientific exploitation of the forest resources of the State and if necessary outside it, in order to obtain maximum financial return thereof.
- To transfer related technology to farmers.
- Tree felling and wood extraction from Government forests earmarked to the Haryana Forest Development Corporation Limited, development of forests and raising plantations.

Salient Features

- To purchase trees of various species from farmers, panchayats and institutions within and outside the State on the purchase prices worked out by the constituted committee every half yearly.
- Felling and conversion of trees from forest and non-forest areas
- Sale of round timber, pulpwood, firewood and stumps from the sale depots by conducting open auctions.
- To manufacture and supply nursery and woven bags to meet out the requirement of Forest Department and other institutions and organisations.
- To manufacture and supply barbed wire and concrete fence posts to meet out the requirement of Forest Department and other institutions and organisations.
- Government of Haryana has declared HFDC as approved source for round and sawn timber, firewood, wooden crates and finished goods manufactured in the form of furniture from various timber species such as Shisham, Kikar, Teak etc.
- Government of Haryana has declared HFDC as approved source for supply of barbed wire.
- To execute various projects like arboriculture, landscaping and plantations for Ministry of Defence, Northern Railway, NHAI, NBCC and Delhi Forest Department.
- To supply wooden crates to various Government agencies such as Food & Supplies Department, Haryana Warehousing Corporation, CONFED, HAFED and Haryana Agro Industries Corporation etc.
- To manufacture and supply dual desks, tables and chairs to the various Government Schools in Haryana State.

Organization Chart

The organizational chat of the Corporation is given below:



Chapter-2

The management of the Company is vested in a Board of Directors having not less than two and not more than 12 Directors. As on 31.03.2016 the Company had five Directors including a Chairman and a Managing Director. The Managing Director, an officer of Indian Forest Service in the rank of Principal Chief Conservator of Forests, is the Chief Executive of the Company. He is assisted by two Chief General Managers, an officer of Indian Forest Service in the rank of Conservator of Forests, at the Head office and one at New Delhi, six General Managers, officers of Haryana Forest Services in the rank of Assistant Conservator of Forests, in the field offices. The General Managers are assisted by Managers (Forest Rangers), Dy. Managers (Foresters) and Assistant Managers (Forest Guards).

The Managing Director is also assisted by a Superintendent, Dy. Superintendent, Assistants, Clerks and Data Entry Operators at the Head office. The total number of officers/officials in position as on 31.03.2013 are 82 against a sanctioned strength of 147 which includes all categories of posts of deputation and also 10 posts of class III & class IV employees working on the permanent establishment of the Company.

The HFDC has established its head office at bays 27-28, Sector-4, Panchkula. In addition to it , there are six field offices located at

1. Ambala
2. Kurukshetra
3. Rohtak
4. Hisar
5. Jind
6. Gurgaon

The field offices are well equipped with the required facilities such as furniture, electronic gadgets, stationery, tapestry, various kinds of stores, AC equipments, electric appliances and many other furniture and fixtures.

Area of operations

The State Government has earmarked certain forest areas to the Company for the purpose of felling of trees as per approved working plans of the Forest Department of the State whose details are given as below:

S. No.	Name of Region	Name of Forest Division	Name of Forest Areas
1	Ambala	Ambala	Ambala District
2.	Kurukshetra	Karnal	Indri Range
3.	Rohtak	Rohtak	Rohtak District
		Jhajjar	Jhajjar District
4.	Hissar	Hissar	Hissar District
5.	Jind	Jind	Jind District
6.	Gurgaon	Gurgaon	Gurgaon District
		Faridabad	Faridabad District
		Palwal	Palwal District
		Mewat	Mewat District
		Rewari	Rewari District

Operation in non-forest areas

The General Managers have been earmarked their jurisdiction for the operation in non-forest areas to avoid confusion and dispute among the General Managers for their operational activities in the State. However, there is no restriction to carry out any activity outside the State for any of the General Manager. The jurisdiction for operation in non-forest areas within the state are as under:

S. No.	Name of Region	Jurisdiction (District)
1.	Ambala	Ambala,Yamunanagar & Panchkula
2.	Kurukshetra	Kurukshetra,Kaithal,Karnal & Panipat
3.	Rohtak	Rohtak,Sonepat & Jhajjar
4.	Hissar	Hissar,Fatehabad & Sirsa
5.	Jind	Jind and Bhiwani
6.	Gurgaon	Faridabad,Palwal,Mewat,Rewari

Share Capital and share holders

The authorized share capital of the Company is Rs. 5,00,00,000/- (Rupees Five Crore only) divided into 50,000 equity shares of Rs. 1,000/- each. The paid up share capital of the Company is Rs. 20,03,000/- (Rupees Twenty Lacs Three Thousand only). There are 2003 shares of Rs. 1000/- each allotted by the Company. Two thousand shares have been allotted in the name of Governor of Haryana through the Principal Secretary, Forest Department and one share each held by three shareholders of the State Government. They are:

i) Financial Commissioner and Principal Secretary, Finance Department
ii) Financial Commissioner and Principal Secretary, Forest Department
iii) Principal Chief Conservator of Forests

The financial position and working results are given as under:

Particulars	2012-13 (RS. In lacs)	2013-14 (RS. In lacs)	2014-15 (RS. In lacs)
Turn over	9439.26	7612.09	5390.66
Expenditure	8422.68	6750.35	4993.50
Gross operating profit	1016.58	861.73	397.16
Income Tax	275.5	277.82	135.18
Net Profit	741.08	580.63	267.61

Prevention and safety

As charity begins at home, safety of the corporation must begin from the corporate head office itself. First of all the equipment, furniture and fixtures, documents, almirahs and racks must be neat and clean and placed at their respective proper places. A regular inspection of such routine work must be entrusted to a senior official who should maintain record of the carried out inspections.

Fire extinguishers with the advice of fire brigade personnel and the manufacturers must be installed at all the vulnerable points. It is a common fact that even after installing the fire extinguishers their use cannot be ensured because of lack of technical know-how regarding its operation and use. The whole staff should be made technically aware by carrying out live demonstration , dousing a live fire, irrespective of hierarchy as everybody at higher or lower level is equal to face a calamity.

Easy getaways in the case of a fire break out must be identified and rehearsed. Fire alarm points at a few places must be installed and be known to everybody. A fire hydrant with sufficient length of canvas hose pipe must be ensured to be there in the office inventory.

A mock fire drill carried out at convenient intervals will go a long way in coping up such disastrous situations.

Well established fire preventive measures will prove beneficial in minimizing damages. Installation and regular maintenance of smoke alarms is helpful to warn people about a fire as soon as it breaks out. Sprinkler system shall be used to douse the flames.

Storm water hazards

During rainy season, it is likely that storm water may enter the basements of the office complexes and cause irrecoverable damages. Such types of damages are common to stores, records, furniture, electric and electronic equipment, air conditioners and can create unhygienic conditions within the premises.

To get rid of such nuisance, it must be ensured that all the drains, traps and other outlets for sewage and sewerage are functional and often checked for their serviceability.

The office records kept in the racks must be ensured that these are free from termites/mites, moisture, humidity and fungus. These records must be kept in neat and clean space and not dumped aside.

Theft

To minimize or eliminate the risks due to theft office complex with its tools must be got insured to ensure safety and security of all types of office equipments like computers, furniture, fixtures, tapestry and other vulnerable stores.

Installation of a close circuit TV is a safe investment to ensure safety, security and smooth functioning of the office. Even the routine official activities can be kept under watch.

Electric installations

Electric supply, generators, inverters need regular inspection. Electric short circuiting is very common phenomenon. Disaster caused by electric short circuiting turning into terrible fire break out, reducing everything to ashes, is rather horrifying. Electric supply and wiring must be kept up to date and miniature circuit breakers should be installed to avoid electric short circuiting.

Electronic equipment

It must be ensured that there should be uninterrupted power supply to the office computers. It will keep the apparatus functional, free from troubles and the software will be safe and will remain available at hand.

Chapter-3

Scope of safety Manual

The Safety manual encompasses various steps to be undertaken observing precautions in multifold operations of the corporation in as much as it focuses on the activities, the branch offices are engaged in like procurement of wood, conversion to timber, transportation to depots, sale by open auction, maintenance of record, manufacturing of furniture, wooden crates, barbed wire, nursery / woven bags, taking up projects of arboriculture, landscaping and plantation. All these activities are undertaken keeping in view their technical feasibility and financial viability i.e. generation of profit.

Objective of the safety manual

1. To lay down guidelines for observing precautions for smooth functioning of the following operations :-
   a) Inspection of trees before procurement.
   b) Felling of trees
   c) Conversion
   d) Transportation
   e) Stacking of boles / round timber in the depots
   f) Safe guard of depots against hazards like fire, floods, theft and pilferage.
   g) Precautions to be observed in the furniture factory
   h) Preservation of wild life, ecology and environment during felling operations.

Chapter-4

Felling operations

The Corporation carries out felling of dead, dry as well as green standing trees allotted by the Haryana Forest Department from its forests areas as per the working plan and emergency felling. After felling and conversion, timber may be stacked in the forest depots itself or be transported and stacked in the sale depots to carry out open auction. The Corporation also purchases trees from farmers, panchayats, governments departments and other institutions at purchase prices fixed by the corporation. About 9.5 lacs cubic metre standing volume (Forest Department and other sources) have been felled by the corporation since the financial year 2001-2013.

By felling, one means, the operation through which the execution of one or more cuts at the base of a tree, determines its felling.

The felling of trees is an art which is acquired by experience alone. Economic conversion begins with the felling of a tree. Excellent subsequent conversion may not entirely make up for the loss of timber resulting from faulty felling. There are two main principles underlying all methods of felling.

(a) Production of maximum round timber that can be available for export from the forest.
(b) Avoidance of damage to the surrounding forest.

1. Following two factors should be given due consideration before felling trees for use as structural timber and getting high returns during auction from the sale depots.
   i) **Maturity** – Trees become mature only after certain years when there has established a good balance between the **heart and sap wood**. In mature trees, growth rate is reduced considerably after achieving height and girth of standard dimensions depending upon the species meaning thereby that MAI shows negative growth. Only such trees should be felled for use in conversion. Immature trees have more of sap wood. Too old trees will also give poor quality of timber as their heart wood starts decaying with age. Hence the mature trees are the best bargain for conversion.

   ii) **Time of felling** – Spring and summer are always ‘bad seasons’ for felling of trees. This is because spring is the season of active growth for most trees. The cells are rich in sap. Summer is bad because the trees will lose sap at a much faster rate during this period after felling.

iii) This 'fast drying' is likely to cause development of a large number of shrinking defects.

Obviously, the best time for felling of trees is autumn and beginning of the winter. There is no growth of the tissues in living trees and during these months and also after felling the shrinkage defects will be minimum.

2. **Sawing of timber** – After felling, trees are usually cut diametrically in convenient lengths. These are called logs and collectively can be called round timber. The round timber or logs are first air seasoned for some period and then further cut into transportable parts. The main methods of sawing of the logs are: - through sawing and the selective sawing.

a) Through and through sawing: - In this method, the log is cut length wise into pieces of suitable dimensions without giving it any rotation during sawing.

b) Selective sawing. In this method the log is rotated in different directions after one or more successive cuts in a parallel direction. The log is cut first into four sections. This may be done to eliminate defects during sawing or for obtaining specific types of boards containing wood from particular wood zones. Two types of cuts are slash and rift cut

   i) Slash Cut (Flat grain or plain sawed). These are the board cut in a direction tangential to the annual rings.
   ii) Rift cut: - (vertical or edge grain). These are board cuts in which the annual rings make an angle of more than 45° to the face. Such boards are obtained making parallel cuts through the central parts of the log traversing through the annual rings.

Slash Cut and Rift cut boards differ in their important properties to a greater extent. In fact, the type of 'cut' of the board is important in determining its use in some cases.

c) Quarter sawing – It is a process of selective sawing of the logs. Main aim is to obtain specially attractive boards. Each board has an edge from the centre of the log and the other edge from the peripheral part of the log.

Quarter sawing is applied only in those species of timber which give beautiful appearance in cross and longitudinal sections. In such woods the medullary rays and the annual rings are developed very conspicuously.

Prevention and Safety

(i) Every day the felling of trees is started, the area under operation must be thoroughly scanned as wild animals like leopards are likely to be lurking in that area. It is not uncommon that leopards have often been found straying even in the inhabited areas. A team of two workers must search the area and shoo away wild animals, scorpions, snakes and other such dangerous beings. After making sure that no such animal in the vicinity is lying in ambush, the felling process should begin.

(ii) Trees should be felled as near the ground as possible to prevent wastage of wood

(iii) Trees should be felled in a manner and in a direction causing least damage to themselves and the surrounding forest.

(iv) Trees should not be felled during a strong wind.

(v) Felling of trees should be undertaken after the rainy season is over and atmospheric temperature is moderate.

(vi) Felling should usually begin at the top of a slope and proceed in a downward direction.

(vii) Felling areas should be divided into sections and allotted to various felling gangs for better supervision.

(viii) Conversion should keep pace with felling to reduce danger from fire, theft and insect attack.

(ix) Felling of trees with axe alone, .being most wasteful, should always be avoided. Felling with saw alone involves least wastage of wood but the fall of tree is difficult to guide. However, felling a tree with axe and saw combinedly is the most satisfactory method as the direction of fall is easily controlled and considerable portion of the butt log, which is the most valuable part of the tree, is saved.

(x) Felling by the root is desirable in case of valuable trees or where an area is to be cleared for road alignment or plantation work.

(xi) Two wood cutters should not be allowed to work simultaneously on one tree with separate axes and saws. Only one wood cutter should work on one tree. With very large trees, however, two wood cutters may work on the same cut but not on opposite cuts.

(xii) Roping and lopping should be done whenever necessary.

(xiii) Cable tensioner (cable puller) should be used for felling leaning trees when they are to be felled against the direction of their leans.

(xiv) Wood cutters should plan their 'get away' before-hand for their safety.

(xv) Saw or other tools should not be left near the stump while the tree is falling.

(xvi) Splitting of butt end of the stem should be prevented by use of stem tightner.

(xvii) Lodging of falling tree over another adjoining tree must always be avoided.

(xviii) Timely warning should be given to the labour working near about, when the tree is about to fall.

(xix) Improved tools and equipment should be used to minimize manual efforts and to reduce chances of accidents.

(xx) Person or incharge of felling operations should be conversant with the theory and practice of felling trees.

(xxi) In case of felling of trees in strip forests, two flag men must be posted on either side of the strip to control traffic and to avoid the chances of accidents.

(xxii) First aid boxes should be kept in Forests and Sales Depots and also at places where felling of trees is in hand to be used for emergency.

Conversion

By conversion, one means the operation, which includes phases necessary (delimbing & cutting to size) to obtain, from the tree felled, the wood assortment required.

Round timber and firewood are the main products of conversion of trees in the forest. Logs may be transported to saw mills for further conversion into sawn timber according to demand, Charcoal conversion may be done at forest site to reduce cost of transportation and to meet charcoal requirement. Bark and other minor forest products may be obtained as by-products during conversion.

Before the wood is actually used in construction, certain operations such as felling of trees, sawing them to logs , poles beams becomes essential. All these processes are described under the head of conversion of timber.

Transportation

Felling and processing / conversion should go side by side to have working space and economy in time management. Converted produce is recorded in the felling register and 14.

The timber is ready for transportation to Sales Depot. Method of loading the produce in the vehicles and type and method of transportation deserve special consideration. Important points to be cared of are mentioned hereunder:-

1. Introduction of mechanical transportation from felling areas to the Sales Depot is economical.
2. Loading of the round boles should be done with crane as far as possible. Loading undertaken manually is fraught with incidents of physical injuries and serious accidents to the labour.
3. Loading should be done in tractor trolleys or trailers with their sides having proper support of strong stumps or built in side supports.
4. While loading every care must be taken that capacity of the trolley / trailer is not over stretched.
5. Type of terrain which the loaded vehicles have to negotiate must not be overlooked.
6. Loaded logs must be lashed with ropes in a proper way lest the logs due to movement during transportation on undulated tracks may roll down the vehicle and the proposition becomes unviable.
7. Transportation of timber through the forest is likely to damage soil, standing trees and cause inconvenience disproportionate to the time and effort invested in loading and movement.
8. Log extraction with tractor, equipped with a trailer, can also be used.
9. Common truck and trailers can enter directly into the field when the soil is dry, the loader can quickly fill these units reducing their expensive waiting time.

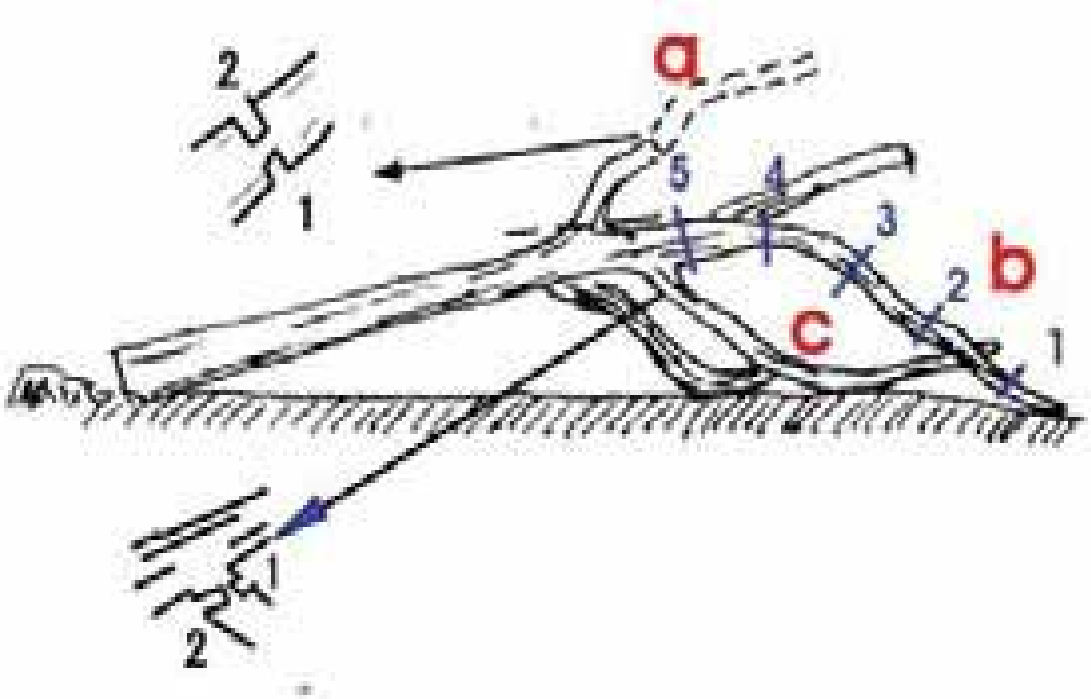
Auger type extractor used to pull roots of tree

10. High speed tractors with 3 axle trailers can provide a good compromise between cross country mobility and road speed.

Delimbing

11. Suitability of the terrain for any of the above proposed methods of transportation must be carefully considered in all respects.

12. Chain saws of various sizes should be used for felling and conversation.



DELIMBING OF TREE.

Chapter-5

Management of Forest Depots

A Deputy Ranger or a Forester will be incharge of Forest Depot. There will be only one forest depot for each lot. The management of Forest Depot involves the control of following works:-

(i) Marking of boles and branches of felled trees for further Conversion into round timber and fuel wood will be done by a marking party consisting of a marker usually a Forest guard and Labourer to assist the marker.

(ii) Measurement and recording of converted forest produce in the shape of logs and fuel wood in felling register will be done by recording party. Each recording party will consist of a recorder who will be a Forester or a Forest Guard and an enumerator normally a Forest Guard or a literate Mazdoor and required number of laborers as needed, who will assist in measurement of logs and firewood stacks.

(iii) Transportation of converted, measured and recorded forest produce to sale Depot will be done by truck, tractor, carts, animals, manual labour or any other mode of transport depending upon circumstantial and economic considerations. This work will be carried out under the supervision of a transporting party consisting of a Forest Guard who will keep all accounts connected with this work.

The number of persons in marking, recording parties can be increased or decreased depending upon work in the forest Depot.

Timber watchers will be engaged for watch and ward of the forest produce in Forest Depots where necessary. All officials entrusted with different duties in Forest Depot will be jointly responsible for any damage done to forest produce or theft thereof.

Record of daily receipt and disposal of Forest produce in and from Forest Depot will be maintained in D. L. form No.2 and 3 which correspond to timber account Forms No.5 and 6, respectively.

Direct sales of major forest produce from forest depots will normally be avoided. Such sales may, however be done occasionally to avoid difficult and uneconomical transportation to sale depot. In such a case, the forest depot will be declared as a temporary sale depot for disposal of specific forest produce and all procedure and formality prescribed for the sale depot, will be applicable for such disposal,

Safe Guards of Forests / Sale Depots against fire hazards

Our forest / sale depots are, by nature of their functions, located in the open land which may be near roads / highways. Floods and fire, if out of control, can cause untoward damages / losses and are major forces. In the neighborhood and vicinity, there is farm land and the farmers remain keen to burn their harvest residues. Due to wind, such fire can fastly approach the depots and cause fire to timber. It is, therefore, imperative to take every care to offset this hazard on the part of the concerned staff. A few measures, which must be taken care of, are explained hereafter:-

(a) Insurance of the Depots: – The depots must be got insured with general insurance companies. These companies have schemes called Floater Schemes or 'add or delete' provisions. A depot insured against fire, theft, flood or other risks is a carefree property. As and when the depot has outlived its utility, it is wrapped up and can be got deleted and some other depot, which comes up a new, may be got added. All branch offices of corporation must abide by these instructions in letter and spirit and have a worry free time to attend to more important jobs.

b) Fire lanes – As soon as a depot comes up with sawn timber and logs, area around the depot, must be free from dry leaves, vegetation, grass and other wild growth. A fire line must be must be created by ploughing the land around to a width of 10-15 metres to obviate any danger of fire from the fields engulfing our depot.

c) As far as possible, fire beaters / squatters buckets and a source of water, to extinguish any sudden fire, must be catered.

d) Staff at the depot must know telephone number / location of the nearest fire brigade to seek their help in case of a fire break. No casual approach in such matters should be taken.

Disposal of low quality timber:-

It is not possible at all times that the whole lot stacked in a sale depot may be auctioned and disposed of in one go. There is every likelihood that some portion of the wood / timber may remain un-auctioned. This lot will keep lying and decaying if not properly and timely attended to. To dispose of such a lot, a special committee may be constituted to make auction by fixing price comparably commensurating with thexisting lot. With the said taken step, the losses, occurring on account of keeping a depot alive for a marginal lot, its watch and ward staff kept on duty, wood allowed to decay and many other avoidable risks can be offset. This aspect must always be attended to by the range officers and general managers. The stock register held at the branch office need to be visited often by the branch manager to keep abreast of the stock, its species and duration of stock held on charge. Over and above, the aspect of disposal of such a lot, there is an ever attendant risk of such dry wood catching fire due to many human and circumstantial errors, like neighboring farm land being cleared by burning stalks of old crop and preparing the field for next sowing or else such lot may be transferred to nearby permanent depot.

Chapter-6

Furniture Units

The corporation has furniture units at Pipli, Kurukshetra, Masani (Rewari), Rohtak and Ambala. The said unit is manufacturing furniture against orders from Government departments, public as well as schools. The factory has a large covered and open area for stocking, seasoning, and sawing, preserving timber before manufacturing and then storing the finished product till its delivery to the user, it is of prime importance that every care is taken to safe guard the timber, men and machinery.

Safety Precautions

a) Insurance: The factory must be insured to cover all damages / losses which are sudden, accidental and beyond the control of the corporation. These losses could occur due to fire, floods, thefts, earthquakes and other such calamities which cannot be foreseen and taken care of by adopting preventive measures.

b) Fire breakouts – The manufacturing of furniture involves numerous activities and processes using materials like paint, adhesives, varnishes and drying of timber. The captioned processes and material used are prone to fire hazards. So fire extinguishers must be installed at places where such hazards are anticipated. All the staff members must know the location of these fire extinguishers. Telephone number of the nearest fire brigade station must be displayed conspicuously at a suitable location and fire point with sand and water buckets, fire beaters, should be installed at the places where fire break out is anticipated. Every care must be observed that there is no fire lit on such areas where inflammable material is stored or is in use. Prevention has always been better than cure. Finished product of furniture, different stages of construction and stacking of seasoned timber as shown on the next page must be protected from fire hazards by installing fire extinguishers and keeping sand and water ready to overcome any untoward incident anticipated to take place.

c) Floods and water logging: - Floods in the monsoon and else are quite common phenomenons. Flash floods, which are sudden, unexpected and too strong to control, can take place at any time of the year, season or day. During rainy season, water can stagnate in the area if proper drainage system is not envisaged and installed. To overcome this problem, it must be ensured that the timber is stacked on comparatively higher ground. Drainage system should be so planned and effected that there is proper outlet of the sewage, storm water and industrial waste.

As a large area is covered by the furniture factory, feasibility of installation of water harvesting plant at a suitable site must be studied and translated into a practical project. This requirement, as it is, is now mandatory for all industrial units to follow with certain terms and conditions.

To check water logging, it must be ensured that rainwater or storm water is not allowed to stagnate. Quick and appropriate flow of water is the only method to get rid of this problem.

d) **Theft -** Watch and ward staff, high boundary walls all around the factory, controlled entry of personnel and safe storage and stacking of both raw material and finished product, are the steps to be taken. High vigil and surprise inspection by senior officers of the branch are not to be ignored.
e) Timber used in manufacturing of durable and fault free furniture must be well seasoned.
f) The workshops, where furniture components are fabricated, must have tiled floors. It is relevant, particularly where finishing processes like scrubbing, varnishing, painting and drying of final product is carried out. All these operations must be carried out under covered and walled areas to safeguard against sun, wind and sand particles attacking the process of finishing and lowering the quality of the end product.

Sawing

Round timber is converted into furniture components in the factory's saw mill. The timber should be so sawn out in a way that there is minimum wastage. To achieve the optimum output of sawn pieces, sawing should be done after due calculations of required pieces of timber from one big round or bole.

SAWING OF ROUND TIMBER

The workmen engaged in the sawing of timber must have in-depth knowledge of all the methods of sawing to minimize the wastage of precious timber. The different methods of sawing are:-

a) Through and through sawing.
b) Selective sawing
c) Quarter sawing

Diseases of Timber

Dry Rot

Rot is decomposition of felled timber caused by the action of various fungi. The fungus reduces fibres to fine powder and the timber loses its strength. This disease is highly infectious and causes tremendous destruction. It occurs when the timber is imperfectly seasoned and placed in a moist, warm and confined atmosphere having no free access of air. Fungus rapidly dies when exposed to air or sunlight. The best remedy is to cut away the affected part and paint the remaining part.

Wet Rot

When timber is subjected to alternate wet and dry conditions, decomposition of tissues takes place. This is not caused by fungal attack. In a living tree, it is set up by the access of water through wounds in the bark and causes the decomposition of sap and fibres of the tree. This may also occur when timber is seasoned by exposing it to moisture. To avoid wet rot well seasoned timber is used with preservatives and paints.

DECAY OF TIMBER

Timber does not deteriorate by natural, physical or chemical changes or by pure ageing. It is, however, affected by destructive elements, such as weathering, chemical attack, fungi, insects or rodents. The most crucial amongst these are fungi, insects and rodents and are being described as follows:-

Decay due to Fungal and Bacterial Attack

Wood is essentially an organic substance made up of a skeleton of cellulose impregnated with lignin. The organic substances are susceptible to attack both by bacteria and fungi. Bacteria are the smallest living organisms and do not cause any serious damage to timber except some sort of discolourations. Fungi are a system of plant organism which live in and attack the timber causing rot and decay.

The method by which bacteria decompose wood is probably similar in nature to a fungal attack. Fungi reproduce through minute particles called spores millions of which are produced at the fruiting stage. These spores send out mycelia which in turn destroy the wood tissues by secretions of solvent chemicals and enzymes. After getting a considerable proportion of the cell wall destroyed by mycelia the wood becomes brittle and weak.

The basic congenial conditions, for the growth and existence of fungi are moisture, suitable temperature and food availability. The wood itself offers food. Optimum temperature conditions are in the range of 18ºC to 30°C. Some fungi like Merulius lacrymans and Poria incrassata provide moisture by themselves and seem to thrive even in fairly dry wood leading to what one can define it technically as dry rot. The various symptoms of incipient decay are discoloration, abnormal mottled appearance, roughness of surface and presence of soft spots of intense discoloration.

Control of Fungi and Bacterial Attack:

One of the prime requirements to control fungal attack is the dryness of timber. The timber should not be subjected to alternate wet and dry conditions. When this is unavoidable a proper preservative treatment should be made. Felled trees should be air-dried as rapidly as possible and sawn timber should be kiln-seasoned properly in accordance with good air-seasoning practice. Thereafter, it should be protected from rain and other sources of moisture. It should be ensured that adequate ventilation should be there around the timber to prevent fungal attack.

Damage due to Insects

Termites: Termites or white ants are the most destructive of all insect agencies. They are small and social insects which form vast colonies and possess differentiated casts to carry on specialized functions in the social structure. They completely excavate the wood at the centre leaving the outer shell intact. They also attack furniture and wood work in houses railway sleepers.

Beetles are small insects and cause rapid decay of timber by converting them into fine powder. Usually the outer shell of timber remains intact and hence the timber looks sound from outside until it fails completely.

Powder post Beetles (Family Lyctidae) attack sapwood of hardwoods with large pores. The eggs are laid in the pores and the larvae that comes out eats through the wood leaving a very fine powder. Even seasoned timber containing sapwood is not immune to attack of these small beetles.

Long horn beetles (Carambycidae) are 6 mm to 20 mm in size. They derive their name from long curved antennae. They normally do not attack seasoned wood and mainly thrive on timber in the forest yard. They can attack any type of wood though they prefer sapwood.

Ambrosia Beetles or Pin Hole Borers are very common attacking structural timber and furniture. They are less than 6mm in size and attack both sapwood and heartwood. The

larvae bore tunnels through the wood which are filled with the characteristic oval-shape pellets.

Death watch Beetles (Xestobium) are somewhat larger than the previous one and the tunnels, so made, are also bigger and filled with bun-shaped pellets. They normally attack timber infested with fungi or otherwise decayed.

Carpenter ants are usually black in colour and vary in size within the same nest. Unlike termites, they do not eat wood but merely tunnel it out for habitation. Their food is largely nectar, honeydew and other sweet substances. They normally attack slightly rotted or water softened wood, but may continue into wood which appears perfectly sound. Timbers are often riddled with galleries before the presence of ants is detected. The frass ejected from the workings is quite coarse and shredding.

Control of insects

It is much simpler than eradicating fungi. The tunnels made by the insects help in the deep penetration of toxic elements that are used to destroy them. Large scale fumigation is carried out using powerful hydrocyanic acid gas, but this method is not recommended as this gas is highly poisonous and dangerous. The use of creosote is also not desirable because of its odour and undesirable color. A good insecticide which does not damage the paint or varnish and vaporizes easily is yet to be found. The vapours should also not be dangerous to human beings. It is found that no insecticide can fulfill all these requirements in one application and periodic applications are required to be effective. The best alternative is common turpentine mixed with a small quantity of orthodichlorobenzene. This vapour is very deadly to insects and is not poisonous to human beings and animals.

Damage due to Rodents

Although the domestic rodents do not destroy timber in the same sense as the organism so far considered, they are capable of penetrating both wood and concrete. The problem of rodents is more serious in food handling establishments.

Control of Rodents :

The guiding principle is to close all openings or passages and making doors and windows capable of closure in a rat-tight manner by fixing metal sheets over the lower parts of doors.

Defects in Timber

Defects can occur in timber at various stages, principally during the growing period, conversion and seasoning process. The defects in the wood are due to irregularities in the character of grains. Defects affect the quality, reduce the quantity of useful wood, reduce the strength, spoil the appearance and favour its decay.

Defects due to abnormal growth

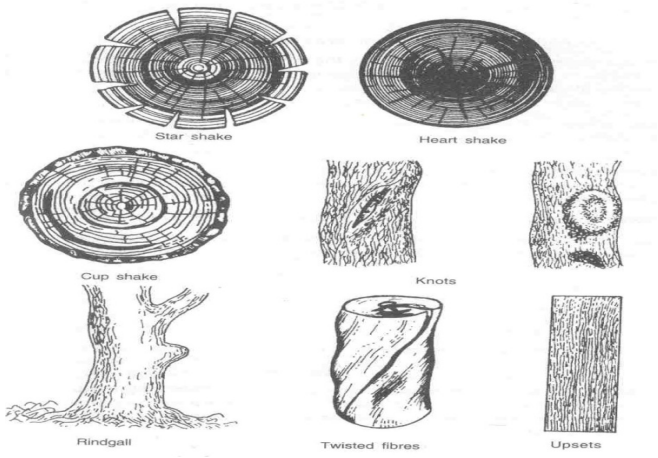
Following are some of the important defects commonly found in wood due to abnormal growth or rupture of tissues due to natural forces.

Checks is a longitudinal crack which is usually normal to the annual rings. These adversely affect the durability of timber because they readily admit moisture and air.

Shakes are longitudinal separations in the wood between the annual rings. These lengthwise separations reduce the allowable shear strength without much effect on compressive and tensile values. The separations make the wood undesirable when appearance is important. Both the shakes and checks, if present near the neutral plane of a beam, may materially weaken its resistance to horizontal shear.

Heart Shake occurs due to shrinkage of heart wood, when tree is over matured. Cracks start from pith and run towards sap wood. These are wider at centre and diminish outwards.

Cup Shake appears as curved split which partly or wholly separates annual rings from one another. It is caused due to excessive frost action on the sap present in the tree, especially when the tree is young.



Star Shake are radial splits or cracks wide at circumference and diminishing towards the centre of the tree. This defect may arise from severe frost and fierce heat of sun. Star
shakes appear as the wood dries below the fibre saturation point. It is a serious fault leading to separated log when sawn.

Rind gall is characterized by swelling caused by the growth of layers of sapwood over wounds after the branch has been cut off in an irregular manner. The newly developed layers do not unite properly with the old rot, thereby leaving cavities, from where decay starts.

Knots are bases of twigs or branches buried by cambial activity of the mother branch. The root of the branch is embedded in the stem, with the formation of annual rings at right angles to those of the stem. The knots interrupt the basic grain directions of the wood, resulting in a reduction of its strength. Additionally, it affects the appearance of the wood. A dead knot can be separated from the body of the wood, whereas live knot cannot be. Knots reduce the strength of the timber and affect workability and cleavability as fibres get curved. Knots are classified on the basis of size, form, quality and occurrence.
Size Pin knot (under 12 mm), small knot (12-20mm), medium knot (20-40mm) and large knot (over 40mm).

Form : Round knot and spike knot (a round knot exposed by sawing lengthwise).
Quality : Sound knot – as hard and solid as the surrounding wood, decayed knot – contains advanced decay and is softer than the surrounding wood, encased knot – the annual rings fail to grow into the fibres of the surrounding wood, tight knot – a knot so securely fastened that it holds its position in the finished product.
Occurrences : Single knot – when wood fibres deflect around one knot, cluster knot – when wood fibres deflect about two or more knots as a unit and branch knot – two or more knots radiating from a common centre.
End Splits are caused by greater evaporation of sap at the end grains of log and can be reduced by painting the exposed end grains with water proof paint or capping the exposed end with hoop iron bandage.

Twisted Fibres are caused by wind constantly turning the trunk of young tree in one direction.
Upsets are caused by the crushing of fibres running transversely during the growth of the tree due to strong winds and unskilled felling consequently resulting in discontinuity of fibres.

Foxiness is a sign of decay appearing in the form of yellow or red tinge or discoloration of over-matured trees.
Rupture is caused due to injury or impact.

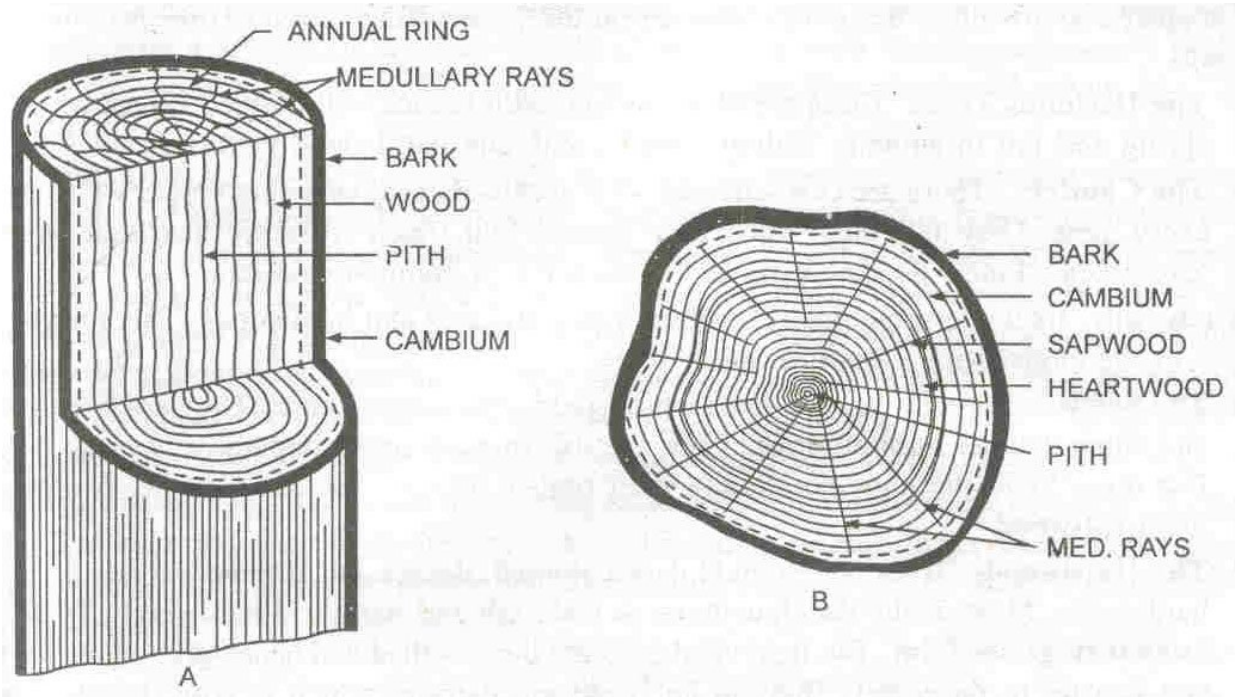
Defects due to Conversion
Conversion is the term used to describe the process whereby the felled tree is converted into marketable sizes of timber. Conversion defects are basically due to unsound practice in milling or attempts to economize during conversion of timber. A wane occurs in timber which contains, on one or more faces, part of the bark or the rounded periphery of the trunk. This reduces the cross sectional area, with consequent reduction in strength in the
parts affected. Excessive slope of grains may also be classed as a conversion defect when conversion has not been done parallel to the axis of the trunk.

Defects due of Seasoning

These defects are directly caused by the movement which occurs in timber due to changes in moisture content. Excessive or uneven drying, exposure to wind and rain and poor stacking during seasoning, can all produce distortions in timber. These defects result in loosening of fixings or disruption of decoration or both.

The common types of the seasoning defects are checks – longitudinal separation of fibres not extending throughout cross section of wood; splitting – separation of fibres extending through a piece of timber from one face to another; warpage – consists of cupping, twisting and bowing.

Structure of Exogenous wood



Seasoning of Timber

As already said, trees contain a lot of moisture in the standing condition. The mode of occurrence of water in wood tissue is rather complex and must be understood thoroughly. It is because a number of important properties of timber depend on its moisture content and the way in which it is present in the wood.

The wood tissue stores water in cell walls and the cell cavities.

(a) The water present in the cell walls is called the bound water, the hygroscopic water or the imbibed water. It is the water, loss or gain of which, will affect the dimensional stability of the timber. It makes 25-30 percent of the dry weight of the wood tissue when all the cell walls are fully saturated with water.

This situation, in which all the cell walls of wood are fully saturated with water (and the cavities are empty) is termed fiber saturation point.

b) The water present in the cell cavities of the wood tissue is called the free water. Its presence effects the mechanical properties of the timber. If the total moisture content in a species of timber is 75 per cent and it's fibre saturation point is 30 per cent, then the free water is 45 per cent.

Whenever a freshly cut wood log is loaded for drying, it is the free water (from the cell cavities) that is lost first. Once cell cavities are empty and drying is continued, then the water from the cell walls will start moving out due to drying effect. It is only the loss of water from the cell walls that causes shrinkage in the wood.

Similarly if a dry piece of wood is left out in a humid atmosphere, wood will start absorbing moisture. Supposing ,the original moisture content of the dry wood is only 6 per cent and the humidity of the atmosphere is 40 per cent, then wood will go on absorbing moisture till its moisture content is the same as that of the atmosphere in which it is exposed. This is called the "equilibrium moisture content "of the wood.

When water is absorbed by the wood, it is the cell walls that must be saturated before the cell cavities are allowed to get any water. This is the reason doors and windows made of wood ,show swelling effect during rainy seasons immediately after a few days of rains especially when they are located where rain water can fall directly on them.

After having obtained the above information about the water content of wood, we shall no difficulty in understanding seasoning of timber.

Objects of Seasoning

By seasoning of wood is understood lowering its moisture content to acceptable proportions before putting to any use.

There are five major objectives of seasoning:

First Reduction in weight. If the moisture content of freshly cut logs is 50 per cent, it means that the 50 per cent weight of wood is due to water only. And if these limber logs are to be transported in the green condition, it will mean we are paying quite huge money for transport of useless water stored in the timber. Therefore, logs must be seasoned as near to the felling place as possible before they are transported. The additional weight due to water will be also an additional load in the building if the green wood is used in the building as beams.

Second Increase in Strength. Moisture content in the cell walls and the cell cavities decreases the strength of the timber. Volume for volume, there is much higher quantity of wood tissue in dry wood than in green wood. It is the wood tissue that bears all the load; water, whether in cell walls or cell cavities, cannot bear any load. Hence, other things being same, higher the moisture content of a variety of timber, lower will be its strength characteristics.

Third Improvement in workability.

Timber has to be cut into smaller boards and planks and other parts for various uses. Green timber will be more difficult to work with.

Compared to seasoned timber. Further, it will be more economical to work with dry seasoned timber because it will involve less effort, less wastage of tools and better workmanship. Moreover, it will be almost impossible to give a good varnish or paint on green timber.

Fourth Freedom from shrinkage defects. If the green timber is sawn into thin boards and planks, it will get deformed within a short time. This deformation described as warping will make the timber almost useless for further working. Such defects will not appear if the thin boards are cut from the seasoned limber.

Fifth Longer life or durability. Moisture in timber invites a number of micro-organisms and insects to thrive on its sap. The fungi and insects have a special taste for cell sap. Hence, the green timber is attacked by these organisms quite easily. They destroy the wood tissue to reach to the sap, thus cutting short the durability of timber.

We may summarize the objectives of seasoning in five sentences:

Methods of Seasoning

At present timber can be seasoned by a number of methods. These can be conveniently discussed under two headings:

- Natural Seasoning and
- Artificial seasoning

1. **Natural Seasoning (Air-Seasoning).** This is as yet the most common process of seasoning used throughout the world. In this process, timber sleepers, planks and scantlings cut from the wood logs are stacked in open air. The method requires careful preparation of
   a) **Stack ground.** It should be level, free from debris and on dry land. It may be a few cm below the ground level.

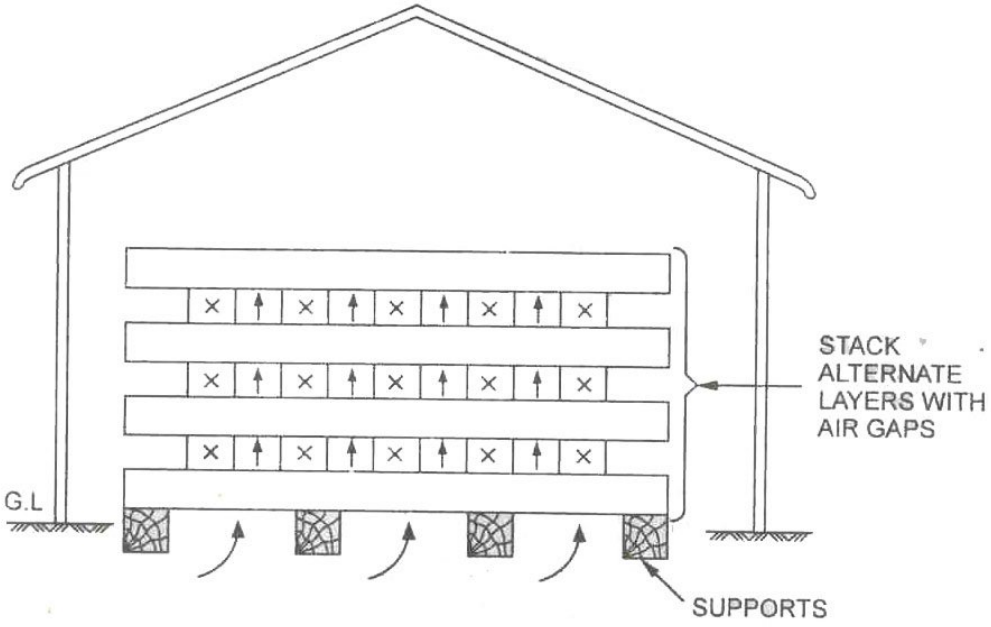
b) **Stack Pillars.** These are constructed at regular intervals out of bricks or masonry or concrete and may be of 50 cm height from the ground level. Their top surfaces should be flat and level with each other.

c) **Stack Proper.** These are made of sawn timber shapes (sleepers, planks, scantlings, poles). One stack should have timber of one shape and same length and width.

The timber shape to be seasoned is stacked in layers in such a manner that enough space is left between.

(i) One layer and another layer above it;
(ii) One part and another part in the same layer;
(iii) One stack and another stack.

The stack length and height depend upon the length of the wood part being seasoned. A single stack may be 3 to 4 meters in height.



The most essential consideration in making such a stack is to ensure free circulation of air around each part of wood placed in a stack. It is also essential that the stack should be safe from direct winds and direct scorching heat. This is because in air.

Seasoning, the loss of water is due to evaporation. The rate of evaporation will depend to a great extent on the atmospheric conditions. Efforts should be made to maintain a uniform rate of evaporation. Scorching heat and strong winds can cause excessive evaporation that may lead to development of shrinkage cracks. The seasoning stack should also be protected from rains because wood being hygroscopic material can absorb moisture quickly.

Outline of stacking arrangement:

The time taken for air seasoning depends on climatic conditions and thickness of the timber. It may take 1-4 years to bring down the original moisture content of 30 percent to a desirable 16-17 percent level.

The advantages of natural (air) seasoning are :

(i) It is highly economical;
(ii) It requires little supervision;
(iii) It is applicable to thicker timber parts as well as thin section.

Among the major disadvantages, following are more important:

(i) It is a very slow process;
(ii) It keeps valuable land and timber blocked for longer periods; and hence in some cases may be uneconomical.
(iii) Moisture content cannot be brought below a certain limit (16-17 percent).
(iv) Seasoning is not always uniform in all the sections of timber.

Water Seasoning:

This is a process of natural seasoning that gives good results with logs of freshly cut trees. When the logs are placed in running water, the sap from the cells can be easily washed out. In place of sap, the cells get filled with ordinary water.

When such logs are taken out and placed for air seasoning, it takes comparatively less time to become dry. The timber logs can also be placed in stagnant water if running water is not available nearby. In such a case, the water should be replaced every week. Placing the logs in water also saves them from unequal shrinkage (at the cut ends and along the length) if left for more time in the open without sawing into smaller pieces. Hence it is a useful process in two ways.

2. Artificial or Kiln Seasoning. This is the modern method of seasoning of any type of timber in a short time. It involves drying the timber in a specially designed kiln where there is perfect control over temperature, humidity and air circulation.

With the help of kiln seasoning it is possible to reduce the moisture content to as low level as 10-12 percent which is perfectly acceptable in all major types of construction. The process takes 15-20 days depending upon the prevailing season.

The method involves broadly the following steps :

(a) Timber is stacked properly in the kiln keeping open spaces for air circulation. The kiln is then heated to low initial temperatures, only slightly higher than the atmospheric temperature outside. It is kept at that temperature for some time.

This initial low heat is essential to avoid cracking or splitting of timber which would become certain if the temperature is suddenly raised to high drying rates. In

that case moisture from the surfaces of the wood will dry out fast (causing shrinkage) whereas moisture in deeper cells will be slow in moving out.

(b) Once the timber has been at low heat and good humidity for some time, the temperature of kiln is raised, humidity is reduced and air circulation is made faster. In this way a continuous process of loss of moisture from the deeper cells to the outer cells of the timber and from there to 'outside' the kiln starts.

(c) During the heating process, all efforts are made to maintain a uniform circulation of the air so that all the parts of timber in the pile receive same amount of heat. This aspect is the most difficult one in kiln seasoning and requires expert handing for good quality seasoning.

Many modifications of kilns for seasoning timber are available. No doubt, it is a costly method. But the quality of seasoned timber is highly satisfactory.

3. Chemical Seasoning (Salt Seasoning):

In this method, the timber piece to be seasoned is treated with a chemical solution like sodium chloride, sodium nitrate or urea. The essential quality of such a solution is that it reduces the vapor pressure on the surface of application. Once such a treated timber is exposed to natural drying, it is the water (sap) from the inner cells that moves to outer cells at lower vapor pressure. The wood surface remains moist while moisture from the interior goes on diffusing to the exterior. In other words, chemical seasoning enables the timber to dry first from inside. It is definitely an advantage as it prevents the risk of cracking of outer shell.

4. **Seasoning by Boiling.** This is also a quick method of removing sap from within the cells. The timber, to be seasoned, is immersed in water and the water is heated to boiling temperature. It is kept boiling for four to five hours. The sap is washed out by this process.
5. On placing in air, such treated timber dries quickly but at the cost of the strength and elasticity of the fibers. Hence, this method is also rarely used.

6. **Electrical Seasoning.** It is of theoretical importance only. Dry wood is a non-conductor of electricity. But when a high alternating current is passed through a piece of green timber, heat generated is enough to dry out the moisture of the cells which do conduct some electricity. In this way, the timber pieces arc dried quickly. The technique involves costly equipment and even the consumption of electricity is so high that the process is uneconomical. Moreover, heating of cell walls causes considerable weakness in them.

Preservation of Timber

Various methods have been used to preserve the timber from decaying. The main objectives of such a treatment is to ensure a longer, trouble free life of timber.

There are three types- of methods used for preserving timber :

(a) Application of some chemical substances (called the preservatives) on the surface of the timber.

(b) Injection of the preservatives into the body of the timber;

(c) Construction of protective covering or shields around timber used in construction.

A preservative may be defined as a chemical compound that when used on or injected into the timber, makes the timber 'poisonous' for insects and fungi without effecting the structural properties of timber.

All the wood preserving chemicals are classed under three groups :

1. **The Oil-Soluble Salts**. Such compounds are soluble only in oils. The most commonly used wood-preservative, coal tar creosote oil, belongs to this category. It is obtained by destructive distillation of coal.

Following are important qualities of this preservative:

(i) It has a high degree of permanence i.e. it stays within the cells for quite a long time.

(ii) It penetrates quickly and easily into the wood tissue.

(iii) It is highly destructive for "fungi".

Among the negative properties of coal tar creosote preservative, the most important one is its unpleasant appearance. Moreover, it does not allow paint over it and has a bad smell too. Hence it cannot be used for preserving timber parts.

2. **The Water-Soluble Salts.** Such salts make an easy solution with water. There is an advantage in it. They can be easily dissolved and used. But there is a disadvantage too. These can be easily “washed away" if the timber happens to be in moist condition. Among the water-soluble salts, zinc chloride, copper sulphate, sodium fluoride, sodium fluosilicates, sodium dinitrophenoxide and compounds of arsenic are included.

3. **Volatile Base Salts** are those which make solutions with substances like petroleum. The creosote petroleum blends are typical examples of this category.

Methods of Preservation

Preservatives are used by different methods depending upon the extent of preservation required. Starting from the simplest to complex, these are: Brush applications; dipping, open tank immersion and pressure application.

i) **Brush Application.** In this method, timber is given one or two coats of the preservative with the help of a brush. This is used for painting coal tar at the ends of beams that are embedded in the walls or base of poles and posts that go to the ground with coal tar. The method is quite cheaper but not very effective.

ii) **Dipping Application.** The timber part to be treated is made to dip in the preservative and kept immersed in it for varying periods from a few hours to few days. It is used when organic preservative solvents are to be applied.

iii) **Open Tank Application**. In this method, the timber is kept immersed in a suitable metallic tank of proper size till a proper saturation is obtained. The tank containing the timber is then heated at about 70º- 80ºC for several hours; this ensures deeper penetration of the preservative into the timber. After this, the timber is allowed to cool within the tank in the presence of preservative. In this way, the timber may actually suck a lot of preservative and ensure complete penetration. Softwoods (conifers) receive this type of treatment in a remarkable manner because their cells are more permeable. The treatment has the disadvantage that it increases the weight of the treated timber considerably.

iv) **The Pressure Process.** This is the best and commonly applied method for preserving costly timber varieties. It involves the passage of preservative into the timber under pressure and is achieved by either of the two processes:

The Full-Cell Process:

The timber is placed in a large steel cylinder acting as a pressure vessel. Vacuum is first created and maintained for about one hour or more. After this coal tar creosote oil or any other suitable preservative, preheated to a specified temperature, is forced into the cylinder under sufficient pressure. This is continued till the required quantity of preservative has been introduced into the timber. Thereafter, pressure is reduced and after giving some vacuum, timber is taken out.

In the Empty Cell method, no vacuum is created in the beginning, instead, timber placed in the pressure vessel is subjected to initial pressure while preservative is being introduced into the cylinder. Once the vessel is full of preservative, sufficient pressure is applied which forces the preservative from the tank into the timber. After this, pressure is released. This causes the air compressed in the cells of the timber to come out along with any excessive preservative.

The main advantage of pressure processes (of one type or another) is that they ensure a proper and deeper penetration of preservative into the timber in a controlled manner. Even those timbers which may not absorb preservative in open-tank process can be filled with preservatives by this method.

The main disadvantage is that these are costly processes involving use of pressure vessels and require skilled operators for better results.

Charring:

It is a common method used for preserving timber poles and posts that are to be dug into the ground. The outer part in the lower ends is charred (incompletely burnt) before insertion into the ground. The charcoal layer so formed is an easy safeguard against attacks by fungi or termite (as these organisms not find any food in charcoal).

Termite Shields:

The base of major timber columns may be preserved against organic attack by constructing suitable barrier between the timber and the ground. These barriers of proper design and shape are called termite shield.

Fire Proofing of Timber

All types of timber are combustible, some catch fire quickly (e.g. soft woods like pines, deodars, kails etc.) and some may take some time before catching fire e.g. hardwoods. But the fact remains that every type of timber is liable to damage due to fire. It is, therefore, desirable that besides treating the timber for preservation, it should also be treated for fire proofing.

It has been found that there is no method of making wood perfectly fire-proof. The rate of burning of wood, however, can be retarded to a good extent by applying certain chemicals on it. Thus, when the surface of timber is covered with a coat of a fire-retarding salt like sodium silicate, sodium arsenate or borax, it takes enough time before it can catch fire to reach the timber. Similarly, when the wood is immersed in solutions of salts like mono-ammonium phosphate, diammomium phosphate and dried, the rate of spread of fire through such timber is considerably reduced.

Chapter-7

Stock taking

Our branch offices have forest depots under their command. Each branch office must have a proper detailed inventory of all the stock held by them at all times. The inventory will consist of both expendable and non-expendable stocks. These stores are held in stock register. Branch office stores are held in furniture and fixtures register. Various items of the stock are received, held on charge, are issued as per guidelines existing for the respective purposes. All these processes must be maintained and exercised meticulously.

To have all the checks and balances in place stock taking – a re-appraisal from time to time is an inbuilt process and it must be followed in letter and spirit. Stock taking must be carried out at a fixed periodicity like monthly – quarterly – half yearly or yearly. A stock taking board will be detailed by the general manager of the branch office which will do the stock taking of all the stores. Equipment & machinery as held in stock register and available on ground must tally. It is customary that the present stock value is also indicated in the stock taking report. Stock taking report must deal with all the receipts of stores during the period since the last stock taking was carried out, all the issuance of stores during the period, issue orders, issue receipts and the purpose of issuance of stores. When the timber is sold by auction or otherwise, a proper report of the procedure followed as per laid down norms of the company. The receipt of proceeds and its final disposal must be studied, preened and recorded.

To delay the stock taking process ,due to one reason or the other ,is fraught with setting inertia which breeds consternation and irregularities wittingly or unwittingly are liable to creep in thus leading to financial losses to the corporation.

Head office will ensure that the periodic stock taking reports are received in time and a perusal of the proceedings at proper levels is conducted.

Stock taking reports act as a mirror of the depot’s holdings, economic viability, orderly and smooth flow of stocks, serviceability and maintenance of machinery. Process of stock taking must be physical, timely and with no room for believing things under the impression of “Good Faith”.

Thus process will help the executive heads of branch offices and also of head office to have always in view the proper functioning of men and material, value of the inventory, cost of annual maintenance and upkeep of the property under their respective command.

Chapter-8

Manufacture of Barbed Wire, Nursery Bags and Furniture

The Company has installed two manufacturing units of barbed wire each at Kurukshetra and Hisar to meet out the requirement of barbed wire of Forest Department. Each unit produces about 600 Kg. Barbed wire in two shifts of eight hours intervals. The price of Barbed Wire depends upon the cost of raw material at the time of purchase by the Company. Government of Haryana has declared the Haryana Forest Development Corporation Limited as approved source for supply of Barbed wire.

MANUFACTURING OF BARBED WIRE

Safety Precautions to be observed in Manufacture of Barbed Wire, Nursery Bags and Furniture

At the branch office where barbed wire is manufactured due precautions must be implemented to eliminate any kind of accident or physical injuries to the workmen engaged in the production of barbed wire.

To have a smooth, time saving and peril free operation of manufacturing barbed wire, it is to be ensured that all around the manufacturing machine there is no unwanted material scattered around. Feeding of the wire must continue uninterrupted smoothly to derive optimum output.

Rolling of the finished product of wire should be done in an orderly manner so that nothing untoward happens. Length of wire in a roll and corresponding weight of the roll should be as per laid down standards both qualitatively and quantitatively. The rolls must be stored in a dry safe place so that no rusting of the wire occurs. Rusting of barbed wire is a common phenomenon which will dissuade the customer from purchasing the product.

The area occupied by the machinery for the said purpose and other allied accessories must be kept spick and span to have hassle free operation. Operator of the machine must not wear loose clothes lest they get entrapped in the machine.

Manufacture of Nursery Bags and Woven Bags

The Corporation manufactures nursery bags in its two units located at Kurukshetra and Hisar and supplies to the Forest Department for raising of plants in nurseries. The manufacturing units at Kurukshetra and Hisar also manufacture woven bags for the Forest Department for raising of tall plants in the nurseries. The prices of nursery bags and woven bags very from time to time depending upon the cost of raw material at the time of purchase by the Corporation. Only two units are manufacturing nursery bags for nurseries to meet out the requirement of forest department and also private consumers.

Raw material for manufacturing nursery bags must be procured from approved source who maintain their quality and credibility. The bag of raw material must be stocked in dry and proper room to take care of its upkeep.

Equally important is to keep observing constantly that the rolls coming out of the manufacturing unit are wrinkle free, un-punctured and with a smooth fabric. The quality nursery bags to hold soil and the seedling will be a matter of major concern in the nurseries. Stitching of the bags should be leak proof and strong enough not to let the bags tear from the bottom.

MANUFACTURING OF POLY BAGS

Supply of wooden crates

The company supplies eucalyptus wooden crates to various government agencies such as Food and Supplies Department, Haryana Warehousing Corporation, CONFED, HAFED, Haryana Agro Industries Corporation and others. The agency and region wise numbers of wooden crates supplied has been

Safety measures:

The wooden crates are manufactured at Ambala, Gurgaon, Rohtak and Kurukshetra. The work men must wear safety gears like helmet and gloves to avoid injuries while working at the saw-mill.

Chapter-9

Projects in Arboriculture, Landscaping and Plantation

The corporation often gets awarded projects in arboriculture landscaping and plantation of trees. As the jobs are awarded through open tenders ,it becomes incumbent on the company that the given project is executed with utmost care, diligence and the need and purpose of the user is always kept in mind and adorned their regular and continuous approve are as important as the work itself.

Landscaping is an architectural method whereby the land is adhered by contouring and planting flowers, shrubs or trees. Grounds allotted must be arranged artistically and professionally. The planning of garden and planting of trees must be carried out in order to obtain a picturesque and harmonious sequence well thought out plan and keeping the local aesthetic proportion in view, climatic condition, annual and seasonable rain fall, how the wind blow presently current of air comes.

Arboriculture:- Private companies, Defence Services and many other agencies award arboriculture projects to the HFDC.

Cultivation of trees for ornament or for the production of timber should be well planned and executed to the entire satisfaction of the user. Tree sapling planted must be well chosen, well nourished and free from any disease. While planting saplings, it must be ensured that the nursery bags wrapping the saplings are carefully removed and the root zones of the sapling should not disturbed.

Chapter-10

A helping hand in maintaining the Environmental stability and Ecological balance.

It is not uncommon that leopards have often been spotted and that too along with their cubs in the foothills of Shivalik range particularly in Morni area. Leopards have also been sighted lurking in Mohali area and Air Force Station area. Antelopes like black buck which is our state animal, is also our National heritage. Black Partridge- again a state bird are also seen in our forest area. Vulture is also waning and for which we have established vulture conservation and Breeding Centre, Pinjore, is also to be saved

Prevention & Safety measures:

While felling trees, the officials in control of the operation must pass instructions to the working force to make sure that the area under felling is free from such wild animals. In case such an animal is sighted or there are pugmarks seen, a cage must be kept ready and nearest wild life inspector must be informed to take necessary steps to trap the animal and leave it at its suitable habitat. Felling party must have the address and contact no of the wild life preservation personnel.

So is applicable about the birds which are our national heritage for the prosperity. Such rare birds are never to be shot at and killed. Such an act is in any case a cognizable crime.