

# Carpentry

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# INTRODUCTION

The carpentry deals with the constructional work, such as making roofs, floors, partitions etc. of a building by means of wood with the help of carpentry tools.

The term joinery is used for connecting the wooden parts with different joints such as making of doors, chairs, stairs windows etc.

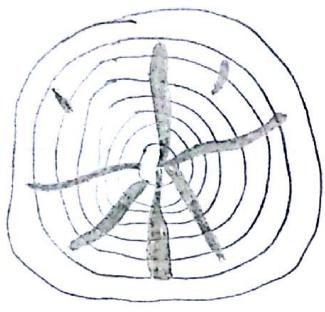
The timber is the material used for carpentry and joinery work. It is the wood obtained from exogenous trees by cutting trees after their full growth. The following technical terms related to timber must be clearly understood :—

**standing or stationary timber** :— It is the timber available from a living tree.

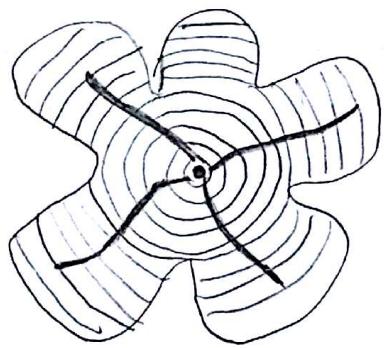
**Rough timber** : It is the timber which has been sawn into various market sizes such as beams, battens, planks etc.

**Dressed timber** : It is the timber which has been sawn, planed and worked to the required condition.

**Structural timber** : It is the timber used in framing and load bearing structures.



Heart snake



# TYPES OF WOOD

The timber is mainly of two types, namely, soft wood and hardwood. These two woods are described here.

**Softwood:** The softwood is obtained from trees having needle shaped leaves or conifers. The various soft woods are kail, Pine, cedar etc. It is widely used for construction work.

Characteristics of soft wood:-

- 1) It is light in colour and weight
- 2) It has straight fibres and fine texture
- 3) It has good tensile resistance but is weak across the fibers.
- 4) It really catches fire
- 5) Easy to be worked.

**Hardwood:** The hardwood is obtained from trees having broad leaves or deciduous. The various hard woods are sal, teak, mahogany, shisham etc. It is widely used for doors furniture, joinery etc.

Characteristics of hardwood:-

- 1) It is dark in colour and heavier in weight
- 2) Its fibres are quite close and compact.
- 3) It is non-resinous wood.
- 4) It is difficult to be worked
- 5) It has both good tensile as well as shear resistance.

# TYPES OF TREES

The trees are classified into the following main classes, depending upon the manner of their growth.

**Exogenous Trees :-** The Exogenous trees are those trees which grow outward from the centre adding almost concentric rings or layers of fresh wood, every year, known as annular rings. The timber obtained from exogenous trees is extensively used in engineering works.

The endogenous trees may be further divided into the following two types :-

(a) Conifers or evergreen trees :-

These are those trees which have needle shaped leaves and are quite symmetrical, with branches radiating from the central trunk. These trees yield softwood which is generally light coloured, resinous, light in weight and weak. They show distinct annual rings. The trees like cedar, pine, chh, kail belong to this category.

(b) The deciduous or broad leaf trees.

These are those trees which shed their leaves in autumn and put on new leaves in spring season. These trees yield hard wood which is usually close grained, strong, heavy, dark coloured, durable and non resinous. They do not show distinct annular rings. The timber used for engineering purposes is mostly derived from deciduous trees. The trees like teak, sal, shisham, oak, mahogany, mango, neem etc. belong to this category.

~~Endogenous~~ Trees :- The endogenous trees are those trees which grow in woods or endwoods. The stems of those trees are light and tough but they are too flexible to be used for engineering purposes. The trees like bamboo, palms, canes etc. belong to this category.

# DEFECTS IN WOOD

The defects in timber are of the following two types

- 1) Defects developed during the growth of a tree.
- 2) Defects developed after falling a tree.

These defects are discussed in details as follows :-

1) Defects developed during the growth of a tree  
In all kinds of timber, several natural defects occur. In all kinds of timber, they are caused by the nature of soil upon which the tree grows and also by the changes of nature to which it is subjected while growing. These defects should be avoided or removed during conversion for use. Following are the most common defects under this category.

(a) Heart shake : These are the wide splits or cracks running through the heartwood of a tree. These splits radiate from the pith running towards the sapwood. This defect usually occurs in overmatured trees and is caused due to the shrinkage of wood.

(b) Star shake : These are radial splits or cracks which are wider at circumference of the tree and becomes narrower towards the centre of the stars. The star shakes are mostly caused by severe frost or by severe heat of the sun. They are mostly confined to sapwood.

(c) Cupshake or ring shake : These are the cavities which appear in between the annular rings as shown in diagram. These cavities may be completely circular or partial. These are caused by strong winds which sway the tree or due to excessive frost which affects the moisture in the tree when it is still growing.

(d) Ring Galls : These are the peculiar curved swellings formed on the body of a tree. These are caused by the growth of layers over the wounds left after branches have been improperly cut-off or removed.

e) twisted fibers :

This defect is developed in a tree owing to its peculiar position where the fibers of the wood are twisted by strong winds turning the tree constantly in one direction. The trees on the hills are the ones most affected by this defect.

2) Defects developed after felling a tree

These are the main defects which occur after felling of a tree.

- a) Dry rot : This defect is caused by the fungus. It changes the timber into dry powder. The unseasoned timber is easily attacked by fungus. Thus a well seasoned timber should be used in order to avoid dry rot.
- b) Wet rot : This defect is caused by the alternating drying and wetting of the timber. The timber used in uncovered situation is very much likely to be subjected to wet rot. It is commonly found in living tree. The wet-rot can be avoided by using thoroughly seasoned wood for exterior and underground use. The seasoned wood should be protected from moisture by staining or painting. The best remedy for treating wet rot is by using a suitable preservative.
- c) Honey combing : This defect is caused during seasoning of wood. The incorrect kiln seasoning causes the interior wood to dry quickly than the external surface. This gives rise to internal stress causing circular and radial cracks in the wood crossing each other.
- d) Case hardening : This defect is caused by uneven drying of timber. The outer portion of the wood dries earlier and quicker than the inner portion.

causing shrinkage to the outer tissues leading to drying stresses. Due to this the outer surface of wood gets hardened

# SEASONING OF WOOD

The seasoning of wood or the timber is the process of drying timber or removing moisture or sap present in the freshly fallen tree. Under controlled conditions.

The following methods are commonly used for seasoning of timber.

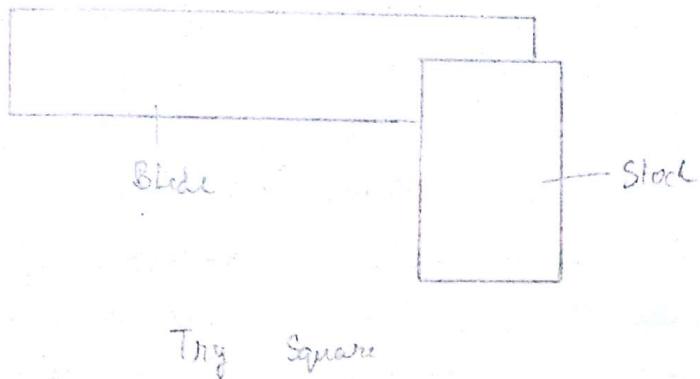
## i) Natural Seasoning or Air Seasoning:

In this method of seasoning, the tree after falling is converted into logs, planks or battens. These are stacked in a dry place about 300 mm above the floor levelled with longitudinal and cross pieces arranged one upon another while stacking, it should be ensured that there is space between them for free circulation of air all around each other. In order to prevent the effect of moisture on the wood. From the bottom a layer of cinder ash or sand is spread on the levelled platform before stacking the wood. In the stacked wood is turned upside down periodically in order to accelerate the rate of drying. The wood gets dried due to the circulation of the free air which drives up the moisture.

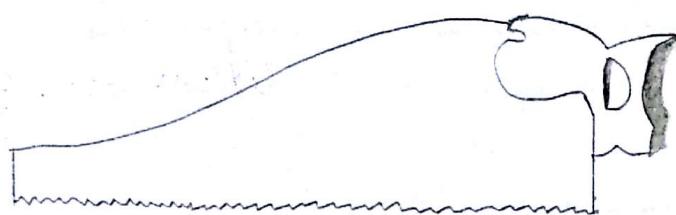
This method of seasoning the wood is simple and cheap but it is very slow and extends over years depending upon the type of wood and its cross section. The soft wood and thin sections dry up easily whereas the dry hard wood and the thicker sections take more time.

## 2) Artificial Seasoning or Kiln seasoning,

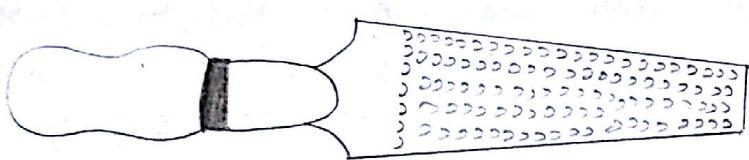
This method of seasoning is quickest of all the methods. It keeps the moisture of it constantly under control. The process is carried out in a chamber under controlled Temperature and humidity conditions with proper air circulation and ventilation system. Usually steam is used for this purposes. The seasoning is started at a comparatively lower temperature and high humidity. The conditions are changed as the timber dries. At the end of seasoning the air is fairly hot and humidity is low. The required humidity level of the air is maintained by the air to avoid cracking of wood. The drying of the wood is at uniform scale. It is well maintained by the circulating air. The ventilation is provided to avoid over heating and excessive humidity. Before removing the wood like kiln is allowed to cool. The temperature inside the kiln is allowed to cool. The temperature inside the kiln is within 15°C to 20°C of the other temperature. The seasoning by this method takes 4 to 5 days under normal conditions. It is best suited for mass production work.



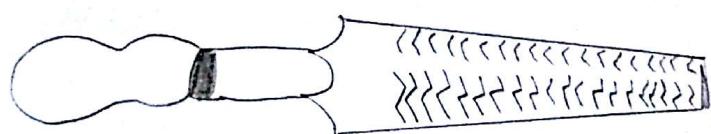
Try Square



Rip Saw



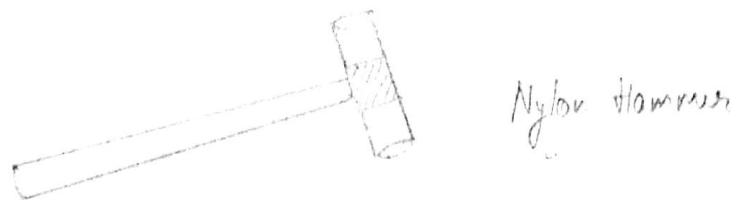
Rasp



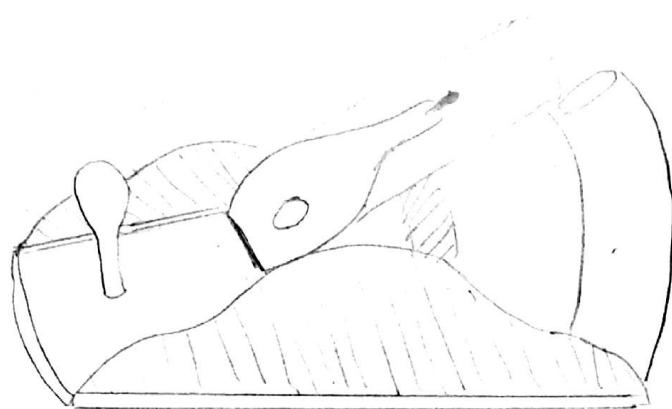
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# TYPES OF TOOLS

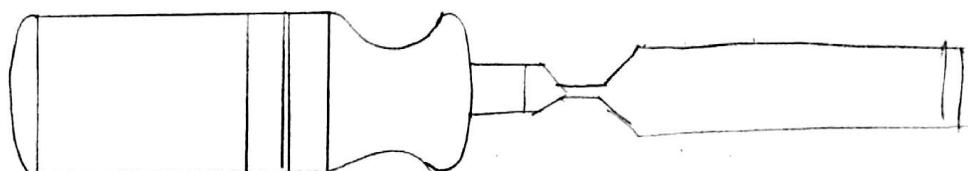
- 1) Try Square : It is used for drawing and testing right angles. It consists of a steel blade fixed at right to the edge of a machined stock when in use acts as a fence and the blade as a guide for marking. It is available in various sizes like 100mm, 150mm and 200mm.
- 2) Rip Saw : It is used for cutting along the grain of wood. Its blade is about 100 mm long and has 3-5 points or teeth per 25mm length. The teeth of the rip saw have a series of chisel edge which tears out shavings each equal to the width of the tool.
- 3) Rasp and file : Rasp is a file used for finishing. The rasp has sharp cutting teeth on its surface for this purpose. The file is used for removing rasp marks and finally the scratches left by the file are removed with the scraper and glass paper.
- 4) Metal Jack Plane : The metal jack plane are used for the same purpose as the wooden jack planes. The metal planes more durable and produces higher finish. The body is made of cast steel, gun metal or malleable iron. It is provided with a wooden handle at the back and a wooden knob at the front for



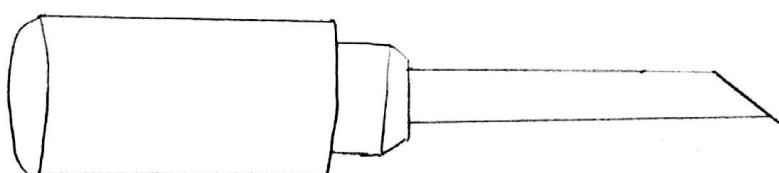
Nylon Hammer



Metal jack plane



Firmer chisel



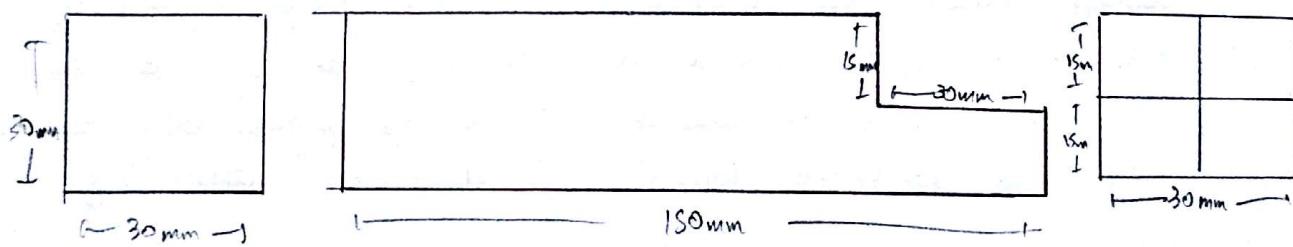
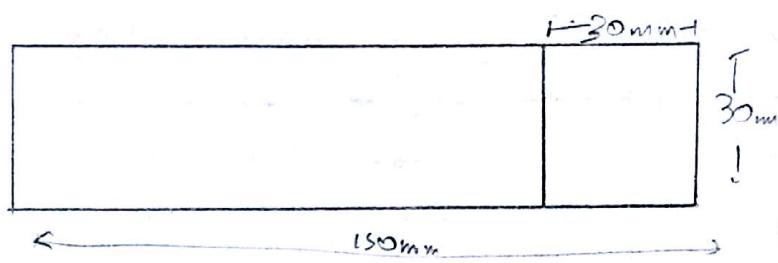
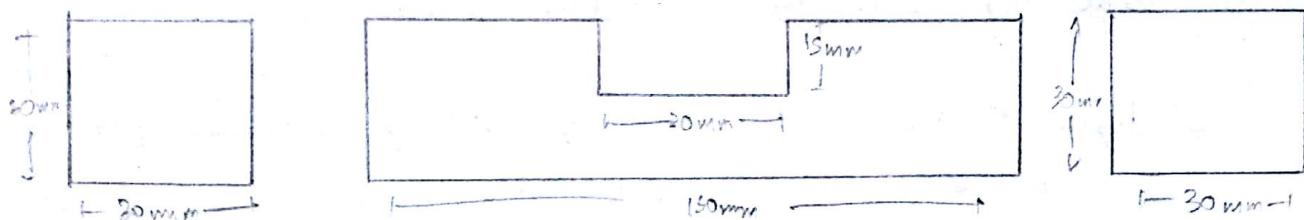
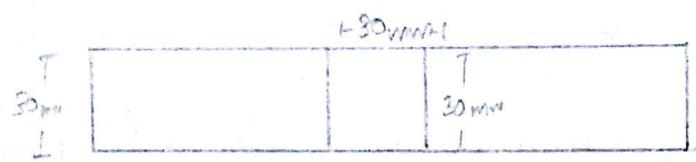
Mortise chisel

holding it by both hands. The outer parts of the metallic fork plane are cutting iron, cap, iron for reinforcement, the lock stop and the adjusting screw.

5) Nylon Hammer : It is kind of striking tool used for giving light blows to the job pieces.

6) Firms Chisel : The firms chisel is a medium duty tool used for general work. It may be used either by hand pressure or by blows from a mallet for cutting square recesses i.e. in mortising. The width of chisel blade varies from 3mm to 30mm and length is about 125 mm.

7) Mortise chisel : The mortise chisel is a heavy duty tool used for withstand large strain as in framing where cuts are necessary. An iron ridge is fixed to the end of the handle to withstand the force of the heavy hammer. The one side is usually plane and the other is gradually tapered towards the cutting edge.



# JOB - 1

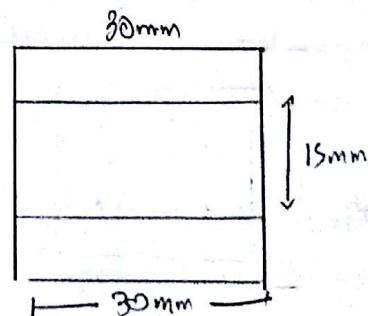
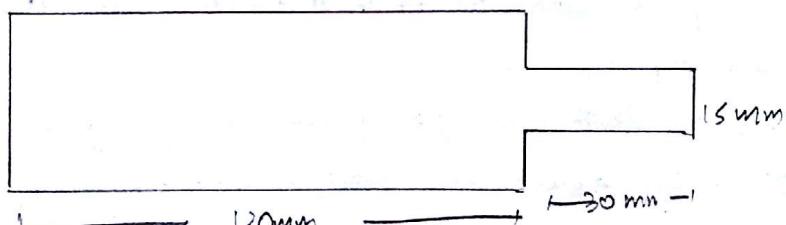
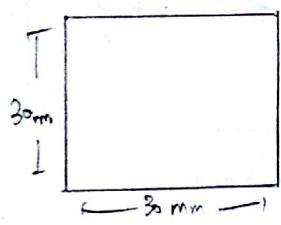
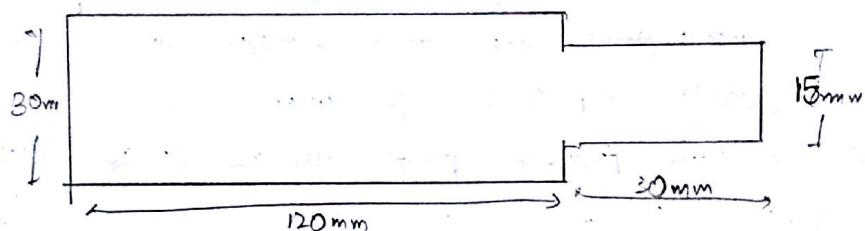
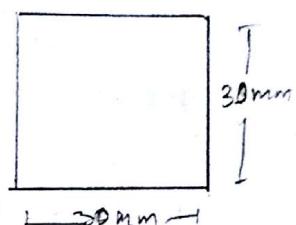
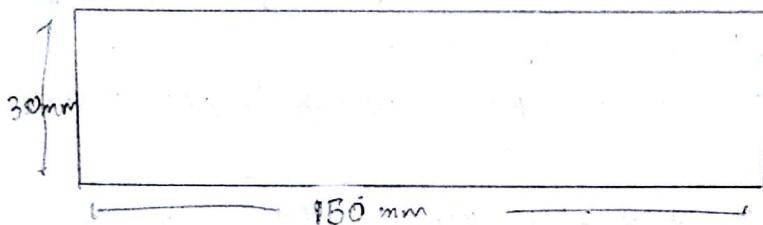
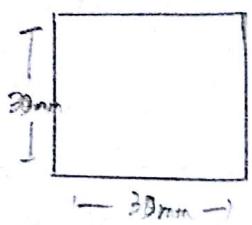
Objective :- To make a T-jap joint

Tools Used :- Steel rule, pencil, try square, marking gauge, rip saw, firmer chisel, jack plane, nylon hammer

Materials Used :- wooden piece 130mm X 30mm X 30mm

- Procedure:
- 1) Took a wooden piece slightly more than the given dimensions
  - 2) The job was fixed in carpentry and planning was done on the width side with the help of a jack plane and smoothing with the help of a smooth plane and check flatness and straightness of the workpiece with help of a try square
  - 3) Repeat the same previous process on the adjacent sides until it makes right angles
  - 4) Makes one size on the work piece and remove extra material accordingly
  - 5) Make other size on the job piece and again remove extra material accordingly
  - 6) Make two pieces each 130 mm in height with the help of a pencil, try square and rip saw.
  - 7) Mark on the both the job pieces as per given dimensions with the help of pencil, try square and marking gauge.
  - 8) Remove extra material and produce recess on one workpiece and at middle of the other workpiece with the help of rip saw and tenon saw former chisel and mallet.
  - 9) Fix the job pieces in the shape of T-jap Joint.

- Safety Precautions :-
- 1) Never feed the stock faster than its capacity
  - 2) Hold the job firmly with clamping devices while working at the machines
  - 3) Always keep the tools at proper position when not in use
  - 4) Keep the Floor area free from obstructions.



## JOB -2

Objective :- To make a mortise tenon joint

Tools :- Mortise chisel, rip saw, steel scale, rasp file, nylon hammer  
Marking gauge.

Material Required :- Wooden piece of  $165 \times 35 \times 35 \text{ mm}^3$

- Procedure :-
- 1) Take a wooden piece slightly more than the given dimensions
  - 2) Fix the job piece in carpentry bench and do planning on the width side with the help of jack plane
  - 3) Repeat the same previous steps on the adjacent side
  - 4) Now mark both pieces accordingly as per the given dimensions
  - 5) Remove the material from the centre of the job piece with the help of mortise chisel, this part now be called mortise
  - 6) Cut the other part accordingly to the given dimensions with the help of rip saw only this part now be called Tenon
  - 7) Mark the necessary adjustments with the help of rasp file to let both the parts fit into each other

### Safety Precautions:-

- 1) Never feed the stock faster than its capacity
- 2) Hold the job firmly with clamping device
- 3) Always keep the tool in proper position
- 4) keep the floor area free from obstructions.