

Carpentry

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Introduction to timber

Timber is another name for wood. It is obtained from **Exogenous trees** by cutting them after their full growth. Exogenous trees are the trees which grow outwards from the centre adding, almost concentric layers of fresh wood every year. Exogenous trees have needle shaped leaves which deciduous trees have broad leaves. Timber is made suitable for engineering or building purposes by sawing into various sizes. Timber of a line tree is called **Stationary timber**, filled trees after sawing is called **Rough timber** & after cutting into two various sizes as **Converted timber**.

Classification of Timber

According to the quality of wood, timber is classified as:

a. Soft timber

b. Hard timber

Soft wood is obtained from **conifers**, wood obtained from **teak, deoder, walnut & seemal**. Wood obtained from **teak, seal, oak, shisham, mango, neem** is known as hard wood.

Another classification of wood is based on the name of trees like **teak, babul, shisham, neem, kail, chir etc.**

Classification of Trees

The tree consists of mainly three parts:

1. Roots
2. Trunks
3. Leaves

Each of these has a distinct function in the growth of the tree. In spring season the roots of the tree suck the requisite food for it from the soil in the form of **sap** which is nothing but a dilute solution of mineral salts in the subsoil water. This sap rises through the cells of the wood to reach the branches and leaves to provide the nourishing food. The leaves release moisture from the sap and, in turn, absorb carbon dioxide which, under the action of the sun, forms a dense chemical compound (also termed as sap). This denser sap descends down in autumn & gets deposited under the bark to form **cambium layer**. It hardens gradually & thus a fresh layer of wood is added to the tree, called the **annual ring**. The function of trunk of a tree is to provide adequate support to the branches & leaves of tree & enough strength & rigidity to its structure.

According to manner of growth, timber trees can be broadly classified as :

- a. Exogenous or outward growing.
- b. Endogenous or inward growing.

a. Exogenous Trees :

These trees develop outward from the center adding & forms almost concentric layer of fresh wood every year, known as **annual rings**. This variety of trees which yields timber suitable for building and other engineering uses.

The exogenous trees are further classified as :

- (i) Conifers or evergreen trees.
- (ii) Deciduous or broad leaf trees.

The conifers give soft wood & the deciduous class hard wood for example: **sal, teak, oak, shisham, beach, ash, ebony, mango, neem, bebid(babool)** etc.

b. Endogenous Trees :

These are trees which grow inwards i.e., every fresh layer of sap wood is added instead of outside, e.g. **cane, bamboo** and **coconut** etc.

Seasoning of Wood

Seasoning of wood is carried out to get rid of the moisture & sap present in it. If water and sap is not removed, there are chances of shrinking, cracking & warping during use. Decaying of timber also occurs. The following methods are commonly used for the seasoning of the timber :

1. Natural Seasoning
 - a. Air Seasoning
 - b. Water Seasoning
2. Artificial Seasoning

a. Air Seasoning :

In this process the barks of timber are exposed to the action of natural air by protecting it from the direct effect of sun & rain. The barks of wood are stacked in a platform in which free circulation of air takes place. The platforms are so constructed that their height is 30 - 40 cm above the ground & the top of the platform is at perfect level. Before stacking the wood, a layer of cinder ash or sand is sprayed over the platform to protect the action of moisture on the wood from the bottom. At the top of the platform a shed is provided & timber is stacked in such a way that the alternate layers are at sufficient distance and alternate columns are at right angle to each other. The stacked wood is allowed to undergo various temperature changes by exposing the wood to the action of air under this shed. During seasoning, periodical turning around of stacked wood is necessary to accelerate the rate of drying. The time required for complete seasoning varies from 1 - 5 years depending upon the type & the cross section area of the wood. Though this process takes much time, wood seasoned by this process is cheapest & best in the quality.

b. Water Seasoning :

In this process, barks of wood are immersed in flowing water for 2 - 3 weeks. During this, sap is carried out by water & wood

becomes free from it. The seasoning of wood is carried out in the usual way as for air seasoning. This process takes relatively lesser time compared to the air seasoning but wood processed is comparatively weaker in strength.

2. Artificial seasoning :

It is carried out in kilns. In this process bark are stacked over large kolliies & driven inside chambers or ovens called **kilns**. Inside the kilns the stacked bark is kept at controlled temperature for suitable time. The temperature of the kilns is raised by forcing hot air or steam into the chamber. In the beginning, the drying of the wood is slower due to lesser temperature, but the rate of the drying increased as the temperature of the chamber increases. This process is advantageous as seasoning of wood is quicker. The main disadvantage of this process is that the recurring caused is high & quality of wood is poor as compared to the natural seasoning process. Other artificial processes carried out for seasoning of wood involve electricity, chemicals, boiling etc.

Defects in Timber

The common defects found in timber can be broadly classified into the following three groups :

- a) Natural defects/defects due to abnormal growth of the tree.
- b) Defects occurring during conversion, seasoning or use.
- c) Defects due to action of fungi and insects.

Natural Defects :

Following defects commonly occur in wood due to abnormal growth of tree :

- 1. Knots
- 2. Shakes
- 3. Irregular grains or twisted fibers
- 4. Rind galls or burls

Defects occurring during conversion,seasoning & use :

The following defects occur during conversion,seasoning and use :

- 1. Shakes
- 2. Distortion
- 3. Case hardening
- 4. Honey-combing

Tools Used

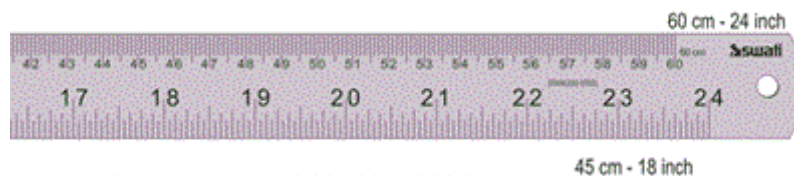
The different categories of tools used in carpentry are :

1. Marking & measuring tools
2. Cutting tools
3. Stricking tools
4. Finishing tools
5. Holding & supporting tools

1. Marking & Measuring tools:

Steel scale:

It is an instrument that is used to measure short dimensions. It is usually 30cm in length.



Inch tape:

It is an instrument that is used to measure longer dimension. It is usually 2m in length.



Marking gauge:

It is used to draw lines parallel to edge. It is made of wood. It consists of a stem having rectangular or square cross-section. The stem carries the head which can be fixed by thumb screw.



Mortise gauge:

It is an instrument that is used to mark for the mortise, i.e. hole in the centre of the block of the wood. It consists of two parallel pins that are used to mark for the boundaries of the mortise.

**Tryscale:**

It is a scale that has two axes and helps in drawing rather a good straight line either parallel or perpendicular to the edge of the wooden block.

**Bevel square:**

It's an adjustable try scale for making angles between 0 & 180.



2. Cutting tools:

Rip saw:

It is used for cutting along the grains of wood. Its blade is about 700mm long & has 3-5 points per 25mm length. The width of the blade is about 120mm-200mm near the handle & 60mm - 100mm at the toe.



Tenon saw:

It has parallel blade of width 60mm-100mm, length 250mm-400 mm & 12-20 teeth per 25mm length. The teeth are shaped like a cross cut saw in the form of an equilateral triangle.

**Bow saw:**

It is used in cutting trees. It consists of a narrow blade about 3 mm-12.5mm long with two wooden handles. It has about 10 teeth per 25mm length.

**Firmer chisel:**

It is a tool used for general work. The width of the chisel blade varies from 5-50mm and the length is about 125mm.

**Mortise chisel:**

It is a heavy duty tool used to withstand severe strain or in frame where deep cuts are necessary. One side of the chisel is plane and the other side is gradually tapered towards the cutting edge. Its blade width varies from 3-15mm and the thickness from 6-15mm.

**Gauges chisel:**

These instruments have a hollow shaped blade for scooping or cutting round holes. It is mostly used for wood turning. There size may vary from 5-25 mm.



3. Striking tools:

Ballpean hammer:

They have got pean of the shape of a ball. It is mostly used for reverting and chipping. The size of this hammer may vary from 0.11 kg to 0.91 kg.



Nylon hammer:

It is the general hammer that are used for striking. The top portion of this hammer is made of nylon.



Claw hammer:

It is made of cast steel and has a head at one end and claw at the other. The head is used to drive the nail and the claw is used to pull out the nails from the wood. Its size varies from 0.25 kg to 0.75 kg.



4. Finishing tools:

Iron jack plane:

This instrument is used for smooth finishing of an object. The blade in this instrument is arranged in such a way that it cuts out a slice from the wooden block if we run this instrument over it



Rasp file:

This instrument is used to give a finer finishing. The small bend plates which are present in large numbers, when run over the wooden block, levels it to a plane if it is not levelled.



5. Holding & supporting tools:

Woodworking lathe:

It is a machine that runs on electricity and is used to make round jobs i.e. with help of this machine we can make any square object round.



Bench vice:

It is a holding & supporting tool. It is used to hold the job while working. It has two jaws in between them we place our job.

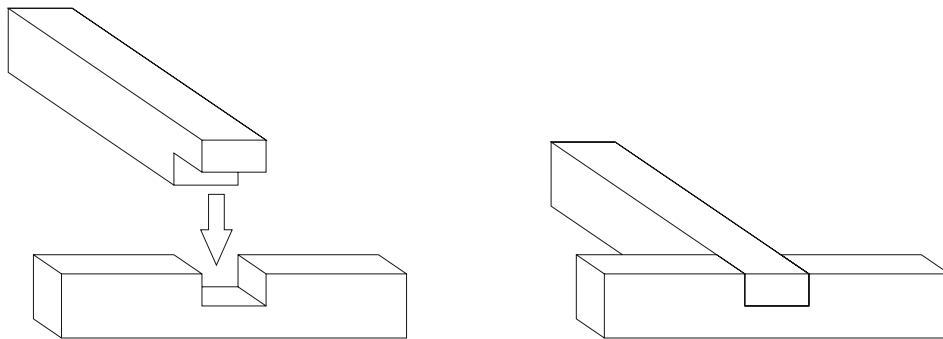


Practical - 1

Aim : To make Tenon-Joint with dimensions 140x25x25 mm.

Material Required :

- Medium type of wood {Red Marindi}
- Mortise Teaser
- Nylon Hammer
- Rasp file
- Iron Jack Plane
- Rip saw



Procedure:

•First of all take two wooden blocks with 140x25x25 mm dimension each. Then in one block mark with help of pencil, try scale and steel scale as shown in the figure of "job 1" and in the second block mark with help of the same as shown in the figure "job 2".

•For job 1, take the hammer and the mortise teaser & create the hole according to dimension as shown in the figure. After the hole is done, make it plane with help of the rasp file.

[Note: the hole should be made with extra care so that it does not exceeds the dimensions.]

•For job 2, take the rip saw and start cutting it through marking. Once the cutting job is done make it plane using the rasp file.

•Once both the jobs are done fit the second block with the first and the tenon joint is complete.

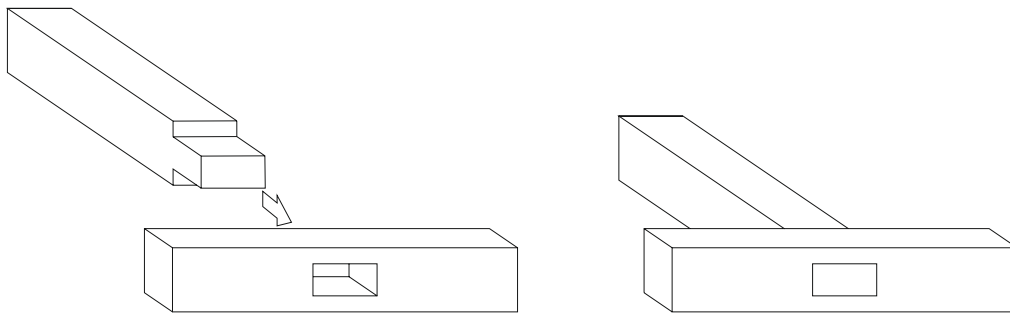
[Note: if the fitting is small then fill it with the fillings and if it is not fitting at all then run rasp file either in hole or in cuttings in job 2 so that it dimension can be reduced for fitting.]

Practical - 2

Aim : To make a T-Joint having dimension 140x25x25 mm.

Material Required :

- Scale
- Triscale
- Rip saw
- Firmer chisel {used for sharp cutting}
- Nylon hammer
- Iron Jack Plane
- Rasp file.



Procedure:

•First of all take 2 wooden blocks of 140x25x25 mm dimension each. Then in one block mark with help of the pencil, try scale and steel scale as shown in the figure of "job 1" and in second block mark with help of same as shown in the figure "job 2".

•For job 1, take firmer chisel and the hammer to do the cutting. In this case be careful not to cut completely in the dimension marked with one hit but to cut it in smaller dimensions so that the whole block doesn't get cut in 2 pieces. Once the cutting is done make it plane using the rasp file.

•For job 2, take the help of Rip Saw to do the cutting according to the marking. Once the cutting is done make it plane using the rasp file.

•Once both the jobs are done fit the second block with the first and the T-joint is complete.

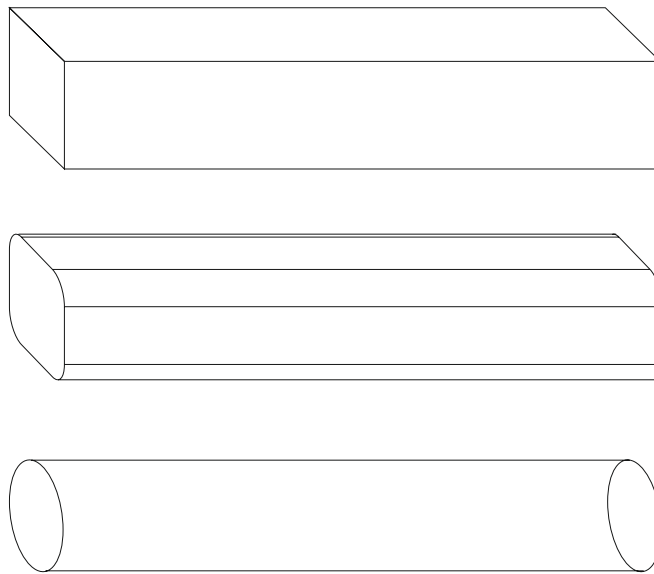
[Note: if the fitting is small then fill it with the fillings and if it is not fitting at all then run rasp file either in hole or in cuttings in job 2 so that its dimension can be reduced for fitting.]

Practical - 3

Aim : To make a round from square having dimension 300x50x50 mm.

Materials required:

- Scale
- Tryscale
- Rip saw
- Lathe machine tool
- Outside calliper



Procedure:

- Mark the wooden block of dimension 300x50x50mm with help of pencil, steel scale and try scale as shown in the diagram.
- Then fix the wooden block in horizontal position and to the end where it has to be made circular.Run Iron Jack Plane so that it can be made somewhat circular.
- Now fix wooden block to the Lathe machine and run it.Now the block wood starts rotating.Take Firmer chisel and touch it with the rotating block.In between check it the circular part has the diameter of 30 mm using outside calliper.

THANK YOU