

Greenfaulds High School

Technical Department



Standard Grade Craft & Design

Knowledge & Understanding In Wood

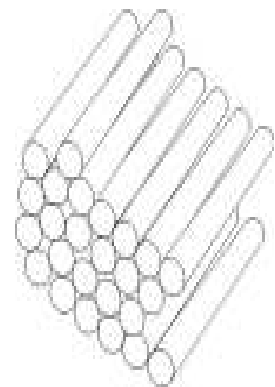
Knowledge and understanding of Wood

Throughout the world there are thousands of different species of tree, adding beauty and colour to our surroundings. They help keep the air fresh by taking in carbon dioxide and giving out oxygen. When cut or felled, and properly seasoned, the wood they provide has many uses including boat construction, house building, furniture and of course a wide variety of articles made in the school classroom.

Grain

All timber is composed of cells and wood fibres packed closely together. The term "grain" refers to the arrangement or direction of the cells and fibres in the timber. Try to imagine holding a bunch of drinking straws, this is basically very similar to how the grain of wood would look like if we looked at it through a microscope.

Grain



Classification of Wood

Trees are classified into two main groups, **Hardwoods** and **Softwoods**.

Hardwoods

This group of trees have broad flat leaves and seeds enclosed in a fruit or seed case. Hardwoods can be deciduous or evergreen. A tree which loses its leaves in the Autumn is called a deciduous tree. Examples of hardwoods are, Beech, Oak, Ash, Mahogany, Teak, Hickory.

Softwoods

This group of trees have long needle-like, shaped leaves and seeds exposed in cones and are known as conifers. Most softwood trees are evergreen (i.e. they keep their leaves all year round). Examples of softwood are, Red Pine, White Pine, Cedar, Douglas Fir.

Timber - Form of Supply

Timber is usually supplied in the following sections.

Planks Vary from 38mm to 100mm in thickness and over 100mm in width



Boards Less than 38mm in thickness and over 100mm in width.



Strips Less than 38mm in thickness and less than 100mm width.



Squares Square Section - thickness same as width.



Dowel Rods Dowel Rods, or cylindrical wooden pegs, are variable in sizes from 3mm to 50mm. Common timber used for dowel rods are Ramin or Beech.



Safety

Safety is of major importance in any craft room, it is imperative that safe working practices are observed at all times. Failure to observe safety rules will result in that individual losing the privilege to work in the craft room.

Some general safety precautions

1. Work benches and machines must always be swept clean after use. Think of the person who has to use them NEXT.
2. ALWAYS walk when in the workshop, running causes accidents.
3. If sharp tools must be carried in the work shop they must be carried facing downwards.
4. ALWAYS work with sharp tools, blunt tools cause accidents.
5. Before any work commences all jackets should be removed and hung up. All bags placed under the workbench. Any loose cloth or hair should be tucked in or tied back.
6. Pupils should be familiar with the position and operation of the emergency stop buttons in workshops. ONLY press if an EMERGENCY arises.
7. Eye protection must be worn if operating any machinery.
8. Report any damaged tools, equipment, etc. to the teacher.
9. ALWAYS store tools in the well of the bench when not in use.
10. ALWAYS keep both hands behind the cutting edge when working with a chisel.
11. NEVER strike two hammer faces together. Flying metal chips could cause serious injury.
12. ALWAYS use a file fitted with a handle, tangs are sharp and very dangerous if used without a handle. If you are unsure what a tang is, ask your teacher, after all that is why they are there.
13. ALWAYS check machines to ensure that any rotating parts are properly guarded and free to rotate without obstruction, e.g. ensure before switching on that the chuck key is removed from the Jacob's Chuck. Never use a machine without permission from the teacher.

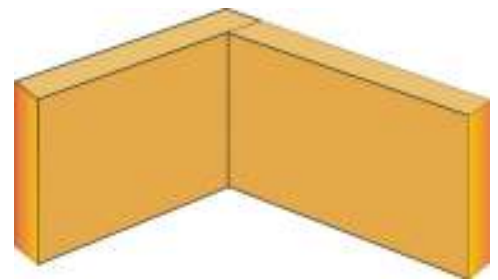
The Workshop is a Safety Zone

Timber Joints

The majority of joints used in woodcraft have been designed specifically to attain the maximum possible strength in the model they are holding together. The type of joint selected will depend on what is being constructed i.e. what forces are going to be exerted upon the artefact. The selection is also dictated by the final appearance. i.e. in furniture manufacture it is normally important to hide the joint as a piece of furniture which has a joint construction which is strong but showing will not be very pleasing to look at and ultimately potential customers would most likely avoid buying such furniture.

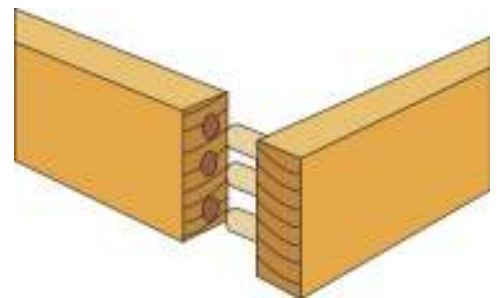
Butt Joint

Butt joints are the quickest and simplest to make but are not very strong. They generally need dovetail nailing to increase the overall strength of the joint.



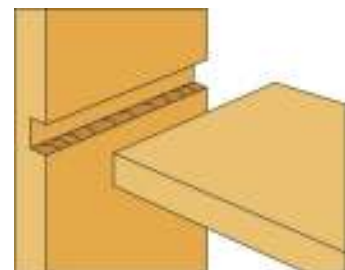
Dowelled Joint

These joints are both neat and strong. The holes must be lined up exactly but this can be done using a dowelling jig. The dowel will have a groove in the length so as to allow excess glue to escape.



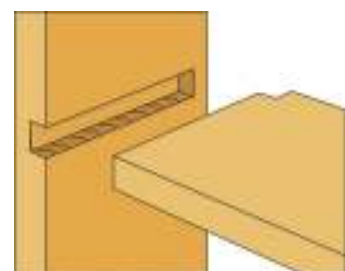
Through Housing

These joints are simple to make and are suitable where the two parts being joined together are the same width.



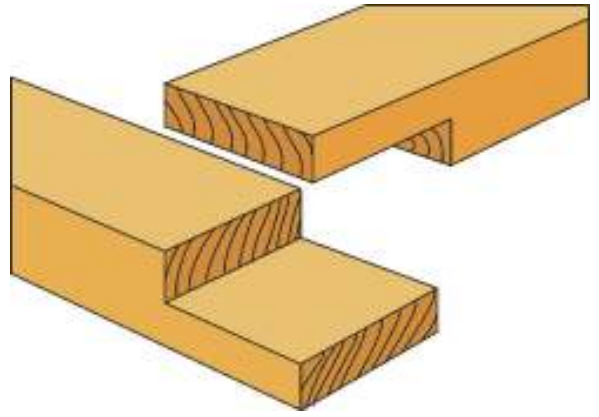
Stopped Housing

These are harder to make, but are neater because the joint does not show on the front edge.



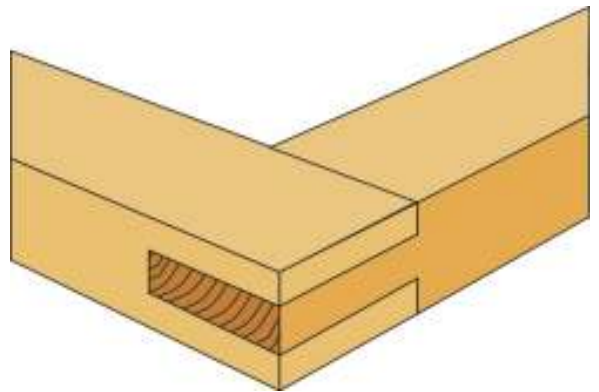
Corner Halving Joint

This joint is stronger than the butt joint and is also simple to make, but still needs strengthening with screws or dowels.



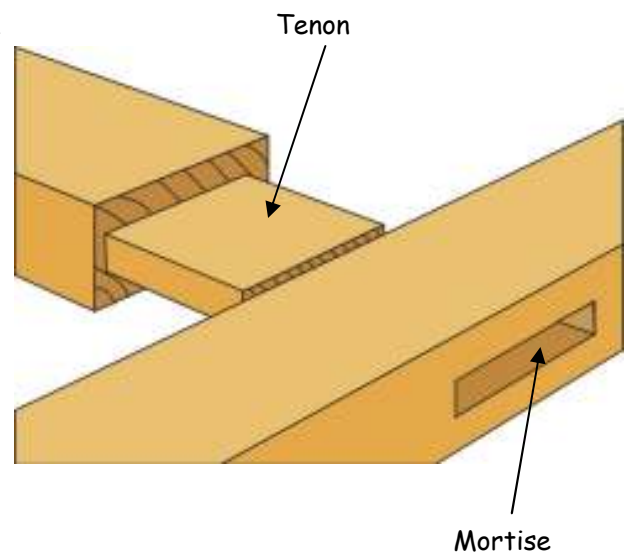
Corner Bridle

This joint is strong and fairly easy to make. They can be strengthened by dowels.



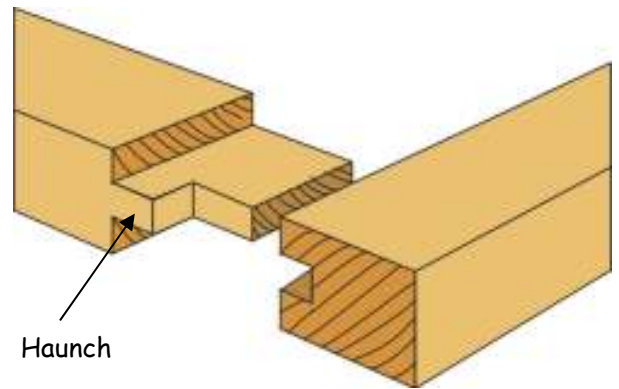
Mortise & Tenon Joint

The mortise & tenon joint is the strongest tee joint and can be further strengthened by wedging or dowelling.



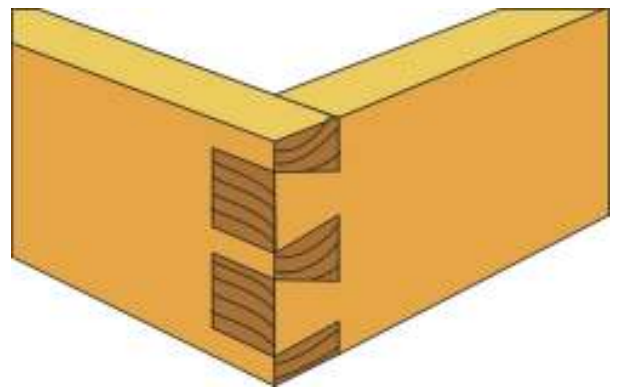
Haunched Mortise & Tenon Joint

This joint is used where the rail of a table join into the top leg of the table. This could be regarded as a hidden joint.



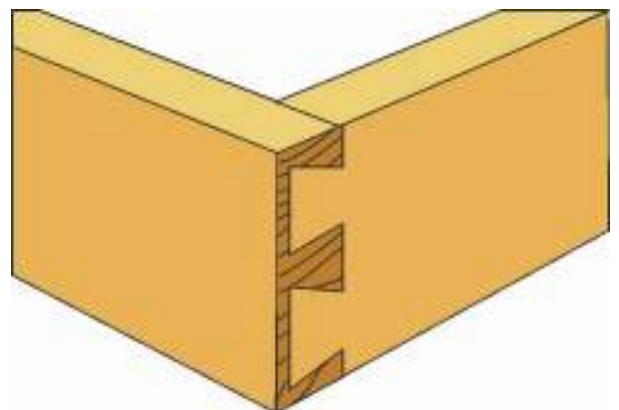
Dovetail Joint

This type of joint is very strong and can be only pulled apart in one direction. It is used to construct drawers.



Lapped Dovetail Joint

The Lapped Dovetail Joint is used in cabinet construction where the dovetail joint is used for strength but should not be seen from one side.



Man-made boards

Very wide boards (cut timber) made of hardwood or softwood are rare, expensive and liable to warping. They are in short supply because many of the world's rain forests are disappearing due to the over cutting of trees. Wide boards can be made by butt joining narrow boards together but this is time consuming and can also warp. One way which has overcome this problem is the development of man-made boards. These boards are generally very strong although some are stronger than others, depending on how they have been made. There are many different types of man-made board available and among the more common are PLYWOOD, BLOCKBOARD, CHIPBOARD, MDF and HARDBOARD

Plywood

This is made from layers or plies of wood glued together so that the grain of each layer of ply is at right angles to the next. There is always an odd number of plies (layers) so that the grain runs the same way on both sides of the board. Plywood can be finished with a decorative hardwood veneer or melamine (thin plastic coat)



Blockboard

These are made by sandwiching strips of softwood between two plies. As with the plywood the strips of softwood run at right angles to the top and bottom plies. It can also be finished with a hardwood veneer. It is only suitable for interior use.



Chipboard

Chipboard is made by gluing small wood chips together under heat and pressure. As with blockboard it is only for interior use. Examples of chipboard use are kitchen work tops which generally have a melamine-faced finish.



Hardboard

This is made by mixing wood fibres with water and synthetic resin glue, hot pressing it into sheets and leaving to dry. It is not very strong and is generally only used internally.



MDF (Medium Density Fibreboard)

This is made in a similar way to hardboard but is much thicker. It has a smooth surface that takes paint and varnish very well and makes an excellent ground for veneers.



Finishing

Finishing is the name given to the process of coating or sealing wood. This is what gives the surface of the wood its final finished appearance. There are a wide variety of finishes available and depending on the final use of the wood will most likely determine what finish will be applied.

The most commonly used finishes in Earnock High workshops are; Water Based Varnish, Wax Polish and Danish Oil.

Before applying a finish it is important to make sure that the surface is very smooth and free from blemishes by using different grades of abrasive paper in the direction of the grain.

Woodworking Tools

The Ratchet Brace

The ratchet brace is used to hold and turn various boring bits when cutting circular holes in timber. The head of the brace rotates on a ball bearing washer to reduce friction. The other end of the crank has a chuck containing "alligator" jaws which hold the bit. The chuck is attached to the brace by means of a threaded core at the end of the crank. The ratchet enables the brace to be used in a confined space where it would be impossible to make a complete revolution of the crank. The sweep of the crank is usually about 250mm.



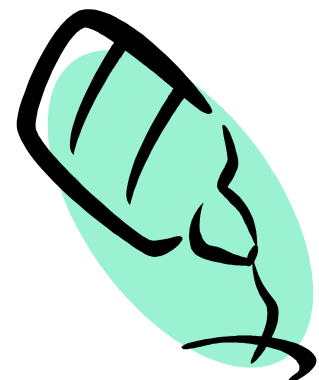
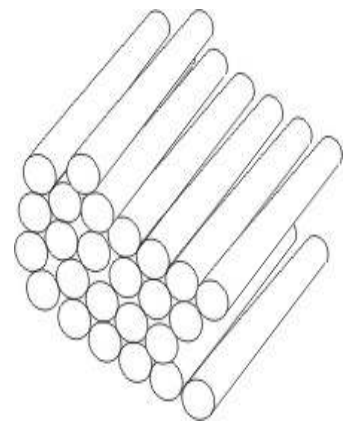
Grain

When we talk about the *GRAIN* of the wood, this refers to the fibres of wood which are all squeezed very tightly together. Try to imagine if we took a really strong magnifying glass to look at the fibres they would look like drinking straws all stacked on top of each other. When planing end grain it is important that the wood does not split.

PVA Glue

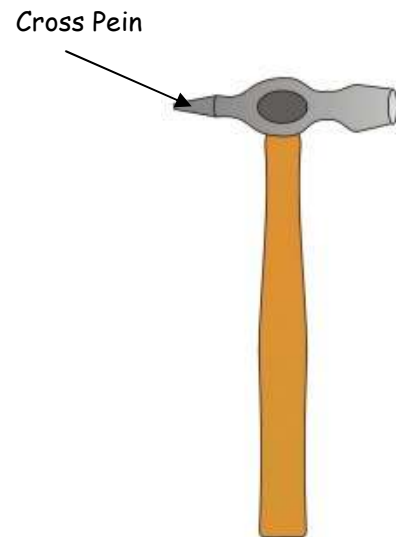
Polyvinyl acetate (PVA) is probably the most common type of wood glue used in the school workshop. It is a white water based liquid adhesive (i.e. it is mainly made of water). It is supplied to schools in plastic containers. It is easy to apply, non-staining (although excess glue should be wiped off with a damp paper towel) strong and attains its maximum strength usually after twelve hours. Page 10

Fibres



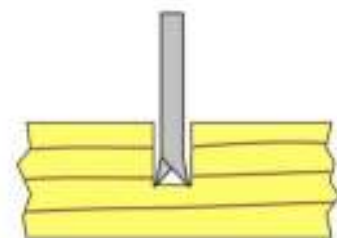
Cross Pein Hammer

This is a very light weight hammer with a cross pein at one end. This hammer is used for light work with the cross Pein part being used to start driving short nails and panel pins into the wood. The shaft of the hammer is made from a special wood called Hickory. The reason for using hickory is because it is a very tough wood and therefore less likely to break when being used.



Tenon Saw

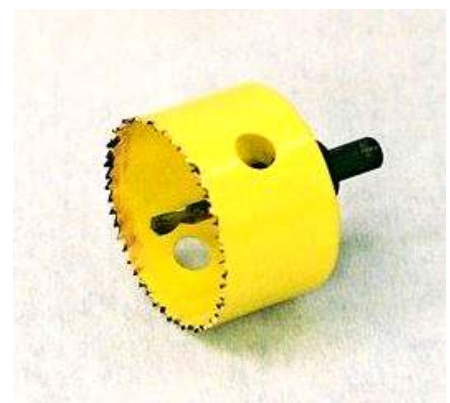
The Tenon Saw is used for general sawing in wood. The fine teeth 12 - 14 per 25mm ensure a fine saw cut or KERF. To help prevent the saw blade jamming when sawing the teeth are SET, i.e. the first tooth is bent to the right and the second to the left and then right and so on. The purpose of this is to make a bigger gap than the thickness of the blade, this will allow the blade to cut without jamming. Your teacher will demonstrate what this means. The Tenon Saw has a brass or steel Stiffening Rib to strengthen the back of the blade and prevent it from being too flexible.



Kerf

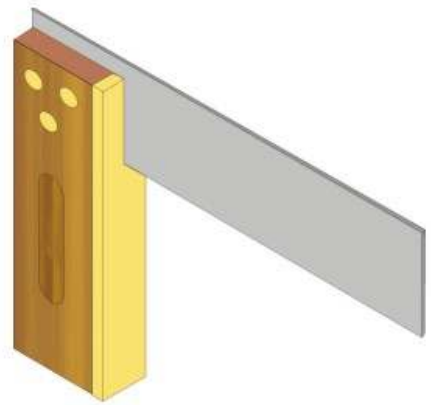
Hole Saw

This tool is used to drill big holes in wood and is generally fitted to an electric drill. The hole saw has a centre drill attached which is called the PILOT drill. It is called this because it ensures the hole saw makes a hole exactly where you want it.



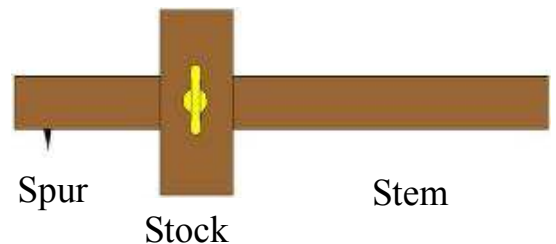
Try Square

The try square is used to test the squareness of material and mark out lines at **right angles** to a given surface on wood or plastic. The stock is made from rosewood with a tool steel blade.



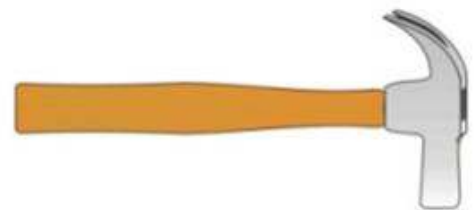
Marking Gauge

The marking gauge is used for marking lines **parallel** to an edge on timber (cut wood). The stock and stem are made from beech because beech is a very hard wearing wood, whilst the spur is made from steel sharpened to a point. The thumbscrew is made from plastic or box wood and then threaded into the stock.



Claw Hammer

This hammer is used for heavy nailing (i.e. used for hammering big nails). The claw part of the hammer is used to remove nails that have already been driven into the wood.



Pincers

Pincers pull out nails which the claw hammer cannot grip, either because they are too small or do not have a head. The small thin claw on the handle of the pincers will fit under the heads of small nails and lever them out far enough for the pincers to grip



Nail Punch

There are different sizes of nail punch to suit different sizes of nail. They are used to drive headless nails and panel pins below the surface, so that the hole can be filled with a suitable wood filler.



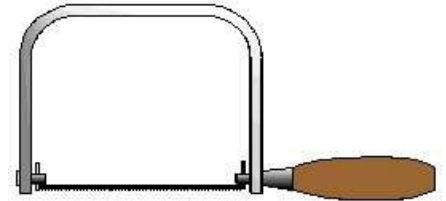
Woodworkers Bench Vice

This vice is fixed to the bench so that the top of the wooden jaw facing the bench is level with the top of the bench, it is used for holding wood.



Coping Saw

The coping saw is used to cut curves and other awkward cuts in wood. It is also unique as it is one of only a few saws which has its teeth facing backwards. In normal sawing the cut is made in the forward stroke but with the coping saw the cut is made on the backward stroke.



Carpenters' Mallet

The carpenters' mallet is used in woodwork for hitting chisels or for assembling parts of wood together. The carpenters' mallet is made from a hardwood called beech as this wood is very hard wearing.



Mortise Chisel

As the name suggests this chisel is used to cut out the mortise in a Mortise and Tenon joint. It is stronger than the bevel edged chisel to allow it to be struck with a mallet and has a shock absorbing leather washer between the handle and the blade.



Bevel Edged Chisel

The bevel edged chisel is used for paring and general chiselling of wood. Two edges of the blade are bevelled along their length and this makes it suitable for accurate joint work. The size of the chisel is indicated by the width of the blade (3mm - 50mm)



Safety Note

When working with the bevel edge chisel or any type of wood chisel **ALWAYS** keep both hands behind the cutting edge.

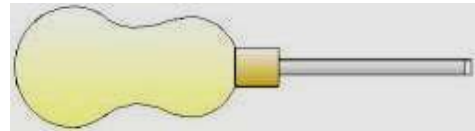
Hand Drill or Wheel Brace

The hand drill or as it otherwise known, the wheel brace is used to drill holes up to a diameter of 8mm. If the hole to be drilled is close to an edge the handle can be removed to allow the drill to get close in.



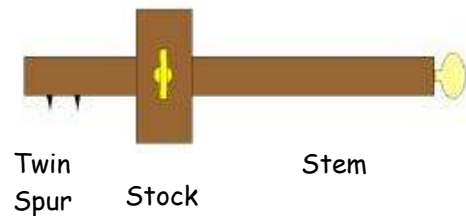
Bradawl

This is used for making small holes in wood prior to starting to insert a screw.



Mortise Gauge

This tool is very similar to the marking gauge but this gauge marks two parallel lines opposed to the marking gauges one line. It is ideal for the marking out of mortise and bridle joints.



Marking Knife

The marking knife is used to mark lines on wood, usually across the grain. A knife cuts a thinner more accurate line than a pencil. It is nearly always used with a try square.



Rasps

A rasp is used for rough shaping of wood and other soft materials. The most commonly shaped rasp is the half round.



Sliding Bevel

Used to mark out lines on wood at an angle to a given surface on wood.



Screwdriver (straight slot)

This type of screwdriver is used to drive slotted screws into wood. The main disadvantage of its use is that it can slip out of a straight slot and damage both the head of the screw and the wood.



Phillips Screwdriver

The main advantage of the Phillips slot is that the screwdriver blades do not slip out of the slots so easily.



Pliers

This tool is mainly used to grip small items but can also cut wire.



Saw Board

The use of the saw board prevents the workbench from being damaged by continual cutting. It also allows timber to be held in a steady position whilst cutting is taking place.



Auger Bit

For boring deep holes in wood. The tang of the bit is square to allow fitting into the ratchet brace.



Flat Bit

These bits are used in electrical drills for fast, accurate drilling in both soft and hard woods.



Twist Drill

This type of drill can drill holes in wood, plastics and metals. Common sizes are 1mm to 13mm.



Rebate Plane

This type of plane is generally used to make a REBATE on the edge of a piece of wood as can be seen from the sketch opposite. It can use a number of different interchangeable blades which allow different types of cut to be made



The Jack Plane

The Jack Plane is used for producing smooth flat surfaces and edges on wood. The overall length of the jack plane is 250mm and the cutting iron (this is the blade that shaves the wood) is either 50mm or 60mm wide.



Block Plane

The block plane is used for trimming the end grain, mitres or interlocking grain.



Router Plane (*Granny's Tooth*)

This plane is used for trimming the bottom of housing joints to the correct depths.



Plough Plane

The plough plane is used for ploughing grooves parallel to an edge. It must be used with the grain i.e. in the same direction in which the grain runs.



Bullnose Rebate Plane

Used in forming stopped rebates and chamfers. It could be described as the smaller brother of the block plane.



The Pillar Drill

The pillar drill (or Vertical Drill) can either be bench mounted or floor mounted. The chuck (part which holds the twist drill) can hold drills up to a 13mm diameter. The adjustable table which holds the work piece can slide up or down and can be locked at a desirable height.

Safety Check

Before Drilling - ensure the drill is secure with the chuck key removed, eye protection on, guard in position and work piece securely held.



G Cramp

This is used to hold work down onto a bench and to cramp small pieces of glued wood together.



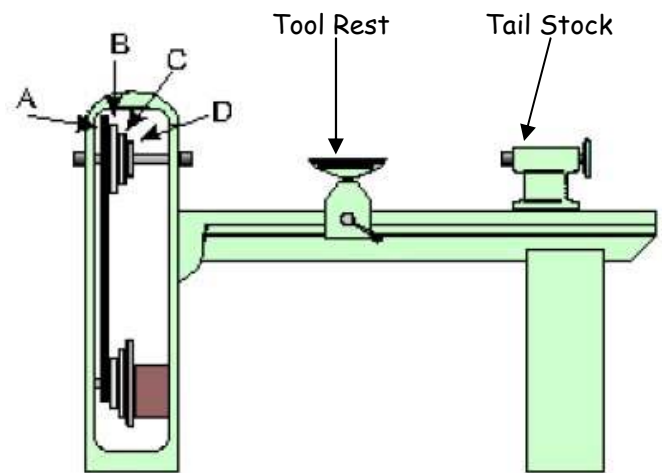
Sash Cramp

This cramp is used to hold frames, carcasses and butt joints while the glue sets. Always ensure that the wood being cramped is protected from damage by using scrap pieces of wood between the cramp and the frame/carcass being cramped.



Wood Turning Lathe

The wood lathe is a machine used to create cylindrical objects in wood, i.e. wooden bowls, table legs, etc. A piece of wood is secured between two points called the HEADSTOCK and the TAILSTOCK. The HEADSTOCK has a motor enclosed and is therefore the end which actually turns the wood.



A—D change speed pulleys

Wood Turning Tools

Wood turning tools are used to shape the work piece. Depending on what shape is required will ultimately determine what type of tool will be used. The tool rest can be seen on the drawing above, this is used to support the tools while shaping is being carried out.

Spindle Gouge

This round nosed gouge takes over from the roughing-out gouge for general between centre turning



Round Scraper

These scrapers are used for working inside bowls and goblets



Parting Tool

The parting tool as it's name implies is used to part off the "turned wood" from the remaining wood at either end.



Centre Fork

The centre fork is secured in the revolving spindle (headstock). The fork is driven into the wood to be turned, the fork then turns the wood.



Face Plates

Face plates are secured to the headstock of the lathe and are used to hold blank pieces of wood which can then be turned into wooden bowls.



Mortise Machine

A mortise machine appears to drill a square hole in wood. The machine actually drills a round hole but because the drill bit is surrounded by a hollow square chisel, while the drill is creating the hole, the chisel is cutting the edges away from the hole leaving the mortise. (square hole)

