

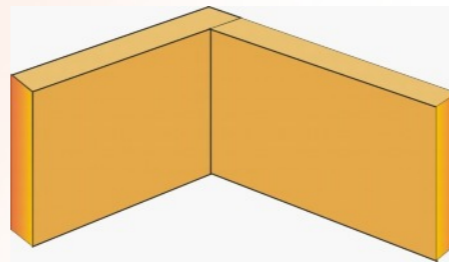
2 THEORY joining materials - wood

Wood 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.

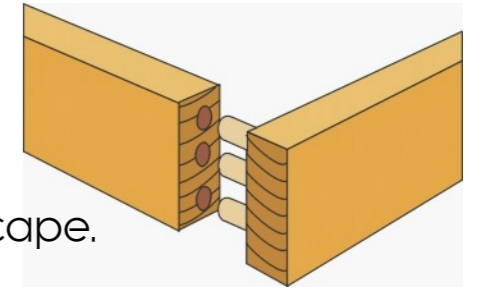
Butt Joint

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.



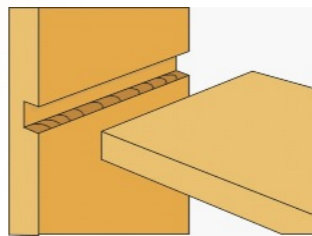
Dowelled Joint

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.



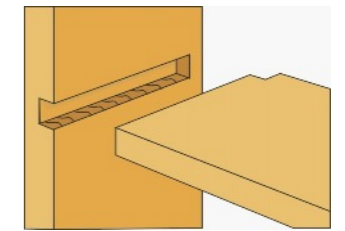
Through Housing

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



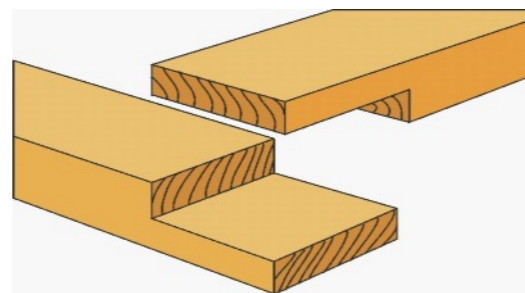
Stopped Housing

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



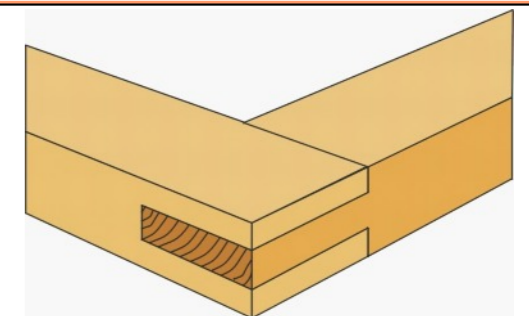
Corner Halving Joint

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



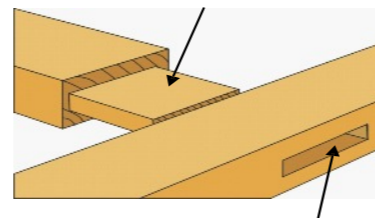
Corner Bridle

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



Mortise & Tenon Joint

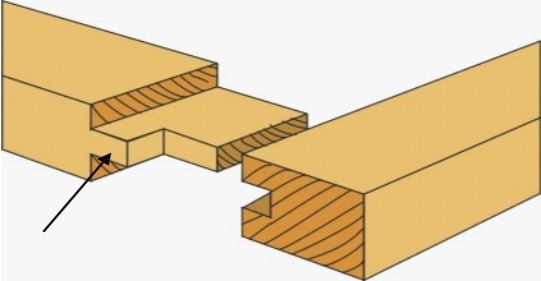
The mortise & tenon joint is the strongest tee joint and can be further strengthened by wedging or dowelling.



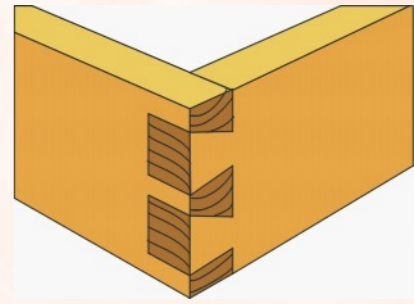
THEORY joining materials - wood

Wood joints

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.




Wood Adhesives

PVA - Polyvinyl acetate is a component of a widely used glue type, commonly referred to as wood glue, white glue, carpenter's glue, school glue, Elmer's glue (in the US), or PVA glue.

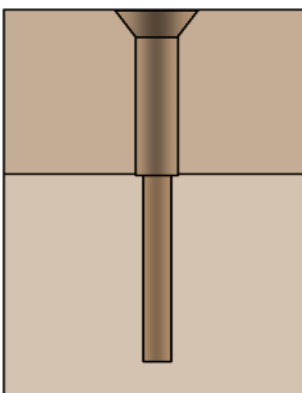


Polyurethane glue (trade names include Gorilla Glue and Excel) bonds to textile fibers, metals, plastics, glass, sand, ceramics, and rubber, in addition to wood. Polyurethane wood adhesives work through a reaction with water which cures the adhesive.



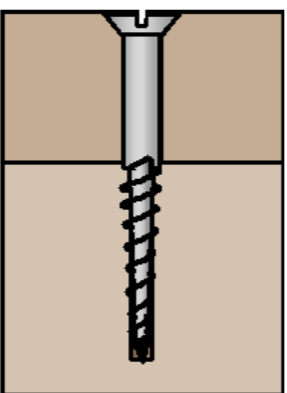
Screws & nails

Countersink to get Screw flush with top

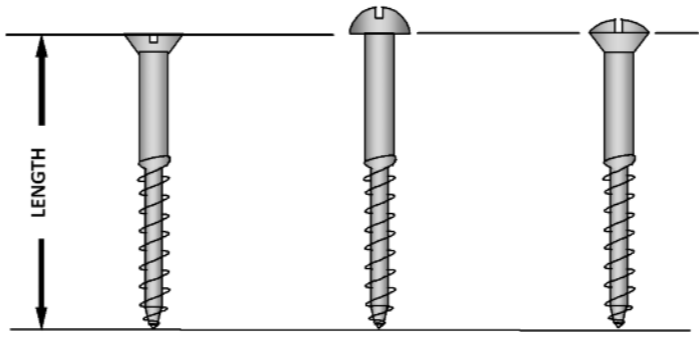


Clearance hole:
Drill to diameter of Shank

Pilot hole:
Drill to diameter of root thread






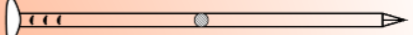
Screw



Counter-sunk Head Round Head Raised Head



Nails

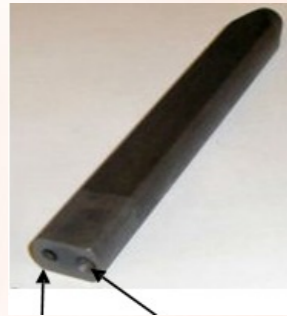
○ Head Shape		Panel Pin
○ Head Shape		Clout Nail
○ Head Shape		Oval Wire Nail
○ Head Shape		French or Wire Nail



2 THEORY joining materials - metals

Metals - Riveting

Rivet Set and Snap

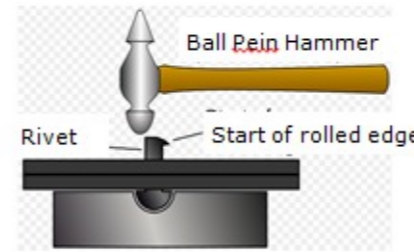


This tool allows us to ensure that the metal being joined and the rivet are all held together firmly. A ball peen hammer is then used to flatten the rivet and secure it

Types of Rivet



The set hole The snap hollow

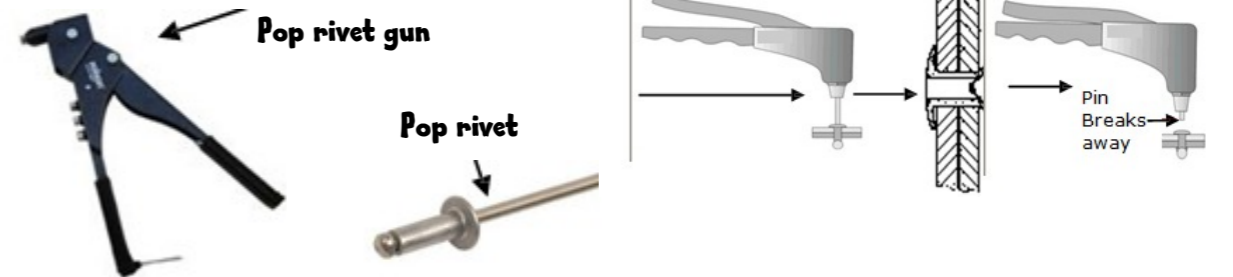


Ball Pein Hammer
Used for general metalwork where a hammer is required.



Pop Riveting

When Pop Riveting the rivet is placed in the holes of the metal being joined. The Rivet gun is then placed over the rivet and the handles squeezed together. As you apply more pressure the rivet expands in the hole until the pin eventually breaks away.



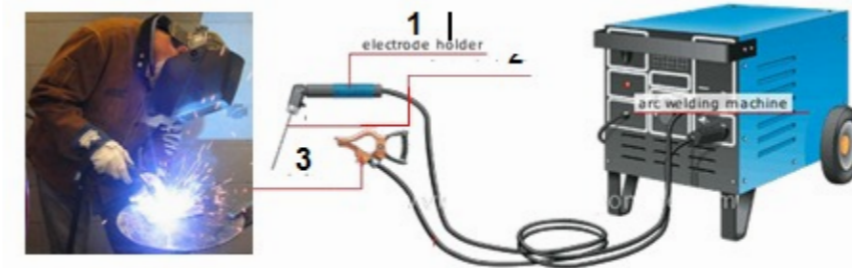
Welding

Spot/Resistance Welding Used for joining thin sheet metal. An electric current is passed through the copper rods and the metal being Joined, which causes heat to build up and melt the metal



Arc Welding

Used for joining thick metals including bar form and round form. Basically a metal filler is pushed through the electrode holder using gas. As this is happening electricity is used to produce heat which melts the metal being joined. The metal filler then fills gap to create a solid weld together.



THEORY joining materials - metals

Soldering

Used for joining thin sheet metal and thin bar. A solder bolt is heated in the forge. Once hot enough it is used to melt a filler metal along the joint of the metal parts being joined.



Gas air
torch

Filler
Metal

Brazing

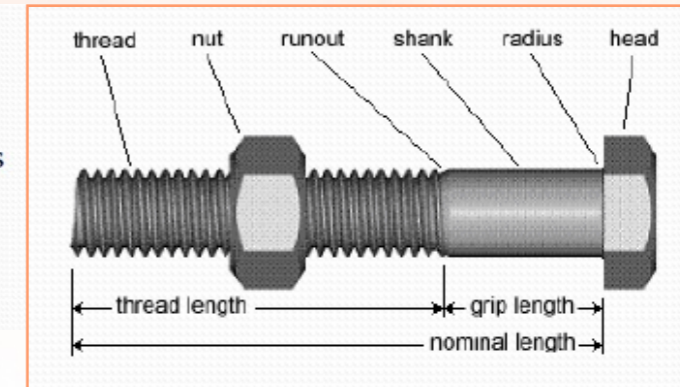
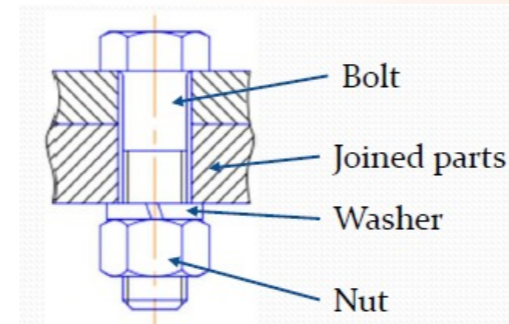
Used for joining sheet metal and thin metal bar/ rod. A gas air torch such as those seen at the forge, is used to melt the metal filler along the joint where the metal is being joined.



Solder Bolt

Nuts and Bolts

A nut and bolt is a non permanent fixing and therefore is suitable for jobs where parts need to be free to come apart. Bolts are available in different diameters, from M2 (2mm diameter) up to M40 and beyond. When used to secure 2 pieces of metal, a washer should be positioned between the nut and the piece of metal. There are 2 reasons for doing this: To distribute the pressure of the nut or bolt evenly over the part being secured, reducing the chance of damage thereto, and to provide a smooth surface for the nut or bolt to bear on, making it less likely to loosen as a result of an uneven fastening surface.



Adhesives

Steel epoxy: A two-part compound sold in tubes, steel epoxy is quite similar to regular epoxy. It forms a very strong, durable, heat-and water-resistant bond and is recommended for patching gutters and gas tanks, sealing pipes, and filling rust holes. Drying time is about 12 hours; curing time is one to two days.

Steel putty: This metal putty consists of two putty-consistency parts that are kneaded together before use. It forms a strong, water-resistant bond and is recommended for patching and sealing pipes that aren't under pressure. It can also be used for ceramic and masonry. Curing time is about 30 minutes; when dry, it can be sanded or painted.

Plastic metal cement: Plastic metal is one-part adhesive and filler. It is moisture resistant but cannot withstand temperature extremes. This type of adhesive is recommended for use on metal, glass, concrete, and wood, where strength is not required. Curing time is about four hours; when dry, plastic metal cement can be sanded or painted.

2 THEORY joining materials - plastics

Plastics - Adhesives

Adhesives, or glues, are designed to bond material together. As there are many different types of material to be bonded, a wide range of adhesives have been developed. The strength of a glued joint depends on three things: the area to be bonded; the strength of the glue when set; and the bond between the material and the glue. To achieve a strong glued joint the area to be glued should be as large as possible, the correct glue should be used and the surfaces to be glued should be as clean as possible.

Here are some adhesives commonly used with plastics:

Epoxy resin (Araldite) – comprises two parts, a resin and a hardener. They are mixed in equal amounts and can be used on most materials.



Acrylic cement (Tenso) – thick clear liquid with unpleasant fumes, specially made for acrylic.



Contact adhesive – thick brown rubbery glue commonly used to stick down plastic laminates when brought together the surfaces cannot be moved for adjustment.



Super glue – bonds on contact and is used on small surface areas.

THEORY joining materials - clamping

Clamping your work

G-Clamps

G-clamps are used to hold pieces of wood together, most often when gluing. The screw section is tightened and the wood is sandwiched between the two flat pads with great pressure. Care must be taken when clamping as some woods can be soft and become marked permanently with the pressure of the pads, this can be stopped by putting a larger piece of scrap wood between the clamp and your job. They are named G-clamps because the shape of the clamp looks like the upper case letter "G".

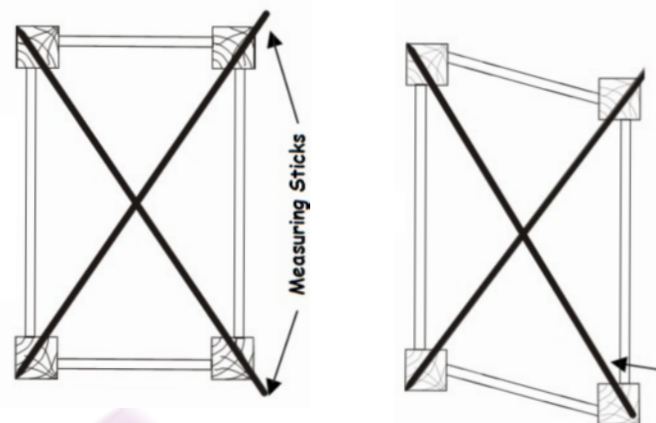
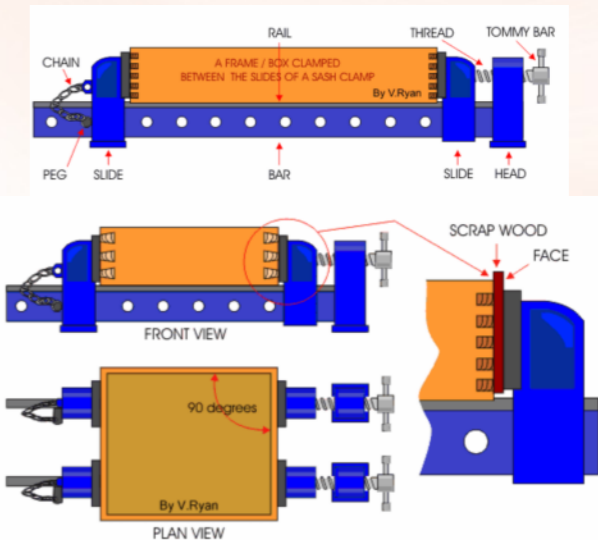


Sash Cramps are also used for holding pieces of wood together, usually whilst gluing. They are used for bigger jobs due to the long. They are normally used in pairs to hold together wooden frames or carcasses. They work similarly to the G-clamps as they also sandwich the wood between its flat pads however the size of the cramp can be changed by sliding the back pad back and forth until then locked into place, before tightening up the screw at the other end.

Sash Cramps

Gluing up Frames

Before any gluing of frames can be carried out, the frame must be assembled DRY. i.e. it needs to be checked to ensure that it is Square and is not affected by Winding (Twisting of the frame). To check if the frame is square it is ideally done using long straight sticks to check the diagonals.



As can be seen from the drawing opposite, if a frame construction is Square, the diagonal distance (Corner to Corner) between each corner will be the same distance. If the frame is not square the diagonal distance from corner to corner will be greater for one of the corners as shown opposite. This is corrected simply by adjusting the sash cramps until a satisfactory square - ness is achieved.

Diagonal much longer than opposite diagonal