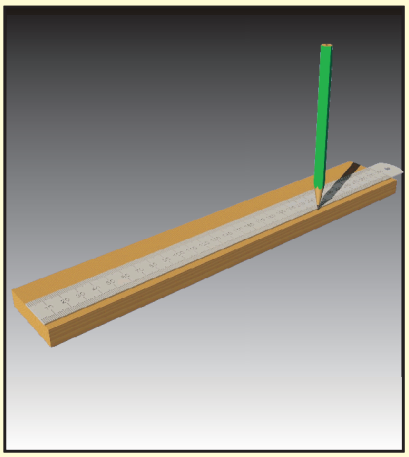
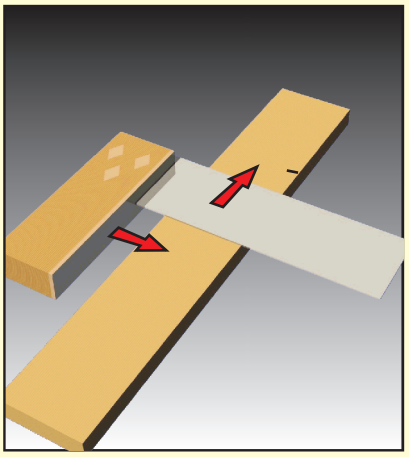
Student's Name: Date:

Marking Out

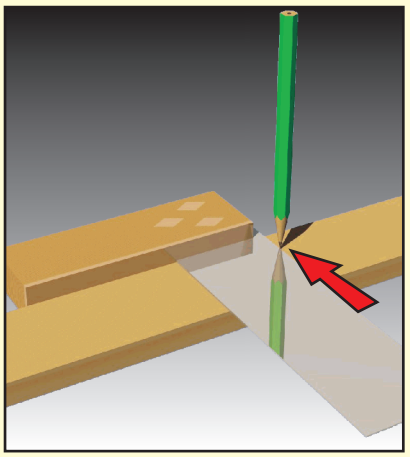
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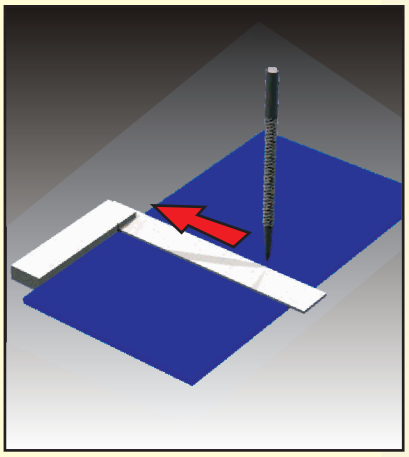
Stage 1: Measure the length of wood you require using a steel rule and mark it off using a sharp pencil.



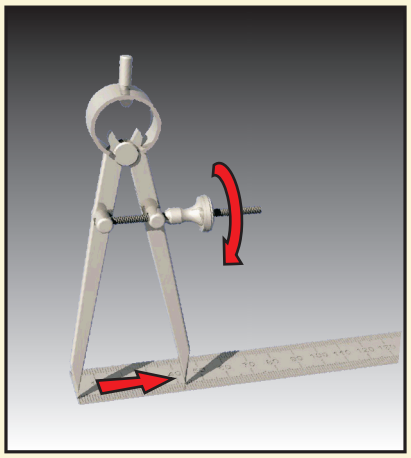
Stage 2: Place the 'handle' of a Try Square against the edge of the wood and slide it along so that the top edge lines up with the mark.



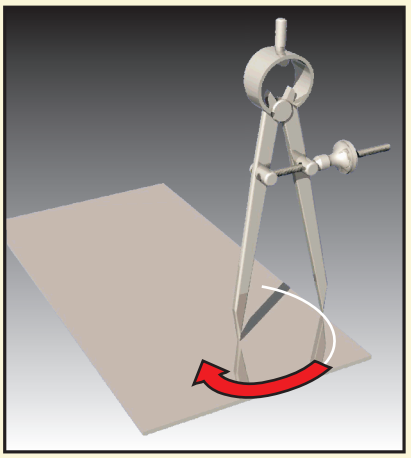
Stage 3: Mark off a line across the face of the wood. Rotate the wood and mark off each face so that a line runs all the way round.



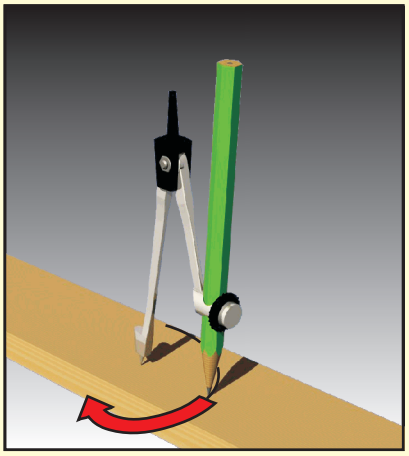
Stage 4: To mark off right angles on plastics and metals follow the same procedure but use an Engineers square and scriber.



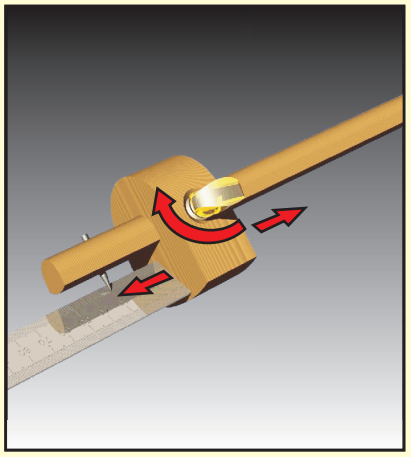
Stage 1: Use a set of Dividers to mark out a curve on metals and plastics. Adjust the legs to the correct radius by turning the screw as shown.



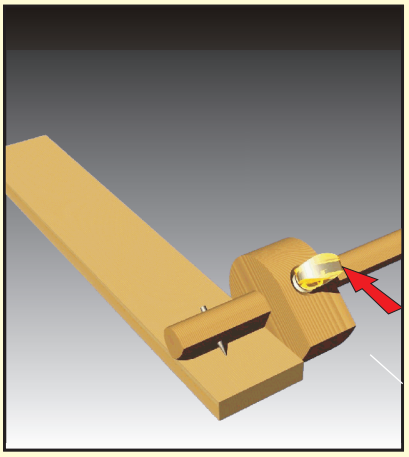
Stage 2: Mark out by pivoting the dividers around one leg whilst scratching the surface with the other.



Stage 3: To mark out curves on wood use a pencil and a normal set of drawing compasses.



Stage 1: To mark lines parallel to the edge of a piece of wood use a Marking Gauge. Set the distance you require by loosening the screw on the side and then sliding the body of the gauge along

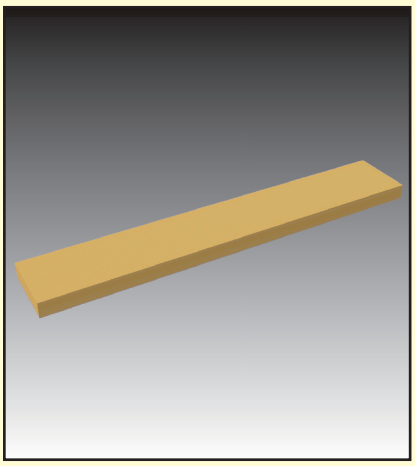


Stage 2: Slide the body of the Gauge along the side of the wood so that the point makes a scratch where you require

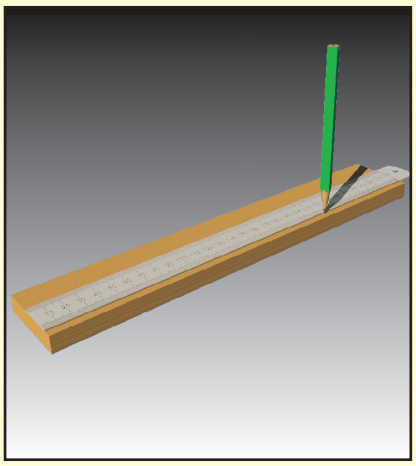
Tools & Processes

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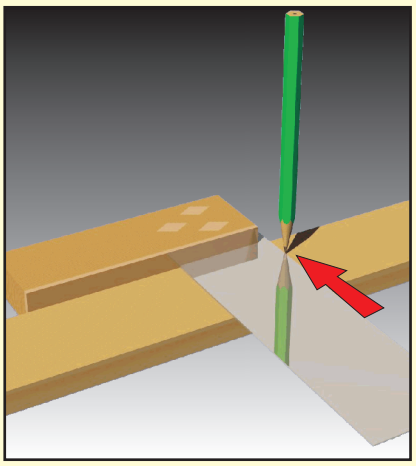
Using the Tenon Saw



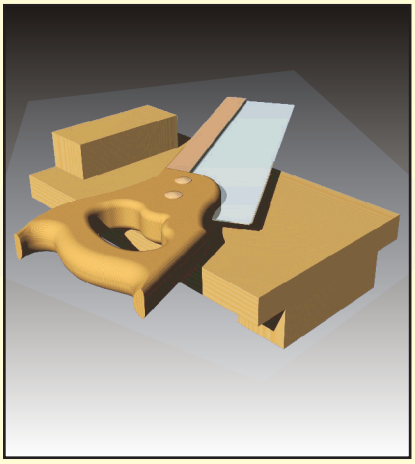
Stage 1: Select a suitable piece of wood.



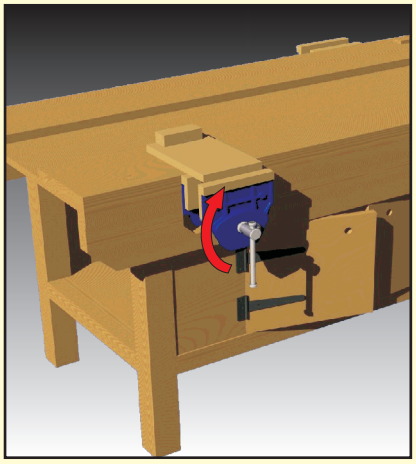
Stage 2: Accurately measure the length you require using a steel rule and mark it out using a sharp pencil.



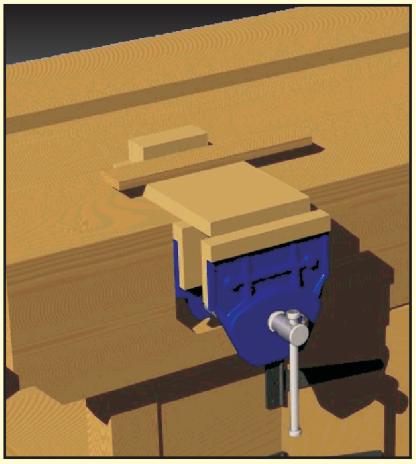
Stage 3: Use a Try Square to draw a line perpendicular to the edge of the wood.



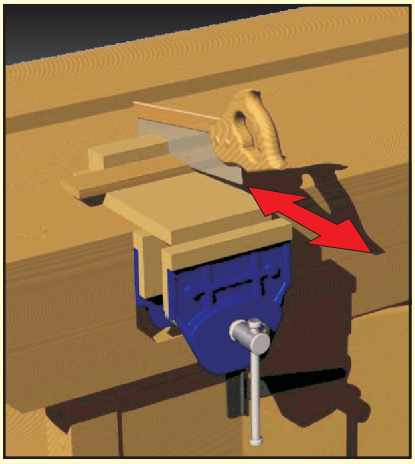
Stage 4: Get out a Bench Hook and Tenon Saw.



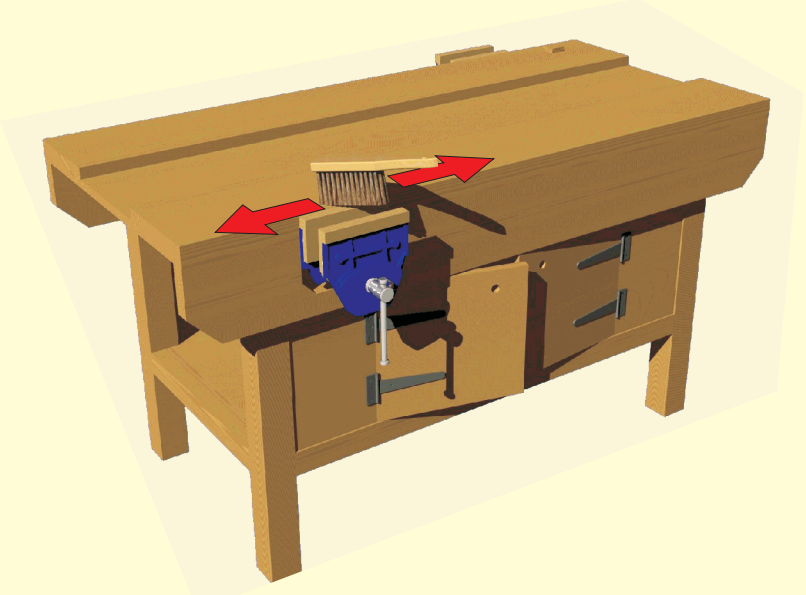
Stage 5: Tighten the Bench Hook into one of the wood vices on a workbench.



Stage 6: Position your wood onto the Bench Hook and 'clamp it' tightly down using your non sawing hand.



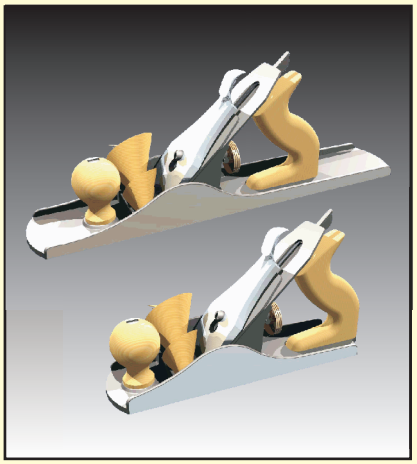
Stage 7: Position your saw with the blade just to the 'waste side' of the line and cut using the full length of the blade, making sure to push the saw through in a straight line.



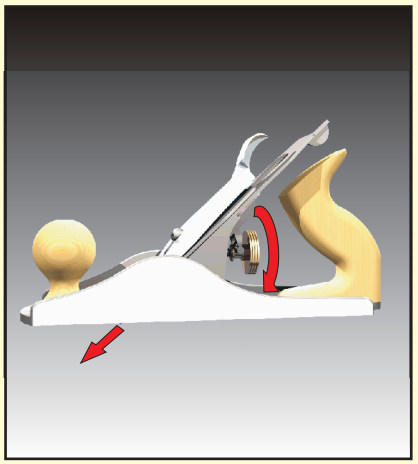
Stage 8: When you have finished, put all of your tools away and brush the bench down

Tools & Processes

Using a Plane



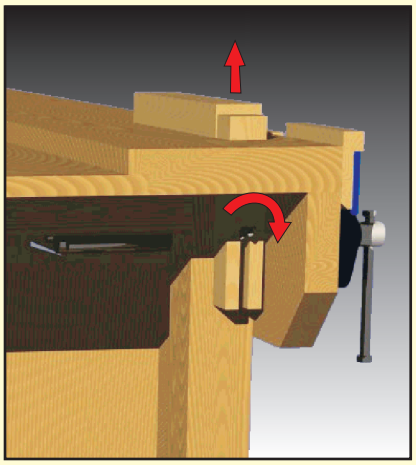
Stage 1: Select the correct plane for the task you are doing. To 'remove waste' use a Jack Plane and to 'finish off' a Smoothing Plane.



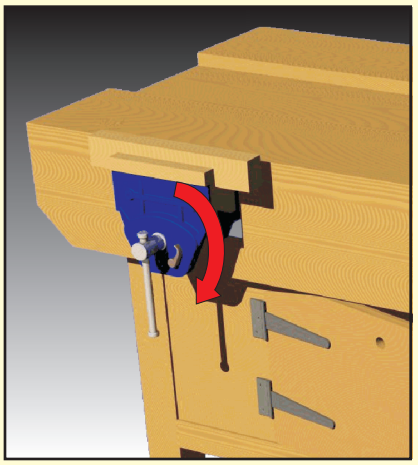
Stage 2: Adjust the depth of cut by turning the brass knob. (You may have to re-adjust this as you go to find the best setting.)



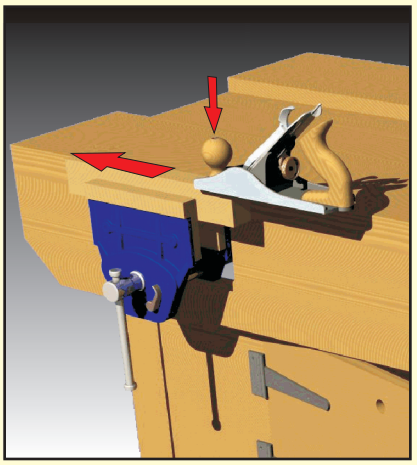
Stage 3: Use the lever on the back of the blade to make sure the cutting edge is parallel to the bed of the plane.



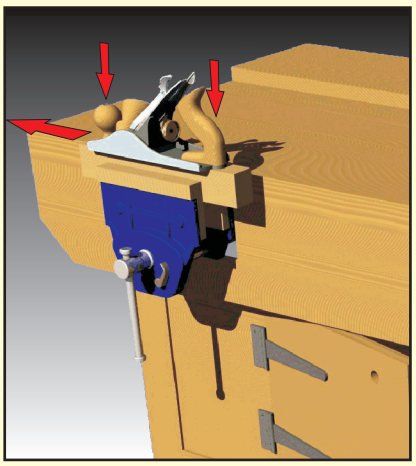
Stage 4: Either use the 'stop' on the end of the bench to support your work or...



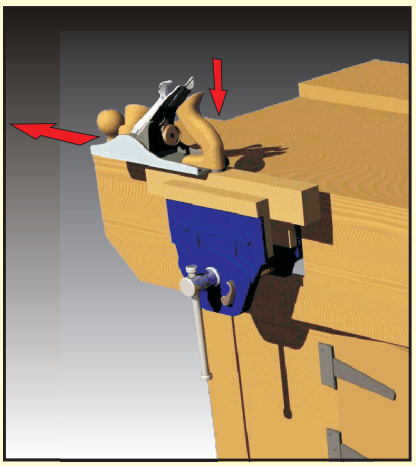
....use one of the wood vices. (It is a good idea to use 'packing' to protect the surface of you work.)



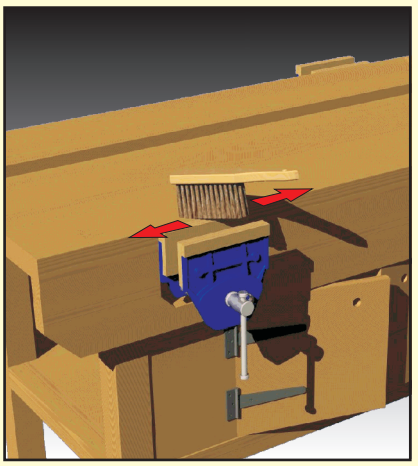
Stage 5: Start by placing the 'toe' of the plane on the wood and push down on the front handle.
Slide the plane forward



Stage 6: As you cut, transfer some of your weight onto the back handle.



Stage 7: When you come to then end of the cut transfer the rest of your weight to the back handle.
Ensure that the plane moves in a straight line throughout.

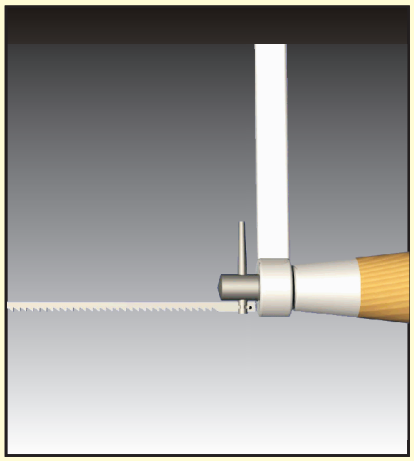


Stage 8: Brush down the bench and return the plane to the tool board when you have finished.

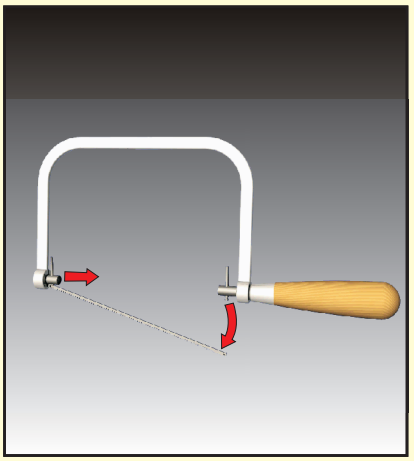
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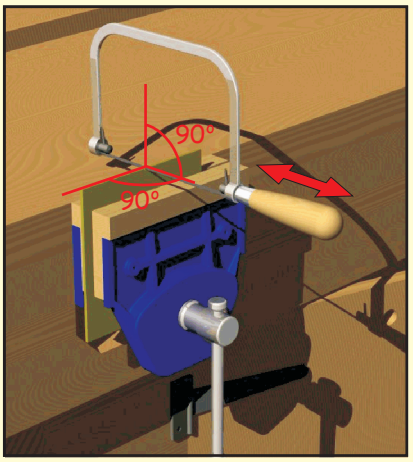
Using the Coping Saw



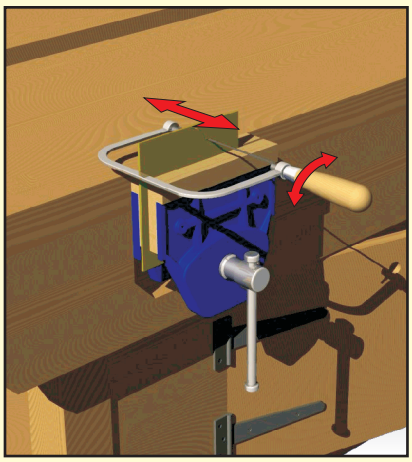
Stage 1: Start by checking the blade is the correct way round - with the teeth pointing backwards - so that it cuts on the pull rather than the push.



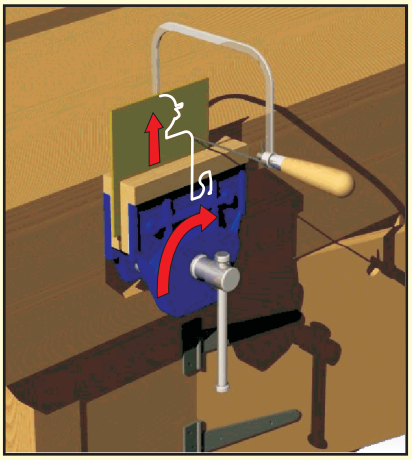
Stage 2: To remove the blade, slacken the handle and then push on the end of the frame to slacken the blade, which can then be un-clipped.



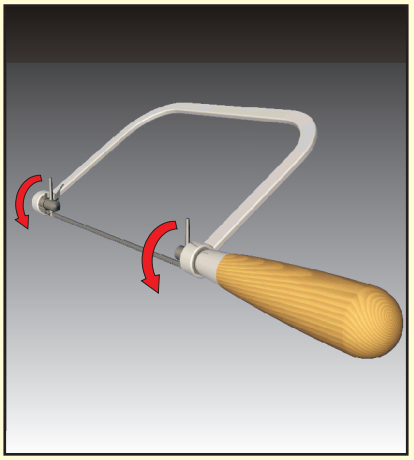
Stage 3: Hold the handle in both hands and move the blade backwards and forwards, keeping it perpendicular to the face of the material at all times.



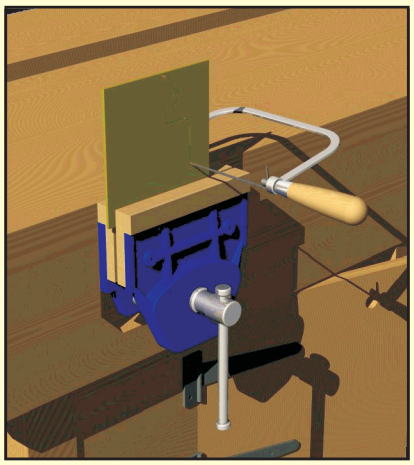
Stage 4: To change the 'direction of cut' gradually turn the handle as you continue to move the blade backwards and forwards.



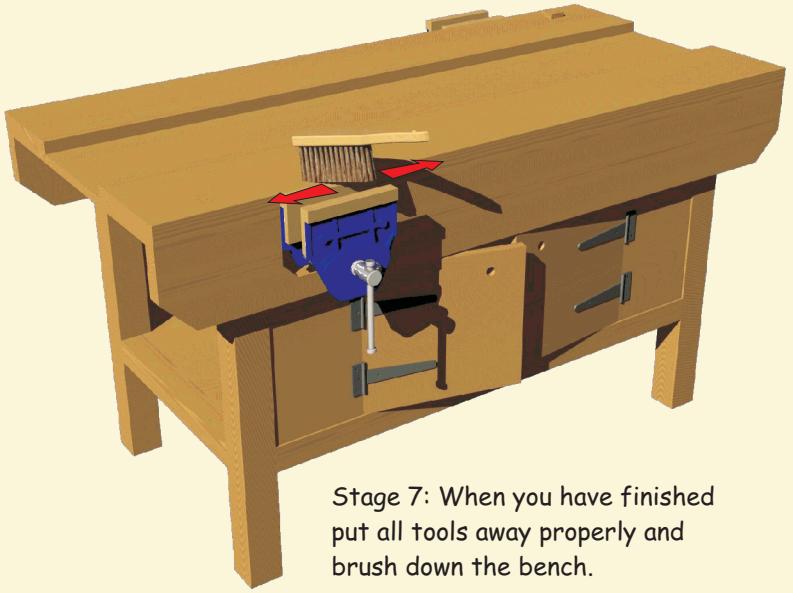
Stage 5: To avoid the 'work' wobbling keep it as low in the vice as you can - move it up as you cut, to avoid damaging the bench/vice.



Stage 6: To avoid the frame getting in the way it may be necessary to turn it to one side.....



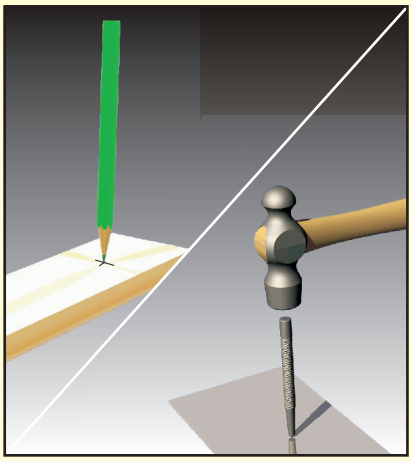
.. To avoid the blade twisting ensure that the pins remain parallel when turning the frame.



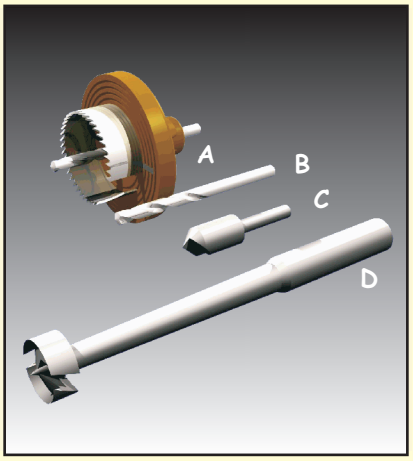
Stage 7: When you have finished put all tools away properly and brush down the bench.

Tools & Processes

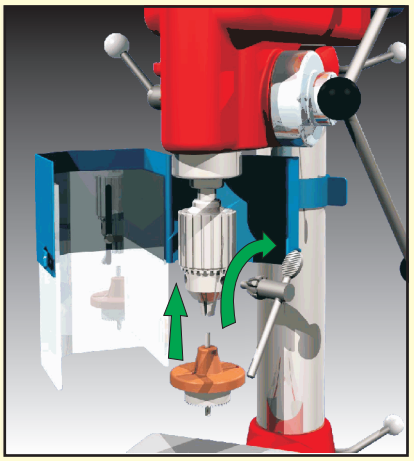
Using the Pillar Drill



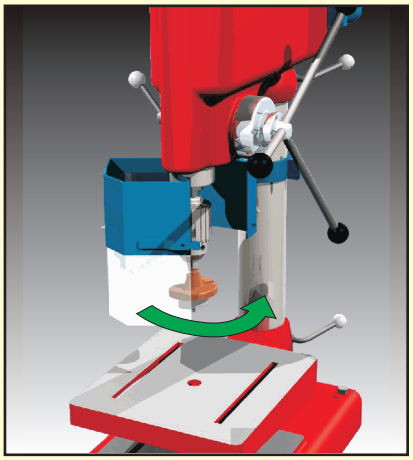
Stage 1: Start by marking out the centre of the hole you wish to drill



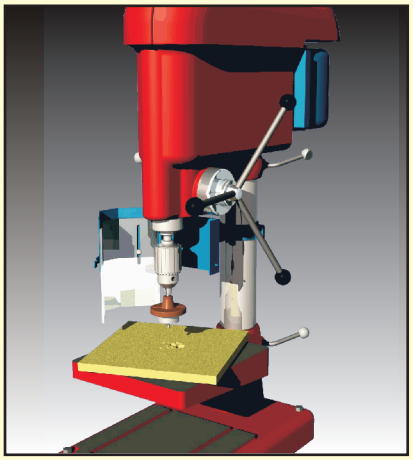
Stage 2: Select the correct drill bit- a) Hole saw,
b) Twist drill,
c) Counter sink,
d) Forstner bit.



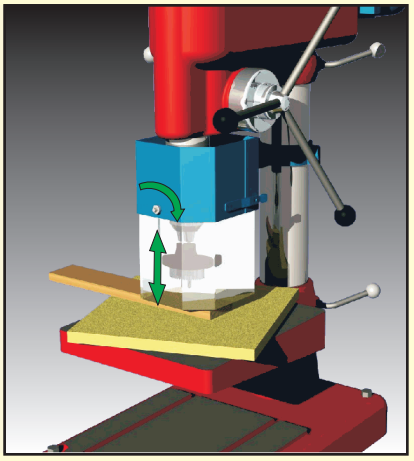
Stage 3: Fasten the drill bit into the chuck of the drill and tighten it with the chuck Key (Use the key in two of the three holes.)



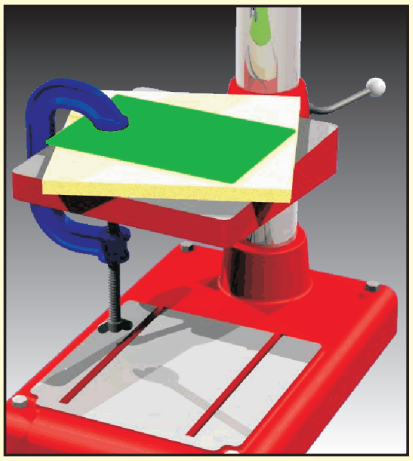
Stage 4: Remove the chuck key and close the chuck guard.



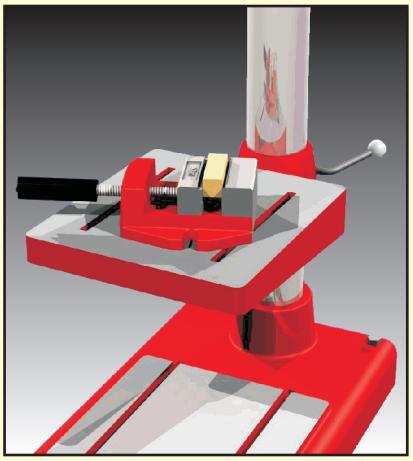
Stage 5: Place a piece of scrap wood onto the table/bed of the drill to avoid drilling into it.



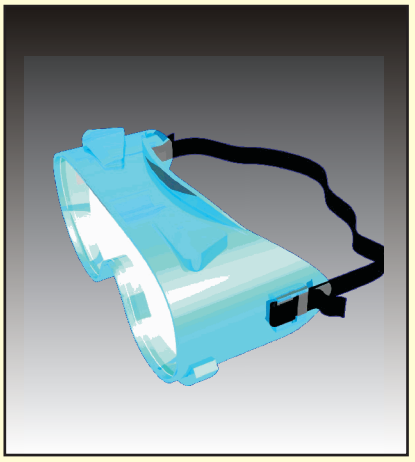
Stage 6: Adjust the height of the chuck guard visor by slackening the screw on the front. The visor should sit just above the top of the work.



Stage 7: When drilling sheet material or using a large diameter drill you should clamp your work down to avoid it spinning out of your hand..



.... For small pieces you should use a machine vice to hold your work



Stage 8: Always put on goggles and an apron before drilling. Remove jewellery and tie back long hair and loose clothing

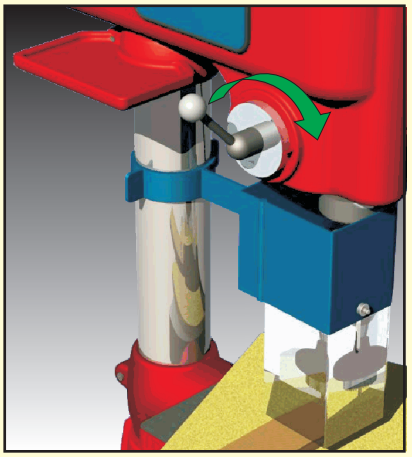
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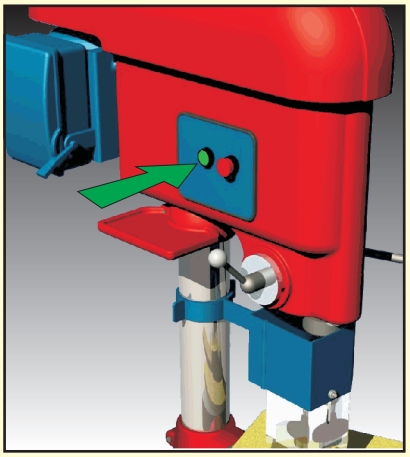
Using the Hand Drill



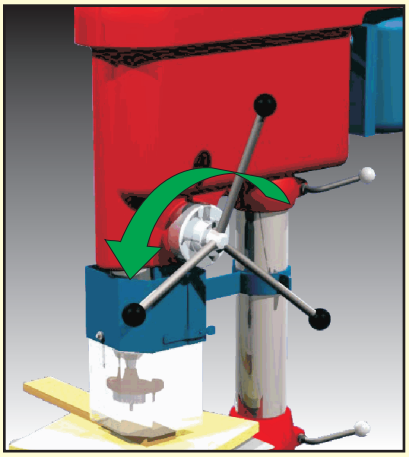
Stage 9: Make sure that nobody else is in the 'Safety Zone' before continuing - nobody else should help operate the machine.



Stage 10: You can control the depth of hole you produce using the depth stop - ask your teacher to help if you wish to do this.



Stage 11: Start the drill using the green button on the side of the machine.



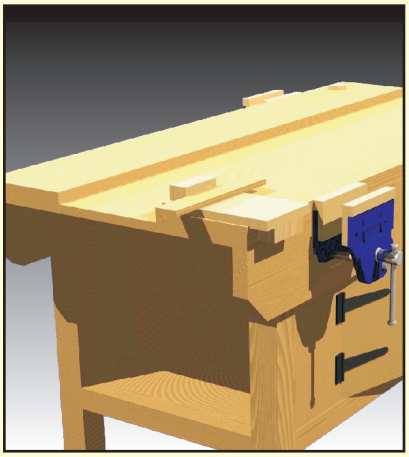
Stage 12: Steadily lower the drill bit using the lever on the side.



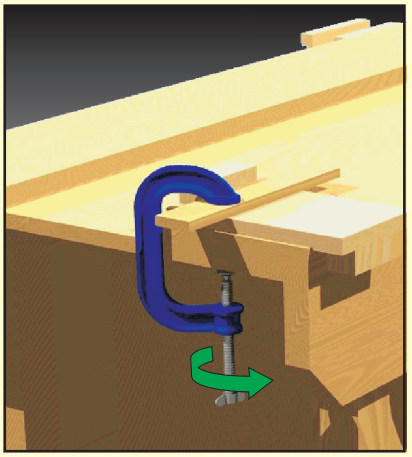
Stage 13: To switch off the machine you can either use the Foot Stop or the red button on the side.



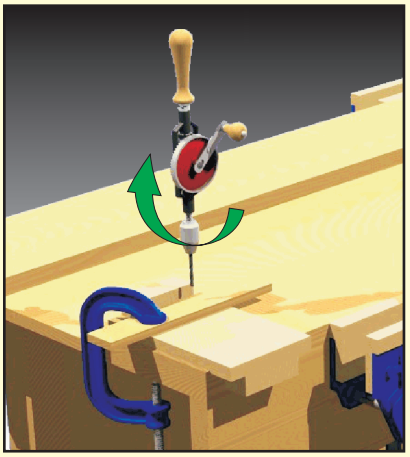
Stage 1: Fasten the drill bit into the chuck of the drill and tighten it up by hand. (Hold the handle to stop it spinning round.)



Stage 2: Place your work on a bench hook...

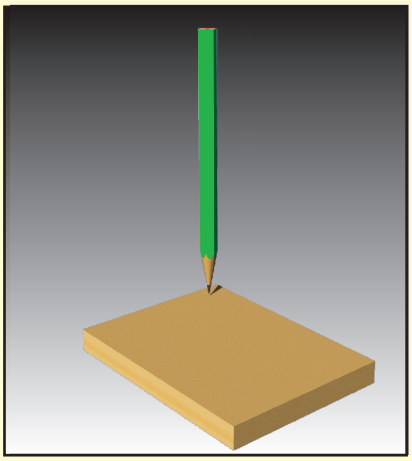


...and clamp it down to stop it spinning round.

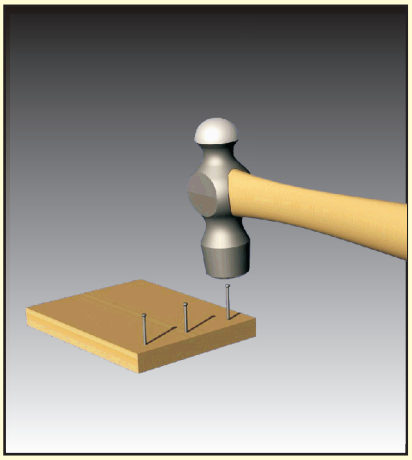


Stage 3: Position the drill and then rotate the handle clockwise to produce the hole. Continue to turn the handle clockwise as you remove the drill.

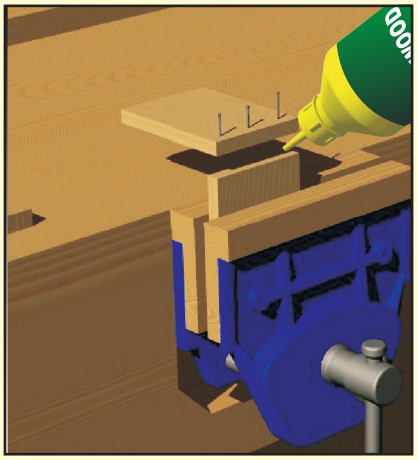
Nailing and Screwing



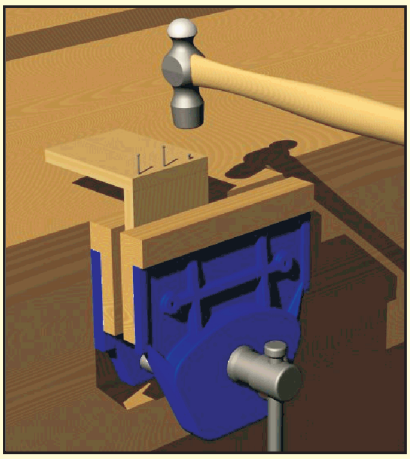
Stage 1: Mark out carefully the position of the nails/pins you wish to use.



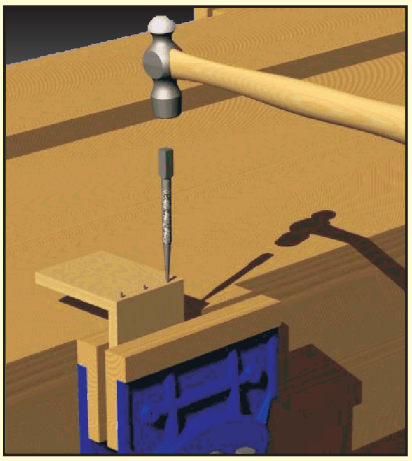
Stage 2: Start the pins/nails off by tapping them in a few millimeters before assembling the joint



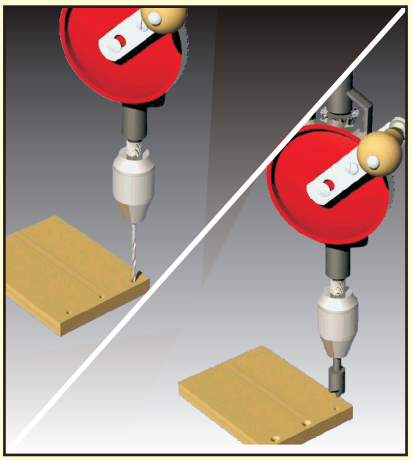
.Stage 3: Apply a thin bead of glue to the joint.



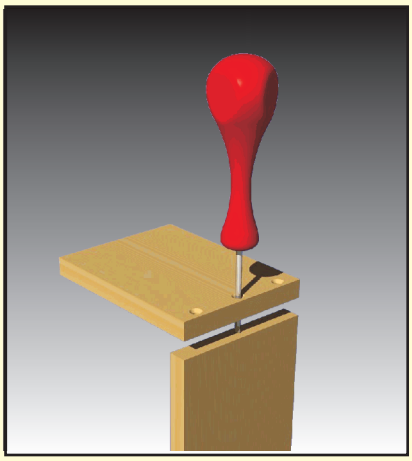
Stage 4: Tap the pins down to within a couple of millimeters of the surface, being careful not to hit the surface with the hammer



Stage 5: Use a nail punch to knock the heads of the pins just below the surface of the wood. Wipe off any excess glue with a damp cloth.



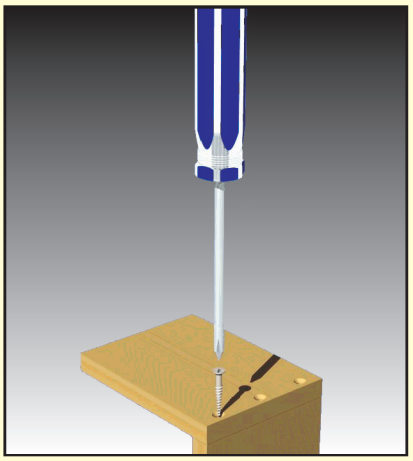
Stage 1: Drill holes slightly larger than the screw, through the first piece of wood. Then use a 'countersink' to 'open out' the holes to take the screw heads.



Stage 2: Use a bradawl to make small holes in the second piece of wood where the screws will go. (On hard woods you may need to drill a 'pilot hole'.)



Stage 3: Apply a thin bead of glue to the joint



Stage 4: Tighten the screws and then wipe off any excess glue with a damp cloth.

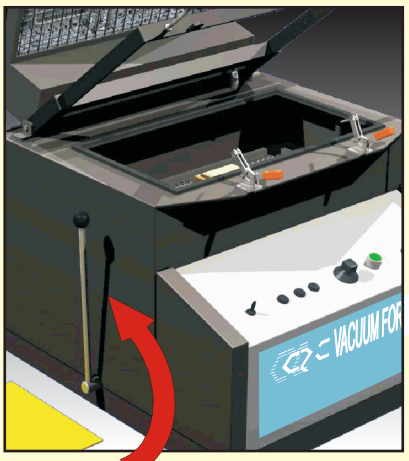
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Using the Vacuum Former



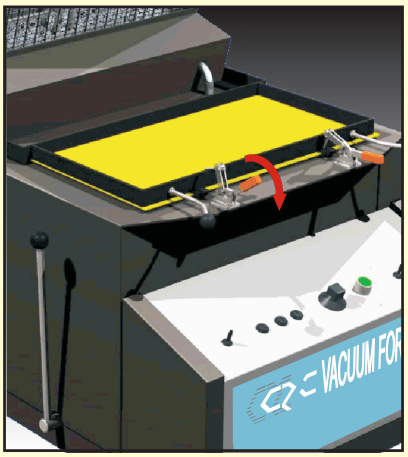
Stage 1: Place your mould on the Vacuum former 'table'. (The mould should have tapered sides to enable it to be removed from the plastic after forming.)



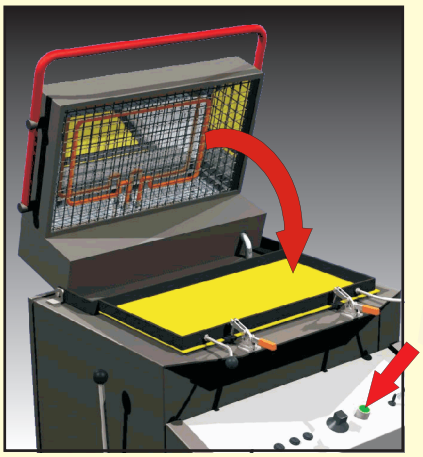
Stage 2: Lower the table by raising the handle on the side of the machine.



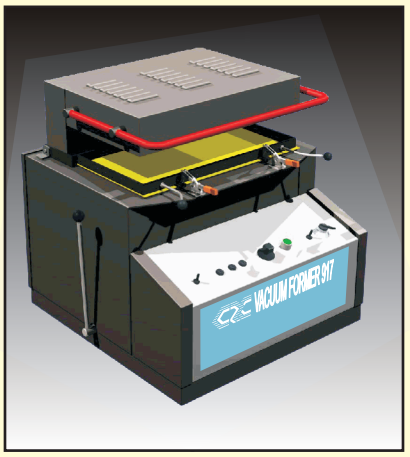
Stage 3: Place a piece of thermoplastic sheet on to the seal and lower the frame.



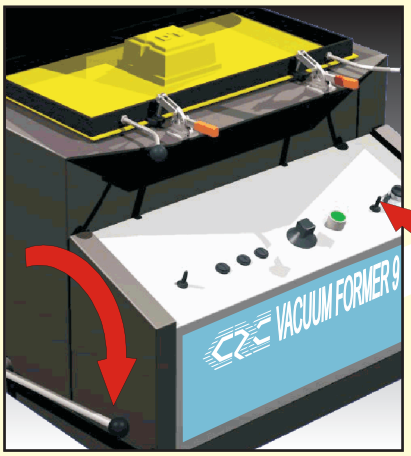
Stage 4: Tighten the frame by closing the two toggle clamps.



Stage 5: Switch on the heater and then lower it down over the plastic.



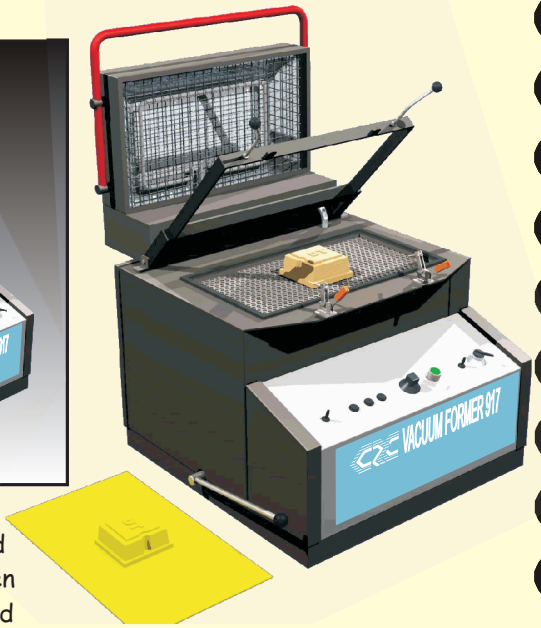
Stage 6: Allow the plastic to soften.



Stage 7: When the plastic has softened raise the table by pulling the handle on the side of the machine down and then switch on the vacuum.



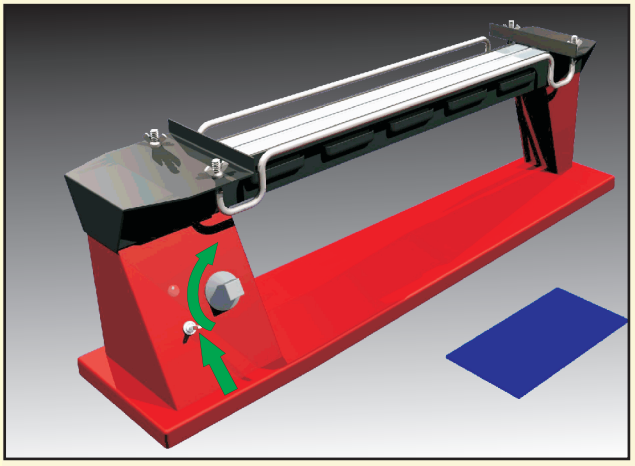
Stage 8: Switch off the vacuum, raise the heater and allow the plastic to cool. Then release the toggle clamps and lift the frame.



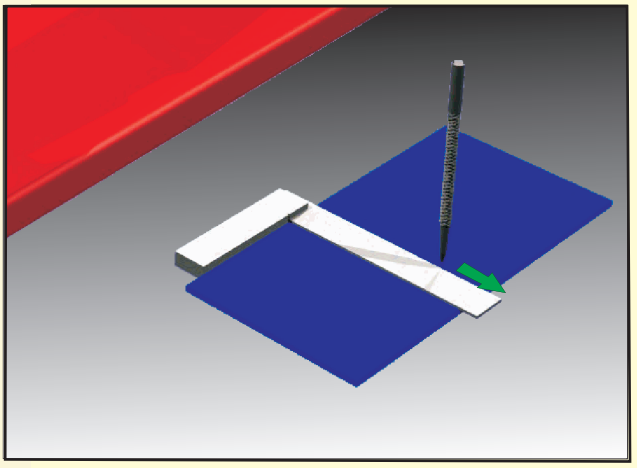
Stage 9: Remove the finished moulding.

Tools & Processes

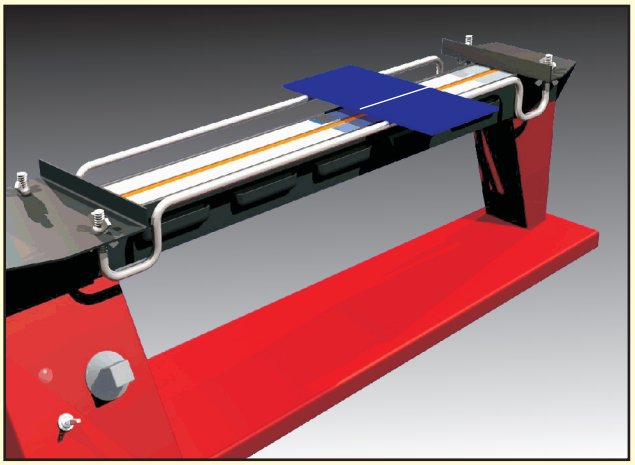
Using the Strip Heater



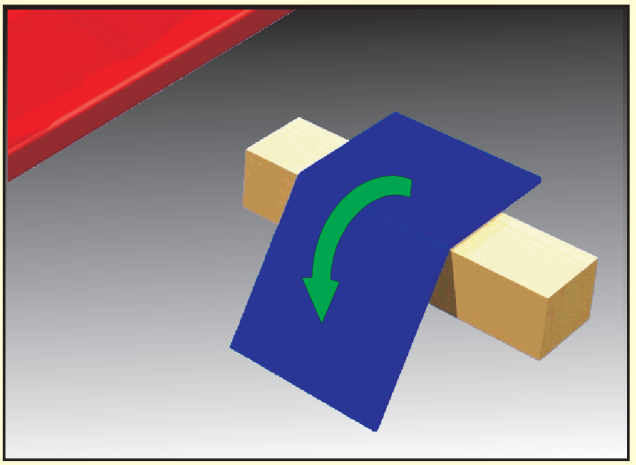
Stage 1: Switch on the Strip heater and set the temperature dial to the required position.



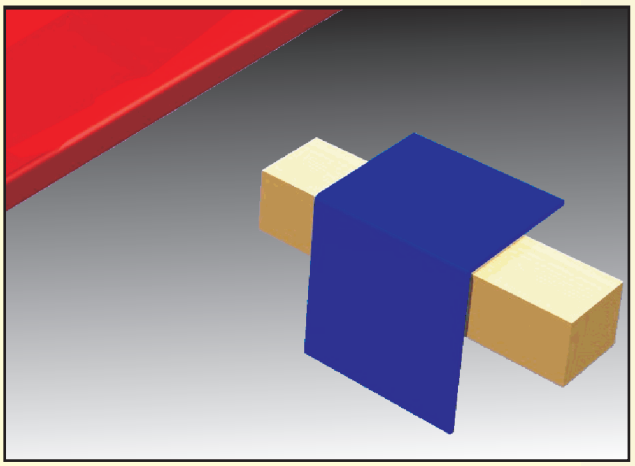
Stage 2: Mark out the position of the bend on a sheet of thermoplastic using an Engineers Square and a scriber or felt tip pen.



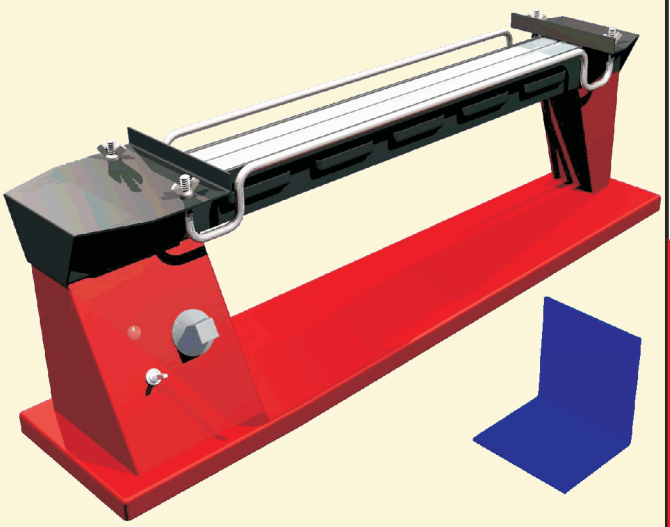
Stage 3: Position the plastic over the hot element and allow it to soften. Turn the plastic regularly to ensure it heats up evenly.



Stage 4: When the plastic has softened remove it form the strip heater and bend it over a mould or 'former'.



Stage 5: Allow the plastic to set before removing it from the mould / former.



Stage 6: Switch off the strip heater and allow it to cool down.

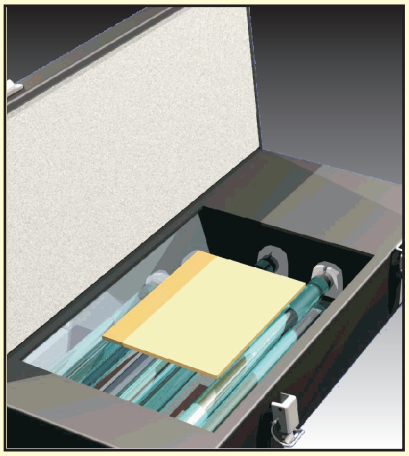
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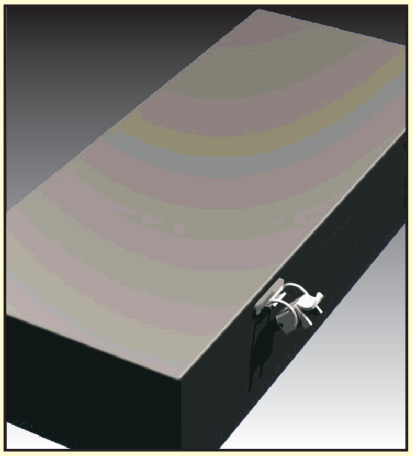
Making a PCB



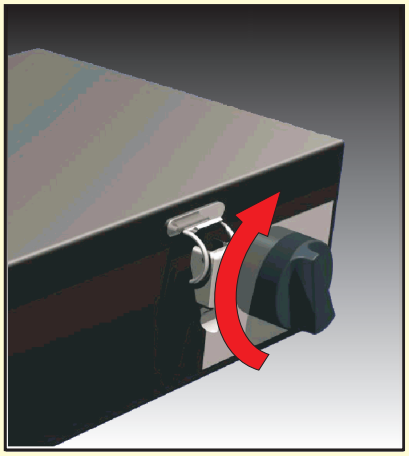
Stage 1: Print your PCB layout onto clear acetate and place it face down in the 'UV light box'.



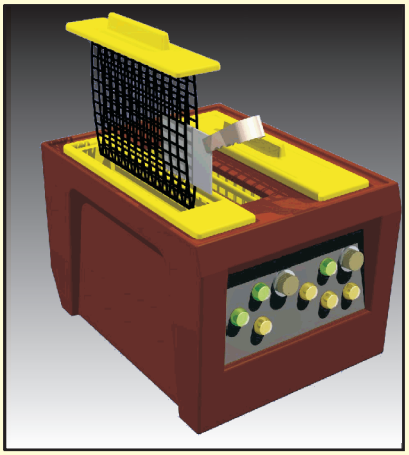
Stage 2: Remove the film from a piece of UV sensitive board and place it silver side down on top of the acetate mask.



Stage 3: Close the UV Light box and fasten the toggle clamps.



Stage 4: Set the timer to 3 minutes by turning the knob clockwise and then releasing it. Wait till the timer runs down and then remove the board.



Stage 5: Place the board into the first basket of the bubble etch tank and lower it into the Sodium Hydroxide for 1 minute or until the tracks can clearly be seen. Wear an apron, goggles and gloves.



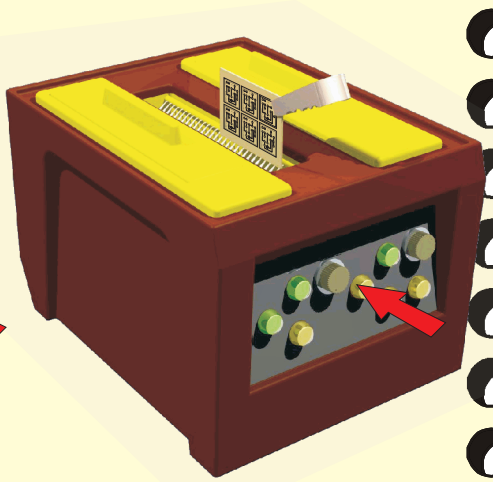
Stage 6: Remove the board and wash it thoroughly in the 'spray wash' on the bubble etch tank. (You will need to switch the spray on first using the button on the front panel.)



Stage 7: Place the board in to the second basket of the 'bubble etch tank' and lower it into the Ferric Chloride for etching.



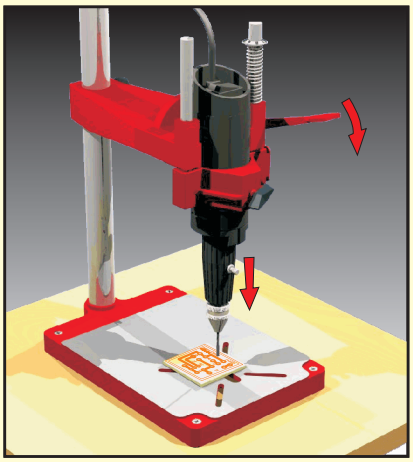
Stage 8: Switch on the 'pump' using the button on the front panel and then leave the board for 8 mins. or until the unwanted copper has all been removed. Switch off the pump before lifting the basket.



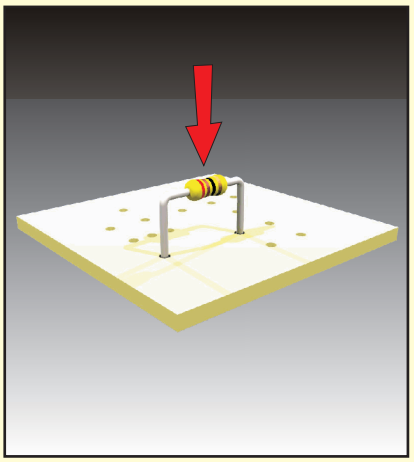
Stage 9: Remove the completed board and wash it as before.
Dry the board ready for drilling and soldering.

Soldering a PCB

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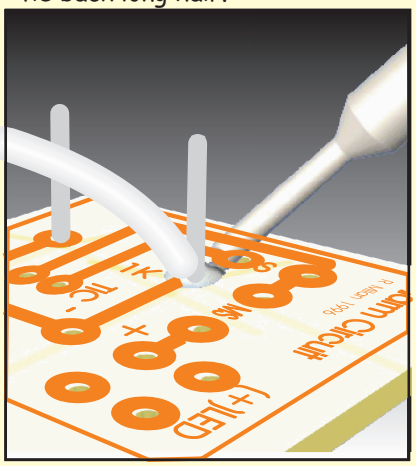
Stage 1: Drill holes in all of the pads on the PCB. Hold on to the PCB tightly, wear goggles, remove jewellery and tie back long hair.



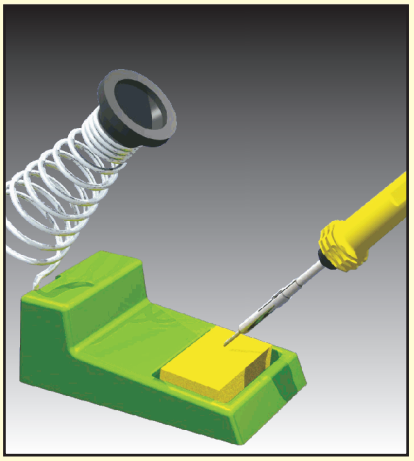
Stage 2: Identify the correct holes for the components and push them through from the back of the board



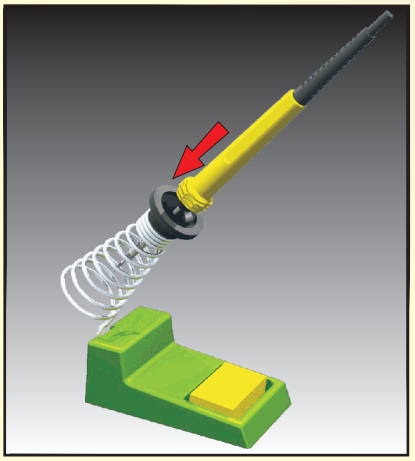
Stage 3: Hold the flat end of the soldering iron 'bit' against the joint you wish to solder and allow it to heat up.



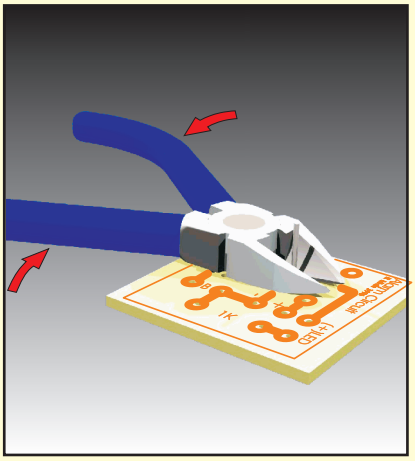
Stage 4: Feed the solder into the joint.
The solder should form a shallow volcano shape rather than a ball.



Stage 5: Wipe the soldering iron on a damp sponge to clean the 'bit'.



Stage 6: Return the soldering iron to its stand when not in use. Always be careful not to catch the flex or any loose clothing/long hair.



Stage 7: Cut off any excess wire using side cutters.



Stage 8: Use wire strippers to remove the plastic coating from the ends of wires prior to soldering.



Stage 9: To remove components heat up the joint using a soldering iron and then suck up the molten solder using a 'solder sucker'.

Tools & Processes

Q4U2Do.

1. What tool is used for marking a line at right angles to the edge of a piece of timber?

2. What tool is used for marking a line at right angles to the edge of a piece of metal?

3. What tool is used for marking out a line parallel to the edge of a piece of wood?

4. What saw would you use to make a straight cut through a piece of wood?

5. What is the difference between a jack plane and a smoothing plane and what are they each used for?

6. What is distinctive about the blade on a coping saw?

7. Describe what each of the following drill bits are for;
Hole saw

Twist drill

Counter sink

Forstner bit

8. Name four safety precautions to be taken when using the pillar drill.

9. Name the tool used with a hammer for tapping the heads of nails below the surface of the wood.

10. What type of glue is used for joining woods?

11. Name the process used for taking a moulding with thermoplastic sheet.

12. Use the spaces below to illustrate the process you named in Q11.

13. Name the process used for bending thermoplastic sheet along a straight line.

14. What type of light is used in the making of a Printed Circuit Board?

15. What safety precautions need to be taken when build a Printed Circuit Board?

16. What is the name of the tool used to cut the excess wires from the back of a PCB after soldering?

17. What is the tool used to remove unwanted solder from the back of a PCB?

18. What safety precautions need to be taken when soldering?

List of CGP Revision questions:

D3 Shaping materials hand tools
D4 Shaping materials power and machines
D5 Shaping Techniques
D6 Moulding and joining

Tools & Processes