

Computer-Aided Design (C.A.D.) and Computer-Aided Manufacture

CAD/CAM are used to design and manufacture (make) things. Both have helped create efficiency in the workplace.

CAD




C.A.D. involves products being designed on a computer, using specialist software. Designs can be saved, edited, and copied many times. The design can be 2D or 3D, and some software can even simulate how a product will work in real life.

Advantages of C.A.D.

- Can be more accurate than hand-drawn designs - it reduces human error.
- Ideas can be tested on screen, to see if they would work in real life. This would save time and money for the company.
- You can save and edit design ideas, which makes it easier and cheaper to modify your design as you go along, which saves time.
- Many copies can be made in one go, consistently and accurately, because computer-aided machines will understand the instructions from the software.

Disadvantages of C.A.D.

- Requires a computer.
- Staff need to be trained how to use the software, which also adds to costs.
- The software itself can be expensive so initial costs are high. (There are free software packages though).

Some examples of C.A.D. software we have in school are :
 Autodesk Inventor  2D DesignTools 

CAM

C.A.M. uses computer numerical control (CNC) to create CAD designs. CAD software creates the 3D co-ordinates of the design. The CAM machine can then make the product.

Advantages of C.A.M.

- Computer Aided Manufacture (CAM) has meant that products and components can be made repeatedly to the same high standard.
- Accuracy of machining is consistently high, and machining through CAM is much faster than machining by human control / by hand
- Large quantities can be produced 24 hours a day, reducing the final cost/price.
- Products can be made directly from CAD files









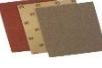









Disadvantages of C.A.M.

- Expensive equipment
- Needs maintenance
- Replaces humans, so they could lose their jobs.
- Staff need training

Some examples of C.A.M. machinery we have in school are :

	Laser Cutter		CNC Lathe		Printer
	CNC Milling Machine		Vinyl Plotter/Cutter		


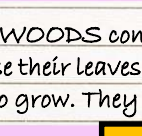
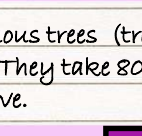
Tools and Equipment

 Bench Hook Used to hold wood still whilst you saw straight lines.	 Pillar Drill For drilling holes. Wear goggles. One user at a time. Secure your work. Long hair tied back. Trained users only. Close the guard.	 Tenon Saw Used to cut straight lines. Used on timber.
 Try / Tri-Square Used to ensure 90 degree angles and straight edges. Keeps the wood "square".	 Steel Rule / ruler Used to measure and draw straight lines.	 Sharp Pencil Used to mark lines on timber. Useful when sketching or measuring.
 Hegnersaw Used to cut plastic and timber. Wear goggles. Tie long hair back. 1 user at a time. Keep fingers away from blade. Keep work flat. Use the guard.	 Belt Sander Used to smooth plastic and timber. Wear goggles. One user at a time. Use the guard. Keep fingers away from belt. Tie long hair back. Keep work flat on bed.	 Sandpaper Used to ensure a smooth finish on your woodwork.
 Coping Saw Used to cut curves. Used on timber and polymers (plastic).	 Twist Drill / Drill Bit Used to drill holes in timber, polymers and metals	 P.V.A. glue Used to join pieces of timber together. Always read the instructions.
 G Clamp Used to clamp/secure your work	 Hand Drill Used to drill holes	 Woodworking vice Used to clamp/secure your work
 File: for straightening/shaping edges. <ul style="list-style-type: none"> flat Half-round Triangular Square Round 	 PPE (Personal Protective Equipment) <ul style="list-style-type: none"> Wear an apron. Protects from dust, chemicals and paints. Wear goggles. Protects your eyes Wear a mask. Protects your lungs from dust and fibres, chemicals. 	 Posca Paint Pens For achieving a high quality and detailed, painted finish. Used on small pieces of work only.

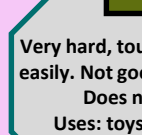
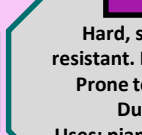
Timber

Timber comes from trees. There are 3 main groups (categories):
 1) Hardwoods 2) Softwoods 3) Manufactured boards

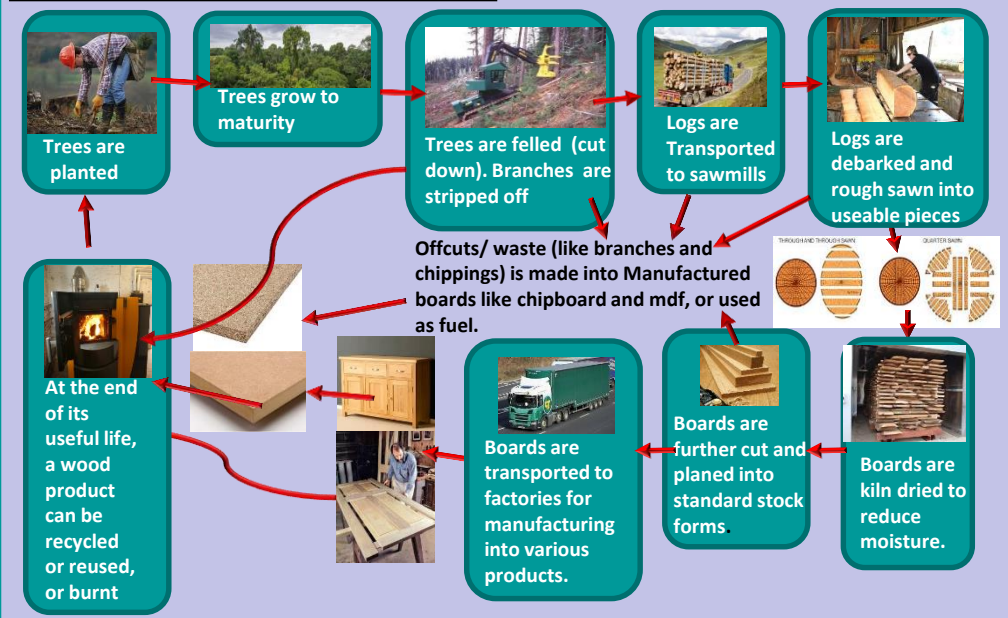
HARDWOODS come from deciduous trees (trees that lose their leaves in Autumn). They take 80-120 years to grow. They can be expensive.

 Beech Very hard, tough, strong. Warps easily. Not good for outside use. Does not splinter. Uses: toys, tool handles, furniture, kitchen utensils.	 Oak Strong, durable, heavy, hard. Tough. Flexible. Corrodes steel (contains tannic acid.) Uses: Doors, furniture, barrels	 Mahogany Hard, strong, rot resistant. Easy to work. Prone to warping. Durable. Uses: pianos, furniture
--	--	---

SOFTWOODS come from coniferous (evergreen) trees. They take only 20-40 years to grow. They grow in cold climates. And are much cheaper than hardwoods.

 Scots Pine Knotty. Straight grain. Strong. Cheap. Easy to work. Uses: window frames, cheap furniture	 Cedar Lightweight. No knots. Soft. Durable against weather, rotting and insects. Easy to work but expensive.
---	---

Preparation of Timber for Commercial Use



MANUFACTURED BOARDS

MANUFACTURED BOARDS are made from recycled woods, chippings and fibres. They are made into boards.

 Medium Density Fibreboard (MDF) Made from wood chips. Broken down into a pulp (small fibres). Not very strong. Easy to work with. No grain. Dense. Smooth surface. Easy to paint. Uses: kitchen units, flat pack furniture.	 Plywood Good strength to weight ratio. Looks stripy. Made from veneers, which are glued at 90° to each other. This gives strength. Can chip at the edges. Uses: flooring, shelves, boxes, furniture
--	--