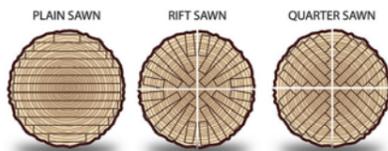


KS4 Design Materials Knowledge Organiser– Unit 5B: Timber based materials

Sources, origins and properties

Timber conversion: how a tree is converted into planks.



Rough sawn is rough on all edges as it has not been planed smooth. **Planed all round (PAR)** has been planed down on all sides to make it smooth.

Seasoning: removing moisture content from the wood.

Freshly cut timber is called **green wood**, the moisture content is around 50%. For use **outside** moisture should be less than 20% and for use **indoors** below 15%.

Timber can be **air-dried** which means stacking planks with gaps to allow air to flow around. **Kiln-drying** requires extra energy but uses less space, it is also faster due to the heat used.

Uneven drying can cause problems such as twisting, cupping and bowing.

Manufactured board: sheets of manmade materials are formed of natural timber and adhesives.

Lamination is used to produce plywood and blockboard, is when layers of wood are bonded together.

Compression requires wood to be shredded, chopped or pulped, then heated and compressed under high pressure. This method is used to produce MDF and chipboard.

Veneers are very thin slices of wood often added to manufactured board to improve the aesthetic qualities.

Sustainable timber production

Due to the fact that new trees can be planted, timber is considered to be **sustainable**. If the rate of use is faster than the rate of growth this leads to **deforestation**. This makes the timber unsustainable and contributes to **global warming**. Organisations such as **The Forest Stewardship Council** and **Programme for the Endorsement of Forest Certification** help to show that material comes from a sustainable source.



Working with timbers

Selection of timber can depend on:

Aesthetics	Time needed to last	Weight	Stability
Size of product	Size of material	Desired properties	Availability
Where to be used	Required finish	Workability	Cost

Standard material stock forms, types and sizes concerns the standard measurements used when buying timber. When ordering planks or sheets measurements are usually length x width x thickness. **Dowel** is ordered by diameter x length. **Boards** are typically 2440mm long by 1220mm wide (8ft x 4ft). **Planks** are limited by the width of trees but come in standard thicknesses and lengths up to 4.8m.

Dowels are circular sections which can be either smooth or ridged and are often used in dowel joints. **Mouldings** are shaped sections often used for decorative features such as skirting boards or door frames. **Woodscrews** are available in a range of sizes and are an effective way of joining timber pieces. **Nails and pins** are often used with adhesive to hold parts while the glue cures but can be driven into the material at an angle to secure more permanently. **Knock-down fittings** are a temporary joining method often found in flat-pack furniture. **Hinges** allow movement of doors and other openings. A variety of types are available such as piano, flush, butt and tee.

Shaping, processing and machining wood requires wasting to remove unwanted material.

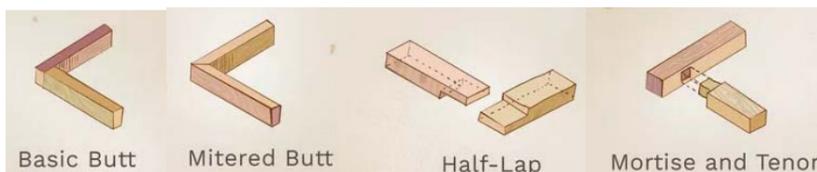
Drilling is an effective way of wasting, a range of drill bits are used depending on the required outcome. Pillar drills are used for accuracy and power but hand held drills can also be used. **Cutting and sawing** can be done by hand or machine. Tenon saw for straight lines, coping saw for intricate shapes and rip saw for cutting large pieces down to size.

Wasting by hand and abrading can be achieved through the use of planes, chisels, surfboards and rasps. **Sanding** provides a smoother finish through the use of abrasive papers. Each paper has a number which shows the amount of grit per square inch, the higher the number the smoother the finish. This can be done by hand or machine. **Wood turning** can create bowls and spindles by spinning the wood around a centre point and remove material using a gouge.

Laminating is the layering of material adding strength and sometimes curved shapes. Adhesive is used and pressure added to ensure a secure bond.

Bending is achieved by soaking wood in water to improve flexibility, steam is often used. The piece is clamped until dry when the piece will retain the shape.

Wood joints are permanent methods of fastening wood. Common joints include: butt joint, doweled, mitre, housing and mortise & tenon. Joints are selected based on the pieces to be joined and the requirements of the finished product.



Commercial manufacturing, surface treatments and finishes

Timber and manufactured board for commercial products is often determined by cost. Cheaper materials are often chosen to reduce cost eg. using pine for children's blocks instead of beech.

Flat pack furniture are usually made from manufactured boards. **Advantages:** low cost, ease of transport, easy assemble, can be disassembled. **Disadvantages:** need to build, not as robust, complex, prone to moisture damage, can chip and break.

Commercial routing and turning is usually done by CNC (Computer Numerical Controlled) machines. This allows repeated accuracy and precision to be achieved even with detailed work.

Quality control ensures dimensional accuracy is consistent and that the product is safe to use. **Go/no go gauges** can be used which are set to the given tolerance for the component, making QC easier and more efficient.

Surface treatment and finishes are applied either for aesthetics or protection. **Aesthetic** treatments add colour or stains to match or contrast with existing materials, enhance natural grain or give a sheen, shine or matt finish. **Protection** can make it waterproof, less prone to fungus or insect attack, more resistant to knocks and bumps, easy to clean.

Pressure-treatments allow wood preservative to be forced into the cell structure allowing better protection than surface treatments.

Common protections and finishes for timber-based products include oil-based, solvent-based and water-based liquids. High levels of **VOCs** (Volatile organic compounds) contained in solvent and oil based products make them less environmentally friendly. Water based products are less harmful during application and are non-toxic. Some examples are: Varnish, oil, paint, wax, stain, wood preservative.

Keywords:

Wood, timber, conversion, cultivation, harvesting, plantation, thinning, felling, planed all round, rough sawn, green timber, seasoning, fault, bowing, splitting, cupping, twisting, logging, desertification, deforestation, lamination, veneer, compression, stock form, standardisation, moulding, self-tapping, countersink, dowel, knock-down fitting, connecting block, cross-dowel, cam lock, plane, chisel, surform, rasp, turning, routing, lathe, joint, bending, engineered wood, flat-pack, self-assembly, CNC, milling, tolerances, go / no go gauge, finishing, VOCs, finishing.