

Year 8 Resistant Materials - Specialist Materials and Processes

Properties of Timber and Sheet Materials

| Property | Definition | Found in |
|-------------------|---|----------------------------------|
| dense | Can be deformed without losing toughness. | oak, beech |
| straight-grained | Timber which has grown straight, has a uniform grain. | oak, beech, red deal |
| knot | Irregularity in wood grain, where a branch or offshoot existed. | spruce, ash, some plywood |
| weather resistant | A tight-grained timber has good water and heat resistance. | oak, beech, ash, plywood |
| stiff | A timber that does not bend easily. | oak, ash, beech, plywood, MDF |
| easy to work | A timber that is either low or medium density. Easy to cut and shape. | red deal, scots pine, balsa, MDF |

Hardwood

Timber from a deciduous tree. They are slower growing and more expensive.

oak: strong, heavy, durable, hard and tough. Open grained. Light brown. Finishes well. Expensive.

Used in construction, high-class furniture, boat building, veneers.

beech: hard, tough, strong/close grained, white/pinkish brown. Prone to warping.

Used in functional furniture, chairs, tables, tools, veneers.

| Property | Definition | Found in |
|---------------|--|--|
| polymer | The umbrella term for synthetic materials engineered from a string of monomers. | plastics, paints, man-made fibres. DNA is an example of a natural polymer. |
| plastic | A synthetic polymer available in many different types, widely used in packaging, product cases, toys and the car industry. | universal applications from toys to artificial limbs |
| thermoplastic | A polymer material which can be deformed and reformed using heat processes. | acrylic, polystyrene, ABS, nylon |

Thermoplastics

Acrylic: A hard, tough thermoplastic available in sheet form and as granules for moulding. In its clear form, it makes a safe alternative to glass. Stiff, hard, durable, self-finishing, scratches easily.

Used in bicycle reflectors, car lights, safety glass, clothing.

Manufactured Boards

Sheet materials manufactured from layers or particles of wood including MDF, plywood and hardboard.

plywood: Reddish brown or white in colour. Layered in odd numbered sheets. Strong. Susceptible to splintering

Used in sheds and cladding, furniture, flooring, boats (marine ply).



Softwood

Timber from an evergreen or coniferous tree. Fast growing.

spruce: fairly strong with small, hard knots. Creamy white, resistant to splitting. Not very durable.

Used in general indoor work such as stud-walls, shelves.

Western Red Cedar: straight silky grain, dark reddish brown. Lightweight and not very strong. Natural oils make it durable against weather.



Wasting

Wasting timber by hand

Most solid woods can be easily wasted and shaped using a range of workshop tools.

- **Chiselling:** chisels are used along with vices and mallets to remove areas that have been pre-cut.
- **Planing:** shape and finish edges using a plane or spoke-shave. Edges require no further finishing after planing.
- **Sawing:** tenon saw, bench saw, coping saw
- **Filing:** rasp, half round, round.
- **Drilling:** hand drill and pillar drill.

Wasting Using CAD/CAM

Sheet plastic can also be wasted effectively using CAM, such as laser cutters and routers.



Addition

Decorative details can be applied to a wooden products using a greater variety of wood types, wood dowel, or other decorative components to enhance the appeal of the product. These may be applied using PVA glue or other liquid based adhesives.

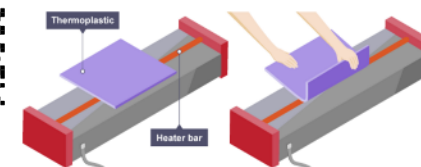
Solvent Welding

This is the most common method used in schools. A syringe is used to place a small amount of solvent on the two faces to be joined. A clean, permanent joint can be created.

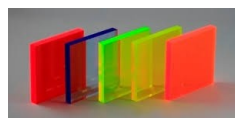
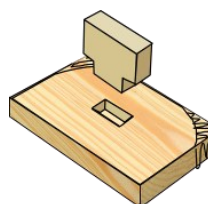


Reforming

A heating element inside a Strip Heater is red hot. It is enclosed in the machine so only an exact line has heat applied to it, allowing you to make a clean bend in plastics such as Acrylic.



A Mortise and Tenon wood joint is created through a wasting process using hand tools



Year 8 D&T Core Knowledge Organiser

Design Influences

Fashion, Trends, Taste and Style

All consumer products are subject to fashion, trends, taste and style. Popular colours, shapes, patterns and forms can all be identified through the analysis of existing products. Some materials are more fashionable than others for different products. Market research is an important factor in understanding trends and taste. Designers also need to be aware that trends can change quickly.



Marketing and Branding

A product's success is partly due to how it is introduced to its target market group. If a consumer is made to feel that they need a product and it will somehow help them, or improve their lives, they are more likely to consider buying it. Some of the best-designed products have not been branded or marketed properly and therefore people are not aware of their existence!



The Impact on Usability

As products evolve, with the use of better manufacturing techniques and new technology, usability is enhanced. This impacts different products in different ways. For devices like mobile phones, the usability of modern smart phones is enhanced beyond measure with the introduction of the internet, app software and Wi-Fi connectivity.

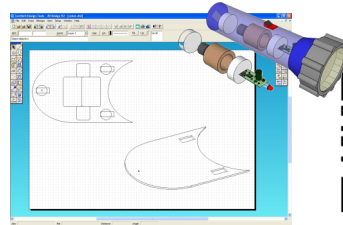


Health and Safety

When moving on to practical work for your projects. You should also know the different categories of safety symbols used through the various D&T rooms and be able to work out the meaning of different safety symbols. The use of PPE (Personal Protective Equipment) is also one important way of staying safe when undertaking certain work.



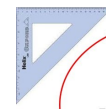
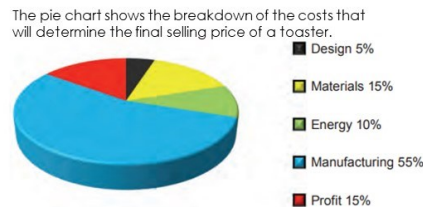
For example, what might this student be doing wrong when operating the Pillar Drill? Should they be wearing anything more to protect them?



Maths in D&T

Data which is collected is often presented in graphical form. This could be anything from a pie chart to a bar chart. The data is often colour coded with added percentages to easily demonstrate the collected information.

In exams this is often tested for your understanding of being able to read and answer questions relating to the collected data in the form of a context.

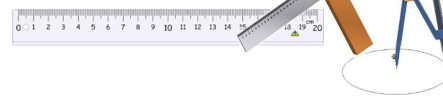


Remember we measure in (mm) **NOT** (cm)
To convert add a 0.
E.g. 10cm = 100mm
2.5cm = 25mm

There is plenty of Maths in DT:

- Measuring
- Scale
- Proportions
- Shapes

To name but a few.



Graphical Data

Computer Aided Design (CAD)

In various forms, CAD allows designers to develop complex, high quality design drawings that can either be in 2D or even 3D formats. The drawings can be easily edited and worked on by multiple users before being sent to a printer, laser cutter or embroidery machine for example. CAD packages include 2D Design, Photoshop or Publisher,

Design Thinking and Communication

User-Centered Design

Good design carefully considers the end user and the experience they will have with any product. A designer will seek to understand and involve the target user in all stages of the design process through exploration, creation, evaluation etc.

Exploration:

- creating mood-board to explore the user's lifestyle;
- conducting questionnaires and surveys;
- studying the design situation from the user's point of view.

Creation:

- gaining the user's views on iterative models and drawings.

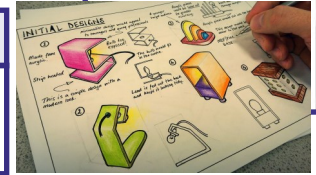
Evaluation:

- carrying out user trials and evaluating the finished prototype;
- the designer conducting an evaluation of the user's experience with the product.

Sketch Modelling

Sketch modelling can help a designer develop a design through looking at it in three dimensions. Different types of sketch model include:

- clay models;
- toiles (paper models of clothing);
- paper models;
- blue styrofoam models;
- CAD models;
- card models.



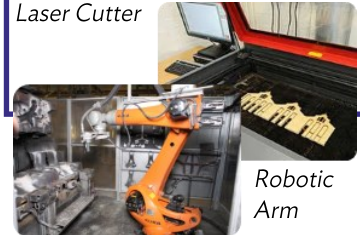
Creativity

Creativity and innovation are crucial when producing new design ideas. Look for new ways of achieving the result you need through the development of unique shapes or themes, material choices and extra functionality for example.

Computer Aided Manufacturing (CAM)

A range of computer guided machines can be used by manufacturers to complete highly accurate products or components at speed. Due to the machines following step-by-step code (generated by a computer), it is possible for parts to be replicated over and over. Examples of CAM include computer guided laser cutters, embroidery machines, Routers and Vinyl cutters. Robotic Arms also allow flexibility in manufacturing and the ability for products or parts to be moved between machines automatically.

Computer Controlled Laser Cutter



Robotic Arm