

Tools and Equipment

Cutting Mat	Self healing, Non-slip cutting surface. Used to prevent work surfaces getting damaged and scalpel blades becoming blunt.
Scalpel	A hardened steel blade used for cutting papers and boards. It can cut internal corners unlike scissors, however takes more skill.
Safety Ruler	This ruler has a raised edge for cutting along. This is for safety as it helps to prevent a sharp blade slipping and cutting the user.
Scissors	A cost effective and widely available cutting method. Products and prototypes can be quickly cut and tested.
Pencil	The pencil is probably the most commonly used drawing tool. The B range indicates blackness, the H range indicates hardness.



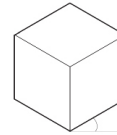
Isometric Drawing

Isometric projections are commonly used by engineers in technical drawings and illustrations and sometimes by architects. Early video games such as SimCity used isometric projection.

Line Weighting Enhances a drawing to make it appear more realistic.

Line Weighting An edge that is connected to two visible faces stays thin.

Line Weighting An edge that is connected to only one visible face becomes thick.



Angles are projected at 30°

30°

Name	Properties	Description	Applications	Advantages	Disadvantages
Copier Paper	80 GSM. - Thin. - Lightweight. - Inexpensive.	- Bright white paper. - Smooth bleached uncoated surface.	- Writing. - Sketching and drawing. - Office and admin work. - Photocopying.	- Takes colour well (highly printable). - Good surface for pencils, pens and markers. - Available in a range of colours.	Can be prone to jamming printers.
Cartridge Paper	120-150 GSM. - Creamy white. - Smooth but has a slightly textured surface.	- Completely opaque (no light passes through). - Accepts most drawing media - paints, as well as pens and pencil.	- Painting. - Mixed-media design and art work.	Can be used with water colours without buckling (waviness caused by water).	More expensive than copier paper.
Tracing Paper	60-90 GSM. - Strong. - Translucent.	Smooth surface texture.	- Making copies. - Overlays.	Translucency allows underneath image to be seen for copying.	- Has low absorbency (this means ink can smudge easily). - More expensive than copier paper.
Solid White Board	- Rigid board. - Excellent printing surface. - Smooth texture.	- Made from pure, bleached wood pulp. - Bright white colour conveys quality.	- Book covers. - Food packaging.	- Strong. - Rigid. - Accepts ink well.	Can be expensive compared to other boards.

Adhesives

Glue Stick A quick method of bonding papers and boards. They are easy to apply, however they are not as strong as other glues, meaning edges can lift over time. Longer setting time means that materials can be moved before they are dry.

Double Sided Tape

Tapes keep the surface of the materials dry, this prevents any warping. Instant adhesion speeds up the time taken to assemble a model or product. No setting time means that care and attention is needed when assembling. There is also no risk of spilling the adhesive tape.

Properties of Papers and Boards

Flexibility The amount a material bends when a force is applied. If a paper doesn't flex it will jam printer mechanisms.

Printability The ability to accept ink onto its surface. If a paper is too absorbent, the printed image will not appear crisp, it will look blurred and blotchy.

Biodegradability The ability to accept ink onto its surface. If a paper is too absorbent, the printed image will not appear crisp, it will look blurred and blotchy.

Health & Safety

Design & Technology involves a lot of practical work, some of which involves significant risks. Therefore, it is vital to implement safe working practices to ensure a positive health and safety culture.

Safety in the Workshop

Rooms must be clean, tidy and in a safe condition. Workstations should be clean and clear of excess materials and tools. After use, tools and materials should be stored correctly, with blades and sharp edges protected. Floors should be clear of obstructions and trip hazards, such as bags and scrap off-cuts.

Clothing and Protective Equipment

Ensure you have no loose clothing; tie back long hair, remove loose jewellery; and tuck in ties and apron strings.

Hazardous materials: Wear an apron or overalls, goggles and the correct gloves.

Hot materials: Wear an apron and the correct gloves; a face shield is required for some jobs.

Dust: Wear a face mask and safety goggles. Ensure there is adequate extraction.

Machine Tools

Do not use machine tools with permission or training. **It is important to understand:**

- The design of the machine and the names of the main parts.
- How to set up the machine and use guards, running speeds and cutter settings.
- How to use the machine safely (learn where the emergency stop button is located).
- Keep machines and guards clean and in good condition, and never touch moving parts. If a machine has a dust extractor, ensure it is running when in use.

Hand Tools

Perform practical work standing up and ensure materials are held securely in place using the appropriate holding device, usually a vice or a clamp. Use the correct tools and technique for the job and materials used. Carry tools with their cutting edges pointing down, and return them to their racks when not in use.

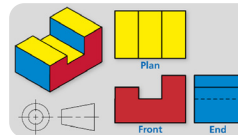
Properties

Timbers Different types of wood have varying properties (e.g. strength, hardness, durability) that make them suited for different purposes and commercial products. In addition to considering the properties of wood, designers must also consider how easy the materials are to manufacture.

Metals Metals have varying properties (e.g. strength, hardness, toughness, malleability) that make them suited for different purposes and commercial products. However, as well as considering the properties of the product it is also important to consider cost, availability and the environment.

Working Drawings (Orthographic Projection)

Orthographic projection is used to depict 3D objects as a set of 2D drawings. It shows the front view, plan view and end view drawn to scale, and measurements are given in millimetres. A third angle orthographic projection is shown below:

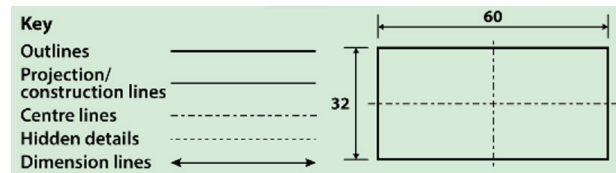


The plan view is drawn at the top, the front view is directly below this and the end view is positioned next to the front view.

Orthographic drawings are often used in manufacturing because they provide detailed information about the design.

Orthographic Drawing Conventions

For clarity, lines and dimensions must conform to British Standards.



Timbers, Metals & Polymers: Shaping & Forming

Wood, metals and polymers can be shaped and formed through cutting, abrasion and addition using a variety of tools, equipment and processes.

Cutting - Wood, metals and polymers can be cut to size with a variety of tools.



Rip Saw/Cross-Cut Saw

Rip saws are used to cut parallel to the grain, whereas cross-cut saws are used to cut against the grain. **Used to cut wood.**



Tenon Saw

Cuts accurate straight lines in small pieces of wood and provides a smooth cut. **Used to cut wood.**



Hacksaw

Has a hard, high-carbon steel blade so it can cut through metal; also available in a junior size for smaller cuts. **Used to cut metal and plastic.**



Coping Saw

Can cut intricate curves in thin materials but is difficult to control; has a blade that can snap easily. **Used to cut wood and plastic.**

When cutting materials, follow the steps outlined below.

- 1: Secure the material with a clamp, or by placing it in a vice to prevent it from moving while the material is being cut.
- 2: Make a mark in the material you want to cut by dragging the saw backwards a few times; this will provide you with a guide to start sawing.
- 3: Use the full length of the blade when sawing, and don't press down too hard. Let the blade do the work!
- 4: When coming to the end of the cut, support the end piece to stop it from falling off and spoiling the cut.



Chiselling

Chisels are used to cut or shape wood (special types are also used to cut or shape stone and metal). They are long-bladed, bevel-edged hand tools that are struck with a hammer or mallet to remove material. Chiselling involves forcing the blade into the target material to carve or cut it.

Safety tip: When chiselling, ensure that the blade is sharp and that the wood is securely held in place.

Planing, Sanding & Filing

Materials can be shaped through planing, filing and sanding.



Planing

Planing is used to shape and smooth material (usually wood). It involves shaving off thin layers of the material until the desired shape and feel are achieved.

Manual hand planers and electric planers are available. Electric planers are quick and require much less effort than manual hand planers, but they are not as accurate.



Sanding

Sanding involves rubbing an abrasive paper against the surface of the material to shape and smooth it. It can be performed by hand or using machines.

Sandpaper is available in different grades. Coarse paper is ideal for heavy sanding and stripping. Conversely, extremely fine sandpaper is used for smoothing a surface and removing small imperfections.

Different versions, such as wet and dry paper, are also available for different materials. This type of sandpaper is ideal for removing paint from painted metal and wood.



Belt Sander

This is a powerful machine used to smooth wood, metals and plastics more quickly and effectively than hand sanding. It contains a motor that drives a pair of drums on which a belt of abrasive paper is held.



Disc Sander

This is a machine that has a powered disc of abrasive paper that is spun at high speed. It smooths surfaces and removes old finishes (e.g. paint) when wood, metals or plastics are pressed up against it.

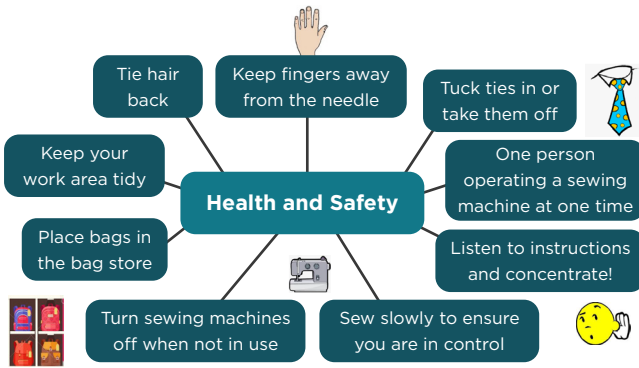
Safety tip: Sanders create a lot of dust, so dust extractors must be switched on to reduce the risk of fire and inhalation. Goggles must also be worn to protect the eyes, and fingers should be kept away from abrasive materials on power sanders.



Filing

Files have a serrated (toothed) surface so when they are rubbed over a material, some of the target material is removed. They can be used on a variety of materials and are available in different forms.

Files with larger teeth remove more material than those with smaller teeth, which are better suited for smoothing.



The Design & Manufacturing Specifications

The main purpose of developing a new product is to solve a problem, thus satisfying a want or need. To ensure a new product is capable of this, it must go through a series of stages.

Design Brief

Once a problem or an idea has been identified, a design brief needs to be put together. This is a statement of intent that addresses how the product will solve the problem and satisfy a want or need. It also acts as a point of reference for the client and designer.

The design brief will usually contain a description of:

- Budget.
- What the product should do (function).
- Target market.
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The design brief can be as simple or as complex as the client wishes. However, the best design briefs have plenty of detail to inform and guide the design process. At this stage, the important thing is to outline what is needed rather than how the item will be produced.

Design Specification

The design specification is shaped through research and product analysis. It expands upon the design brief with specific details and ensures that the product meets its requirements.

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- How will the product work?
- What materials will be used?
- How will the design be produced?
- How much will it cost to produce?
- What are the safety requirements?

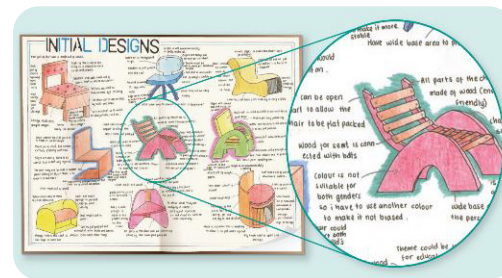
Having measurable specifications, such as weight and size dimensions, allows the product to be tested against the outlined requirements throughout the design process.

Annotated Drawings

Annotations are used to describe, explain or specify certain aspects of a design. For example, labels can be added to show sizes, materials, processes, weights and tolerances.

Annotations show good use of planning, decision-making and development in the design process.

Annotations can communicate in simple terms the designer's view about a certain aspect of the design. They can also be used to note how the design fulfils criteria within the specification.



Natural Fibres

Natural fibres come from biological sources (plants and animals). They are renewable and biodegradable.

Name	Image	Properties	Uses
Cotton Sourced from the cotton plant.		Strong, highly absorbent and cool to wear in hot weather. It is also easy to dye and wash. However, it creases easily, can shrink and is flammable.	Clothing, upholstery and towels.
Wool Sourced from animal fleece (mainly sheep).		Soft, warm and absorbent. It is also crease-resistant and has low flammability. However, it can shrink and takes a long time to dry.	Jumpers, rugs, blankets, coats, carpets.
Silk Sourced from silkworm cocoons.		Lightweight, smooth and soft. It has a lustre due to its fibre's triangular structure. However, it is expensive, weak when wet and creases easily.	Dresses, ties, soft furnishings and upholstery.

Synthetic Fibres

Synthetic fibres are polymers manufactured from chemical sources or fossil fuels. Therefore, most synthetic fibres are not sustainable or biodegradable.

Name	Image	Properties	Uses
Polyester		Strong and durable with low flammability. It is also non-absorbent and resistant to creases and biological damage. However, it is not very warm.	Sportswear, raincoats, bedsheets, rope, bedding.
Polyamide (nylon)		Lightweight but strong and hard-wearing. It is also crease-resistant, warm and non-absorbent. However, it is easily damaged by sunlight.	Ropes, sportswear, tights, swimwear.
Elastane (Lycra®)		Smooth, strong and very stretchy (elastic). It keeps its shape well and is crease resistant. However, it is highly flammable.	Sportswear, swimwear, leggings, underwear.

Cutting and Shearing

There are a range of tools available for cutting and shearing fabrics.



Fabric Shears

Also known as dressmaking scissors, these have long, sharp blades to cut fabric quickly and neatly.



Pinking Shears

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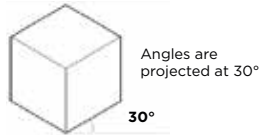
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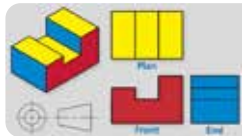
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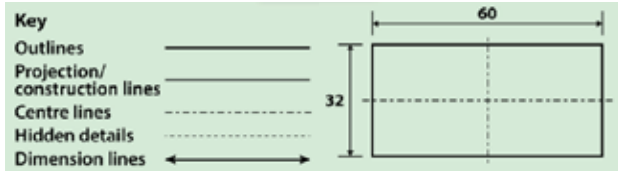


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Disc Sander

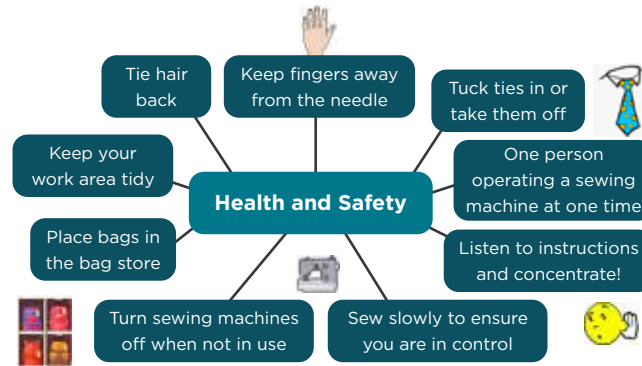
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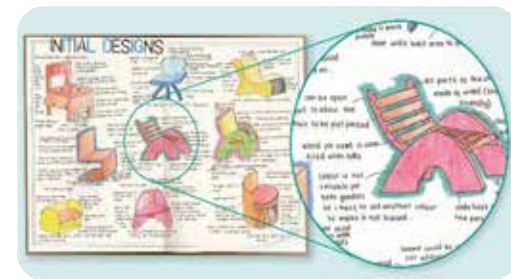
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Wool Sourced from animal fleece (mainly sheep).		Soft, warm and absorbent. It is also crease-resistant and has low flammability. However, it can shrink and takes a long time to dry.	Jumpers, rugs, blankets, coats, carpets.
Silk Sourced from silkworm cocoons.		Lightweight, smooth and soft. It has a lustre due to its fibre's triangular structure. However, it is expensive, weak when wet and creases easily.	Dresses, ties, soft furnishings and upholstery.

Synthetic Fibres

Synthetic fibres are polymers manufactured from chemical sources or fossil fuels. Therefore, most synthetic fibres are not sustainable or biodegradable.

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Polyamide (nylon)		Lightweight but strong and hard-wearing. It is also crease-resistant, warm and non-absorbent. However, it is easily damaged by sunlight.	Ropes, sportswear, tights, swimwear.
Elastane (Lycra®)		Smooth, strong and very stretchy (elastic). It keeps its shape well and is crease resistant. However, it is highly flammable.	Sportswear, swimwear, leggings, underwear.

Cutting and Shearing

There are a range of tools available for cutting and shearing fabrics.



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Also known as dressmaking scissors, these have long, sharp blades to cut fabric quickly and neatly.



Pinking Shears

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Teamwork means enjoying working together

What makes an excellent freeze frame?
(levels, stillness, focus, expression, contact, dynamics, shapes)

Techniques
Angel Devil
Pause Play
Pause
Multi Role
Choral Speech

Being Creative

What kind of character is Big Bad Bun?

Games, trust and team building activities

Techniques
Shared narration
Devising
Line learning

Playing a character
Moving/thinking in character.
Reactions.
Relationships

Line learning

Big Bad Bun Essential Vocabulary

Actor	Person on stage performing.
Character	The person in the story the actor pretends to be – e.g. Hermione is a heroic character in Harry Potter.
Characterisation	To pretend to be another personality, person using acting skill, insight, and creativity. Modern actors often play several characters in the same play.
Creative Skills	A complex and brilliant set of skills mixing intelligence and imagination with other people and tasks.
Devising	Making up a scene or story with others.
Expressing emotions	How actors show specific emotions using body, face and movement. Everyone expresses a huge range of emotions.
Freeze Frames	A still image of a point in the story, a character or location made of the performers in interesting shapes.
Multi-role	The actor plays more than one character, or narrator. Actors can also play elements of a picture or objects/moods.
Rehearsal Skills	Where actors use time to develop, explore and improve their scene. They might practice, try things, add detail, change parts, memorise work, and improve their vocal and movement skills.
Actions and Reactions	Action – what one character does. Reaction – how another responds.
Story Theatre	Non-naturalistic, very physical theatre using the whole team, choral speech, actions, comedy and movement to tell a story.

Teamwork Skills	Working as a company with communication, creative and fantastic group skills awareness as a team.
Shared Narration and Choral Speech	Speaking in unison with accuracy and expression.
Unison	Moving or talking together in a synchronised way.
Non-Verbal Communication	Everything we convey through movement, stillness, gesture and expression.
Transitions	The sections linking freezes. Ideally these are in unison, quick and creative.
Angel Devil	A technique to show a character's internal conflict.
Pause-Play-Pause	A technique to bring a moment to life between freeze frames.

