

Paper and Boards: Revision Booklet Yr11

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Sources, Origins and properties

GSM =
Grams
Per
Square
meter

GSM =
 $\frac{\text{Mass of sheet}}{\text{Area of sheet}}$

Paper	Description	Uses	+	-
Copier Paper 80gsm	Lightweight, inexpensive bright white paper, smooth bleached and uncoated surface.	Writing, printing and drawing	• Takes colour and pens/pencils well. • Readily available. • Lots of colours	• Can easily jam printer feeds
Cartridge Paper 120-150gsm	Creamy thick paper, heavyweight	Drawing and printing, good for water colour paints	• Takes lots of drawing and painting media well • Opaque (not see through)	• More expensive than copier paper
Tracing Paper 60-90gsm	Thin, smooth, translucent. Made by beating air from paper to make a dense, strong alternative.	Artwork, making copies and creating overlays on drawings	• Strong • Translucent	• Expensive • Doesn't absorb ink easily, takes time to dry
Bond Paper 50-100gsm	High quality. Stronger than copier paper but has a rough surface. No glue is used to bond the fibers together.	Durable writing and printer paper	• High quality • Range of colours available	• More expensive than copier paper
Heat Transfer Paper (Sublimation) 70-140gsm	Not too absorbant so colour pigments from the ink sits on top, ready to be transferred to other surfaces.	Used to transfer coloured inks to non paper surfaces like t-shirts and mugs	• High quality printing • Full colour images printed and easily transfered	• Expensive, both inks and heat press are costly

Why is copier paper so widely used

- Copier paper is bright white in colour which provides high quality printing allowing vivid colours to be represented.
- Copier paper has a smooth surface which allows it to absorb/take ink well and prevents the ink from bleeding outwards, which would ruin the quality of the image.
- Copier paper is opaque meaning it is unlikely to allow colours, text and designs from underneath to be seen through it, therefore the printed image will be clear to see.

Boards	Description	Uses	+	-
Folding Box board	Stiff layers of card: 1 – A printable bleached virgin surface on top 2 – Unbleached yellowish middle layer 3 - A bleached bottom layer	Cereal boxes, food and healthcare packaging	• Great for scoring and bending neatly as the layers stop splitting • Takes print well • Inexpensive	• Not as strong as solid white board
Corrugated Card	Made up of two or more layers of 'fluted' paper, sandwiched between two paper liners. Different thicknesses are available.	Protective packaging and parcel boxes	• Strong AND lightweight • Resists impact to protect products • Inexpensive AND recyclable	• Brown finish isn't very fancy or luxurious • Can deform under pressure • Not water resistant
Solid White board	Strong and rigid board made from pure, bleached wood pulp. Amazing print surface.	Book covers, food, medicine and cosmetic packaging	• Strong and durable for a luxury packaging choice • Takes print well	• Can be quite expensive – people pay for luxury!

Paper consists of fine **cellulose** fibers, usually from **wood** – but also hemp, flax, cotton and bamboo. These **fibres** are pressed together with water and then dried. Pulp is made using either a **mechanical pulping** process or a **chemical pulping** process.

Paper becomes classed as **board** when it reaches 220gm and over.

Board is normally measured in **MICRONS** as a thickness rather than weight per gram.

Microns are 1000th of a millimetre.

Properties of paper and boards include:

Flexibility – How much the material will bend when force is applied. **Flexural stiffness** is resistance to external bending force. **Handling stiffness** is the ability to support its own weight.

Printability – How well the material can accept a printed image (**porosity**). Easily affected by surface finishes and smoothness. Being bulky or thick can also affect this. NOT the same as print quality, which is made up of different factors like printer settings, inks etc.

Biodegradability – how well the material **breaks down naturally**. Most uncoated papers will do this easily. If a product is **compostable** it will biodegrade in **less than 12 weeks**

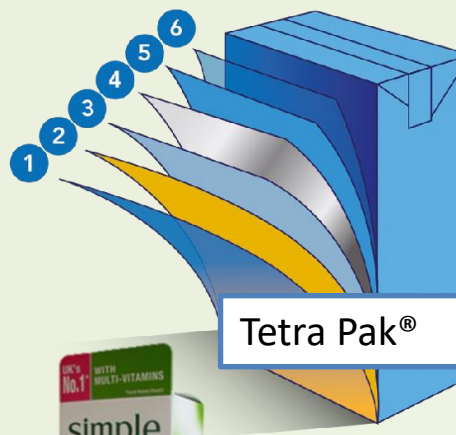
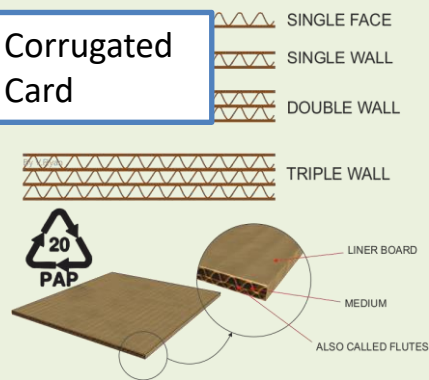
Laminated papers and boards

Paper	Description	Uses	+	-
Foil-lined board 1000-3000 microns	Laminated board containing foil (usually aluminium) and a layer of board	Used in food packaging to seal in freshness	• Strong • Aluminium won't react with food • Gives a good moisture barrier to stop contamination	• Expensive
Packaging Laminate (Tetrapak 220gsm-300gsm)	Tetrapak is made up of 6 layers to help keep food and drink fresh, 4 of these are polyethylene. A paperboard layer is also included for added structure along with a layer of aluminium to stop contamination.	The layers protect food and drinks from being contaminated by heat, light and oxygen. This makes them last longer (think long-life milk cartons)	• Maintains nutritional value and flavours in food. Less food waste	• Expensive • Not recyclable in most areas of the country
Packaging Laminate (Paperboard 224+gsm)	Quite strong paper based board. Paperboard is a layer in Tetrapak to add stiffness and structure to the packaging.	Used for packaging, book and magazine covers and postcards	• Stable and strong material for packaging. • Smooth surface for good printing, makes packaging look fantastic	• Absorbs water easily
Packaging Laminate (Polyethylene 3.5-500 microns)	Common and flexible plastic layer in laminate. Normally layered with foil or another plastic to seal in gases and prevent contamination.	Used in food packaging to stop contamination and leaking of liquids.	• Excellent moisture barrier to stop liquid leaking in food packaging • Helps aluminium to stick to paperboard in layers	• Does not biodegrade easily • Harmful to environment as extracted from fossil fuels
Packaging Laminate (aluminium foil 6.35-15 microns)	Aluminium is extracted from its metal ore form (Bauxite) to help provide flexible packaging for food.	Used in a range of food packaging and cartons to stop contamination of gas and oxygen	• Protects against oxygen and light so food doesn't spoil and becomes waste	• Extracting aluminium takes a lot of energy

Folding Box Board

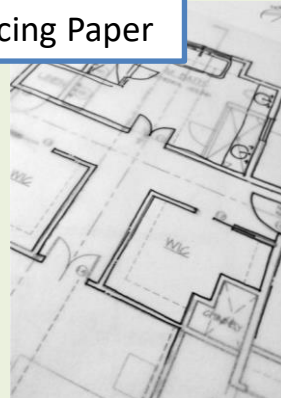


Corrugated Card



- 1 Polyethylene - protects against outside moisture
- 2 Paper - for stability and strength
- 3 Polyethylene - adhesion layer
- 4 Aluminium foil - oxygen, flavour and light barrier
- 5 Polyethylene - adhesion layer
- 6 Polyethylene - seals in the liquid

Tracing Paper



Cartridge paper



Solid White Board



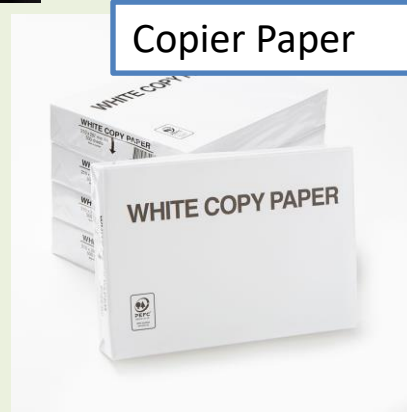
Foil lined board



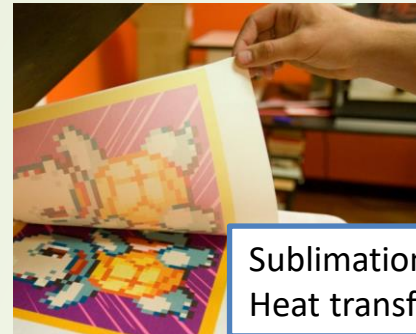
Bond Paper



Copier Paper

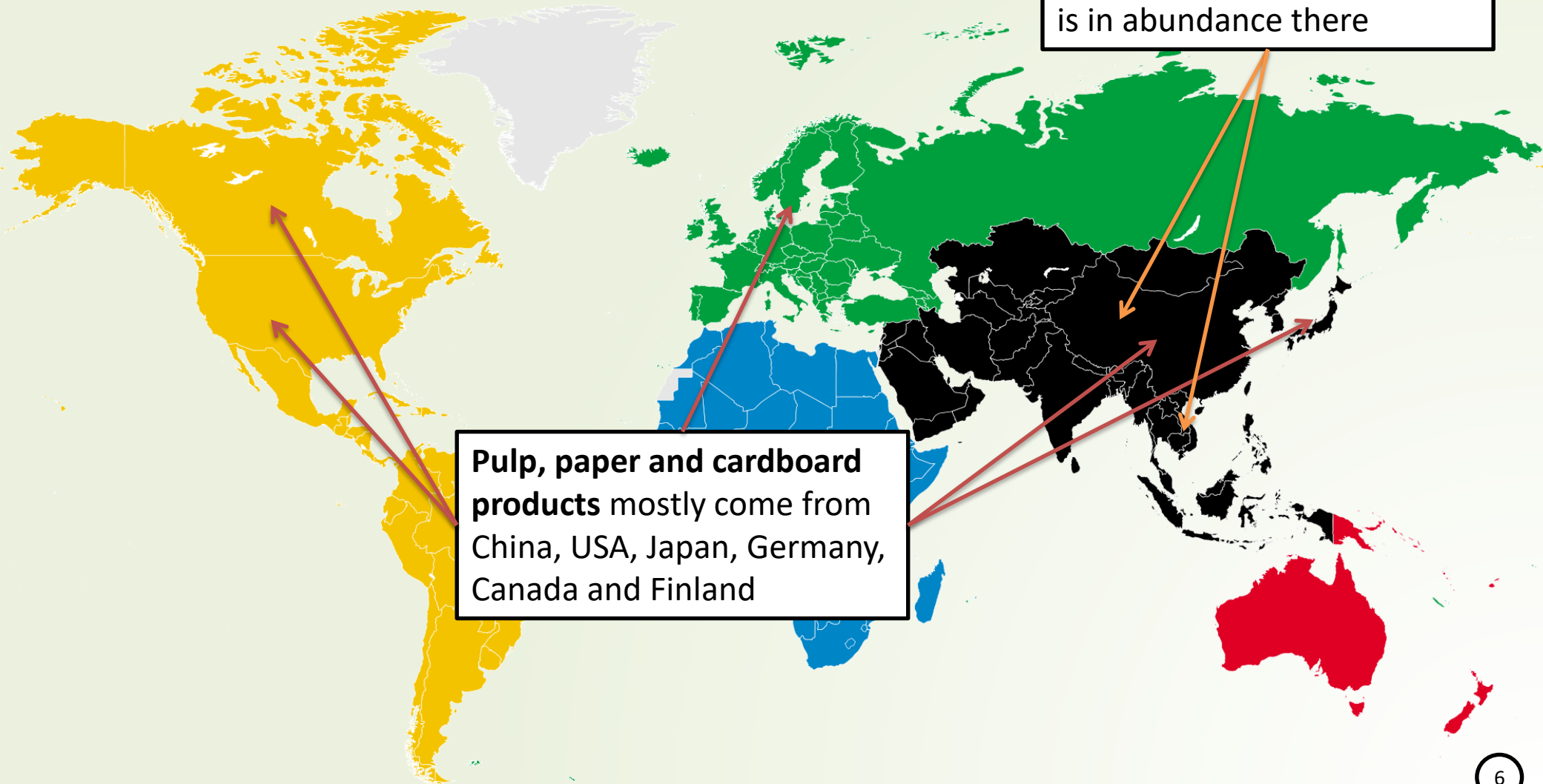


Sublimation Printing and Heat transfer paper



Origins of paper products

Rice paper comes from Eastern Asia, mostly china and Vietnam as this resource is in abundance there



Pulp, paper and cardboard products mostly come from China, USA, Japan, Germany, Canada and Finland

Physical and working Properties of Paper and Board

We have covered some **working** properties of paper in the previous sections to some degree (**printability, flexibility** and **biodegradability**).

Other properties and information you need to know about are:

- **Surface finish** – How **smooth or rough** a surface is will determine how **sharp and detailed** the print will be. **Photograph paper** is very smooth, it has to be to allow for a sharp and high quality print.
- **Absorbency** – This is how much water can be **absorbed by the surface** of the paper or board. This can influence its **printability**, especially with water based inks. In **sublimation printing**, the ink separates from the water so that it sits on top of the paper and can easily be transferred to other materials using a heat press.
- **Printability** – To accept ink well, the surface of paper and boards has to be **porous**. This is measured in **porosity**. Other factors listed above will affect printability; including **smoothness and absorbency**. Structural factors also play a part – if a material is particularly **bulky or thick** this might affect porosity and smoothness, which will in turn affect how well the surface of the material will accept ink **without smudging**.

Physical properties of paper and boards include:

- **Paper density** – this is its **mass divided by its volume**. For example, tissue paper is 250kg/m³. In contrast, copier paper is 800kg/m³. How dense a material is can affect its transparency. It can also be described by how **compact** the material is.
- **Transparency** – the opposite of transparent is opaque. It describes how much light can pass through the material. Printing paper needs to be fairly opaque so double sided prints do not show through to the other side. Tracing paper needs to be highly transparent so other images can be easily traced.
- **Texture** – this is determined by how the product **feels** – smooth, bumpy, porous, coarse, silky etc. Water colour paper is highly textured so it absorbs water well and creates depth in paintings. Some fabrics are described as '**woven**' as they have a similar texture to some woven fabrics. These are often used as writing papers.

Social Impact on the use of Papers and Boards

Trend Forecasting

Paper and board is **BIG business** – just like the fashion industry, it pays to get an idea of what will be needed months or even years in advance. Trends of this material are influenced by:

- **Mood boards and colour palettes** of **new and emerging** wants and needs in packaging, interior design and brand design as they all contribute to what materials might be needed. EXAMPLE: a few years ago foiling on video game inserts became popular, and so drove the trend for foiling to be used on other unconventional products.
- **Trade shows** present **new materials and technologies to the industry**. This can include advances in papers and boards, or print processes and finishing techniques. EXAMPLE: Over the years printers have developed dpi printing – dots per inch. The more dots per inch the better quality the print will be. Some printers went from 400dpi to 4000dpi over the last decade.

Recycling and Disposal

We use **12.5million tonnes** of paper and board every year in the UK. However 2/3rds of paper we use is **recycled**. This produces 73% less pollution than producing **virgin paper** (paper with no recycled material). It also is normally **bleached with oxygen** rather than using chemicals like **chlorine** which pollute the environment.

Even though recycling is a very positive thing for our planet, **paper can normally only be recycled seven times** before the fibres become too short to be used and then needs to be mixed with other wood fibres. We still have a **responsibility to reduce our paper usage** because of this. Many companies help this cause by switching from paper to digital documents.

Sourcing materials and its impact on communities and wildlife

- **Hardwood and softwood trees** provide the materials to make most paper products. Some trees are preferred over others due to their **structure and chemical properties**. Taking a certain amount of one type of tree can affect the areas **biodiversity** – meaning this will change **the variety of plants and animals** that inhabit the area.
- Harvesting trees can also **destroy habitats** and cause **soil erosion** so crops cannot be grown.
- **Transporting** timber to be pulped adds to **CO2 emissions and air pollution**.
- Processing pulp for paper can be noisy and so cause **noise pollution** – this can affect surrounding communities. The dust from this process also adds to **air pollution** and can **cause respiratory issues**.
- A lot of water is used for the processing of pulp and is normally taken from local rivers. This will affect **ecosystems and communities**. In turn, waste water is put back into these systems and **can pollute main water courses**.
- **Excess waste wood fibre** needs to be disposed of and this is often done using **landfills or incineration**.

Reduction of packaging materials

Even **small changes** in how packaging or products are designed can make a **huge impact** on how this saves materials and reduces the impact on our environment.

A **huge increase** in online shopping means the demand for **cardboard packaging** is on the increase. Many items are sent in small boxes but still take up more space than is needed. This is not only **unnecessary** but takes up a lot of **space in the warehouses** of companies.

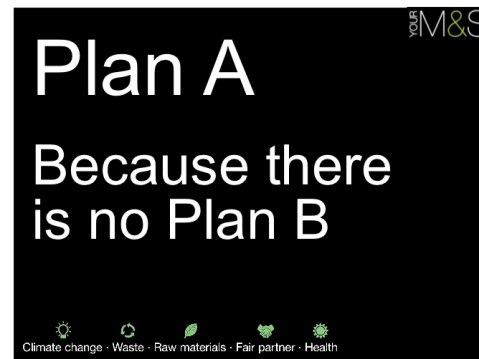


Amazon is notorious for using large boxes to send small items to your door. Many also add plastic padding so your products will not arrive damaged.



BT home hub – designed with fold away stand so it can fit in a slim box for posting easily through your letter box.

Many companies are committed to reducing waste in their packaging while still producing a safe way to transport goods. Marks and Spencer have focused on how they impact on the environment by releasing their 'Plan A' statement – focusing on 5 key areas of sustainability issues. Reducing materials in packing will always **reduce waste and energy consumption**. Cleaner air, less burning of fossil fuels, less transport impact, lower global warming contribution, less habitat damage and a **more sustainable future for generations to come**.



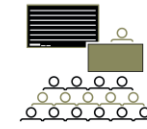
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57

number of Plan A 2020 commitments achieved to date



762,000

workers in the M&S clothing and home supply chain trained by M&S since 2010 (110,000 more than 2014/15)



91,000

people helped by M&S Global Community Programme in last 12 months



42%

percentage of M&S cotton from sustainable sources



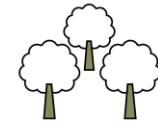
100%

percentage of UK & ROI operational waste from M&S stores, warehouses and offices that is recycled in some way

28

28%

percentage of M&S leather sourced from Leather Working Group certified tanneries



99%

percentage of wood used in M&S products, packaging and buildings from FSC, recycled or sources that protect forests and communities



24

number of towns and cities that will benefit from a Spark Something Good customer and employee volunteering event over 24 months



Zero

carbon emissions from M&S operations for four years in a row



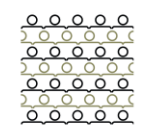
2.7 million

number of used and unwanted garments donated to Oxfam by M&S customers through the Shwopping scheme in 2015/16



100%

percentage of electricity used to power UK and Ireland stores from renewable sources



2,002

work placements for young people who barriers to employ 2015/16

Brand Identity – Companies and Print

Brand identity can be described in many ways, but it is essentially a variety of things that build customer perception about what the product is and how it a company goes about its business. A collection of these associations are shown below:



A brand identity will include a **logo**, **marketing messages like slogans or tag lines**, **customer service and reputation** at its core. One element of brand identity is **consumerism**. This is how a business sees their customers and how they want their customers to respond to their products. The **customers interest needs to be at the heart of the brand** in order to **promote sales** and **drive consumerism**. There is another side of this coin however – meeting consumer demand and wants can generate more waste and make communities seem materialistic and greedy.

Companies have to **balance** these consumerist ideas with the impact on the environment – more and more people are caring about waste and what happens to products at the end of their life cycle, as well as how they are manufactured. Responding to these requests from their **target audience** are more likely to bring in more sales.

Over time McDonalds developed their packaging in response to new and available materials. At first all packaging was made from paper – including cups. Over time plastic became more accessible and so plastic lids were added.

McDonalds serves millions of people all around the world every day. The waste they produce as one company is astronomical. The company recognises the need to be responsible in their packaging choices, and they want this to be reflected in their brand.

For the last decade they have promoted their 'Reduce, Re-use, Recycle' policy and have since recycled 14,700 tons of cardboard a year.

89% of the materials they use for packaging are recycled. The trays for their produce are washed and reused, rather than being disposable. This commitment is all part of their brand identity. It would easily push more consumers their way knowing they don't have to worry about where their waste is going.



Not only was this brand iconic in its design, the OXO cube was also turned into a convenient, long lasting way of adding flavour and protein to the diet. This was possible because of the introduction to foil in its packaging, making it hard for moisture to reach the stock cube and spoil it.

Oreos are another brand that has stood the test of time. Originally starting out in convenient boxes, Oreo took on the power of the shiny, luxurious plastic foil wrap it is found in today. This might be seen as negative – consumers are attracted to shiny bright materials but plastic waste has a more negative impact on the environment.



Ecological Footprint

Sustainability

Demand for paper products is very high, and will continue to be so for many years to come. The amount we need currently outweighs the materials available to make paper products we consume. This is unsustainable.

FSC (Forest Stewardship Council)

Forests managed by the FSC are managed well enough to plant trees and maintain forests all over the world. This prevents a rapid decline in timber. Some timber is not sourced from a well managed forest and can cause large areas of trees to be cut down (**deforestation**). Often in the USA paper is only taken from thinner trees that are cut down at intervals over a span of 15 years – this keeps forests as they are without damaging the landscape. This process of **thinning** also **decreases the risk of forest fires and pest infestations**.

Our ecological footprint comes from the **activities we do** and the **resources** it requires to do them alongside the **waste** it generates.

There are many factors to consider in this – **sustainability, environmental impact, social and economic factors**.



Our demand for paper products has increased by **400% over 40 years** – with 35% of all harvested trees being used for paper manufacture.



Although harvesting timber for wood pulp can cause issues (like **noise pollution**, **CO2 emissions**, **land erosion** etc) it can also **provide jobs** for the local community.



Transport is often forgotten about as a contributing factor to the environment. It plays a big part in **global warming** due to the release of CO2. This is also true of the **factories** that pulp the paper.



Plantation forests are made up of **one type of tree** – harvested normally for one reason. This is known as a **monoculture**. This can lead to a **reduction in the range of wildlife** in the area, which in turn affects the **surrounding communities** that rely on this habitat for food and materials.



Pulp bleaching

The dark colour of the pulp is mainly due to residual lignin. This is removed gradually during bleaching.



Lignin is a naturally occurring polymer in plant and tree fibres. In the olden days, most paper was yellow or turned yellow with age. In order to remove this yellowing effect bleaches like chlorine are added in stages until the pulp is purely white. This is then used to form the paper we use today.

Other chemicals like **chlorine**, which bleaches paper, and other solvents that soften wood fibres can **leech into water ways** once **waste** from the factories is expelled. Other factors also include **organic materials** that **consume oxygen** from waterways, **sulphur dioxide** which contributes to **lake acidification** and **phosphates** that **boost algae growth**.

Advantages of using sustainable paper & boards

- Fewer trees need to be cut down and this will reduce deforestation because sustainable board can be manufactured from waste pulp or wood fibre
- Less energy is needed in processing the board compared to using virgin pulp so therefore reducing the carbon footprint of the board and lowering emissions
- The timber and pulp is likely to come from a well-managed forest where trees are replaced in an ethical manner, for example FSC managed forests.

Selecting Papers and Boards as a Designer

What might affect how we choose the materials we need for the products we design?:

Aesthetics:
How the material looks and feels

Form – How thick or bulky the surface is as well as the size of the paper or board. Other physical properties will have a say in its shape, like flexibility and transparency.

Colour – choices are wide and **varied** and many colours are available for different materials. Neutral tones might work where different impressions need to be made, like on an environmentally friendly beauty product. From a luxury perspective, bright whites give the impression of 'clean', and off white might be used for older styled prints to help give the right impression.

Texture – this gives an impression just as much as colour or style does. Imagine a business card – given to clients to make a good impression. Smooth surfaces with a silky feel are professional. More rustic papers can be used for nature themed businesses to give a more ethical impression.

Surface Graphics – How well the material can accept print or finishing methods like foiling or laminating will affect its overall look. Smoother surfaces produce a crisper print.

Availability:
What we can access and can afford

Some materials are more **readily available** than others, as well as being **cheaper** for a wider range of customers to afford. Printers and designers are aware of what provides the **best print, embossing, folding, cutting, fit for their machines** etc.

Most stock is **easy to order which saves time and costs** for the consumer. Most stock comes **pretreated** to be shiny, dull, glossy etc. This is why a lot of stock will be classed as '**gloss**' or '**matt**'. Gloss is cheaper than other stocks; you will often find flyers and magazines printed in gloss. If a stock is classed as '**dull**' there is little shine to its surface.

Specialist materials will need extra consideration, especially if those materials are quite new and have not been tested with **different printing inks** or **finishing effects**. Many materials will be classed as **bespoke** due to their availability and luxury. This goes for finishing methods also.

Environment:
Sustainability, pollution and waste, genetic engineering

A materials **life cycle** needs to be considered when being chosen for a product. Where the materials **come from, how they are processed, transported, disposed of** etc.

Biodegradable coffee cups, for example, are made from **biodegradable polymers** that were sourced from plants. **This cuts out the need to use fossil fuels** to obtain polymers that will last long enough to be used at least once.

Single use materials should have **as little impact on the environment as possible**. Those we use longer can afford to have more of an impact as over time this works out to be less.

Pollution is also an issue – CO2 as we know adds to global warming and can cause health issues.

Genetic engineering is also used to increase the amount of pulp that is useable from trees. **Lignin** needs to be broken down to make paper – **modifying trees** so they **produce less Lignin** means less energy and chemicals are needed to break it down.



COST

..affects what materials and manufacturing processes would be selected



SOCIAL FACTORS

...different trend influences in the market – what is in demand at any one time



Many different costs will come into play when figuring out what designs will work and what costs need to be covered for materials/manufacturing:

- **Quality of materials** – higher quality materials will obviously cost more money. If lower cost papers and boards are more suited to your budget, this could be an option – however people pay for quality, and if the print quality is poor you might not get a good investment.
- **Finishing/decorative techniques** – processes like die cutting, foiling and embossing all cost money – this will be added onto your manufacturing costs. They normally cost more money because plates or shaped cutters need to be made unique to one batch of print – over time it may be worth it but for small batches this will prove expensive.
- **Manufacturing prints** – if you require a small batch of prints, laser printing (digital process using toner, a dry powder) might be your best option. Larger batches of prints should be completed using offset lithography, for example. The quality is far superior and more cost effective for a large print run.
- **Commodity price** – this is the cost of the raw materials, often as bought in bulk. Delivery cost is added to this.
- **Cost of recycling** – Using partly recycled materials could save energy and therefore save costs. Specialist materials to do this, and even transport, should also be considered.

In our community, there are **different social groups** who find different materials or prints attractive. For **high volume** prints that are going to appeal to a **younger audience**, for example a night club, this might be printed on a **thinner, glossy paper**. For a **small batch of wedding invites**, the print might need to be seen as more luxurious – a **thicker, textured card** might be used for this – maybe even with some embossing or foiling applied.

Many products that come packaged are **iconic** in themselves – the packaging **draws in the customer** and **increases its sale** potential. Imagine if every product you went to buy had poor quality print and graphics - it would put you off.

Take the iPhone box as an example – simple, but elegant with foil embossing to show luxury and expense.



Take perfume boxes as another example – some are creative and beautifully designed. They can even become a collectors item in themselves. They can also be driven by popular movie trends, like this star wars product opposite.

Even things like **stickers, collectors cards and craft trends** like origami all **drive social factors in the demand for paper products**

Avoiding Offence

It is important that when we design graphics or choose materials for our products it **does not offend the community** that work will be present in. We need to be cautious of **colour, imagery and symbolic meaning**. An example would be that in Muslim culture, creating an image of Allah is blasphemous. Designers need to **research culture** to make sure they do not offend that community. Materials that are a poor choice for the environment are also becoming more **ethically implausible** – something else that could offend the community.

Suitable for intended market

Each **target market** is different – research needs to be carried out to see what materials and design detail would **suit the needs/wants of that group**. Some people push for more sustainable, rustic designs but others are more concerned with luxury and cost. The only way to make money from your products is to know **what will work and what wont**.

Culture is the characteristics and knowledge of a particular group of people, encompassing language, religion, cuisine, social habits, music and arts.

Culture and Ethics

Ethics is the basic concepts and principles of decent human conduct. It includes study of universal values such as the equality of all men and women, human or natural rights, obedience to the law of land, concern for health and safety and also for the natural environment

Colour and language

When designing in different languages, it is important to know **exactly** what is being said so it does not offend that culture – some translations are not accurate and this could easily offend a group of people. **Symbols** are often used to **increase the understanding** of paper products and prints so they can be understood across the globe, like the recycling symbol.

Colours are also vital in understanding graphics work – for example in **China the colour red is lucky**, but in **south Africa it is the colour of mourning**.

Built in product obsolescence also adds to consumerism – designers often make products that will have such a **short lifespan** its almost like they are built to be thrown away – they often do not break down easily either.

The Consumer Society and Effects of Mass Production

Consumerism is driving waste production – many people disregard the way products are **disposed of** and are only concerned with getting things **quickly and easily**.

Many manufacturers help fuel this '**throw away culture**' by **mass producing** items as it is more cost effective for them to do so. It means we get things **cheaper and more accessible**. This adds to all of our **environmental issues** – more products, more waste, more CO2 etc. Due to **mass manufacture** more unskilled jobs are hard to find as **machines do it quicker and more cost effectively**.

Aesthetics and Availability

The gold is aesthetically pleasing to a more luxurious market – the pink is feminine so would probably attract a female market. The texture is smooth with a raised surface which implies cleanliness and expense. It also provides a good quality print.

As the product is folded and printed, sourcing paper to do this might take longer and it will definitely be more expensive. The material is also sturdy and resists twisting or weight so this shape is a positive for the target audience.

The UV gloss coating would take extra time and would need to be done by a specialist printer.

Social factors

Thick card stock is used, normally solid white board, as this is stiff enough to hold its shape well when it is picked up by the customer – as well as hold the heavy bottle in place. This tells the customer money was spent in its production – high quality.

The embossing and foiling also stands out to the richer market – it is luxurious and elegant.

Its use of branding – logo, layout etc – also reflects this impression.

Example Analysis



Cost Factors

Embossing and foiling adds to the cost of the product – as well as the original source of material being more expensive than folding box board.

The use of die cutting to make the NET of the box is also an additional cost. Over time of production, this cost will become more economic.

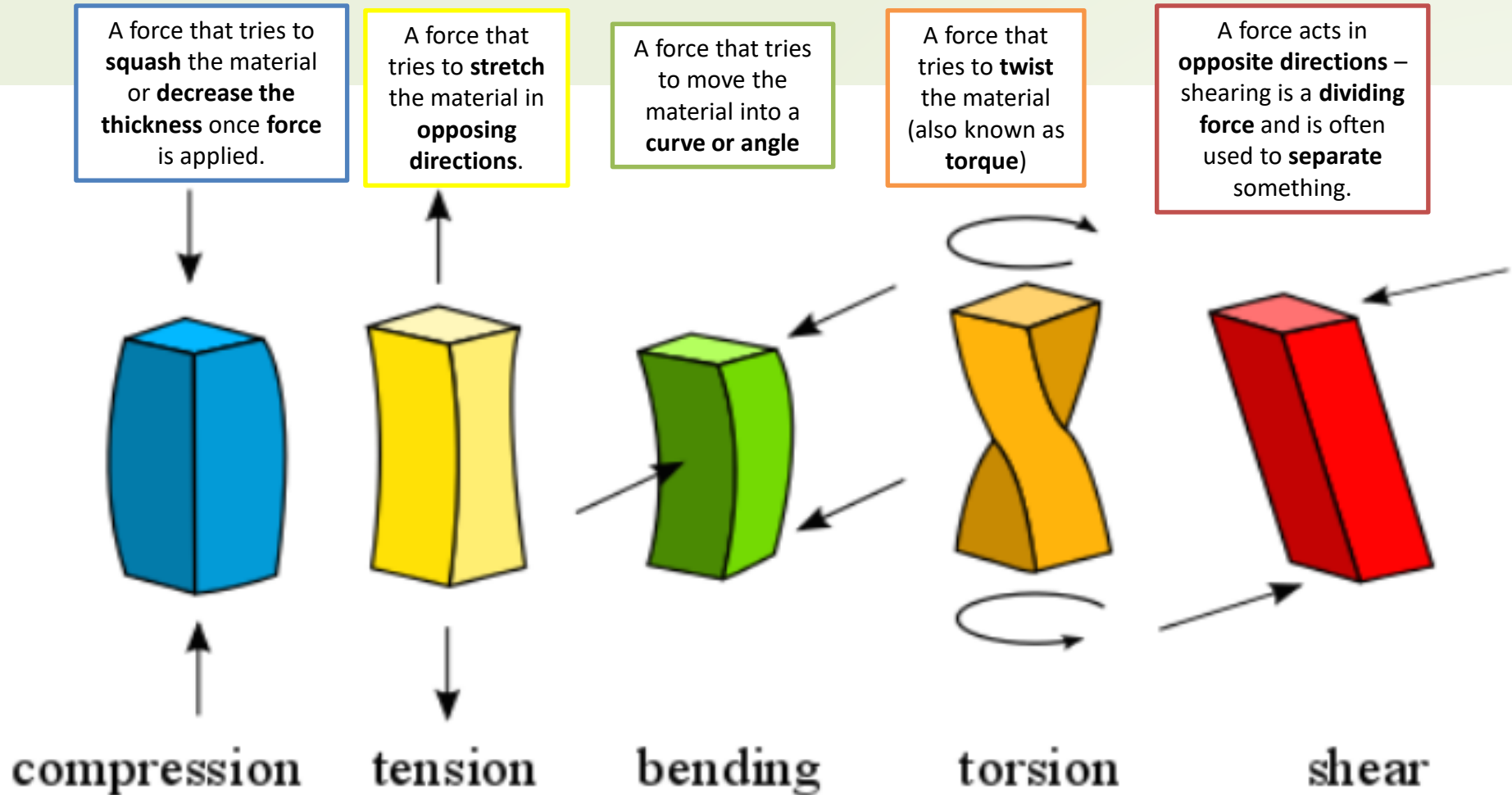
The cardboard is UV varnished to make it shiny – as well as adding costs this makes the overall product hard to recycle as it technically has a plastic coating over the top.

Environmental Factors

As already mentioned, the layers of coating on the board make it hard to recycle. The bleached quality of the paper also means it has been thoroughly bleached before it was white enough to get a good quality print. This takes more energy and chemicals to be used, which will affect the environment. Using polymers also means fossil fuels were used to produce the coating. This in turn adds CO2 into the atmosphere – adding to pollution.

Forces and Stresses on Paper and Boards

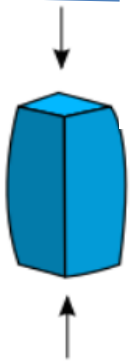
Some materials used in print and packaging can **withstand forces better than others**. For example, you wouldn't use the same material to package a stereo as you would to print your local paper on. Below is a range of forces and stresses you need to know about. All paper and board products will in some way come under these forces:



Many papers and boards will come under these stresses in different ways – from the way they are printed on to the way they interact with the customer – even how they deal with being stored and transported.

Below are some examples of how we need to consider these stresses when thinking about paper and board products:

Many board products are used in furniture as a more ecofriendly way of creating interesting designs to decorate your home. This chair below is made from **corrugated card**. The layers of corrugation make it more **resistant** to compression. A chair made with this material will easily support the weight of an average person. Impressive! Just don't spill your drink on it :D



compression



torsion

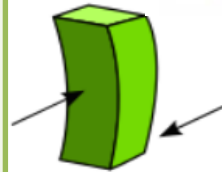


We don't tend to think of paper or cardboard in terms of '**twisting**'. Most can withstand some torsion, but when put into **layers** that resistance will increase massively.

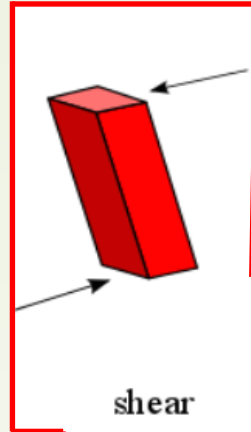
Try it with a newspaper. Take a few layers and twist them. Easy, right?

Now try it with a whole rolled up newspaper – not so easy!

This luxury packaging has a bent slot system that secures the handle to the sides to keep it closed – much more interesting than a boring old box! This card was chosen because it is **flexible** enough to bend to this shape **without tearing or the surface splitting**, which would look unattractive. The material is also **stable** enough to **stay in this bent position** whilst supporting the contents inside.



bending



shear



When you get all excited to open your presents on Christmas morning I bet you don't think about **shear force**, right?

Well, that's what ripping is – dividing two materials in opposite directions – shear force! Wrapping paper has **low resilience to shear force**. Which is important as you don't want that kind of hassle opening those goodies!

Reinforcing materials to strengthen them



Encapsulation

A good example of encapsulation would be a **restaurant menu** – the paper is put between **two layers of plastic** and **heat sealed**, so no liquids can spoil the graphics and its harder for tiny hands to rip in two!



Sandwich Construction

This is where a **thicker material or layer** sits in the middle of **two thinner sheets** – it can be paper, foam or another type of board. Or in the case of corrugated card, a **fluted (wavy)** layer adds **strength and stability**. These types of materials **resist being compressed**, making them ideal for **packaging and model making**.

Packaging laminates are hard to **recycle** and need to go to **specialist recycling plants** – some areas cannot do this so they go to **landfill**!

Tetra Pak products are another example of a laminate – layers of different materials to provide different functions like stability, hygiene and freshness. **Less waste more taste!**

Lamination



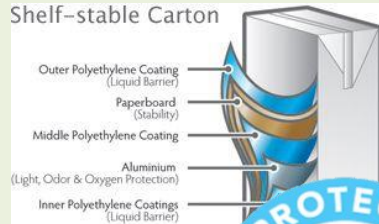
Laminating is **not the same** as encapsulation – it involves **layers** being built up to make a material **better**. It doesn't have to be **plastic**, it can be layers of **foil, foam or cardboard/paper**. It doesn't just help the **function** (stronger, water resistant etc) but also the **look** of the product – just like this chocolate wrapper on the right; layers of paper and foil give **strength and aesthetics!**



Foam board is another good example of a sandwich construction material – a layer of **polystyrene foam** in-between two sheets of **coated paper** – ideal for cutting out wedges and making **clean folds** with **no breakage** to the outside edge – great for **displays and model making**.



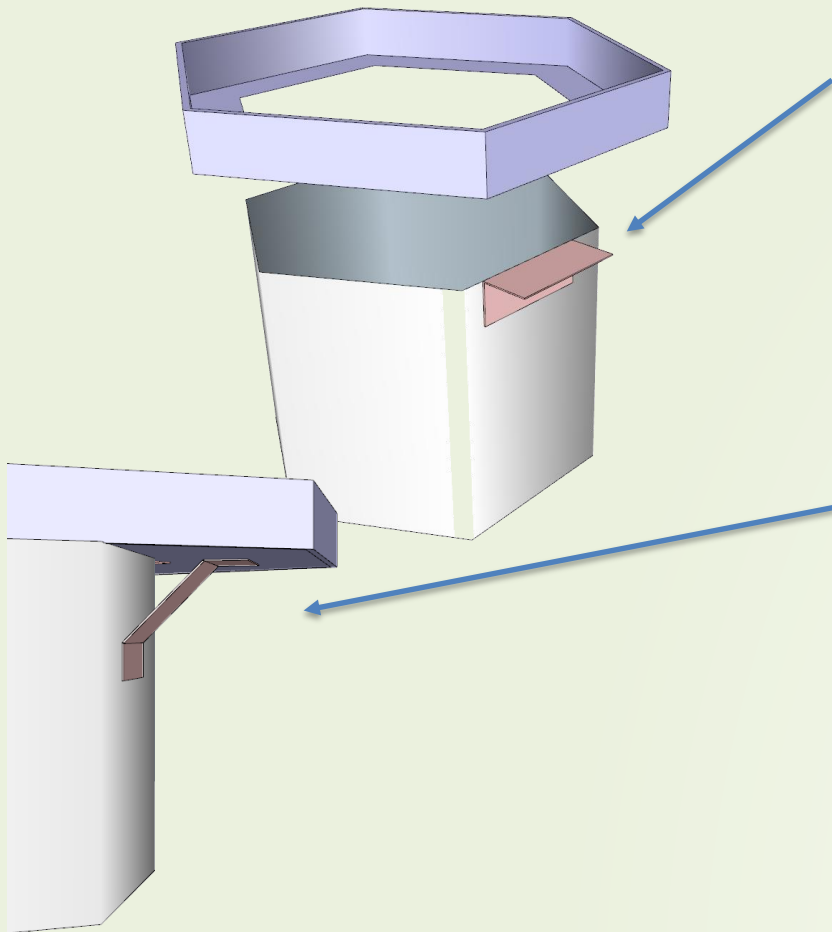
Shelf-stable Carton



PortaBio is a new brand that makes laminates with **biodegradable cellulose layers**. This ecofriendly laminate is **renewable and sustainable**. As it is made out of cellulose (found in all **plant products**) it is **easy to get hold of** and easy to **compost at the end of its life**. This becomes even more important in single or limited use products like flyers or brochures.

Other methods of reinforcement

- Create an upstand on the end of a part to increase gluing area



- Add a structural member to support the part
- Add slots to the part
- Applying glue to surfaces
- Providing support whilst the pieces set

Don't forget to:

1. Check alignment
2. Apply adhesive
3. Remove excess
4. Push together
5. Hold in place

Stock forms, types and sizes

For printers and designers to know **how much material they need**, they need to know what **sizes** they have to order to produce the correct amount of prints or products. Papers are measured in **WEIGHT (GSM)** and boards often in **THICKNESS (MICRONS?)**. However **standard sizes are common** – this makes it easier for companies to deal with each other and for manufacturing to be on a mass scale. Most paper stocks come under the **metric system** for paper and boards, outlines in **British standard ISO 216**.

Bespoke sizes are possible and can be ordered however as this is outside manufacturers standard sizes the cost can be much higher.

Laminates

The thinnest laminate layer can go down to **0.04mm**. Other common thicknesses are **0.08mm, 0.1mm and 0.2mm**. The **thicker** the layers, the **more rigid** the material will be. Paper backed foil laminate (like the roll below) is made by heating a layer of foil and a layer of paper with a food safe adhesive in between. These materials come on **long rolls called webs** and are pressed together to make a range of different lengths of the final product.



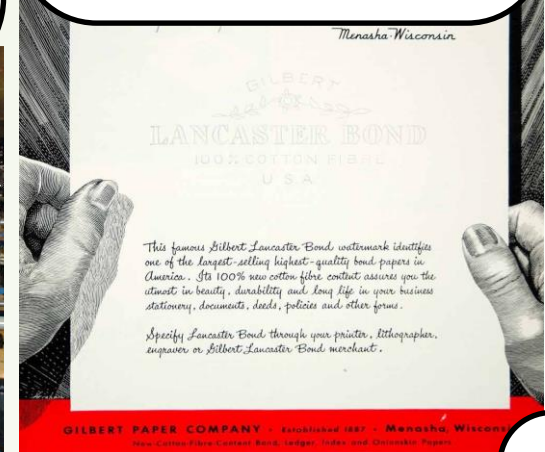
Newsprint/Magazines

In manufacturing processes, especially magazines and newspapers, **webs of paper** are also used. This speeds up the printing process as the rollers **constantly feed the paper into the printer**. This means more products can be made in a shorter time, **saving money and time**. However if a mistake is made and not noticed straight away, more waste could be generated – losing the company money. This is why so many printers have **strict quality control policies** and machinery that often checks set up before artwork goes through to the printer.



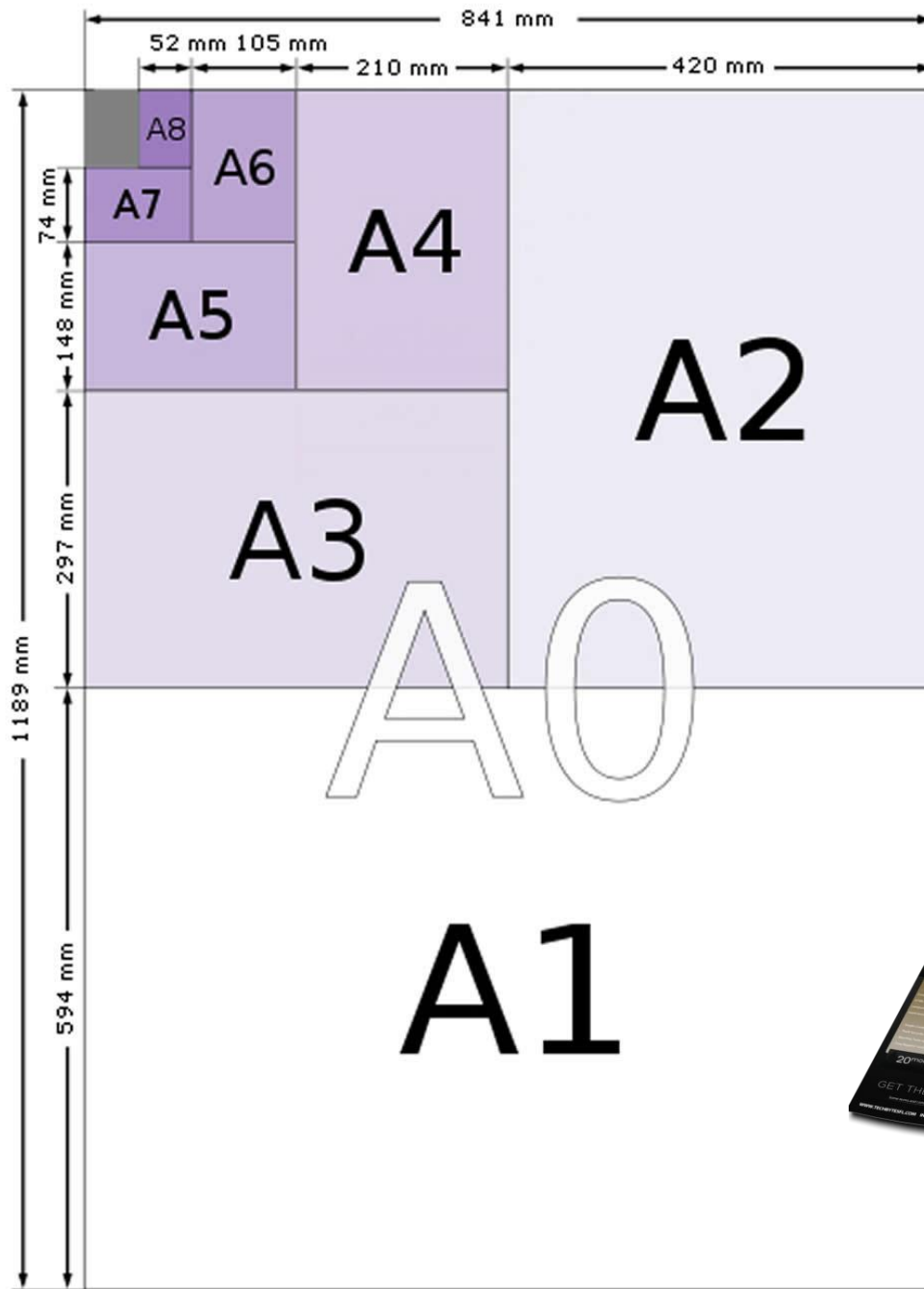
Bond Paper

This type of paper is often used where people **need to write on** the prints, such as printing of **letters, forms, typing paper** etc. Bond paper is **uncoated** to take inks well and often has a **strong surface strength to deal with being written on**. Higher quality bond papers contain **high levels of cotton** to absorb ink better.



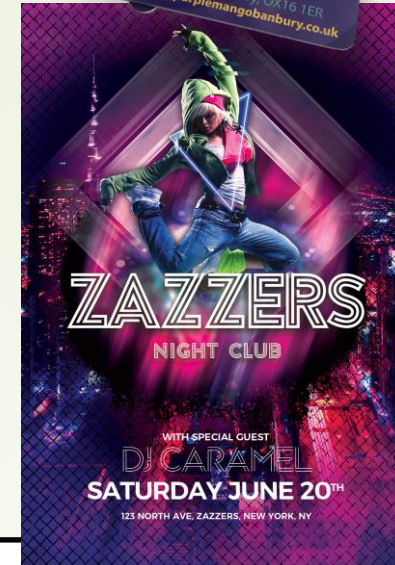
Some advantages of using stock sizes

- We use A3 and A4 stock sizes of paper in school. This is because it can be purchased easily making sure that supplies are readily available from wide range of suppliers.
- Also A3 and A4 paper is a standardised size to fit printers and photocopiers, therefore will it allows images and text to be printed using an inkjet or laser printer.
- These stock sizes are available in bulk packs (reams) so it can be bought in bulk, therefore reducing material costs.
- We don't have to invest money in specialist machinery or printers, so this saves capital and any training costs.



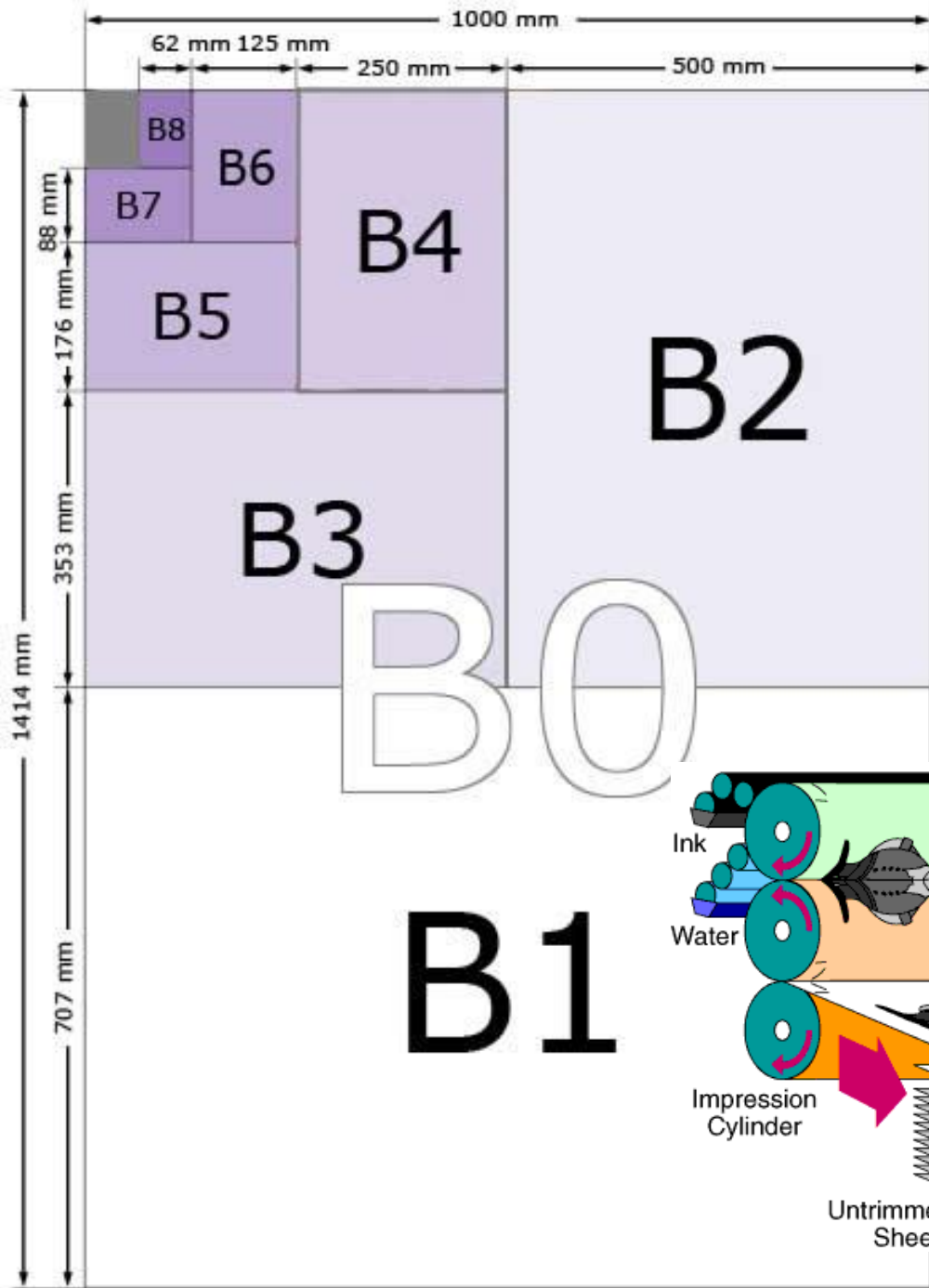
A Series Formats

A0	841 x 1189
A1	594 x 841
A2	420 x 594
A3	297 x 420
A4	210 x 297
A5	148 x 210
A6	105 x 148
A7	74 x 105
A8	52 x 74



This is the **most common printing format** used in **businesses** like schools, offices, small format printing etc

Most prints you receive from **events or advertising** will be an A size print. Think posters, flyers, loyalty cards etc

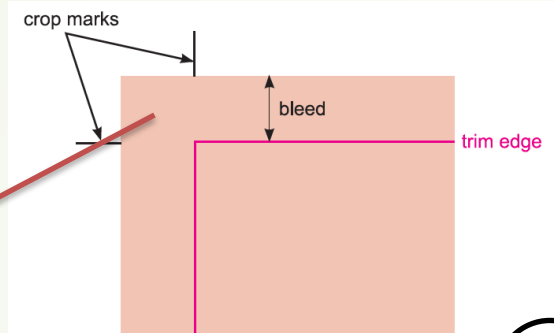
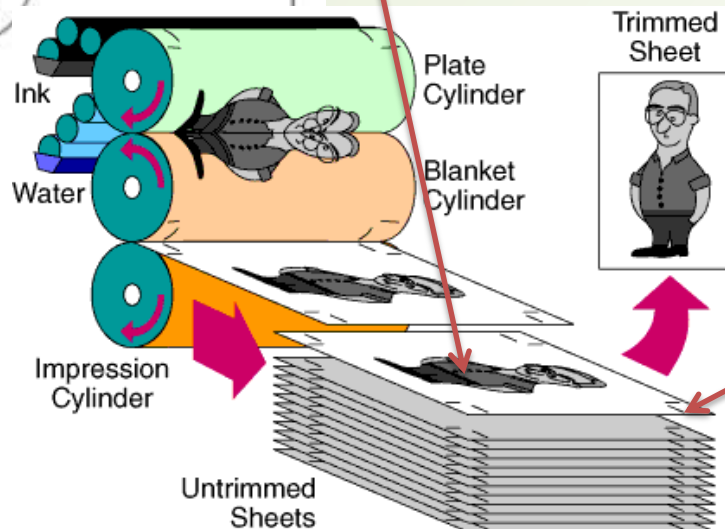


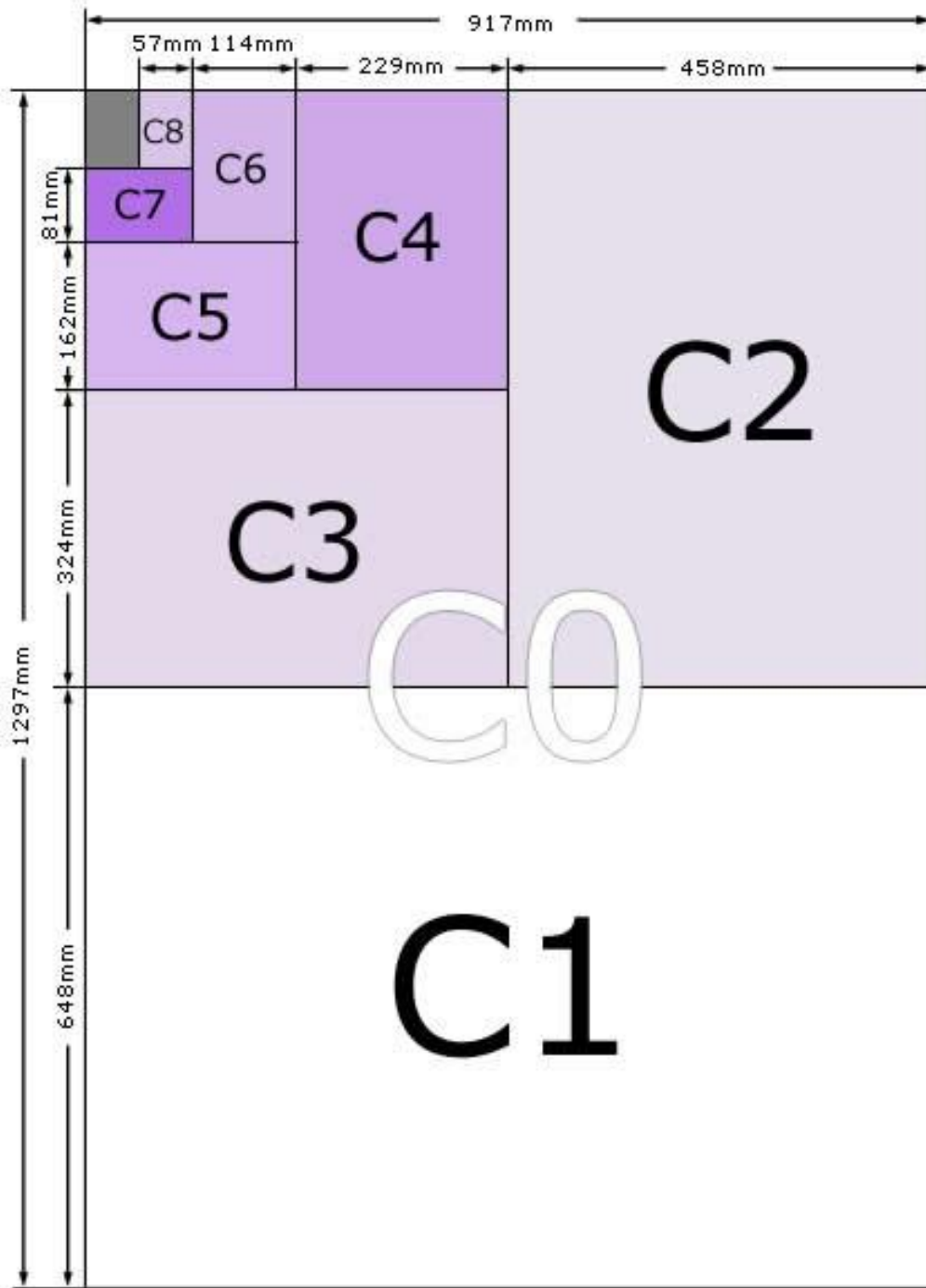
B Series Formats

–	–
–	–
B0	1000 x 1414
B1	707 x 1000
B2	500 x 707
B3	353 x 500
B4	250 x 353
B5	176 x 250
B6	125 x 176
B7	88 x 125
B8	62 x 88

B series papers are used to **set up print presses**. They are **larger** than A sizes so they can be cut out of the sheets easily with the use of **registration marks** and with **bleed** not being affected.

In printing, printers often use B series formats to feed into **offset lithography printing**. The sheets are printed onto and sent to be **trimmed down** using the trim marks on the paper (applied when the artwork is set up for print).



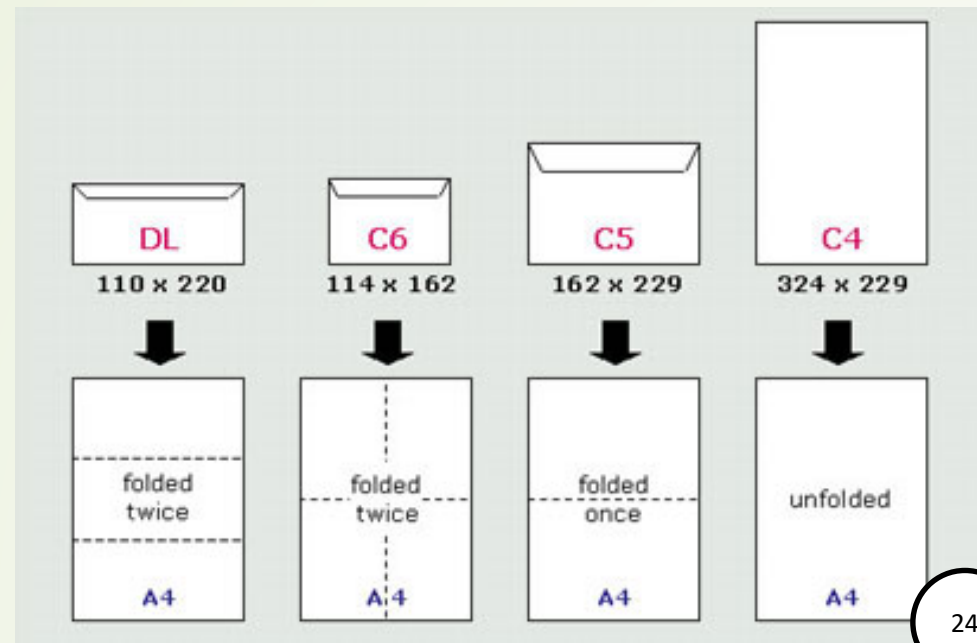


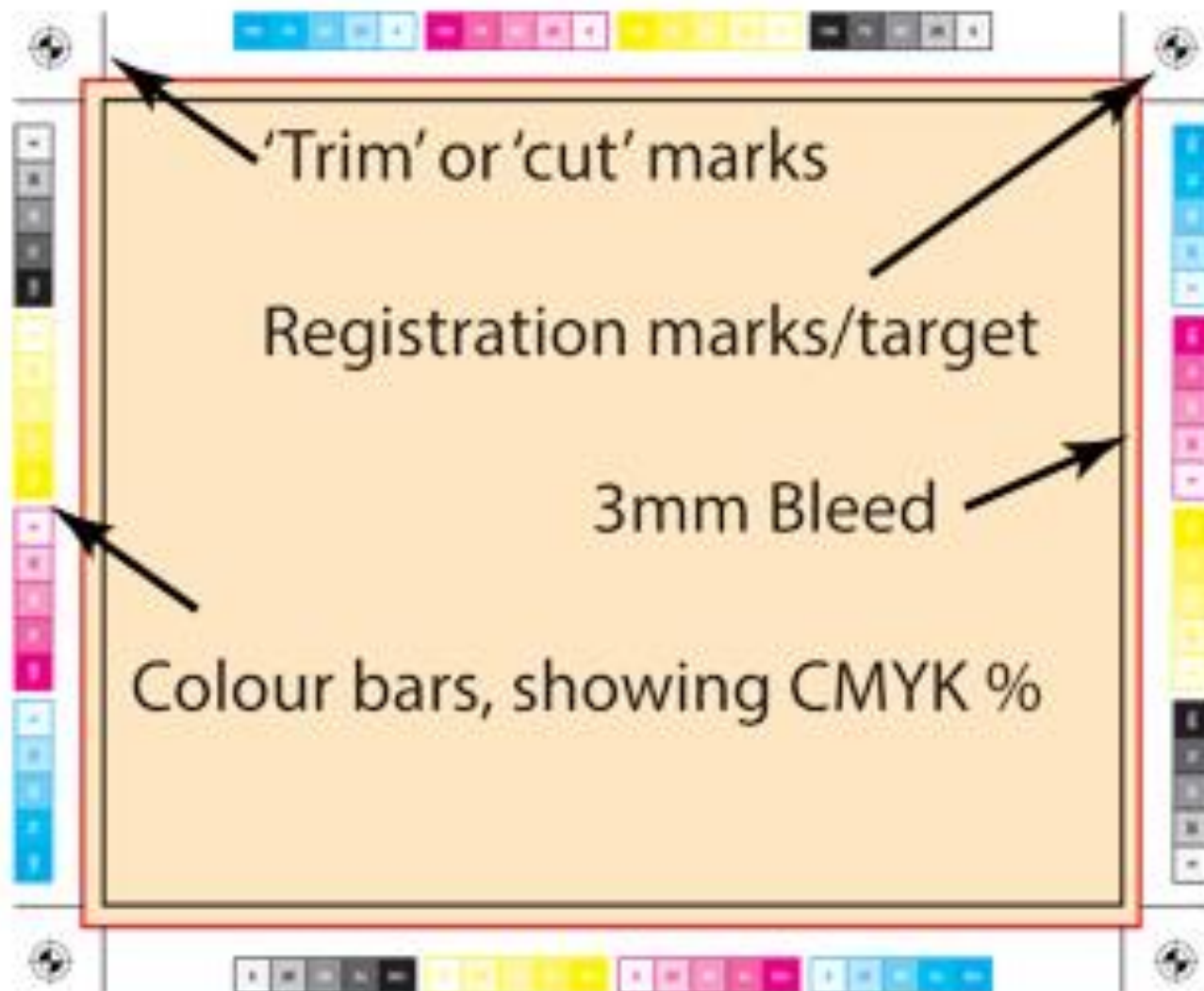
C Series Formats

–	–
–	–
C0	917 x 1297
C1	648 x 917
C2	458 x 648
C3	324 x 458
C4	229 x 324
C5	162 x 229
C6	114 x 162
C7	81 x 114
C8	57 x 81

C series formats are ENVELOPE sizes.

Pretty easy to remember – A4 prints fit into a C4 envelope. If we fold that A4 into an A5, it will fit into a C5 envelope – simples!





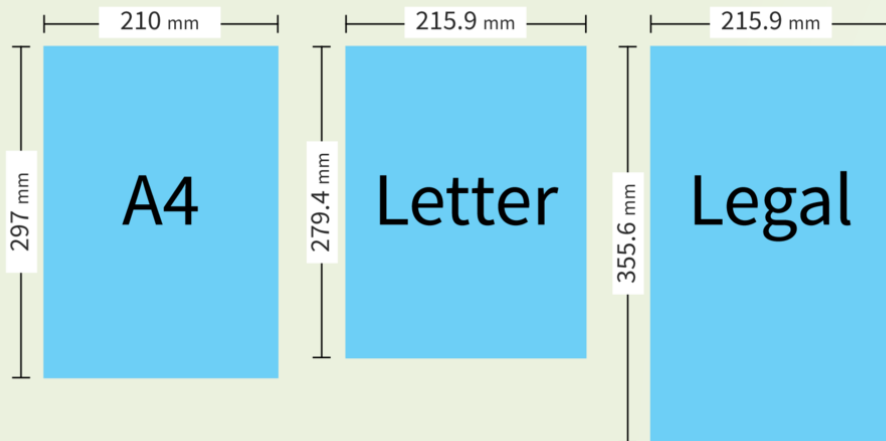
Different sizes you need to know

Letter size/Legal Size

This document size pops up from time to time, especially If you make a word document you might well see this in '**Page Size**' options.

It is an **American size**, slightly wider than (but also not as long as) A4 at **216mm x 279mm**. As it is common to use in **America, Canada and Mexico** most **software** will include this size in their program options to print to make it more accessible for the **wider global market**.

'**Legal**' paper is **not so common** to find in printing software. It is considered the standard size for legal documents which needed to stay the same size to **match up to important documents used throughout history**, this is the reason it is still used today.



Foolscap

This is measured at **203x330mm** – it was a traditional size of paper used in Britain **before** the A sizes became a global standard. **It is not often used now**, but some people still use the size for things like **folders** as they are slightly larger than A4 prints, making storing many copies in them easy.



Methods of Manufacture - Printing



Digital Printing – at home and in industry

In schools and offices it is very common to find either **laser or inkjet printers**. Laser printers use **TONER** and inkjet printers use **INK CARTRIDGES**. They are both great for **small scale prints** as it is **quick and easy to do**. You will also find a small print run digital printer in many **printing companies for quick and easy print runs** that only need a **small number** of products made up.

However, **long print runs on these printers would not save you money** as other printing methods use ink more economically.



Photocopying

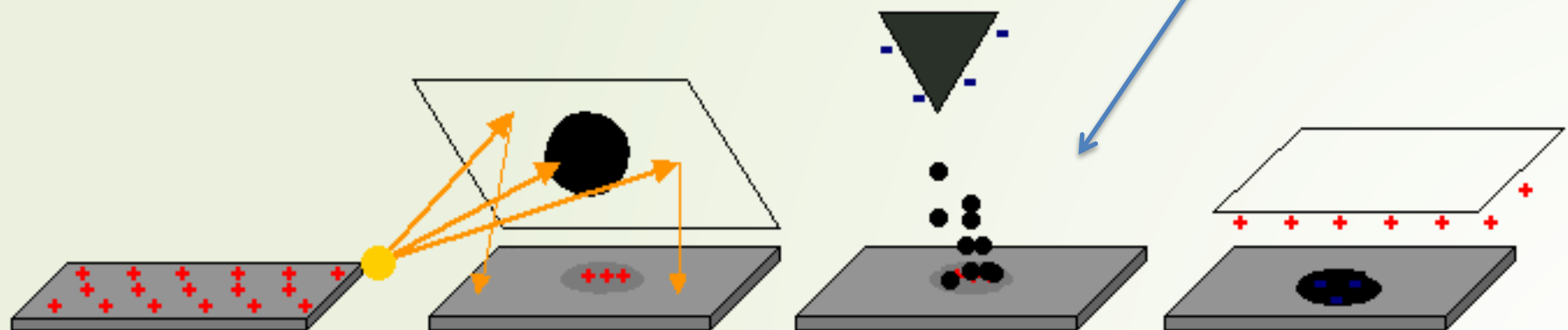
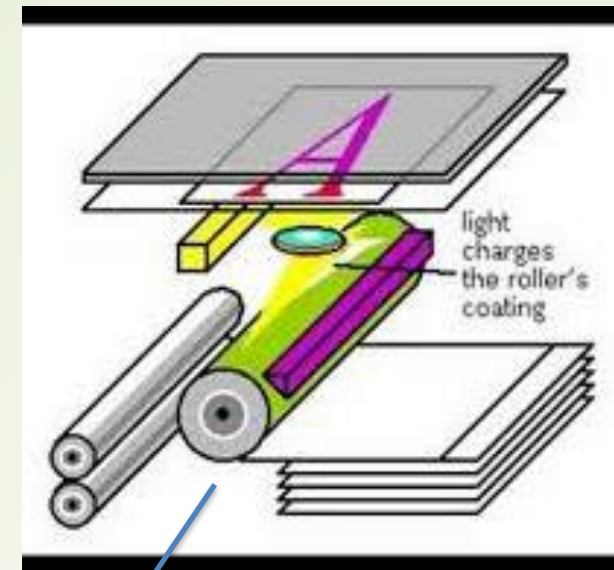
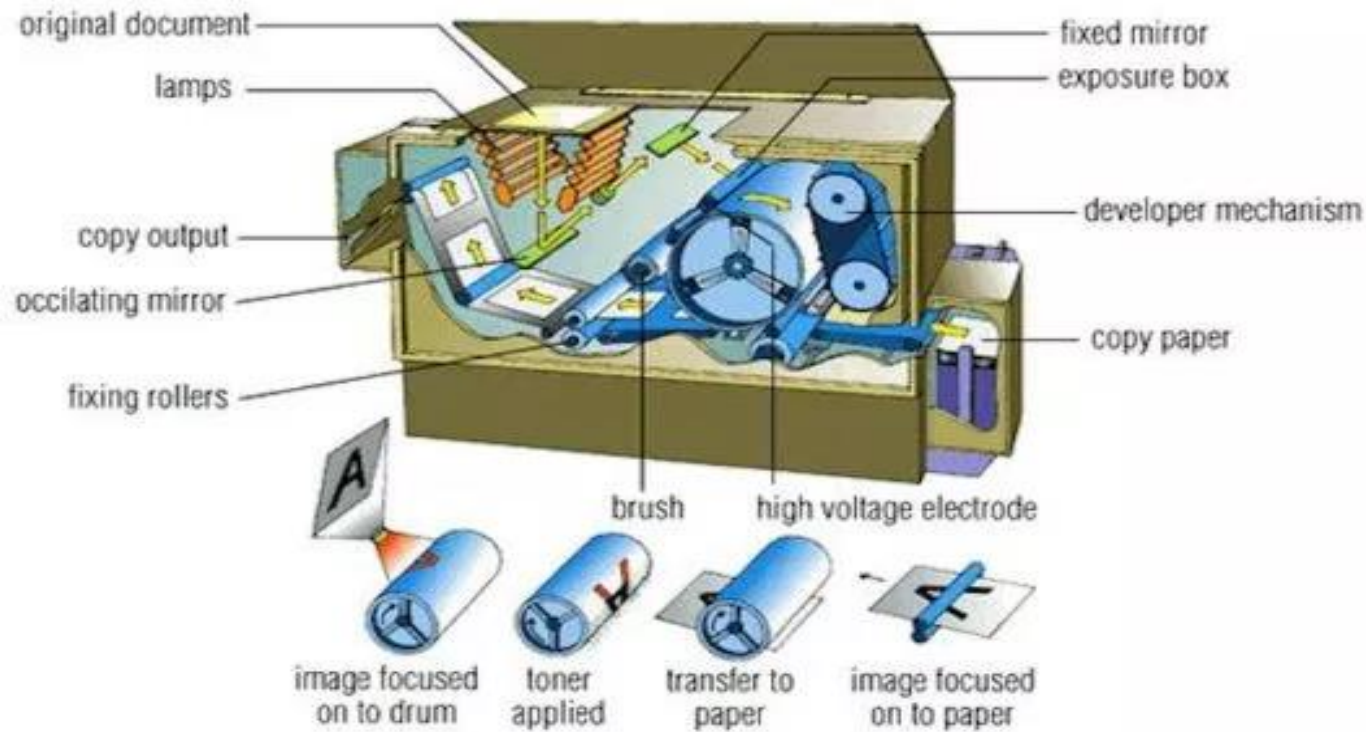
This is more economical than printing many copies from the computer. Photocopying uses **toner** – which is a **powder**. It works in stages:

- 1) First a **beam of light reflects off of the document** and an **electrostatic charge of that image sits on the rotating cylinder**. The white areas in the document do not produce an image they just reflect the light back – similar to how your eye picks up images, using light rays!
- 2) The area of the cylinder drum that has the image on is **negatively charged**. Any white areas that have been reflected (not to be copied) are **positively charged**.
- 3) The photocopier **toner is positively charged**, so when the cylinder rolls over the toner the **powder wants to stick to the negatively charged area** (as we know, positives particles are only attracted to negative particles!)
- 4) This image (now with toner powder on) is now **pressed into a paper sheet**, and then passed to a **heater to 'fuse' so the toner sets**.
- 5) The **drum cleans itself** of the previous image ready to be used again and again.

Photocopies can produce **multiple copies very quickly** – idela for use in schools! Most have been adapted to **add staples and even folds** to print work to make the variety of jobs much easy to achieve in different environments.

As the image is made using an **electrostatic processes**, over time that **image will fade** so it isn't good if you want to make a lasting impression!

If you want to **mass produce prints (in their 100's and 1000's)** it is also **not very economical**. It would be much better to use **offset lithography printing or gravure printing**.



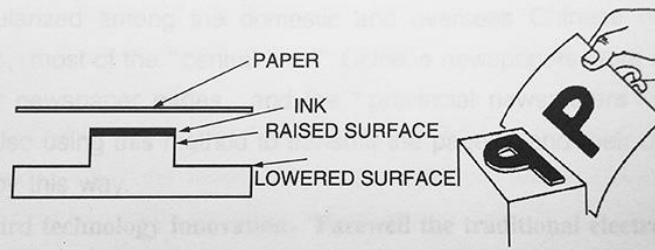


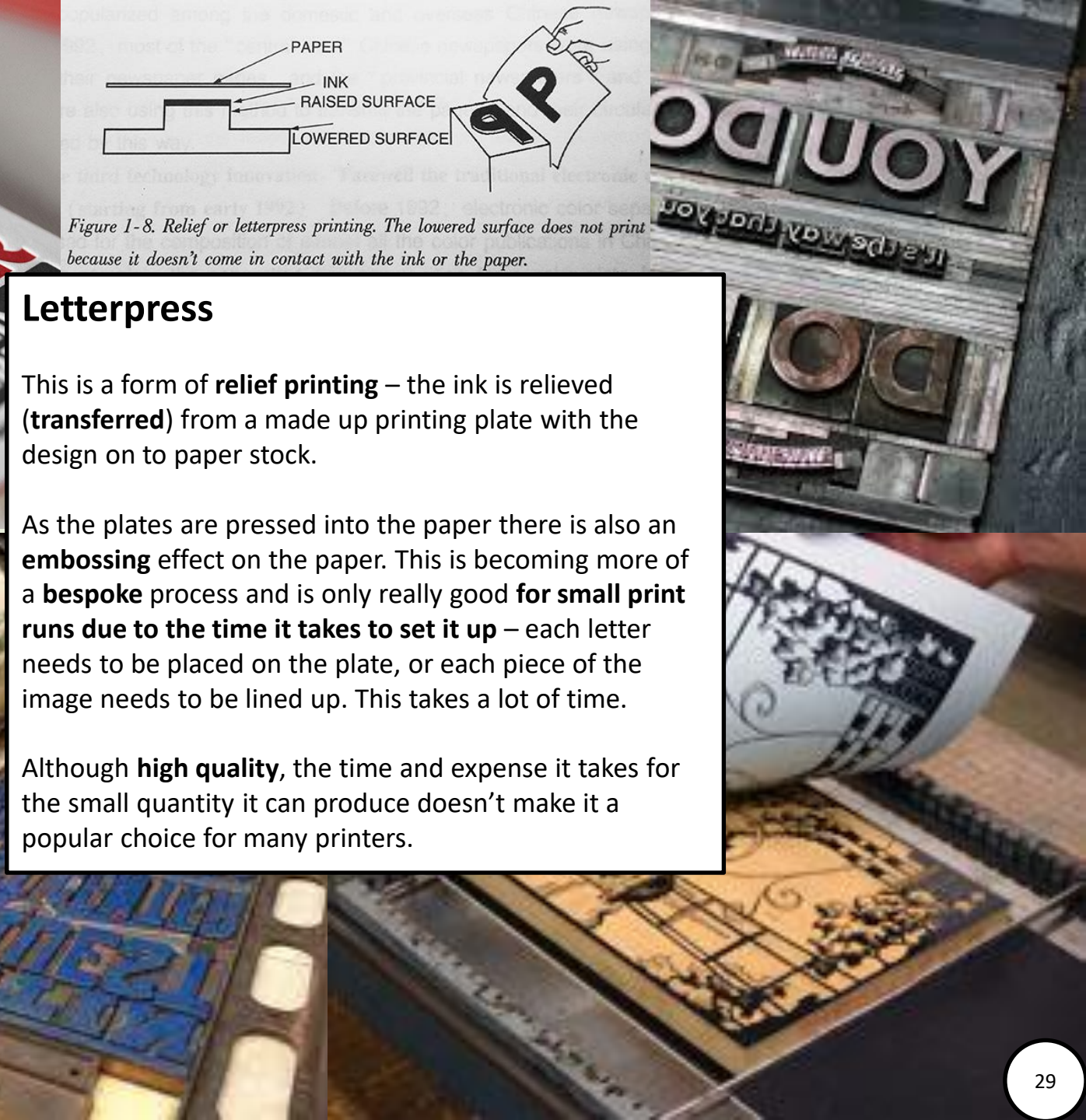
Figure 1-8. Relief or letterpress printing. The lowered surface does not print because it doesn't come in contact with the ink or the paper.

Letterpress

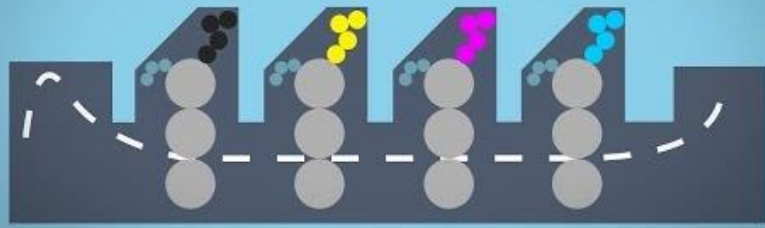
This is a form of **relief printing** – the ink is relieved (**transferred**) from a made up printing plate with the design on to paper stock.

As the plates are pressed into the paper there is also an **embossing** effect on the paper. This is becoming more of a **bespoke** process and is only really good for **small print runs due to the time it takes to set it up** – each letter needs to be placed on the plate, or each piece of the image needs to be lined up. This takes a lot of time.

Although **high quality**, the time and expense it takes for the small quantity it can produce doesn't make it a popular choice for many printers.



HOW OFFSET PRINTING WORKS



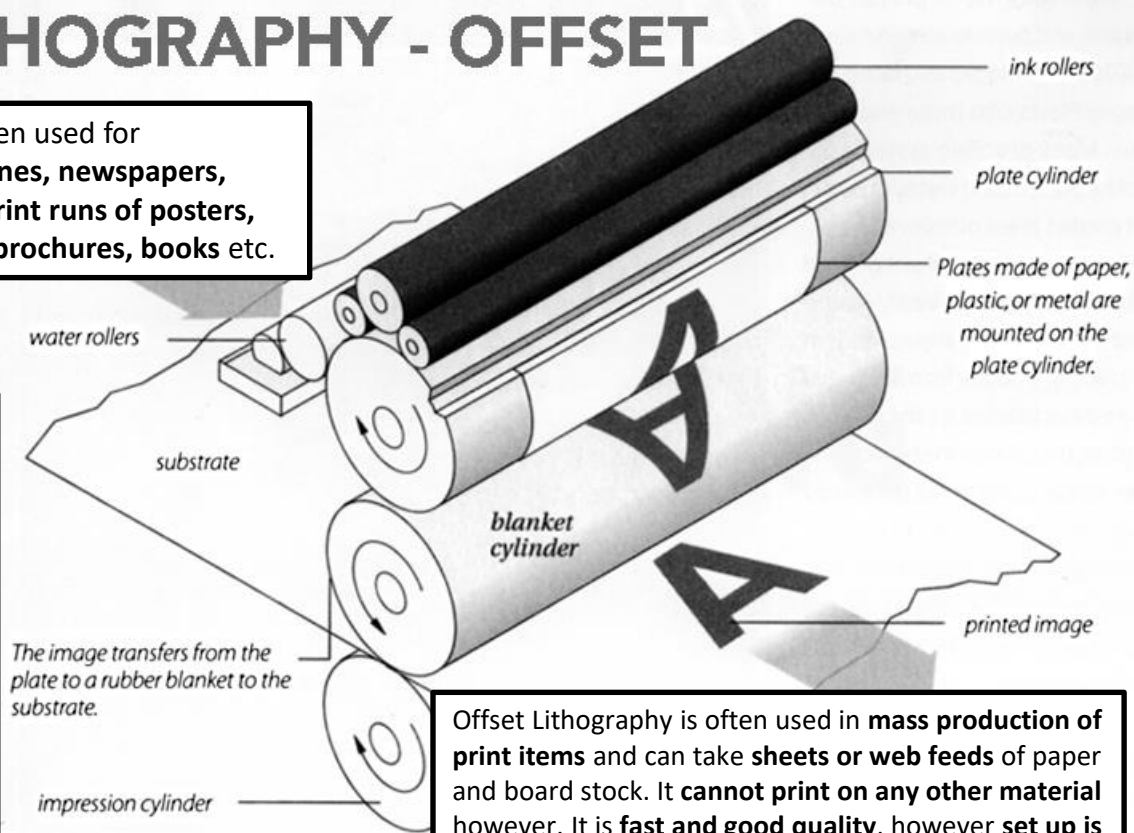
It is often used for **magazines, newspapers, large print runs of posters, flyers, brochures, books etc.**

This type of printing relies on the fact that **water and oil do not mix**. A relief image is made up onto a **plate cylinder** which **collects ink and transfers it to a blanket cylinder** - then it is **pressed** into the paper or card stock.

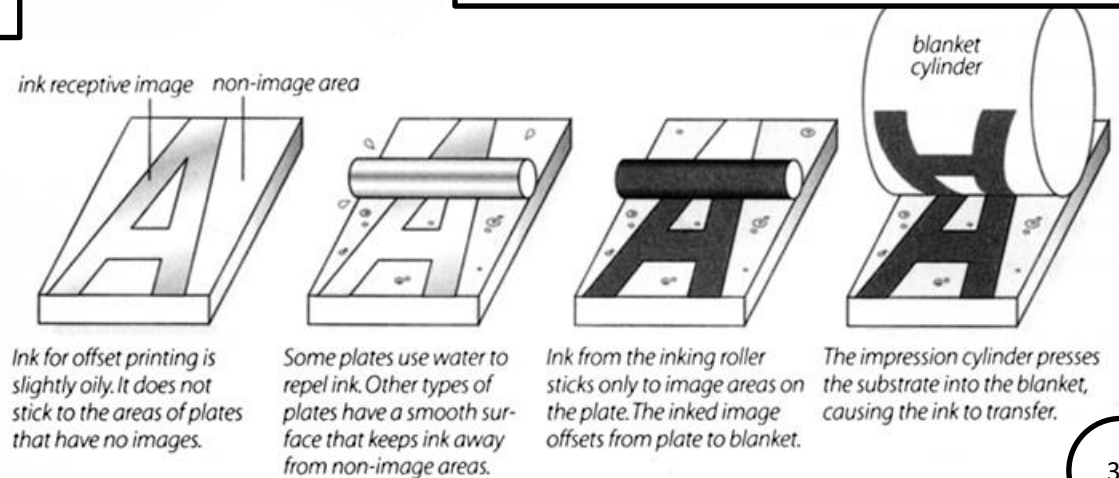
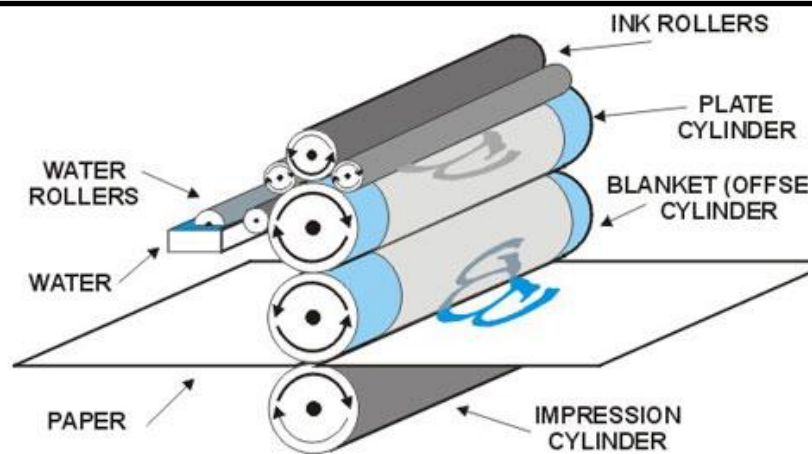
This is possible because an **emulsion** is used which is **oil based** and is transferred to the plate cylinder. When the water rollers **add water** the emulsion **repels** it, so the ink is left to stick to the area with emulsion on only. Another cylinder (**blanket cylinder**) then takes the ink and **rolls it onto the paper**.

Each **CMYK colour** has a chamber with **ink rollers**, so each plate cylinder applies its own layer of colour to the paper to produce the final image.

LITHOGRAPHY - OFFSET



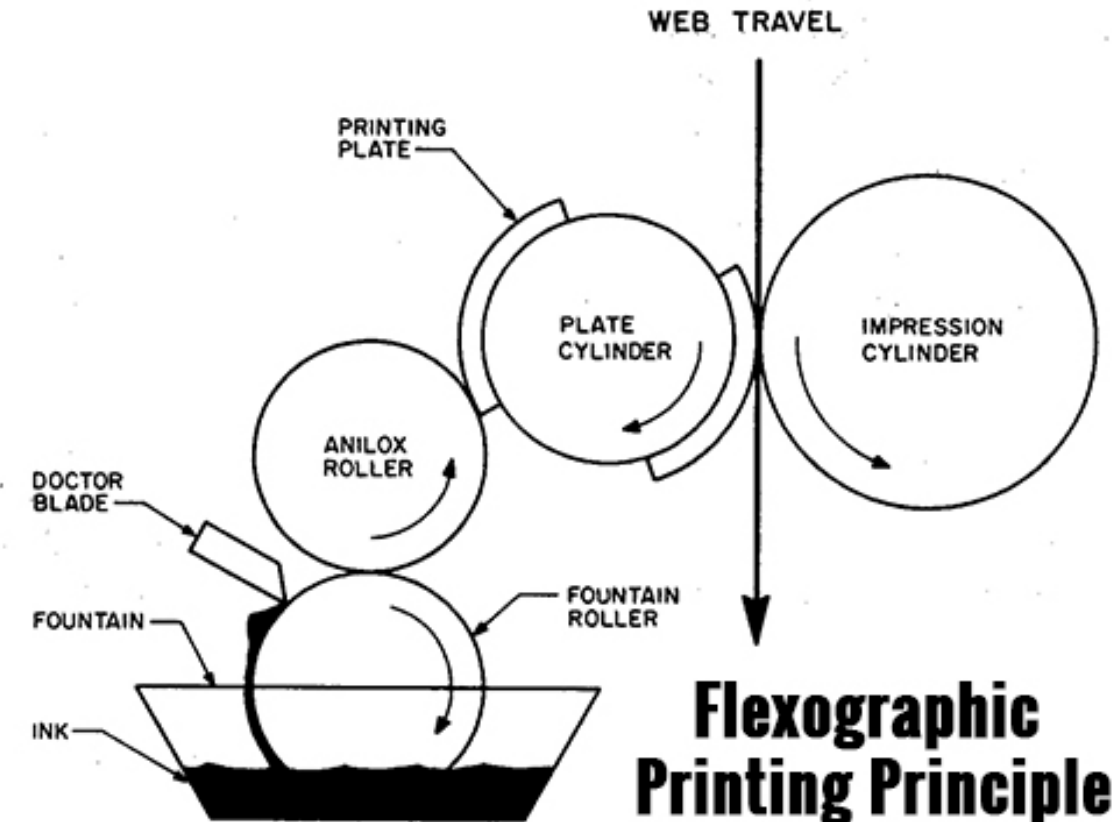
Offset Lithography is often used in **mass production of print items** and can take **sheets or web feeds** of paper and board stock. It **cannot print on any other material** however. It is **fast and good quality**, however **set up is expensive** so this is why it is only used for mass production printing.



Flexography uses a **relief image** on thin, flexible printing plates made of **rubber**.

Flexography can be used to print on materials such as **cellophane, polythene and metallic films**, so it is often used to print **plastic shopping bags, labels and fabrics**. It is also used to print **newspapers and paperback books**.

It is good to use with **web feeds of paper** so **continuous prints** on things like **wall paper and wrapping paper** are popular with this type of printing.



Here you can see the final relief image pressing the final colour layer into these bottle labels.

Each cylinder will have a **different image on**, wrapped around the plate cylinder.

It can also use **die cutting or laminating methods** in the **same print run**, so everything can be done in one go without stopping.

The **set up is expensive** however, so it is only economical to do **large print runs or even continuous production**. It can take hours to get everything ready for a print run.

Flexography **isn't great at adding fine detail** to prints either, so for this offset lithography is used.

Gravure printing uses **engraved copper cylinders** to hold ink from an ink tray and then pass this ink onto paper rolls.

It uses a **doctor blade** (usually made of rubber) to wipe off excess ink before the laser image is pressed into the paper.

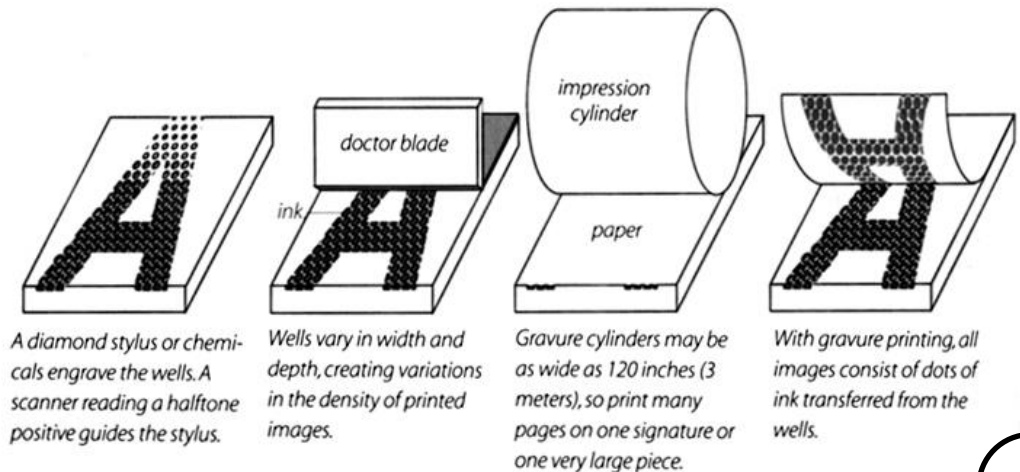
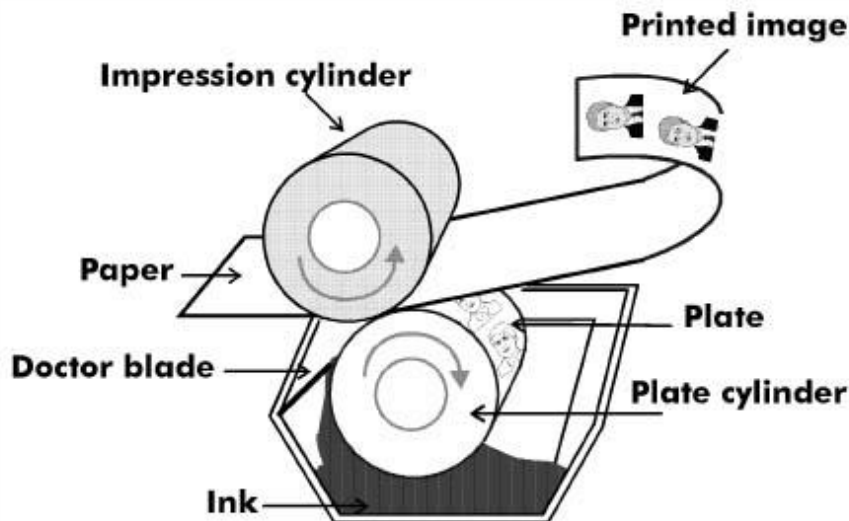
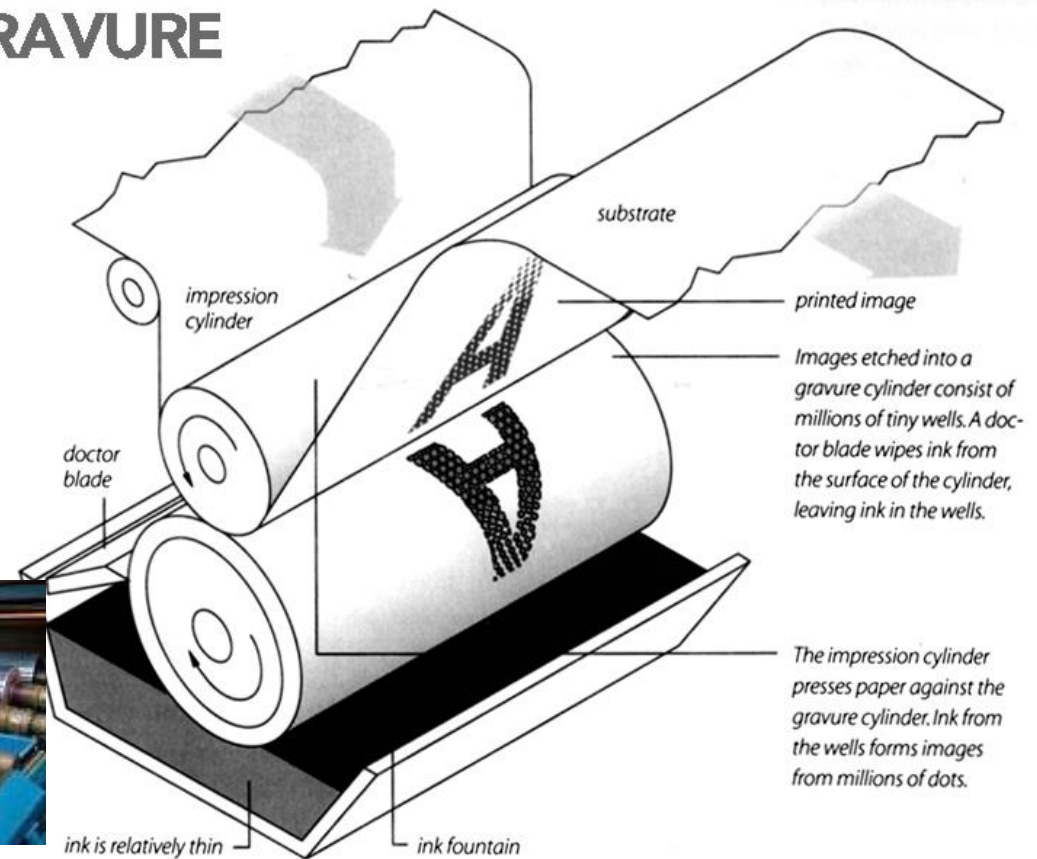
It is used for **large print runs** like magazines or books and mostly uses **web feeds of paper**.

The print is **high quality** and the **ink is fast drying** which makes it a suitable choice for many printed items.

However the set up is **very expensive**, the most expensive of all printing types.



GRAVURE



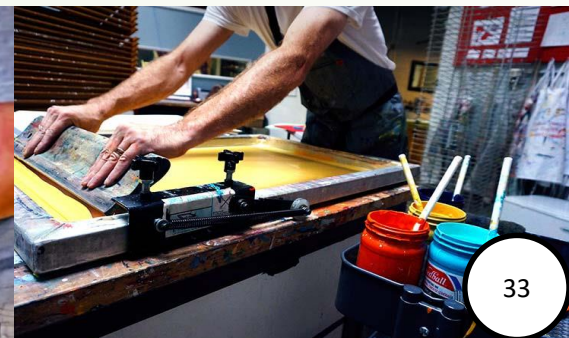
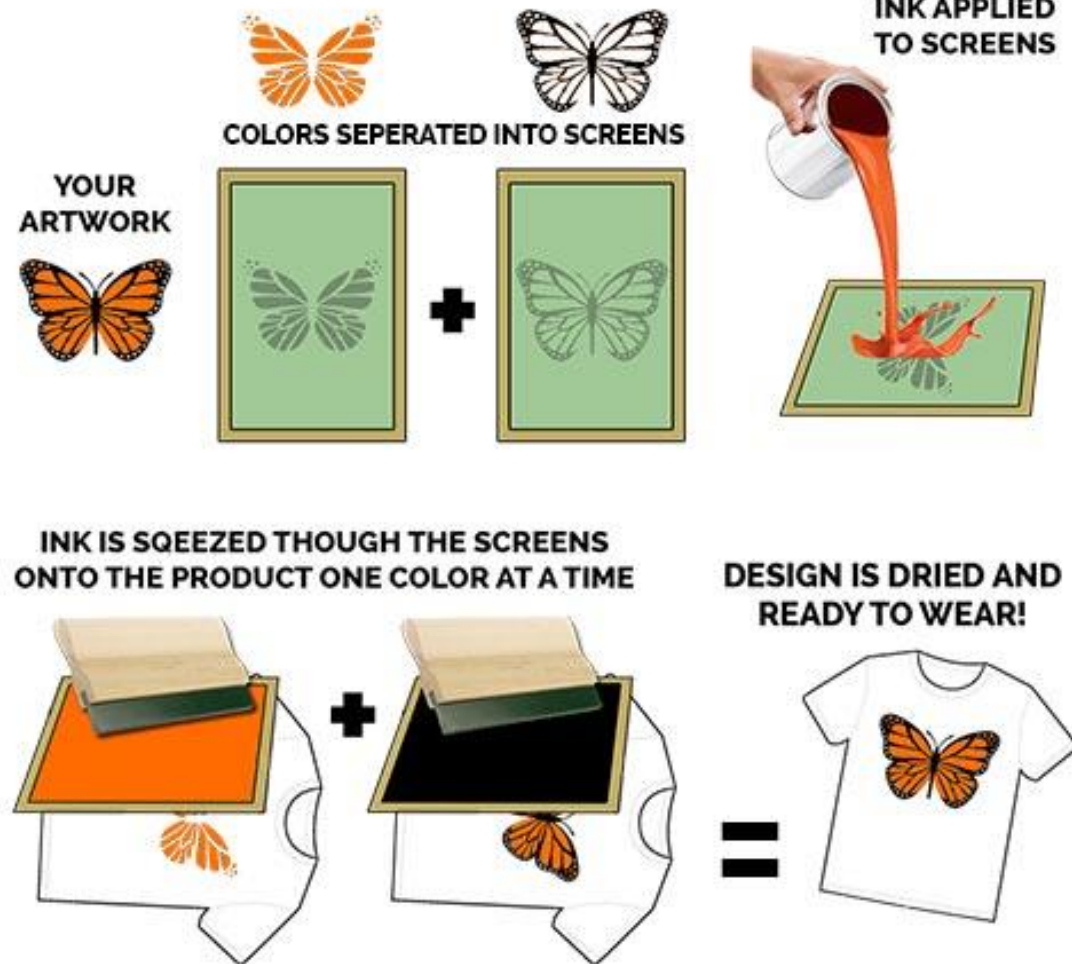
Screen Printing is used for small print runs like posters, display boards, fabrics, and even control panels for electrical products.

It is very popular for use in **T-Shirt printing** too.

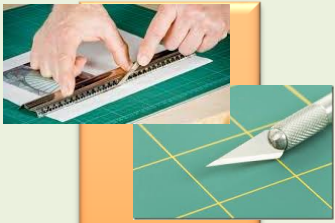
It works by using a **stencil** for each part of your print, or for each **CMYK colour layer** if making a multilayer image.

The stencil is placed under a **mesh frame**, ink is placed over the top of the mesh screen and a **squeegee** is used to drag the ink down over the stencil.

The prints are **not as high quality** as other methods and if using different stencils and screens for the layers this can prove **costly** and **takes time to clean** etc



Other processes for manufacture



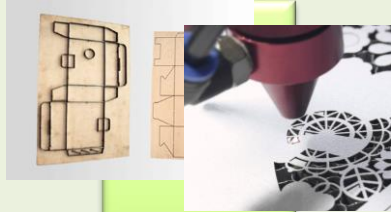
Cutting By Hand

Cutting paper products by hand can be done with the following equipment:

- Craft Knife/Scalpel
- Scissors
- Cutting mat
- Safety Ruler

This equipment is **easy to use and easily available** to most people.

However it can be **inaccurate due to human error and is a slow process** to complete.



Cutting with Machinery

Machinery commonly used to cut shapes in paper products are:

- Laser cutter
- Die cutters

Despite being **very accurate and fast** compared to hand cutting methods, **Laser cutters** **require a design software** to work and **can leave a burnt edge on products**.

Die cutters use dies made by putting **steel blades** into a block in a **specific shape** and pressed into paper. **They can be costly as each shape is normally made for the print order**.



Mock up Modeling

Modeling is important in the design process, and using paper and card to do this is **low cost**. It is often used in **packaging prototypes**.

It is a great way to **quickly and cheaply** give an idea of how a final product will **look and function**.

However in many cases prototypes **can be flimsy** when made from paper or card materials, and for larger products they **need to be to scale** to give a better idea of the workings of the product.

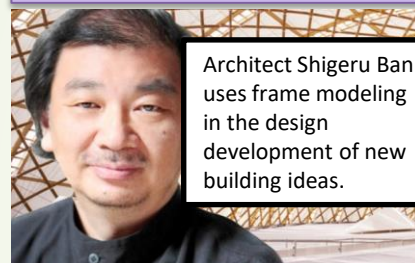


Frame Modeling

Frame modeling is where **paper is rolled into tubes** and then made into **model products** – it's a great way to test bridge structures and anything that calls to test compression and weight.

Its **quick and easy to do**, but if the tubes are not **cut or prepared with accuracy** this will affect the structure.

If using cardboard tubes these can be **hard to cut** with hand tools.



Architect Shigeru Ban uses frame modeling in the design development of new building ideas.



Test Modeling

Test modelling is a **general term for anything made using paper or modelling products**. The better the model at testing things like size, shape, ergonomics etc, the better testing and evaluation opportunities there are.

Using materials that **hold well together or can be shaped and painted easily** will help the designer form a better understanding of whether their products is going to be **effective**.

Using paper as templates to cut blue foam is a popular idea for test modelling. They can also be easily painted.

Scale Of Production

One-Off

This item is one of a kind, **bespoke**, unique, special etc. It is often made by hand or with specialist equipment and is **labour intensive**. An example would be a one off chair design or a hand made printed T-Shirt.



Although the product is **high quality and exclusive**, it can be **very expensive** to buy as a **high amount of skill** is needed to make the item, meaning **designers will charge more money**.

Mass

This produces a **high volume of identical products**, using a production line. Sometimes there are **different parts of the process to add different components** – such as folding, laminating etc.

As **materials are bought in bulk** for mass production **they bring lower costs**. The process also needs **less skill** to work as many sections are **automated**. In turn, staff need less training.

Although **expensive to set up**, **unit costs remain low** due to the large number of products made in a short space of time.

Due to the large amount of products however, **storage of these can be difficult**.

Some are also concerned that these **automated production lines are taking job opportunities away from communities**.



Magazines are a good example of mass production, as thousands are made but they will change every month or so, so new set ups need to be made.

Batch

This can mean up to **20,000 items that are IDENTICAL** are created in a **shorter space of time**.

Things like **limited edition prints** or paintings are batch produced. It is **much cheaper** than doing things by hand. However, to use the machinery to carry out the print **staff need training**, and **many other workers are involved** – like designers, testers etc.

If a company needs **different artwork** done, **time is wasted by stopping production to set up another print**. The tasks are also **repetitive** and so **errors might be missed and duplicated**.



Good examples of batch production could be some loaves of bread at your local bakery, wedding invites or a run of posters for a special event.



Continuous

This method **constantly makes identical products**, so no time is wasted changing over machinery or settings. Only a **small workforce is needed** also.

Although **unit costs are low**, it is only suitable for **simple products that require very few features**.

Like Mass production, the **set up costs are high** and if errors are missed many products are affected, causing **excess waste** and **wasting time and money**.

Continuous production is a constant flow of the same product, as it is unlikely the artwork or style will need to change. This production works 24/7, and is used for high demand products like cereal boxes, toilet roll, paper and cotton buds.



Advantages of batch process techniques

- **CAM (computer aided manufacture) e.g. laser cutter or CNC plotter cutter**

Why?

You can produce repeat cuts therefore making identical components.

Also power settings can be adjusted which allows materials to be either cut or marked for folding.

- **Cutting dies (commercial or manual die cutting)**

Why?

Lets you cut out shapes or parts to size therefore requiring little or no marking out.

- **Folding jig**

Why?

In box manufacture, it ensures all flaps or tabs are bent or folded-in equally to the same angle.

How can we check for quality when we manufacture products?

Marking Out and Careful Cutting

Simple and quick to do, using pencil and ruler, possibly a compass also, to make sure you are being accurate.

Carefully lining up templates for cutting etc

You need skills for this, and it takes practice to be accurate!



Fixtures

These are similar to jigs because they help guide the cut of materials. However, they clamp to the material to aid with cutting by holding the material place for you to work with.

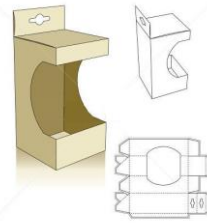
A machine vice is a type of fixture and they can be mounted to pillar drills.



Jigs for folding

These pieces of equipment can speed up the folding of many pieces of work without marking out each one separately.

They are only worth the money if you are going to be doing a lot of folding though!



Templates and Patterns

Precut shapes can be drawn around to create the same product.

Packaging templates are popular with this method, but although its easy and saves time making from scratch, its not as fast as some methods.

Stencil

Often made from thin card, vinyl or plastic. Makes the same shape every time.

Can be used with pen, pencil and paints. Lettering stencils are popular.

They can slip however, ruining the artwork. They also need gaps so some internal detail doesn't get left out.



CAM

Computer aided design like laser cutting is highly accurate and can work all hours of the day. The files can also be easily changed.

However, it's quite expensive to run and training is needed to get it right.



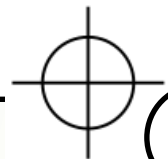
Quality control

Printers use quality check marks to make sure layers line up and colours print as expected.

This includes trim/crop marks, registration marks and CMYK colour bars.

A proof is asked for normally to check the first print for errors. These are compared to later prints to check consistency.

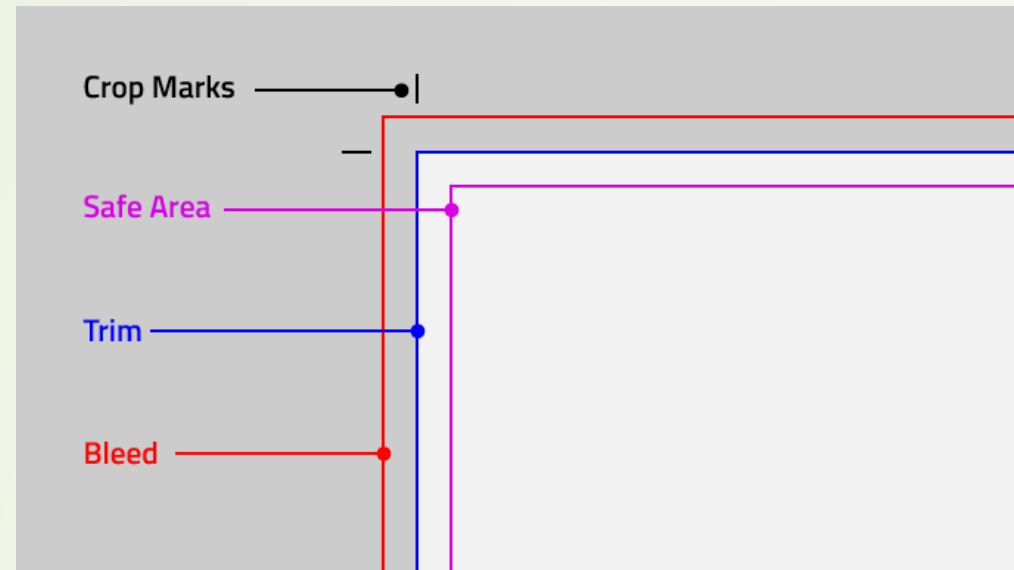
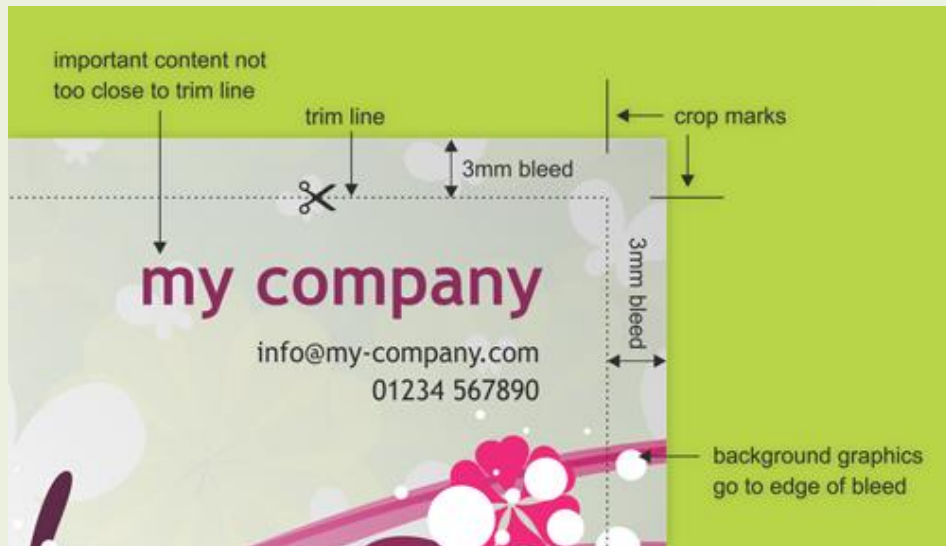
This ensures high quality prints and less waste or error. Although it takes extra time and cost.



Working within a tolerance – reducing waste

Making room for error is actually a great way to reduce waste. Tolerance means there is a maximum or minimum amount to work between. This is normally in mm.

Bleed is a great example – 3mm of bleed is added to a print file so that when the machines trim against the trim mark, if they are 1mm out or so this will not be noticeable in the final product. This means the client will not reject the print and less waste is created.



Specialist techniques for high quality paper and board prototypes

Tools and Equipment

Many tools are used to make quality products.

Hand tools include:

- Templates
- Pens
- Pencils
- Markers
- Scissors
- Craft Knives
- Cutting Dies
- Cutting Mats
- Safety Rulers
- Paper Trimmers

Machinery

We can use many types of machines to make jigs and templates to help make our paper products.

Machinery, though expensive, is normally very accurate and quick.

These can include:

- Die cutting machines
- Drills
- Scrolls saws
- Vacuum formers

These all require training and skill.

Digital Design

Using CAD software can be hard to learn but very effective. As everything is digital, it can be downloaded and amended easily.

Even inkjet printers are part of digital design, as well as more complex methods like laser cutting.

All require training and software which can be expensive.

Shaping

Many paper and board products need to be shaped to meet their purpose.

Scoring and folding produces a clean edge and can be done by hand.

You can also press these materials into shape – think embossing.

Dies can also be used for more complex folding and creasing, or even perforation, where a dashed cut is made so parts of the product can be ripped off.



Notching

This is cutting a slot in a material.

Its used to remove some bulk on corners of products, or when you need components to slot together, like the top of cereal boxes which have a tab and slot system to help close the box once it is opened, making the contents fresher for longer.

The items opposite have notched sections so they slot together. They are popular in paper crafts.



Assembling paper products – permanent and temporary



Split Pins

Create a fixed point and a moving pivot for mechanisms or paper toys – easy to use and get hold of. Cheap.



Stapling

More secure method of attaching products together, so used in brochures. Easy to get hold of and use. Can be hard to get through thick layers.



Taping

Different tape used for different jobs. Masking tape is much more temporary as its low tack. Packing tape is used for holding boxes shut. Double sided tape is used on envelopes for the customer to unpeel when needed.



Adhesives

These are permanent, as they adhere to the paper and board. They often come in liquid form like PVA. They are easy to get hold of but the right glue needs to be used for the right purpose – you wouldn't use PVA for an envelope as it would take too long to dry, but a glue stick would be perfect.



Mapping pins

Can temporarily hold card in place. Good for modeling card mechanisms when pushed into a cork board. Easy to do, cheap, reusable.



Paper engineering

This is a way of manipulating paper to make detailed work, like pop up cards. Folds and scoring is used to set rigid structures in paper products. It can be effective if done right but requires planning and skill.



Strengthening models

You can use many of these methods together to strengthen paper products when making models.

You can strengthen materials too by layering them, adding lamination or adding ribbing to make it stronger.

Using dissimilar materials to make products

This just means using materials with your paper and board products that do not have similar properties or work differently.

For example, a sandwich box will be made of card, but with an acetate (plastic) window. The adhesive used would need to fix the acetate to the card without it coming off. This is also popular with novelty packaging products like cupcake boxes.

The materials need to work well together to make the final product effective, as you cannot see the sandwich through cardboard unless you have x-ray vision.



Using laminates

We have covered laminates previously, but they are worth a mention here as they are high quality materials.

Plastic films or waxes are used to add water resistance to products so if they get a little damp the product won't be ruined and wasted. Paper cups have a plastic coating.

As we know, aluminum stops gases and light getting to food contents, keeping it fresher. This is why it is used in cartons. It is also used in medicine packets to stop the precious pills being contaminated.

Greaseproof lining is also used on products that need to be baked – for example ready rolled pastry is packaged on greaseproof baking paper for easy use. This also stops the fats in the product seeping through to the packaging.

Lettering in quality products

As we know, the type of lettering you have on your artwork can speak volumes.

Serif fonts have serif detail on the ends of letters.

Sans serif just means 'without' serif – no fancy detail on the ends of letters.

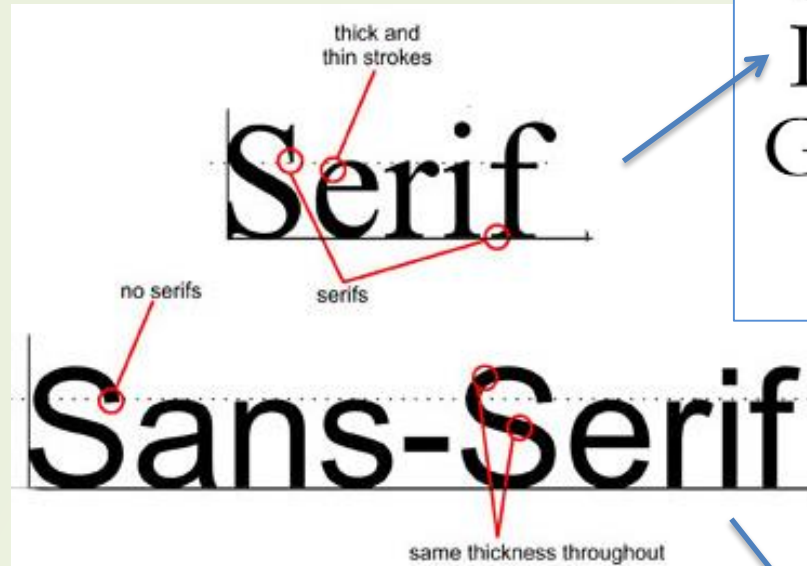
Serif is traditionally used in more elegant or luxurious prints that need to be formal.

Sans serif is normally used for more laid back impressions and less formal artwork.

Other fonts that have a handwritten style are called **Script fonts**. These are decorative and are often used for a more personal touch like wedding invites or formal invitations.

Julietta
A LOVELY SCRIPT FONT
LIGATURES / ALTERNATES / SWASHES

Times
Century
Palatino
Garamond
Bodoni



Kerning is the space between letters – with the shape of letters differing, it is important that kerning is applied so spacing doesn't look odd and non-uniform.

Arial
Geneva
Helvetica
Tahoma
Verdana

KERNING

the amount of spacing
between two letters

WITHOUT KERNING:

ADVANTAGE

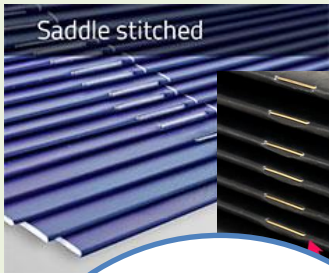
WITH KERNING:

ADVANTAGE

Binding and folding

Binding is important in books and magazines so that, you guessed it, the pages don't fall out!

On this pages are some examples of binding pages together to make books and magazines.



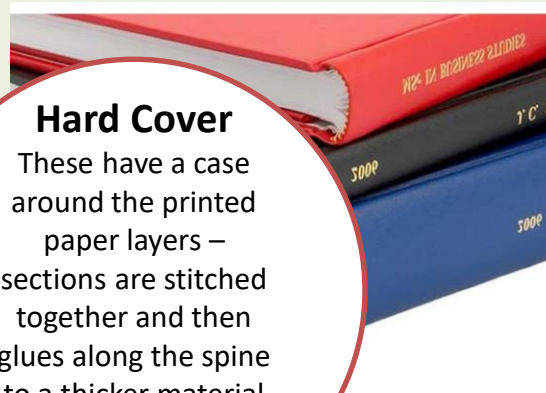
Saddle Stich

Can be done by hand and thread or metal staple – two positions along the spine. If hand stitching holes need to be made first. Only good for a smaller number of pages.



Side Stitching

Similar to Saddle stitch but, to the side, obviously.



Hard Cover

These have a case around the printed paper layers – sections are stitched together and then glues along the spine to a thicker material to create a more luxurious product.



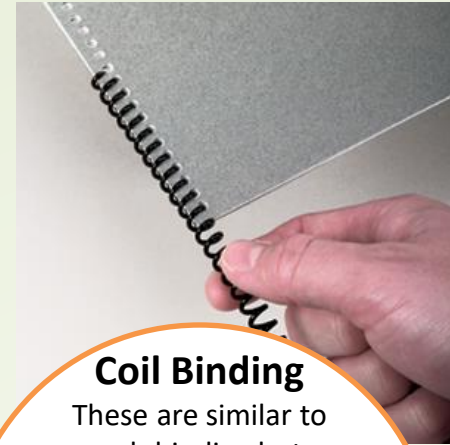
Comb Binding

For lesser paged products- quick and easy to use but machine does it for you – it punches slots and then pinches the comb into the slots. Gives a sturdy spine. Can be removed to amend pages if needed.



Thermal Tape Binding

This is for products with more pages but isn't as expensive as making a hard cover. Thermal tape is applied to the spine to strengthen the layers as well as make it look professional. This is a specialist method.



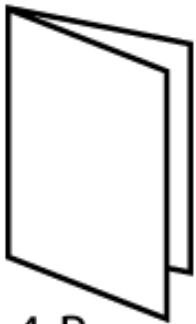
Coil Binding

These are similar to comb binding but a coil is used to twist into the holes made in layers of paper and card to secure them in place. Can also be removed if needed. It is also called spiral binding.

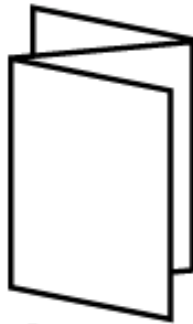
It is good to know how different products like leaflets are folded – you might decide to use them in your coursework. Each face of the fold is counted as a page. For example, if you fold an A4 in half, there will be 4 pages in total to apply print too.

This is how printers stop confusion between printing on multiple sides and pages. At the printers, all of these products would either be creased using the machine (if thicker stock like 300gsm card) and either folded by hand or machines.

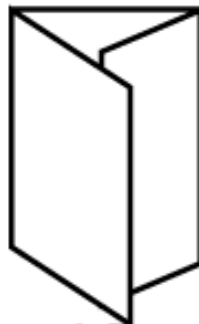
Types of Folding



4-Page
Single Fold



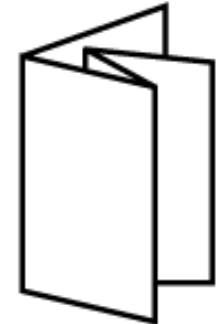
6-Page
Concertina Fold



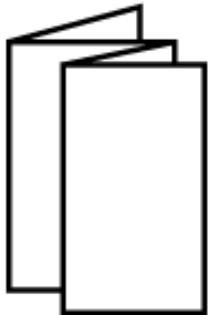
6-Page
Standard
Gate Fold



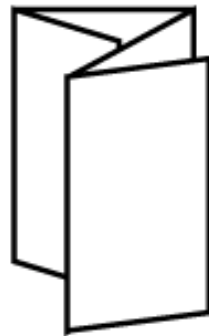
8-Page
Right-Angle Fold
or French Fold



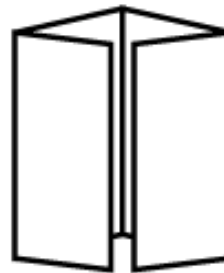
8-Page Parallel
Double Fold



8-Page
Concertina Fold



8-Page
Parallel Map Fold



8-Page
Gate Fold



10-Page
Concertina Fold

Surface treatments and finishes



Varnish can be applied to the whole of the surface, in either a **clear gloss, satin or matt effect**. This is called **flood varnishing**. If it is just applied to a **section** of the print this is called **spot varnishing**.

UV varnishes need UV light to cure (dry).

This process gives a **very high quality and luxurious product**, however it is **expensive to set up** and can be difficult to apply. Adding flood varnish also adds a **protective layer** to the print, meaning it can **last longer**.



Hot Foiling can be done a few different ways. The results are the same.

You can either buy **pre-glued foil to heat press onto paper**, or you can use **adhesives** to make a shape and then heat foil over the top.

It is **cost effective doing it this way**, rather than more complex industrial methods. It still adds costs to the overall product however. Many find it worth it for the **high quality and expensive look** it gives.



Embossing is **raising the surface** of a print to add luxury. Although **costly**, the effects are very **high quality**.

This is normally done using a **steel die** with the desired shape as a stamp on the surface.

It can also be achieved at home using a wooden template and a rubber matt to help press the paper into a **shaped template**.



Edge staining is applied to many products, like books and business cards.

Only the **visible edges** of the product are stained. It is quite an **unusual effect** and gives a special quality to the product. Like all finishing techniques, there is an **additional cost**.



Its time for **packaging laminates** to have another mention.

The **layers** in laminates are designed for **freshness and high quality printing**; one layer of foil or similar, one layer of printed flexible paper, and a final layer of polymer such as PET or LDPE (Polyethylene Terephthalate or Low Density Polyethylene) to strength and glossy shine.

They are suitable for so many products as **they seal in freshness and moisture, provide high quality printing and good protection from ripping or tearing** meaning the produce will **last longer**.

They are **tricky to recycle** however, and many areas of the country do not have the facilities to do this so many items go to **landfill**, adding to plastic pollution.