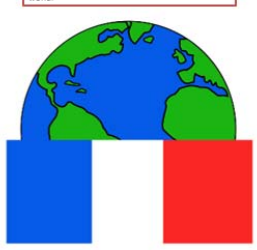
AS Product Design

Logo Development

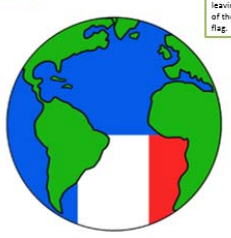
1) I initially found a bitmap image of the world on the internet and copied and pasted it into Photoshop. I then used the 'magic wand' tool to cut out the background and the fill tool to colour it green and blue.

2) On three separate layers, I used the ruler and the marquee tool to create the French flag, ensuring that all 3 parts would have the same width once cropped to the size and shape of the world.



3) After that, I duplicated the world layer and deleted the oceans, just leaving the continents. Then I sent the world layer to the bottom and the continents to the top, leaving the flag in between to give the look of the land but not the sea going over the flag.

5) Finally, I added the writing "City Souvenirs" and "Paris" to the logo in a font which suits the style of the brand ('Gabriola', which I liked because it is very clear, while looking slightly like handwriting, showing how the brand sells handmade gifts). This is still clear and easy to read, as well as informative so that someone looking at the logo would know which brand the logo is for. The colours are black and white because they have a high contrast with the background, which also means that the words are easy to read.



4) I then removed the parts of the flag that were outside of the picture of the world, leaving just the parts inside, which I think looks very neat and interesting.

Joining Processes/Construction Techniques

Wood

Mitre Joint
This is most commonly 90° joints, however, the angles could be adjusted depending. A mitre saw is used to cut the two pieces of wood to be joined at 45°. A disk sander can also them be used at 45° to ensure that the angle of the saw was correct and to make the surface smooth. From then, wood glue can be used to securely glue the pieces together. It is one of the most aesthetically pleasing joints.

Screws
When using screws, the top piece of wood needs to have a hole drilled into it that is large enough that the screw for easily fit through but still holding it in place. The bottom piece needs to have a smaller hole that the thread can 'bite' into, holding the screw more securely.

Butt Joint
This is the simplest joint, as it is simply gluing two pieces of wood together at a 90° angle. Although it is very easy, this joint is not strong at all because the surface area that glue is applied to is very small. The other problem with the small surface area is that it is harder to get the two pieces at exactly the right angles. Therefore, I will probably not choose to use this joint.

Housing Joint
This is where a piece of wood is glued perpendicular to another piece of wood, but it fits into a pre-cut slot, which makes the joint much stronger than a butt joint. The slot would need to be 1-2 mm wider than the wood going into it and should be about half as deep as the width of the piece of wood the slot is being cut into. The sides would initially be cut with a Tenon saw before the rest of the waste wood is chiselled out. This is effective when the end of one plank needs to be attached to the side of another. However, this is a tricky procedure, particularly when chiselling, so I would avoid it if possible (or use a CNC router to create the slot) to ensure that the quality of my product is as high as possible.

Dovetail Pinning
This method works when connecting a thin piece of wood to a thicker one. Two pins are hammered into the two pieces of wood at different angles, which means that there is no way for the two pieces to slide apart without first removing the pins.

Rebate
This is a more visually attractive way to connect a thin piece of wood to a thicker piece, compared to dovetail pinning. A rebate plane is used on the thicker wood so that a 'step' is created. Then the thinner piece can be glued on to create a flush joint. This is more difficult and permanent alternative to dovetail pinning, so the method I would use would depend on my priorities.

Adhesives

PVA Glue
PVA, or wood glue, is a fairly cheap glue which is perfect for attaching pieces of wood together because it is especially effective with wood, as well as it being strong, easy to use and setting clear. Some forms are also water resistant. Also, it is one of the least dangerous adhesives to use. I would definitely use this for gluing wood together.

Epoxy Resin
This is used for joining metals and plastics. It is strong and waterproof, but needs to be mixed immediately for use.

Contact Adhesive
This is a very strong glue which is used to join plastics. After setting, the plastics are virtually impossible to separate again. The only problem is that it takes quite a few hours to set properly.

Tensol Cement
This is arguably the best glue for plastics because it is easy to use and strong, so permanently binds plastics together, although it needs to set for 24 hours. I would either use this or contact adhesive for plastic-to-plastic joints.

Glue Gun
This is a very easy adhesive to use and is non-toxic. It is applied by holding the trigger on the glue gun , which squeezes molten plastic out of the nozzle. It is hot so you could be burned, however you will not with sensible use. It is weak so only used for semi-permanent joints but could be useful for me for something like hidden wiring, where strength is not crucial.

Summary

There is a very wide range of joining processes and construction techniques. I need to ensure that the joints I choose have a good balance between aesthetics and strength. Therefore, for wood, I would be likely to choose mitre and housing joints, as well as rebate joints, depending on the circumstance because they are all suitably strong and visually acceptable. For plastics, I would either use mechanical means for the ease, adhesives if not too much strength is required, or plastic welding if I need a mixture of strength and visual appeal. Ultrasonic welding is not feasible with the equipment I have access to. For metals, I will probably solder the parts of the lighting circuit and use mostly brazing for connecting larger pieces of metal. The adhesive I would use for wood would be PVA glue, for plastic would probably be Tensol Cement and for metals would be epoxy resin, as these are the most suitable for their respective materials.

Plastics

Mechanical Means
Polymers can be joined together by mechanical means, i.e. nuts and bolts. The choice of material for the nuts and bolts depends on:

- The application.
- The type of polymer to be joined.
- The amount of load the joint is to carry.
- Whether or not the joint will be affected by the environment.

Standard fixings can be obtained in mild steel, stainless steel, brass and nylon. Used appropriately, these will produce a durable joint.

Adhesives
Adhesives, in general, do not do a very good job of joining polymers. Tensol is used especially with acrylic. It acts as a solvent, dissolving the plastic at the joint, so is fairly successful.
Adhesives work more effectively in packaging. Heat is applied directly to the film lid of a pre-cooked of a pre-cooked food package, a layer of adhesive is melted on the rim of the container, allowing the film lid to adhere to the container. This also created a seal between the two components, making the packaging hygienic.

Ultrasonic Welding
The use of very high frequency sound waves is an excellent method of joining plastics, especially sheet materials. The two parts being joined are firmly clamped together. Ultrasonic vibrations are then introduced to the materials through the clamp. This generates heat, resulting in the two pieces of plastic bonding with each other.

Plastic Welding
Thermoplastics can be welded using similar principles to those for welding metals, in that the application of heat is used to filler rod to the components being joined. A powerful heat gun is used to provide the heat necessary to melt a metal. An attachment ensures that it softens the components and the filler rod at the point where it is to be joined.
This method is useful for producing one-off products such as containers for thermoplastic sheet and for the repair of damaged products where the inclusion of a filler rod will not be detrimental to its function.

Integral Fixings
Polymers can be used to manufacture complex 3D shapes needed to produce modern products. The advantage of this is that fixings, such as posts for screws, captive nuts, locating and securing clips, can all be made integral to the component being joined.
Examples include battery covers for phones and clips that hold CDs in their cases. These types of fixings rely on the elastic properties, as well as the strength and durability, of the polymers used to make the components.

Metals

Machine Screws
This is the safest way of joining metals, although it can also look ugly. Holes are drilled in the metals and need to be pre-threaded before the screws are simply screwed into place. This can be time-consuming compared to other joints but there will be no filler metal to remove later. To make it more aesthetically pleasing, the screws can be countersunk so that their heads are flush with the metal.

Brazing
Brazing is where a filler metal is used to bond two or more other pieces of metal. This filler metal is sometimes a silver alloy and usually has a melting point between 450°C and 1000°C and this obviously needs to higher than the melting point of the metal being brazed, or it would melt. Flux can be used to reduce the effects of oxidation on the joint.

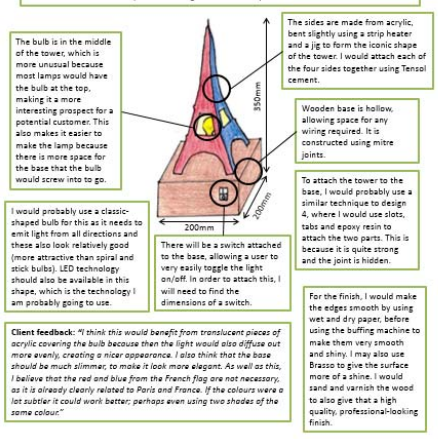
Soldering
Soldering is a form of brazing where lower temperatures are used. Solder is the filler metal and a soldering iron is used instead of a brazing torch. This method is usually used for connecting small circuits because solder is a good conductor of electricity. I will probably do this as I will need to connect my bulb to a source of power.

Welding
During welding, both pieces of metal are headed along the line where they are to be joined and they fuse together as they cool. A filler metal can also be used for this. In oxy-acetylene welding a very hot flame is used. In electric arc welding a spark is used to heat the metal. This is more dangerous than brazing because the sparks could cause fires and the temperatures are extremely high because they can partially melt the metals being joined.

Initial Ideas

Environment: This is not the most environmentally friendly product because it uses a lot of plastic, which is a synthetic polymer made from crude oil, which is non-renewable, as well as the fact that it takes a lot of energy to produce the acrylic from crude oil. Also, plastic is difficult to recycle so usually ends up in landfill, where it biodegrades very slowly, sometimes releasing harmful gases into the air. Also, the bulb, like with all the other designs uses electricity generated by fossil fuels so contributes a small amount to climate change, however, using an efficient bulb will reduce this and the user's energy bill. The wood is the most environmentally friendly part of this design because the trees can be replanted, as long as it is from a reputable, FSC certified retailer.

Environment: Sublimation printing is fairly environmentally friendly, as the ink used cannot get into the water system as no washing is required. Also, a print can be used several times (although the intensity will decrease), minimising waste. I will be using wood, which is sustainable because trees can be replanted if I obtain it from an FSC certified source. However, the bulb uses electricity, generated usually by burning fossil fuels, which are non-renewable, although if I use an efficient bulb this problem will be reduced because less energy will be wasted so less is needed in the first place.



The bulb is in the middle of the tower, which is more unusual because most lamps would have the bulb at the top, making it a more interesting prospect for a potential customer. This also makes it easier to make the lamp because there is more space for the base that the bulb would screw into to go.

The sides are made from acrylic, bent slightly using a strip heater and a jig to form the iconic shape of the tower. I would attach each of the four sides together using Tensol cement.

Wooden base is hollow, allowing space for any wiring required. It is constructed using mitre joints.

I would probably use a classic-shaped bulb for this as it needs to emit light from all directions and these also look relatively good (more attractive than spiral and stick bulbs). LED technology should also be available in this shape, which is the technology I am probably going to use.

There will be a switch attached to the base, allowing a user to very easily toggle the light on/off. In order to attach this, I will need to find the dimensions of a switch.

To attach the tower to the base, I would probably use a similar technique to design 4, where I would use slots, tabs and epoxy resin to attach the two parts. This is because it is quite strong and the joint is hidden.

For the finish, I would make the edges smooth by using wet and dry paper, before using the buffing machine to make them very smooth and shiny. I may also use Brasso to give the surface more of a shine. I would sand and varnish the wood to also give that a high quality, professional-looking finish.

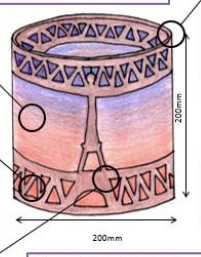
Client feedback: *"I think this would benefit from translucent pieces of acrylic covering the bulb because then the light would also diffuse out more evenly, creating a nicer appearance. I also think that the base should be much slimmer, to make it look more elegant. As well as this, I believe that the red and blue from the French flag are not necessary, as it is already clearly related to Paris and France. If the colours were a lot subtler it could work better; perhaps even using two shades of the same colour."*

I would finish the wooden part by sanding and varnishing it, while I would use wet and dry paper on the acrylic part.

I chose the colours because they are almost complimentary colours so go well with each other. Also, they create a sunset effect, but with a purple sky instead of blue, which draws attention to the product. I got this idea from my mood board, which features two images of the Eiffel Tower with a very colourful sky in the background.

The wood would need to be thin, so I could use balsa or several layers of veneer, which is curved and glued, creating a cylinder. It is easy to bend as it is so thin, although there is the risk of it snapping. In order to effectively bend the veneer, I could use steam bending, as this both makes it easier, with less chance of snapping the wood, as well as making it retain its shape better.

Sublimation printer used to create the gradient effect from orange to purple.



This is designed to be a standalone lamp. However, if a user wished, they could turn it into a lamp shade relatively easily.

Triangles made from acrylic and glued into the gaps in the wood so that they are flush with it.

Lead exits through the back so that it is not visible from most angles, making the product more aesthetically pleasing.

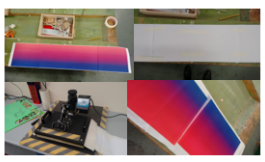
I would use Techsoft 2D Design to create the pattern of the triangles and the Eiffel Tower and then use a laser cutter to cut out the shape on a thin piece of wood.

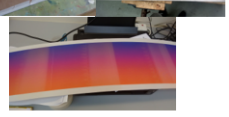
Client feedback: *"I like the colour scheme, as it think it is very atmospheric, particularly for evenings and low-light situations. It is also very original and looks more sophisticated than most of the other designs. I worry if banding the veneer into a cylinder of that size would be feasible because it could very easily snap. Apart from that, I think this is my favourite design because of the originality, colour choices and sophistication of it."*

Manufacturing

Health & Safety / Quality Control / Adaptations

6) After I had tested my colour scheme from Photoshop with the sublimation printer, I attempted to print onto my actual fabric. Before I did this, I made the gradient slightly gentler on Photoshop because on my test piece, the dividing line between the purple and orange was slightly too definite. I printed 4 pages, with the sublimation printer and then used masking tape to attach them to the fabric, overlapping each page slightly so that there would not be any white lines where there was a gap between the pieces of paper. I double-checked that all the parts were not upside down. Because the sublimation press is not a metre long, I had to press several times in different places so that all of the ink was transferred. During the pressing, I made sure that I did not touch any parts of the press except from the handle because it is made from metal, which is a very good conductor of heat so it could easily burn skin. I tried to make sure that there was as little overlap as possible between the parts I was heating with the press so that each area would have the same amount of time. However, once I had finished I found that there was still a white line on the fabric. I think that this was caused by the masking tape losing its stickiness due to the heat, which allowed the pieces of paper to move out of place and therefore not cover the entire piece of fabric.
I was not happy with this result so I decided to try again. I printed 4 more pages with the sublimation printer and cut more fabric, so that it was larger than the required area. However, this time, I also cut a length of MDF of about 2mmx1000mmx250mm and stuck the fabric to this, folding it around the sides so that I could attach it to the back with masking tape. The tape at the back would not have lost its adhesive qualities because it would be shielded from the majority of the heat by the MDF. At the front, I stuck the sublimation paper face down onto the fabric using heat-proof copper tape. This meant that it should still stick during and after being heated to 330°F. Unfortunately, once I had used the press again, I found that strange, triangular marks had appeared at the edges of each pressed area (shown in image). As this did not happen the first time, I assume that it was a result of using MDF, which is a lot harder than the spongy base and therefore did not cushion the top of the press as much as the normal base, creating an impression of the heating element, where the parts of the fabric in contact with it were heated more than the other parts. Once again I was not happy with the result so I decided to try the printing one last time. This time, I did not use the MDF because of the problems it caused the previous time. Once I had printed onto the sublimation paper again and cut more fabric, I secured the paper onto the fabric with the copper tape because that seemed to reduce movement on my last attempt. Also, I made sure that the pieces of sublimation paper overlapped in order to remove the chance of white lines appearing. After testing, I reduced the time to 230 seconds from 320 because the overlapping parts will be exposed to the heat for double this time and I found that when keeping the heat on for any longer, the colour began to be bleached due to excessive heat. I did not reduce the time any more because otherwise the areas with only a single application of heat and pressure would not have all the ink transferred from the paper to the fabric. I used the press in the same way as before and this method worked better than my previous attempts, as the differences in shade between areas pressed once and twice were less noticeable although definitely still present. The machine is not meant to be used to print on a long piece of fabric multiple times, so this was as good as I was going to be able to get the print. However, there was still one white line (although I do not know why it was there when the overlaps were sufficiently large to avoid this problem). To fix this, I pressed that area again with another piece of sublimation paper with the pattern on it. This reduced the severity of the line to a point where it would not be an issue when hidden behind one of the Eiffel Tower outlines. As I was running out of time this print would have to do because, as I mentioned earlier, the limitations of the press meant it was impossible to do a perfect print.





7) I needed to cut a place in the base for the bulb holder to go in, as well as a slot for the lead to exit the lamp through neatly. To do this, I used a wood router. I started with the slot, clamping the base to a workbench , held in place by the piece of wood that it was cut out of in the first place. I also clamped a straight piece of wood to it a set distance away from the centre of the base (the distance from the bit to the edge of the router) as a guide, so that I cut a perfectly straight slot in the right place. I wore safety glasses because the sawdust could have flown up into my eyes. Also, I attached the end of a vacuum cleaner to the router, to remove the majority of the fine wood fibres flying up into the air. After selecting an appropriately sized router bit (wider than the lead), I turned on the router and cut the slot, applying downwards and lateral force against the straight piece of wood, moving the router slowly towards the centre of the MDF base until it reached a mark I had created earlier to tell me it had reached the exact centre.
After that, I needed to cut the circular recess for the bulb base to sit in on the other side of the MDF. To do this, I first had to measure the distance between the outside of the guide on the bottom of the router and the edge of the bit. I measured this several times in a couple of different places with a ruler to ensure that I got exactly the right value. I then added this to the radius of the bulb holder. On 2D Design, I created a 300mm diameter circle with a circle with the radius that I had just worked out cut out in the centre. I laser cut this onto another 9mm MDF board. I attached this board to my MDF base with double sided tape before clamping both to the workbench again. This would allow me to cut the right sized circle in my base by simply moving the router around the larger circle of MDF I had just cut and attached to the top of my base. Once I had routed away all of the material, I noticed that there was not a hole in the wood where the two routed parts on either side meet. This meant that I had to slightly increase the depth of the router and redo the circular part so that there was an actual hole which the lead can pass through. On the second time, the hole was formed, so I was able to stop. I used the vacuum cleaner to remove all the sawdust, leaving the base ready to attach the bulb holder to. However, I would wait until the end of the project to do this because I would still need the base to do things with without having the bulb holder and lead in the way.