
BEND IT..
With: Micheal Fleming & Dave Beazley

EXAMPLE

This slide is an example of what students could produce while trailing and testing techniques.

For 1.2 students could experiment with making their own material for the structure of the light. Example could be instead of using Acrylic, a student could melt milk bottle lids and form them into the shape desired.

This brief would not be a class set but one students portfolio. The class could have a lighting brief though.

TOM RAFFIELD

https://youtu.be/ZD5JWP3qDdg?si=eKS-8D2fjKdykmTI

TOM RAFFIELD

https://youtu.be/H4xaZ5CgofA?si=MJ5hwpbboPUMIqZQ

TOM ROSSAU

https://youtu.be/e1ISvYohO24?si=rvRdS3391LTMC7e0

DAVID TRUBRIDGE

https://youtu.be/wrJKjb-mk8M?si=XiI96kVggPuQ2KPD

MATERIALS

Timbers: American Ash, European Beach, Walnut, White Oak, Maple.

Glue: Titebond 2, Titebond original, Titebond quick and thick.

Clamps: Quick release, Squeeze Clamps.

Jigs: Plywood, MDF

Clean up: Sandpaper, Rags

Cutting: Handsaw

700 x 22 x 7mm Euro beech 2.1mmx3

APPLYING THIS TO ACHIEVEMENT STANDARDS

1.2	Experiment with different materials to develop a Materials and Processing Technology outcome.
1.4	Demonstrate understanding of techniques selected for a feasible Materials and Processing Technology outcome.
3.60	Implement complex procedures to process a specified product.
3.22	Implement complex procedures to make a specified product using a Computer Numerical Controlled (CNC) machine.

1.2

Experiment with different materials to develop a Materials and Processing Technology outcome.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Experiment with different materials to develop a Materials and Processing Technology outcome	• Examine different materials to develop a Materials and Processing Technology outcome	• Evaluate different materials to develop a Materials and Processing Technology outcome

Achievement standard 1.2

https://www.nzqa.govt.nz/framework/search/results.do?type=UNIT&query=92013&_gl=1*117l4a4*_ga*MTU3MDQ1ODU2OC4xNjQ1OTk4NDM5*_ga_TFQQ681L2E*MTcxMjA3OTQwNC4xOC4xLjE3MTIwNzk0ODcuMC4wLjA.

1.4

Demonstrate understanding of techniques selected for a feasible Materials and Processing Technology outcome.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Demonstrate understanding of techniques selected for a feasible Materials and Processing Technology outcome	• Explain techniques selected for a feasible Materials and Processing Technology outcome	• Evaluate techniques selected for a feasible Materials and Processing Technology outcome

Achievement standard 1.4

https://www.nzqa.govt.nz/framework/search/results.do?type=UNIT&query=92015&_gl=1*8pl3mf*_ga*MTU3MDQ1ODU2OC4xNjQ1OTk4NDM5*_ga_TFQQ681L2E*MTcwODU4NDcwNi4xNi4xLjE3MDg1ODU2NzMuMC4wLjA.

1.4 EXAMPLE

1.4

Demonstrate understanding of techniques selected for a feasible Materials and Processing Technology outcome involves:

• **trialling** to select appropriate **techniques** in the development of a feasible outcome
• describing the most **appropriate techniques** for the feasible outcome.

Explain techniques selected for a feasible Materials and Processing Technology outcome involves:
• **comparing** the most appropriate **techniques** to make **informed decisions** for the feasible outcome
• applying **stakeholder feedback** to **improve decisions** for the feasible outcome.

Evaluate techniques selected for a feasible Materials and Processing Technology outcome involves:
• **analysing** how **trialling**, appropriate **techniques**, and **stakeholder feedback connect** to improve the feasibility of the outcome.

Appropriate refers to the **functional attributes** to consider when selecting techniques in the development of a feasible Materials and Processing Technology outcome.

For the purpose of this achievement standard, stakeholder feedback is used to inform the decisions to select techniques for a feasible outcome.

Stakeholder feedback is documented verbal or written information sourced first-hand. Sources of stakeholder feedback could include the end user, or people or groups that have expertise, experience, or a combination of both in this area. **More than one stakeholder must be consulted.**

A feasible outcome is one that has the potential to be made. A **physical outcome is not required** for this achievement standard.

1.4

ACHIEVED

- Trial techniques and describe the most appropriate techniques.

MERIT

- Compare techniques and use stakeholder feedback to inform/improve your product development.

EXCELLENCE

- Analysing the techniques trailed and how feedback connects to the improvement of the product.

Functional attributes refers to what the product does. The example for a light shade is it's functional attributes is to diffuse light, hold a light batten, cast shadows, protect the light bulb. It also relates to where the product is located and how it interacts within the space.

STUDENT STATEMENT

1.4

What am I making?

I am making a light shade. The light shade is not going to be designed to diffuse the light, but rather cast purposeful shadows around the room. It will be in the hallway. At present there is a pendant light that is outdated. My parents have asked me to design a light shade that will not diffuse the light very much, but make the pendant light more aesthetically pleasing. It must not be higher than 400mm and no wider than 600mm. My mother wants it to have some curved parts to it and can be made from any material as long as it is durable and sustainable.

LOCATION

LIGHT LOCATION

Width 900mm
Height 2600mm
Length 5000mm

Interior description:

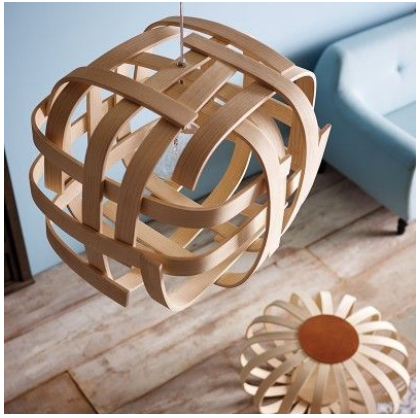
Recycled brick, black windows, dark grey carpet, off white painted walls.









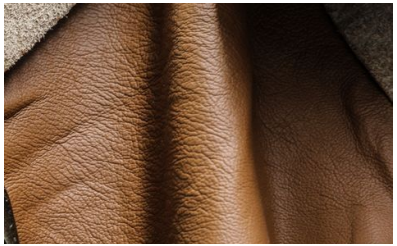
RESEARCH

CONCEPTS

LEATHER

ACRYLIC

TIMBER



MATERIALS

FEEDBACK

FEEDBACK:

I have gotten feedback from my parents about the research I have gathered so far. They both were not a fan of the leather, as the material reminded them of a dingy biker bar. A conversation about how the light projected through the acrylic and how it looked interesting was had and they wanted me to try it. But mum is worried it would look cheap and may not cast shadows. They both liked the timber and its soft aesthetic would fit into the interior of the hallway.

I have decided to continue with the timber and acrylic material choice and investigate them.

ACRYLIC

TIMBER

WHAT TRIALS COULD I PERFORM

What trials or tests can I perform?

Acrylic

Heat:

Heat gun
Oven
Pressure
Jig

Cutting:
Laser cutter
CNC
Bench saw

What trials or tests can I perform?

Lamination

Dry lamination
Wet lamination
Types of jigs
Dry times
Timber thickness
Timber length & width
Timber types (Look into properties)
Timber finishing

Steam Bent

Temperature
Time in the steam box
Jigs
Assembly time
Dry times
Timber thickness
Timber length & width
Timber types (Look into properties)
Timber finishing

Kerfing

Timber type
Depth of cut
Width of cut
Timber size

What trials or tests can I perform?

Cutting:

Lathe
Chiseling
Bench saw
Laser cutter
CNC
Bandsaw
Miter saw
Hand saw

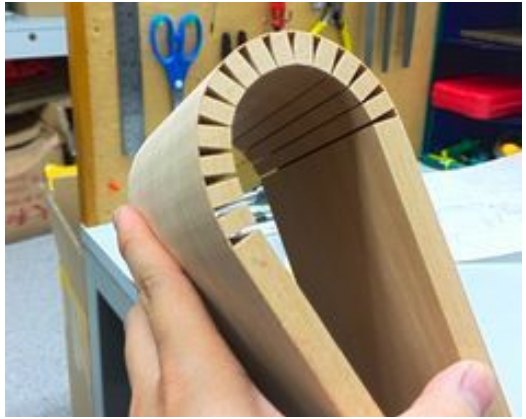
Finishing:

Sanding
Machine sanding
Oiling
Staining
Spraying
Burning

What trials or tests can I perform?

Light:

Projection
Diffusion
Shadow
Warmth
Bulbs
Location



Kerfing

Melting plastic

Fabric glued to timber

Bending with a jig

TECHNIQUES

Laminating

Steam bending

TRIAL 1

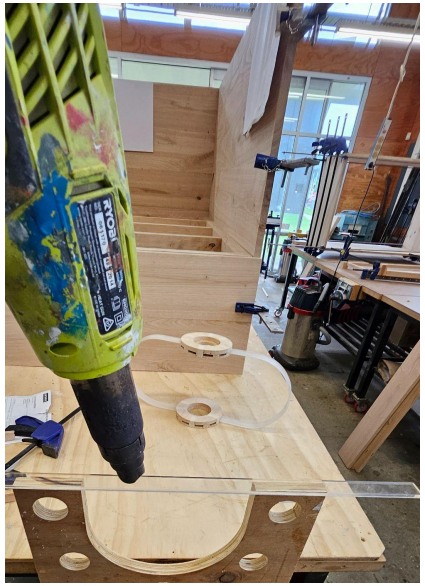
What technique am I trialing: Bending acrylic using heat from a heat gun. Using a jig to form the shape.

What material am I trialing the technique on: 5mm acrylic. Strips are 22 x 600 x 5mm

Trialing results:

The heat gun took 4 minutes to heat the acrylic up to where I was able to bend it into the form. It showed no imperfections. I had to hold down the acrylic with clamps until it had cooled down as it would move away from the jig. I was able to do 4 identical acrylic ribs for the light shade. The acrylic held its shape once cooled and was strong enough to hold up the top part of the shade. With the addition of more ribs the shade will become stronger. The acrylic held the top and bottom in correct position due to it rigid form.

Heating the acrylic longer than 4 minutes did create some small bubbles in the surface. The heat gun did not give consistent heat over the whole rib.



Using the heat gun continually moving it to get a consistent heat over the acrylic. I did find that if i heated the center more i was able to bend it a bit quicker.

Clamping to hold the acrylic to the jig. This meant that all the ribs popped out identical.

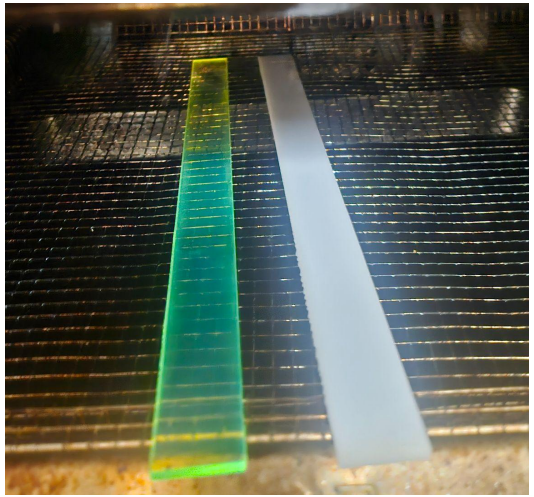
TRIAL 2

What technique am I trialing: Bending acrylic using heat from a oven. Using a jig to form the shape as I found this worked consistently in the previous trail using the heat gun. I spoke to my dad about the bending with the heat gun and we worked out that it would take me about 18 minutes to do one rib. I have ten ribs in total so it would take me 180 minutes. This is to long. Dad suggested that I use the oven to put all my ribs in to speed up the process. This will also heat up the acrylic more consistently and should make it bend more easily.

What material am I trialing the technique on: 5mm acrylic. Strips are 22 x 600 x 5mm

Trialing results:

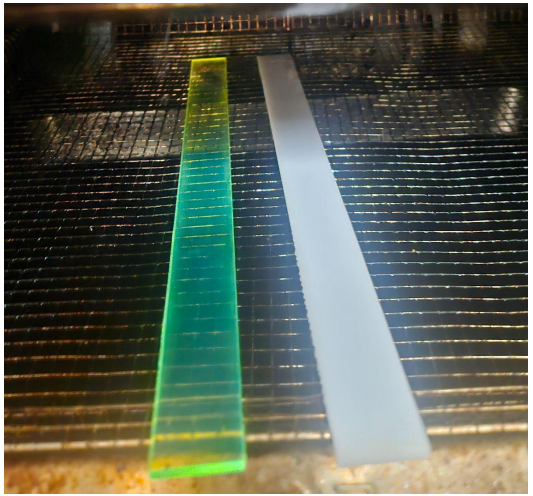
Using the oven it gave a consistent heat over the whole surface of the acrylic. I was able to heat up to 10 acrylic ribs at a time and keep them hot while I bent each one. I found that heating it to 80 degrees for 6 minutes was opiminal. This gave the acrylic enough flex, was not too hot to handle and was able to cool down in 5 minutes. I heated some up to 120 degrees for 5 minutes and the acrylic was hard to handle as it was far to flexible. I had used a oven tray with mech in the 120 degree test, it left small mesh marks on the acrylic. I changed to a smooth tray and this did not mark the acrylic.

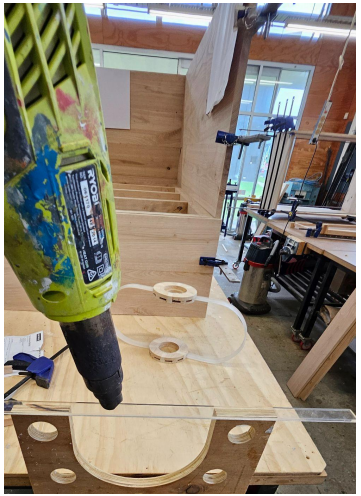


Mesh tray which marked the surface of the acrylic. I thought this would be good as the heat would be more even instead of a solid tray.

Some of the acrylic cooling down. I used masking tape to hold it in place while it cooled down.

CONCLUSION





TRAIL 1	TRAIL 2	COMPARISON
HEAT GUN Took a long time Inconsistent heat Loss of heat (cooled down quick) Bubbled acrylic Had to use clamps	OVEN Consistent heat Multiples could be heated up at a time Easy to handle Could multitask Was a bit smelly in mums oven	Comparing the two trials I will use the oven as I can do multiple ribs at a time, it heats the acrylic to a consistent temp which makes it easy to bend and handle. The oven with the flat tray does not damage the surface of the acrylic.

TRIAL 3

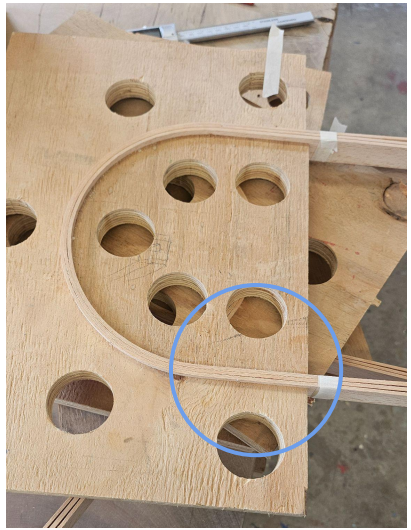
What technique am I trialing: Bending timber by laminating timber together.

What material am I trialing the technique on: European beech. Strips are 3 x 22 x 600 x 2.6mm

Trialing results:

Using european beech at 2.6mm thick I was able to bend all three pieces into the mold. The timber was stiff to bend and I had a 30% chance of breaking the timber. Some of the strips went in but cracks did appear as the timer was under too much pressure. This resulted in the rib being weakened by the crack and not suitable for the shade due to it weakened form and appearance. It also had gaps in between the laminates where the jig was unable to apply enough pressure to the timber. The end results after two attempts was that it was too inconsistent to be able to manufacture ten identical ribs.

Some of the snapped timbers. These were cut on the bench saw and the consistency of the thickness varied over 0.2 - 1.1mm. I need these timber to be exact to be able to fit into my jig.



Checking for consistent thickness I found was essential for the timber to fit into the jig so that applied the correct equal pressure. Some gaps can be seen due to lack of pressure.

FEEDBACK

FEEDBACK: Mr Fisher (Teacher)

I asked Mr Fisher for feedback on how I was able to stop the timber from cracking. He suggested soaking the timber in hot water until it was pliable. He also mentioned that the three timbers were too tight in the mold and it was not pressing on all the sides of the jig. I mentioned that the timber was hard to get a consistent thickness resulting in some ribs being thicker. He suggested cutting the timber on the bench saw to 4mm then using the thicknesser to finish the thickness needed. It would also minimise the time to sand and clean the faces of the finished ribs.

CHANGES:

- Soak timber to become more flexible.
- Timber thickness to be less to fit in jig.
- Use thicknesser for consistent thickness.
- Use thicknesser for finished face.

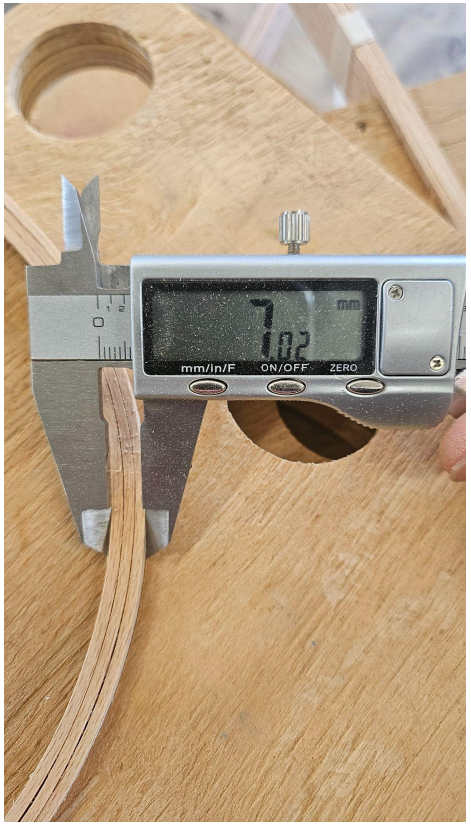
TRIAL 4

What technique am I trialing: Bending timber by laminating timber together.

What material am I trialing the technique on: European beech. Strips are 3 x 22 x 600 x 2.3mm

Trialing results:

From my feedback I used the thicknesser to get a more consistent thickness. I also made each bit at 2.3mm totalling a rib at 6.9mm. This was to fit in my jig better as the previous trial was too tight. I also soaked the timber in hot water to relax the grain. This made the timber a lot more flexible. The glue i was using was water based so i would dry any excess water from the timber before glueing. From doing all this the end result was a consistent rib with no cracking or structural / aesthetic imperfections. The glue did take longer to dry than the previous test but the results were better.



CONCLUSION

TRAIL 3	TRAIL 4	COMPARISON
Inconsistent timber thickness. Cracking. Not fitting tightly in the jig. Timbers had gaps. Snapped timbers. A lot of pressure was needed to bend. Material wastage. Normal glue dry time.	Consistent timber thickness. Clean timber face(s). Timber easily bent. No cracking. Less pressure to gain bend. Took glue longer to dry. Had to wait for timber to soak. Process took longer.	Comparing the two trials, trial 3 was to inconsistent and had wasted material and the structure was compromised due to the cracking. It was quicker to manufacture the ribs due to not having to soak the timber and the glue dried quicker. Trial 4 took longer but the rib structure was 100% solid, I had no breakages or cracks. Dry time of the glue was longer but the use of the thicknesser to machine the timber to a finished state minimised the clean up time. I will proceed with the techniques used in trial 4 to complete the rib structure of the light shade.

LIGHT PROJECTION

FEEDBACK: Mum & Dad

I have completed a prototype to show mum and dad the light projection.

- Dad tested the rigidity of the light shade by pushing down on it. He thought that the laminated timber was well strong enough to hold and protect the batten and bulb.
- They both thought the aesthetic matched the location and that the timber choice softened the space.
- We discussed that the light did not diffuse any of the light and that they were happy with this due to the choice of bulb. This bulb is a soft yellow hue.
- Mum wanted it to cast shadows and it did, but she would like to see more shadows cast.
- They both want to see what a acrylic version of the light would look like.

WHERE TO NEXT:

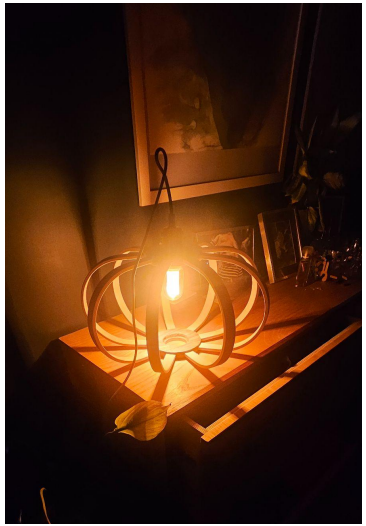
Trial: light projection, amount of ribs, spacing, shade shape, bulb, height of light hung, materials

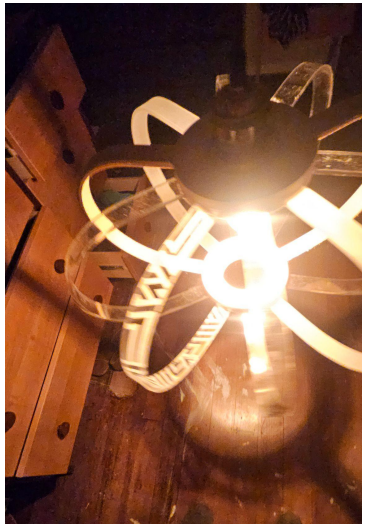
TRIAL 5

LIGHT PROJECTION / SHADOWS

TIMBER:

ACRYLIC:



CONCLUSION

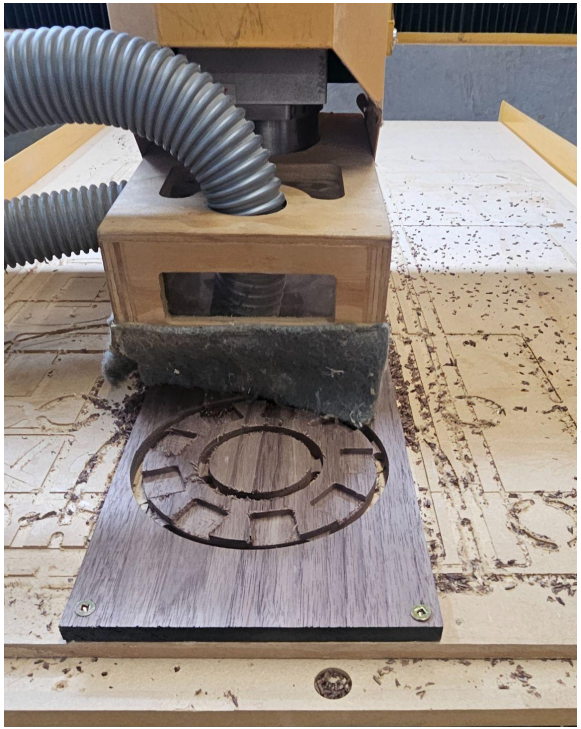
TRAIL : Timber	TRAIL : Acrylic	COMPARISON

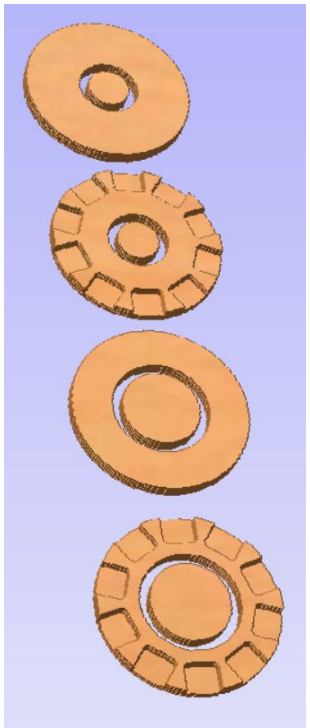
PROJECT CONCLUSION

CONCLUSION:

Summary of how the trials, analysis and feedback have contributed to the design of your outcome:

RIB & BATTEN HOLDER

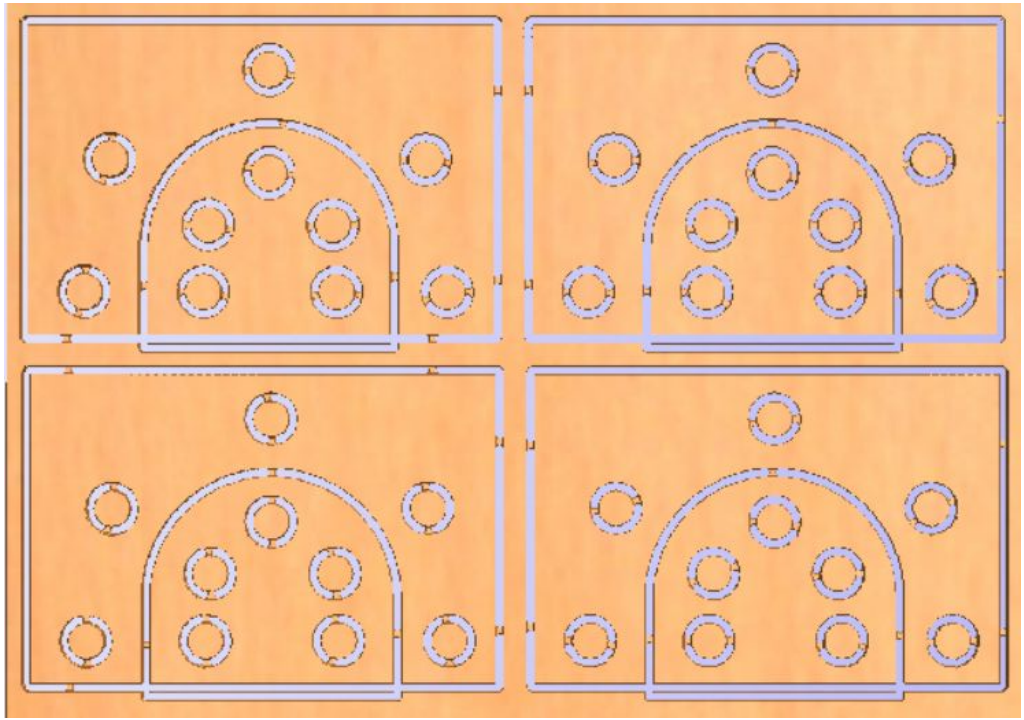




Possible techniques that could be trailed:

- Lathe
- Chisel
- Router
- Laser cut
- CNC
- Drill & Cut

CNC JIG



1.2

1.2

Experiment with different materials to develop a Materials and Processing Technology outcome

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
· Experiment with different materials to develop a Materials and Processing Technology outcome	· Examine different materials to develop a Materials and Processing Technology outcome	· Evaluate different materials to develop a Materials and Processing Technology outcome

Achievement standard 1.2

https://www.nzqa.govt.nz/framework/explore/domain.do?frameworkId=1732843820#standards

1.2

Experiment *with different materials to develop a Materials and Processing Technology outcome* involves:

- **exploring** the **properties** of **different materials** through **experimentation**
- creating a **purposeful outcome** informed by the **exploration**.

Examine *different materials to develop a Materials and Processing Technology outcome* involves:

- **investigating** the properties of different materials through **ongoing** experimentation incorporating **stakeholder feedback**
- **refining** the use of materials in the creation of the purposeful outcome informed by the **investigation**.

Evaluate *different materials to develop a Materials and Processing Technology outcome* involves:

- **analysing** the properties of different materials for the creation of the purposeful outcome
- **justifying** the use of materials in the creation of the purposeful outcome.

The term *materials* encompasses all items, ingredients, and components that a Materials and Processing Technology Outcome could be made from.

In Materials and Processing Technology, *experimentation* refers to trying out new ideas or methods for the purpose of discovery. Examples of experimentation with different materials include:

- transforming by altering the structure
- combining by mixing materials
- manipulating materials without changing their structure or composition
- forming to create a new material.

For the purpose of this achievement standard, *stakeholder feedback* is used to inform the exploration and selection of materials for a purposeful outcome.

Stakeholder feedback is documented verbal or written information sourced first-hand. Sources of stakeholder feedback could include the end user, or people or groups that have expertise, experience, or a combination of both in this area. More than one stakeholder must be consulted.

A *purposeful outcome* has to meet a need or opportunity identified for a person, whānau, or community.