

Bandsaw Operation Procedure



1. Bauxite is the raw mineral that is mined and eventually processed into aluminium.
2. Weipa in north Queensland has enormous quantities of Bauxite and has been mined here for decades.
3. Once mined, it is shipped to Gladstone, where it is processed into aluminium.

Also, include some information about threads.

1. For the handle, a $\frac{1}{4}$ " B.S.W. thread is being used. This stands for British Standard Whitworth, a very old thread.
2. A thread type that is common today is metric threads, 8mm, 10mm.
3. The pitch of a thread is the distance between one peak to another, e.g. a 20mm thread has a pitch of 2.5mm

Safety Precautions:

- Wear safety glasses and appropriate footwear.
- Long hair must be tied back; clothing should be close-fitting.
- Always keep your hands clear of the blade.
- Beware of coolant puddles on the floor to avoid slipping.
- Report any unusual noises or blade issues immediately.

Process:

1. Check Material and Measurement

- Select 18mm diameter aluminium stock from storage.
- Confirm handle length from the material list (approx. 145mm).
- Set bandsaw stop-block to approximately 150mm (to allow trimming later).

2. Prepare Bandsaw

- Lift the head unit.
- Lock it securely in the horizontal lever position (blue lever).
- Confirm blade speed setting at approximately 30 (mild steel setting suitable).

3. Clamp Material

- Position the aluminium firmly against the stop-block.
- Secure material firmly using the vice wheel only (avoid overtightening).

4. Start Cutting

- Turn the bandsaw on using the provided switch.
- Move lever to vertical position to lower the head unit slowly onto the material.
- Allow the bandsaw to cut automatically; it will switch off when completed.

5. Remove Material and Repeat

- Raise the head unit, remove the cut piece.
- Continue cutting additional pieces without changing the stop-block position.
- When not in use, lower the head unit to protect hydraulic seals.

Metal Lathe Operation Procedure



Safety Precautions:

- Wear safety glasses and appropriate footwear.
- Remove the chuck key immediately after use; never leave it in the chuck.
- Do not touch any lever, button, or control unless specifically instructed.
- Report machine malfunctions or unusual noises immediately.

Process: (refer to the A3 poster)

1. Centre Drilling

- Insert material firmly into the chuck.
- Fit the centre drill securely into the tailstock.
- Set the lathe speed to 1100 RPM for aluminium.



- Start lathe (**red** level down); gently advance tailstock to drill conical hole approx. 3-5mm deep.
- Turn off lathe; repeat on opposite end of material.

2. Facing Off Ends

- Confirm finished handle length required (typically around 143mm, based on internal toolbox tray measurement).
- Move cutting tool into position close to the material end.
- Engage automatic feed (**yellow** lever across to the right and down) to face off the end smoothly.



- Disengage feed lever when the cutting tool reaches centre-drilled hole.
- Repeat process on opposite end.
- Continue facing both ends incrementally until exact handle length is achieved.

3. Measure and Confirm Length

- Confirm length precisely by placing handle within toolbox tray to achieve snug fit.
- Adjust by incremental facing off as required.

4. Drilling for Tapping

- Replace centre drill with 5mm drill bit.
- Drill each end to a depth of approximately 30mm (measure depth with a simple marked tool or straw method).

5. Thread Preparation

- Begin thread tapping directly on the lathe to ensure threads start square and aligned.
- Once initial thread has been formed, complete tapping manually in a bench vice.

Tap Procedure

Safety Precautions:

- Avoid placing hands near cutting edges or moving parts.
- Secure the workpiece firmly before starting.
- Regularly apply lubricant (WD-40 recommended) to prevent damage to threads.

Process:

1. Select the Appropriate Tap (in this case, ¼ inch):

- Identify tap types:
 - **Taper Tap:** Threads gradually start; used initially to form threads.
 - **Bottoming Tap:** Threads extend fully to the bottom; used to finish threading blind holes.

2. Begin Threading on Lathe:

- Secure aluminium handle firmly in lathe chuck.
- Install **taper tap** into tap wrench.
- Bring the centre up the tap wrench, ensuring the taper tap is firmly pressed into the 5mm pre-drilled hole. Lock off the centre so it does not move.
- Move the handfeed wheel so the tool holder housing moves in to meet the tap wrench handle to act as a stop for the tap wrench. This will ensure it does not move when pressure is applied. See pic next page for the set-up.



- Place the chuck key into the lathe chuck for better control. Turn the lathe chuck half a turn anticlockwise while simultaneously turning the centre piece adjustment so that it pushes the tap into the drilled hole. The diametric turning of each end will start the thread square with the piece, and set start of the thread square with the hole.

3. Complete Threading in Vice:

- Transfer the workpiece carefully from lathe to workbench.

Use a **tap wrench** with the appropriate tap (starting with taper tap, then switching to bottoming tap).

- **Do not use serrated-edge vices**; select smooth jaw vice to prevent damage to the aluminium surface.



4. Manual Threading Technique:

- Insert bottoming tap into previously started threads.
- Turn tap wrench gently:
 - Turn $\frac{1}{2}$ **turn clockwise** to cut.
 - Back off $\frac{1}{4}$ to $\frac{1}{2}$ **turn anticlockwise** regularly to clear aluminium shavings.
- Regularly apply **WD-40** or a suitable lubricant to maintain smooth cutting and prevent binding.



5. Complete Threading Process:

- Continue threading carefully until resistance indicates the bottom of the drilled hole has been reached.
- Remove tap by turning anticlockwise, ensuring threads remain undamaged.

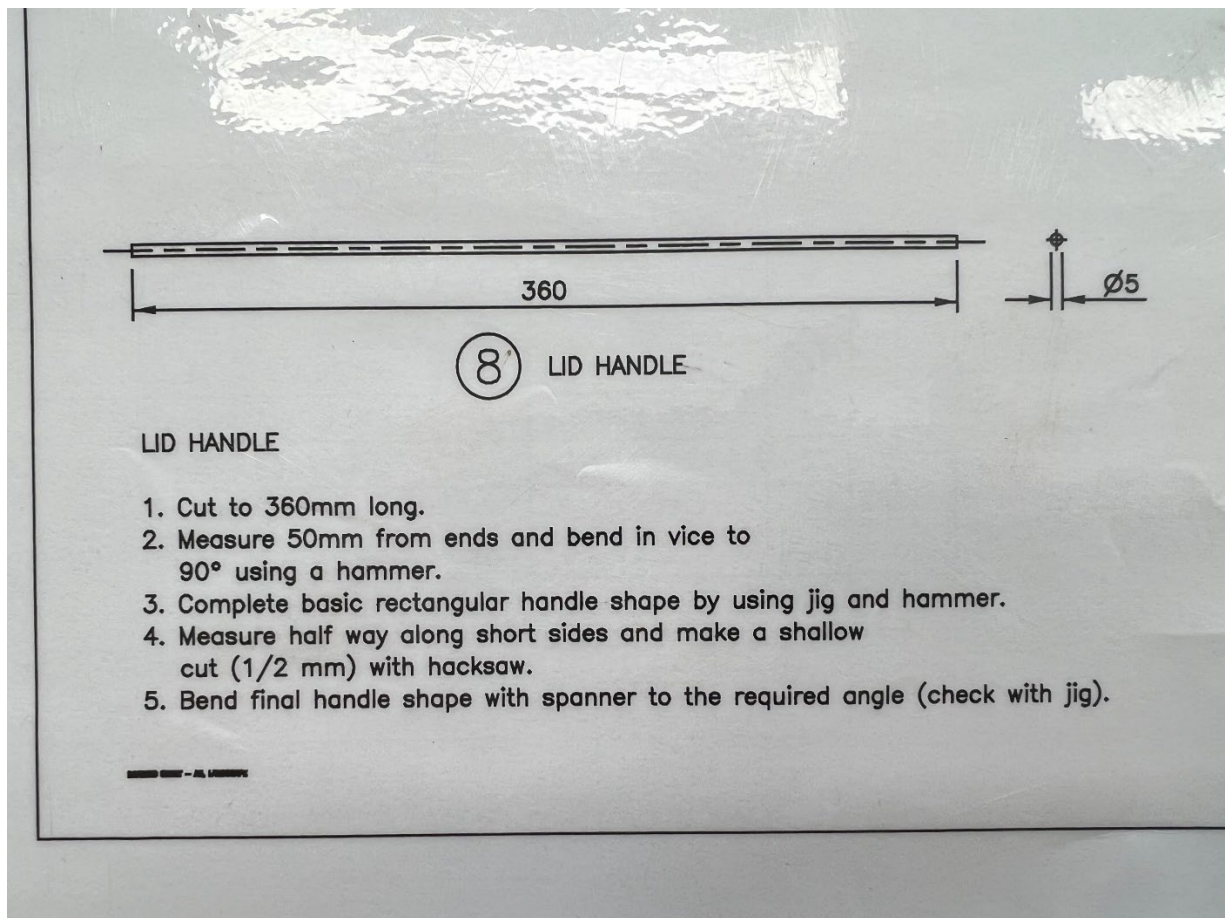
Workflow Tip:

Maintain efficiency by having one student start threads on the lathe while another finishes their threads manually in the vice.

Making the Handles

Process:

Refer to the below on the plan for an overview of the process.



Bending the 5mm handle wire into a rectangular shape

1. Secure in a vice vertically, ensuring that the 50mm scribe line is appropriately positioned relative to the desired bend.
2. Using a ball pein hammer, strike the wire to form a 90-degree angle relative to its hold position.
3. Repeat on the other end. Essential to ensure there is no 'rock' in the ends i.e. when placed on a flat surface, the wire is bent flat and does not rock when lateral force is applied. If there is 'rock' in the wire, place it back in the vice and make the necessary twists required to straighten and achieve the desired alignment.

4. If the angles are good and the rock has been removed, it's time to move on to the bending in the jig. Show your work to the teacher for approval to move on to the jig.

Bending in the Jig

1. Place the 50mm bent end of the 5mm wire into the holding slot. Using a ball peen hammer, strike the bend point, similar to the 50mm bends in the previous process, while continuing to apply bend force to the joint to achieve a tight 90-degree bend.
2. Remove the item from the job and make any necessary fine adjustments. Repeat the process for the other end.
3. Make finer adjustments where required to achieve the desired rectangular shape



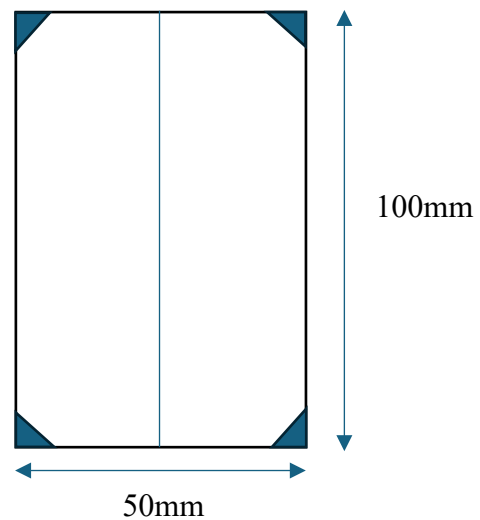
Making the handle plates

Safety Precautions:

- Take care when cutting sheet metal, sharp corners etc
- Tin snips are like using sharp scissors, use similar precautions

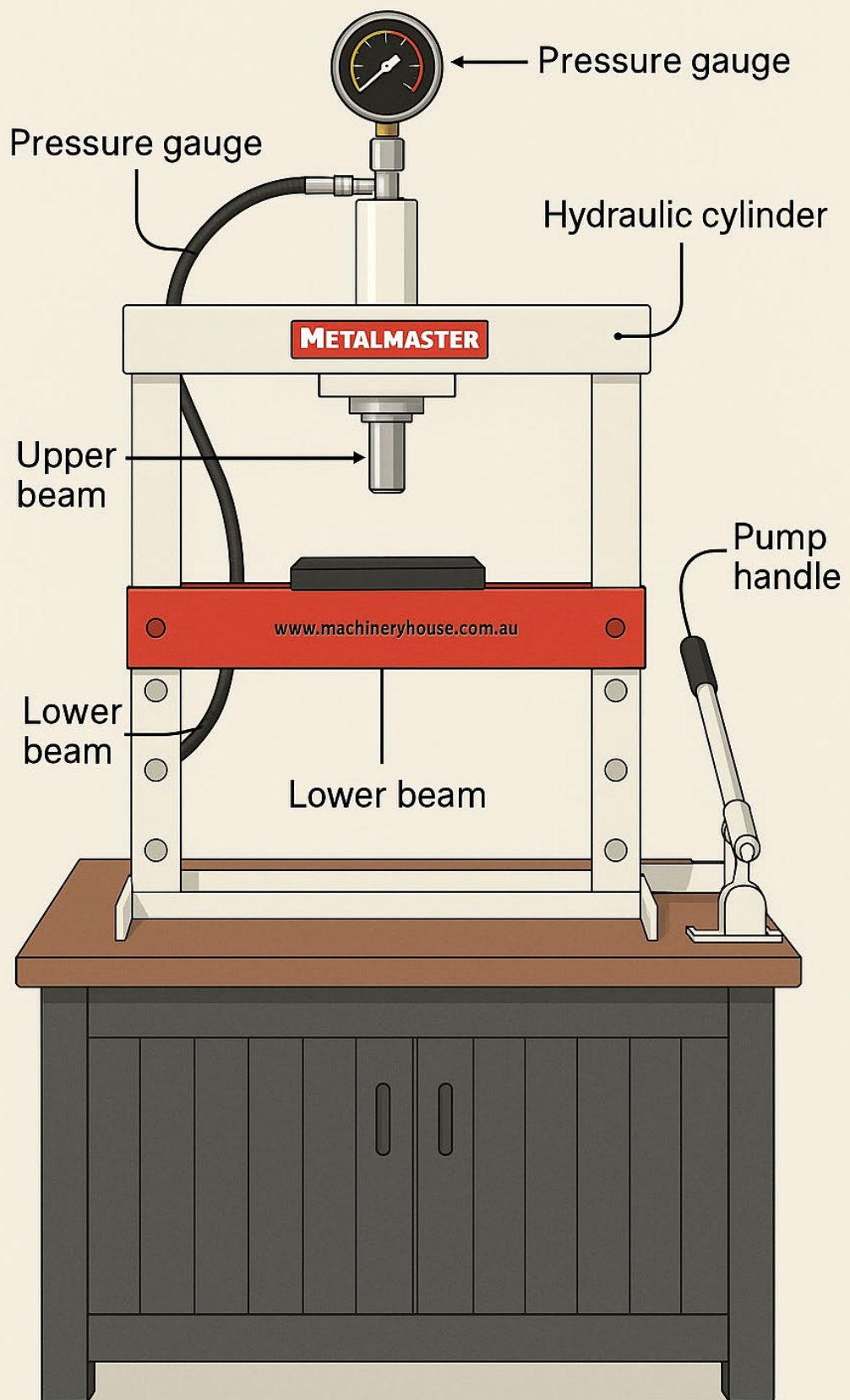
Process:

1. Cut two pieces of galvabond – 100mm x 50mm. Draw a centreline on each, dividing the piece into 25mm halves.
2. Mark 5mm x 5mm corner cuts and trim all the corners on both plates.
3. It's now time to move over to the hydraulic press.



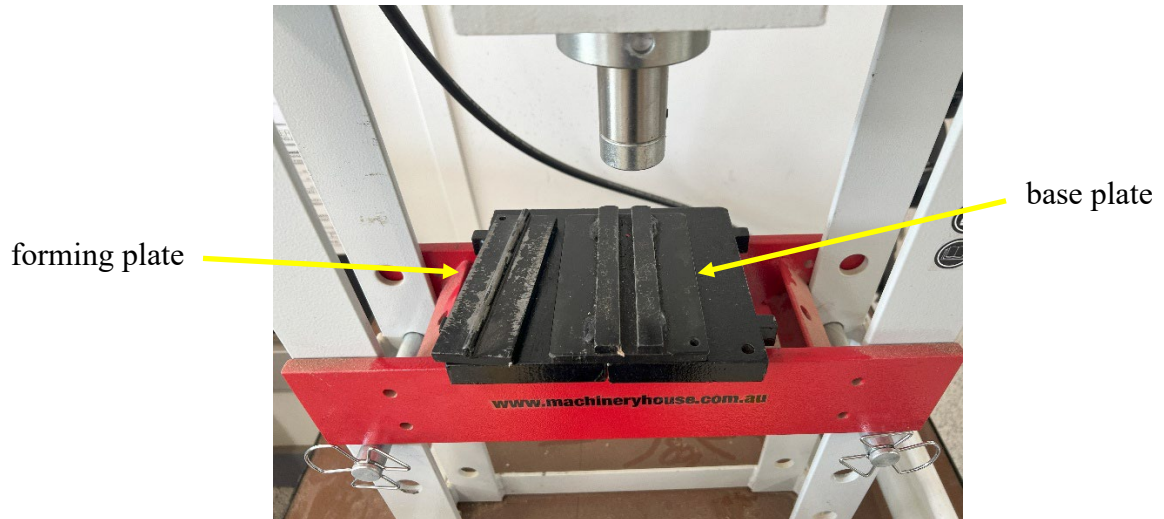
The hydraulic press is used to create the depression in the sheet metal to act as a housing to secure the handle to the toolbox. A hydraulic press operates on Pascal's principle, which states that pressure applied to a confined fluid is transmitted undiminished throughout the fluid.

This allows a small force applied to a smaller area to be multiplied into a larger force on a larger area, enabling the press to exert significant compressive forces. Perfect for creating shapes in thin metal like galvabond, zincalume etc.

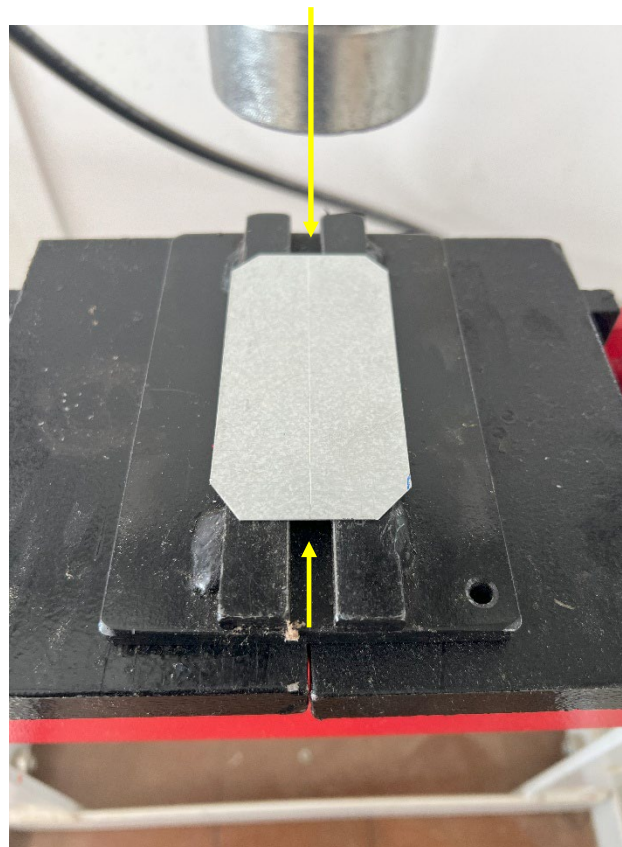


Process

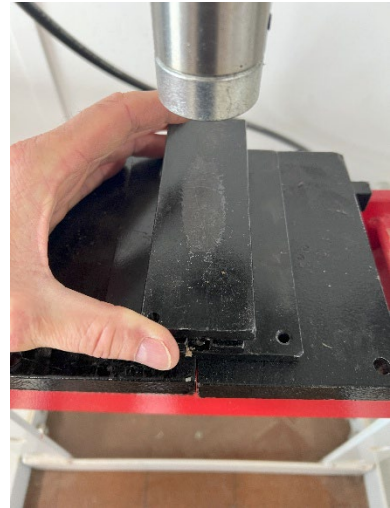
1. Two hardened steel formers are required (located under the press in the storage shelves) – base plate and top forming plate



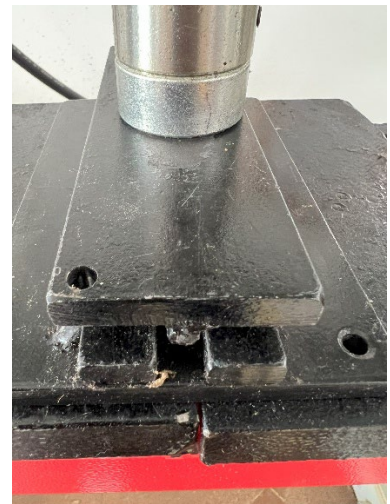
2. Place the sheet metal handle blank on the base plate, ensuring that the centre line marked out previously is centred in the base plate recess.



3. Carefully apply the top forming plate, ensuring not to knock the sheet metal off its centreline position. It is critical that the process be done with care and attention.



4. Ensure the pressure release valve is tightened to finger tightness. Then lower the hydraulic cylinder with the handle to first set the press in place ready for the final shaping.



5. Continue to use the handle to press until the plates have about a 1 mm gap between them, as the picture shows. Release the pressure value, and the cylinder will rise automatically. Remove the piece and inspect.



Should look something like this (without the holes drilled)

