



Backrest for Dragon boat

Fixperts✓

Hit ID

Department of Industrial Design
המחלקה לייצוב תעשייתי



5013

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חותרי הפארק

Fixperts

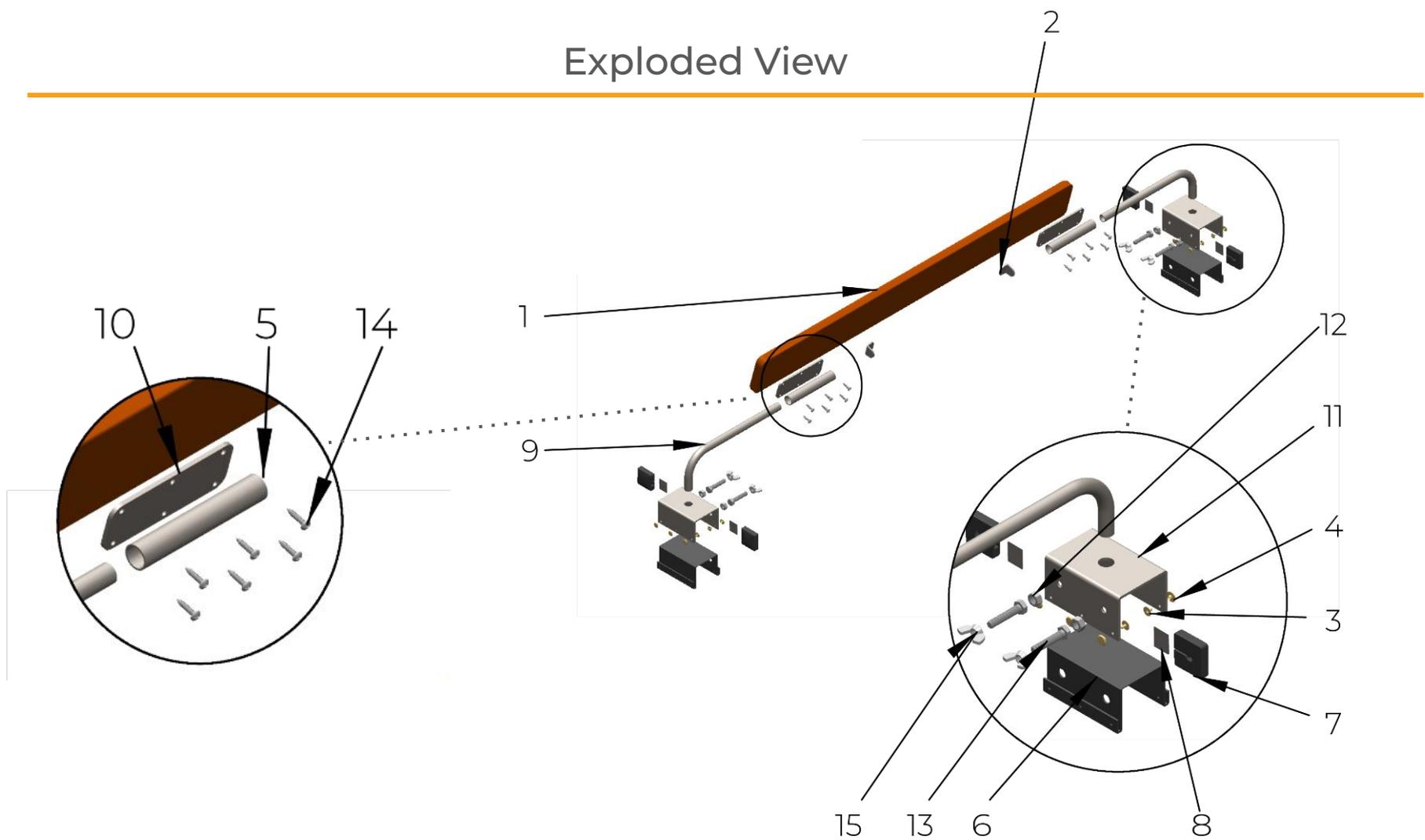
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Department of Industrial Design

המחלקה לייצוב תעשייתי



Exploded View



Bill of Materials

ITEM NO.	PART NAME	MATERIAL	QTY.
1	Backrest	Hardwood (Teak or Mahagony)	1
2	EndStop	3mm Stainless Steel	2
3	Rivit A	snap fasteners McMaster-Carr	12
4	Rivit B	snap fasteners McMaster-Carr	12
5	19mm Tube	tubing McMaster-Carr	2
6	Rubber	neoprene rubber McMaster-Carr	2
7	TPU Cap	Black TPU 95A	4
8	Steel Insert	0.5mm Stainless Steel	4
9	16mm Tube	tubing McMaster-Carr	2
10	AttachmentFlange	3mm Stainless Steel	2
11	UAttachment	3mm Stainless Steel	2
12	Hex Nut M8	hex nuts McMaster-Carr	4
13	Hex Head Screw M8X35	18-8 Stainless Steel Hex Head Screws	4
14	Phillips Rounded Head Screws M4X22	phillips screws McMaster-Carr	12
15	Wing Nut	wing nuts McMaster-Carr	4

Wood - Use hardwood, preferably teak or mahogany

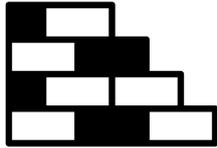
Metal - For moisture resistance, stainless steel is best, other metals can be used if you have the appropriate equipment.

Rubber - The friction with the side of the boat is critical. Use real rubber, not foamed thermoplastics.

Filament - TPU or any other flexible filament will work fine, make sure to use the appropriate slicer and printer settings.

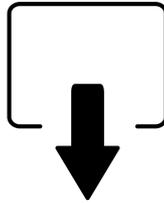
What You'll Need

Hardware



Bill of Materials From
Previous page

Downloads



End Cap STL for TPU print
DXF drawing for laser cutter

Tools



Tools next in the
page

What You'll Need

Tools



Basic woodworking tools

- Saw
- Drill
- Sander
- Router
-

Metal Break

Bar bending machine (optional)

Welder (suitable for stainless steel)

3_{mm} Hole punch

10_{mm} Hole punch

Hammer

3D printer

C.A. glue

Wood oil

Large paint brush or rag

Tools for cutting sheet metal - can be done with

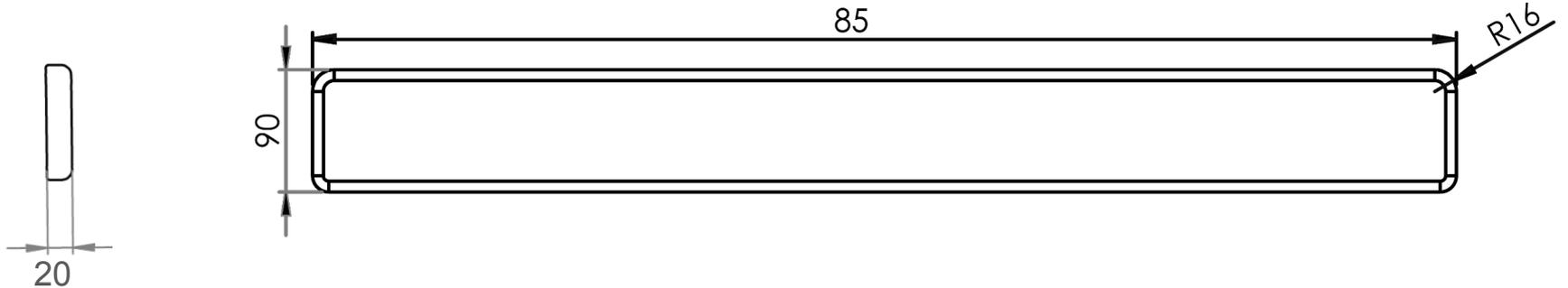
- Band saw and a drill press
or
- Laser cutting

Backrest

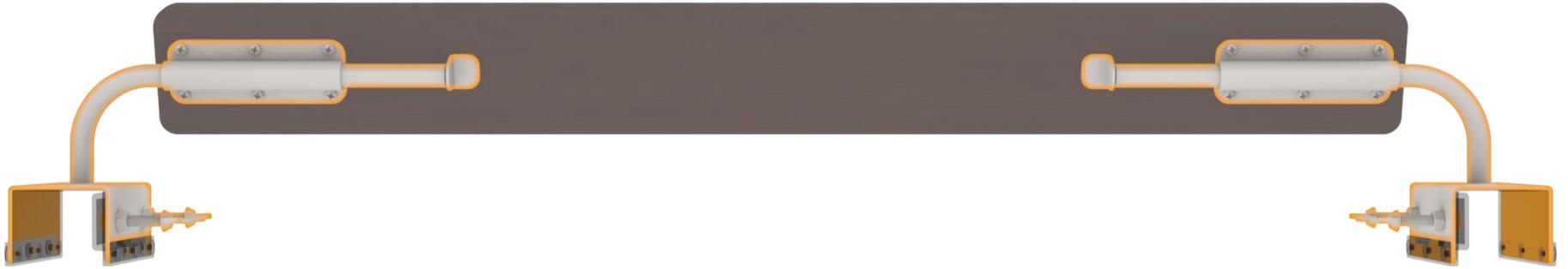


Backrest

1. Saw the wooden plank to the dimensions (all dimensions are in millimeters) indicated.
2. Round the corners using a router bit or a belt sander.
3. Round the edges using your choice of round over bit on a router.
4. Sand to the appropriate level of finish
5. Apply wood oil finish.
6. Set aside until assembly



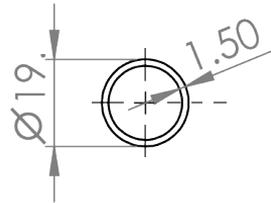
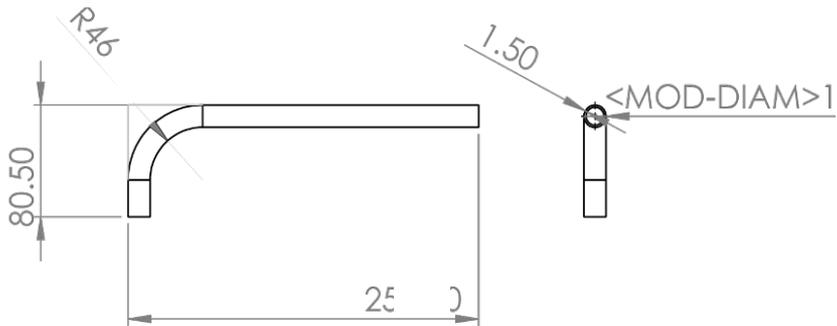
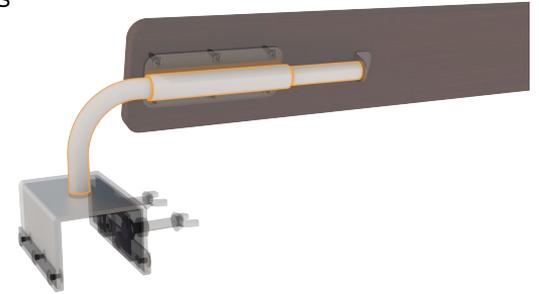
Attachment Arms



Attachment Arms

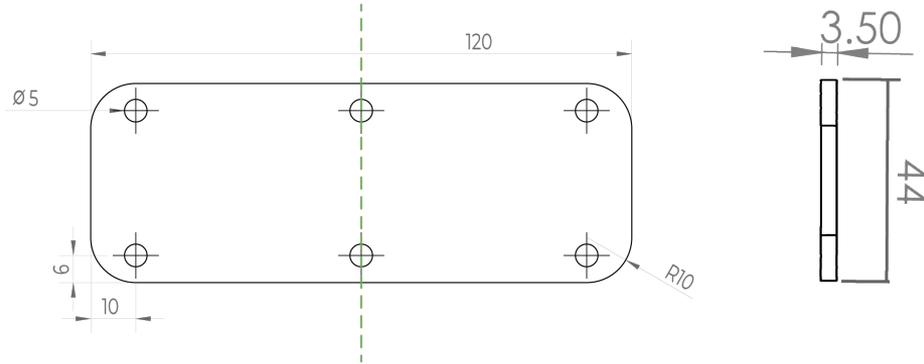
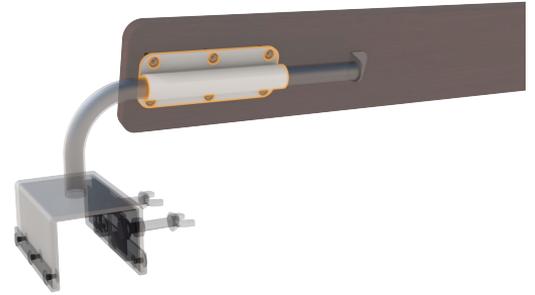
1. Bend two lengths of the 16mm tube 90°
(If you don't have access to a tube bender, an acceptable alternative would be to cut the tube at a 45° angle and weld to form a 90° corner.)
2. Cut the bent tubes to the indicated dimensions.

3. Cut two lengths of the 19mm tube to the dimensions shown



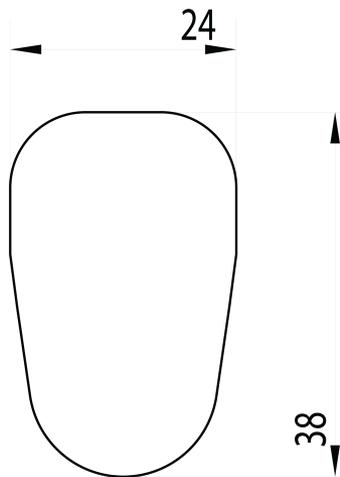
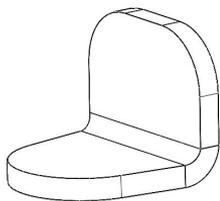
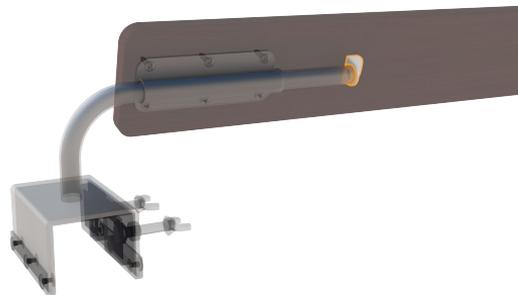
Attachment Arms

4. Using a laser cutter or any other appropriate tool, cut out the following patterns from the sheet of stainless steel. Repeat so that you have two of each part.

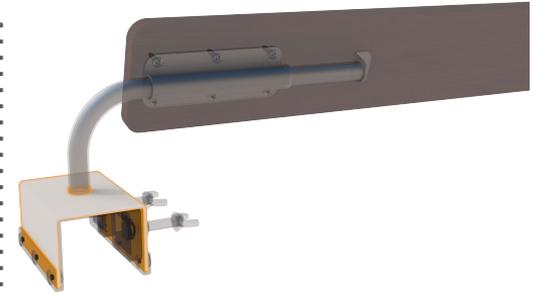
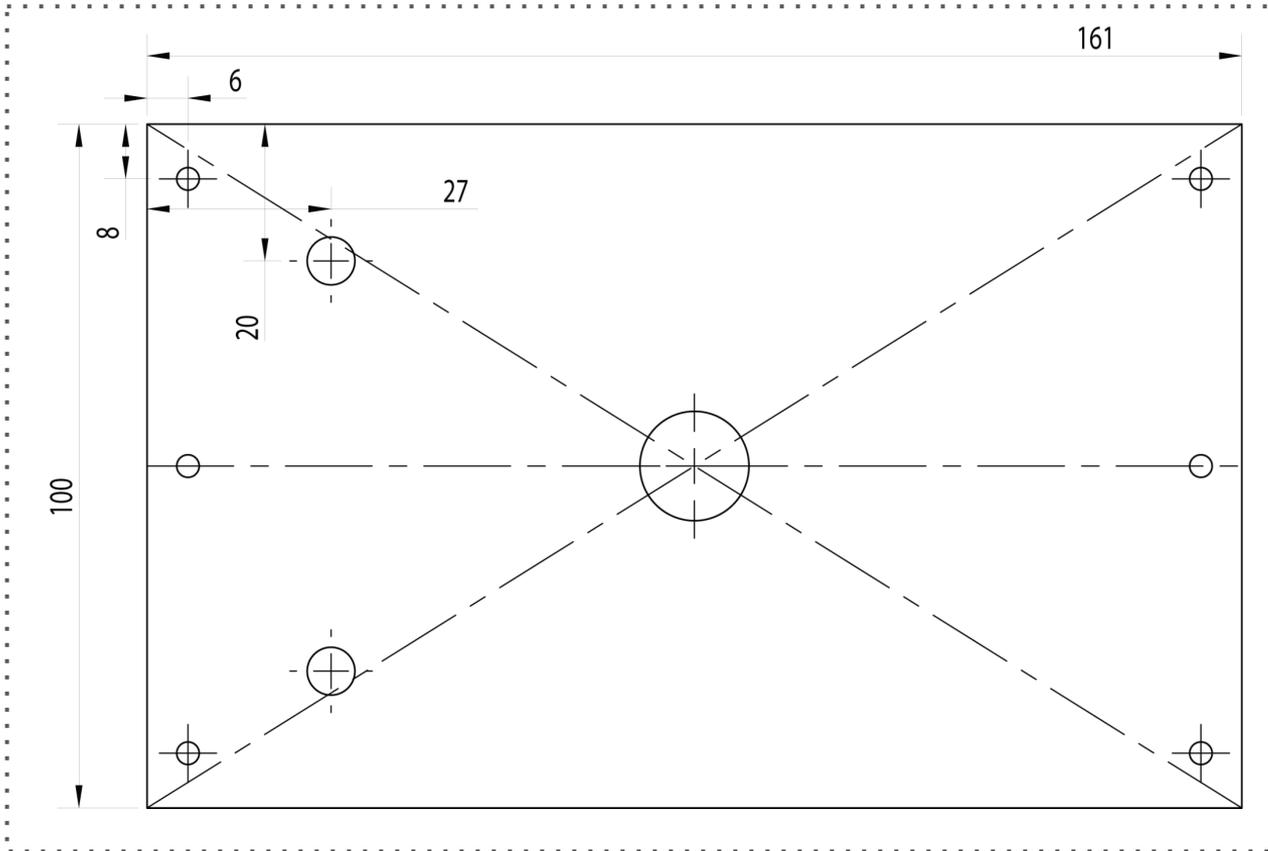


Attachment Arms

4. Using a laser cutter or any other appropriate tool, cut out the following patterns from the sheet of stainless steel. Repeat so that you have two of each part.



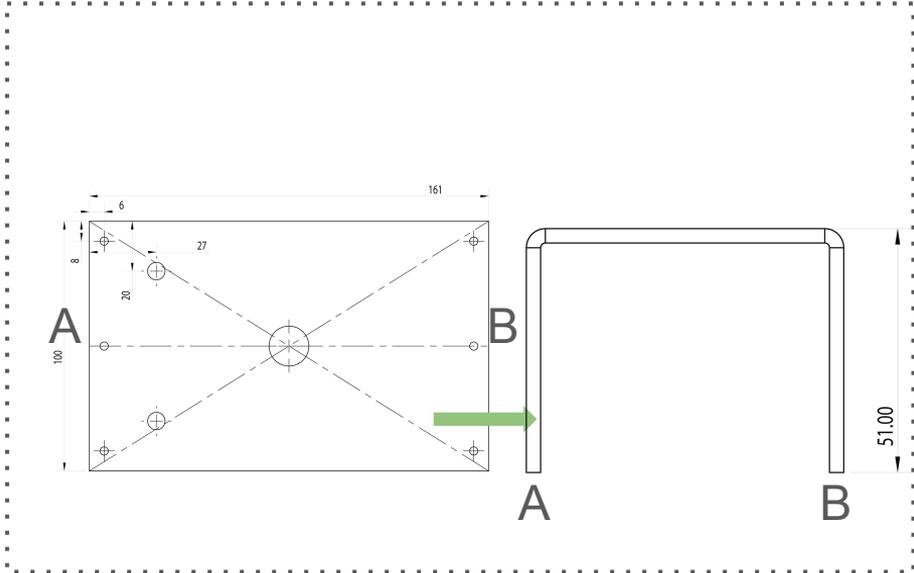
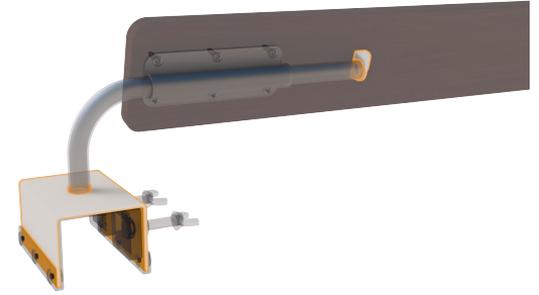
Attachment Arms



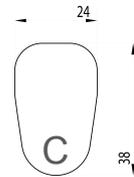
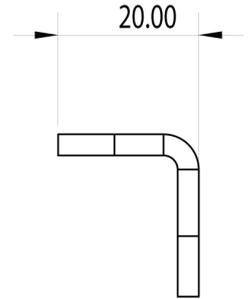
4. Using a laser cutter or any other appropriate tool, cut out the following patterns from the sheet of stainless steel. Repeat so that you have two of each part.

Attachment Arms

6. Perform the following 90° bends according to the diagram, you should have two `U` shaped, two `L` shaped and two flat sheet metal parts.



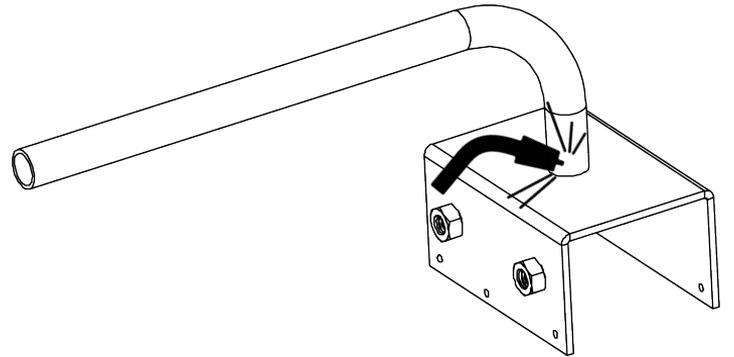
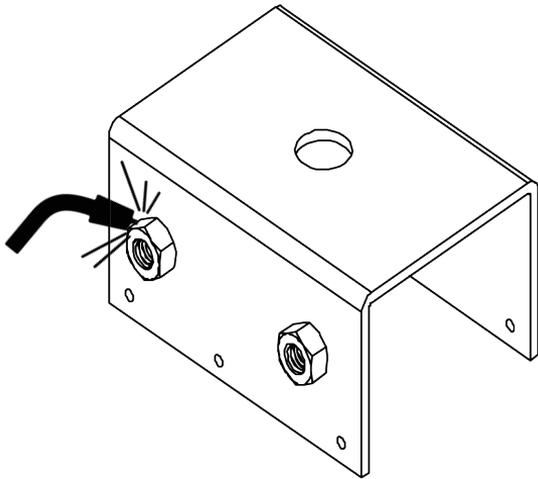
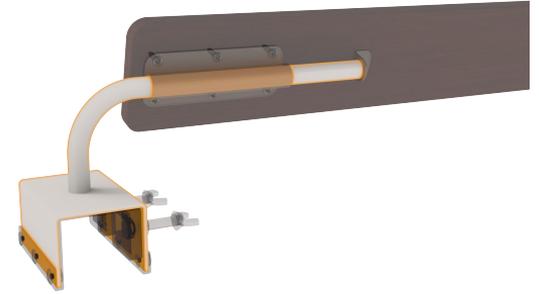
It's ok to overdo this bend, make sure it's at least 90° otherwise it will interfere with the wood



Attachment Arms

7. Weld two hex nuts to the outside of each grip, make sure you are aligned with the holes.

8. Weld the 90° tubes to the top of the U shaped part using the center hole as a guide. Make sure that the tube is level and perpendicular to the part.

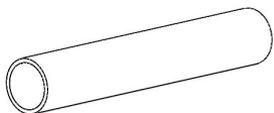
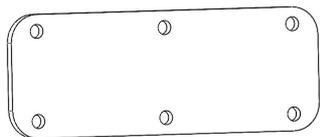


Attachment Arms

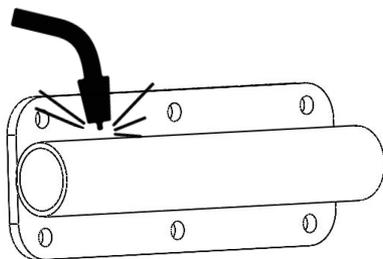
9. Weld the 19_{mm} tube to the center of the attachment flange.

10. Slide the 16_{mm} tube through the 19_{mm} tube.

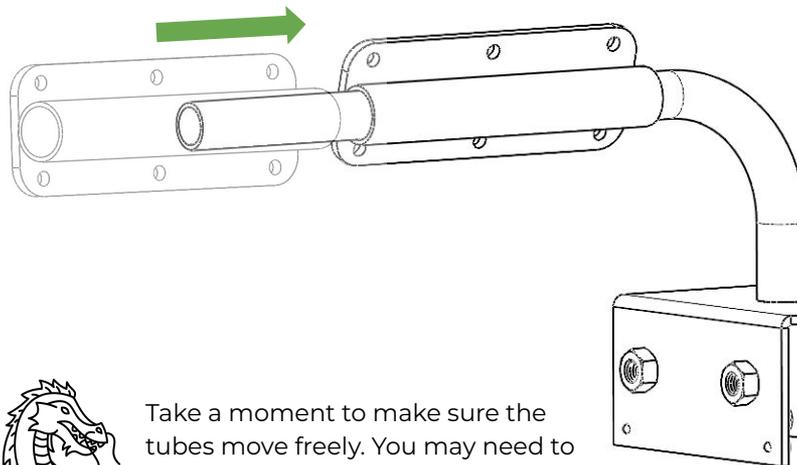
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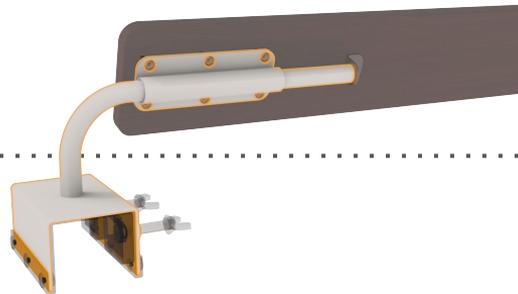
2



3

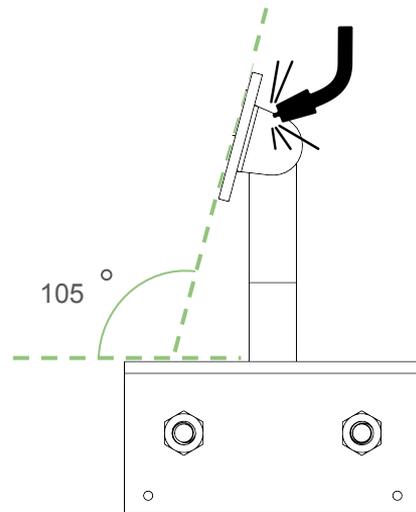
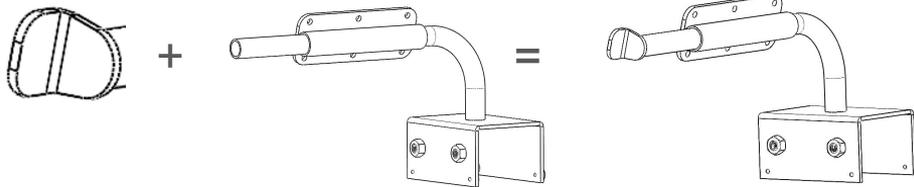
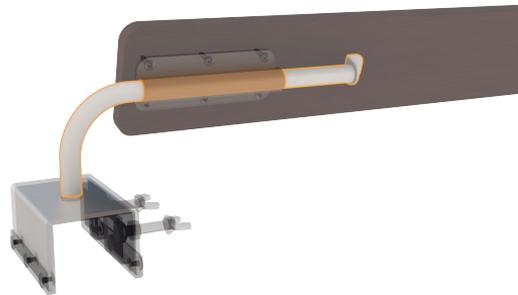


Take a moment to make sure the tubes move freely. You may need to do some filing and sanding.



Attachment Arms

11. Weld the endstop to the end of the 16_{mm} tube at a 105° angle.

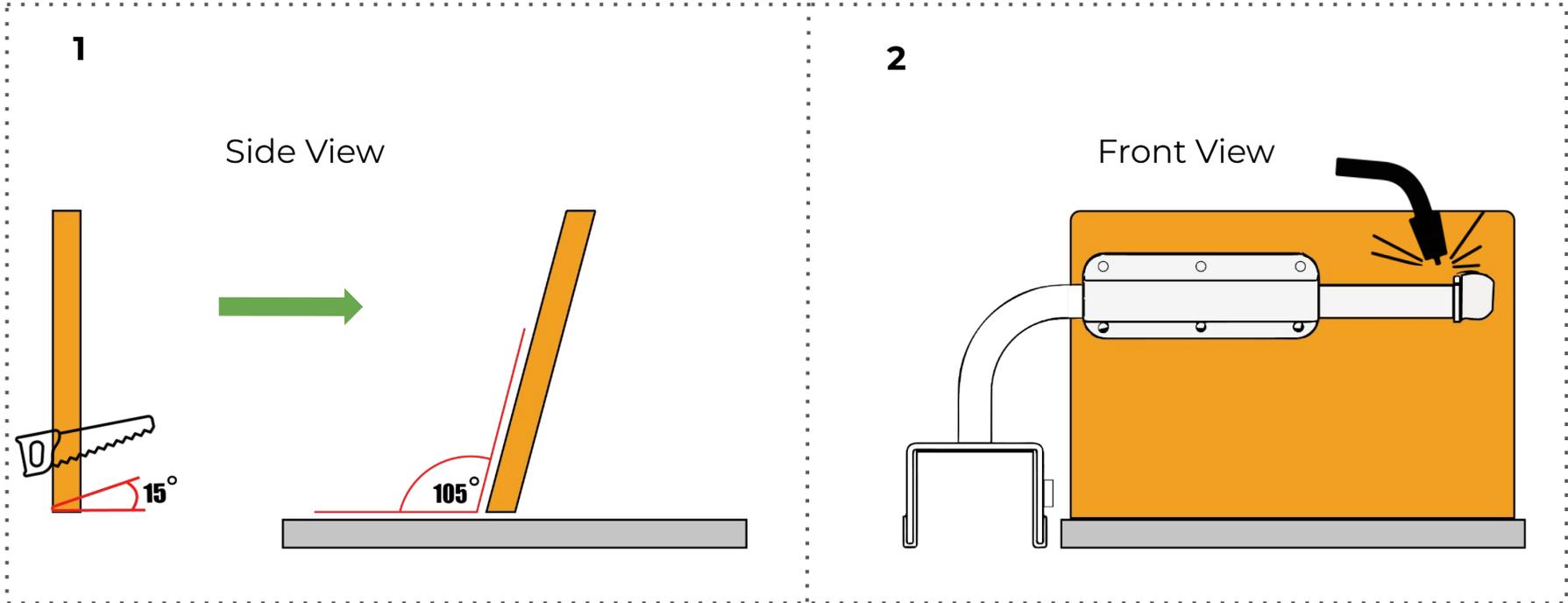


This is a tricky step, the endstop slides across the backrest. It's very important to get the angle right, and to make sure it's inline with the attachment flange.

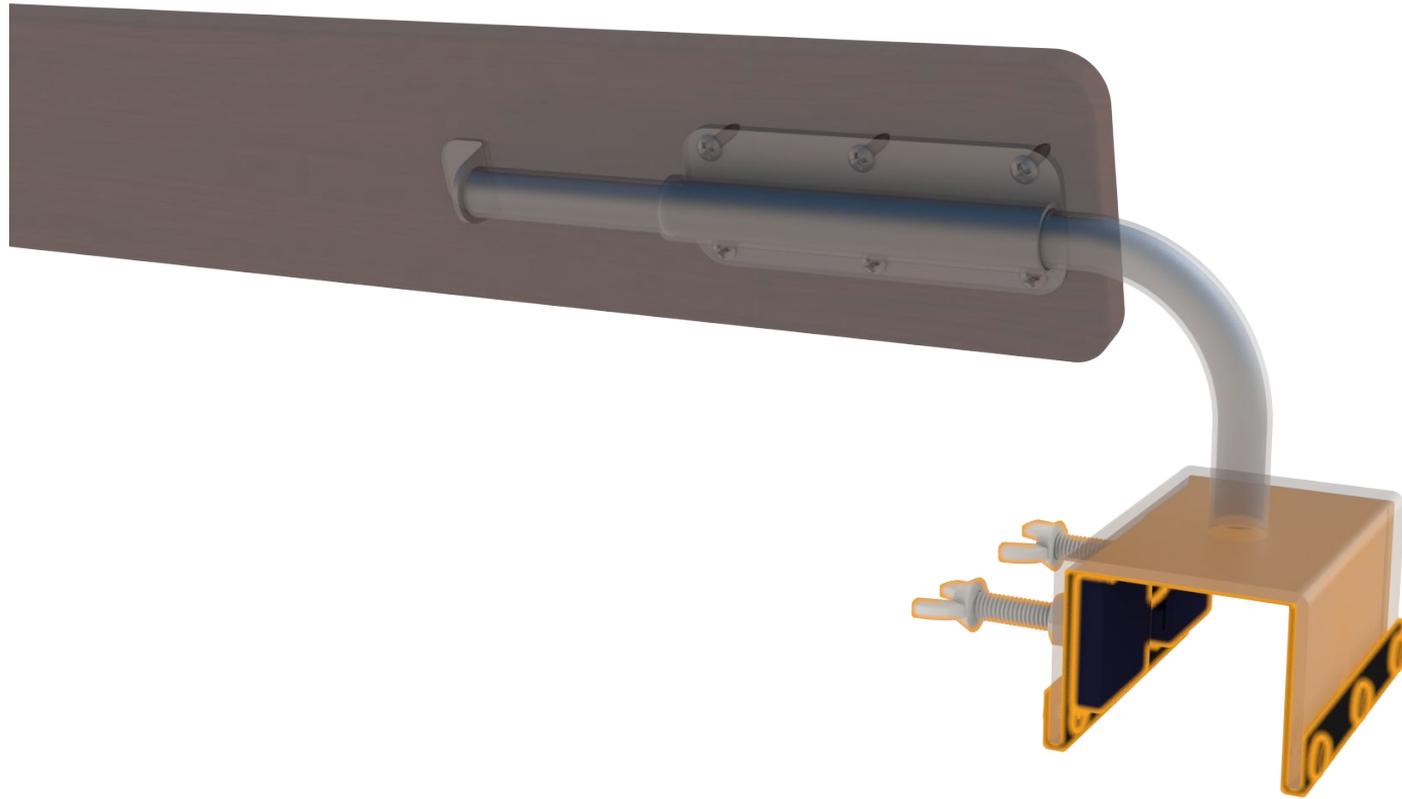
Instructions for preparing a jig for precise welding on the next page

Welding Jig

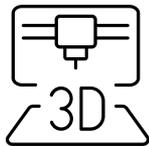
- A. Saw off the end of a scrap piece of wood board at 15°.
- B. Attached it to a flat base.
- C. place the end of the attachment arm on the table and rest the attachment flange and endstop against the board, clamp in place if necessary
- D. Weld the endstop to the end of the tube.



Vice Grips



Vice Grips

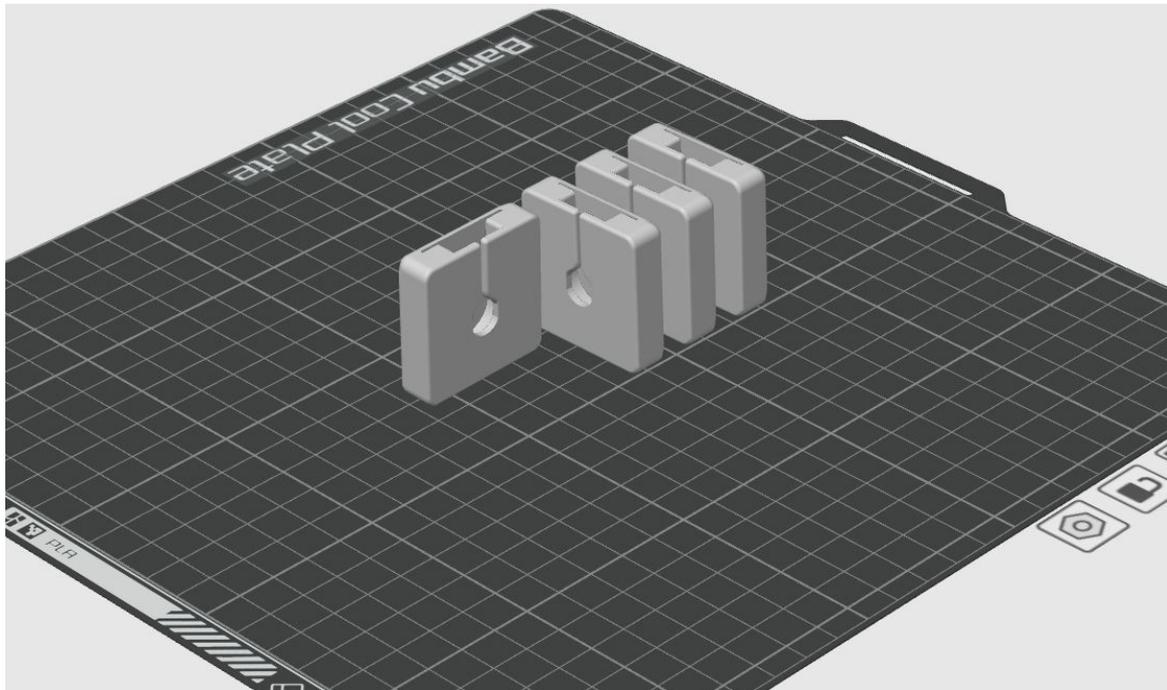
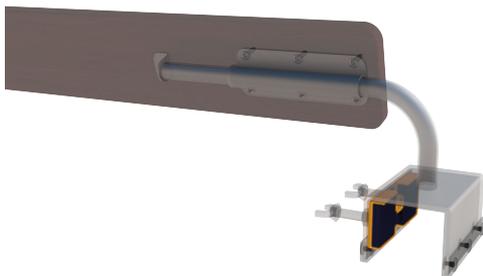


1. Print 4 copies of the TPU caps. Orient them as shown in the photo, and use the following settings:

material - Black TPU 95A

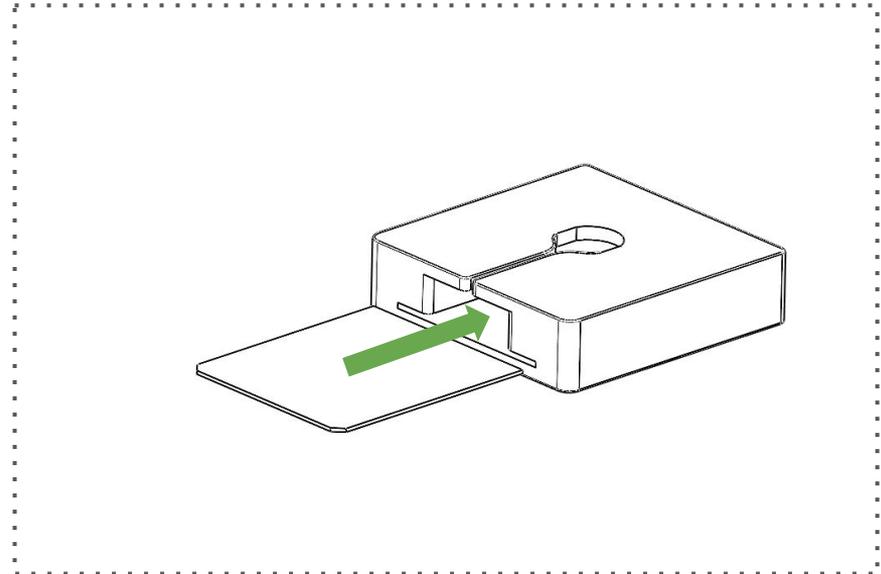
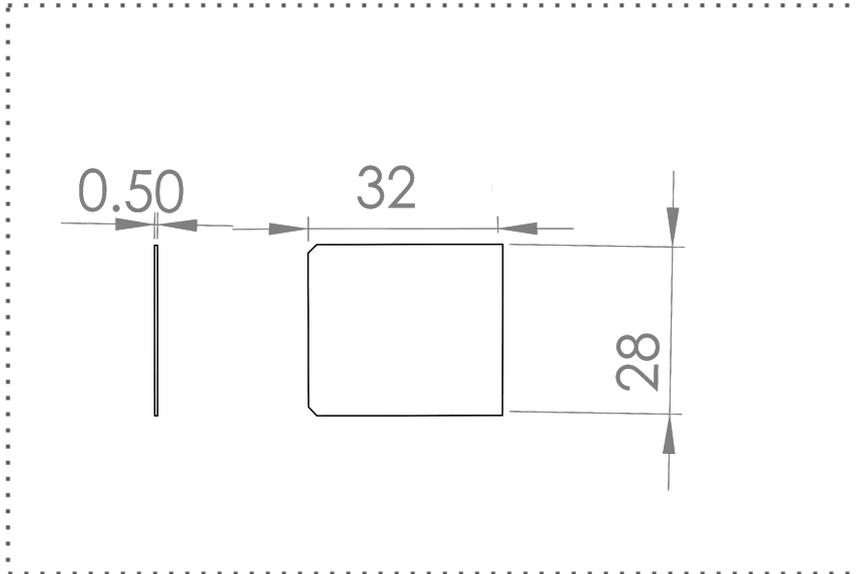
Infill - 20%

Layer Height- 0.2



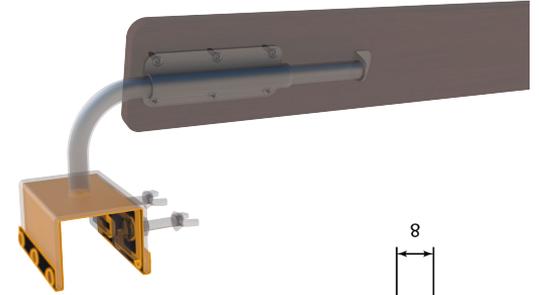
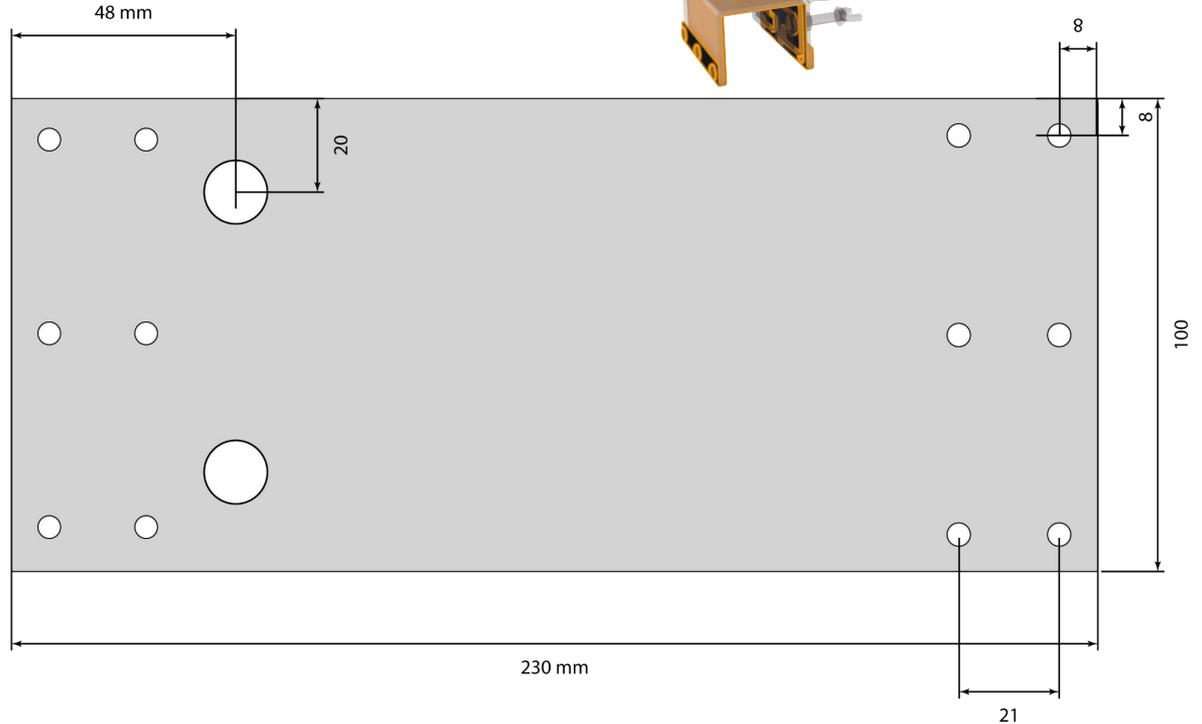
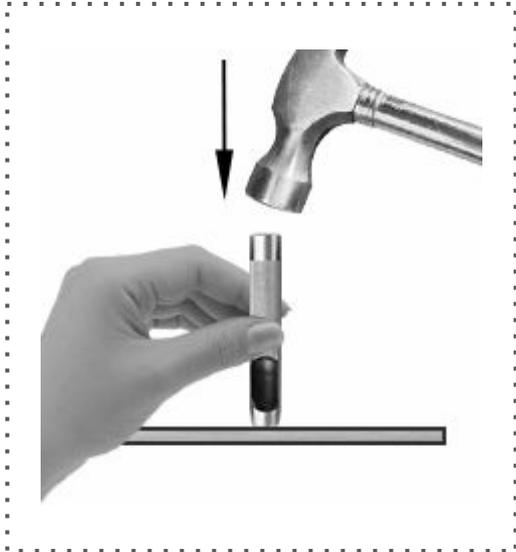
Vice Grips

- Using a metal break, bandsaw, or laser cutter, cut 4 pieces of 0.5_{mm} stainless steel to the dimensions shown
- Insert them into the slot in the TPU caps.



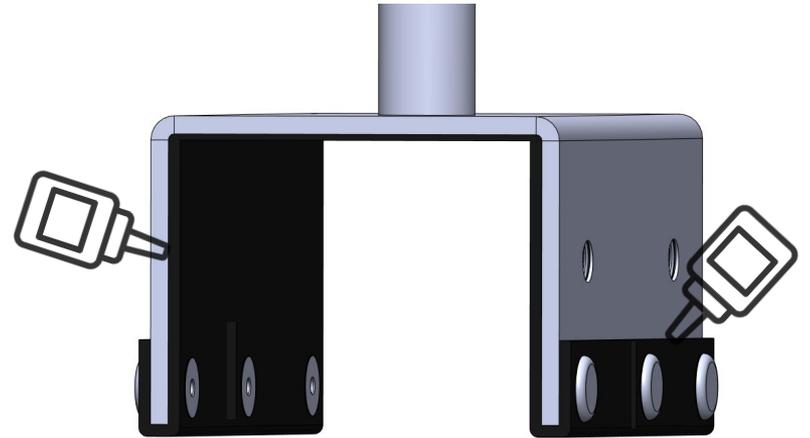
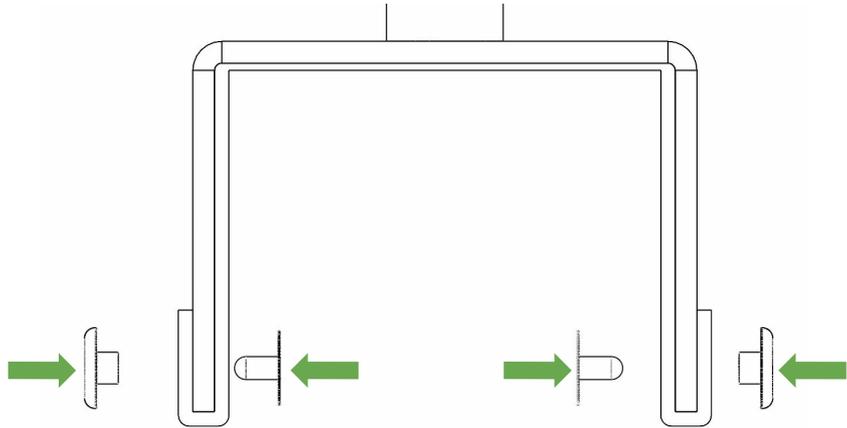
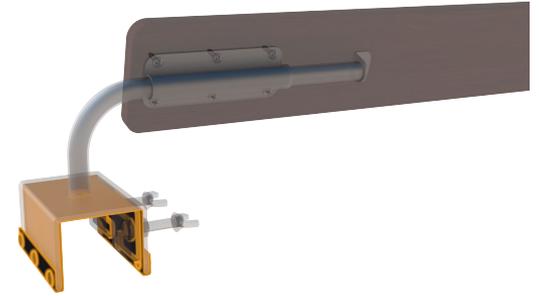
Vice Grips

4. Cut two pieces of rubber to the dimensions shown and use a hole punch to punch out holes according to the patterns. Use a 3 or 4_{mm} punch for the small holes and a 10_{mm} punch for the large ones.



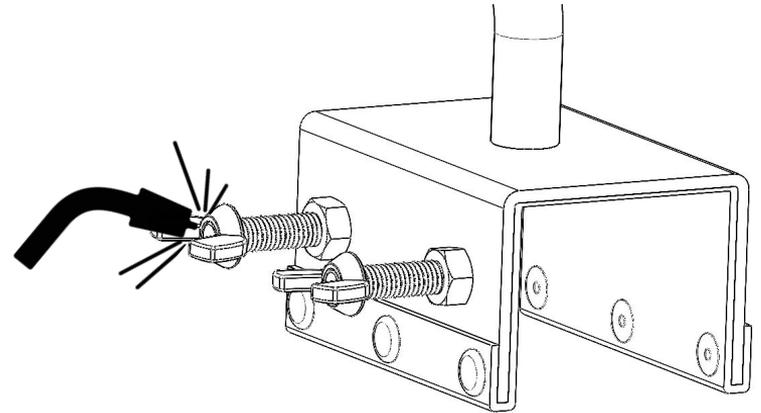
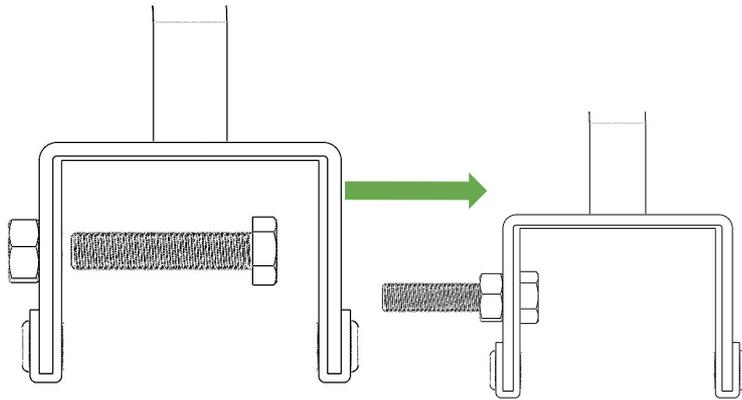
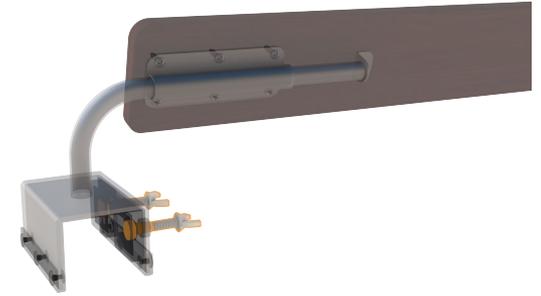
Vice Grips

5. Attach the rubber to the grip using the rivets, six to each arm (twelve total).
6. Secure the rubber to the metal with C.A glue.



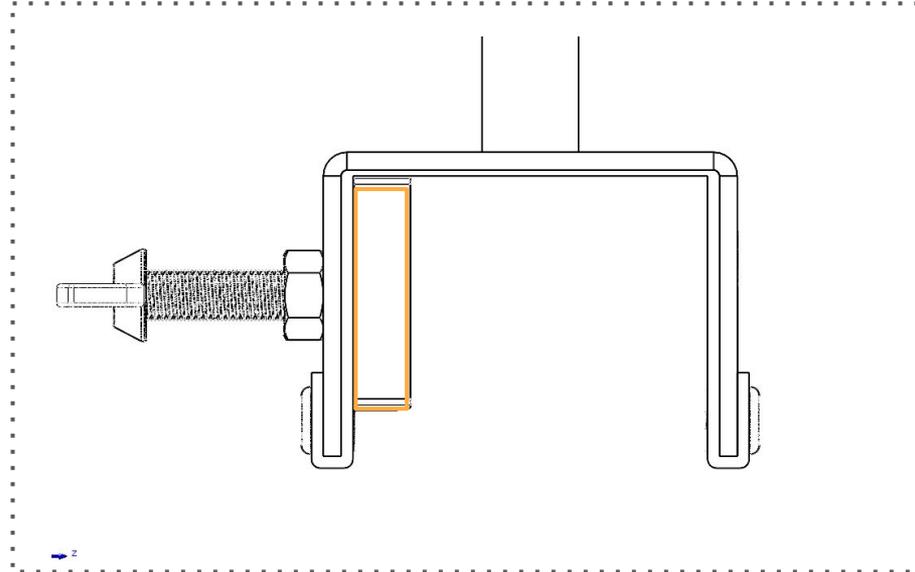
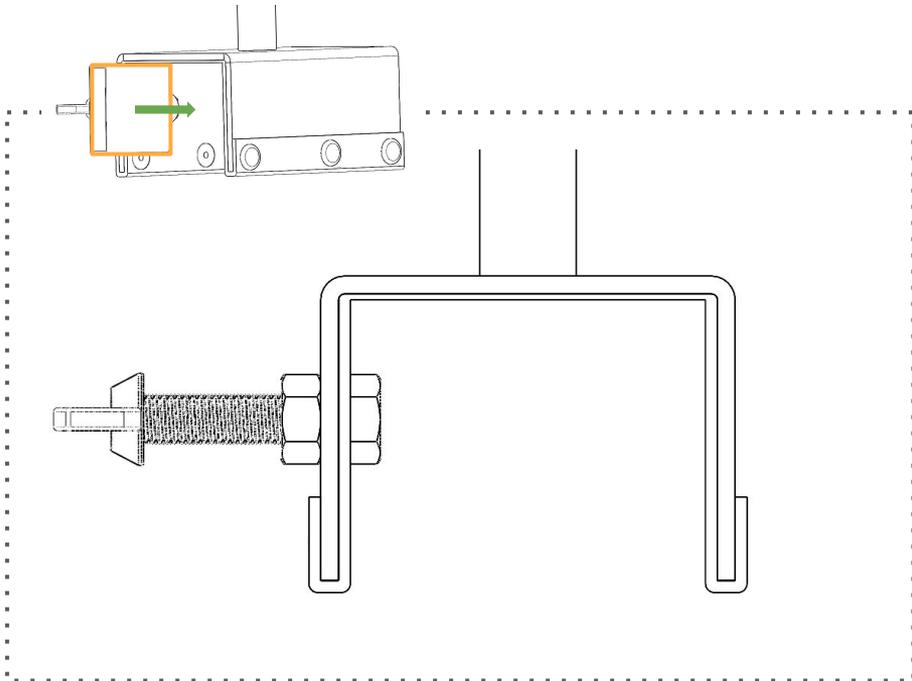
Vice Grips

7. Screw 4 bolts (2 on each vice grip) into the nuts with the head facing inwards
8. Screw a wingnut on to the end of each bolt and weld it there



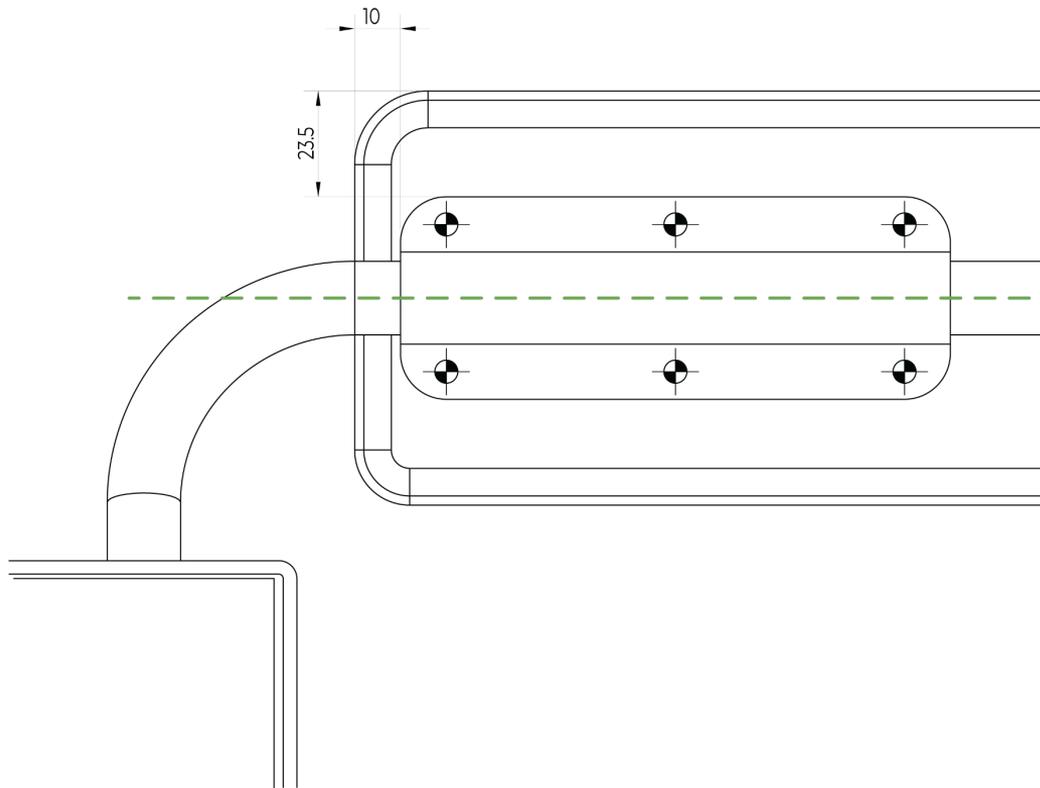
Vice Grips

- Slide a TPU cap onto the head of each bolt



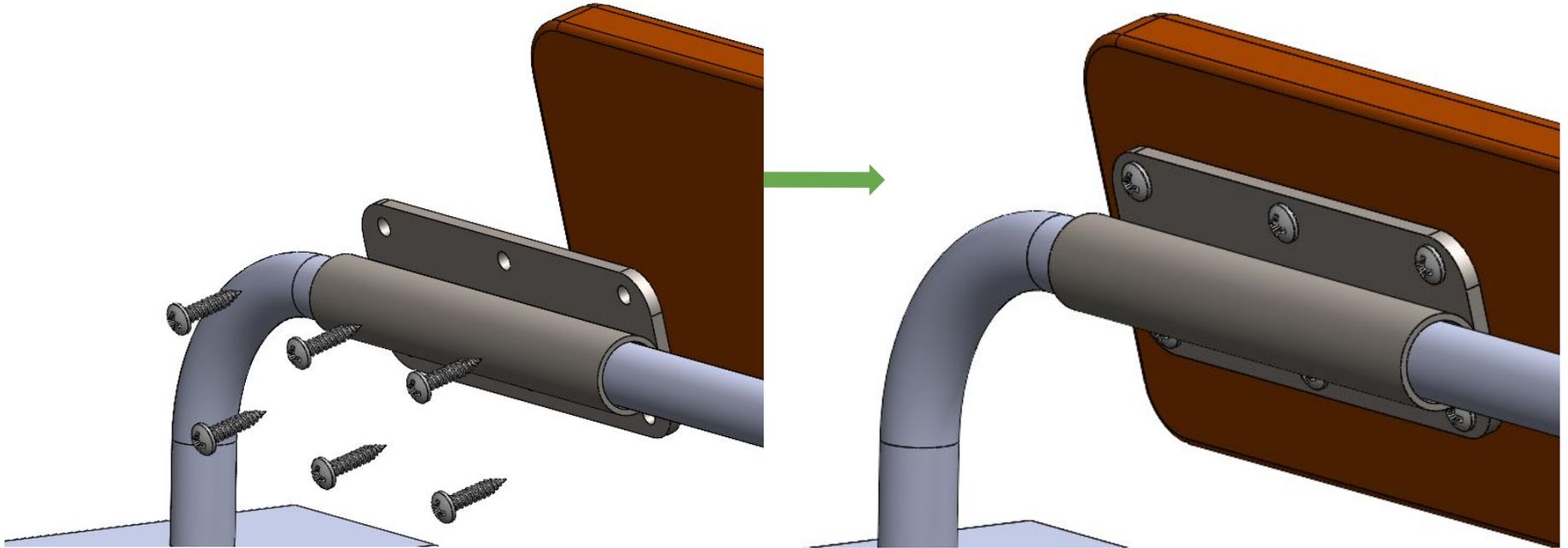
Assembly

1. Place the legs on the backrest as shown.
2. Mark the holes.
3. Remove the legs and drill pilot holes into the wood to prevent splitting.

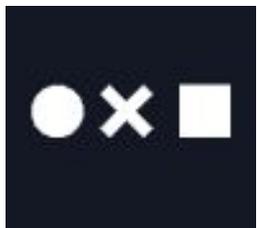


Assembly

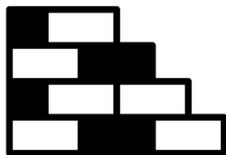
4. Screw the legs on to the backrest



Icon attributions



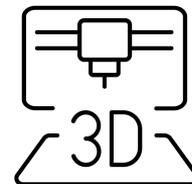
[thenounproject](https://thenounproject.com)



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Created by Marco Livolsi
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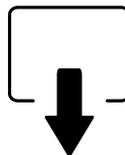
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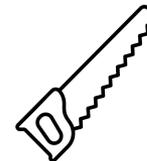
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