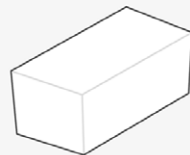
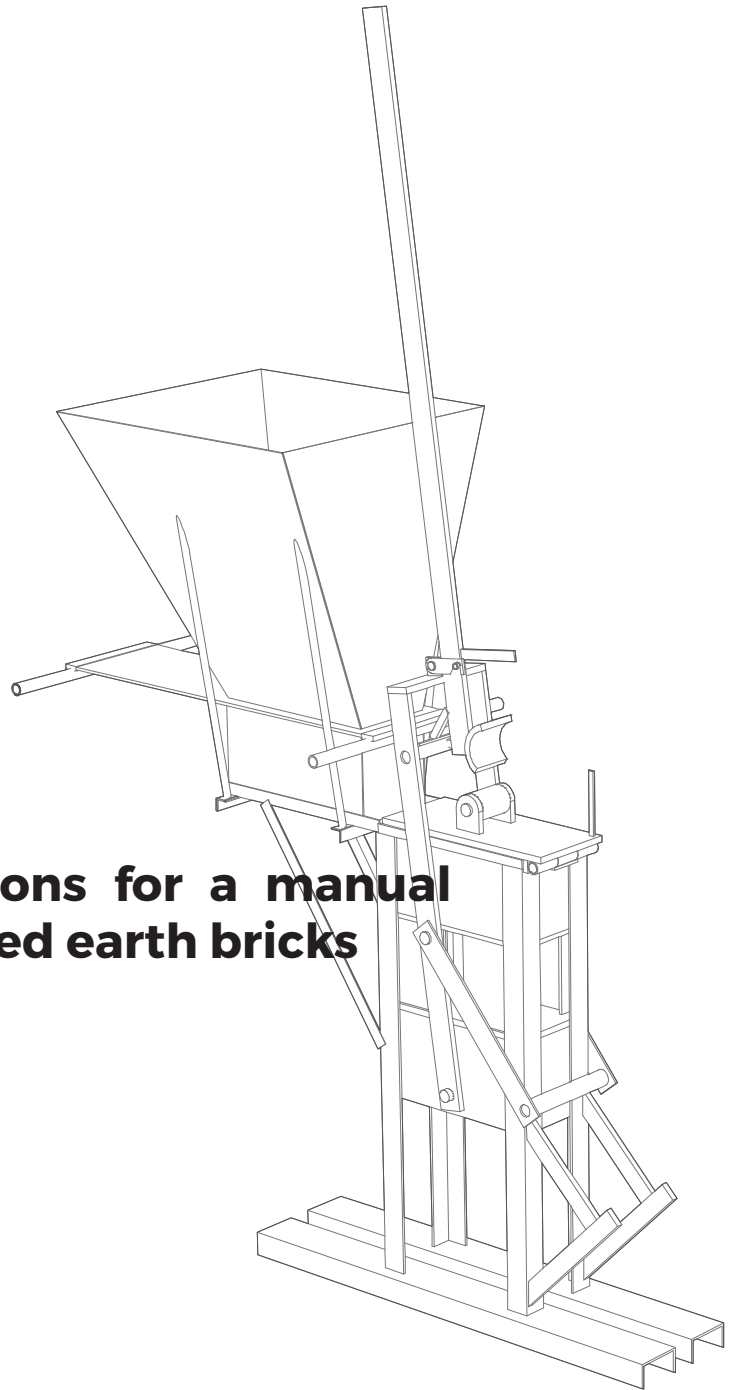


Sophie

**assembly instructions for a manual
press for compressed earth bricks**



betezé

open architecture systems

About Betezé

We believe sharing knowledge is the best way of achieving an equitable development in communities throughout the world and the cooperation between humans is crucial for our growth as a society.

Project goals

We want to spread our knowledge on Compressed Earth Bricks (CEB) by distributing assembling and usage manuals of different CEB machines. This distribution is to be done for free! If you possess one of our manuals you will be able to assemble your own proper press. Make sure you read carefully all our annotations and follow the instructions to assure the best possible results and to prevent you from taking any risks.

With this press, which we named **Sophie**, users will be able to make building bricks 300mm x 150mm x 90mm by compressing a mix of sand, clay and eventually some stabilizing cement.

The technology and the necessary tools

The reproduction of this machine requires some expertise in order to assure a correct result. Despite our efforts to simplify and optimize the designs we strongly recommend **only professional blacksmiths and welders take part in the the assembling** of the various pieces.

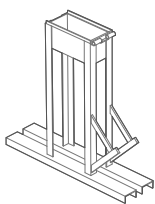
The material required to reproduce one of our machines are:

- Band Saw
- Drill (up to 16mm)
- Welding Machine (or Electrode)
- Grinding Machine with cutting discs, stone discs.

Elements to assemble

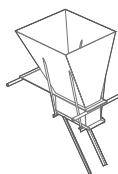
To reach the final objective of reproducing the press **Sophie** you will have to produce 5 separate pieces to finally assemble them all together.

Sophie is composed by:



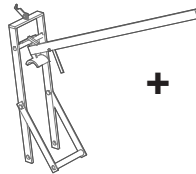
structure

+



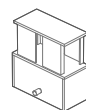
earth hopper

+



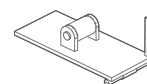
lever

+



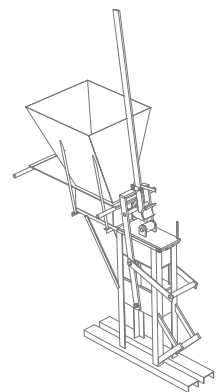
piston

+



lid

=



Measurements

In the following pages you will find detailed 3D images of all the elements that conform the different parts of the machine with accurate measurements so you can precisely reproduce them in your own atelier with simple blacksmith and welding machinery.

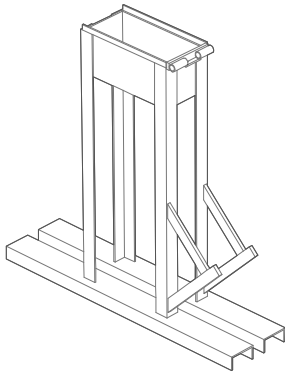
We have decomposed the machine in order to make the assembling process easier and more comprehensible. All measures are in millimeters (**mm**).



ALL PIECES MUST BE METICULOUSLY CUT IN ORDER TO ASSURE THE CORRECT FUNCTIONING OF THE MACHINE

A_Structure

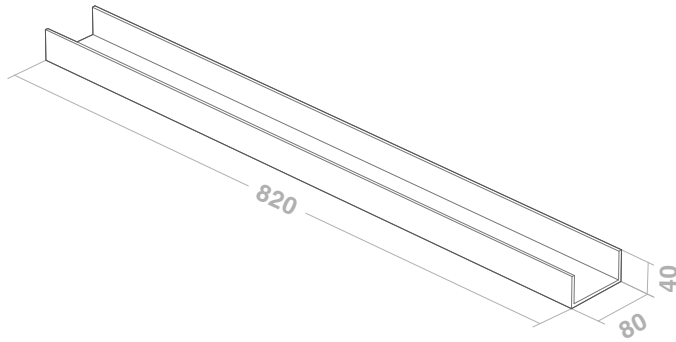
This piece is the machine's skeleton and must be built with good quality steel. Pieces should be amongst the thickest of the whole machine in order to resist the weight of the various parts that will rest on it and the heavy compression process for the conformation of the bricks.



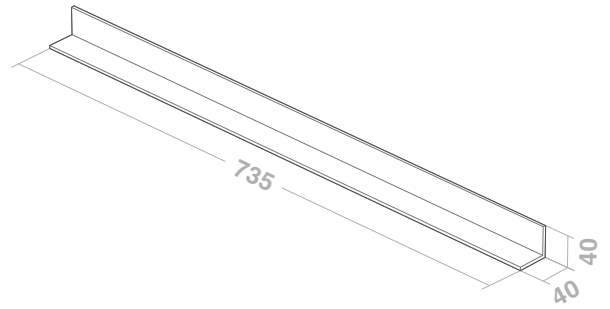
Pieces **A1** and **A2** should have a thickness higher than **5mm**

Rest of the pieces should NOT be thicker than **5mm**

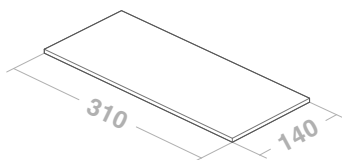
A.1 x2



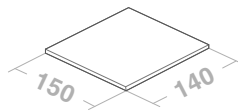
A.2 x4



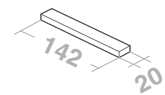
A.3 x2



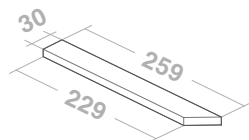
A.4 x2



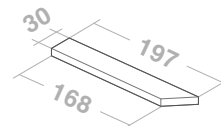
A.5 x1



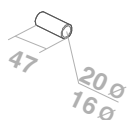
A.6 x2



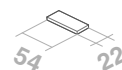
A.7 x2



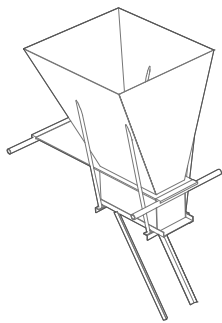
A.8 x2



A.9 x1

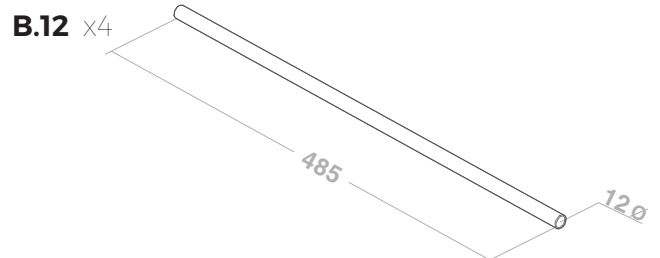
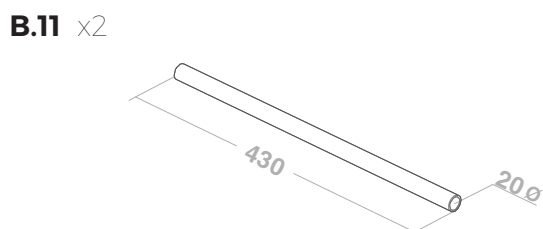
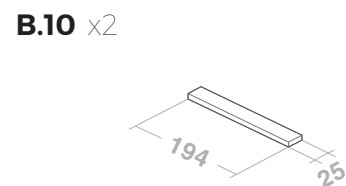
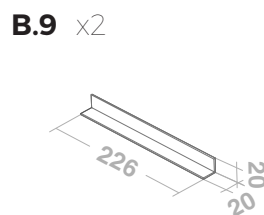
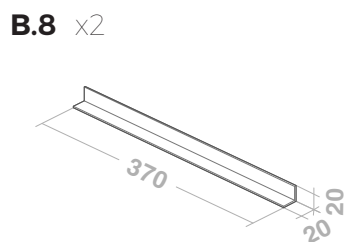
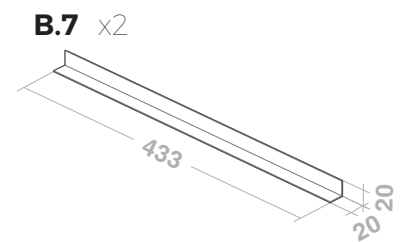
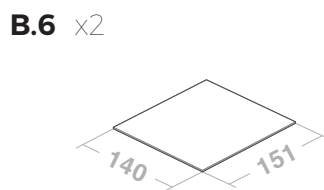
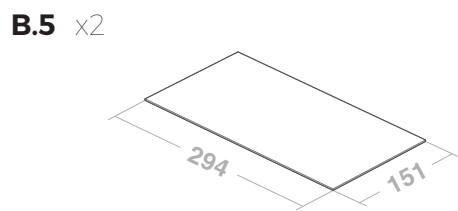
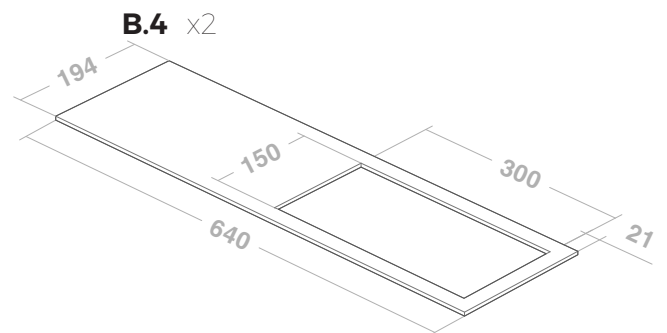
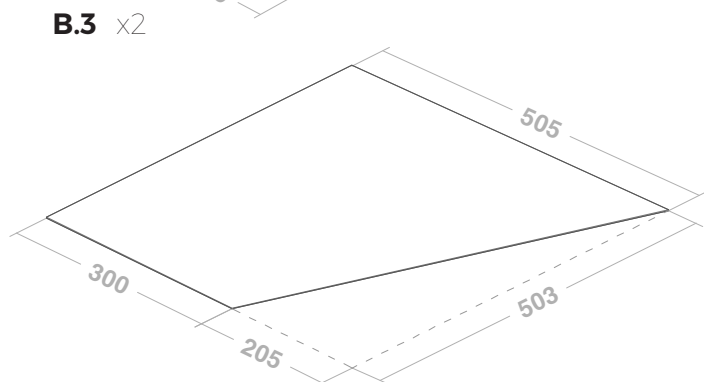
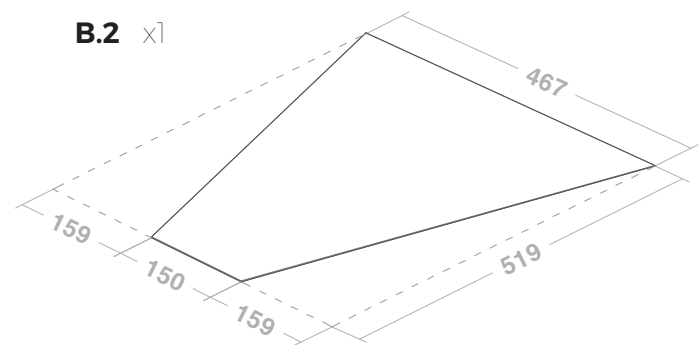
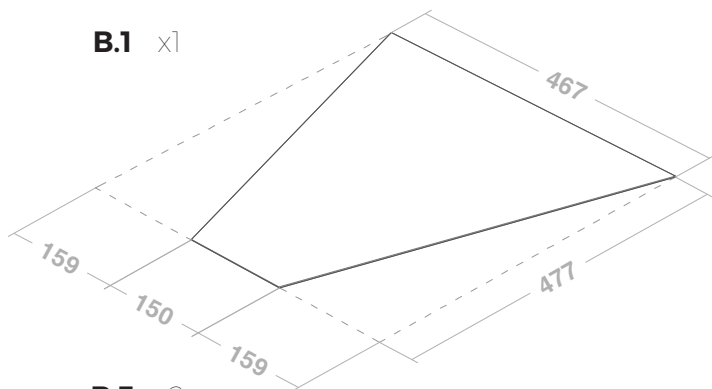


B_Soil Hopper



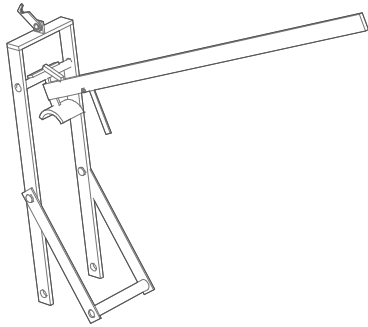
Since this element of the machine doesn't have a structural function, nor will it receive any additional efforts from other elements of the machine, it is desirable that it is made out of light materials so make sure you use thin sheets of steel (between 1mm/2.5mm) **except in specific pieces.**

Pieces **B.1**, **B.2**, **B.3**, **B.5** and **B.6** can have a thickness between 2mm and 3mm
Pieces **B.7** should have enough thickness to bare the weight of the hopper.

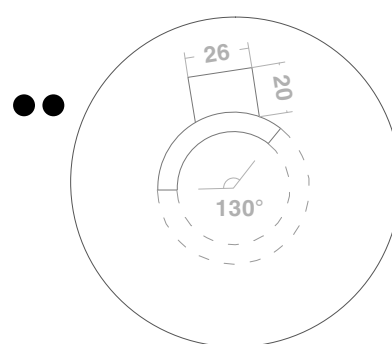
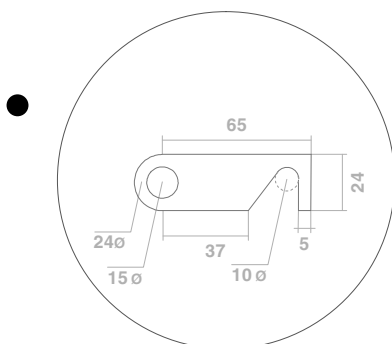
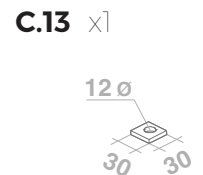
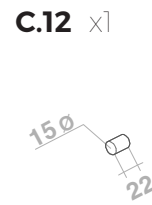
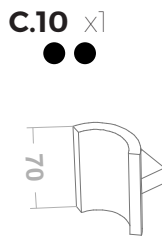
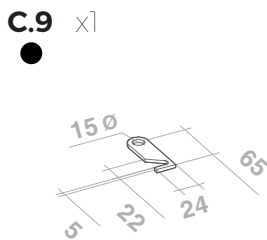
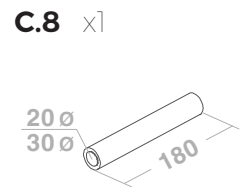
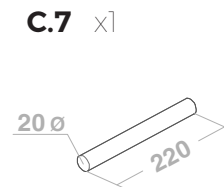
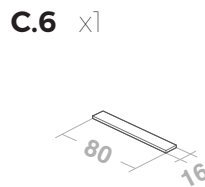
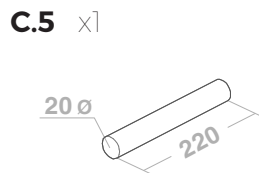
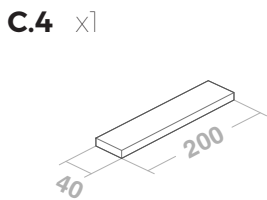
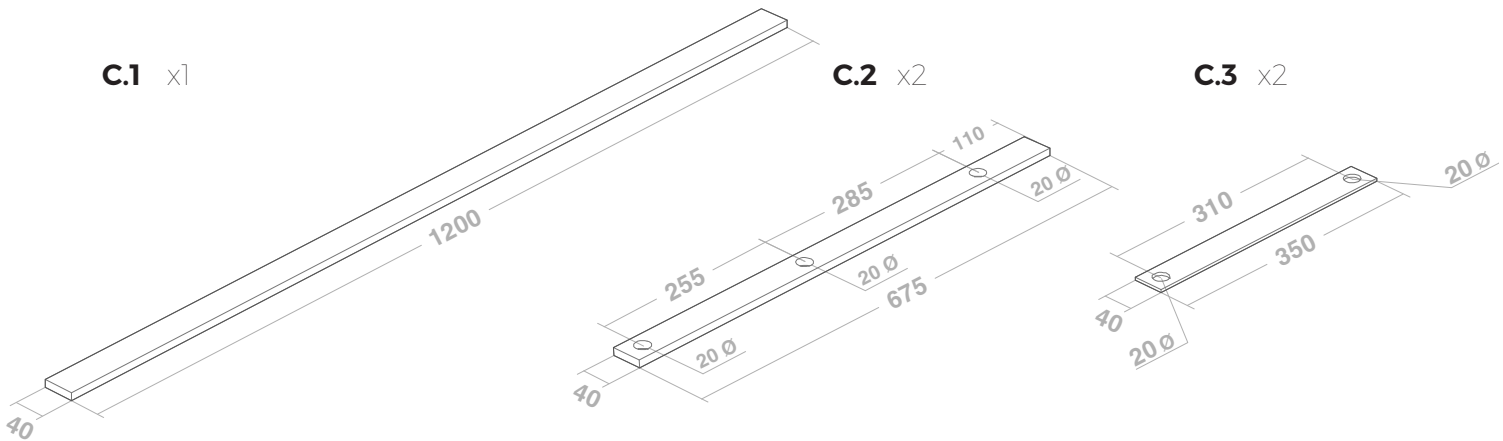


C_Lever

This piece is in charge of transmitting the force applied to the handlebar to the piston. Therefore it is designed to undergo heavy traction forces.

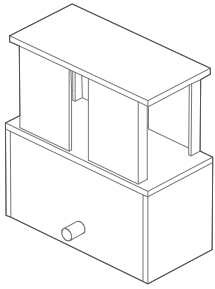


All pieces should have a thickness higher than 5mm, especially **C.1** and **C.2** which, if possible should be 10mm thick.



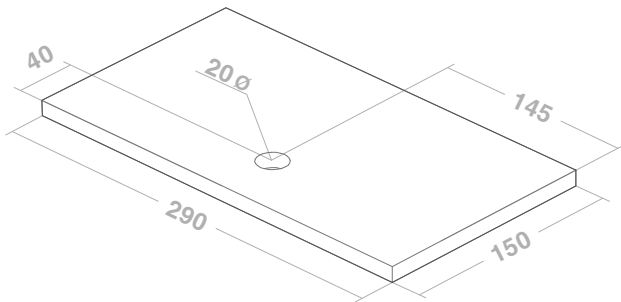
D_Piston

This piece is in charge of compressing the soil when the lever is activated. It will undergo high compression and therefore it has to be built according to all this measurements.

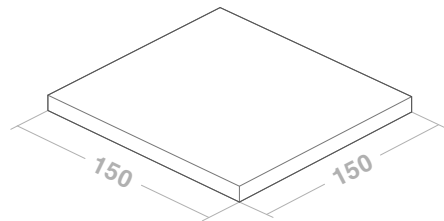


All pieces should have a thickness higher than **5mm**, especially **D.1** and **D.3**, which should be thick enough to resist heavy forces.

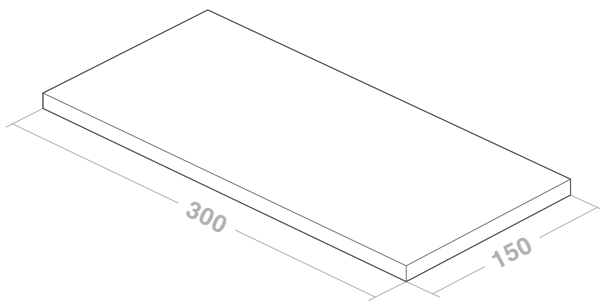
D.1 x2



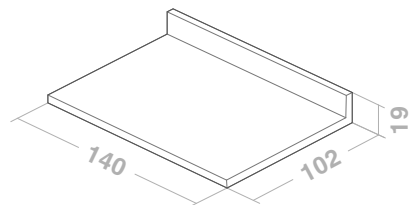
D.2 x2



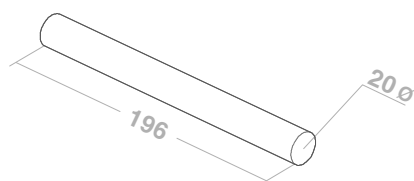
D.3 x2



D.4 x4

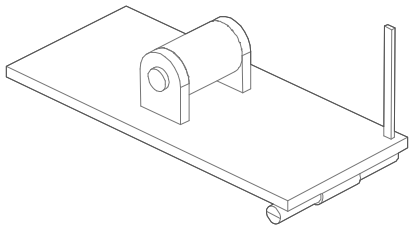


D.5 x1

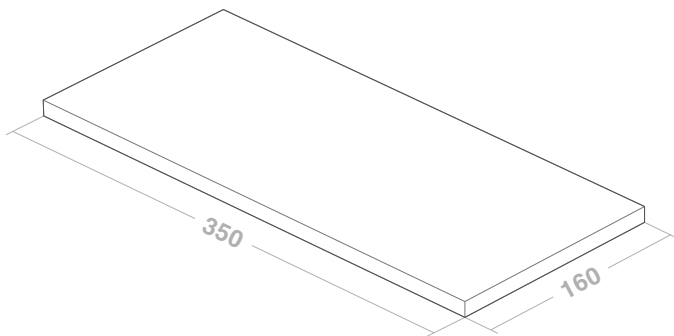


E_Lid

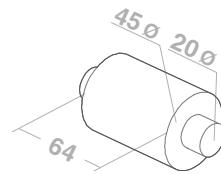
This part, if well built, will automatically close with the movement of the lever. It shall then be resistant enough to bare hundreds and thousands of hits.



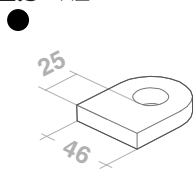
E.1 x1



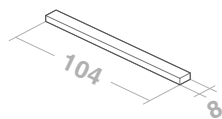
E.2 x1



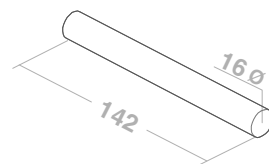
E.3 x2



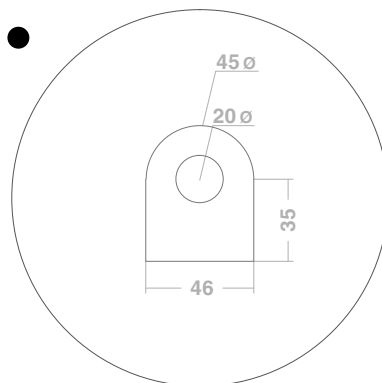
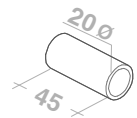
E.4 x1



E.5 x1



E.6 x1



Assemblage

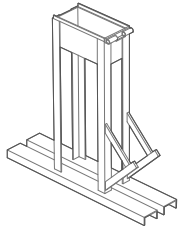
Once you have faithfully reproduced the various elements that conform the machine you will be able to start the assembling process detailed in the following pages.

Dotted lines represent, schematically, the assembling movements and assembling positions whilst grey ones indicate where the different pieces should be welded. All measures are in millimeters (**mm**).



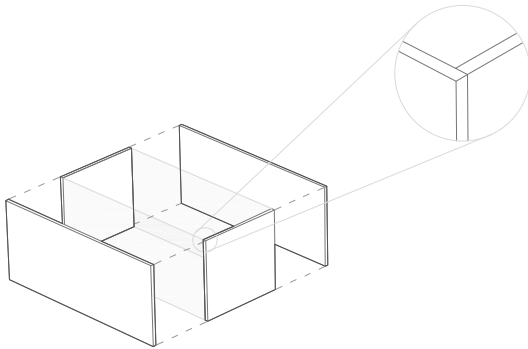
ALL PIECES MUST BE METICULOUSLY ASSEMBLED IN ORDER TO ASSURE THE CORRECT FUNCTIONING OF THE MACHINE

1. Structure



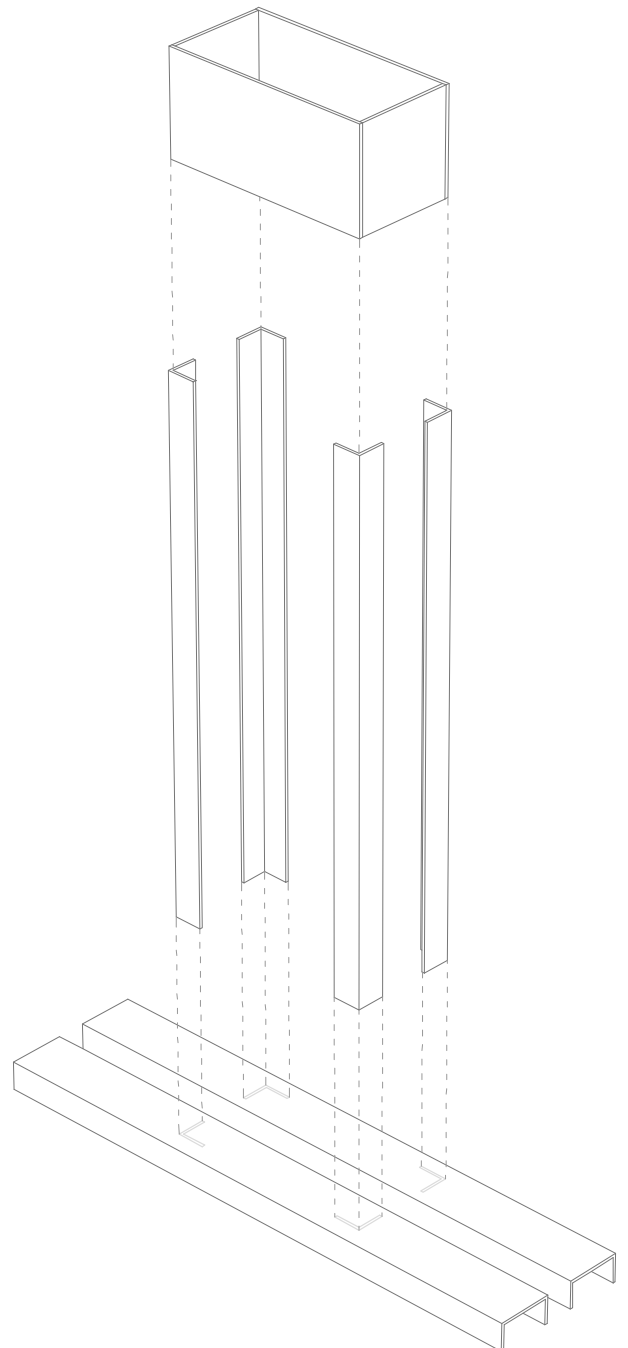
1 Assemble pieces **A.3** and **A.4** as shown. Take special care assuring that the resulting element is completely straight and has no imperfections, describing a perfect rectangle.

2 Make sure vertical elements (**A.2**) are completely vertical and situated in the marked places. This is important to guarantee the stability of the machine whilst in use.

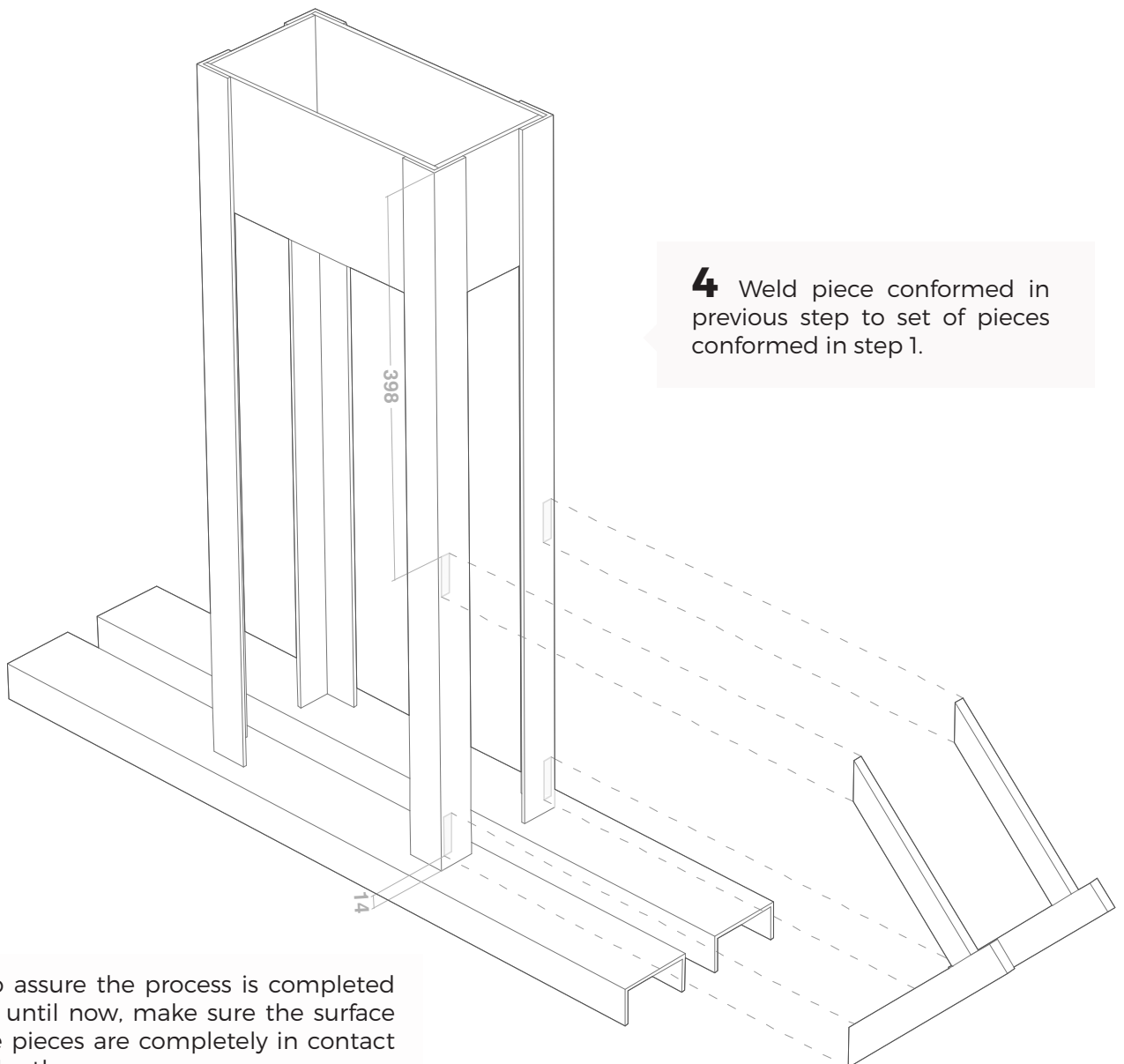
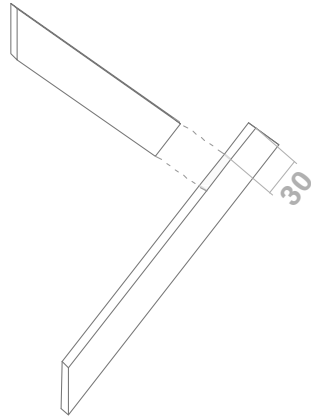


! Pay attention to how the pieces are disposed. (The longer surfaces are meant to be in the outer part of the rectangle).

! **NOTE:** Make sure the finishing of the coronation is smooth without any sharp edges. This is very important, otherwise the lid won't close correctly and could decrease the bricks stability.



3 Weld pieces **A.6** and **A.7** making sure they describe a 90° angle. Do that twice.

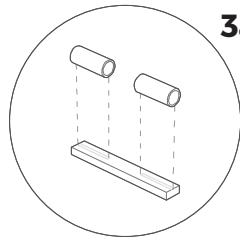


4 Weld piece conformed in previous step to set of pieces conformed in step 1.

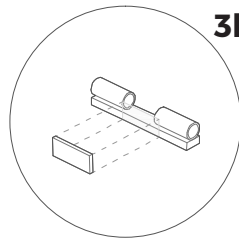


NOTE: To assure the process is completed correctly until now, make sure the surface of all the pieces are completely in contact with each other.

5 Assemble the pieces **A.5**, **A.8** and **A.9** as shown, ensuring the resulting piece is symmetrical.

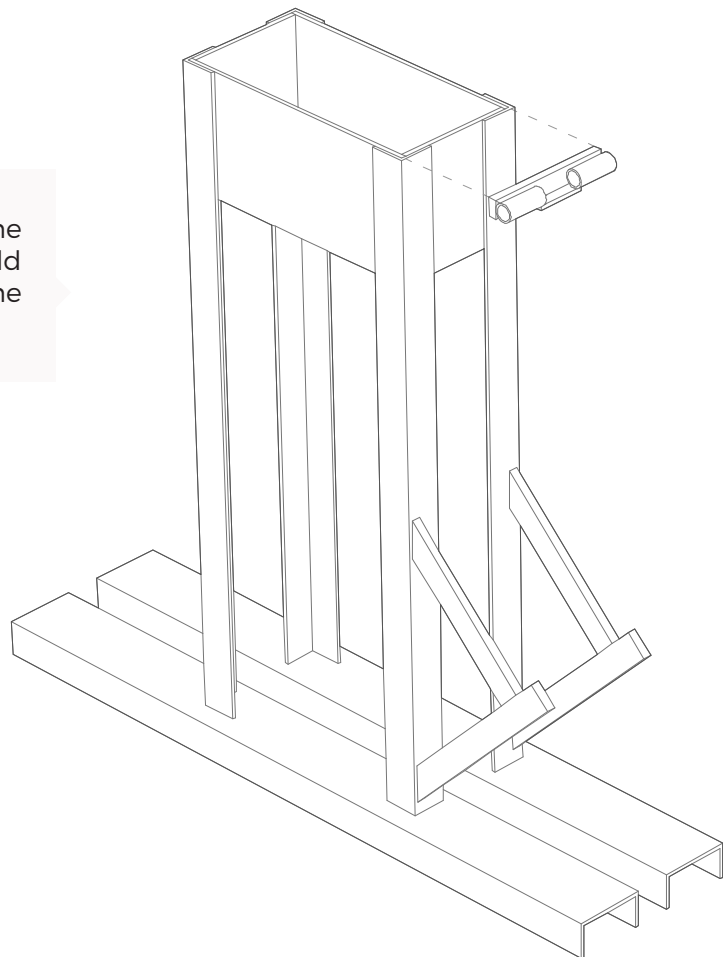


3a



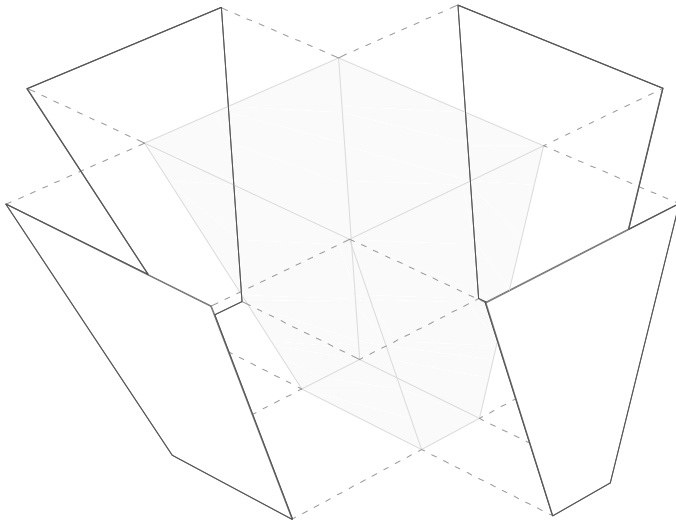
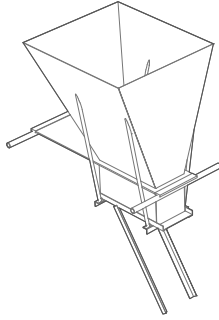
3b

6 Join piece assembled in the step 3 with the structure. Weld it symmetrically, ensuring the opening of the lid afterwards.

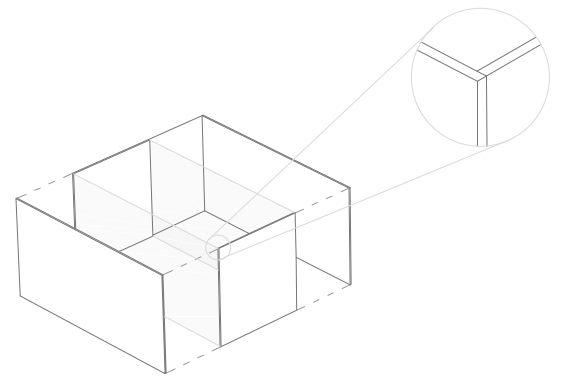


2. Soil Hopper

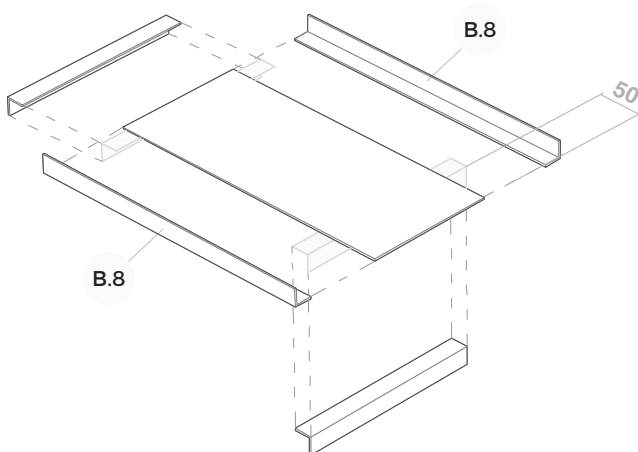
This element of the machine is very important if you wish to optimize your production rate. It increases considerably the process of reloading the mould generated within the structure. It reduces both effort and time during the brick conformation process.



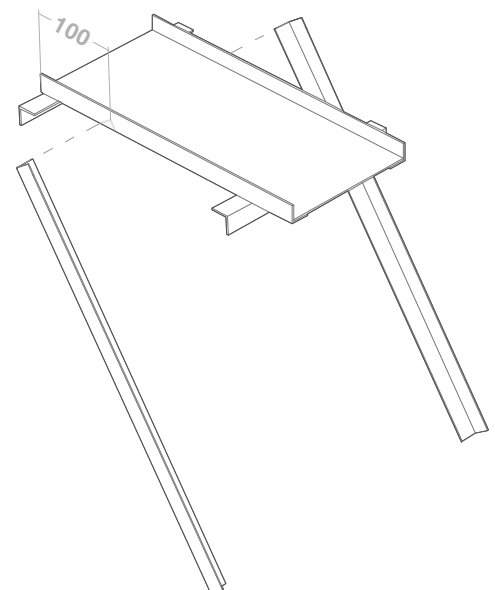
1 Assemble the soil tank making sure the bottom hole has the same measures as the soil deposit assembled in the structure.



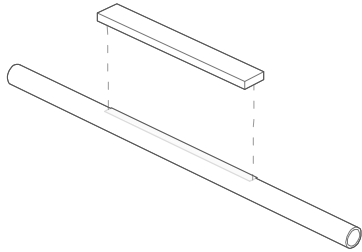
2 Be careful to reproduce this element faithfully by assuring all faces within the polygon are parallel.



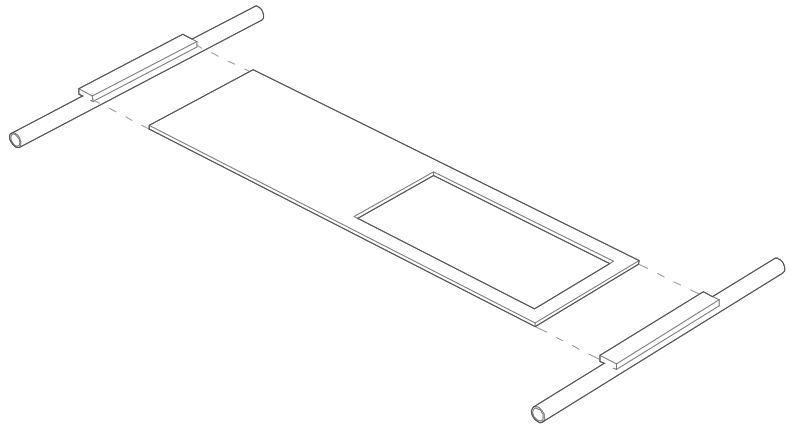
3 Pay attention to the order in which elements are welded. Pieces **B.8** shall go first.



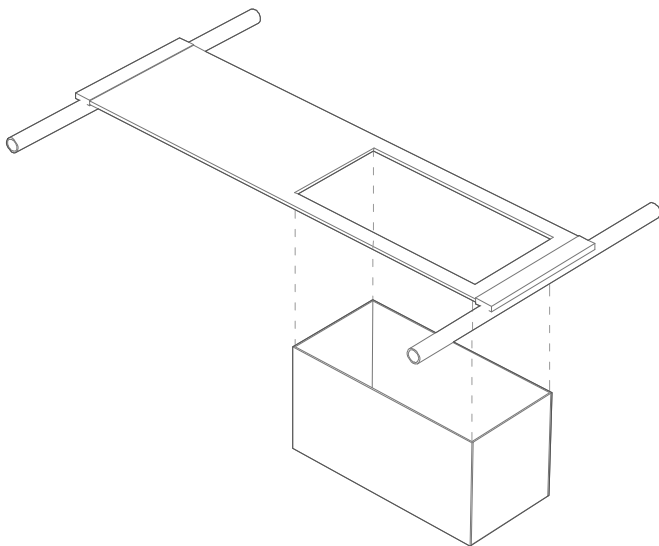
4 Make sure piece **B.7** has a thickness of between 2.5mm / 5mm and assemble it ensuring it will resist heavy weight.



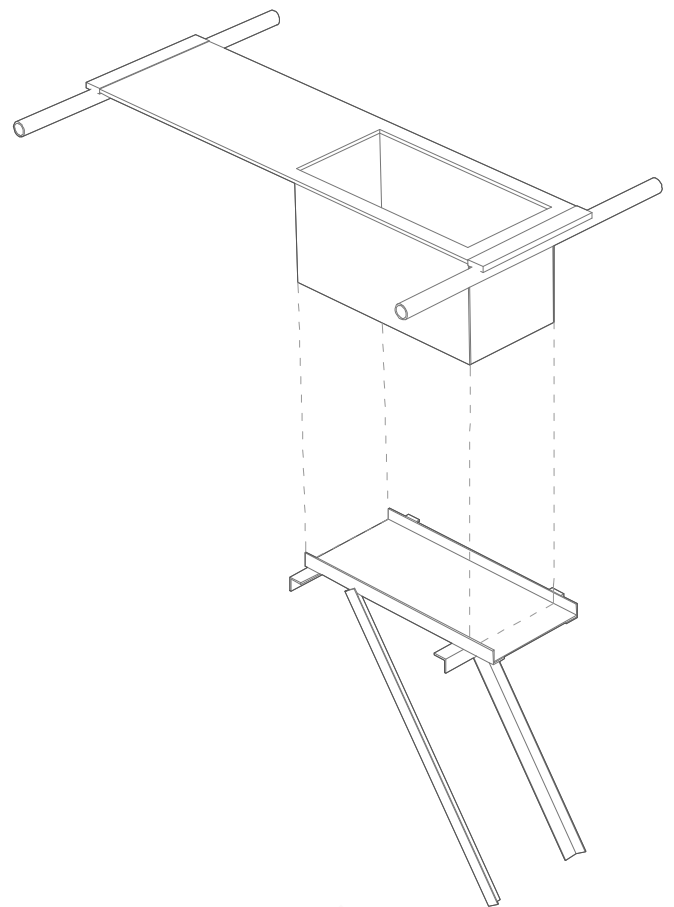
5 Weld piece **B.10** in the middle point of piece **B.11**. Do this twice.



6 Weld pieces reproduced on previous step with **B.4**. Make sure to keep the orientation described on images.

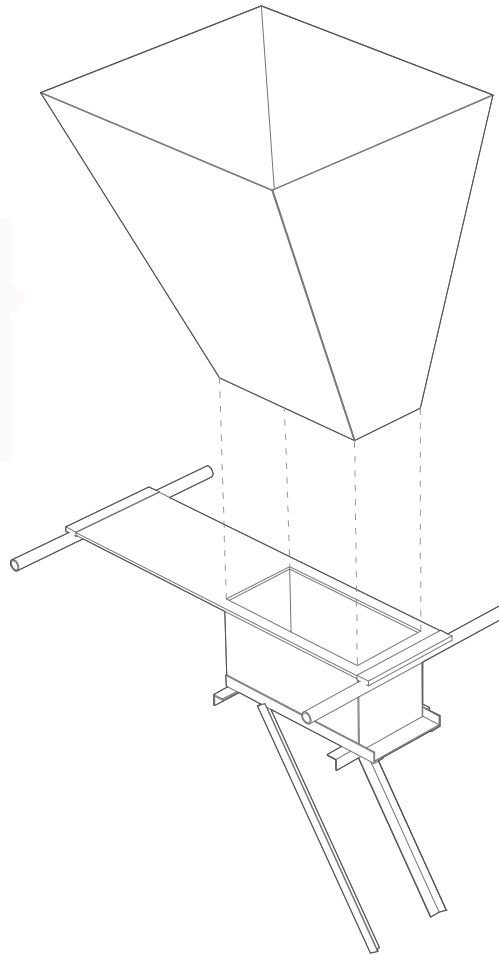


7 Join these two parts. Make sure the welding is done on the edges that won't be in contact with the soil.



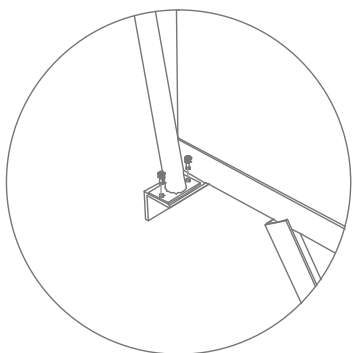
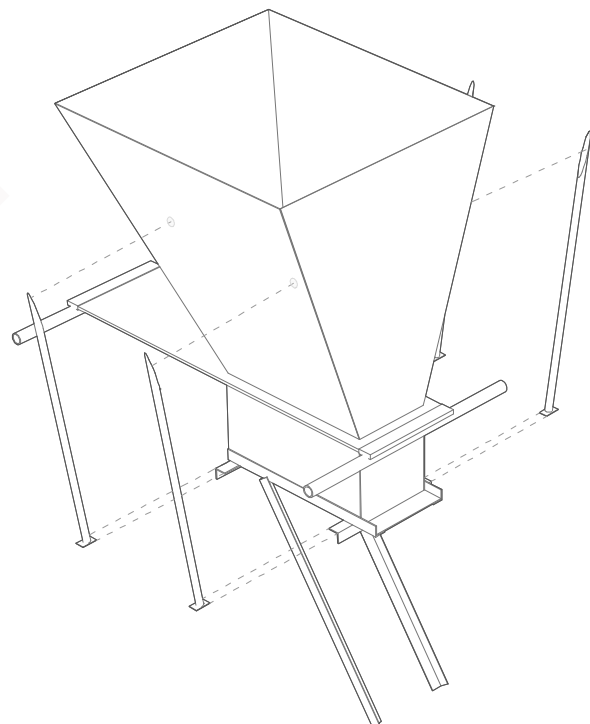
8 Do not weld. Just place on top.

9 Place the soil tank on top of the tray so that it fits right on top of the rectangular hole. But do not weld it! Make sure you **lift the tank about 2mm** before taking the next step.

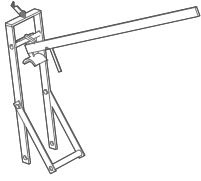


10 Weld pieces **B.12** to soil tank and screw them to the base you prepared in **step 4**, as shown in the detail.

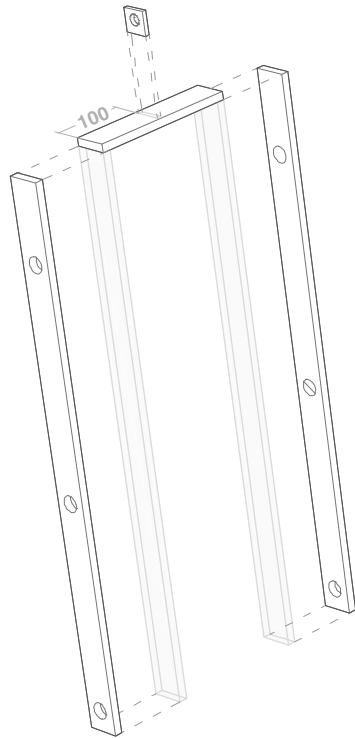
NOTE: Make sure you leave the tray unwelded so it can maintain its required freedom.



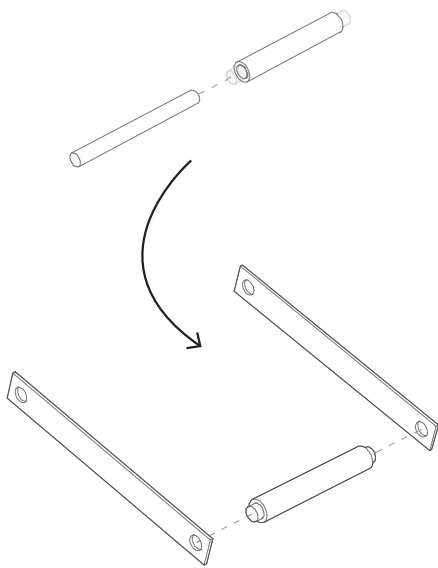
3. Lever



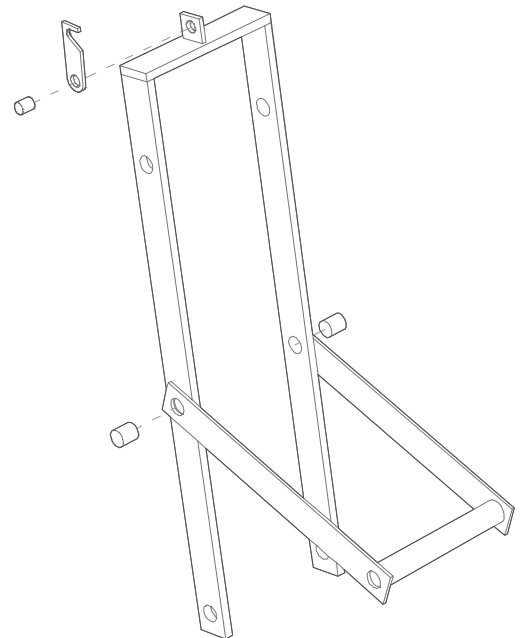
Make sure the vertical elements are situated in the correct places and that they are perfectly parallel and vertical. If this elements aren't properly positioned it will limit the machine's performance by not letting the piston move up and down resulting in the machine not functioning at all.



1 Weld pieces **C.2** on piece **C.4**. Weld **C.13** too, in the middle of **C.4**.

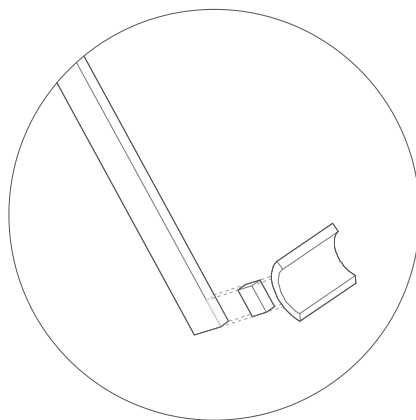
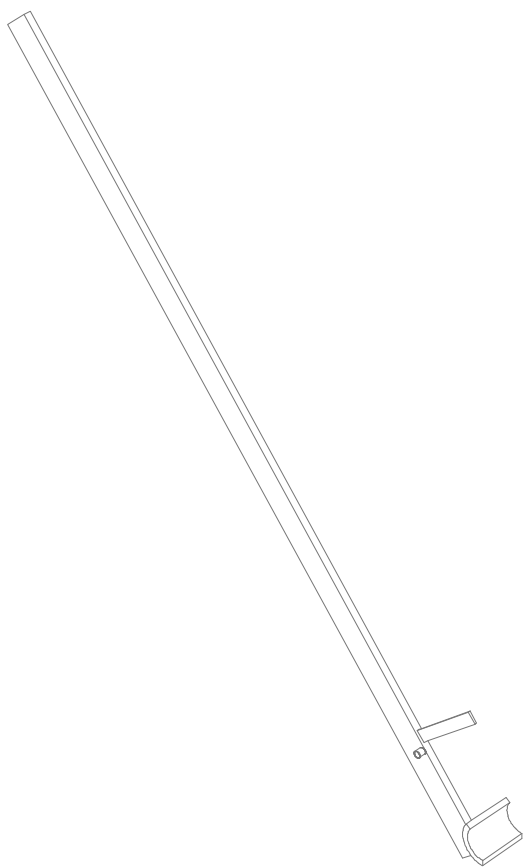


2 Introduce **C.7** inside of **C.8** and weld rod to rest of pieces making sure to let enough space for this piece to fit properly with the rest of the lever as shown on **step 3**.

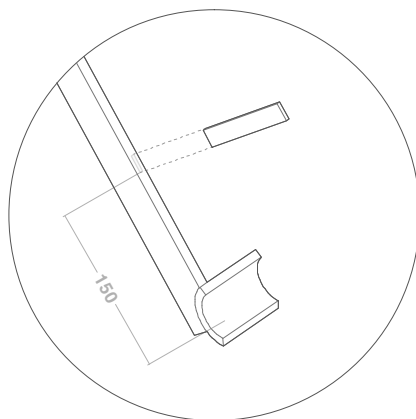


3 Assemble it all using both **C.11** rods, ensuring the rotation between the two parts. Don't forget adding the pieces **C.9** and **C.12** too!

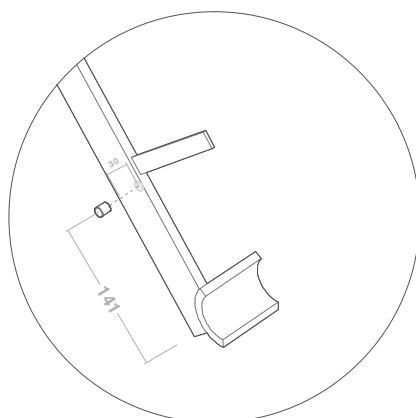
4 The handlebar is one of the most vulnerable parts of the lever so it should be assembled with care.



4a Weld piece C.10 at the bottom.



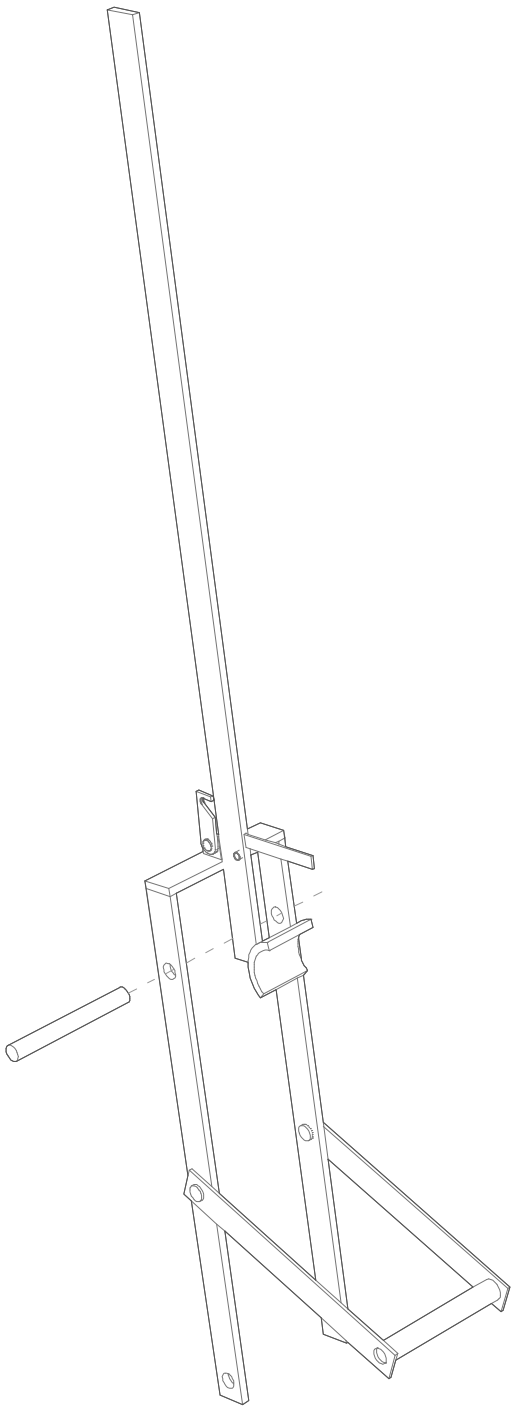
4b Weld piece C.6 at the distance shown.



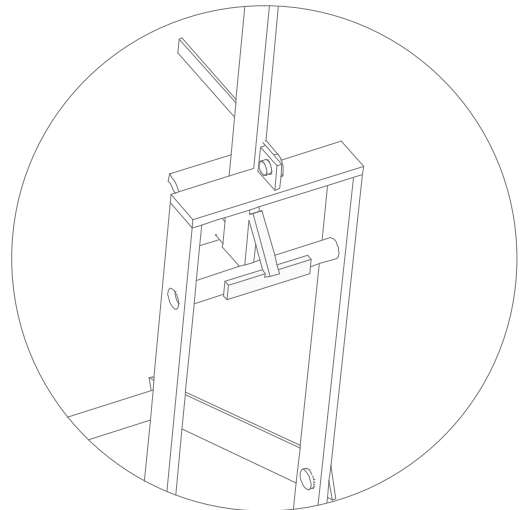
4c Weld piece C.12 as shown.

NOTE: Distances must be respected as if it isn't built properly the machine won't work at its best and some elements might not even work at all.



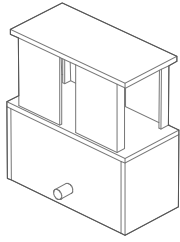


5 Weld the rod **C.5** to the lever **C.1** so that they rotate together.



NOTE: Reinforce this union, since it is the one that will bare most of the forces. The example shown is just one of the many ways you can do that. The stronger you make it, the less problems you will have afterwards!

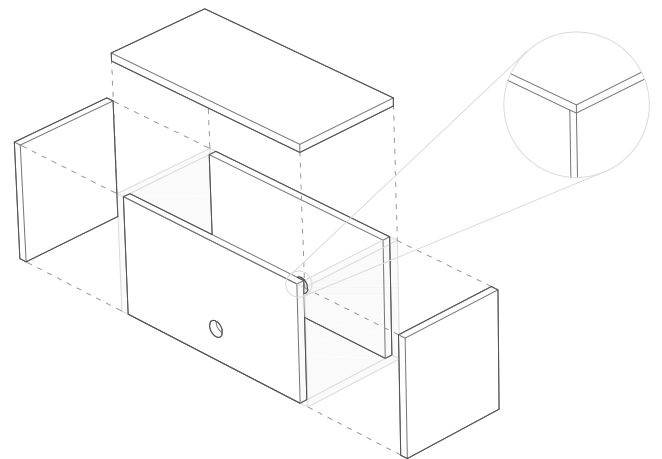
4. Piston



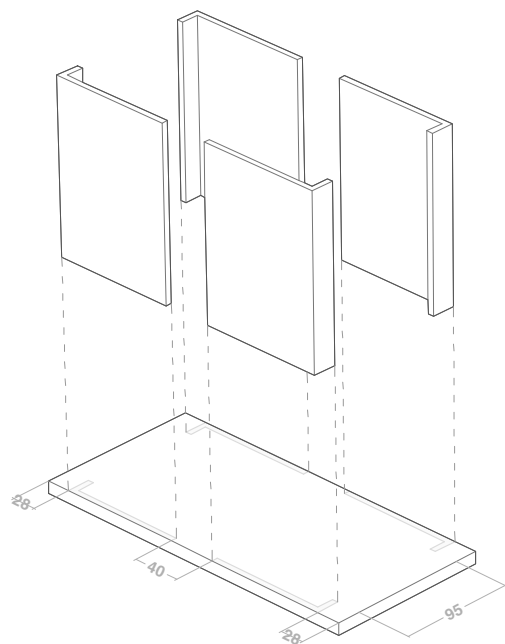
Make sure all the different parts of the element are faithfully reproduced and polished before being assembled together. You are about to start probably the most critical stage of the process so be warned to follow the instructions with extra care. **The most delicate step is ensuring all opposite sides are parallel to each other.**

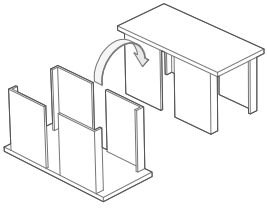
1 Join pieces **D.1** (x2) with **D.2** (x2) and put piece **D.3** on top. Welding shall be done in the interior of the resulting box. Be careful and take note that holes must be aligned so rods can be put through.

NOTE: This element will be in contact with the structure of the machine so it has to be very carefully cut and assembled with all the edges describing perfect perpendicular angles.

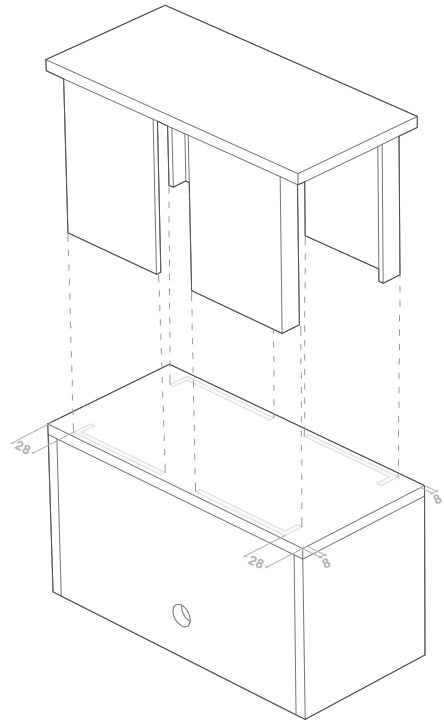


2 Weld all four **D.4** pieces to the remaining **D.3** piece.

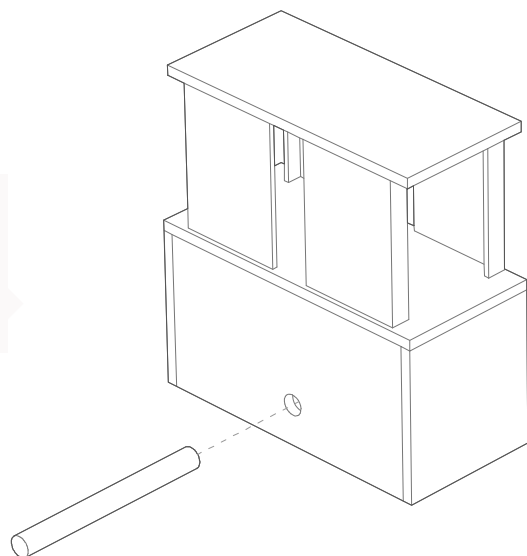




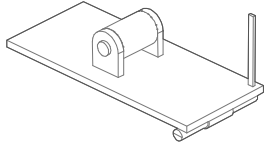
3 Basically weld these pieces aligned. Follow the measures if needed.



4 Do not pass the D.5 rod through yet! You will do that when assembling the whole machine.

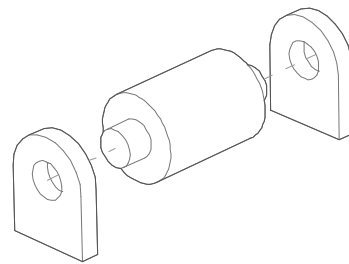


5. Lid

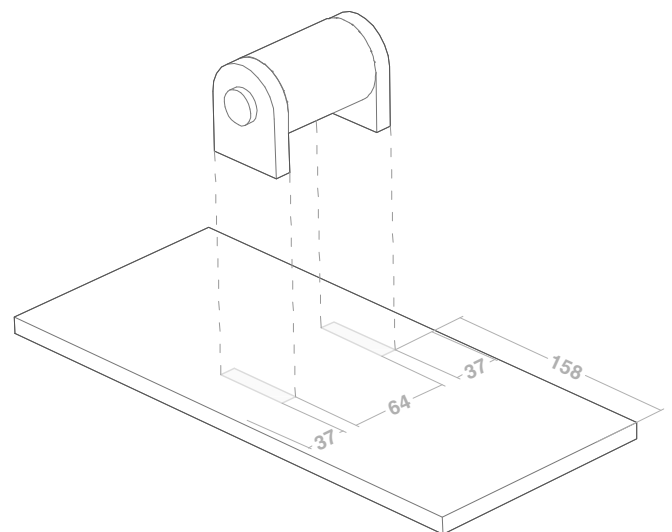


Make sure all the different parts are faithfully reproduced and polished before being assembled together. You are about to start probably the most critical stage of the process so be warned to follow the instructions with extra care.

1 Join the pieces without welding them yet.

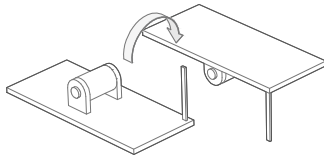
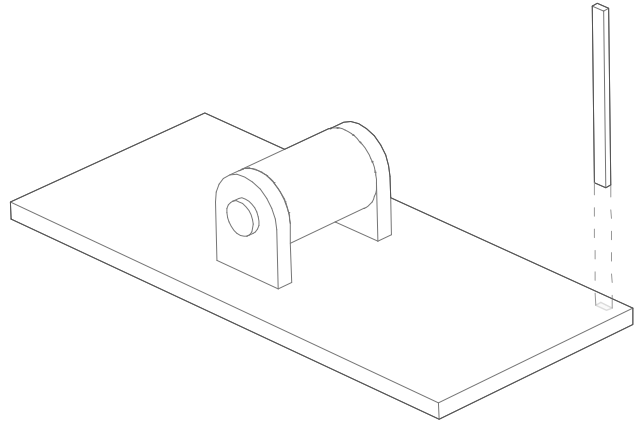
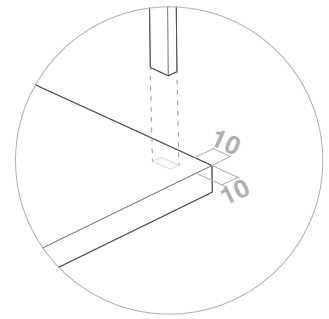


2 Weld and allow the cylindrical piece (E.2) to move within its position.

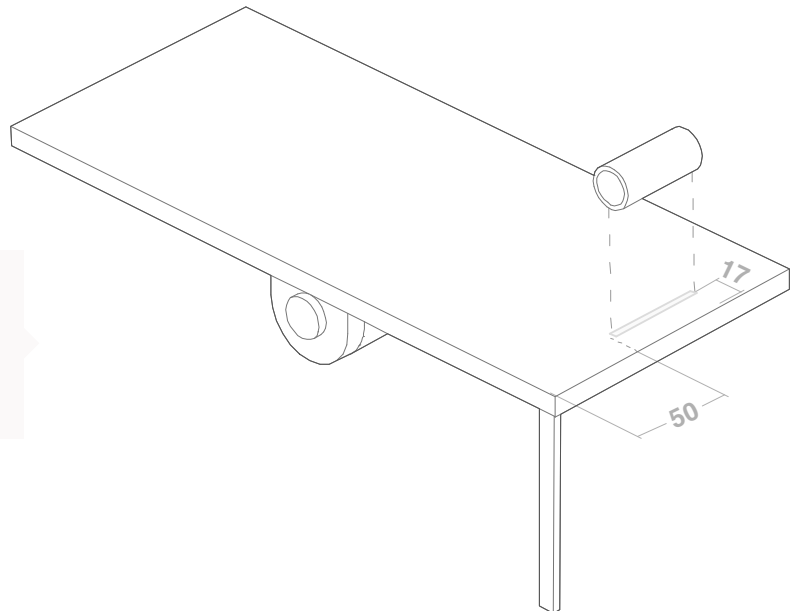


3 Ensure you place **E.4** it in the right position and completely straight.

NOTE: If not done properly, lid won't open automatically and machine will lose some production rate.

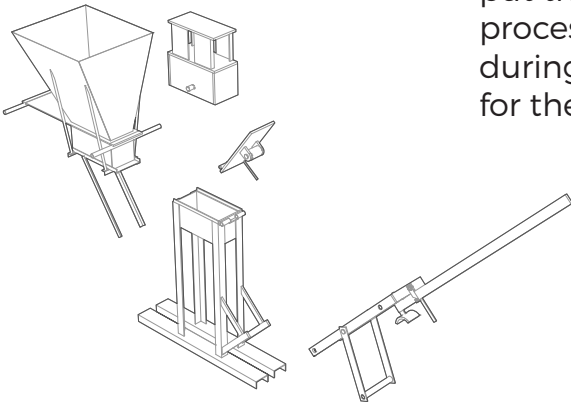


4 Weld piece **E.6** to rest of the lid, ensuring that it will close well when joined with the rest of the structure (**A**).

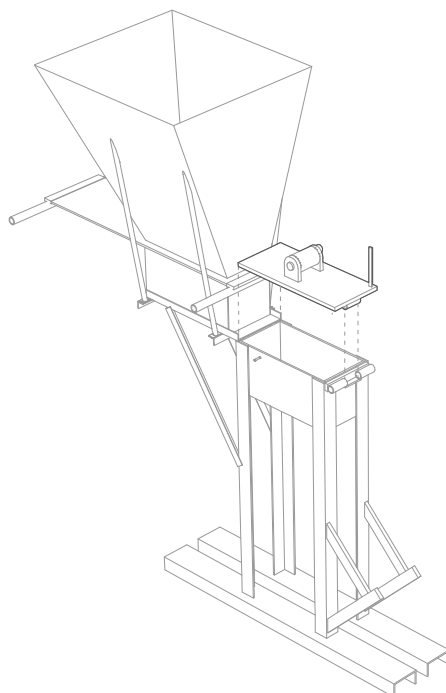
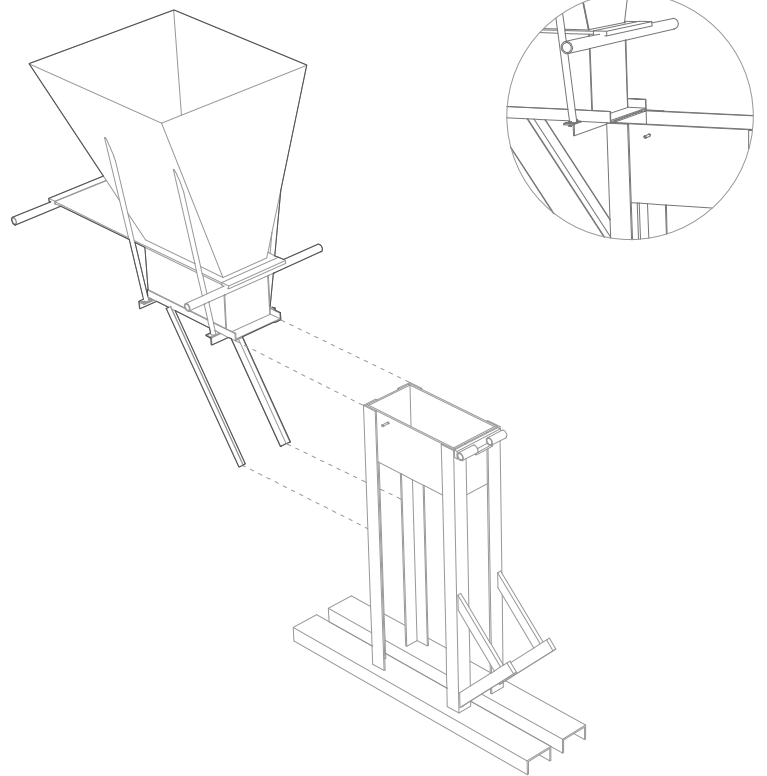


Assembling

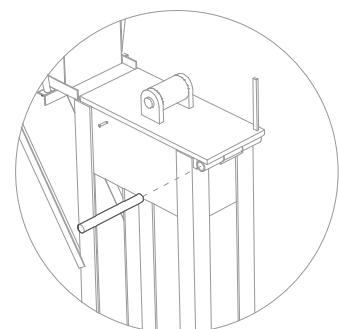
Now that you have assembled all the different elements that conform the **Sophie** press it is time to put them all together in order to be done with the process. The hard work is almost done so take care during the following steps as they are still important for the machine to function.

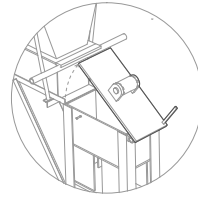
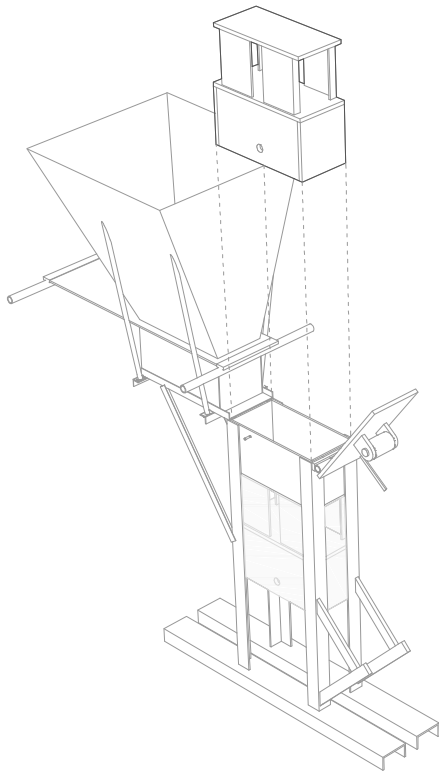


1 Weld the pieces assuring the hopper is leveled with the structure's coronation and than the tray will easily move back and forth.

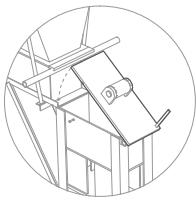
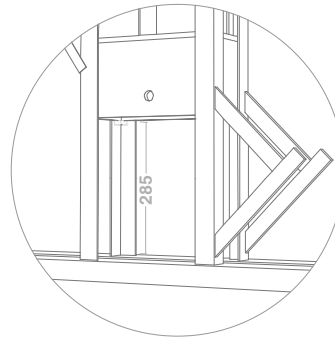


2 Place the lid on the structure. Make sure it closes properly and then pass the rod through.

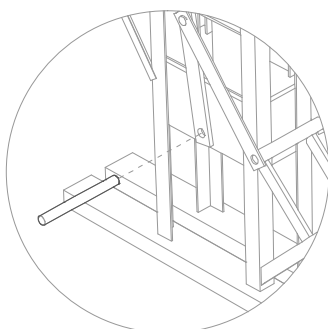
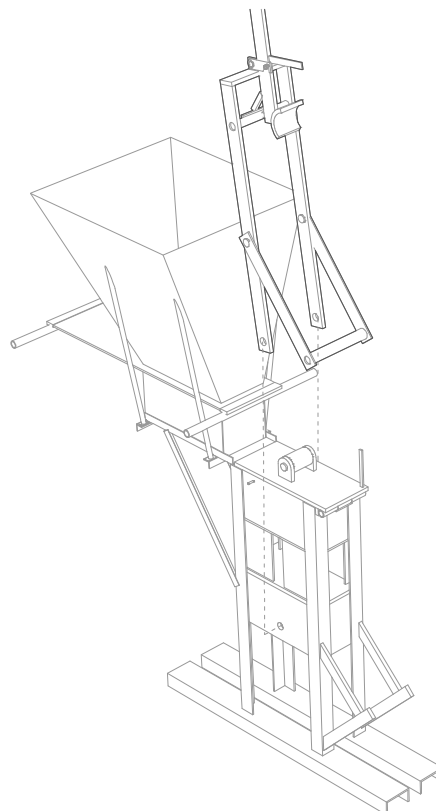


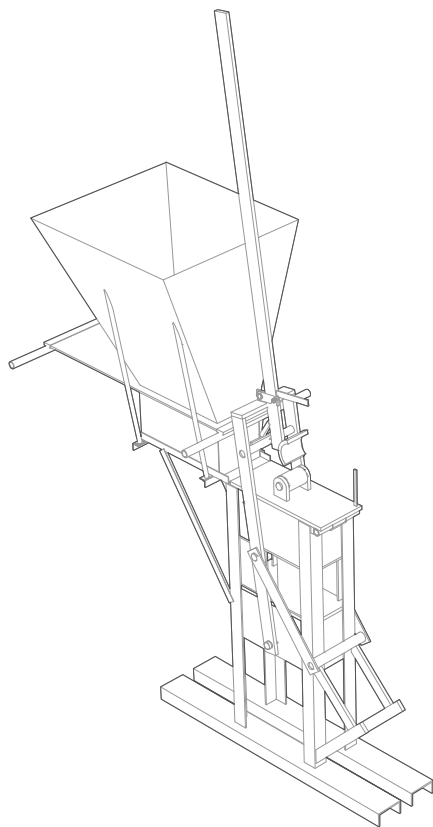


3 Open the lid and insert the piston inside the structure. To stop the piston from moving far too down, weld a metal chip around all 4 corners of the structure as shown in detail.



4 Close the lid and carefully introduce the lever in the position shown and pass the rod through afterwards ensuring its rotation.





Enjoy your **Sophie** press!

NOTE: Before adding any sand, make sure all sliding and rotating elements are greased and check if the machine moves correctly. If any of the movements shows some difficulties, check the machine manuals to find the error.

If problems persist, do not hesitate to contact us on our website.



www.beteze.org