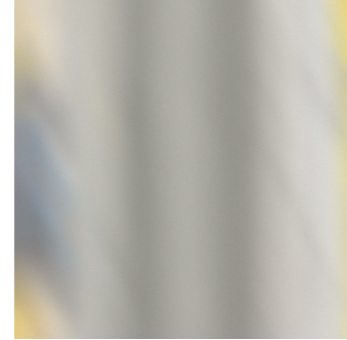

STEP BY STEP

REINFORCED FIBERGLASS CONCRETE BEAM

Welcome to the practical guide
for self-building a reinforced
fiberglass concrete beam.



HOW TO DO



Construction of a reinforced concrete beam
with fiberglass mesh.

Giada Ranaldo
Emiliano Zoppi

This guide has been created for those who wish to learn the fundamentals of constructing a strong, lightweight, and durable beam using accessible materials.

Constructing a reinforced fiberglass concrete beam can be an excellent solution for various projects. The fiberglass adds strength to the structure, reducing the use of traditional steel bars and simplifying the construction process.

This guide will take you step by step through the process of self-building a reinforced fiberglass concrete beam. We will provide clear instructions, practical tips, and safety guidelines to help you create a solid and long-lasting beam.

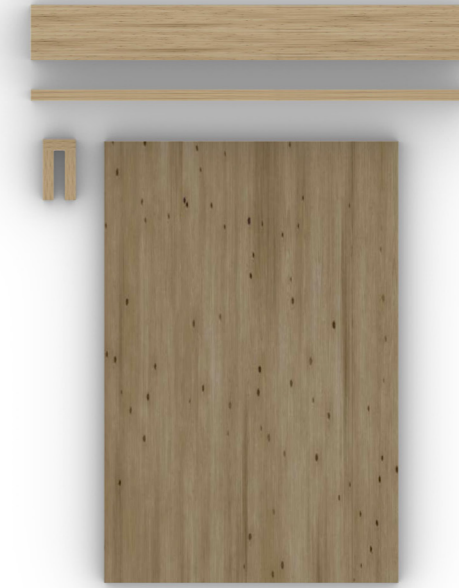
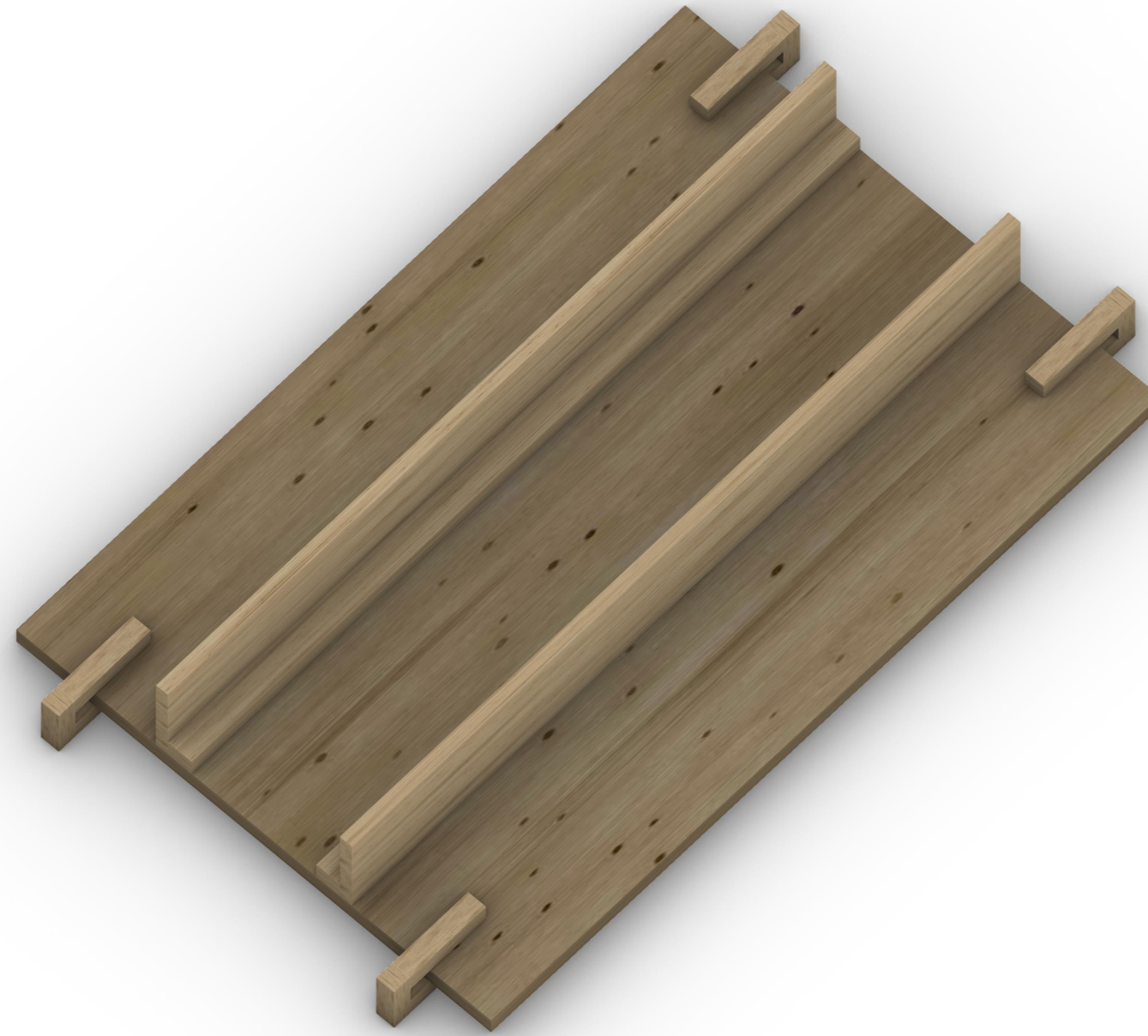
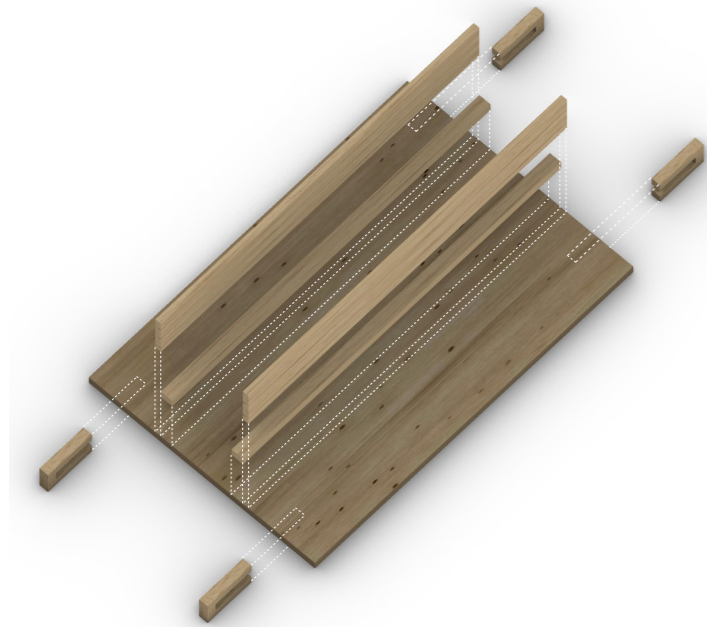
Don't worry if you have no prior experience in the field of construction. This guide is also designed to provide detailed explanations and illustrations that will guide you along the way.

Remember that safety is always a priority. Always consult a qualified professional before undertaking any construction project.

Are you ready to get started? Grab your guide, and let's begin building a reinforced fiberglass concrete beam together. Good luck!

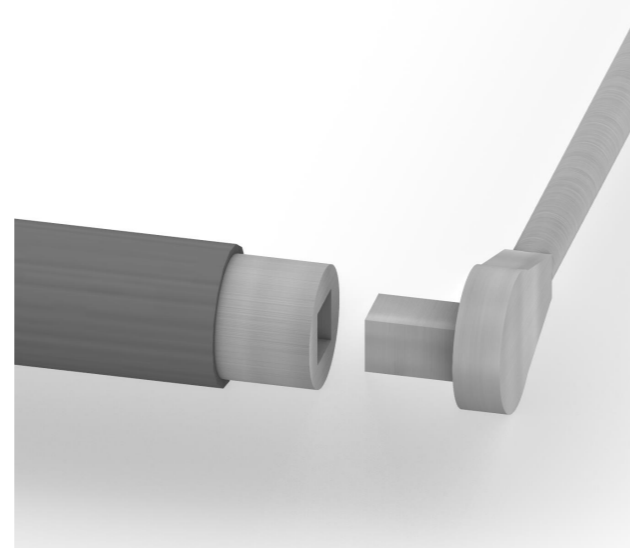
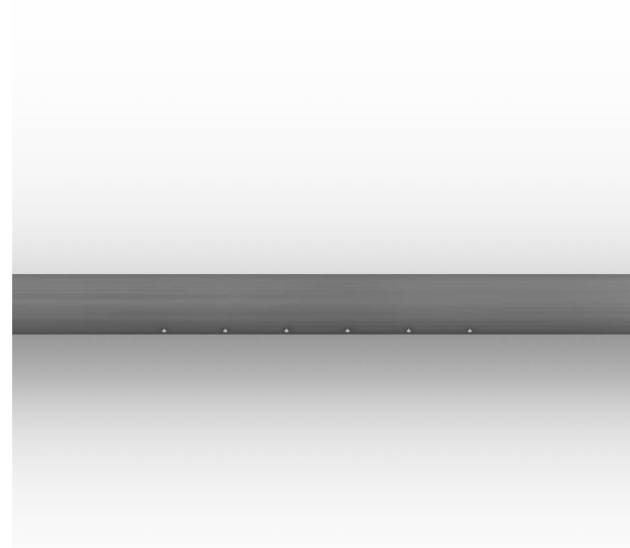
1 | Constructing the base

Use a wooden board that will serve as a work surface. Secure wooden slats with screws on top of this base, which will act as guides. Finally, attach wooden pieces to the ends of the base so that they create slots.



What you need:

- 1) Wooden board: thickness as desired, dimensions 360 x 200 cm
- 2) Low slats: dimensions 360 x 4 x 3 cm
- 3) High slats: thickness as desired, dimensions 360 x 45 cm
- 4) Wooden blocks: dimensions as desired to create a 3 cm slot.

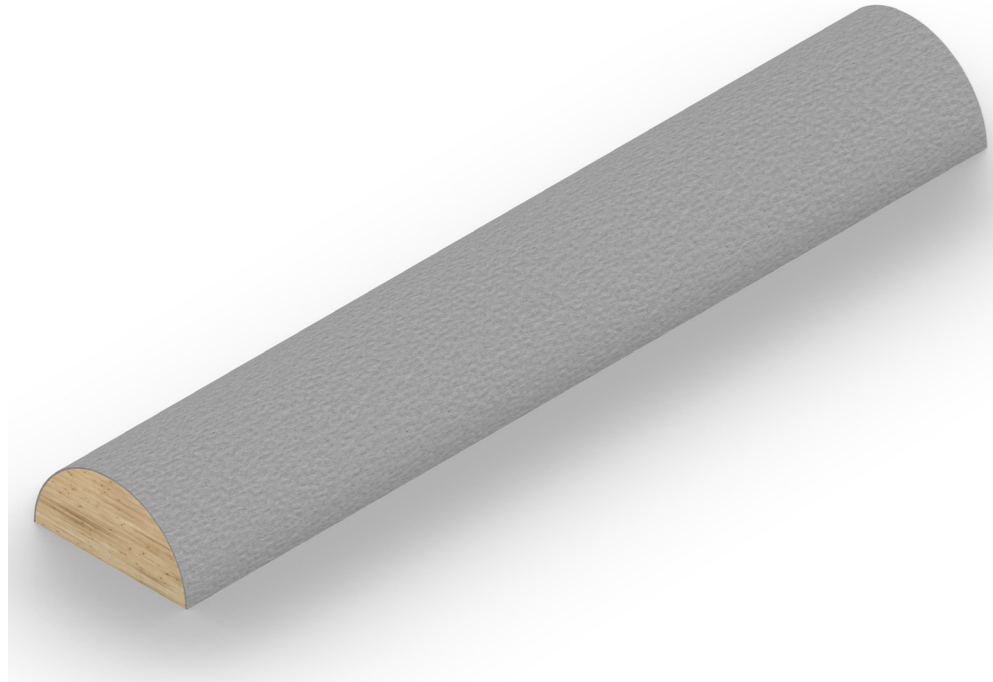


2 | Add to the base

Inside the previously constructed slots, place a metal tube on each side; these tubes will serve later to position the net and keep it under tension. One of the two tubes will be smooth, while the other will have screws inserted so that the net can hook onto it. Additionally, a nut will be welded to the end of this tube so that the torque wrench can be attached.

Torque wrench

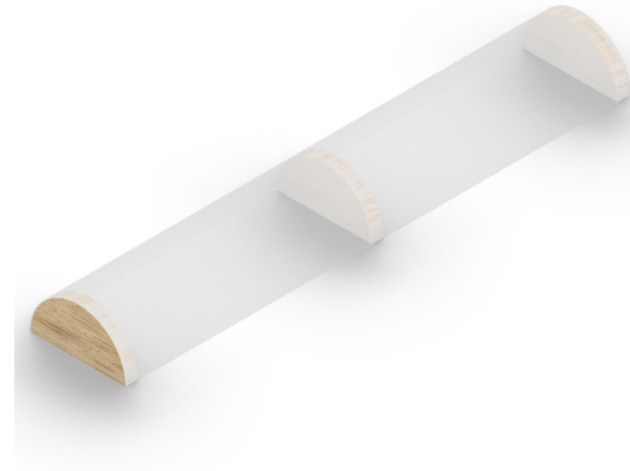
A torque wrench is a specialized tool used to measure and apply a specific amount of torque, or rotational force, to a fastener such as a bolt or nut. It is designed to ensure that the fasteners are tightened to the required specifications, preventing under-tightening or over-tightening.



3 | Constructing the formwork

Cut wooden pieces in such a way as to form half-moons of the desired size, which will serve as the framework for the mold. Use cardboard or cardstock to cover the half-moons and attach them with pins.

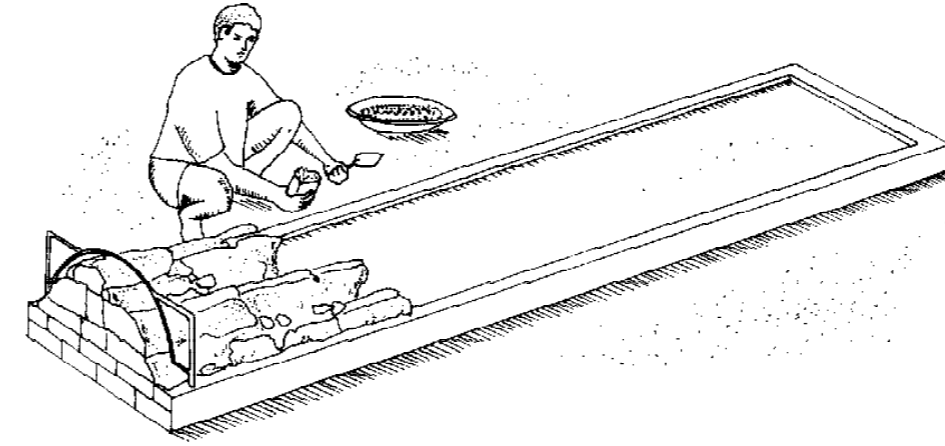
This is the method used during laboratory tests, but it can be replaced with any other technique as long as performance and shape are ensured.



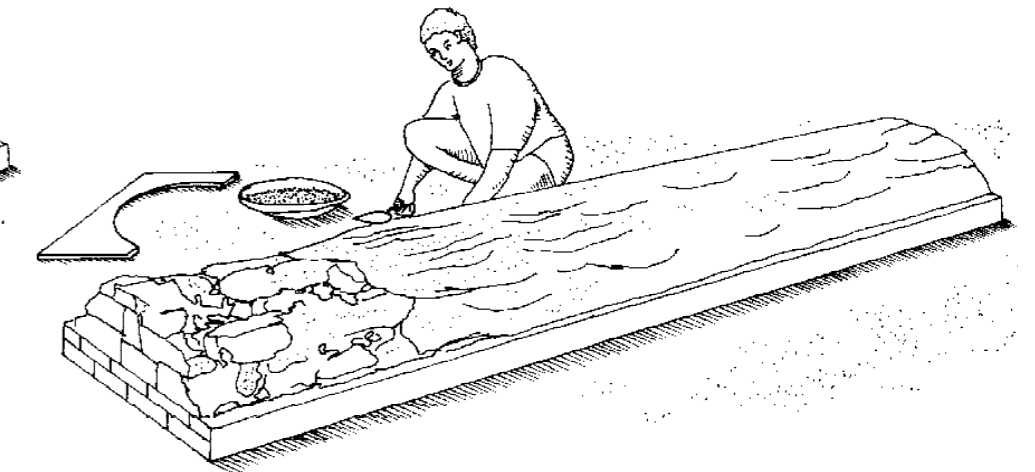
What you need:

Wooden half-moons: diameter 45 cm

Cardboard: thickness min. 2 mm



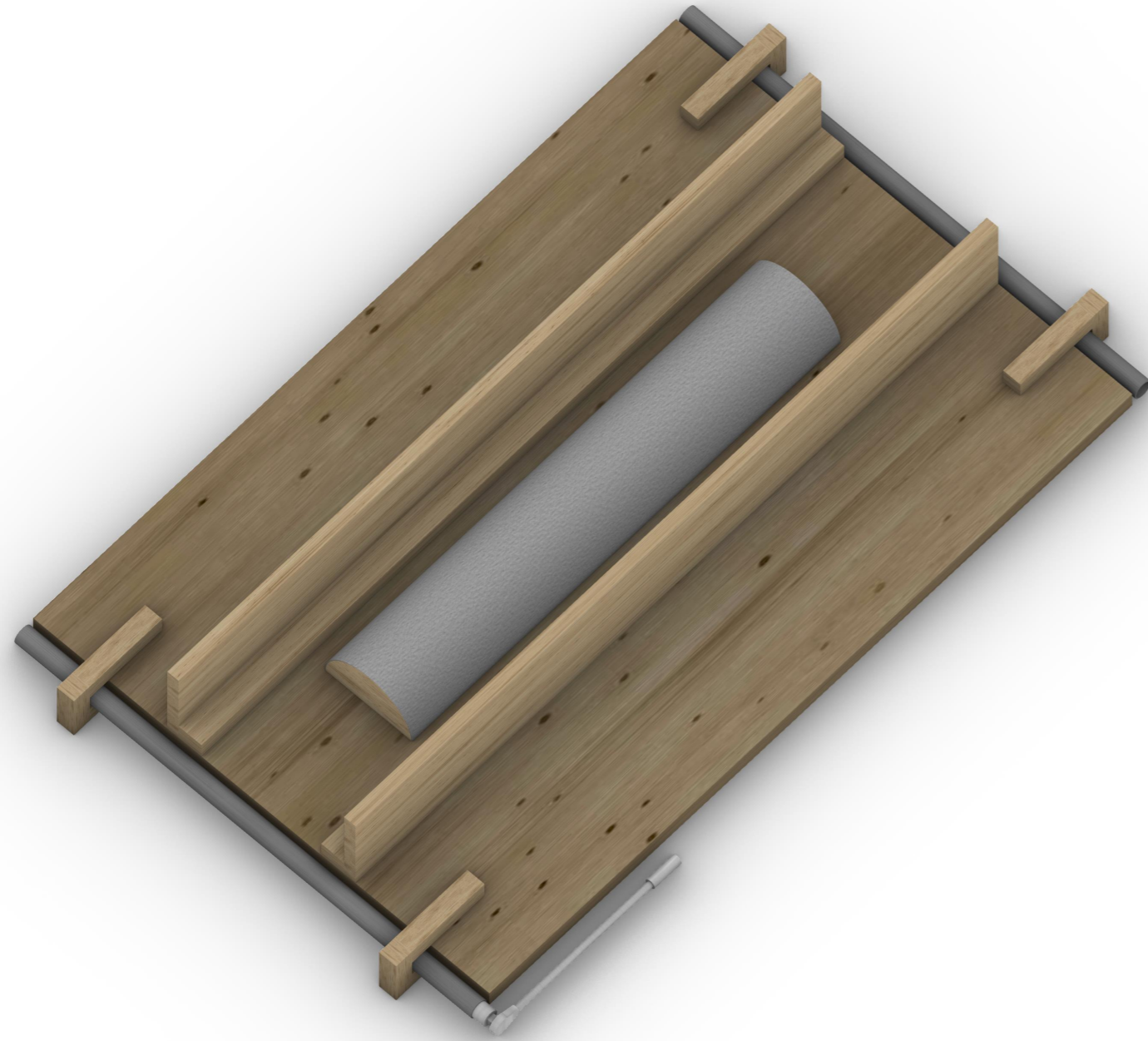
AUROVILLE BUILDING CENTRE



3.1 | Constructing the formwork - by other way -

Other similar experiments propose the construction of the formwork using discarded bricks, onto which a layer of mortar is applied and subsequently leveled to achieve a uniform surface.

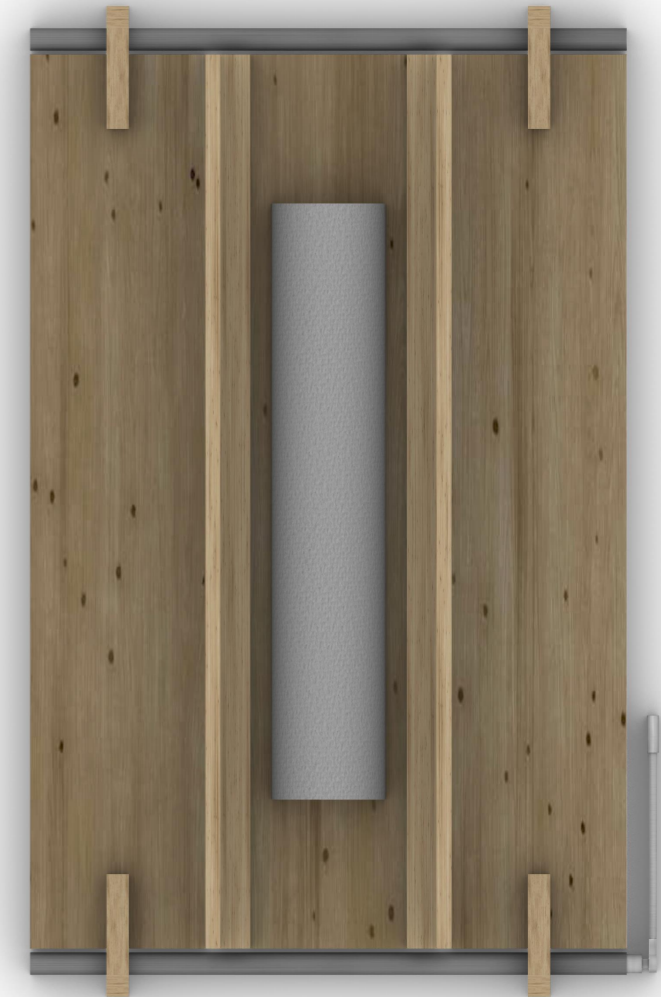
The use of this technique does not guarantee the same level of precision as the one illustrated on the previous page. Furthermore, it requires a greater use of materials and more skilled labor.



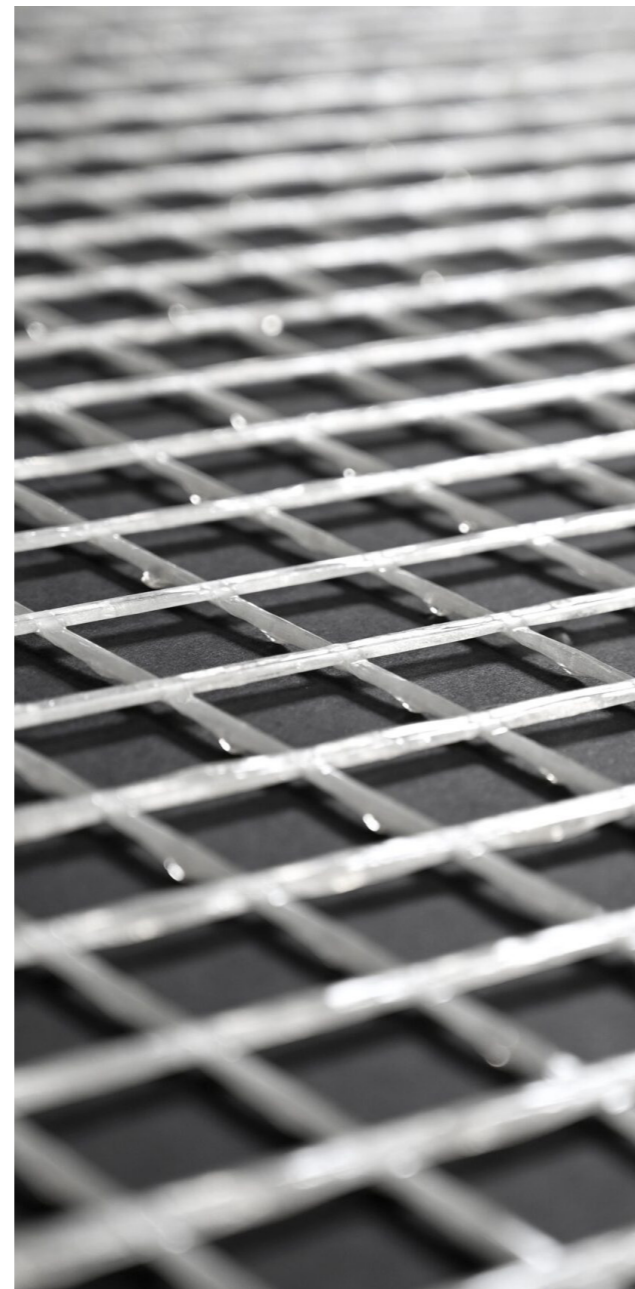
WE CAN START

After completing the construction of the equipped base with everything it needs and also completing the formwork, position it in the center of the base. To facilitate the positioning, use side guides with a thickness of about 3 cm to ensure the correct placement of the formwork. Once positioned, secure it to the base.

And now we can start!

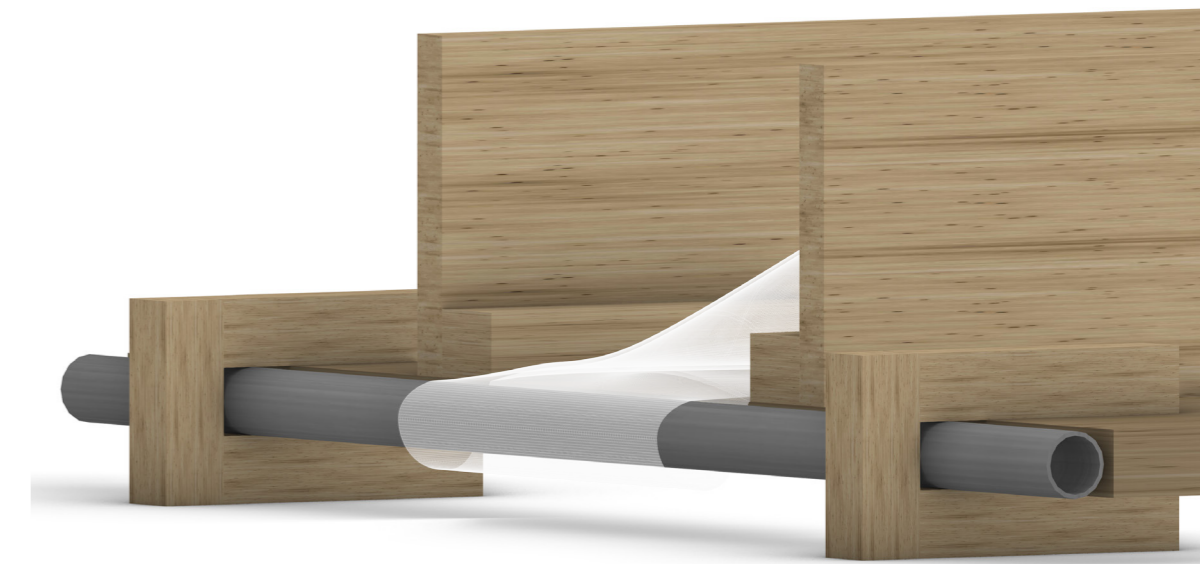


Cut the fiberglass mesh to obtain a strip that is two and a half times the length of the base and 5 cm wider than the width of the tracks.



Fiberglass mesh:

Unit weight: 90g / sqm (5%)
Alkaline resistance: SBR glue



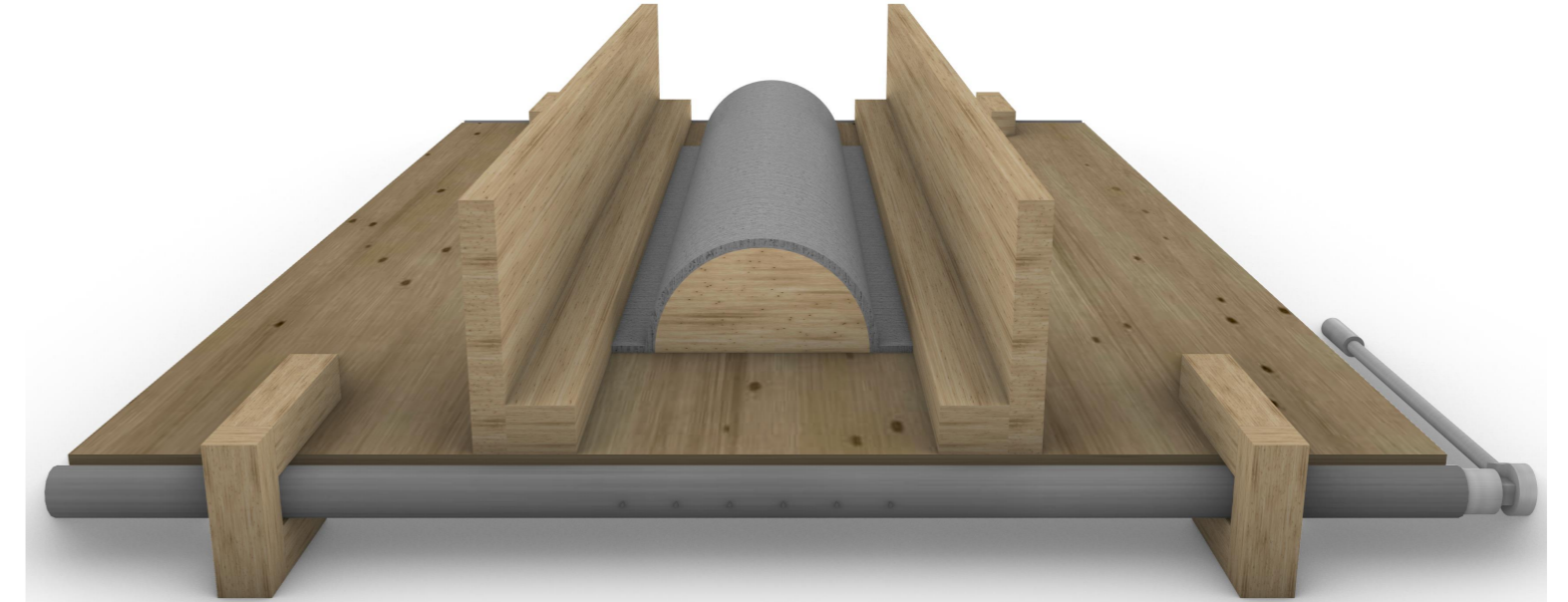
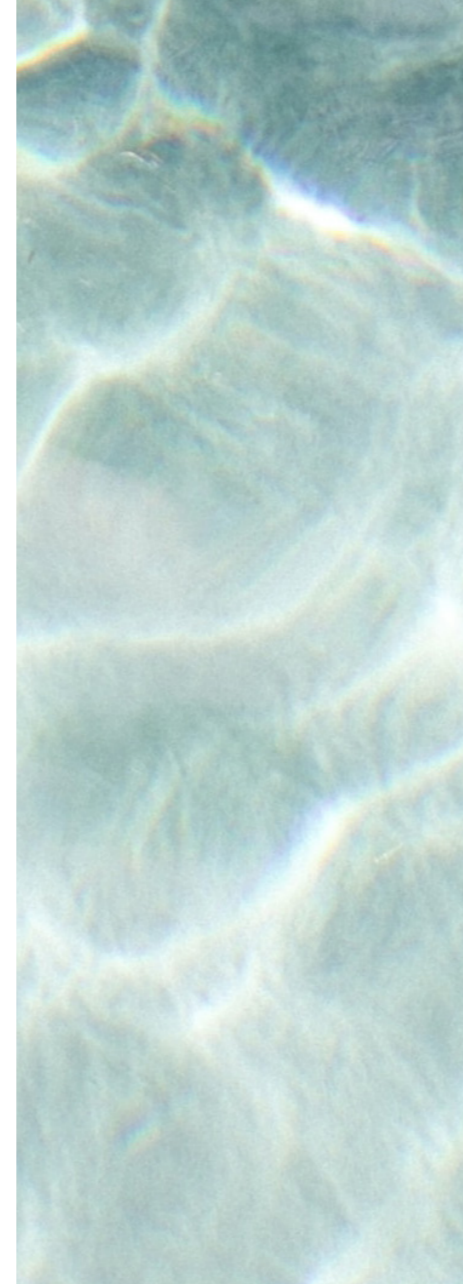
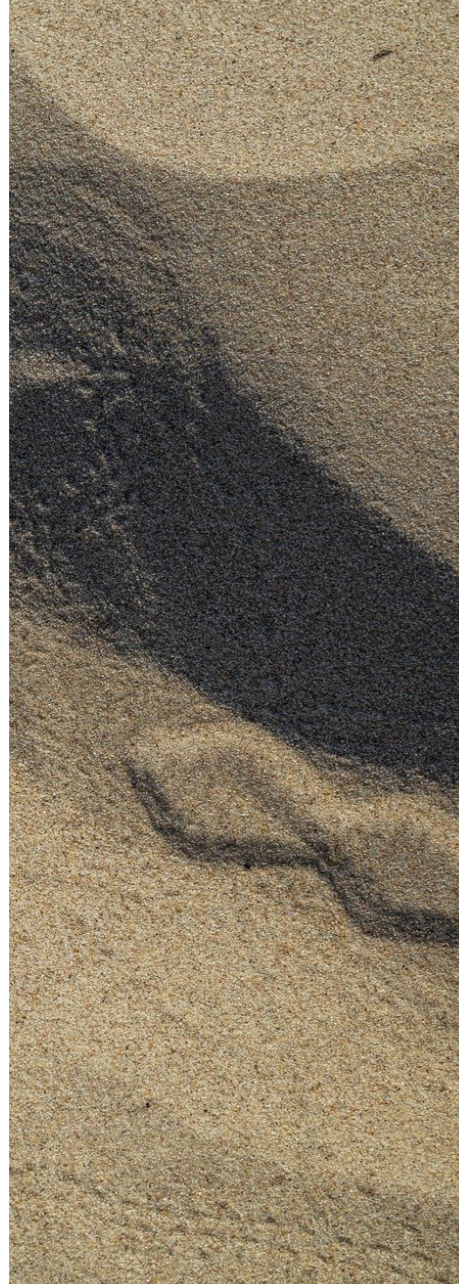
Place the cut mesh at the rear tube, as shown in the figure, in order to obtain two equal-length ends.
Once positioned, ensure that the underlying formwork is clear to proceed with the next step.

It's time to prepare the concrete:

Step 1: 2 part of sand

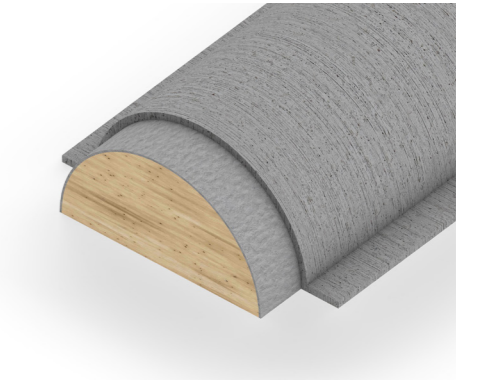
Step 2: 2 part of concrete

Step 3: 0.8 part of water



4 | Apply the first layer

To achieve a better bond between the concrete and the reinforcement, it is important to apply a homogeneous layer of concrete directly in contact with the formwork before placing the reinforcement.

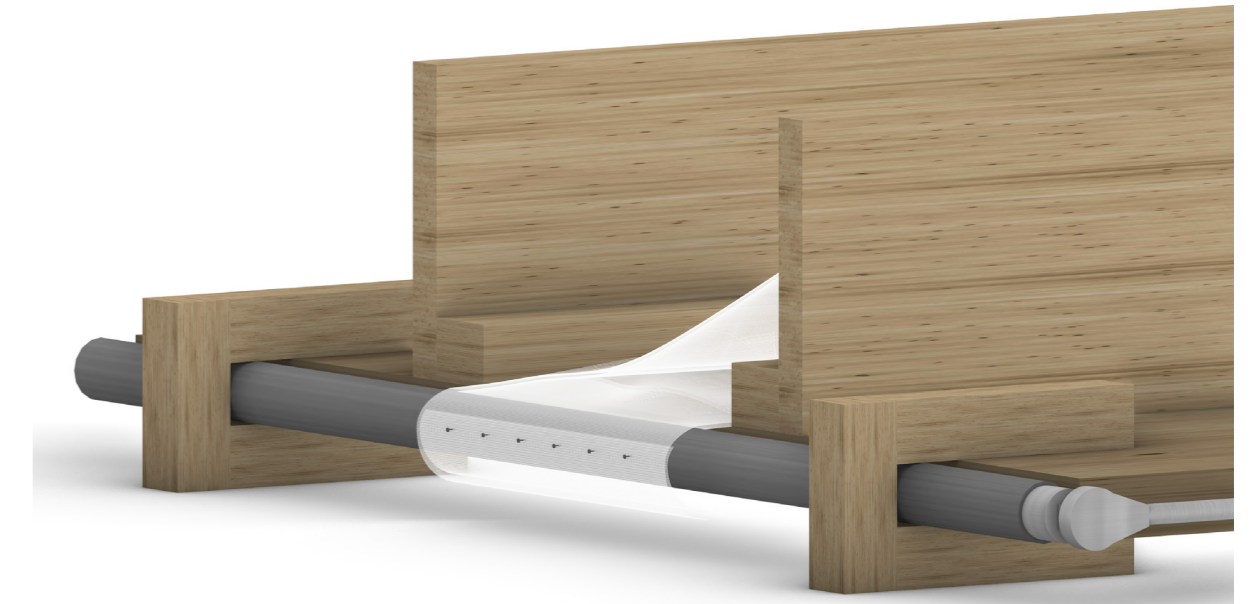
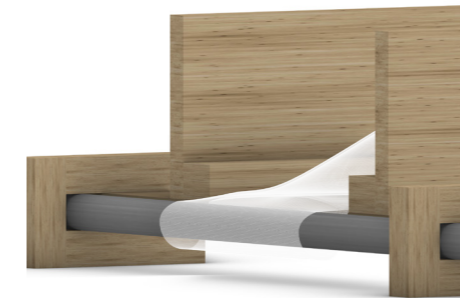


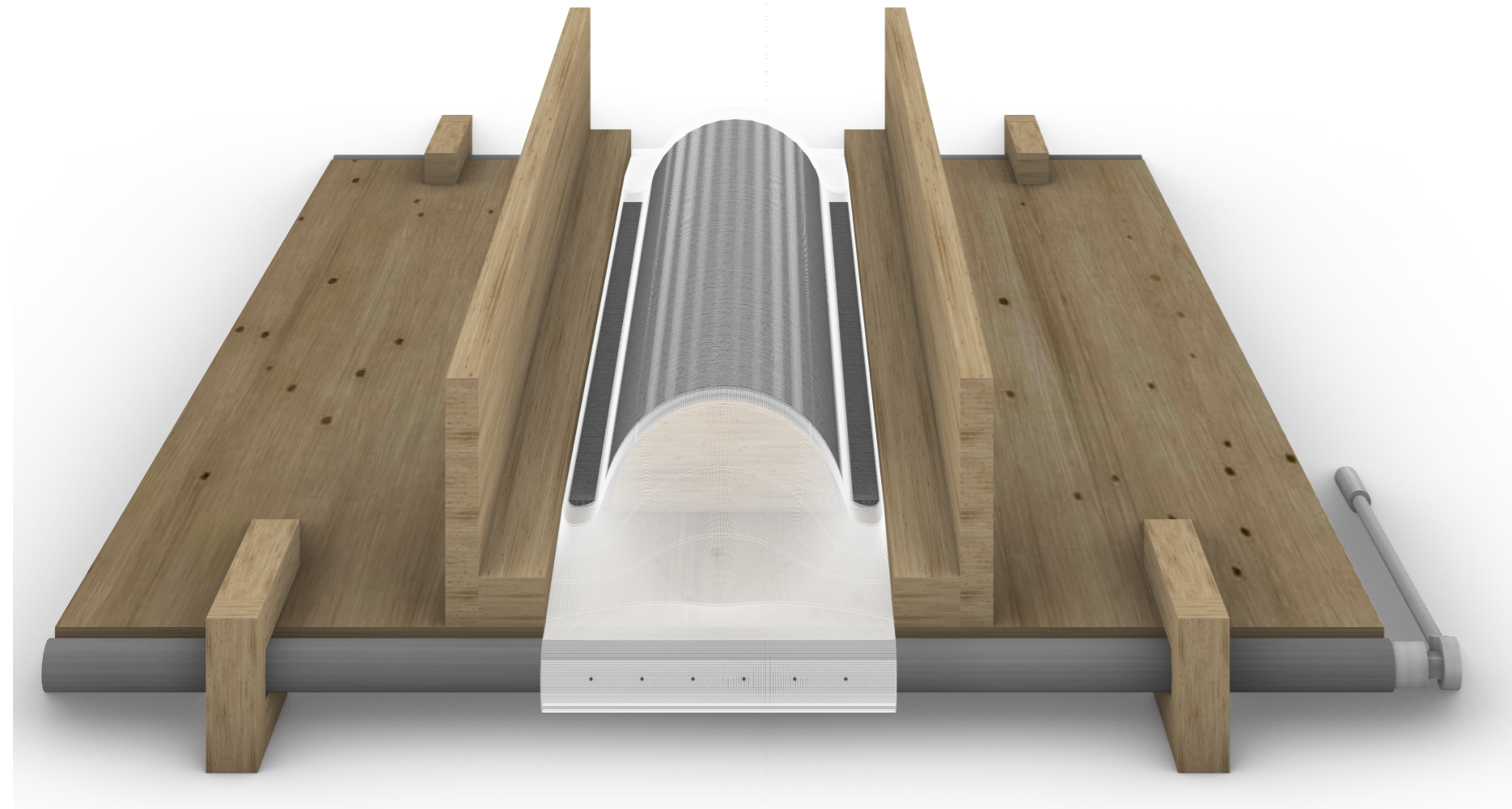


5 | Positioning the net

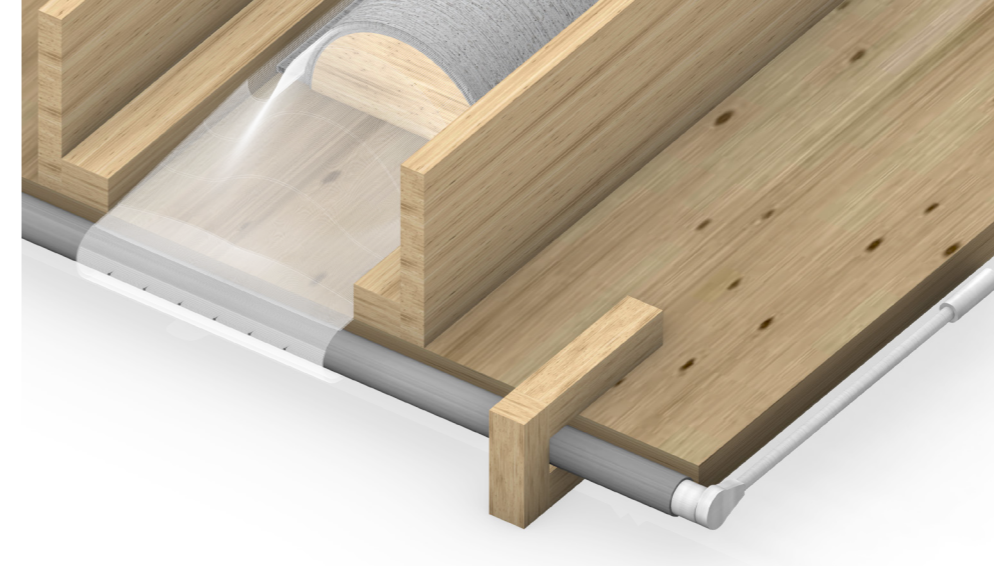
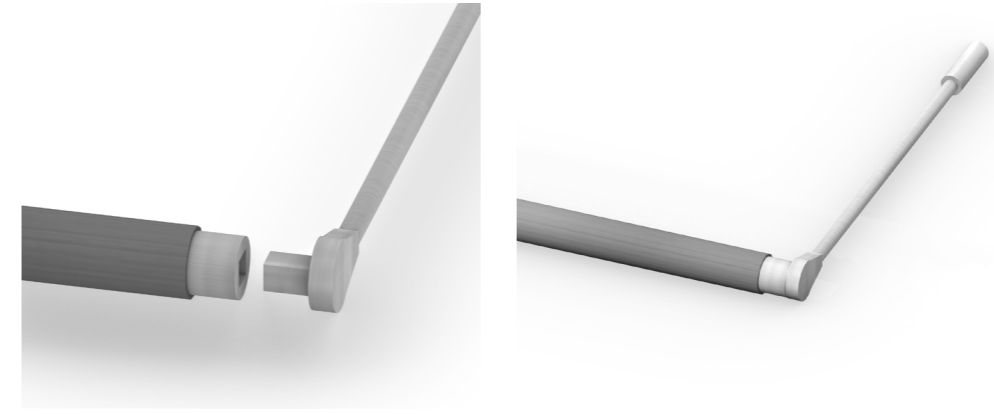
Once the first layer of concrete has been applied, take the previously positioned mesh and lay it over the concrete in such a way that it adheres well to the mortar and is slightly covered by it.

Secure the free ends of the net to the front pipe, equipped with screws, in a way that allows the mesh of the net to firmly engage and interlock with the screws, ensuring a solid and reliable anchorage. This ensures that the net remains securely fastened to the pipe when it is tensioned, providing a strong and dependable connection.



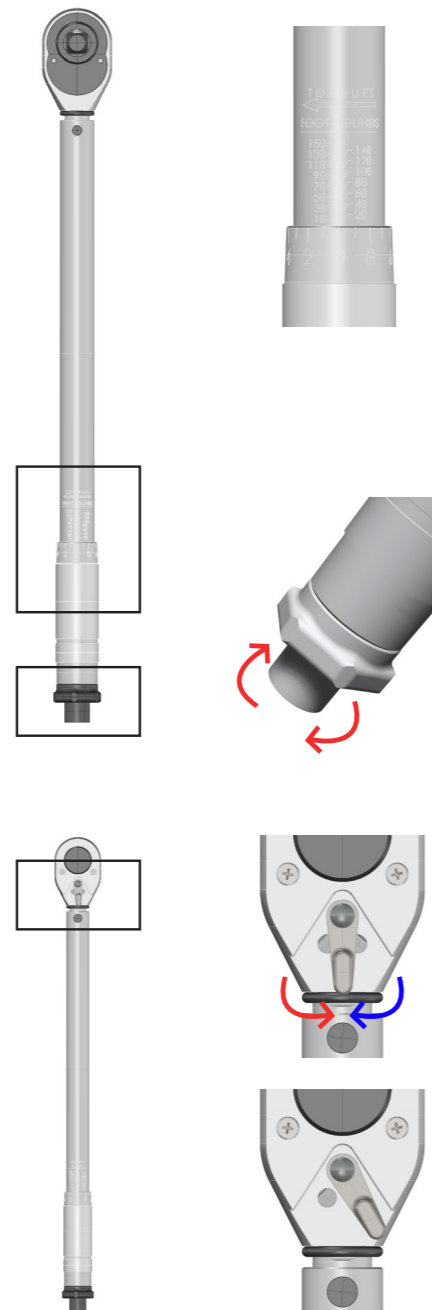


6 | Now we are ready to stress the mesh!



During the network tensioning procedure, it is crucial to securely fasten the network to the pipe nails and ensure that the wrench is properly engaged. Once everything is ready, proceed to set the wrench to rotate the pipe and, consequently, the network inward to maximize the flattening of the network onto the applied concrete layer.

HOW TO USE A TORQUE WRENCH



1|

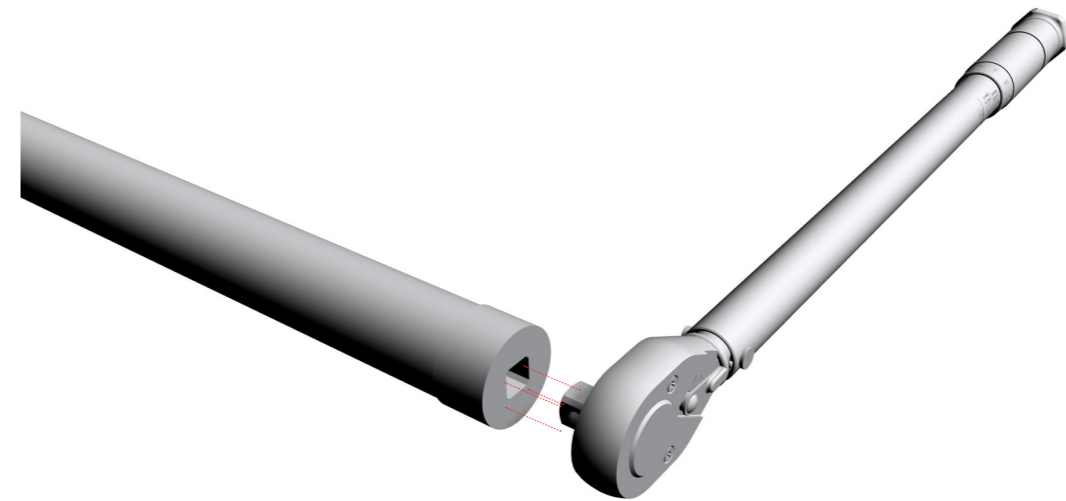
Align the upper edge of the handle with the nearest approximate torque marking according to your needs, rotate the upper dial of the handle for precise adjustments, and add the numbers on the key and the dial to determine the total torque.

2|

Screw the locking knob back in to lock the setting.

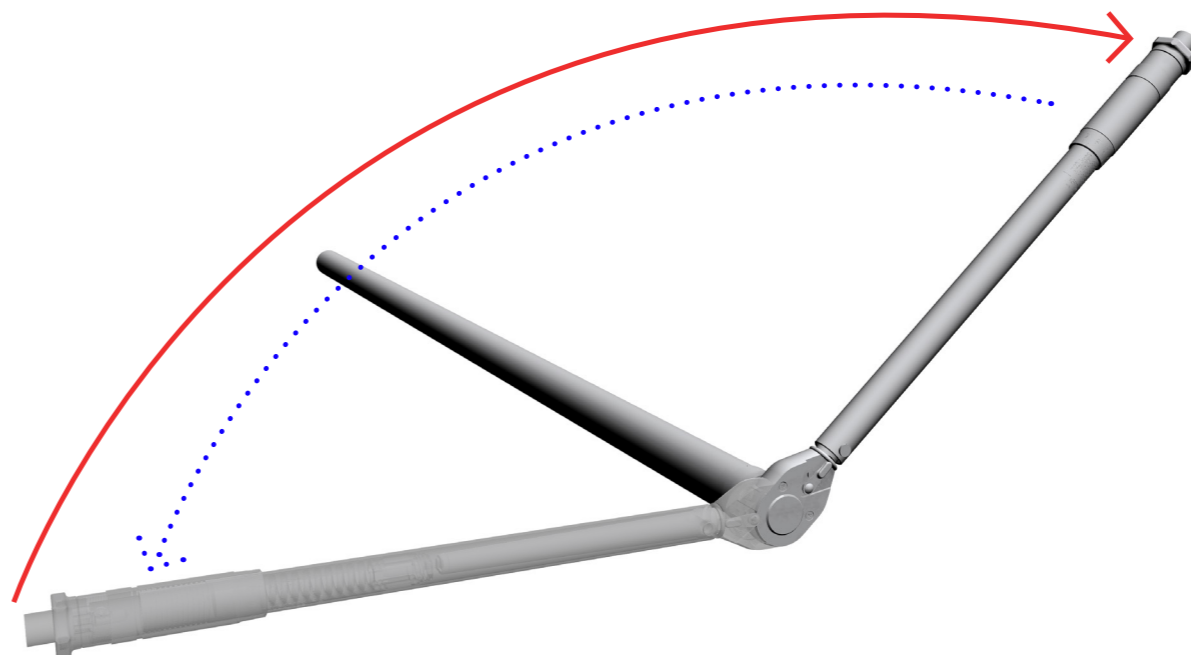
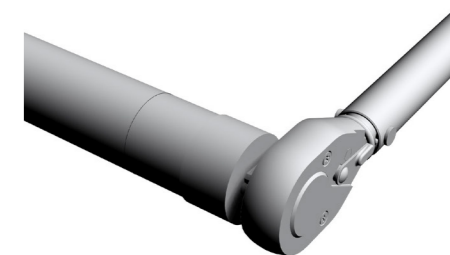
3|

The first image shows the torque wrench's blocking position. The second image shows one of the two possible positions: this determines the direction of rotation that is desired. In our case, this is an important step to successfully tighten the net by rotating it inward.



4|

Proceed by securing the torque to the nut, and consequently to the pipe, and you can begin to apply leverage on the torque.



5|

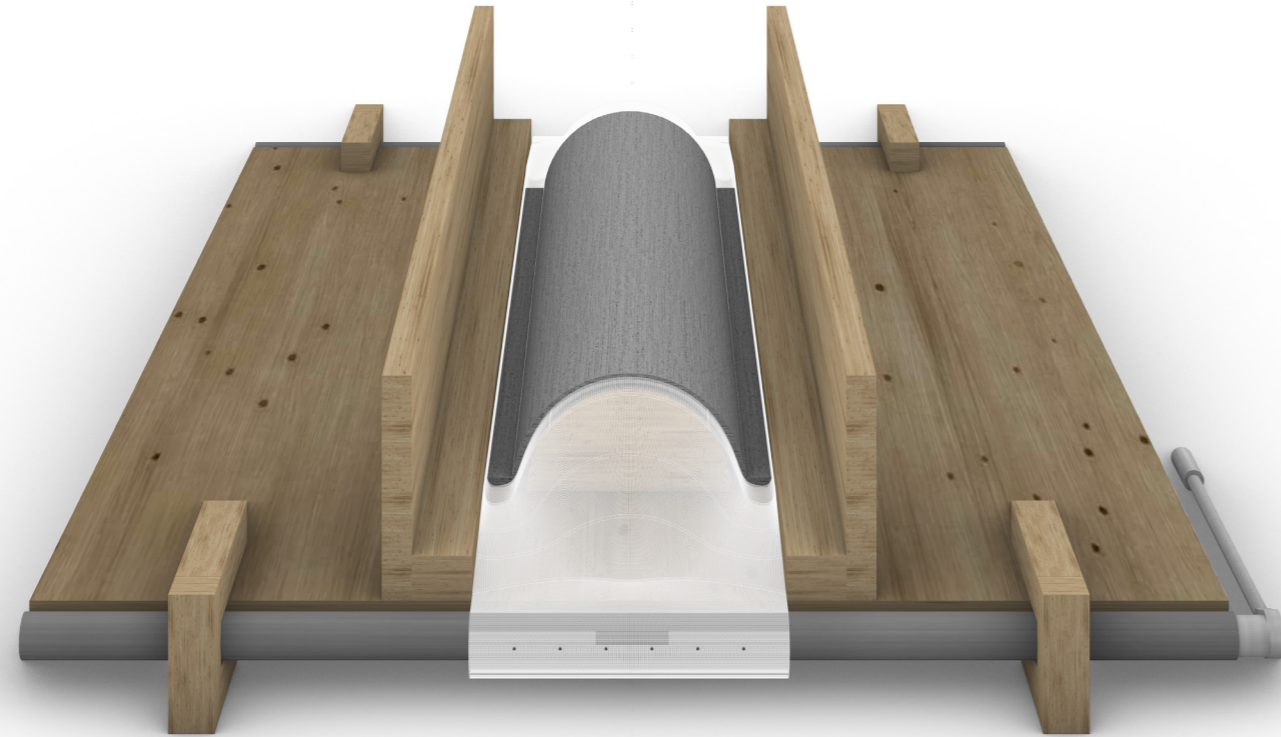
The torque, in one direction, the one we have selected, exerts force, while in the other direction, it pivots on itself, keeping the pipe steady. This way, it will be possible to return to the starting position and continue applying force in the desired direction.

The torque wrench will lock in place with a "click" when it reaches the previously set force.

7 | Last layer

Once the net has been stretched and the torque wrench secured in place to prevent movement, you can proceed with the application of the final layer of thin mortar.

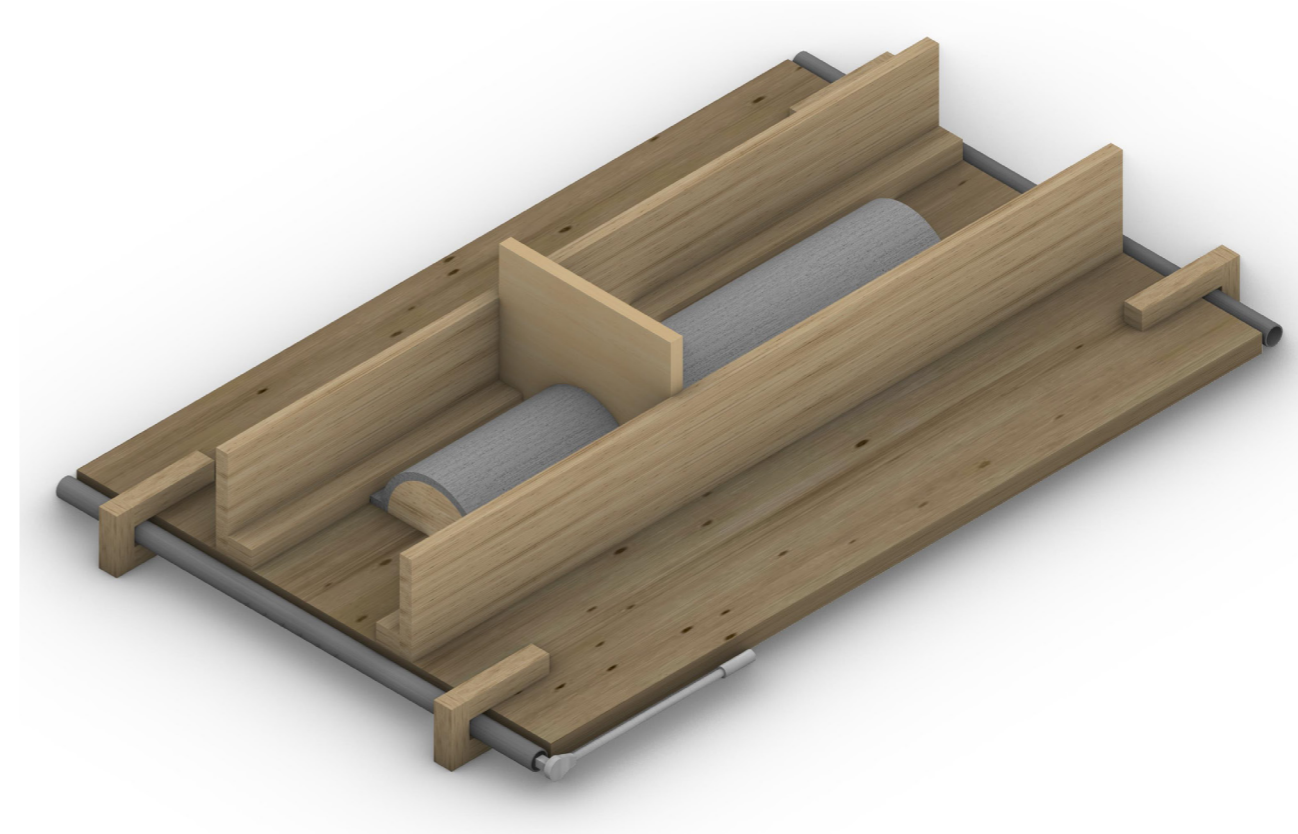
It is crucial to apply pressure during the application process to ensure that the mortar penetrates and adheres uniformly to the mesh of the net.



8 | One last piece

After applying the final layer of mortar, to achieve better performance, it is important to ensure that the layer is uniform in terms of thickness and as smooth as possible.

For greater precision, it is possible to use a shaped template of the desired dimensions.





9 | Wait and detach

After completing all the steps, all that's left is to wait for the concrete to cure enough to be detached from the wooden structure.

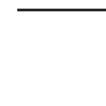


10 | THE
END





POLITECNICO
MILANO 1863



SCUOLA DI ARCHITETTURA URBANISTICA INGEGNERIA DELLE COSTRUZIONI

Laurea In Architettura - Ambiente Costruito - Interni

Anno Accademico 2022/2023

