

# AFRIFURNITURE II



# CONTENT

## ● EXECUTIVE SUMMARY \_\_\_\_\_ 5

THE PARTIES BEHIND THE INITIATIVE 8

## 1 THE PROCESS \_\_\_\_\_ 11

SELECTION OF CARPENTERS 14

DESIGN PROCESS 17

PROTOTYPING 26

MATERIAL 34

TOWARDS THE MARKET 41

FINAL STAGE 45

SUMMARY 48

## 2 TECHNICAL DRAWINGS \_\_\_\_\_ 51

CABINET 50

CHAIRS 54

SOFA TABLES 56

MODULAR SOFA AND CHAIR 58

SOFA BED 62

TEMPLATE EXAMPLES 64

## 3 PHOTOS \_\_\_\_\_ 67

CABINET 70

SOFA TABLES 72

SOFA BED 74

CHAIRS 77

MODULAR SOFA AND CHAIR 78

CONCLUSION 79



# EXECUTIVE SUMMARY

The Afrifurniture initiative (including projects: Afrifurniture 1, 2021; Afrifurniture 2, 2022; start-up initiation, 2022; and upcoming projects) form a systems innovation process. This systems innovation is designed to transform Tanzanian wood value chains to create long-term local sustainability and poverty reduction.

In our previous report (Afrifurniture, 2021) we explored the furniture market in Dar es Salaam and concluded that the current furniture supply does not meet the needs of the urban middle class. There is a need for contemporary lightweight furniture that fits small apartments and is easy to move. In that report, we also studied the production capacity of small carpentry enterprises (SMEs) in the Iringa region of Tanzania. We concluded that there are desirable and feasible opportunities to create a market around sustainably produced wooden furniture.

Based on the systems innovation plan presented in that report we here executed the first phase, a six-month-long process of collaborative furniture design in the region. The main outcome of this project is not this report, but a series of new furniture designs, technical drawings and prototypes of those and the improved capacity of a group of chosen carpenters representing SMEs in Mafinga. However, in this brief report, we account for the process of a Finnish and a Tanzanian designer

**2022**

LEAPFROG PROJECTS FOR PFP

GRAPHIC DESIGN INA FIEBIG

LEAPFROGPROJECTS.COM

HELENA@LEAPFROGPROJECTS.COM



collaborating with the carpenters and the PFP personnel to design the collection of contemporary, lightweight furniture possible to pack flat, assemble and made locally of sustainable wood.

This phase has included:

- 1 Expose a chosen group of local carpenter entrepreneurs to design thinking and co-design.
- 2 Give business training and support to carpentry SMEs.
- 3 Design a collection of lightweight and flat-pack furniture of sustainably grown wood.
- 4 Train the carpenters to produce the furniture according to technical drawings and standardized material.

We further recommend the initiation of a governance model and diverse value chain enhancement activities to help shift the furniture value chain toward self-organizing and sustainability. Additionally, we recommend continuing to build capacity among local carpenter entrepreneurs and carpentry SMEs as well as to expand the network of carpenters who learn how to produce this kind of furniture. When production is happening at a steady pace, the furniture collection can be expanded.

Beyond the obvious benefits of a new sustainable furniture market, it is important to emphasize that the goal of this work is to improve the livelihood of local smallholder farmers (especially in the Iringa region) through growing market demand for sustainably produced wood. The approach focuses on creating a new value chain that is sustainable and fair so that value is captured near the forests and hence improves livelihoods there. Once this systems innovation model is validated, its impact can be leveraged by adapting the approach to other sectors as well (e.g., construction or energy production). This type of whole systems approach also improves the resilience of Tanzania at large, as it reduces dependency on imports and creates local dynamic value chains.

The process did not evolve exactly according to the plan. Firstly, we encountered difficulties in the selection process of carpenters, due to the delayed selection process. Secondly, the availability and enthusiasm of the carpenters were lower than expected. However, the main important steps are taken, there is a newly designed furniture collection, the chosen carpenters are involved in the production, and the learning process is continuing.



# THE PARTIES BEHIND THE INITIATIVE

## THE PRIVATE FORESTRY PROGRAMME (PFP) / PARTICIPATORY PLANTATION FORESTRY PROGRAMME (PPF2)

The collaboration between Finland and Tanzania goes back 50 years. Following several bi-lateral forestry projects, the Finnish Ministry of Foreign Affairs and the Ministry of Environment and Resources in Tanzania co-initiated the 16 year PFP that aims to build the industry based on smallholder forest owners. The first 4 year period of the project was implemented by Indufor, a Finland-based consultancy.

The PFP operations are initiated in the Southern Highlands of Tanzania. During the first phase, the focus was on planting trees. Tree Growers Associations (TGA) were formed locally, and through them the smallholders received training on how to manage their forests. In addition, PFP initiated relations to a wide range of stakeholders, including private companies, local authorities and NGOs. They established relationships, but with the longer-term aim that the TGA will eventually manage such relations.

## INDUFOR GROUP (INDUFOR)

Indufor is one of the world's leading forest consulting service providers. Indufor provides high-quality knowledge and services for clients along the forest and forest industry value chains, adding value to clients and to all the affected communities. Indufor's headquarters are based in Helsinki, Finland.

## LEAPFROG PROJECTS (LEAPFROG)

Leapfrog is a mission-driven consultancy specialized in transition design. We rely on a transdisciplinary approach to address how people, communities, institutions and market actors can coordinate more effectively within planetary boundaries. Leapfrog Projects is the initiator of the AfriFurniture project and will be responsible for carrying out the project's activities.

## R-LABS

A business capacity building organization that unlocks a mindset of possibility. RLabs Tanzania tackles poverty by enabling people to become their best selves. RLabs' Grow Leadership training enables people to start businesses from their existing resources and passions. In a context where formal employment is scarce, R-labs empowers young people to be problem solvers and risk trying something new.



# 1 THE PROCESS

# THE PROCESS

## IN THIS CHAPTER YOU WILL FIND:

SELECTION OF CARPENTERS  
DESIGN PROCESS  
PROTOTYPING  
MATERIAL  
TOWARDS THE MARKET  
FINAL STAGE

The project background is presented, including project aim and key questions to be addressed. Next, the parties behind the initiative are introduced and the reader is reminded of the three project phases as anticipated in the spring of 2020. Next, our methodology, frameworks for understanding sustainability, as well as global considerations and anthropological perspectives on consumer culture are outlined. Finally, we provide an overview of wood types used for furniture production in Tanzania.



# SELECTION OF CARPENTERS

## Project initiation

We began the project in the middle of March 2022. Helena Sandman (project lead) prepared Henri Judin (the Finnish designer) for his stay in Tanzania and Kemi Kilakawe (local designer) started to prepare their collaboration and familiarize themselves with the material in the report from last year. Helena and Henri arrived in Dar es Salaam on the 21st of March. They met the PFP team and a few representatives of carpentry SMEs, visiting Dar es Salaam for a fair, Kemi Kilakawe, and Naomi Rouse from R-labs. Henri, who had not visited Tanzania before, was introduced to Dar es Salaam and the whole group visited local homes, carpenter workshops and furniture shops. The following week, Henri and Kemi travelled to Mafinga to begin the work there together with PFP's wood technologist, Jesse Favis.

## The selection process

The carpenters were not selected yet at this point. We arranged a meeting that approximately 30 carpenters attended, where Henri, Kemi and Naomi shared information about the project. During the first week, the team visited carpenter workshops to identify additional potential candidates. R-labs arranged a selection process and received 28 applications. John Kalolo (R-labs) offered the first part of their development training for the applicants, to observe how the carpenters engaged with the training. The training was followed by two workshops where the carpenters explored their creativity, did design exercises, and practised constructing based on drawings. A selection committee including representatives of PFP, R-Labs, and Leapfrog chose 10 small carpenter enterprises (SMEs) to be part of the Afrifurniture project based on their attentiveness to the training and the capacity during the workshops. For the project, it was important to include carpenters with different skills and different facilities (carpentry, upholstery, finishing...). We hoped for a 'supply chain' outcome rather than having one carpenter make one whole piece of furniture.

## The carpentry SMEs

After the selection of the carpentry SMEs was ready, Henri and Jesse visited all of them. Nine of them are in central Mafinga and one is a bit further away in Vikula. All the workshops are quite basic, and the amount of machinery and electric tools is limited. All of them have access to shared or rented tools and machinery if needed. They found out that there were many and varying problems in the workshop settings. For instance, no flat floor surface, meaning that producing furniture that would stand straight on a flat floor would be difficult. Also, a lack of organization regarding tools and wood. We added this to the project plan. Jesse started to support the carpenters in arranging their working surroundings to best serve their purpose.

MANY OF THE WORKSHOPS HAD NO STRAIGHT FLOOR







# DESIGN PROCESS

## Designing the modular system

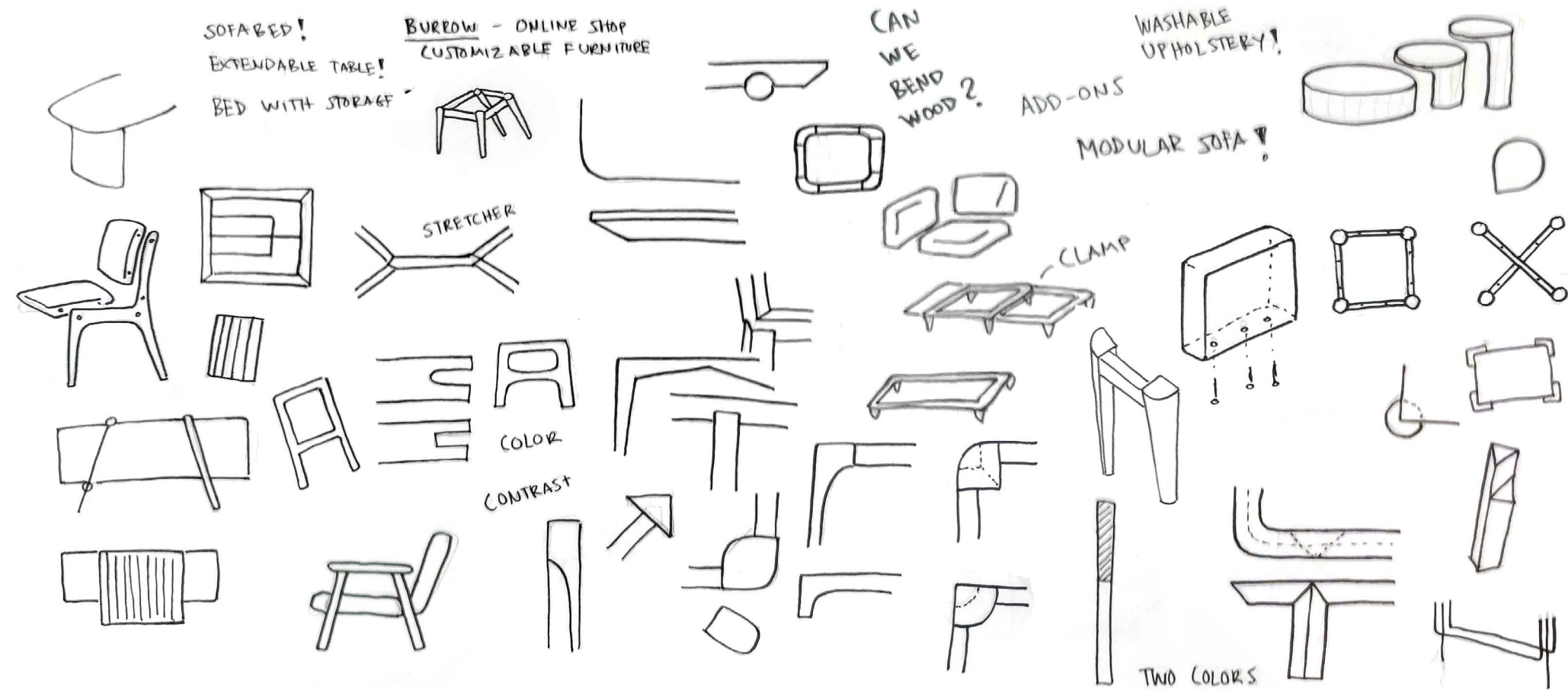
The designers started by ideating design options based on the ethnographic research in Dar es Salaam done the previous year. The idea was to design a modular system where the same pieces and elements can be used in as many pieces of furniture as possible. The same base can be used for example in a sofa, and in a low table, a high table, a cupboard, or a bed. Changing the length of the stretchers, it could be used in a chest of drawers or in a bed. Just the top part is different. This enables customization too. By changing the length of the legs, it could become a dining table. This allowed the carpenter training to focus on techniques, that could be used in the different furniture pieces, and opened for co-design within the framework of the techniques.

This design idea and alternative solutions within this framework were developed further by the designers based on feedback that Kemi gathered from 15 potential clients in Dar es Salaam and the feedback and ideas Henri got from the 10 carpenters. The reason the carpenters did not take part in the initial design phase was that the final group was not identified, and we wanted to get the design work started. However, this framework for the design allowed for adaption and development along with the training of the carpenters.

The products designed are lightweight with a Scandinavian touch combined with visible traditional local handicraft (the basket weaving). The designers decided to leave the wood visible, with a natural oil finish, to bring the material close to the user. In this way we seek to promote the sustainable wood alternative as something precious and nice to touch. The common way of treating wood in Tanzania is to cover it by a thick varnish, which erases the soft feel that natural wood has. Whereas oil or wax treatment looks beautiful and highlights the features of the material rather than covering it.

DEVOTA NYAGAWA HAS ONE OF THE MOST WELL EQUIPPED WORKSHOPS





MODULAR IDEAS

<p>TIME</p> <p>+4 MONTHS Product design &amp; prototyping happen simultaneously Prototypes of 6 pieces - which ones tbd</p> <p>Participation of end users / carpenters / both</p> <p>PROJECT START</p>	<p>PROTOTYPES</p>	<p>PACKAGING DESIGN</p>	<p>PRODUCT DESIGN</p> <p>- add-ons - customization</p> <p>- top parts</p> <p>- fittings &amp; fasteners</p> <p>- base parts</p>	<p>TABLES</p> <p>MODULAR SOFA</p> <p>SOFA BED</p> <p>BEDS</p> <p>STORAGE &amp; ORGANIZATION</p> <p>SEATS</p>	<p>Small chair &amp; armchair don't follow 100% the same concept. Requires different components, more parts and more planning</p>	
	<p>SPECIFYING THE CONCEPT</p>	<p>CONCEPT DESIGN</p>	<p>IDEATION WEEK (8-8.4.2022)</p> <p>IDEATION - moodboards - conversation - sketching</p>	<p>BENCHMARK</p> <p>Getting to know Tanzanian furniture</p> <ul style="list-style-type: none"> <li>- market</li> <li>- business</li> <li>- styles</li> <li>- homes</li> <li>- culture</li> <li>- ...</li> </ul>	<p>- different base types / one base type (tbd)</p> <p>- lots of different top parts</p> <p>-&gt; many different furniture pieces</p> <p>- using same or similar components &amp; same fasteners</p> <p>-&gt; uniform look for the collection, easier to manufacture, package, stock, customize...</p>	
	<p>-ONE WEEK (18-22.4.2022)</p>	<p>-ONE WEEK (11-14.4.2022)</p>	<p>-ONE WEEK (8-8.4.2022)</p>	<p>-3 WEEKS</p>		

DESIGN PROCESS PLAN



### Co-design and training workshops

The workshops were planned to support the carpenters to start manufacturing the pieces of furniture. The techniques and skills

learnt in the workshops are used in the final furniture collection. All the materials and tools used in workshops are available in Mafinga (except for the flat pack fasteners), so the carpenters can apply the same techniques in their own work as well. The workshops altered woodwork and design.

In the woodwork ones, the carpenters learned techniques like producing a round profile (for legs) and bending laminated veneer (for chair backrests). For instance, for bending veneer, it is possible to build a mould to create more complicated shapes. This requires a little bit more time, material, and money, but once you have a good mould, you can use it infinite times. If the mould is well designed, it is also possible to make more than one product with it. This was a new way of working for many carpentry SMEs.

In the design workshops, they practised reading and producing technical drawings. This is not an easy task and was unknown to most of the carpenters.

Many of the carpenters had wished to learn how to come up with new designs. We planned a co-design workshop where we first dis-

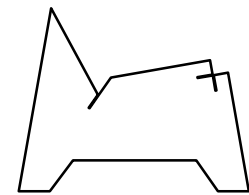
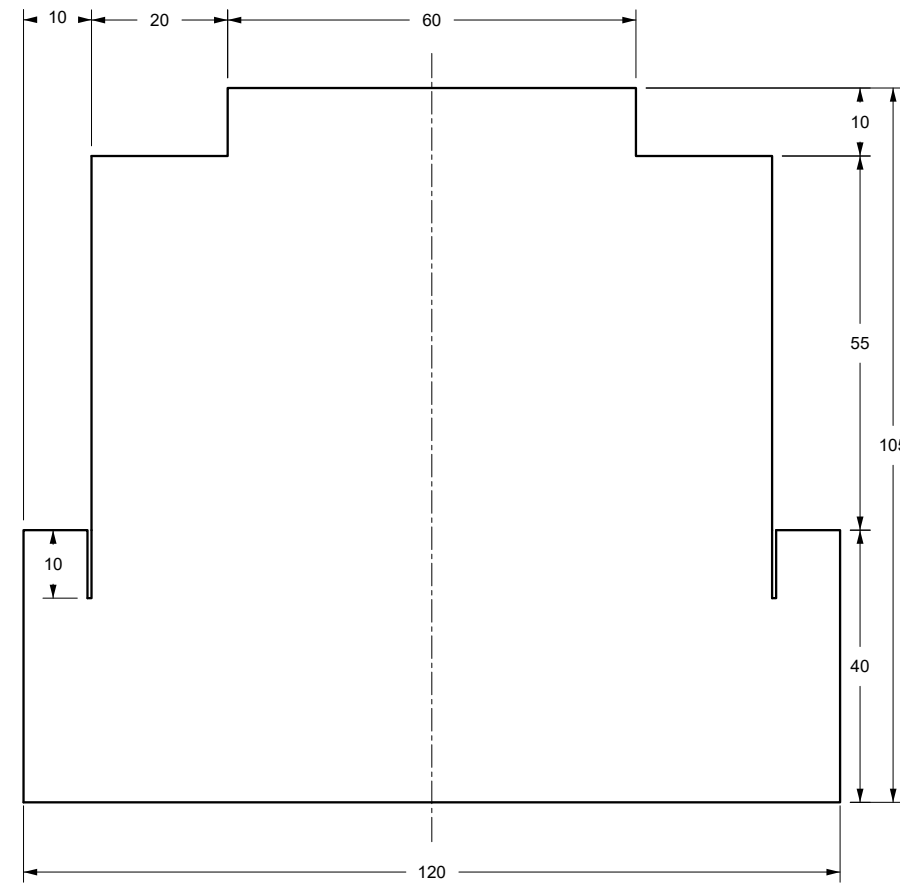
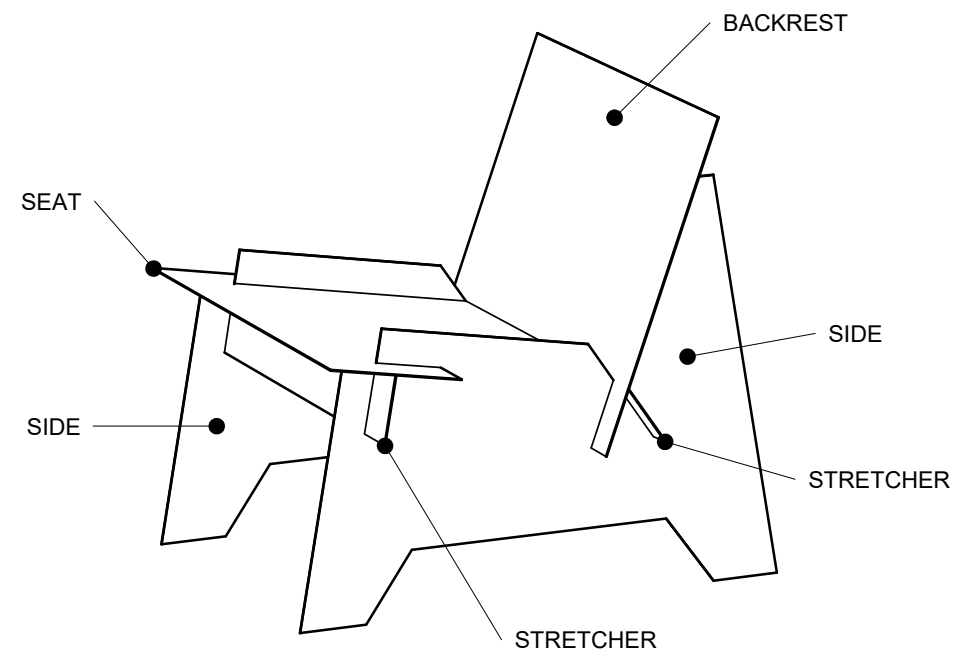
cussed creativity, sources of inspiration, benefits, and the value of creating something new and inspiring. We came up with new table designs using creative workshop methods and building scale models. Some of the ideas will be used in the final table designs.

Using scale models was also a new concept for many of the carpenters. They learnt that with a scale model they can easily test ideas and make mistakes without using a lot of material. With a scale model, you can develop a design. The model can also be used to communicate with customers and as a tool to better understand the structure in three dimensions.

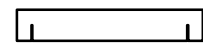
SOME OUTCOME OF THE CREATIVE PLAYDOUGH TASK



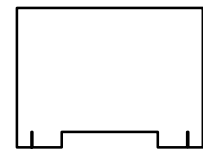




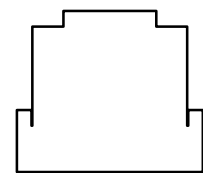
SIDE x 2



STRETCHER x 2



BACKREST x 1



SEAT x 1

Product, part	Workshop chair, <b>seat</b>				
Drawn by	HJ	Scale	1:1,5 / A4	Changes	
N:o	220421-01			a	
PFP2 / Afrifurniture				b	
TWITC Mafinga				c	
Print date	22.4.2022			d	
				e	

TECHNICAL TASK







**Oswald Zanganya (Carpenter):**  
It's a completely new thing for us. It really takes a lot of time. We're reading the technical drawings, it requires a lot of concentration. We're doing it, and we need to get faster. It is a really big achievement.

All workshops aimed to develop skills needed to produce high-quality furniture. Unfortunately, not all carpenters joined the workshops, which is a little problem, but the ones who have joined have shown a lot of interest and commitment.

The carpenters were not available for training more than once a week. Thus, it was decided that there would be a co-design and training workshop with varying themes on Wednesdays. Due to the availability, R-labs decided to postpone their group training until the design and carpentry workshops were concluded. (They have, however, continuously supported the carpentries individually during the six months.)

TEN SME'S JOINED THE SECOND WORKSHOP



CALSON, OSWALD AND  
ZAULO DRILLING HOLES FOR THE  
SOFABED AT A LATER STAGE



# PROTOTYPING

## Prototypes

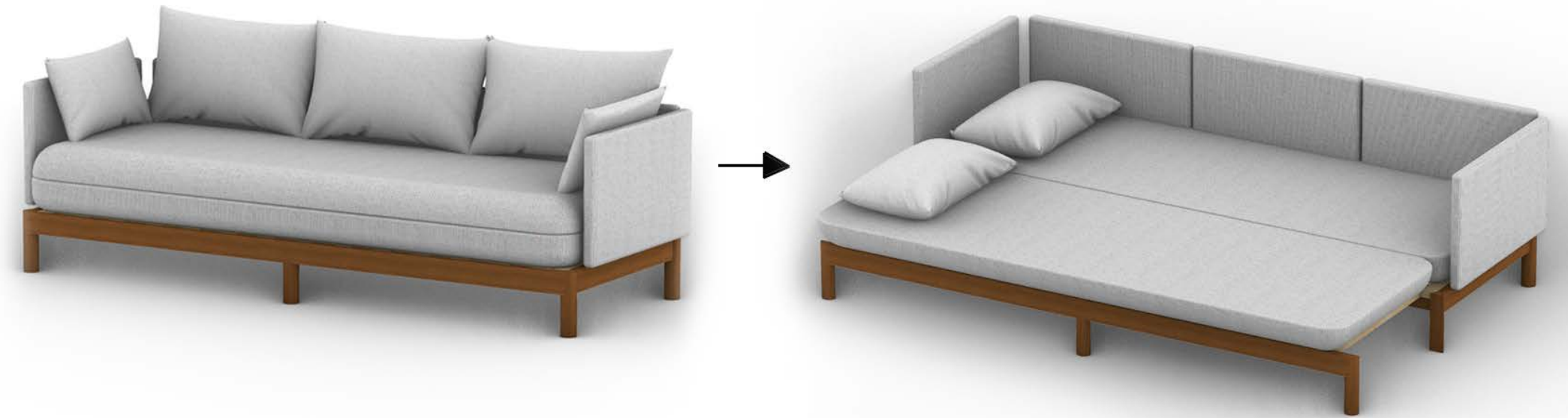
From all the designs, the sofa bed was one piece that the carpenters really wished to learn how to make. Therefore, we decided to start with this piece, even if it was one of the most complicated. The sofa bed uses a very simple pull-out mechanism, but what makes this product a bit complicated is the flat packability. In the workshop, we started building the sofa bed together with the carpenters. Henri had prepared all the technical drawings. It has many components, and to be able to build a functional flat-pack piece of furniture, all the pieces must be made very precisely. The carpenters had learned this in the previous workshop being introduced to the fasteners, so they did good work and paid extra attention when measuring the pieces.

We are very happy with the outcome. The sofa bed mechanism works nicely, and the frame structure is strong. It was a very good first prototype. During the building process we learned what to improve for the next version.

The prototypes of the other pieces were built at the FWITC workshop. We decided that it was important that Henri would be present and participate in the production of each prototype. As the carpenters were not available more than once a week, we could not involve them in all stages, as Henri's contract was limited to six months. Henri and Jesse and the wood tutors Frank and Evaristo built the prototypes.

Now there are prototypes of: a small chair (with two different backrests), a sofa (modular, multiple combination possibilities), an armchair (+ ottoman) (modular, multiple combination possibilities), a sofa bed, a side table and sofa table set, cabinet.

With these prototypes, it is easy to communicate with the carpenters as well as with the clients. In any case, the carpenters are familiar with all the techniques used in the pieces. Jesse will continue the work to ensure that the carpenters are ready and confident to start the furniture production and that the outcome is high-quality, well-finished flatpack pieces of furniture.



SOFA BED





## Upholstery

Many of the pieces have upholstery. Even if this project was about using wood and working with the carpenters, upholstery is an important element of furniture. It is a way to make a piece of furniture more soft, inviting, and comfortable. It is also a way to use and hide some not-so-good quality wood and save in finishing. In our case, we didn't have access to good quality veneer so, for example, for the small chairs we only decided to make fully upholstered versions. Jesse will continue sourcing better quality veneer. One option is to have it made for us at the veneer factory next door (discussions initiated).

We were prototyping the sofa upholstery with one of the SMEs, who is an upholsterer. It was a bit challenging to find time, as the SME prioritized paid work. It would have been of advantage to include a couple of more upholsterers, as we ended up with several designs needing upholstery.

PRACTICING MAKING ROUND LEGS

HENRI AND FRANK PROTOTYPING A

BOX FOR SOFA UPHOLSTERY





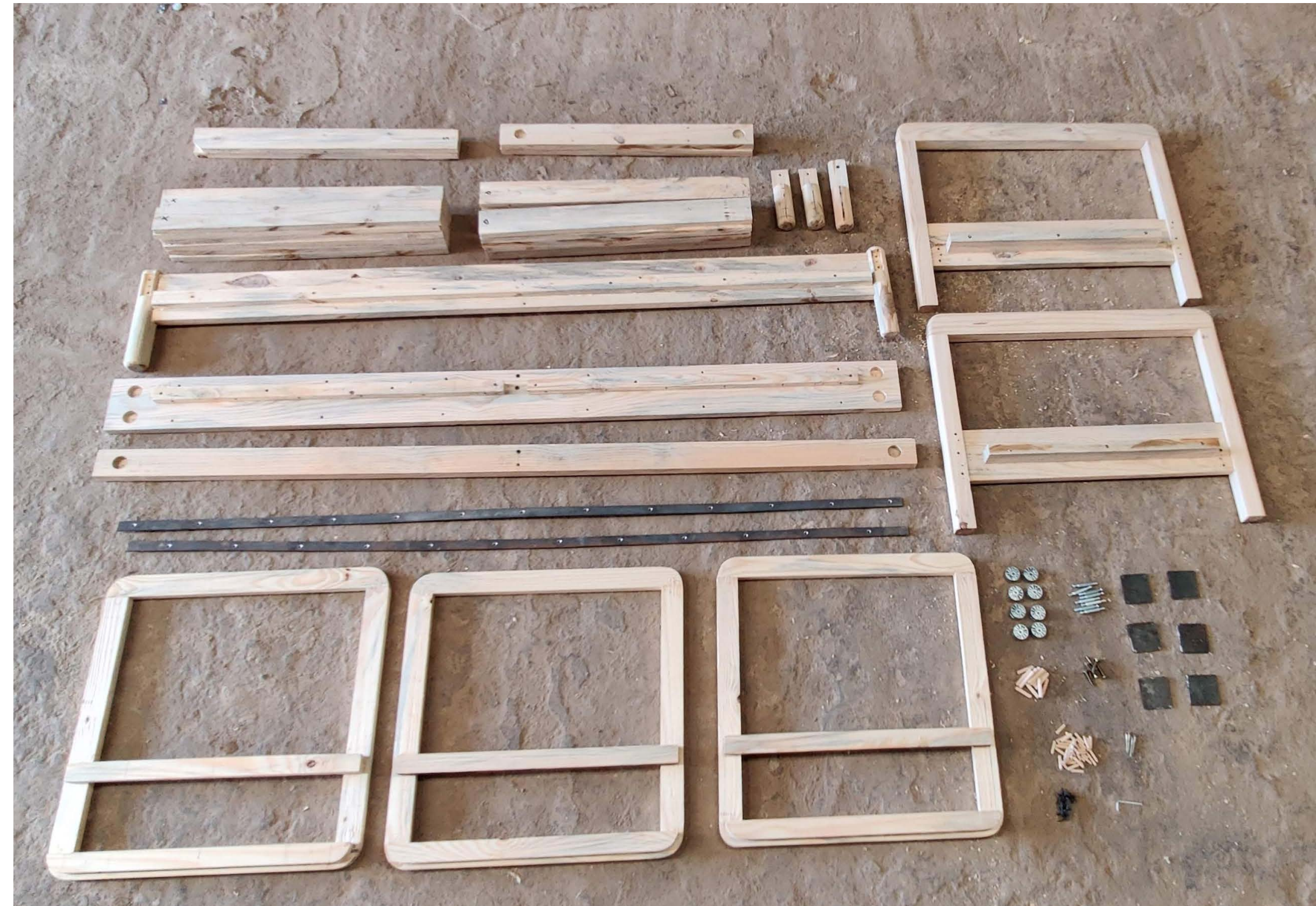


THE CONCEPT OF FLATPACK IS STILL  
VERY NEW TO TANZANIA AND NEEDS A  
LOT OF EXPLANATION

### **Flat-pack furniture**

The prerequisite for producing flat-pack furniture is to be able to take the furniture into pieces. For that there is a need for fasteners. These are very difficult to find in Tanzania. Therefore, to begin with, Jesse had ordered a big number of alternative pieces from South Africa. It is planned that FWITC would start to sell the flatpack fasteners (without profit, just to cover the costs) so those will also be available for the carpenters. Further on, the idea is that we would suggest a Tanzanian retailer order these to the region. However, the package arrived much later than expected, and the work with prototyping the furniture pieces was delayed due to this. Due to the delay of the fasteners, Henri, Jesse, the PFP tutors and the carpenters started by doing prototypes for the leg structure pieces and the upholstery box, instead of the final prototypes. After many months of waiting, finally, the flat-pack fasteners arrived. Many of the designs rely on fasteners and it was a big relief to receive them. The carpenters were excited and fascinated to try them out. It is a totally different way of building furniture than what they are used to.

JOHN CHECKING THE FLATPACK  
FASTENERS





This is a link to the gifs:

[https://drive.google.com/drive/folders/1jiZI\\_sJafFgB-4pHIYckYQIJdH3QHD5lm?usp=sharing](https://drive.google.com/drive/folders/1jiZI_sJafFgB-4pHIYckYQIJdH3QHD5lm?usp=sharing)

### Technical drawings and manuals

The technical drawings of all pieces are drawn. The drawings are clear. With some training a carpenter will be able to read the drawing, build the piece and understand the assembly process. These function as the professional manuals for the producers. Out of the technical drawings, it is also possible to print out templates that can be used for sawing the pieces of wood. These could ideally be made in metal sheets, to be durable. The team agreed that the carpenters, in addition to the drawings would benefit from videos that would show the different stages of the techniques used. We hired James Kasela to produce the videos. So far one video is produced, but there will be a couple more needed. The start-up is responsible for the customer assembly manuals and videos, if they conclude that those are needed (if we go for home assembly, they are, if assembled by technicians, additional material will not be needed). However, we made a proposal by using simple gifs for three of the item.

This is a link to the technical drawings:

[https://drive.google.com/drive/folders/1pkG6BrO-Q1br-YL\\_gBQg5KQRZ7wvP1sgp?usp=sharing](https://drive.google.com/drive/folders/1pkG6BrO-Q1br-YL_gBQg5KQRZ7wvP1sgp?usp=sharing)

### Tolerances to technical drawings

Below is a table with the allowable tolerances for the wooden components of the Afrifurniture range. The acceptable variation is measured against the technical drawings for each piece of furniture. There is no tolerance for the flat pack fastener placement and positioning within the pieces. If the tolerance isn't stipulated in the table, it is assumed that there is no tolerance.

COMPONENT DESCRIPTION	TOLERANCE
Round profile leg diameter	2mm
Angles on the small chair	1°
Upholstery plywood carcass for sofas	5 mm
Upholstery plywood base and backrest for small chair	3 mm

CALSON'S WORKSHOP



# MATERIAL

## Wood species

Pine wood and eucalyptus were the species originally considered for the Afrifurniture furniture. However, the excessive presence of blue stain affecting pine in timber yards of the Southern Highlands, would lead to an eye-sore in the finished pieces of furniture. Apart from there not being a source of blue stain free wood, poor forest practices in some regions have led to the wood having an excessive number of dead knots within pine. These dead knots are localized weak spots in the wood and create serious defects in the manufactured components. In the right environment and growing conditions, pine can grow incredibly fast. Unfortunately, these logs contain a high proportion of core wood and the lumber milled from these logs often doesn't have sufficient mechanical properties for furniture applications.

Therefore, the wood species used for Afrifurniture is eucalyptus. There are two common species in the Southern Highlands, namely saligna and grandis. Saligna has a reddish to pink honey colour, while grandis has a yellow to grey-brown colour and is referred to as "gum", by the locals. Either of these species can be used for

Afrifurniture as eucalyptus is about twice as strong as pine, for the same sized member. This makes it a much more forgiving material to work with, when it comes to knots.

**Jesse Favis (PFP2 wood technologist):**  
On a more technical level, I feel the carpenters now have a better idea on which power tools and machines to invest in that will give them more versatility in their workshops and allow them to use the new techniques. I hope all the mistakes we made along the way with the prototypes encourage the SMEs to make their own mistakes in their own product development. Hopefully, the Afrifurniture SMEs are slightly more confident to just try, and less fearful of the mistakes that are part of the process.

## Lumber moisture content

The moisture content of the wood used to build the furniture is very important. Furniture built from wood which is not properly seasoned will go through dimensional and visual changes as the wood slowly dries in the finished product. These changes are likely to include shrinkage, deformation (warp) and splitting. The value of the furniture will decrease as these undesirable changes start to appear in the once well finished piece. To avoid this scenario, the moisture content of the wood used to build the furniture collection must be at the correct moisture content to begin with. The table below shows the moisture content percentages for the different seasons.

### EQUILIBRIUM MOISTURE CONTENT

| Wet season (Nov - Apr) 12-15%

| Dry season (May - Oct) 10-12%

\* The values in the table above show the equilibrium moisture content of timber in the Southern Highlands of Tanzania. These values cannot be applied to all regions of Tanzania.

## Finishing

The furniture collection was designed with a natural wood finished look in mind for the appearance and overall style of the furniture. In Tanzania, high gloss, synthetic sealers are the preferred look for wood finishing, generally speaking. The wood has a high level of protection from the elements and great scratch resistance, but the essence of the natural, raw wood is lost. Sticking to the sustainable concept behind Afrifurniture, a more natural wood preserver and protector was sourced in the Southern Highlands. Linseed oil is deep penetrating and gives a breathable, waterproof protective layer to the wood. This type of finish does require an annual application of the oil to keep the wood protected and to make the colours of the wood vivid again. To leave some aspects of the Afrifurniture range customizable, the type of surface finish and if the wood should be stained, will be left to the customer to decide. A variety of sealers and varnishes are available in the Southern Highlands, in a range of tints and tones. However, wax and oil are more natural and easier to apply than varnish. They are also much more forgiving in a dusty environment, as in all the workshops in Mafinga.



### Adhesive

A one-component polyurethane adhesive, which is widely available in the Southern Highlands, is the advised adhesive for all glued joints in the Afrifurniture range. The adhesive is very fast setting, and will assist in speeding up production. It also expands as it sets, providing gap-filling properties to joints that are misaligned. The polyurethane adhesive is moisture curing, so if the timber happens to be above the required moisture content, the adhesive just sets faster, but the bond strength isn't affected.

The curved plywood components are the only pieces that require a PVA (polyvinyl acetate) wood adhesive between the veneer layers. In the Southern Highlands, this type of adhesive is known as a synthetic resin adhesive. The assembly time required to manufacture the curved plywood is too drawn out for the fast-setting polyurethane adhesive. The slower setting PVA adhesive allows enough time to bring all the elements together and apply pressure. As it is water-soluble, it can be thinned out with water to get a better spread over the veneer surfaces, and rollers and working surfaces are easier to clean after manufacturing.

### Curved plywood components

The curved plywood components are fabricated by laminating layers of 3mm thick eucalyptus (A grade) veneer together using PVA adhesive. Make sure that the veneer's moisture content is in the range for the season. The grain direction of the veneer must be alternating, so that in each layer, the wood grain orientation is perpendicular to the previous layer. The PVA adhesive can be thinned out with water (4:1 adhesive to water) to get it to apply and spread over the veneer easier. For the curved chair back, 5 layers of veneer are used in the lamination process, and they must remain pressed against the mould for 24 hours before being removed. The curved cabinet plywood is 7 layers thick, and must remain in the mould for 48 hours.

SOME EXAMPLES OF THE BACKREST DESIGNS THAT  
THE SMES CAME UP WITH







Naomi Rouse (R-labs):

The Afrifurniture project has been the chance of a lifetime for carpenters to learn completely new furniture techniques. The project highlighted the huge skills gap that exists between local carpenters in Tanzania and countries like Finland or even South Africa, even in quite basic techniques like using jigs. Without the project, the carpenters would have likely made small innovations to their products over the years in response to customer demand using existing techniques, but would not have been able to significantly upskill. With the new skills learned in the project, they are now able to create a much higher quality of furniture and open up a world of design possibilities.

AN ADVANCED VENEER LAMINATION MOLD

## Textile

The availability of textiles for upholstery in Mafinga is an issue. It is very hard to get standard quality when availability varies. The fabric we used for our very first test prototypes was no longer available the following week. For the final prototypes, we bought a lot of upholstery material from Iringa to make sure we would have everything and then provided the material to the upholsterers. I think this will be the way to do it in the future as well. We cannot trust the availability in Mafinga.

CHUMA EXPLAINED THE OTHER  
SMES HOW THE UPHOLSTERY IS  
MADE







### **Basket weaving**

Another element we used in the pieces in addition to wood is baskets. Baskets are produced by women in the Iringa region. A lot of different weaving techniques and baskets for different purposes are available. For the designs, we need the basket to be woven flat in specific sizes. We did not manage to get the basket surfaces custom-made yet, so we used ready-made baskets that we cut in the right size for the prototypes. Jesse will continue communication with the weavers.

VIKAPU BOMBA STORAGE

# TOWARDS THE MARKET

### **Packaging**

Regarding flat packaging, the best and for the time being, most affordable solution that we have found after a rigorous search is one-sided wave cardboard, which is bought by the meter in a roll. Using this is far more affordable than ordering boxes for the different pieces. This can be purchased in Dar es Salaam and brought to Mafinga if needed. It is also possible to transport the pieces from Mafinga to Dar es Salaam using recycled blankets that can come back to Mafinga and be used over again. As the finishing of the furniture will potentially be done in Dar es Salaam as well as the assembly will be done in Dar es Salaam the packaging does not need to be as rigorous during that phase of transportation.

### **Pricing**

The market research in Dar es Salaam has shown that the price for a dining chair, for example, should not exceed 200 000 Tsh to be affordable for the urban middle class. This is the starting point for the pricing of the items in the collection. The SMEs and Jesse are still in the process of figuring out the price for materials and the time required for production. As only the first prototypes are produced so far, it is difficult to establish a price yet. As an initial purchase and production try, we asked the SMEs to give an offer for a set of dining chairs. They suggested 180 000 Tsh/chair. This price is however too high, to meet the market, as transportation, distribution, and marketing were not yet included. Jesse will still make a proper cost breakdown for each product. There might be a need for serial production to a certain extent, to be able to meet the cost requirements.





This is a link to photos of the furniture pieces and to the videos:

<https://drive.google.com/drive/folders/1aMejBJBVhvgYaJN-p6h9uaNjcfTE8-ff8?usp=sharing>

<https://drive.google.com/drive/folders/1C-LHZ4sEp5SZLK6tND-TEcFhOxWNC16gi?usp=sharing>

### Photography

The final thing for Henri to do in Tanzania was to photograph the pieces of furniture. We did the photography with James Kasela. He is a professional photographer, but he doesn't have much experience in product or furniture photography and he was a little bit surprised that it actually took the whole day to take the photos. Henri has been involved in hundreds of furniture photo shootings, so he has a good eye on that, but he didn't have the technical knowledge which James has. That made them a good team and at the end of the day they got great photos and James said that he learnt a lot of product photography.

We have further engaged James in producing teaching videos for carpenters. The first video is ready and edited.

JAMES TAKING PHOTOS

RANDOM FREESTYLE RAPPERS  
APPEARED IN THE MIDDLE OF OUR  
PHOTOSHOOTING

**Henri Judin (Leapfrog furniture designer):**  
In a way, the carpenters got exposed to design thinking (without knowing it). They got exposure to different ways of thinking about furniture. In addition to the pieces they are making now, a piece of furniture can also be for example modular, customizable, extendable, flat-packable, not glossy... They also got exposure to different ways of making furniture: using jigs, making jigs, veneer lamination, technical drawings, non-visible joints, and high-quality finish... Many of these concepts and terms might said nothing to them before the project, but now I think and hope that there are makers in Mafinga who are not afraid of trying these things. There are now furniture options that can lead to a new clientele, new markets, and more income. The collection, we made, is one example of an option and I think the collection itself is a positive outcome of the project.







# FINAL STAGE

### Final meeting and exhibition

In the beginning of September, we had a final meeting discussing with the SMEs. Seven of the carpentry SMEs showed up. They are also the ones that have been the most active during the training. Some SMEs we unfortunately lost during the project. They have all the potential to start building the furniture if they believe in themselves, work hard, attend to future training.

We decided to have an exhibition opening to showcase all the prototypes and the whole process to the PFP steering committee. We wanted people to be able to see and try the furniture.

### Continued activities

R-Labs is continuing the capacity training of the carpenters until the end of the year. The training has been delayed due to the availability of the carpentry SMEs. The carpentry training is now continued within PFP with Jesse, Frank and Everesto at FWITC. FWITC will also start producing furniture items.

**Kemi Kilakawe (Tanzanian designer):**  
For me as a designer it was exposure to a new way of working and exploring new wood at the source. Seeing that the carpenters can be creative and can get lost in creating something from their imagination. The potential to grow creativity is massive and move the carpenters from the copycat syndrome. If they had time I believe at least 40% of them would grow in design skills, providing more product diversity. They were also exposed to new techniques of work, which will translate to a change in some of the ways they produce their own products. They also now can imagine a bigger market, they still have a way to go to get the the quality that market wants but the doors and eyes have been open, and I believe the is gives hope for a more productive future.



## Evaluation

We needed to modify the project in an agile way as it evolved. However, some steps could have been done differently. It would have been good that the choosing of the carpenters would have happened separately, before this 6-months period, alternatively, the project and its schedule of deliverables would have been planned for a longer period. The long selection process was time-consuming, and not of advantage, for the already short project. Due to this delay, it was stressful to fulfil the deliverable according to schedule, which also resulted in an unnecessary rush in the end. Upon the selection, it would also have been good to inform the carpenters of the input required to be part of the project. Potentially, it would have been better to follow a more traditional model, and start by production in FWITC, and slowly employ young carpenters when the production line is ready, instead of working with established SMEs.

## Outcome

Despite some challenges, particularly with the availability of the carpenters, this project has reached the expected outcome in this short time frame. The furniture collection meets the demanding requirements of being highly desirable locally, representing a combination of african and nordic design, being affordable and possible to produce by the local carpenters. This is of critical importance for the whole systems innovation plan to work. Most importantly from a poverty reduction point of view, is that there is now a group of carpenters who have learned entirely new skills and work practices for improved quality. They are continuing to practise their new skills and are expected to master them within 6 months. They will, most probably include these techniques also in their regular production. As the beautiful prototypes of the furniture has created demand, the carpenters have a real possibility of doing work in the Iringa region for the urban market – which means getting more income. With time, the project will most probably have an impact on future furniture production in the region when other carpenters, outside the program, can see the benefits of the participants.





# SUMMARY

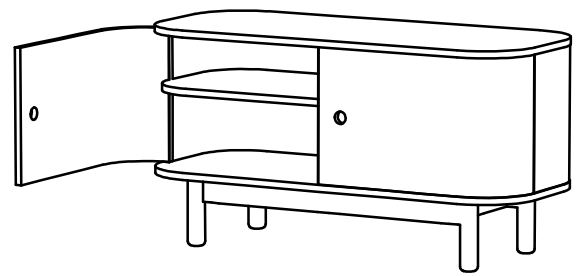
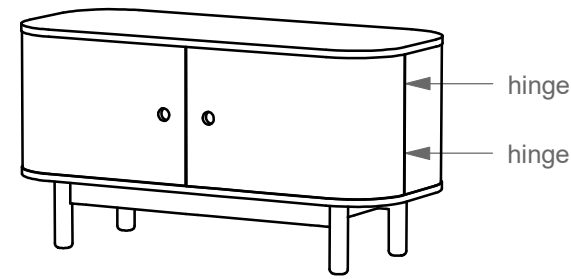
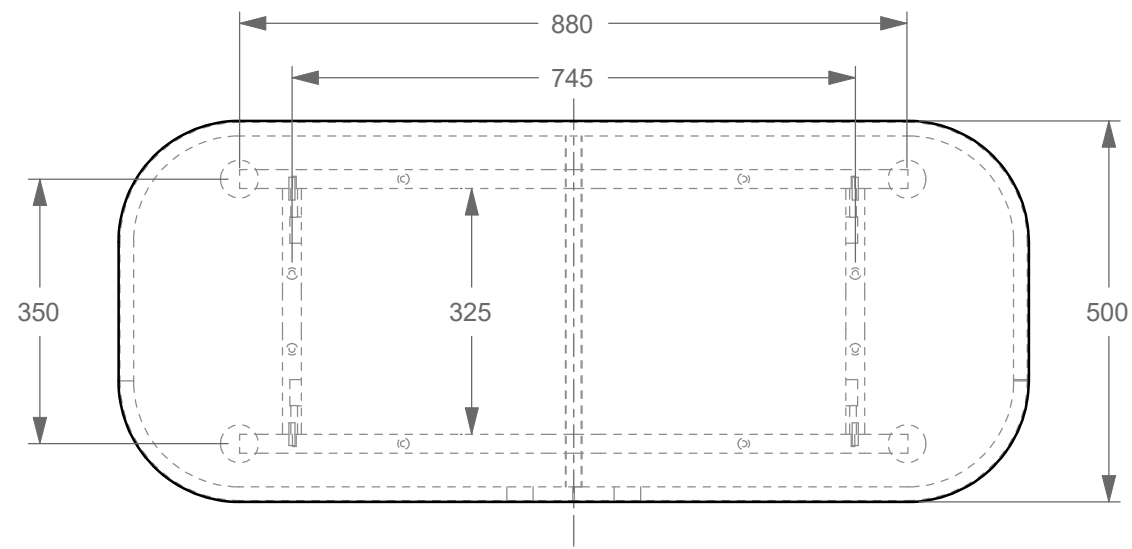
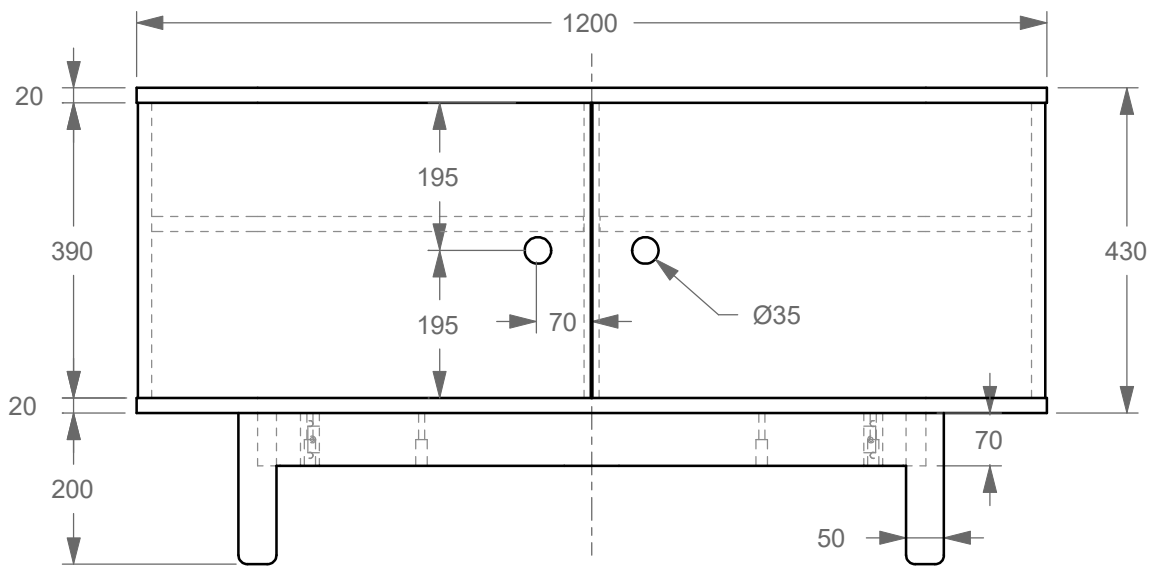
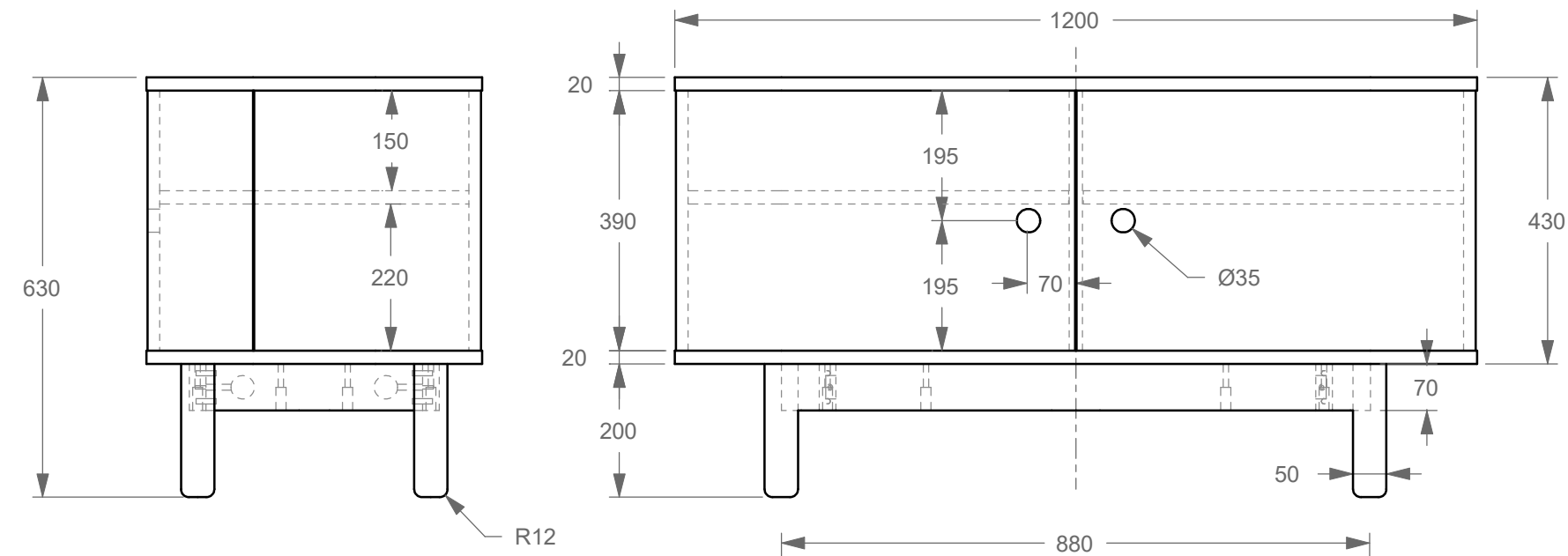
In more detail, the direct positive outcomes that the project has reached so far are the following:

- 1 The selected carpentry SMEs have understood what is needed for a good, secure, and efficient working environment. Their workshops have been rearranged for professional furniture production.
- 2 The carpenters have learned how to read technical drawings, build scale models, and replicate the same piece of furniture precisely.
- 3 The carpenters have been part of a design process, exploring their creativity and producing new furniture, without copying existing models.
- 4 The carpenters have learned a series of sophisticated techniques that they did not know before: making jigs, making a veneer lamination, making a round leg, making flat-pack furniture, reading technical drawings, making scale models, making non-visible joints, and making a high-quality finish, among others.
- 5 The SMEs have learned about sustainability, and flat-packing and seen the potential of getting orders and selling online to urban customers.
- 6 The local designer learned about sustainable wood alternatives.

The indirect potential impacts of this project phase includes:

- 7 A linkage between urban demand and rural supply has been created, but it is still weak. If nourished, it may create a very dynamic mechanisms for creating sustainable jobs and wealth locally (carpenters, tree growers, other value chain actors)
- 8 A possibility for self-accelerating behaviour change and education among local carpenters if they see that the new business of the trained carpenters lead to increased wealth (education can be made available online for any interested carpenter)
- 9 The beautiful furniture may shift buyer preferences towards sustainably grown and fairly Tanzanian made furniture, reducing the pressure on natural forests in Tanzania – which directly influences biodiversity.





Product, part	Sideboard		Date
N:o	220804-01	Scale 1:10 / A4	Version, changes
PFP 2 / Leapforg Projects FWITC, Mafinga			a
Drawn: Henri Judin / +255 67 826 42 86			b
			c
			d
		e	

# 2

## TECHNICAL DRAWINGS



# TECHNICAL DRAWINGS

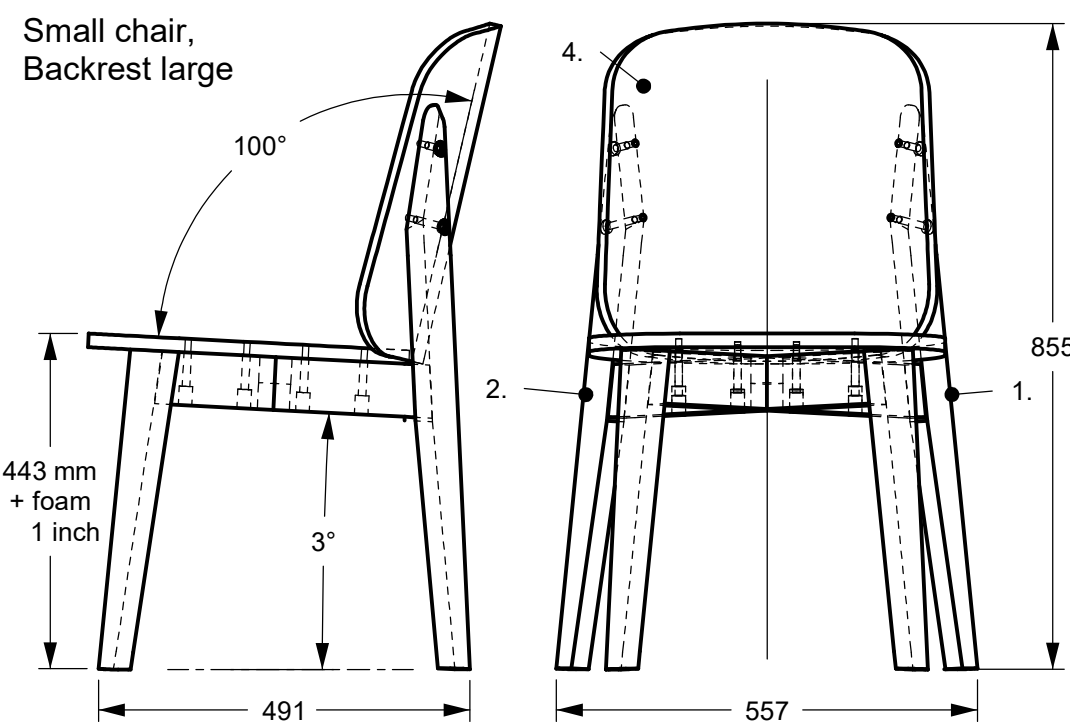
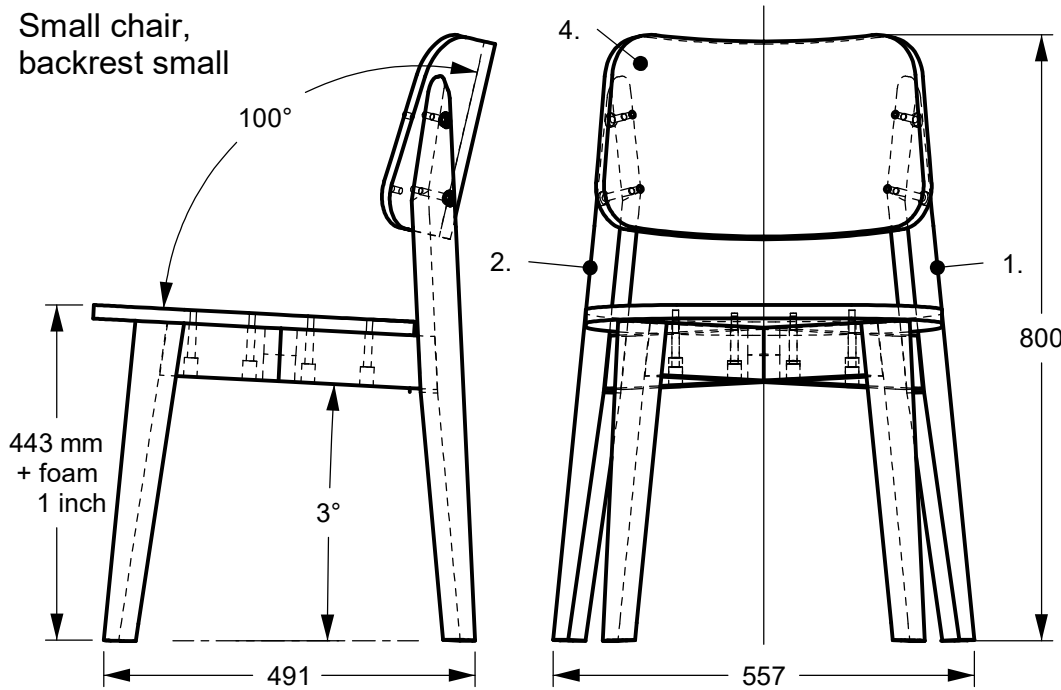
## IN THIS CHAPTER YOU WILL FIND:

CABINET (EARLIER PAGE)  
CHAIRS  
SOFA TABLES  
MODULAR SOFA AND CHAIR  
SOFA BED  
TEMPLETE EXAMPLES

The furniture series has been documented in a set of technical drawings and templates to print as tools for production. In this chapter we present a few of the drawings in English. The full set in English and in Kiswahili can be found in this Google drive folder:

[https://drive.google.com/drive/folders/1pkG6BrOQ1br-YL\\_gBQg5KQRZ7wvP1sgp?usp=sharing](https://drive.google.com/drive/folders/1pkG6BrOQ1br-YL_gBQg5KQRZ7wvP1sgp?usp=sharing)



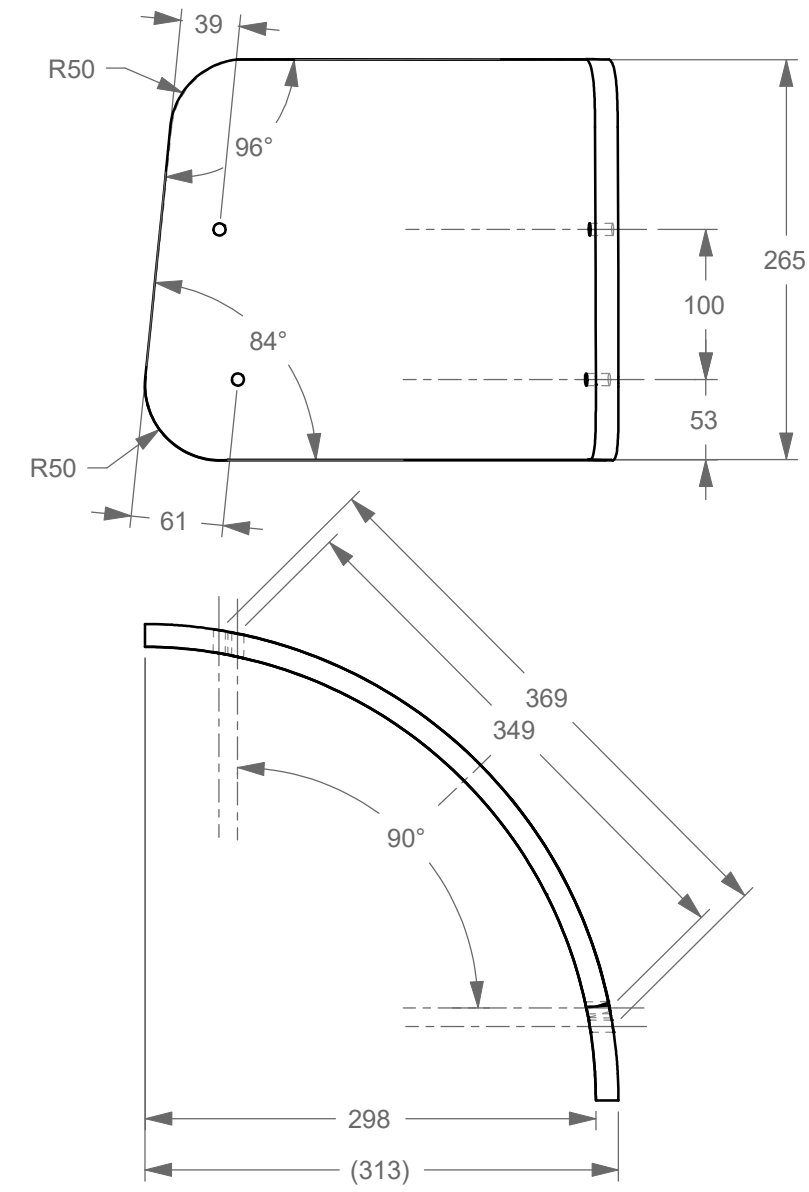
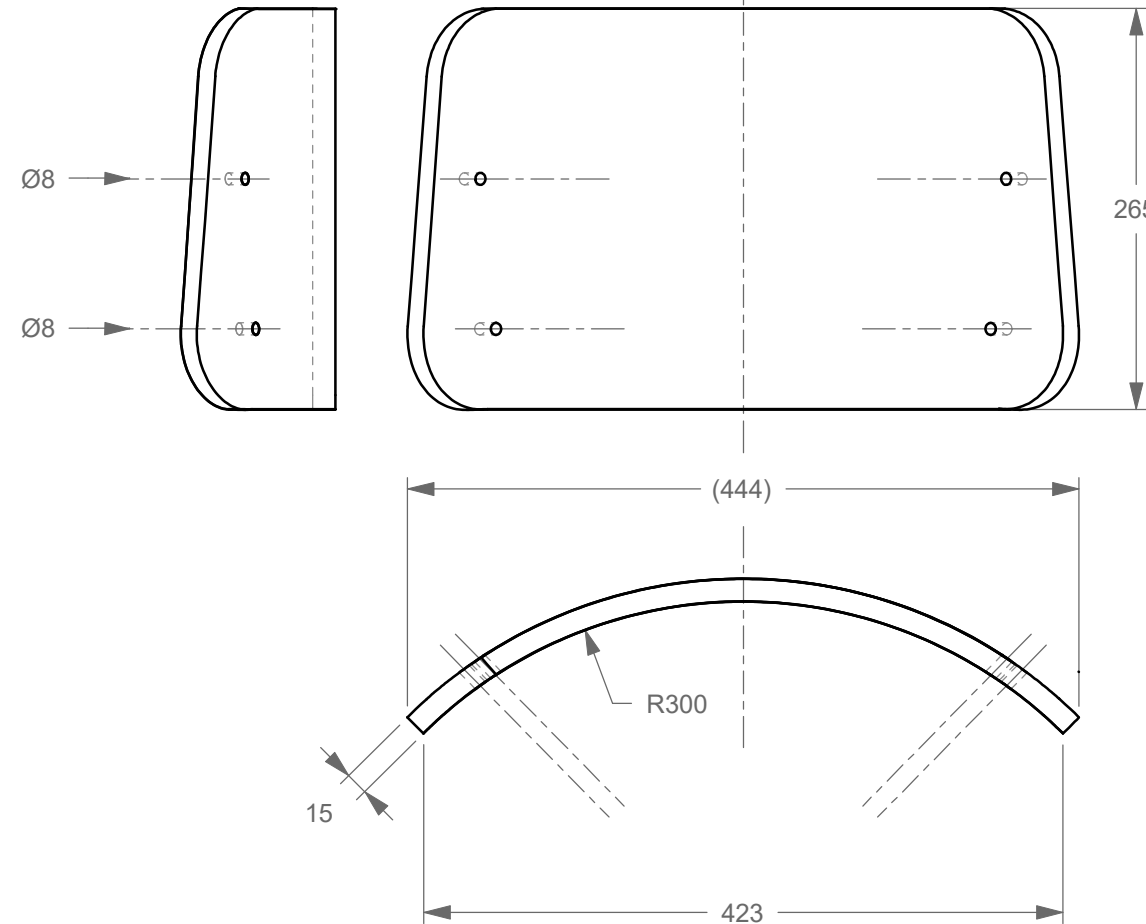
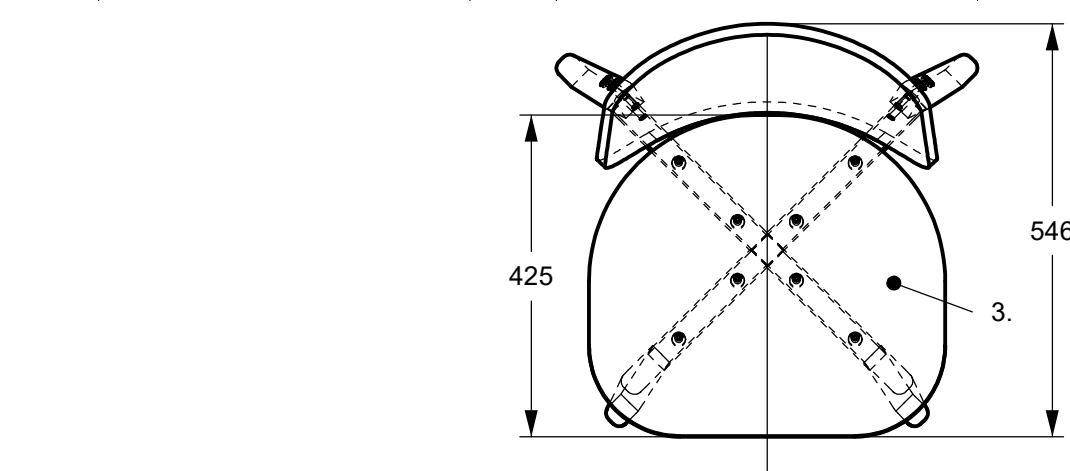
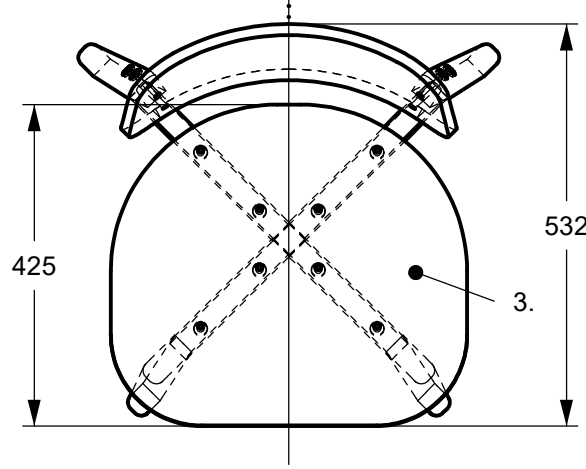


- all measurements in millimeters (mm)

- all sharp edges to slightly sanded (R~1)

- Assembly with furniture screws M6, flat head

- Backrest: 35 mm x 2
- Backrest: 60 mm x 2
- Seat: 60 - 85 mm x 8 (depth of the hole in stretcher according to the screw)



All measurements in millimeters (mm)  
All sharp edges to slightly fillet (R~1)

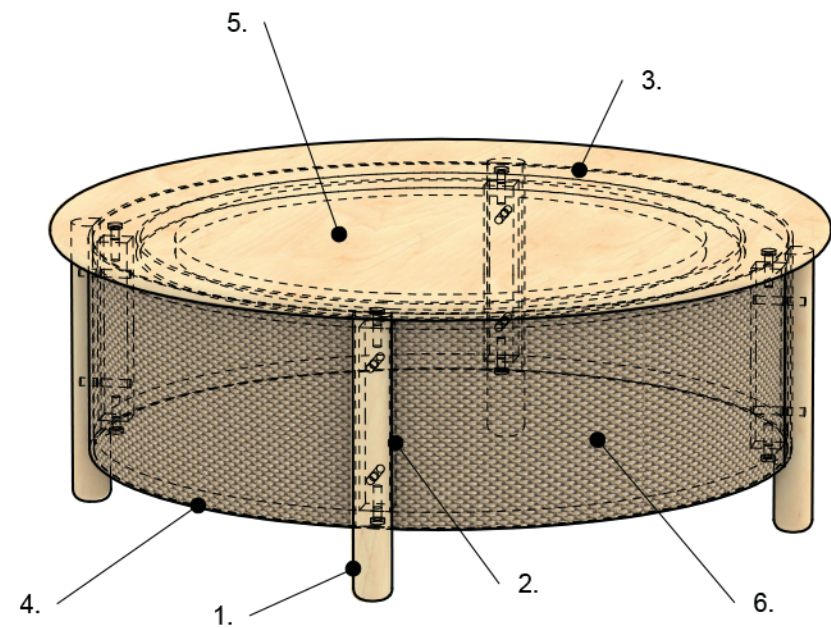
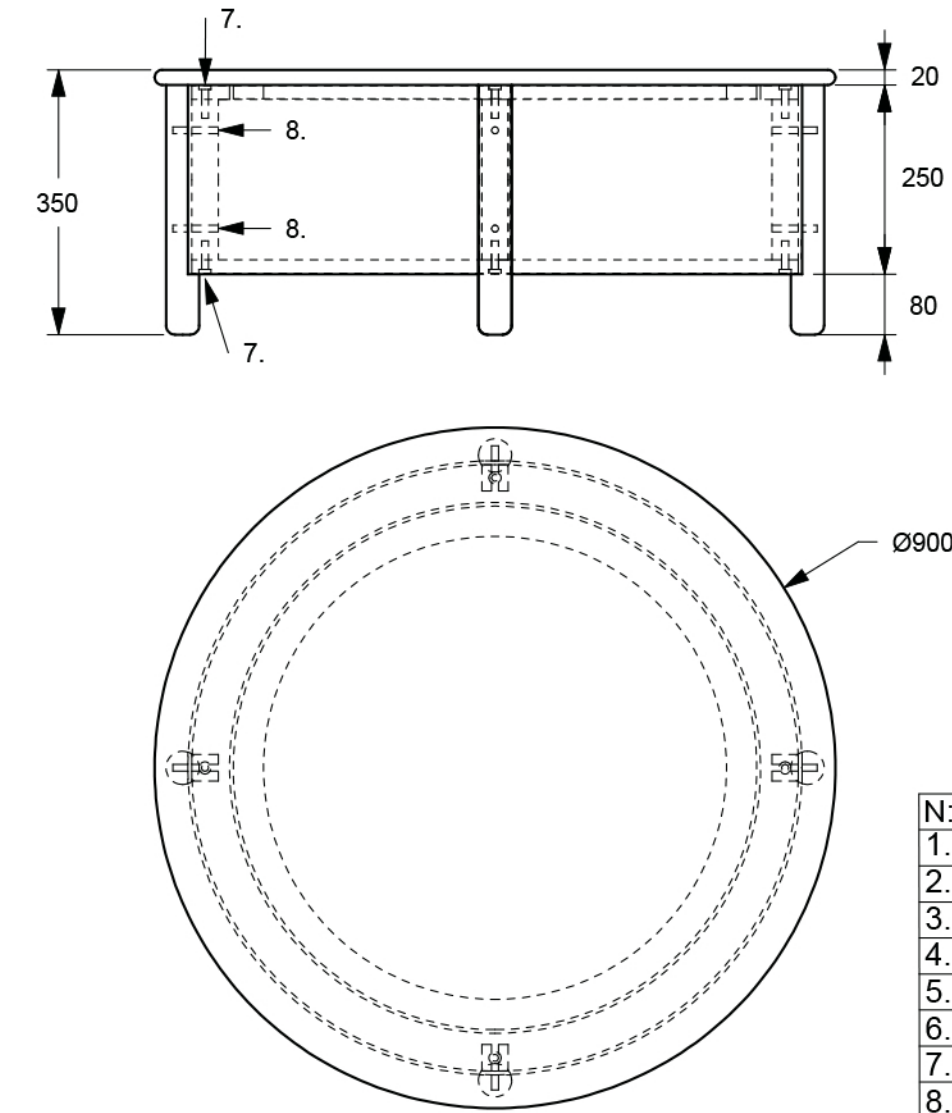
T-nut M6 into Ø8mm holes (4 pcs)

Product, part		Small chair, backrest small				Date
N:o	220819-06	Scale	1:5 / A4	Version, changes		19.8.2022
PFP 2 / Leapforg Projects FWITC, Mafinga				a		
				b		
				c		
				d		
				e		
Drawn: Henri Judin / +255 67 826 42 86						

N:o	Name	Assembly / Part	Draw. N:o	pc(s)
1.	Leg A	A1	220819-03	1
2.	Leg B	A2	220819-04	1
3.	Seat	P3	220819-05	1
4.	Backrest small OR	P4	220819-06	1
5.	Backrest large	P5	220824-02	1

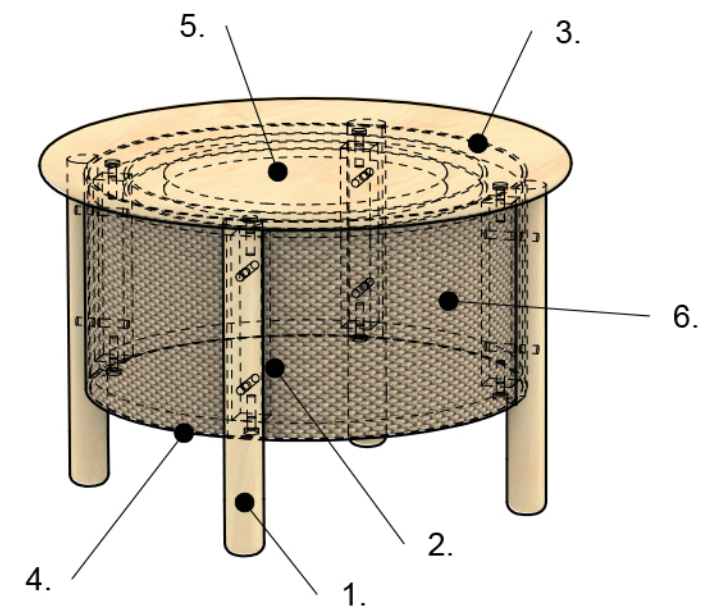
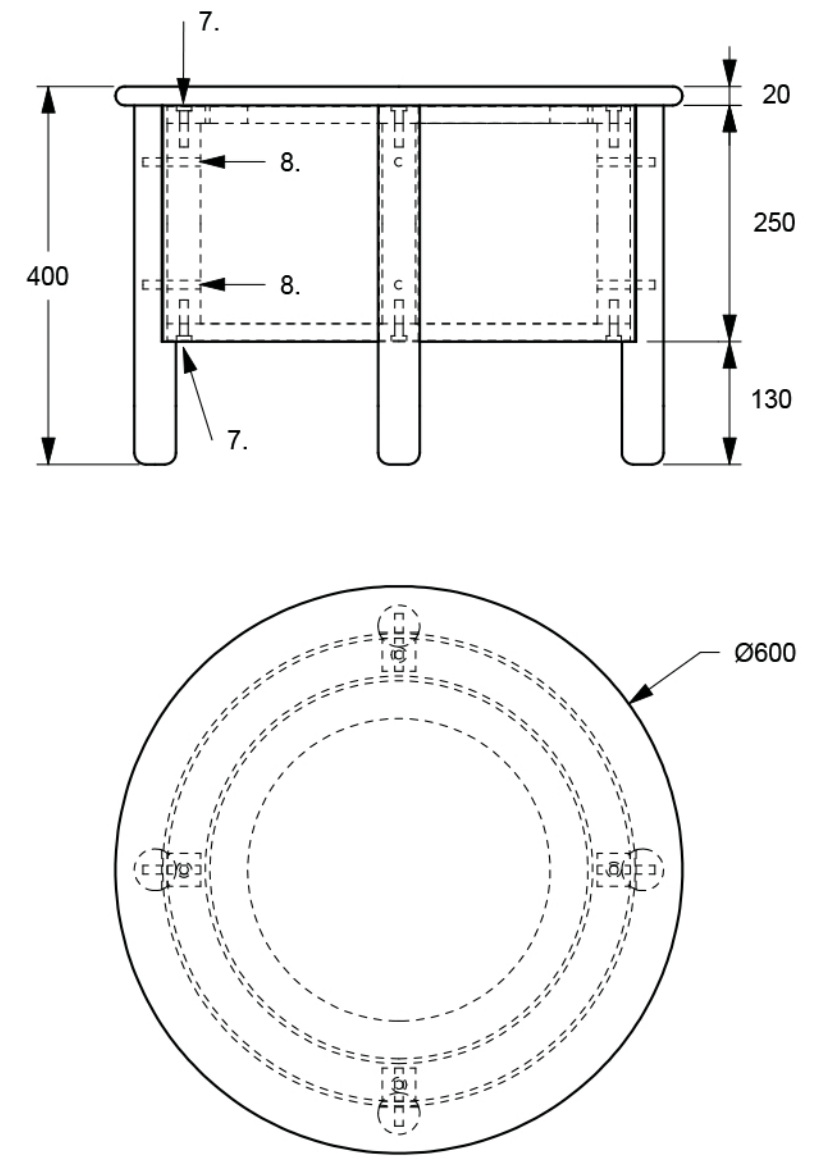
Product, part		Small chair		Assembly 0		Date
N:o	221117-01	Scale	1:10 / A4	Version, changes		17.11.2022
PFP 2 / Leapforg Projects FWITC, Mafinga				a		
				b		
				c		
				d		
				e		
Design & drawn: Henri Judin						





N:o	Name	Assembly / Part	Draw. N:o	pc(s)
1.	Leg for Ø900 table	Part 1	220810-02	4
2.	Vertical support	Part 2	220922-01	4
3.	Top ring for Ø900 table	Part 3	220810-01	1
4.	Bottom for Ø900 table	Part 4	220810-05	1
5.	Table top for Ø900 table	Part 5	220810-04	1
6.	Basket for Ø900 table	Part 6	220922-03	1
7.	M6 x 35 mm furniture screw, flat head			8
8.	M6 x 60 mm furniture screw, flat head			8

Product, part	Basket table, large Ø900		Assembly 1	Date
N:o	220922-02	Scale	1:10 / A4	Version, changes
PFP 2 / Leapforg Projects FWITC, Mafinga			a	
Design & drawing: Henri Judin			b	
			c	
			d	
			e	
Date				
22.9.2022				



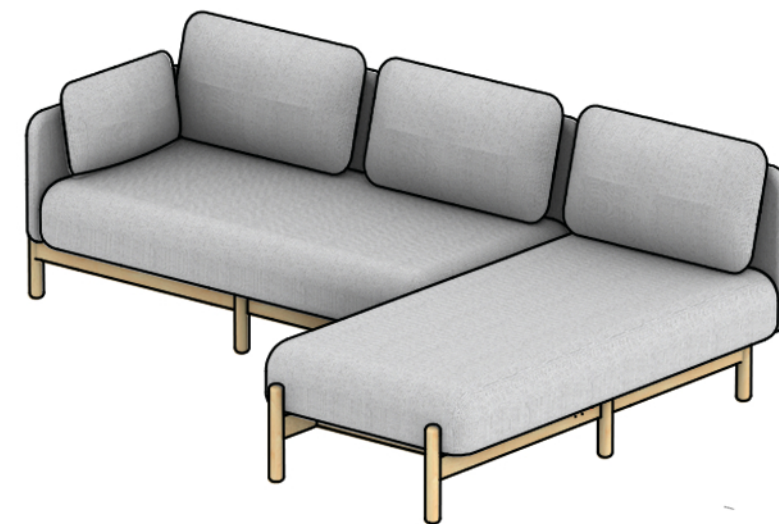
N:o	Name	Assembly / Part	Draw. N:o	pc(s)
1.	Leg for Ø600 table	Part 1	220810-02	4
2.	Vertical support	Part 2	220922-01	4
3.	Top ring for Ø600 table	Part 3	220810-01	1
4.	Bottom for Ø600 table	Part 4	220810-05	1
5.	Table top for Ø600 table	Part 5	220810-04	1
6.	Basket for Ø600 table	Part 6	220922-03	1
7.	M6 x 35 mm furniture screw, flat head			8
8.	M6 x 60 mm furniture screw, flat head			8

Product, part	Basket table, medium Ø600		Assembly 2	Date
N:o	220922-04	Scale	1:8 / A4	Version, changes
PFP 2 / Leapforg Projects FWITC, Mafinga			a	
Design & drawing: Henri Judin			b	
			c	
			d	
			e	
Date				
22.9.2022				





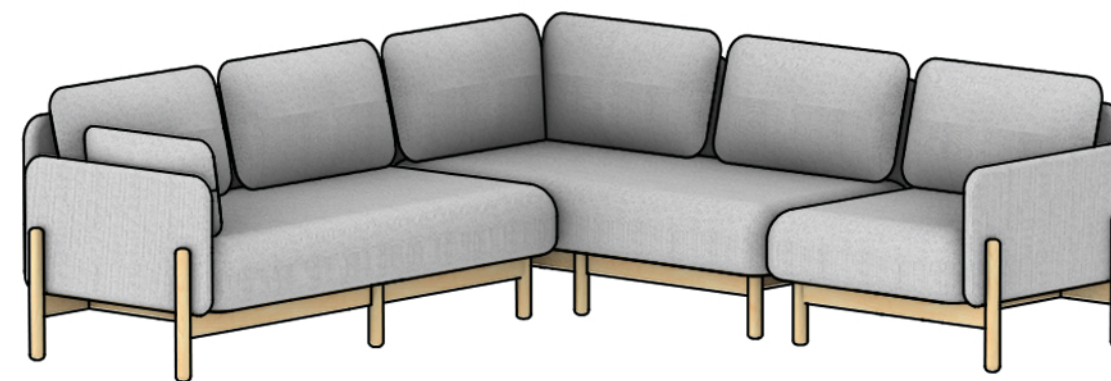
**ARMCHAIR**  
1-SEATER, LEG 4  
+  
**2-SEATER SOFA**  
2-SEATER, LEG 4



**SOFA WITH DIVAN**  
2-SEATER, LEG 3  
2-SEATER, LEG 2

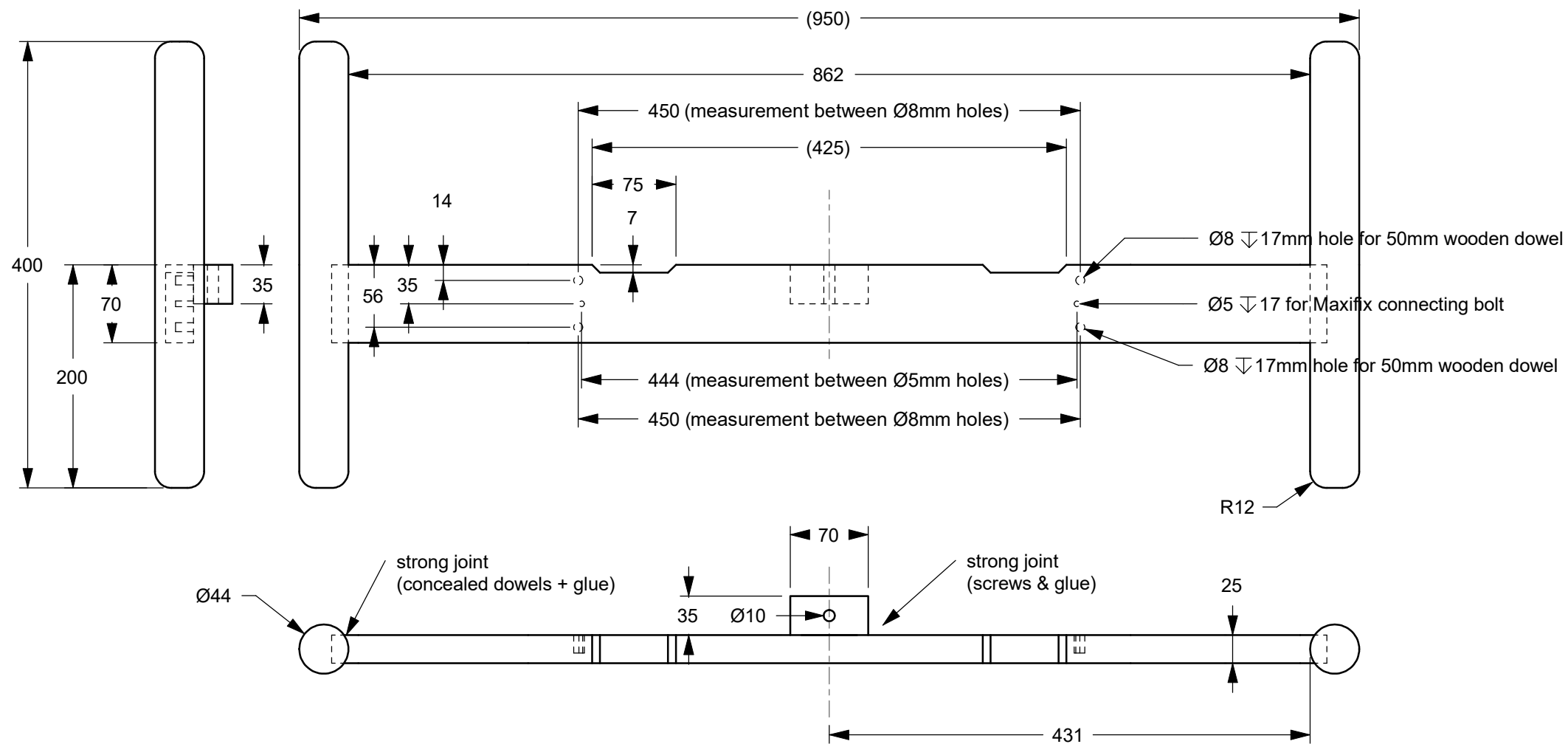


**3-SEATER SOFA**  
1-SEATER, LEG 3 x 2  
1-SEATER, LEG 1  
+  
**OTTOMAN**  
1-SEATER, LEG 1



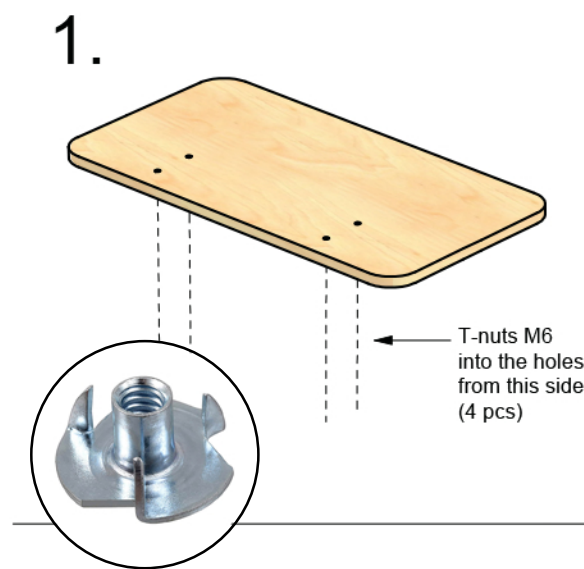
**CORNER SOFA**  
2-SEATER, LEG 3  
2-SEATER, LEG 1  
1-SEATER, LEG 3



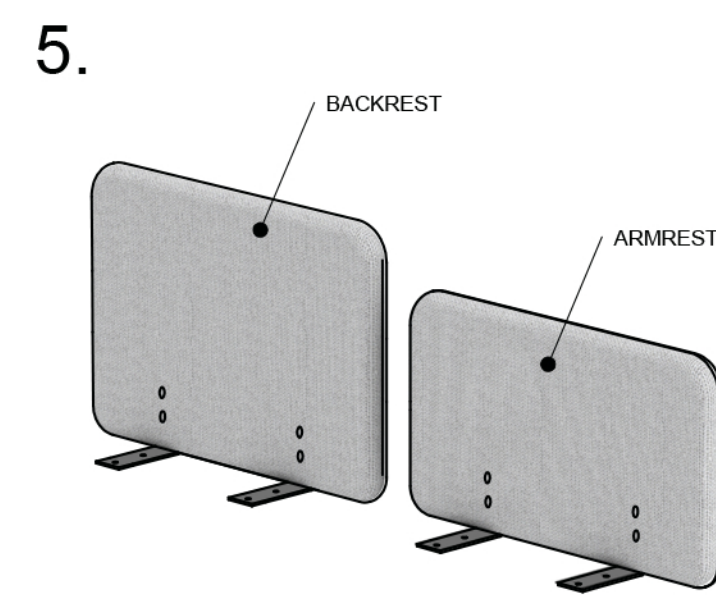
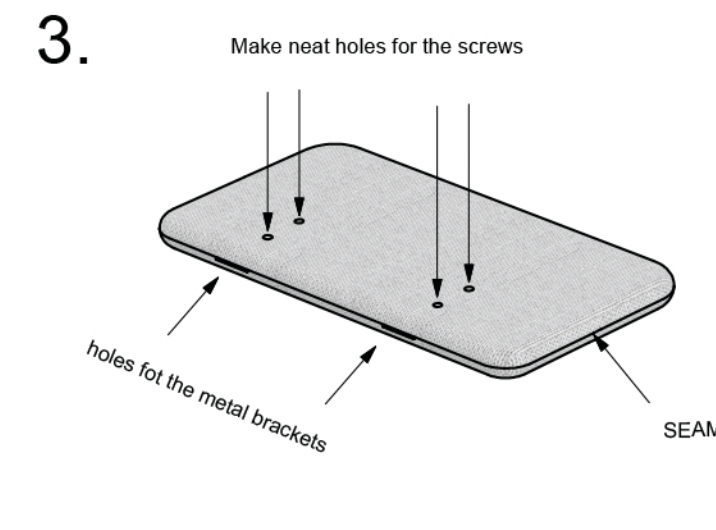
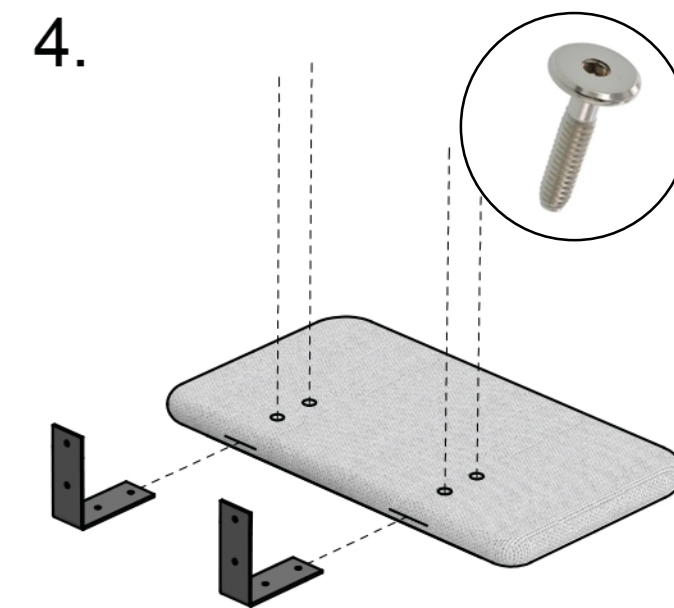
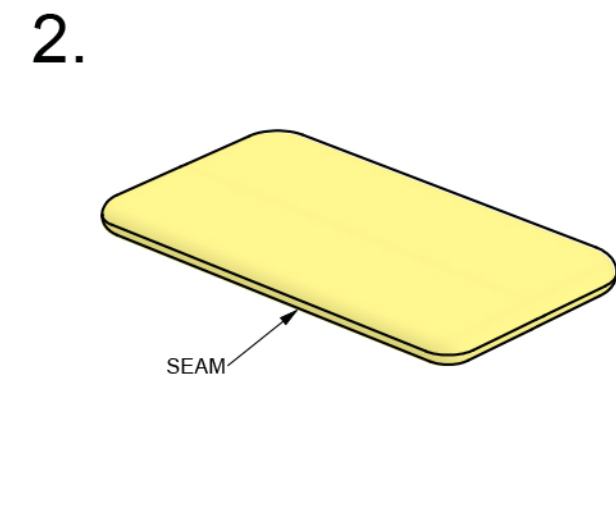


- 2 pcs / chair
- all measurements in millimeters (mm)
- all sharp edges to slightly sanded (R~1)

Product, part	Modular sofa, leg 4 - 1-seater (Armchair)	Part 4	Date
N:o	MS-02	Scale	1:5 / A4
PFP 2 / Leapforg Projects FWITC, Mafinga		Version, changes	13.6.2022
Design & drawn: Henri Judin		a New attachment holes	15.8.2022
		b	
		c	
		d	
		e	

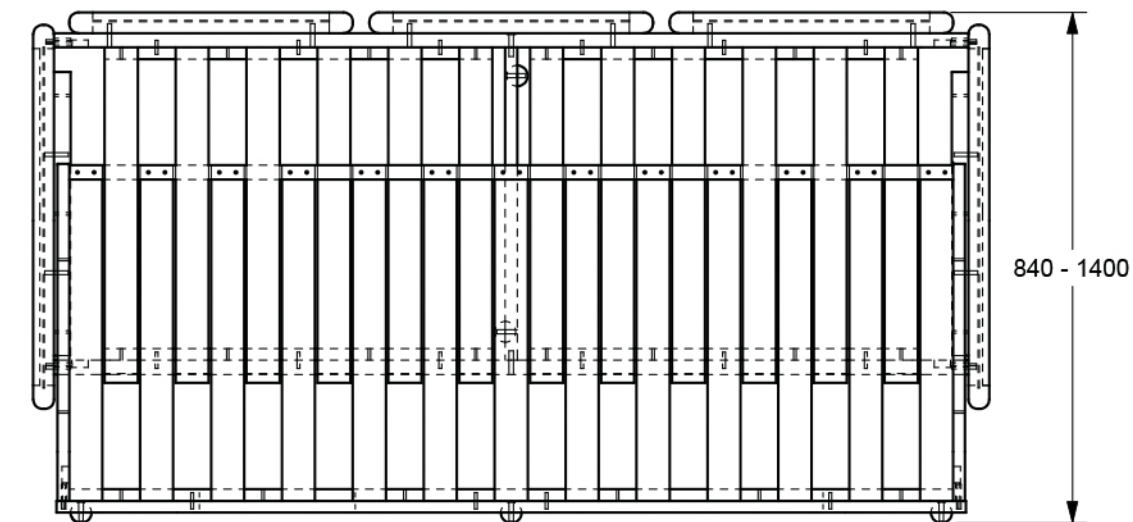
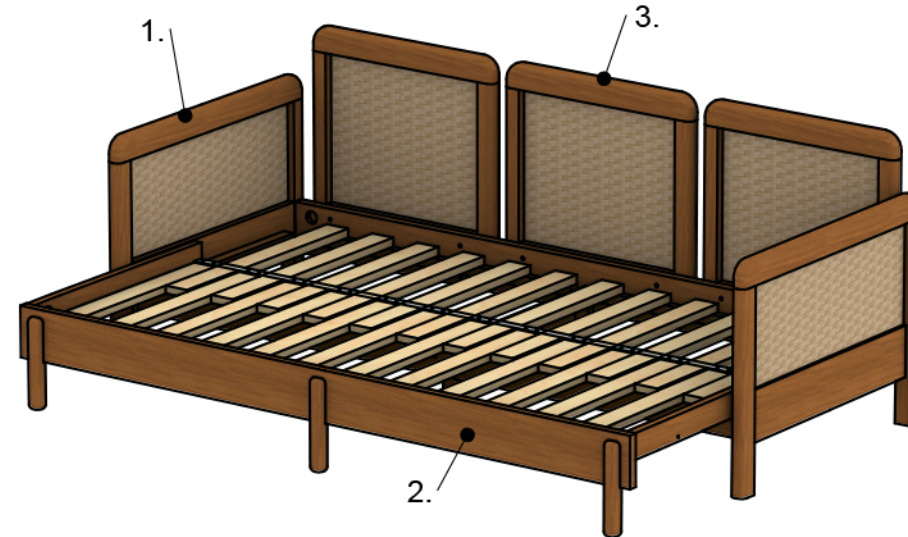
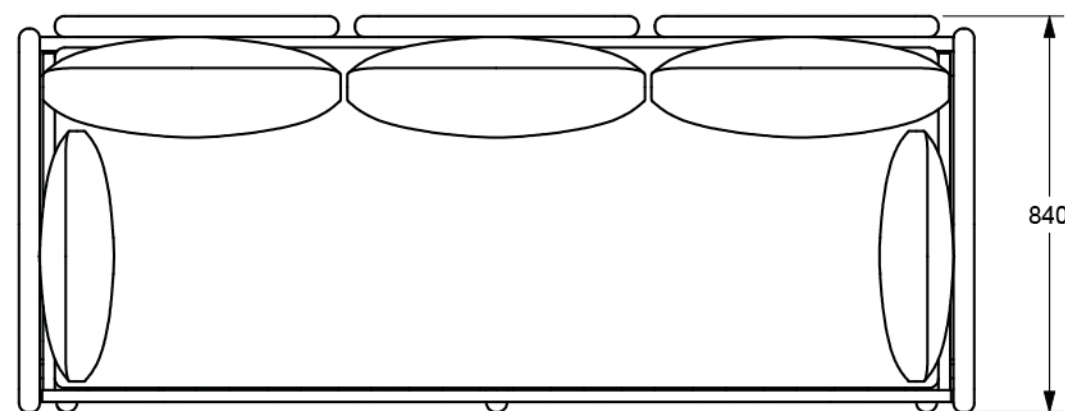
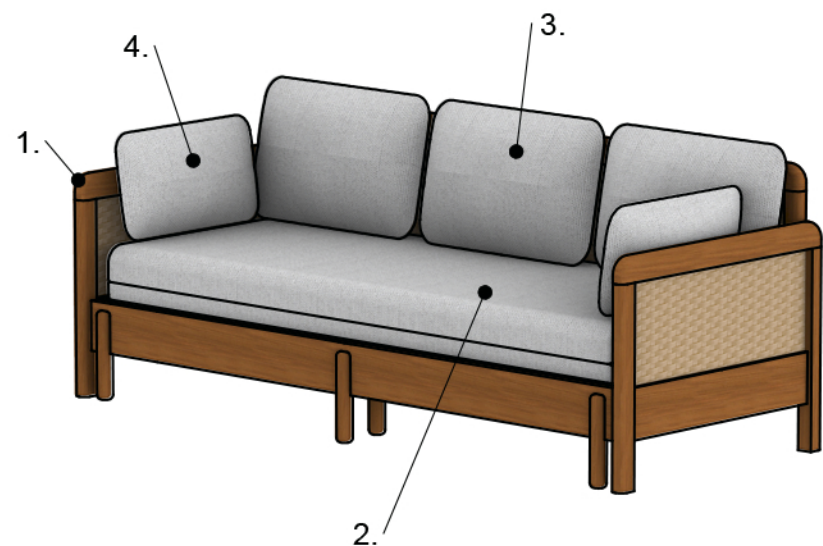
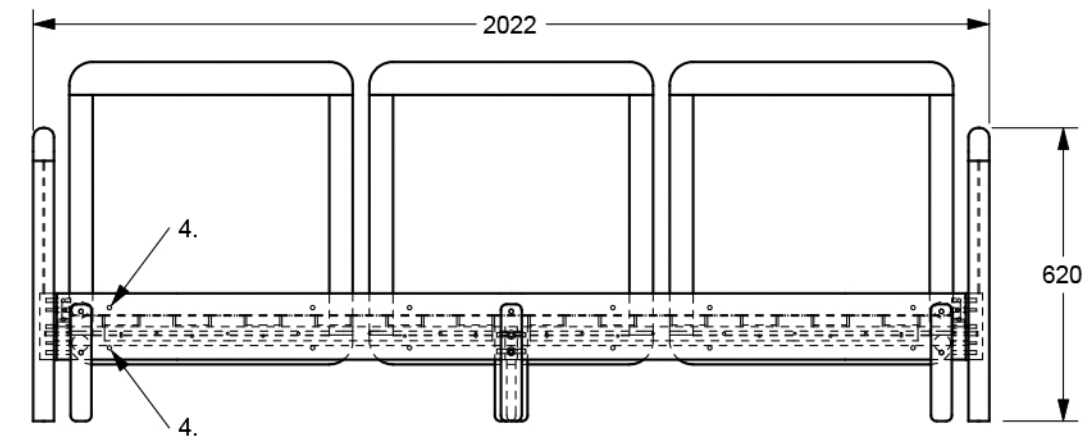
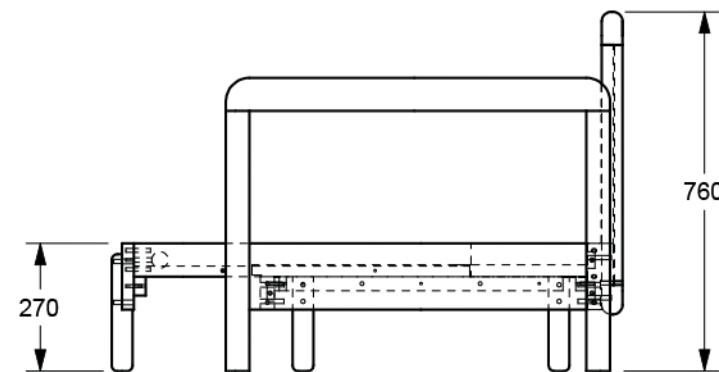
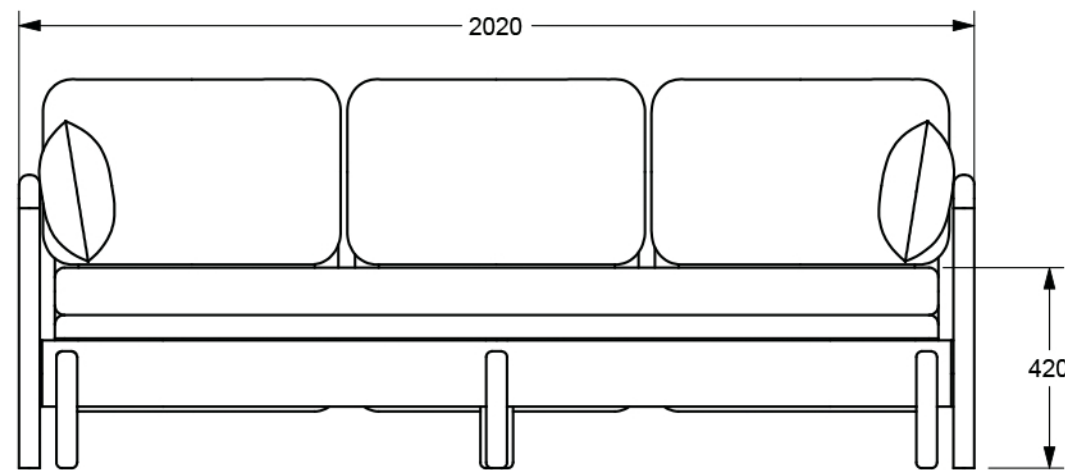
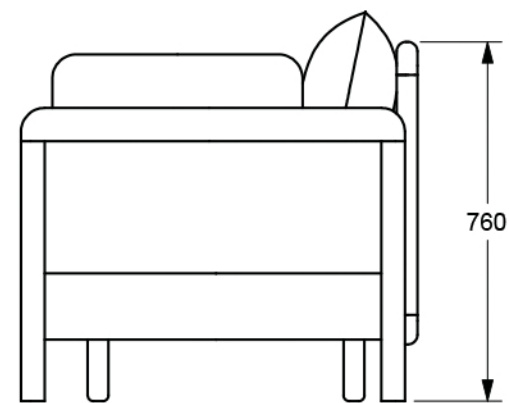


1. Make sure all the T-nuts are fixed
2. Apply 1,5 inch foam to both sides. One seam around the plywood
3. Apply the upholstery fabric. There is one seam around the shape. Make sure to leave holes for the metal brackets. Use a bracket to mark the screw holes.
4. The brackets are fixed after transportation with M6 x 25 mm flat head furniture screws (4 pcs)
5. The backrest and the armrests are upholstered the same way. Size of the backrest: ~ 700 mm x 500 mm x 50 mm Size of the armrest: ~ 700 mm x 400 mm x 50 mm



Product, part	Modular sofa, armrest and backrest upholstery	Date
N:o	220920-02	20.9.2022
PFP 2 / Leapforg Projects FWITC, Mafinga	Scale	-
Design & drawn: Henri Judin	Version, changes	
	a	
	b	
	c	
	d	
	e	





Components:

N:o	Name	Assembly / Part	Draw. N:o	pc(s)	other
1.	Frame	Assembly 1	220726-11	1	
2.	Mattress	Part 16	221005-01	1	Upholstery: Draw.No: 221005-03
3.	Backrest	Part 17	221005-02	3	Upholstery: Draw.No: 221005-03
4.	Armrest	Part 17	221005-02	2	Upholstery: Draw.No: 221005-03

Product, part	Sofabed	Assembly 0
PFP 2 / Leapforg Projects FWITC, Mafinga Design & drawing: Henri Judin		
N:o	221005-04	Date
Scale	1:16 / A4	5.10.2022
Version, changes		
a		
b		
c		
d		
e		

Components:

N:o	Name	Assembly / Part	Draw. N:o	pc(s)	other
1.	Frame half	Assembly 2	220726-06	1	
2.	Extension frame	Assembly 3	220726-07	1	
3.	Backrest	Part 15	220729-01	3	

Fasteners:

4.	Fastening the backrests	M6 x 45 mm	12	
----	-------------------------	------------	----	--

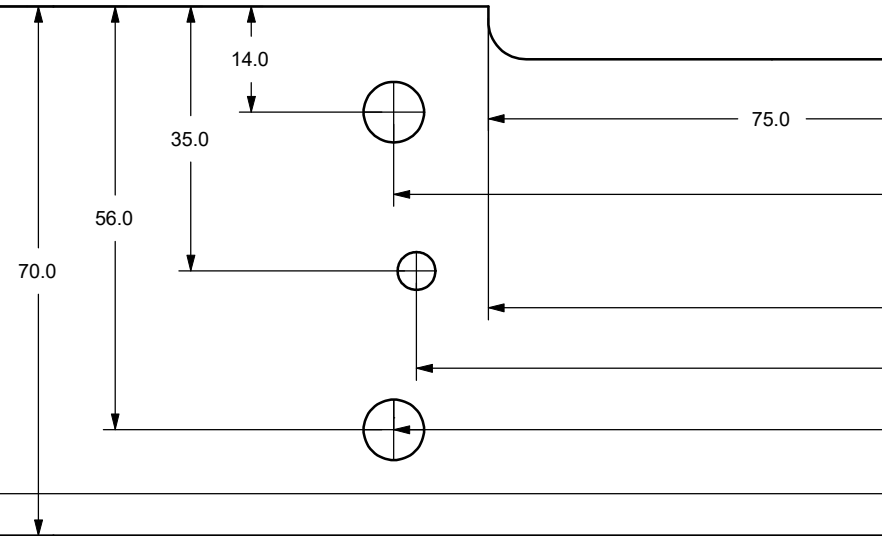
Product, part	Sofabed, frame	Assembly 1
PFP 2 / Leapforg Projects FWITC, Mafinga Design & drawing: Henri Judin		
N:o	220726-11a	Date
Scale	1:16 / A4	26.7.2022
Version, changes		3.10.2022
a	new structure	
b		
c		
d		
e		



TEMPLATE  
Modular sofa, 1-seater - leg 4  
(Armchair)

Scale 1:1 / A4 (4 pcs)  
Draw.No: 220613-04 / Part 4  
Material thickness 25 mm

NB! When printing, tick 'Print in actual size'

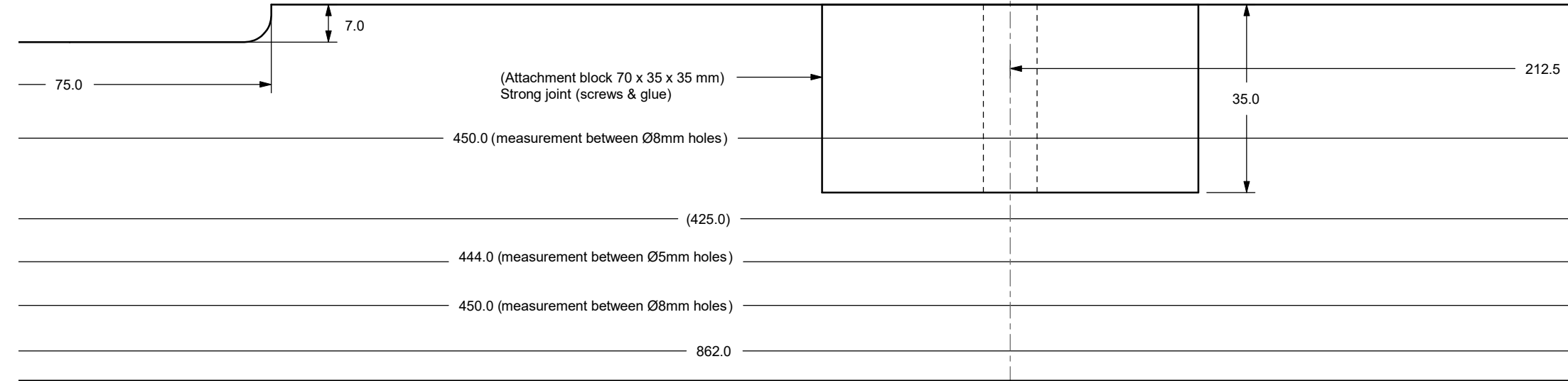


A

A

A

A



B

B





# 3 PHOTOS OF THE PROTOTYPES



# PHOTOS OF THE PROTOTYPES

## IN THIS CHAPTER YOU WILL FIND:

CABINET  
SOFA TABLES  
SOFA BED  
CHAIRS  
MODULAR SOFA AND CHAIR

So far the furniture collection consist of a modular sofa set, a sofa bed, two different dining chairs, a cabinet, and sofa tables. The next pieces to be developed are a bed (based on the sofa structure) a higher cabinet, and a dining table.

We photographed the prototypes in the end of the project. There is a set of photos taken in nature and another set in studio settings. The full set of photos can be found in this Google drive folder:

<https://drive.google.com/drive/folders/1aMejBJBVhvgYaJNp6h9uaN-jcfTE8-ff8?usp=sharing>

The instruction videos for carpenters can be found in this Google drive folder:

<https://drive.google.com/drive/folders/1C-LHZ4sEp5SZLK6tNDTEcFhOx-WNC16gi?usp=sharing>





















# CONCLUSION

If/When this systems innovation comes to full play, it will ensure the long-term presence of sustainably planted forests in the Southern Highlands with significant impact on both carbon sequestration and poverty reduction. Moreover, a close loop city-regional value chain increases resilience in Tanzania, as global value chains are increasingly fragile.

For it come to full play, we note that more support is needed, especially in ensuring that the start-up is able to do its part, the carpenters are supported in their learning and that the governance structure and value-chain enhancement is continued.





LEAP PROJECTS