Remain

a **sofa** with focus on longevity

LUND UNIVERSITY

Degree Project for Bachelor of Fine Arts in Design

Main field of study: Industrial Design

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a sofa with focus on longevity

by *Ellen Hallström*

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Sammanfattning

I detta kandidatprojekt undersöker jag hur soffor kan uppnå längre livslängd genom cirkulär design. Projektet följer stegen i en klassisk designutvecklings-process, från efterforskning och idégenerering till en slutlig prototyp. Resultatet, *Remain*, är en modulär soffa som kan monteras, demonteras och återmonteras vilket möjliggör återanvändning, reparation, renovering och återvinning.

Abstract

This Bachelor's degree project investigates how sofas can reach longer life span through circular design. It follows the steps of a classic design development process, from research and ideation to a final prototype. The result is *Remain*, a modular sofa that can be assembled, disassembled and reassembled multiple times enabling reuse, repair, refurbishment and recycling.

Keywords: Sofa, furniture design, circular design, longevity, Design for Disassembly, modularity

Table of content

Synthesis

Final result

Sources

INTRODUCTION

Acknowledgements

This project was carried out at *Lund University School of Industrial Design*. As a student there I am thankful to have had such a creative and allowing place to learn and work in. I would like to thank Charlotte Sjödell who supervised this project together with the other supervisors, as well as my classmates and the workshop staff. Thanks to these people I felt both challenged and supported throughout the project.

Finally, I would like to thank the people I reached out to and who shared with me their expertise: the people at *Erikshjälpen*, *SYSAV*, *IKEA*, and three kind furniture upholsterers.

Thank you!

Background

This project started with a personal desire to understand how today's furniture industry can become more circular and how I, as a designer, can make conscious decisions to support it. Each year, the EU accounts for 10.78 million tonnes of furniture waste, 80% to 90% of it is incinerated or sent to landfill, with 10% being recycled. Reuse and repair activities occur, but are very low in relation (*European Environment Bureau*, 2017).

Transitioning to a circular economy entails a systemic shift in which designers can play a valuable part. The circular model involves reusing, repairing, refurbishing and recycling products and materials as long as possible instead of wasting them. But this behavior must be embedded within the design. If the design does not allow for, encourage or instruct the user on how to do it, it is less likely to happen.

The aim of this project is to design a long-lived piece of furniture that has a good chance of staying in the loop.

Initial brief

Design a piece of furniture that fits into a circular economy.

motivation

analysis

synthesis

evaluation

realisation

Method

The procedure in this project follows a typical design process and the report is composed of five parts: motivation, analysis, synthesis, evaluation and realisationon. In the first half, I look at today's challenges and how to meet them. I consider the motivation for applying Design for Disassembly and then identify the key principles when it comes to sofa design. In the latter part, which is more practical, I apply the Design For Disassembly method to evaluate and develop my own sofa design.

The design process is built on research through reading articles, reports, listening to users and reaching out to experts. Continuous discussions with my supervisor and engaged classmates helped me make decisions through the project. The final product is a result of the research as well as ideas developed through sketches, mockups, material tests and prototyping both physically and digitally.

Project timeline

Research
Week 1

- Project description
- Procedure
- Time plan
- Motivation

Analysis
Week 2

- Interviews
- Design for Disassembly principles
- Needs & requirements
- Scenarios

Synthesis
Week 5

- Concept generations
- Material & construction
- Mockups / tests
- Evaluation

KICK OFF

Week 8

Final concept

Full-scale mockup

User journey

Presentation

Week 12

Feedback

Adjustments

Exhibition

Report

Realisation

Week 9

Detailing

Visualization:

Full-scale prototype

3D renders

The furniture industry today

Every year 10 million tonnes of furniture are discarded by businesses and consumers in the EU. According to a report by the *European Environment Bureau* 80% to 90% of the EU furniture waste is destined for incineration or landfill, with only 10% being recycled (2017).

Today's way of doing things highly rely on a linear process where humans extract materials from the Earth, turn them into products and after a while throw them away as waste. The *Ellen MacArthur Foundation* calls it a "take-make-waste system".

TAKE

MAKE

linear economy process

REUSE

REPAIR

REFURBISH

RECYCLE

circular economy process

Moving towards a circular economy

When it comes to furniture, the most critical issue to overcome is the huge amount that end up as waste. In a circular economy, the waste is seen as a resource that, through different ways of recovery, can flow within a closed material loop. These ways or steps of recovery are referred to as the four R's: reuse, repair, refurbish and recycle. The R's can also be arranged in a waste hierarchy in which they ranked from most to least environmentally preferred. For example, the hierarchy places greater emphasis on reducing and reusing than recycling and composting (Barreiro-Gen & Lozano, 2020).

According to the *Ellen MacArthur Foundation*, an important part of the designer's job becomes to make products that encourage and allow for these behaviors. For example, if a product is difficult to move it is less likely to be sold on a second-hand market, if single components can not be replaced the product might not be worth repairing and if materials are not separable they can not be sorted and recycled.

How products are designed is at the heart of the circular economy, states the foundation. It determines the whole sequence from how a product is manufactured to how it is used, and what happens with it after. Once things are designed, it is difficult to reverse, but with circularity in mind during the design process, the creation of waste can be prevented right at the start.

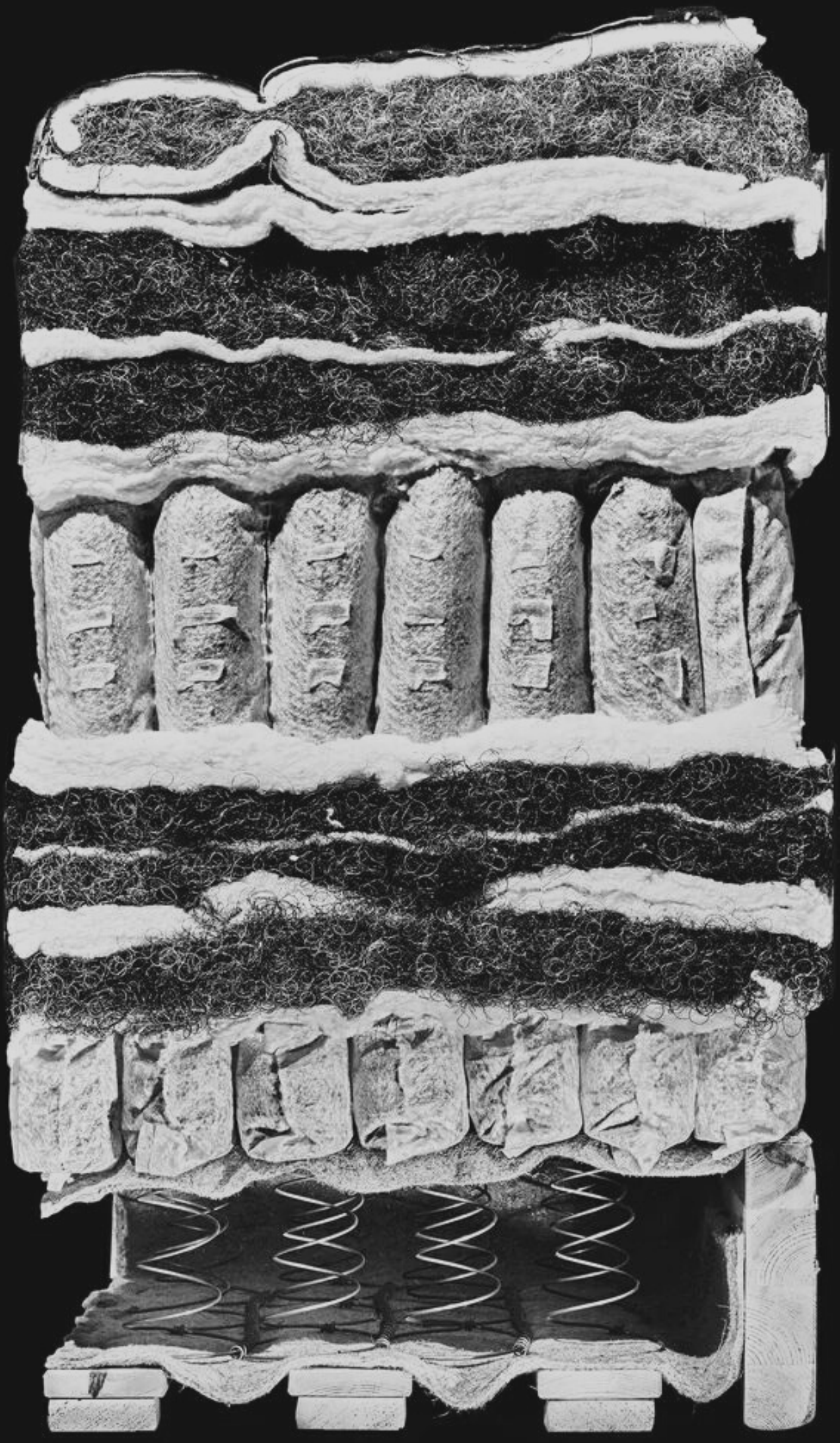
Upholstery furniture

Upholstery is a combination of materials such as fabric, padding, webbing, and springs that together make up the soft coverings of chairs, sofas, and other furniture. According to the *European Environment Bureau* (EEB) today's upholstery is problematic due to the high cost of repair and refurbishment and difficulty when it comes to separation of materials and thus recycling (2017).

Between the years of 2009 and 2019 the Swedish consumption of household furniture increased with 47% which makes it the most expansive category of all consumer categories according to the *Swedish Society for Nature Conservation* (*SSNC*). At the same time, the second-hand market is becoming increasingly more important in order to keep furniture alive. One of their reports highlight the importance of reuse and compare the climate and environmental impact of new versus reused furniture. They bring up sofas as an example of a product that needs to stay in use for a longer time. Buying a new sofa gives rise to 300 kg CO2e emissions and just over 530 kg of total waste which corresponds to buying six sofas second-hand (2021).

The climate impact of buying a new sofa corresponds to buying six sofas second-hand.

Swedish Society for Nature Conservation (*SSNC*)



MOTIVATION

Updated brief

Design a sofa with focus on longevity.

A conversation about the recycling of sofas

SYSAV is a Swedish company that recycles and treats waste from households and industries. At their recycling centers people can dispose of anything from old Christmas trees to hazardous chemicals.

Rustan Nilsson, Envirormental Educatoror at *SYSAV*, is very familiar with sofas and other upholstered furniture such as beds and mattresses through his work. "The general sofa is a typical example of a non-circular product due to a worthless design", he says. "Sofas are made from several materials that are not easily separated. When upholstered furniture arrive at the recycling center it is sorted as bulky waste by the consumer and then crushed by large machines. The metal suspension is picked out to be recycled but all the rest is incinerated", Rustan explains.

I ask him: what would happen if the sofa could be dismantled into padding, textile, wood and metal? "First of all, the dismantling has to be done by the owner since work environment rules do not allow *SYSAV* workers to touch the furniture, they can only direct and promote the people who come. When it comes to recycling, the only difference would be that the wood can be shredded and turned into wooden chipboard", he answers. The padding and textile would still be incinerated.

What if someone comes in with a sofa that is completely compostable? "The answer is that the whole thing would be incinerated anyway", Rustan tells me. "*SYSAV* guaranties a certain quality of the compost we sell and therefore furniture can not go in it. Even if the furniture is free from toxic chemicals, how can we be sure of that? Also, there is no time to treat each piece of furniture separately."

Rustan also points out that many people discard of there sofas even if they are in a good or decent condition. This means that sofas are not managed in accordance with the waste hierarchy, with reuse failing to be prioritized over recycling (personal communication, February 10, 2022).

" The general sofa is a typical example of a non-circular product due to a worthless design. "

Rustan Nillson
Envirormental Educatoror at *SYSAV*

A conversation about a circular IKEA

As Sustainability Developer at *IKEA*, Per Stoltz takes part in the world's largest furniture retailer becoming a circular company. This means a total shift of their business model, and one key to the puzzle is to change the way they design products.

In our conversation, Per Stoltz, brings up *IKEA*'s eight circular design principles as a framework on how to design. But he also points out that there is no universal solution for circular product design since different products come with different possibilities and demands. Therefore it is about figuring out what is crucial for the product you are working with. "Principles that apply on a sofa will not apply to a toilet brush for example", he points out.

One circular approach is to look at products as services where companies do not sell the ownership but the usage of a product. But this can be a challenge due to currant attitudes, meaning not everyone is ready to rent or lease instead of own, he explains. "It works for some products such as cars and in some contexts such as business to business. When it comes to beds and sofas in a private home the consumer market is not ready, both due to hygienic reasons and the perception of it being more expensive. It might work for students or people who live in a place temporarily."

Another way to create reuse within a business, which *IKEA* is doing, is through buying back furniture from customers to sell again. Since this happens physically the product has to allow for it to be brought back. *IKEA* has long been famous for flat-packaged products that can be assembled at home, but not necessarily that can be disassembled and reassembled multiple times. To create fittings and constructions that allow for this becomes an important part of their future design.

Sometimes the design intention is good but does not go all the way through the chain, Per points out. Many years ago *IKEA* designed a sofa that could be cut apart with a pair of scissors as a way to help the user sort and recycle it. The problem was that neither the user nor the people working at recycling centers knew of this so in the end it did not happen. This highlights the importance of communication (personal communication, February 24, 2022).

" There is no universal solution when it comes to circular design. "

Per Stoltz
Sustainability Developer
at *IKEA Retail Services AB*

Experiences from a large second hand chain

Throughout the project I have been in contact with one of Sweden's largest second-hand chains, *Erikshjälpen*, asking them about their experience of selling sofas second-hand. Here are some of the answers provided by two of their furniture experts (personal communication, Mars 24, 2022).

What types of sofas are difficult for you to handle and why?

"It's really only large divan sofas and corner sofas that are a bit awkward. Due to their shape an size they take up a lot of space, both in the store and warehouse. Sometimes during transportation we need to remove the armrests to fit a sofa into an elevator which is not very convenient."

What types of sofas are more difficult for you to sell and why?

"Sofas from the 80's and 90's, with outdated patterns or strong colors, are difficult to sell."

When and why do you decline a sofa?

"When they are dirty, smell bad, worn or broken. By experience they do not sell and we also need to be able to set a fair price or there will be no development aid money left in the end."

What happens with sofas that do not get sold?

"A sofa can stand in our store for four weeks, if not sold by then we send it to another of our stores. If it is still not sold we send it to the recycling station or send it to our partner company in Estonia. We only send it to Estonia if the sofa is considered very good and depending on space."

What common damages do you encounter when it comes to sofas?

Generally, we see stained, damaged or worn textile covers and deformed back or seat pillows.

The last question was further elaborated on by a supervisor at *Erikshjälpen*'s transport department. It is the transport department which accepts or denies furniture and their policy is: "whole and clean".

Which good/bad sofa features do you look for?

- Higher quality materials always seem to age well and be resellable.
- Wider legs do not break as much as thin legs.
- Textile: smoke-resistant, water-resistant, animal-smell resistant: most things do not get picked up if they are stained, broken or smell.
- The covers should be washable.
- The cushions need to be strong and firm because they tend to loose shape and sink in.
- Oil from hands and head should be taken into consideration. With multiple use the sofa will quickly get a "used" feeling, and you can see where the person continually rubs their head or hands.

Asking questions to people selling sofas via an online second hand platform

In order to find direct targets to talk to and specific reasons to why people sell or give away their sofas I turned to Facebook's online second hand platform, *Facebook Marketplace*, and asked private sellers why they were disposing of their sofas .

I found that the people who gave their sofas away for free were doing it for two primary reasons. Some were in the middle of moving and could not bring their old sofa to their new home due to size and transportation. Others had sofas that were clearly damaged, worn or out of style and were hoping for someone to take care of the sofa for them.

The people who wanted payment for their sofas were often tired of them, not pleased or also moving. One woman selling a previously bought sofa told me that her family had grown from two to four and thus they were in need of a larger one. (personal communication, Mars 2-18, 2022).

" It's recently purchased and sparingly used, but we want a larger one. "

- Private sofa seller

" I am not even sure this sofa would fit in the elevator at our new place. "

- Private sofa seller

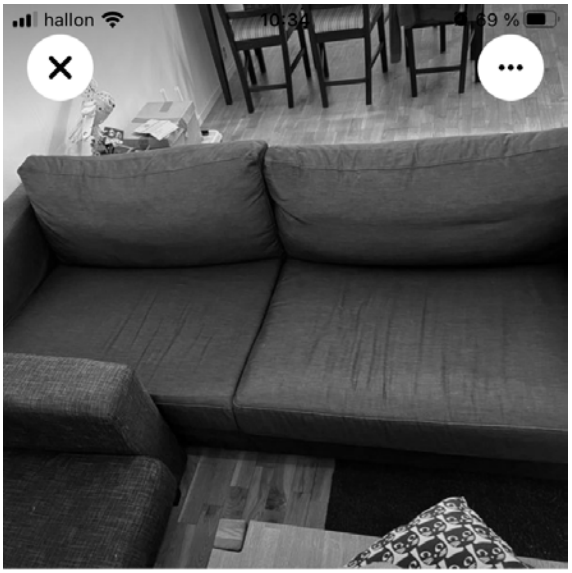
" If no one picks it up by the end of the week, it will go straight to *SYSAV*'s recycling center. "

- Private sofa seller

" I am giving it away for free because I don't have a driving license and don't know what to do with it otherwise. "

- Private sofa seller

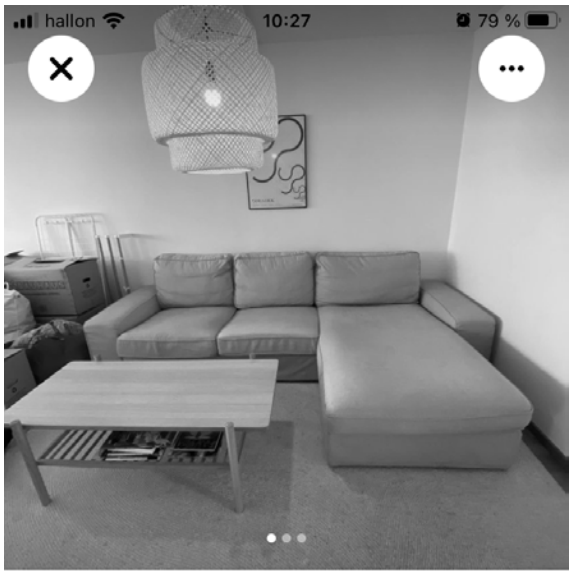
MOTIVATION



Soffa bortskänkes
FREE
Listed 18 hours ago in Malmö, Skåne län
Message Seller

Soffa GRATIS
FREE
Listed about a day ago in Anderslöv, Skåne län
Message Seller

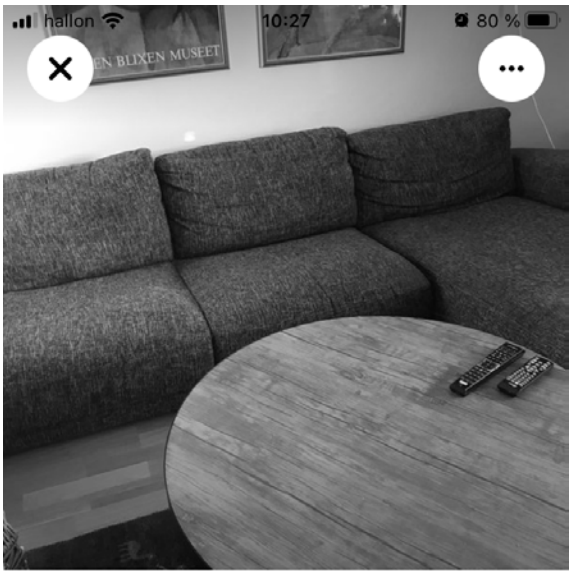
IEKA Sofa cum bed which has compartment for sale
Free ~~100 kr~~
Listed over a week ago in Lund, Skåne län
Message Seller



Soffa bortskänkes mot upphämtning (märke Kivik från Ikea)
FREE
Listed 23 hours ago in Malmö, Skåne län
Message Seller

Gratis soffa!
FREE
Listed about a day ago in Ängelholm, Skåne län
Message Seller

Free Black sofa
FREE
Listed over a week ago in Helsingborg, Skåne län
Message Seller



Soffa bortskänkes
FREE
Listed about a day ago in Malmö, Skåne län
Message Seller

3-sits sofa
FREE
Listed about an hour ago in Lund, Skåne län
Message Seller

Some of the online adverts from private sellers that was contacted.

A longevity design mind-set

The *Design School Kolding* in Denmark has come up with a deck of "sustainable design cards" that helps unravel how designers can work with sustainability in their work processes. Below I have selected a few topics from the cards that felt closely related and of importance to my project (2018).

"Design for Disassembly" (DFD)

Meaning to work with materials and product design in a manner that allows for material separation once the product is discarded or in need of repair. It should alse be easy for the user to understand how to disassemble the construction.

Maintenance

A product's lifespan can be prolonged through regular product maintenance. The design should motivate and empower users to maintain products. Taking care of the product can also help strengthen the relationship between user and product. One challenge is that users may not read care labels, are habit driven and have limited knowledge of materials and maintenance. Also poor material or product quality makes maintenance difficult.

Mono-material

Mono-material products are composed of a single type of material or of components that are each made of a single type of material and can be split apart. Mono-materials can simplify maintenance, reuse and effective recycling. One challenge can be the lack of facilities that process into new high value materials which limits the possibilities for reutilisation.

Modularity

Modular products contain separable parts (modules) that can be replaced or upgraded individually by the user. This can support the functional lifespan and overall product longevity through the replacement of single components. One challenge can be that it demands product continuity and standardisation.

Multi-functionality

Multi-functional products serve multiple functions for one or several users. It can help minimise our use of resources by optimising product usability. But it can also create a risk of a low product functionality overall. Sometimes trying to please everyone can end up pleasing no one.

Sharing or renting system

Creating systems and services that allow diverse actors to share and rent products. A sharing paradigm can promote more responsible consumption and resource use. It can also represent an economic advantage for users and make certain products accessible to a wider public. A challenge can be to design for extensive use. Also people might not want to share due to current attitudes and cultures.

Customisation

With customisation the user can influence the final product, before production, in relation to individual user needs and preferences. It can support product longevity through stronger user satisfaction and emotional investment. A challenge can be that users may not want to make choices, or choices might be trends and "want" rather than need.

Alteration & modification

Users can have products adjusted or modified. An existing product can have a higher use potential and/or emotional value than a new equivalent product. More importantly it requires less resources to adjust than make new. Same product + adjustment instead of a completely new product. A challenge can be to create a service system that support this.

User understanding

Basing the design on concrete insights regarding the users, for example, their values, economic resources or practical life, is key to circular design solutions. An enhanced product/user match can help prolong a product's lifespan.

A deeper look into "Design for Disassembly"

As previously mentioned, Designing for Disassembly (DFD) can make it easier to repair and refurbish a product and thereby prolonging its useful life. It can allow for separation of materials before recycling and enable components to be replaced or reused. When it comes to furniture and larger products it can also allow the product to be compressed or even flat-packaged simplifying storage and transportation.

Since DFD is a broad approach that can be used for anything from technical products to buildings I decided to select and summarise a few strategies that are applicable to furniture design. The strategies were found through the book *Designing for Environmental Sustainability* by Vezzoli and Manzini (2008).

DFD strategies

Use fewer parts. The less there is to take apart - the easier and quicker it is.

Minimise the overall number of different fastener types (that demand different tools).

Minimise the overall number of fasteners.

Use fasteners that do not require any tools (reversible joining systems). Make sure they are intuitive and able to do and undo without breaking.

Fasteners can be minimized through a central joining element that holds down several layers or parts.

Avoid glues. If needed use adhesives that are heat reversible or dissolve in common non-toxic solutions like water.

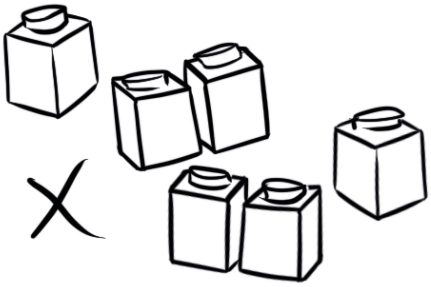
Build disassembly instructions into the product.

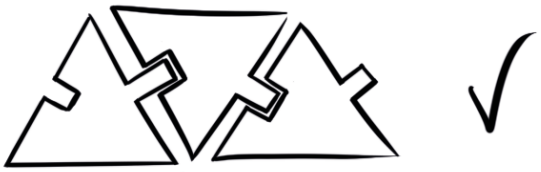
Prioritise disassembly of more easily damageable components.

Engage modular structures

Vezzoli and Manzini (2008)

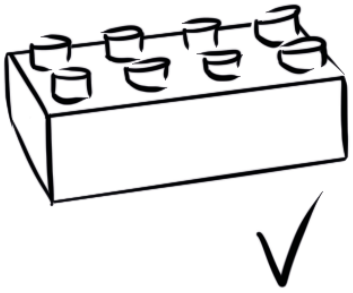
MOTIVATION





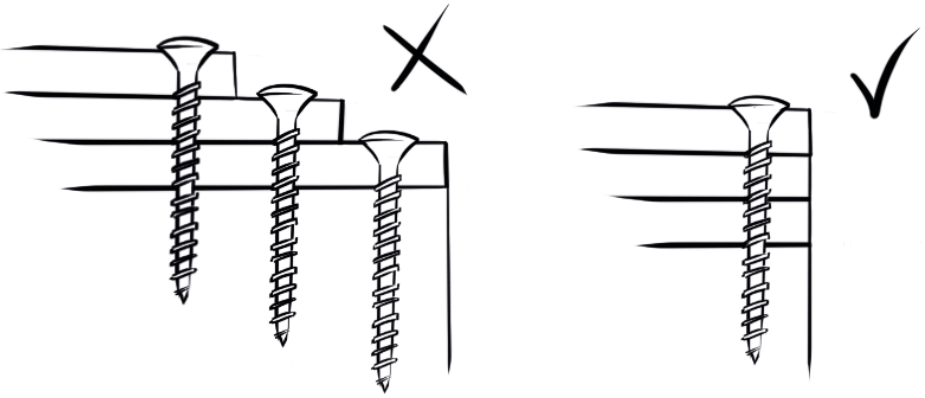
modular structures

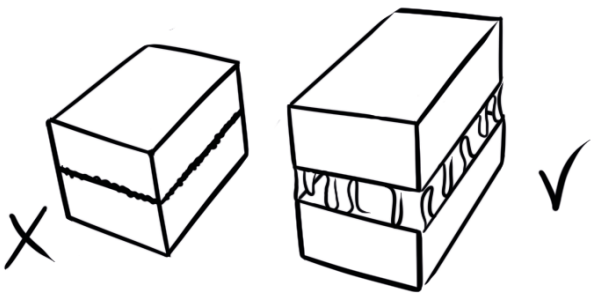
/ standardised parts



fewer parts

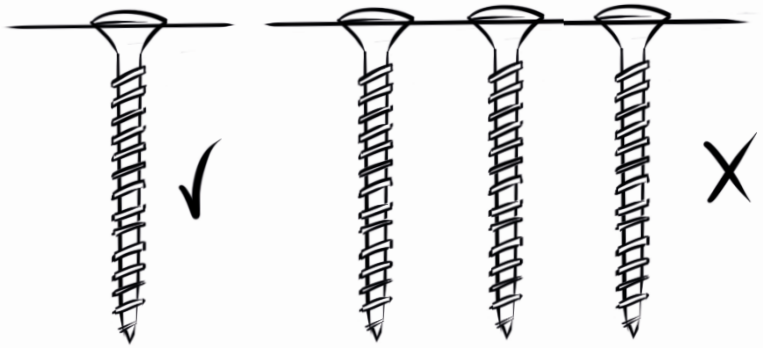
central joining / single-set

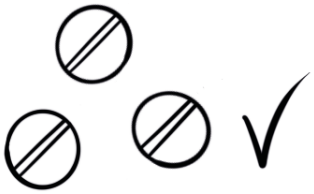




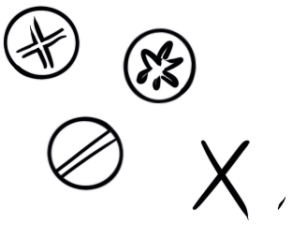
avoid / use reversible adhesives

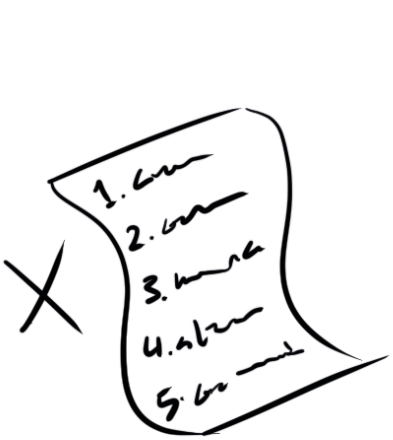
fewer number of fasteners

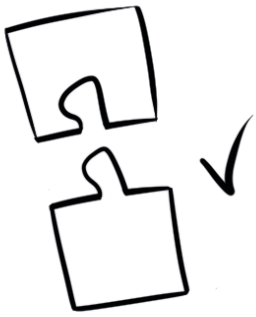




common & similar fasteners







"show don't tell"
built-in assembly instructions

Design for Disassembly main-take-aways.

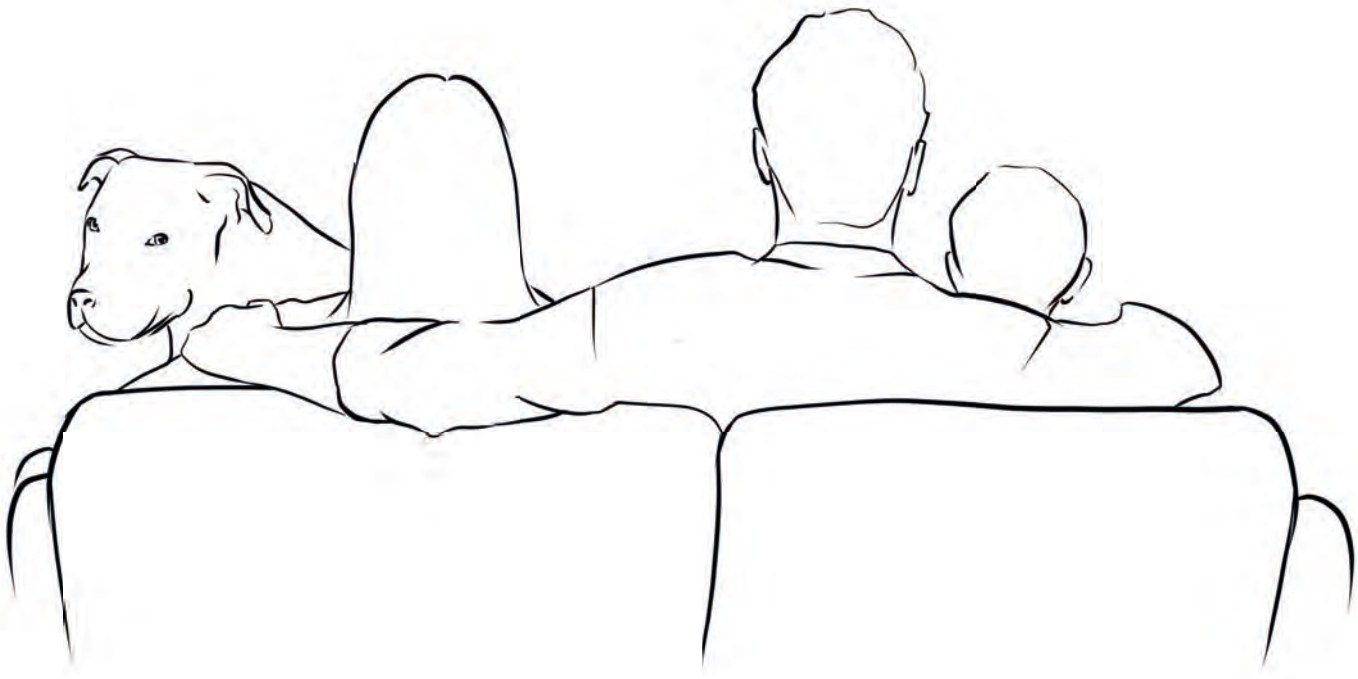
Target Group

The target group is consumers who do not own any special tools or have any carpentry skills. Since a sofa should last for many years the target group will go through different stages of life and have changing needs, alternating taste and place of residence.

Scenarios

1. A family is relocating to another part of the country. They have a big corner sofa that they enjoy, the problem is, they can not fit it into the moving truck. Even if they paid for a larger truck they remain unsure whether it could be brought up the stairs to their new apartment. They upload it to an online second-hand platform, but receives no responds. Since they are in the middle of moving they need to make quick decisions and the sofa ends up as combustible waste at the recycling center.

2. A couple is buys a sofa together, two years later they get a dog and soon after after, their first child is born. The sofa is becoming smaller and smaller as well as quickly more worn. When they decided to buy a light sofa with non-removable coverings they where not thinking ahead.



ANALYSIS

Final brief

Design a modular sofa that can easily be assembled, disassembled and reassembled, enabling reuse, repair, remanufacture and recycling.

Needs

User

easy to move / transport

adaptable use - change depending on needs

stay in fashion / attractive

easy to maintain, repair & recycle

Functional analysis

Function		Rank	Comment
provide	seating	HF	
allow/simplify	assembly	N	
allow/simplify	disassembly	N	express this feeling
allow/simplify	reassembly	N	
stand	ruff usage	D	
stand	moving	D	
simplify	repairing	N	
express	finess	D	
express	smartness	D	
minimise	parts	D	
maximize	material quality	D	
be	modular	N	
be	adaptable	D	change depening on needs
be	self-explanatory	N	
be	economical	D	in production & for the user

Precedents / Market

Looking at the market there are a lot of modular sofas while the level of disassembly varies. A few have removable / adaptable arm and backrests, but each module is often designed as one solid piece of mixed materials.

"Arbour Eco Sofa" by Daniel Rybakken & Andreas Engesvik for *HAY*

+ well-constructed, quality-materials, separate components

- not modular

"SÖDERHAMN" by *IKEA*

+ modular, washable/ exchangeable covers

- modules themselves not designed for disassembly

"GLOSTAD" by *IKEA*

+ easy assembly, efficient use of materials

- not modular, low comfort

"COSTUME" by *Diez Office* for *MAGIS*

+ modular, designed for disassembly

"Modular sofa" by *Noah Living*

+ modular, plug-in system, designed for disassembly

- medium/high material usage

Concept Generation I

I decided to divide the sofa into a list of main components and then brainstorm on how to construct and combine them as well as which materials could meet their different functions.

The main components became:

frame / legs
armrest / backrest
springy base
padding
covers
+ add-ons

Ideas for parts & materials

frame/legs

sheet metal / pipes (steel)
solid wood (oak, ash, beech)
plywood
combination of metal and wood

(springy) base

wooden slats
plywood board / pegboard
woven mesh / net (saddle girth)
wire mesh

padding layer

coconut fiber
organic latex foam
feathers
horsehair
Spanish moss

covers

wool (+flammable resistant, -wash)
hemp (+wash)
organic cotton (+wash)

additional guidelines

1. try to use renewable, recyclable, biodegradable or leftover materials
2. try to be material-efficient when using them
3. do not compromise durability over Design for Disassembly

visual separation

distinction between layers

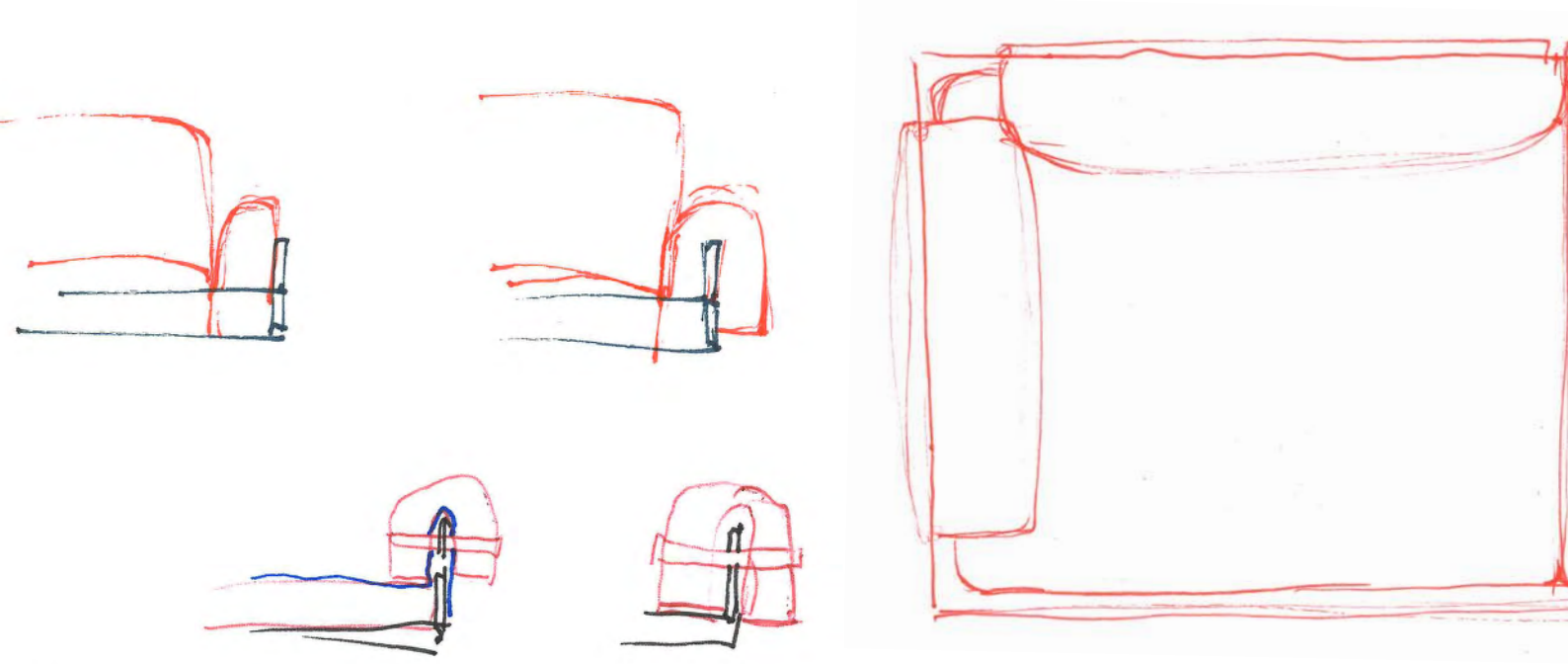
& materials

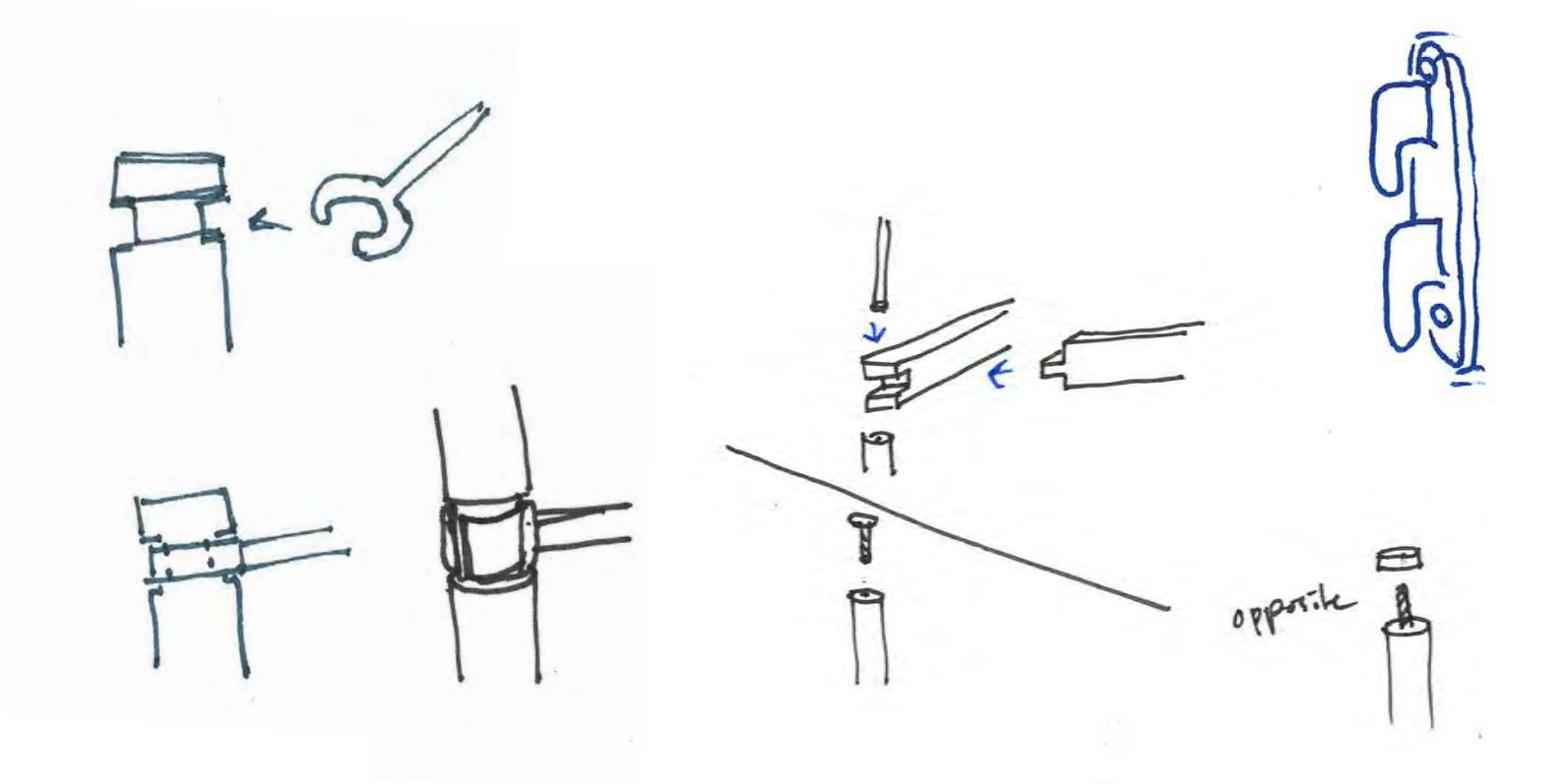
Mood board I

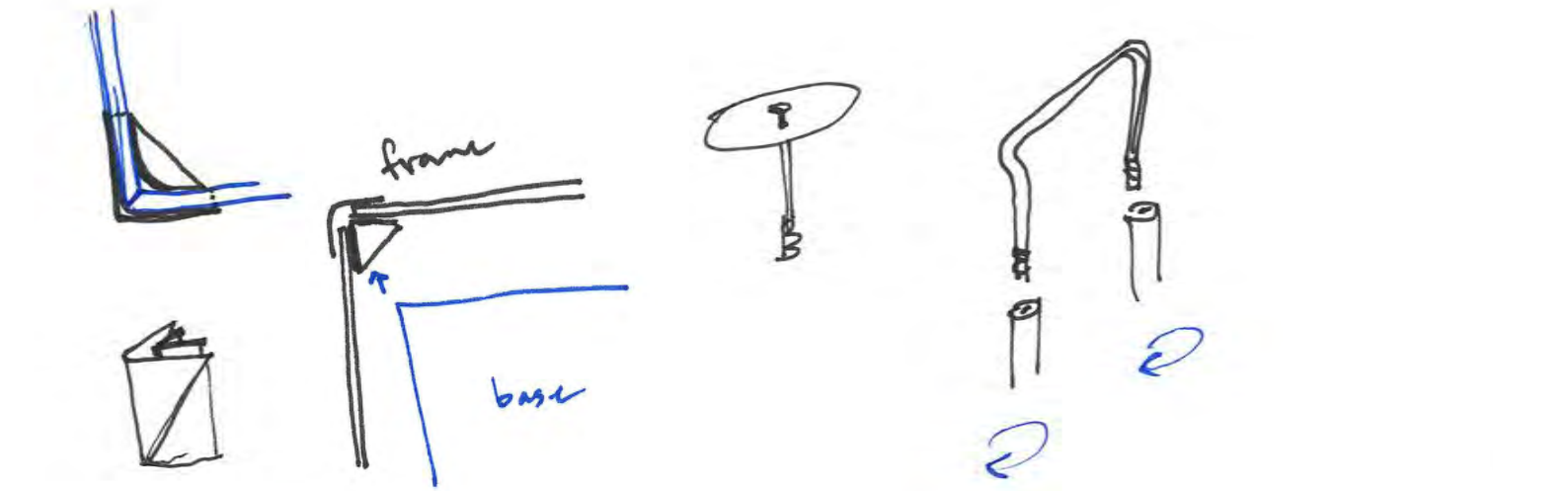
"sandwich / cake system"

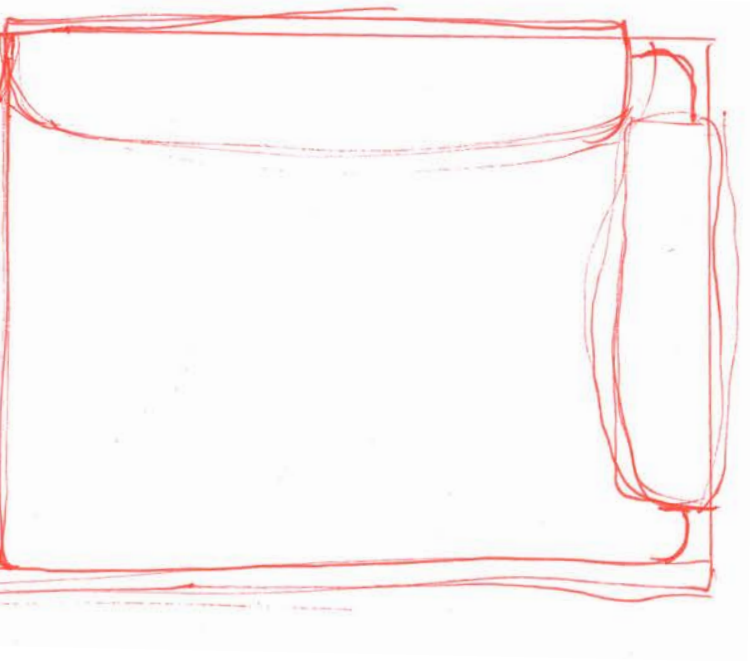
adding things to a frame or skeleton

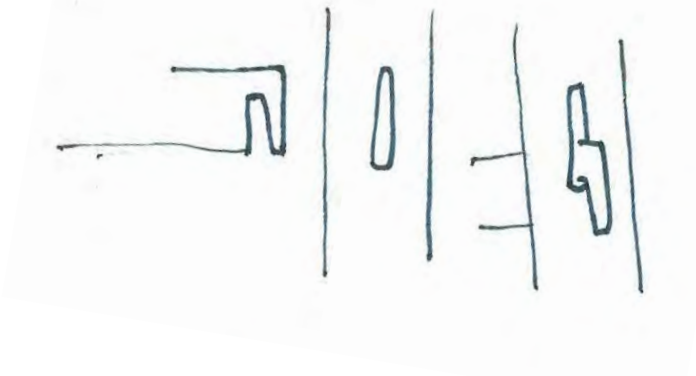
SYNTHESIS

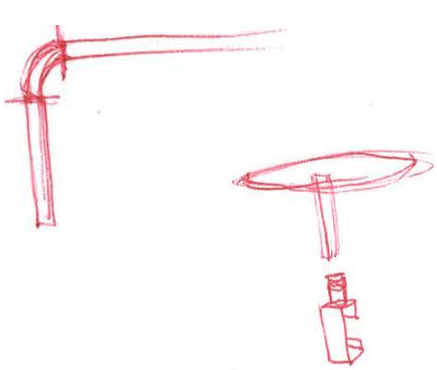


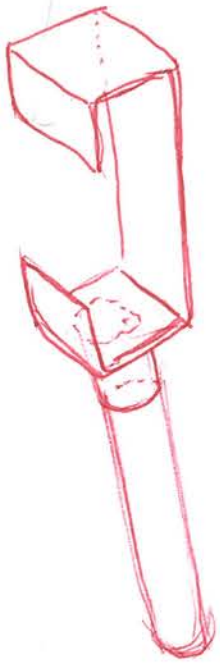


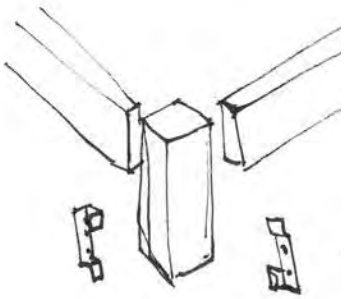


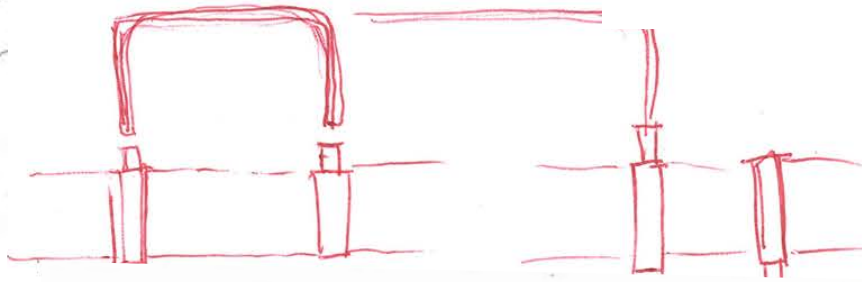


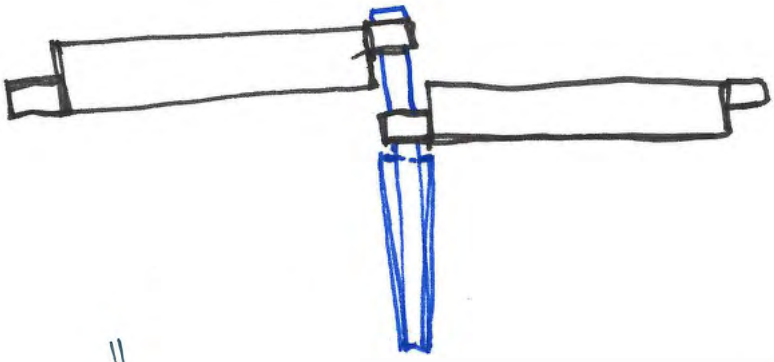


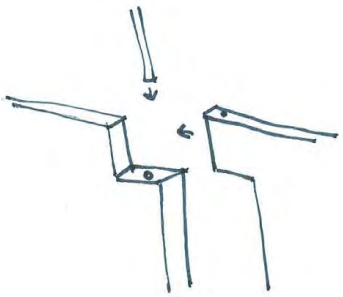


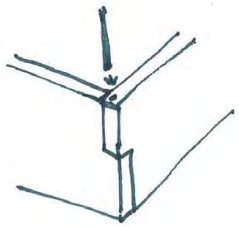


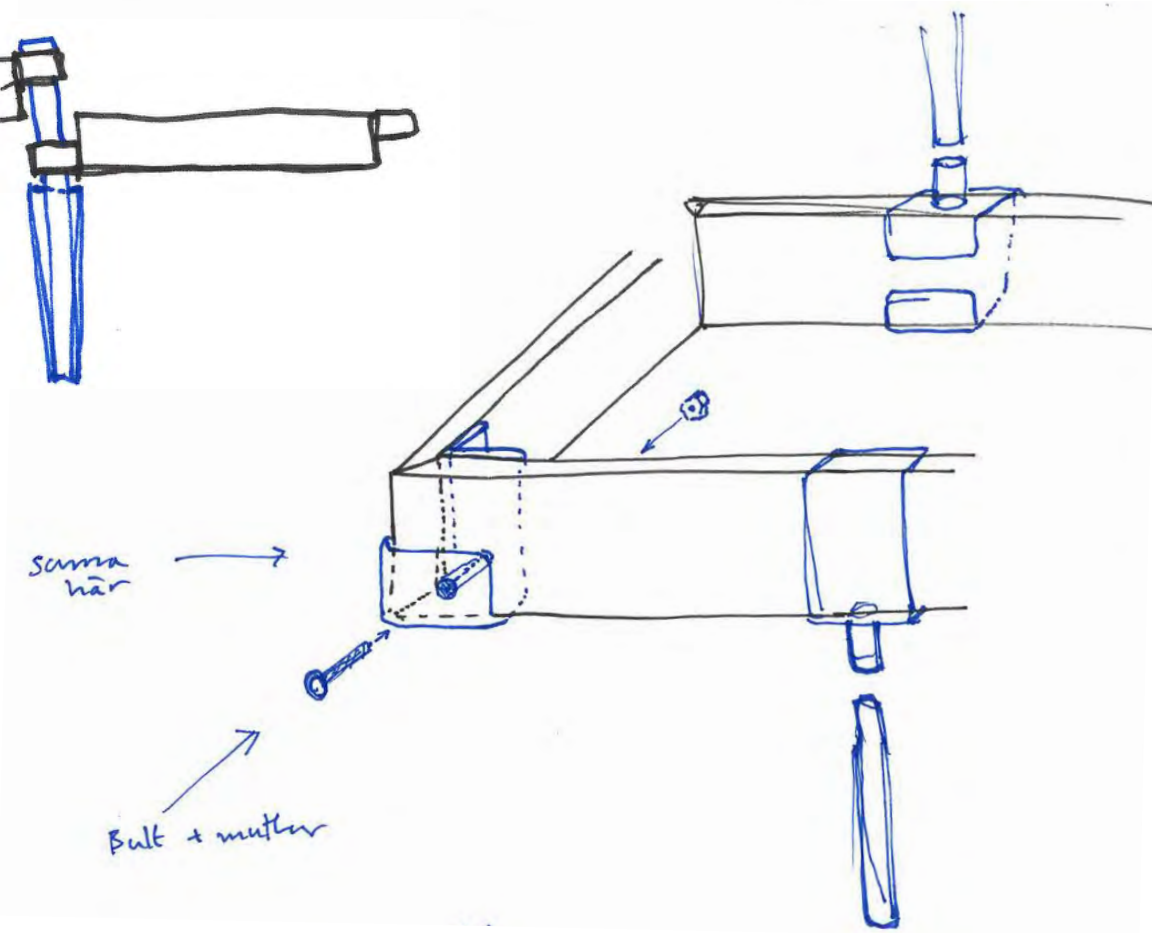











Skruva här
Bult + mutter

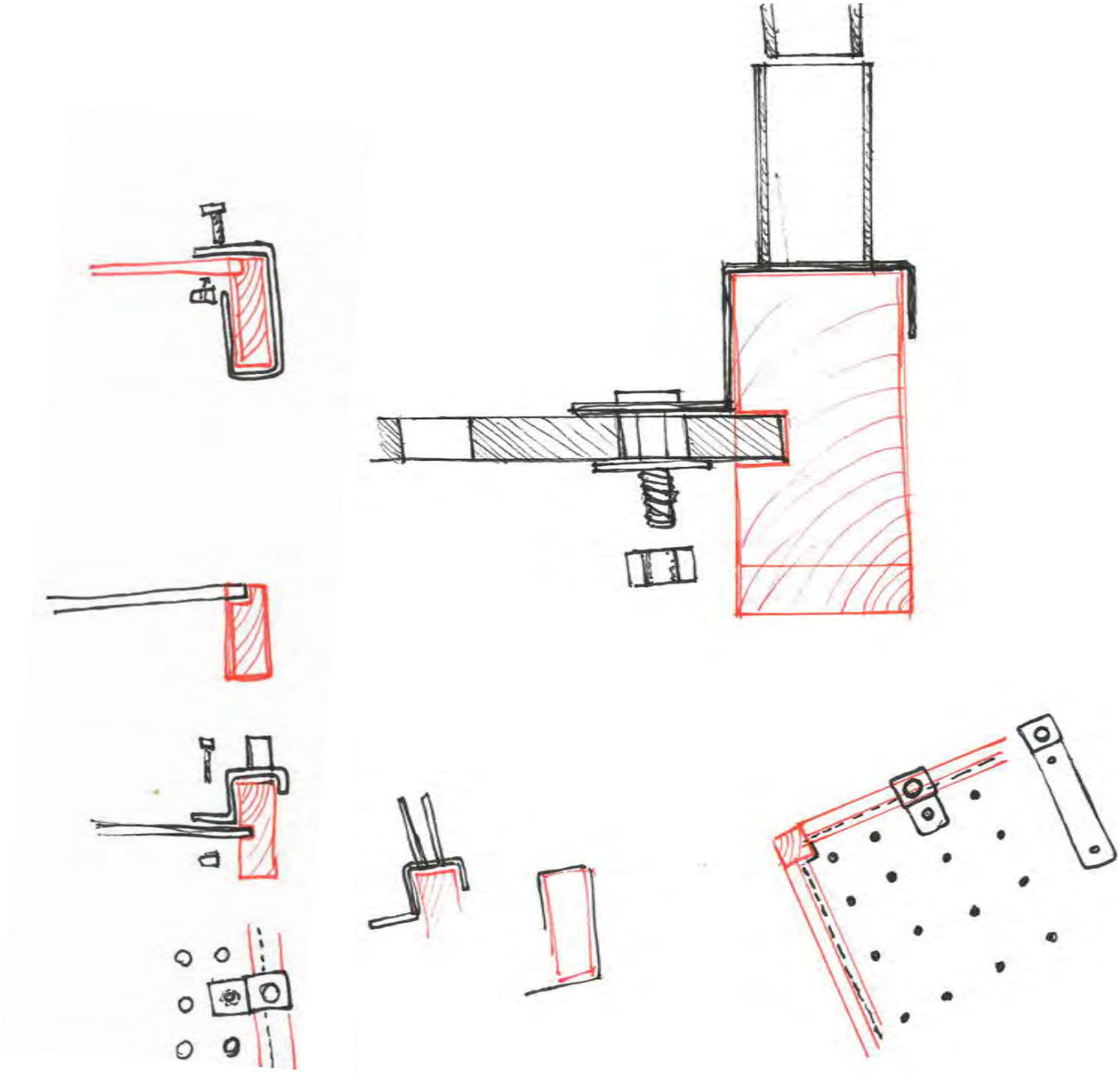
Concept generation II

To further investigate I selected a few of the ideas that I felt had most potential and combined them. Doing small-scale and full-scale mockups quickly demonstrated what worked, what did not work and why, both in terms of construction and appearance. I decided to build a wooden frame and then add thing to it.

Testing a temporary wood joint.

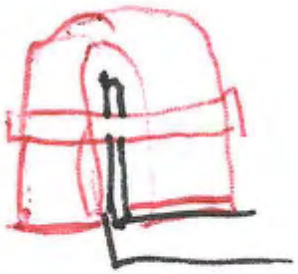
Concept A

For the first concept I decided to work with plywood peg board as a base together with ideas for the back- and armrests.



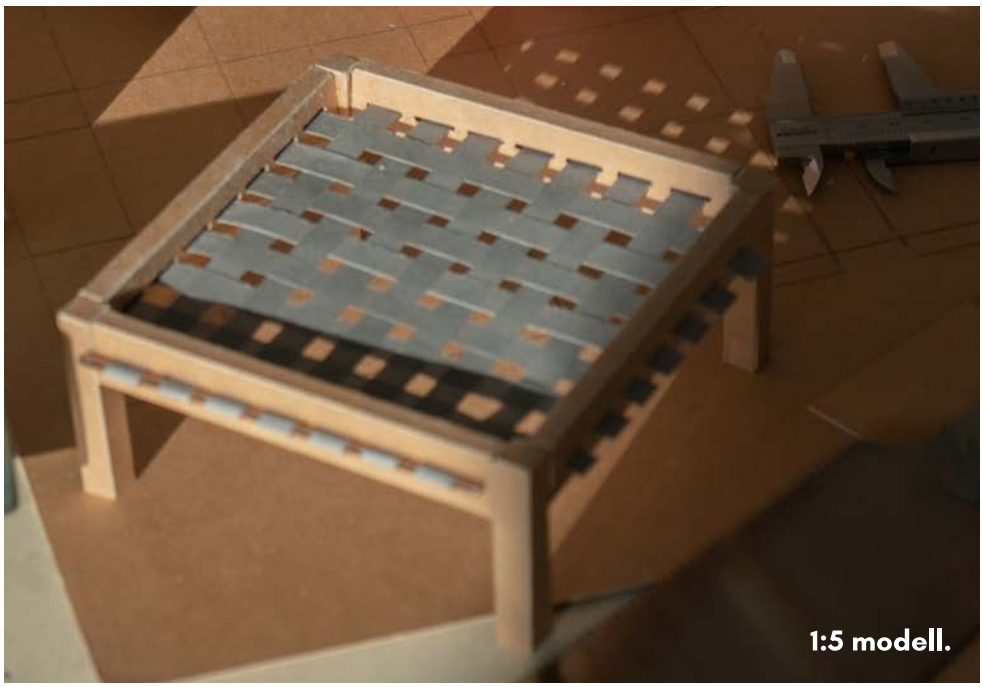
The metallic fasteners connect to the pegboard as well as pipes that would later be dressed in cushions. They are kept in place by nuts and bolts.

+ straightforward system
+ allows for adaptable use
- plywood board does not give any suspensions
- the connectors + screws + nuts quickly become a lot of small extra parts

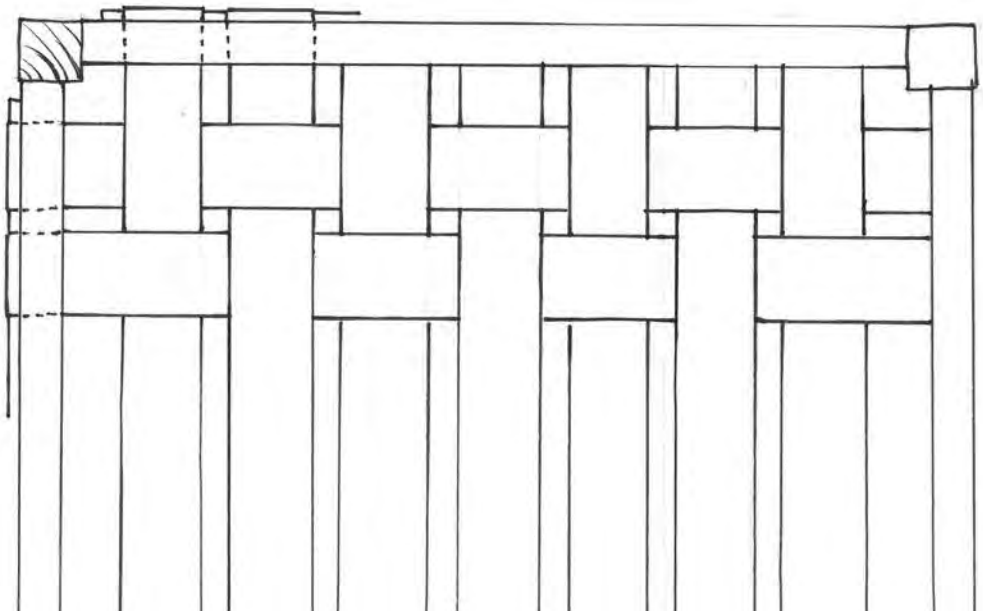


Concept B

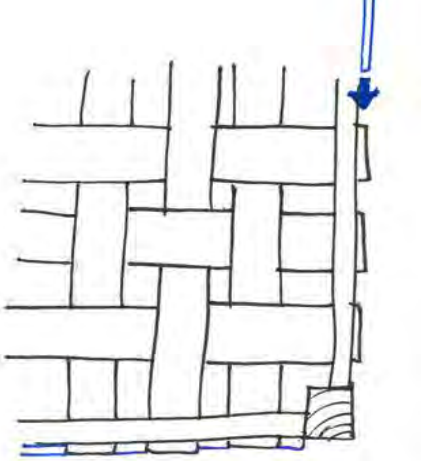
In this concept I worked with braided saddle girth. Saddle girth is a historical material that is very is persistent and typically used in upholstered furniture. Traditionally it is tightly fastened and fixed onto the frame with nails and specialized tools. I wanted to explore if it could be temporarily fastened instead.

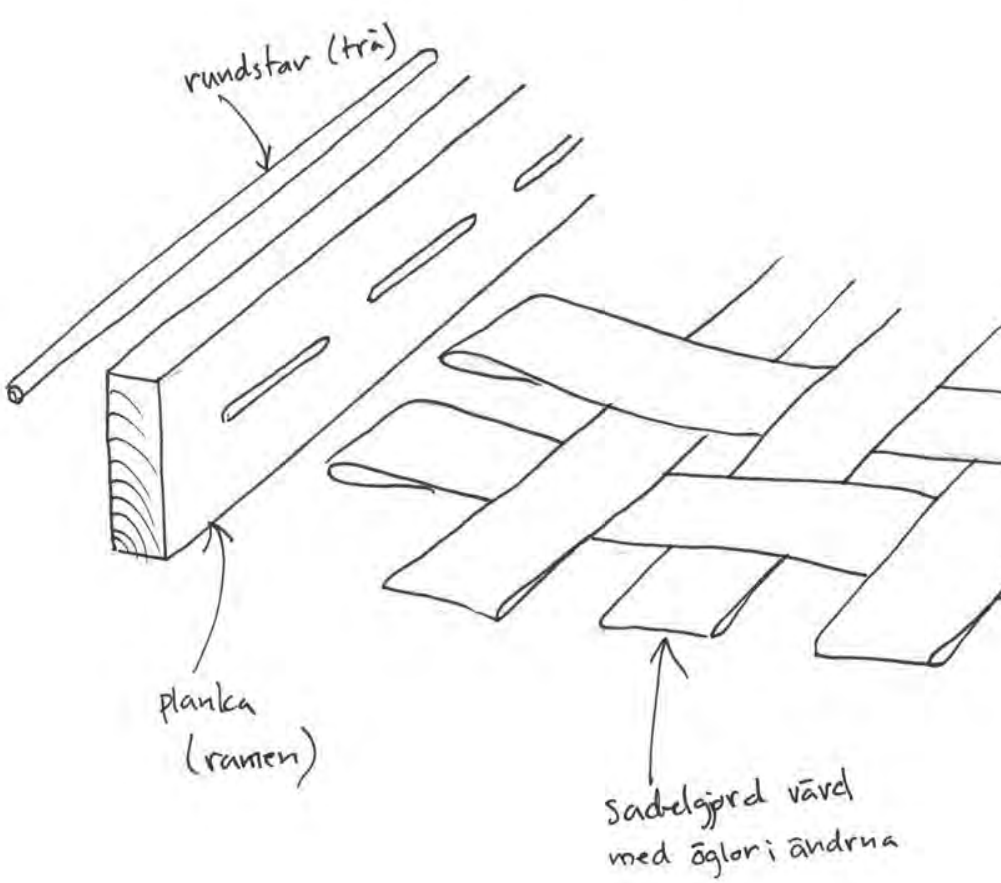


1:5 modell.



1:1 mock-up explaining the action.



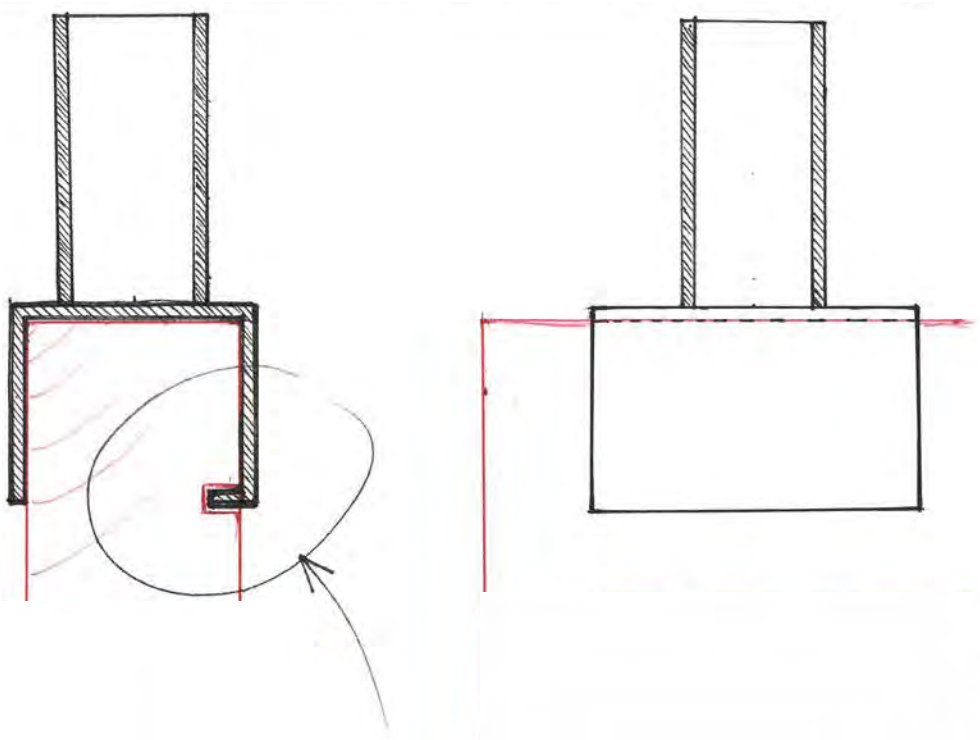


The braided saddle girth mesh has loops at the ends, these are placed through slots in the frame, a stick goes through on the other side and holds it in place.

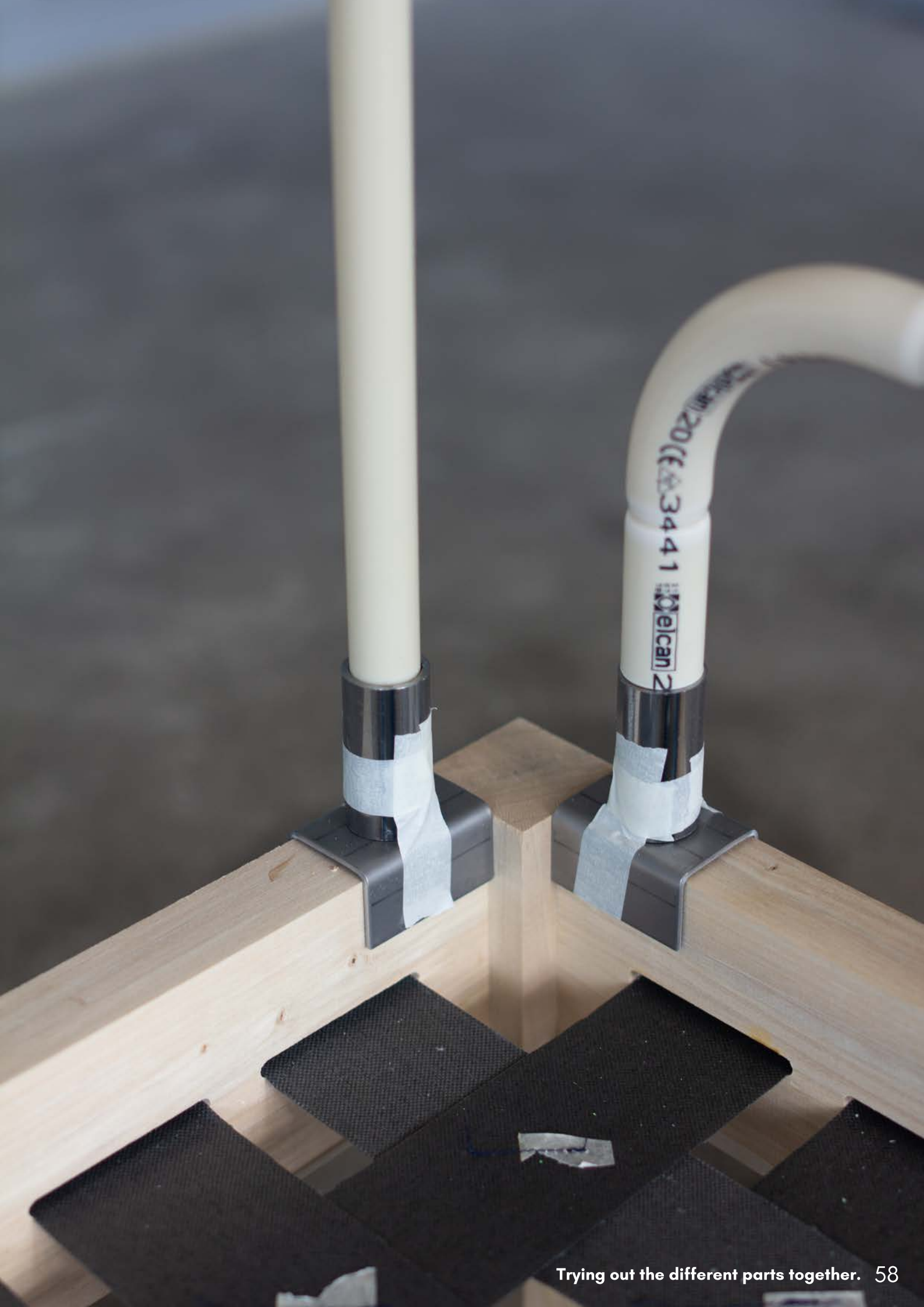
+ new idea
+ adds finesse to the aesthetic impression
+ semantically satisfying
- difficult to combine with modularity (connecting each module)
- may not be tight enough, can result in a "hammock effect"
- Design for Disassembly may be compromised over durability

The issues were discussed with three different furniture upholsterers.

I tried to find a way to combine the holders for the arm- and backrests with the saddle girth instead of peg board. Instead of securing them to the bottom piece I looked for ways to secure them to the frame.

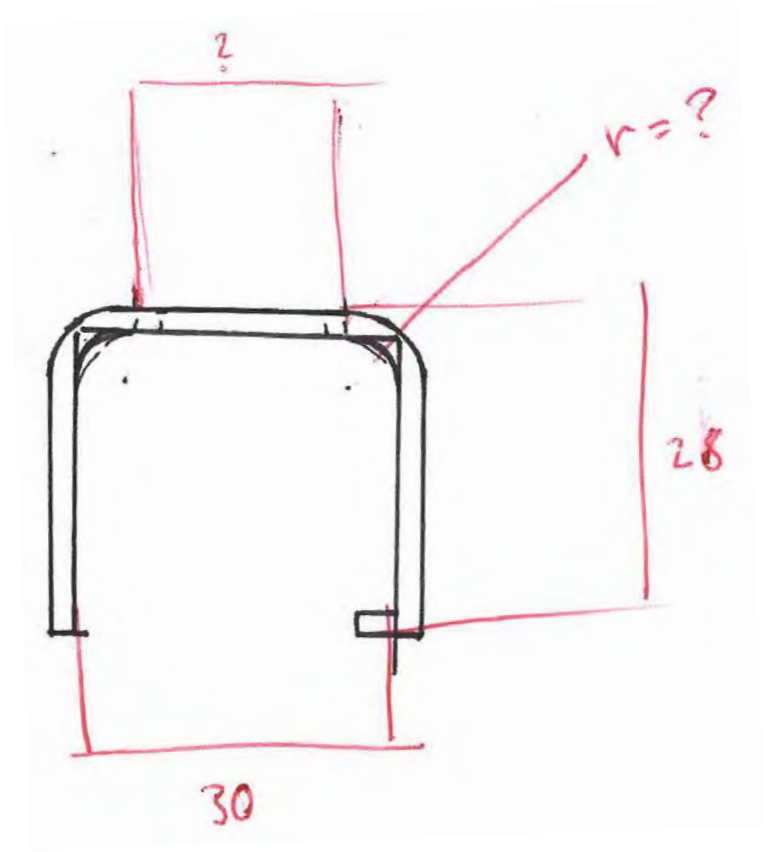


The sketch shows the metallic fasteners bent around the wooden frame and kept in place through a small tenon that fits into a spring.



Trying out the different parts together.

 Cardboard mock-up next to a quick test version in steel.



+ straightforward
+ durable
+ in line with DFD and modularity
- needs to be attached before assembling of the frame
- may damage the wood after a while

The idea was to combine the metallic connectors with pipes and create a skeleton/structure for the cushions. The pipes could come in different lengths and heights and work as both arm- and backrests.

Combining the pillows with the "pipe skeleton".

63 **Turns out anything will do when it comes to mock-ups.**

Trying different shapes with foam to see how it acts. 64

 Bent plywood slats placed inside the frame.

Concept C

Instead of using a durable plywood board with no suspension or a light weight saddle girth that may sag I decided to look for a middle ground. I found that bent plywood slats (commonly used in beds) could work. The slats sits over a wooden strip inside the frame.

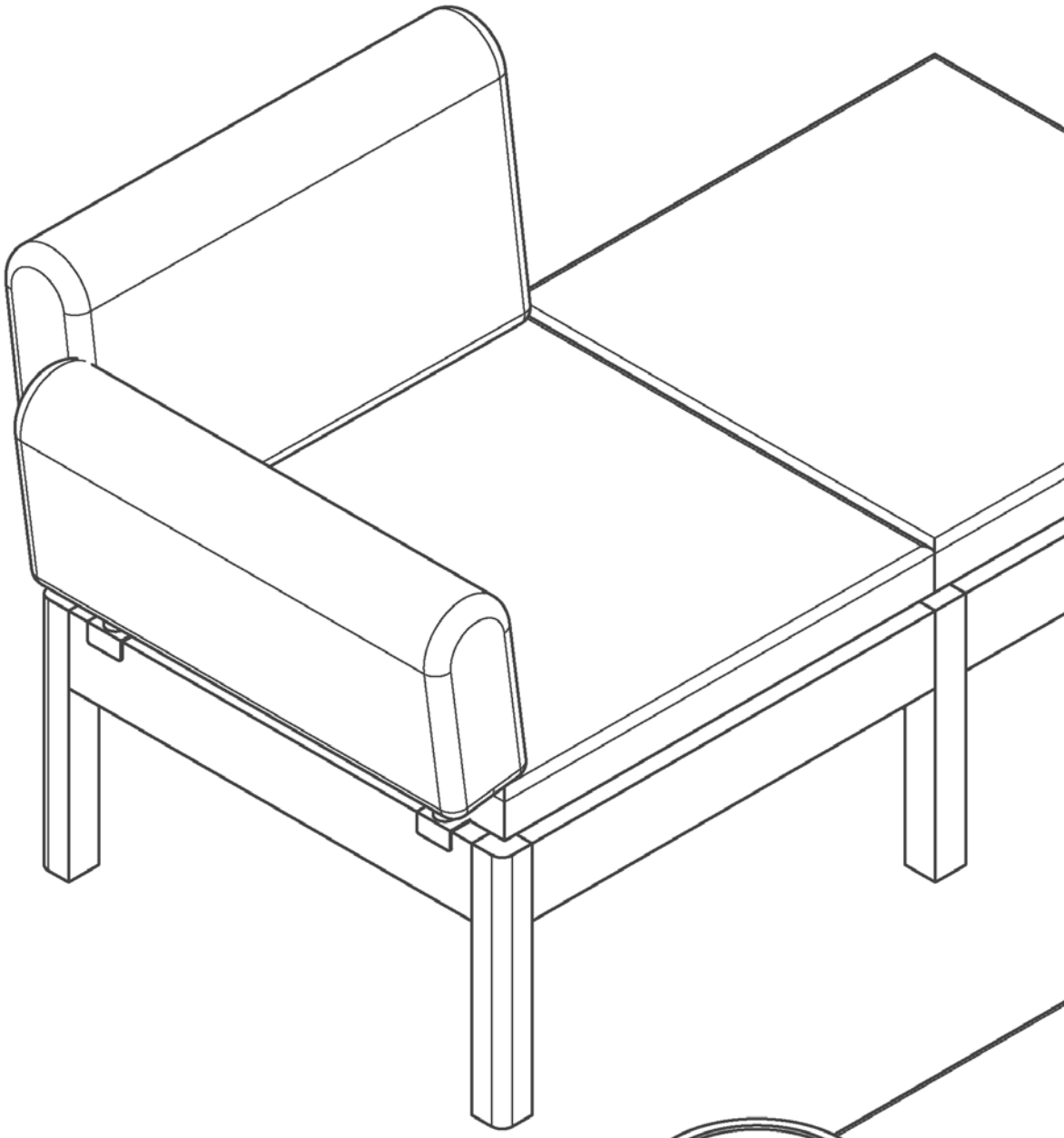
+ medium-low weight
+ provides suspension / bounce
+ space-efficient
- the slats need to be held in place / connected to each other in some way

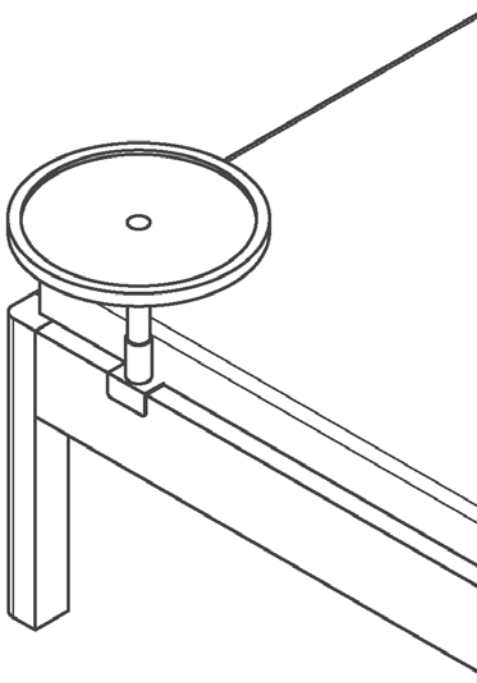
To connect the legs and frame I decided to use glue for the gables and metallic fittings called "bed rail brackets" for the rest. These fittings make it easy to attach and detach the wooden frame parts and connect the modules to each other. Tools for the screws would be needed, but only at one point, before recycling.

+ easy to attach/detach multiple times
+ very durable over time, does not become lose and wobbly
- requires tools before recycling

Temporary "bed rail hooks" together with glued tenon joints.

 3D render.

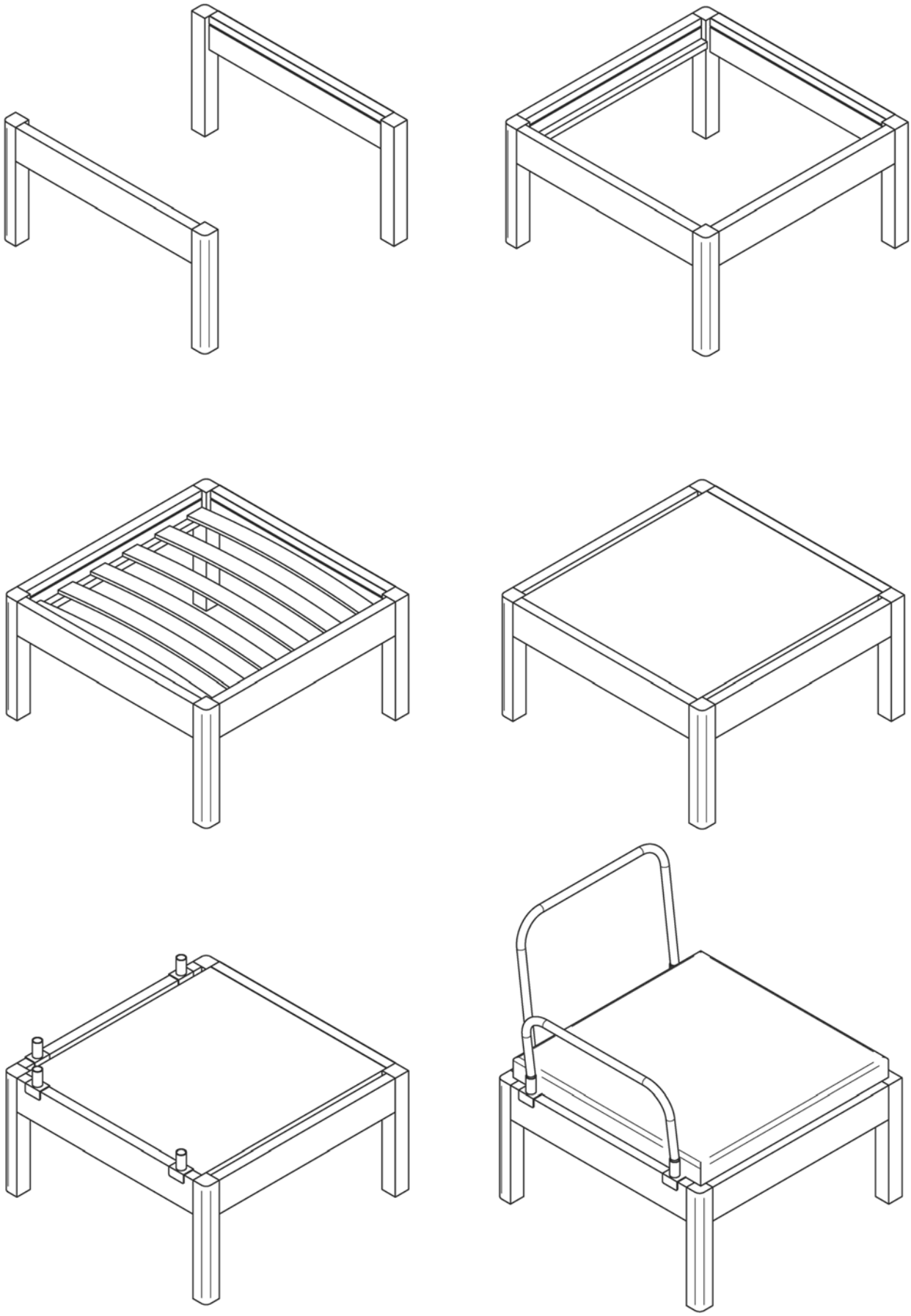




Final concept

The final concept is a mixture between concept A, B and C. Working with some of the materials and trying out different constructions in full-scale helped me evaluate and come up with new ideas and improvements resulting in a final concept.

 3D render of different configurations.



73 **Simplified technical drawing of the construction (one module).**

Construction (one module)

wooden framework

Two gables glued together through tenon joinery + two planks hooked on through metallic fittings = a modular click-in system.

plywood slats working as a base

Bent plywood slats are placed inside the frame.

padding layer

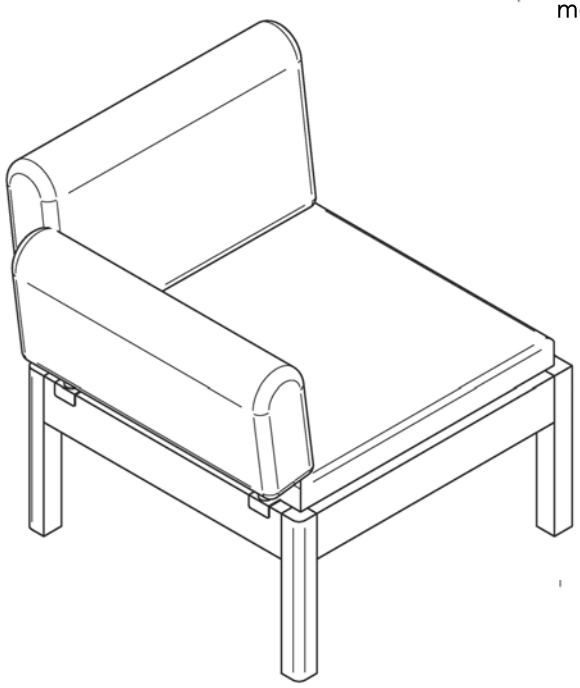
A stiffer padding layer goes on top of the plywood slats to build suspension and to give structure + a softer seat cushion.

arm - & backrest based on a steel pipe system

Metallic connectors are slid onto the wooden frame. Bent pipes are placed in the connectors and used as a skeleton for the cushions.

arm - & backrest cushions

Cushions are places over the pipe construction making it soft and hiding it.



Mood board II

A modern patchwork

I wanted to make a modern version of a classic patchwork and use fabric in different nuances both to create a dynamic impression and to make use of leftover material. The idea of bringing different components, new or reused, together was already embedded in the construction, but I also wanted it to be part of the over-all expression.

geometric

asymmetric

dynamic

light earthy tones

+ unexpected vivid color

/ dark line

 For my prototype I decided to sew two-sided pillow covers combinging dark and light beige.

Remain

The final result is a *Remain*, a modular sofa system that can be assembled, disassembled and reassembled without the use of tools. This makes it easier to move and adapt to changing needs. *Remain* only consists of renewable and recyclable materials that can be separated from each other, single components can be repaired and replaced and separate materials sorted and recycled. The construction is material-efficient and yet comfortable and durable.

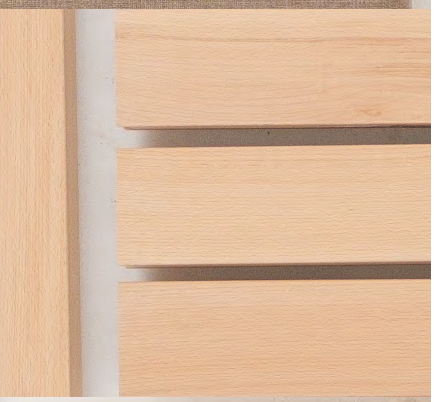
Materials

Steel pipes + sheet: 100% recyclable
+ Black powder coat (polymer) as surface protection

Coconut fiber + natural latex matting: 100% biodegradable
can be reused as rooting mats in gardens or composted

Natural latex foam: 100% biodegradable

Organic cotton cover: 100% biodegradable

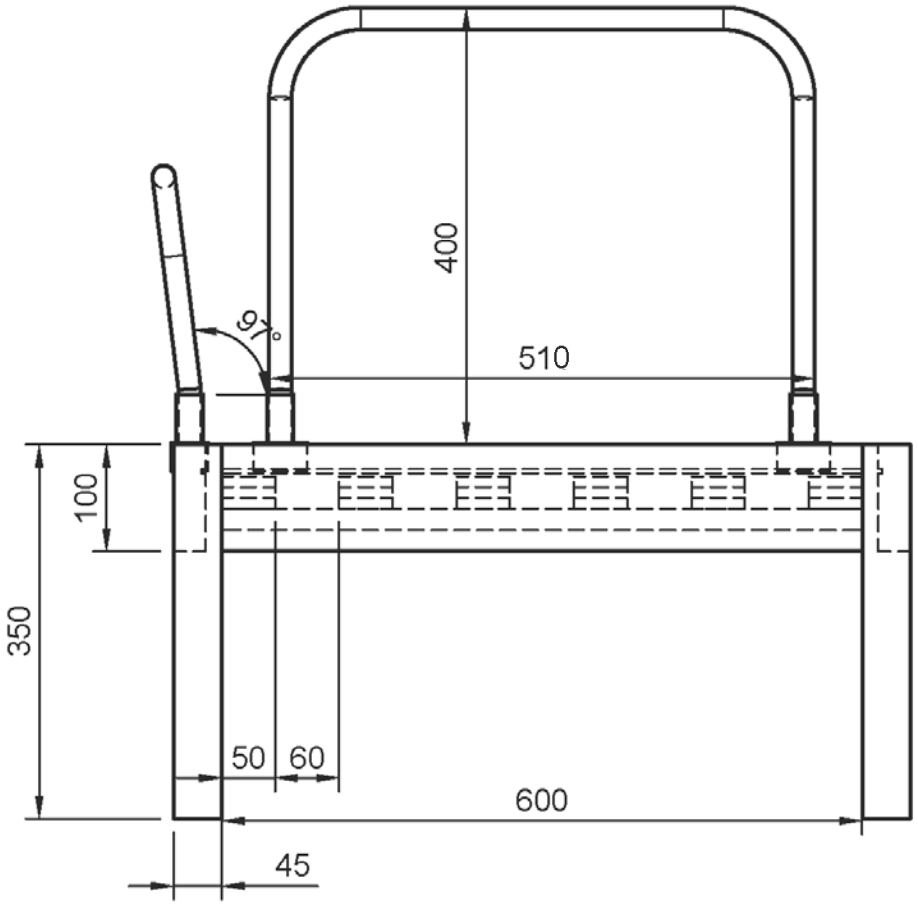


Solid beech wood: renewable
can be refurbished into new furniture or recycled into chipboard

Birch plywood slats: renewable
can be recycled into chipboard

Assembly

All components (two-seat sofa) laid out before assembly. 84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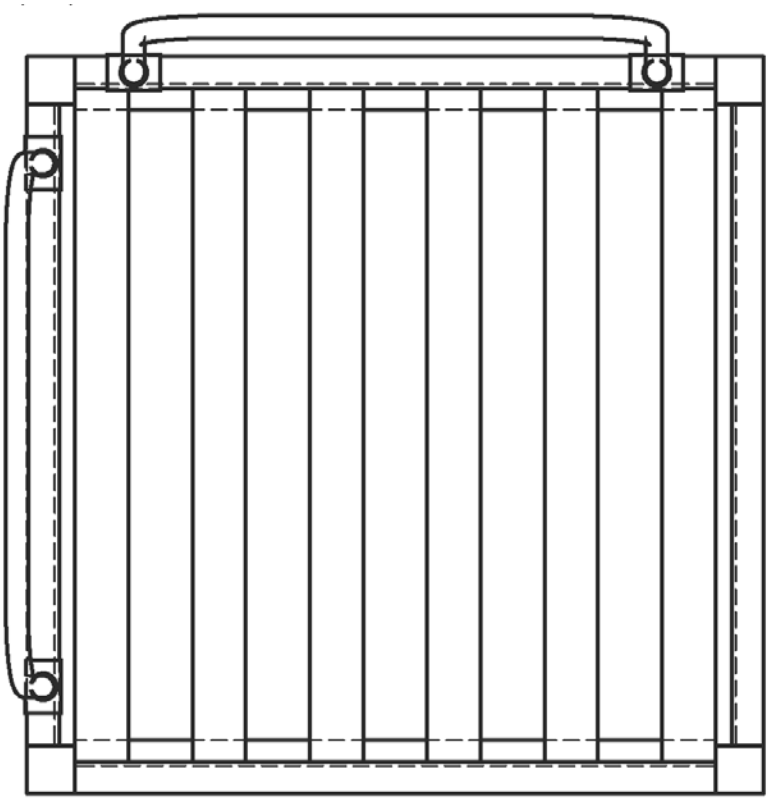
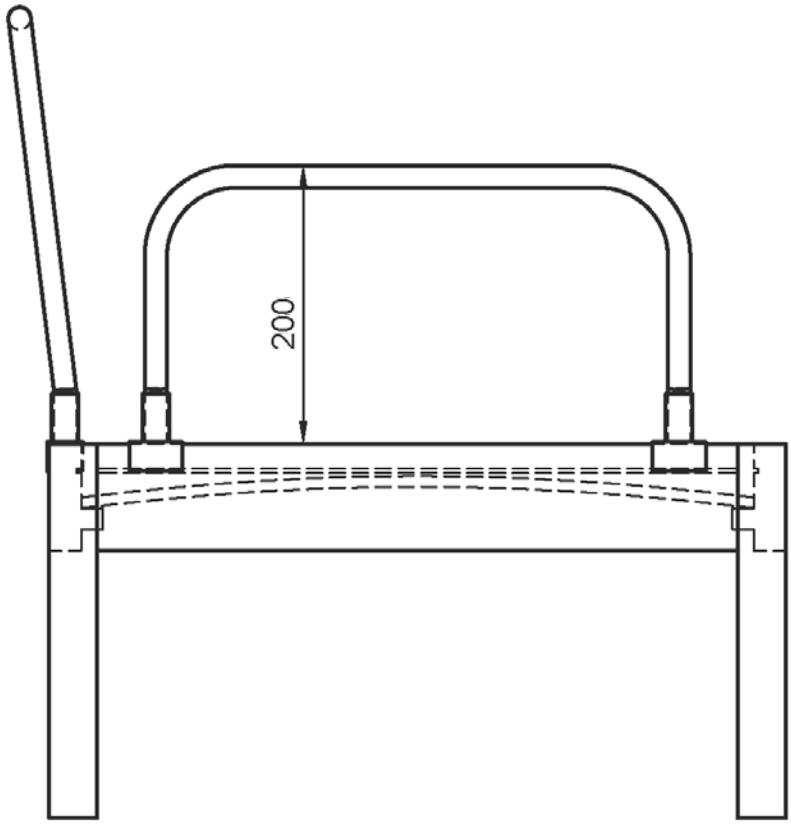




Technical drawing

scale 1:10

Wooden frame

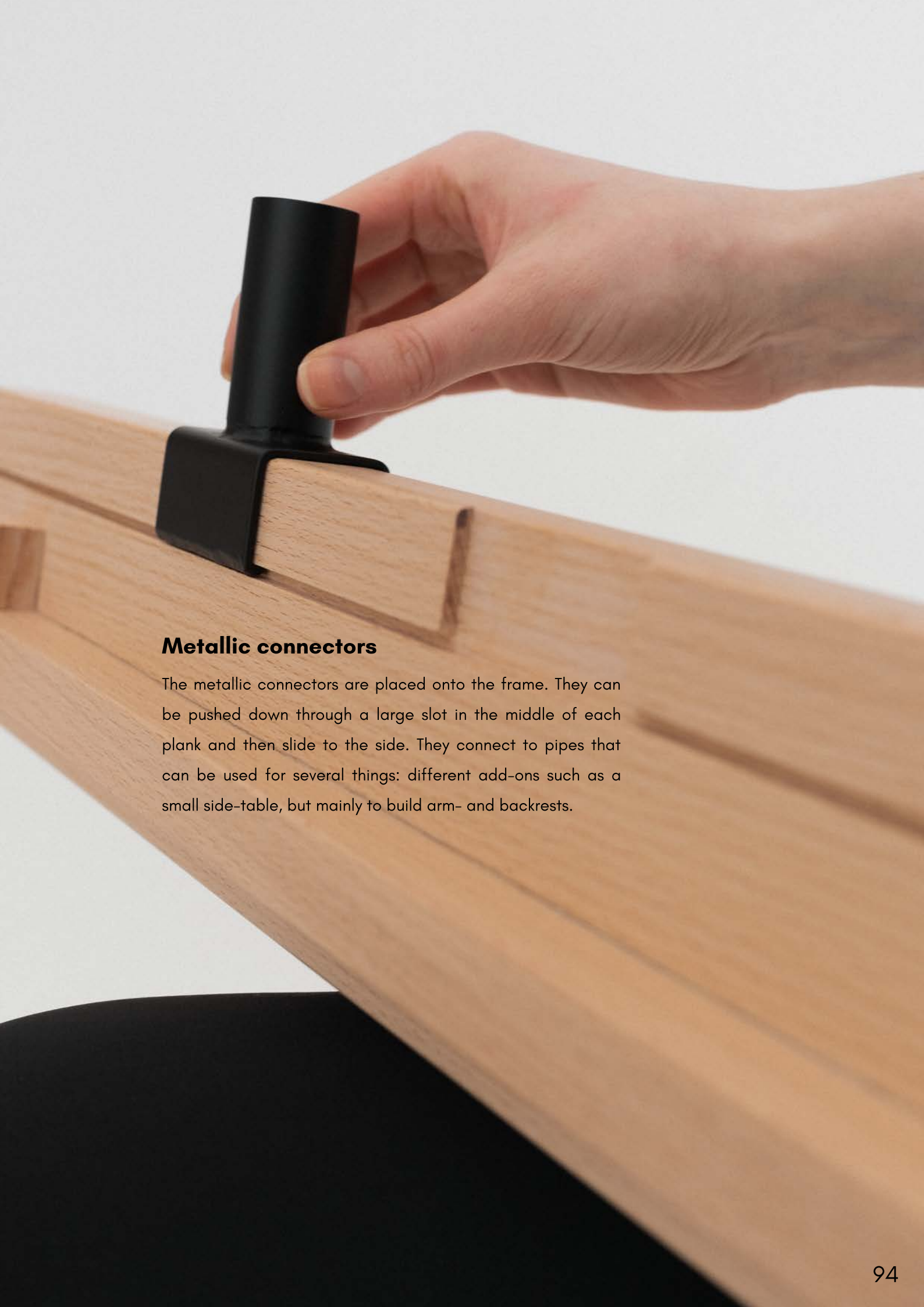
The wooden frame consists of gables that are glued together and front/back planks that are hooked on and off through bed rail hooks. The hooks themselves only need to be detached with tools (a common screwdriver) before recycling.

Plywood slats

The plywoods slats are held together by a ribbon with loops and placed in the frame. A small wooden champ is holding each row in place. The slats are light-weight and help absorb tension from the person's weight.

Coconut fiber layer

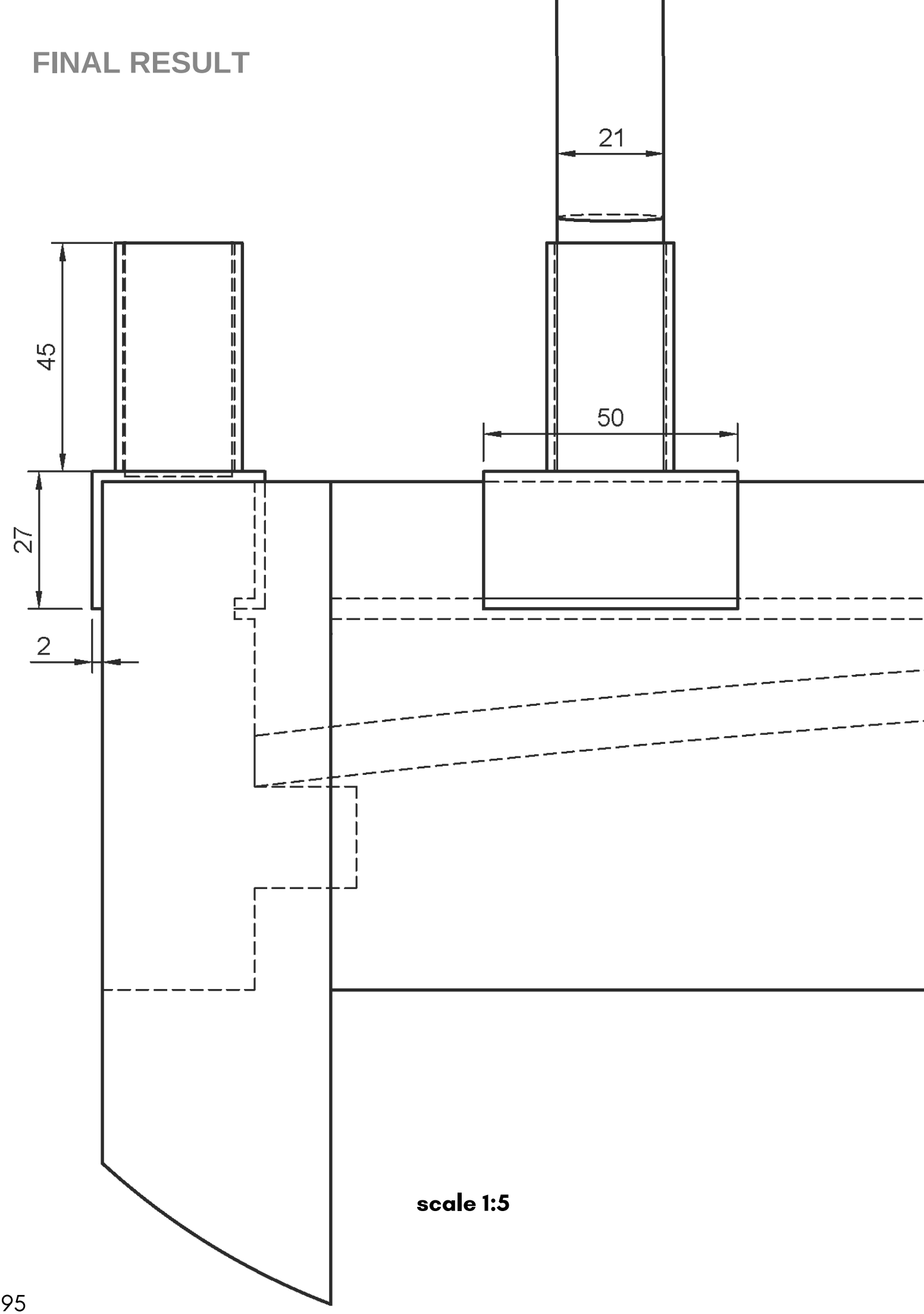
Coconut fiber is extracted from the outer husk of coconuts and is a large left-over from coconut milk production that often end up being incinerated. The fiber in this case is reused as a firm and bouncy padding layer. The friction of the naked surface also helps keep the seat cushions in position.



Metallic connectors

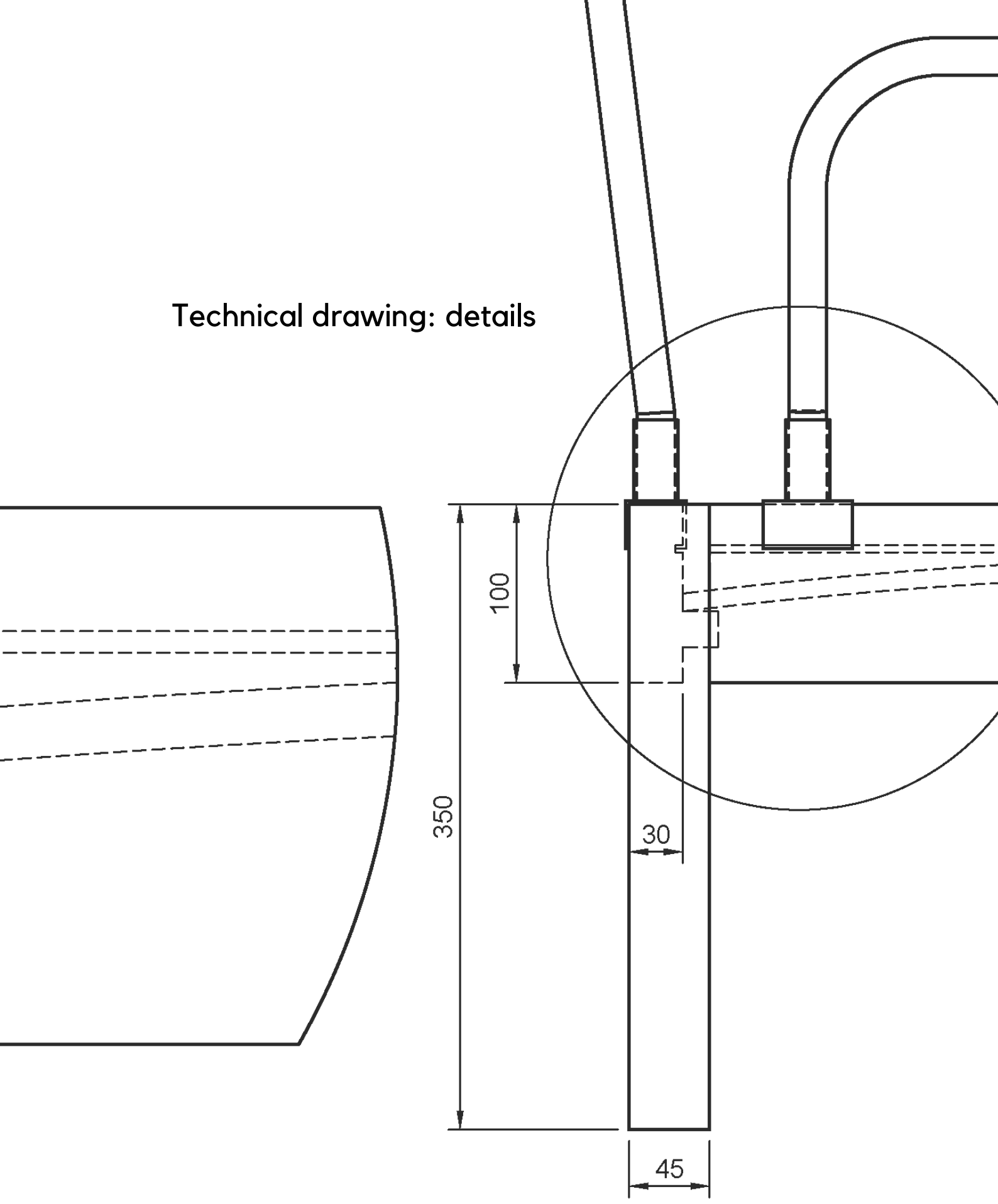
The metallic connectors are placed onto the frame. They can be pushed down through a large slot in the middle of each plank and then slide to the side. They connect to pipes that can be used for several things: different add-ons such as a small side-table, but mainly to build arm- and backrests.

FINAL RESULT



scale 1:5

Technical drawing: details



scale 1:8

FINAL RESULT

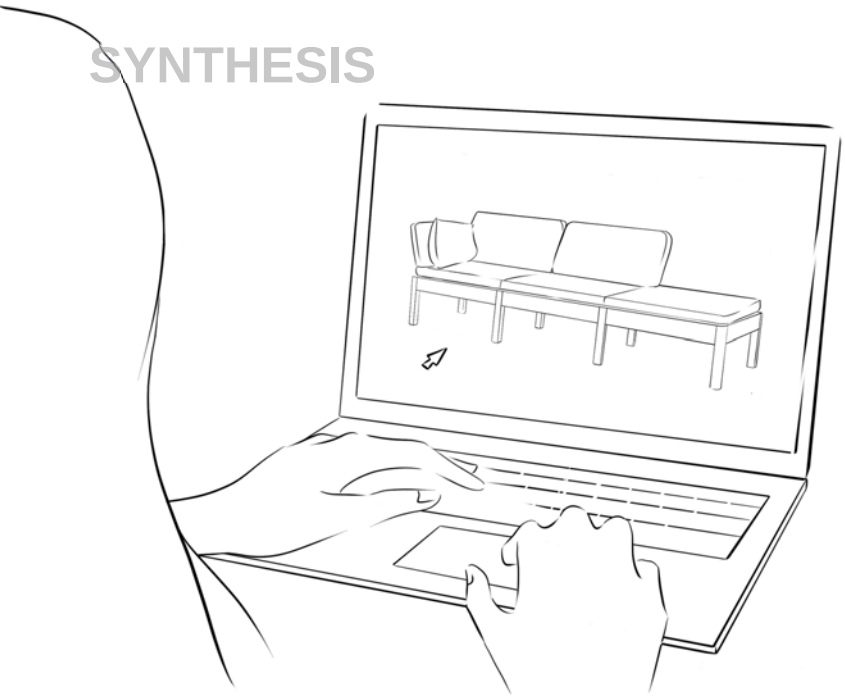
A modern patchwork

The modular approach and possibility to exchange parts together with two-sided pillows in different nuances creates a dynamic impression. I wanted the sofa to resemble a modern patchwork where the fabric comes frame waste or leftover material and can be exchanged when needed.

The pillow cases can be washed and each pillow can be rotated or turned upside down for even wear. If the sofa gets a large stain the user can add a piece of fabric to hide it or exchange one pillow case without changing the whole appearance.

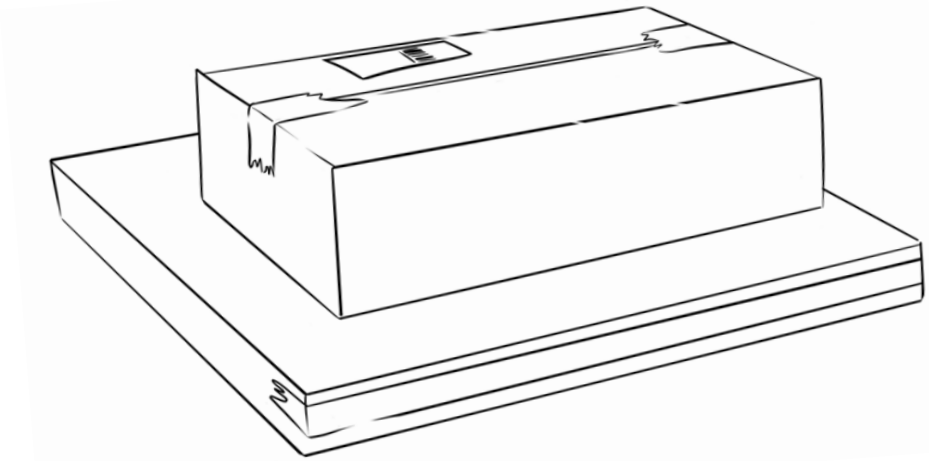
The additional fabric loops both help hold the pillows in place and can be used as an extra protection that is easy to wash or replace. Lastly it creates the opportunity to renew or personalize the product. Like a table cloth, people do not paint their dining tables red each Christmas, but they often change the cloth.

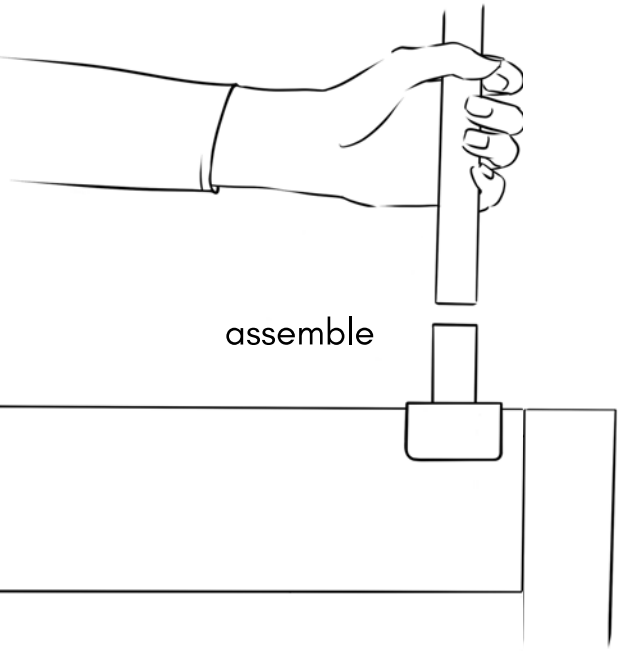
User journey



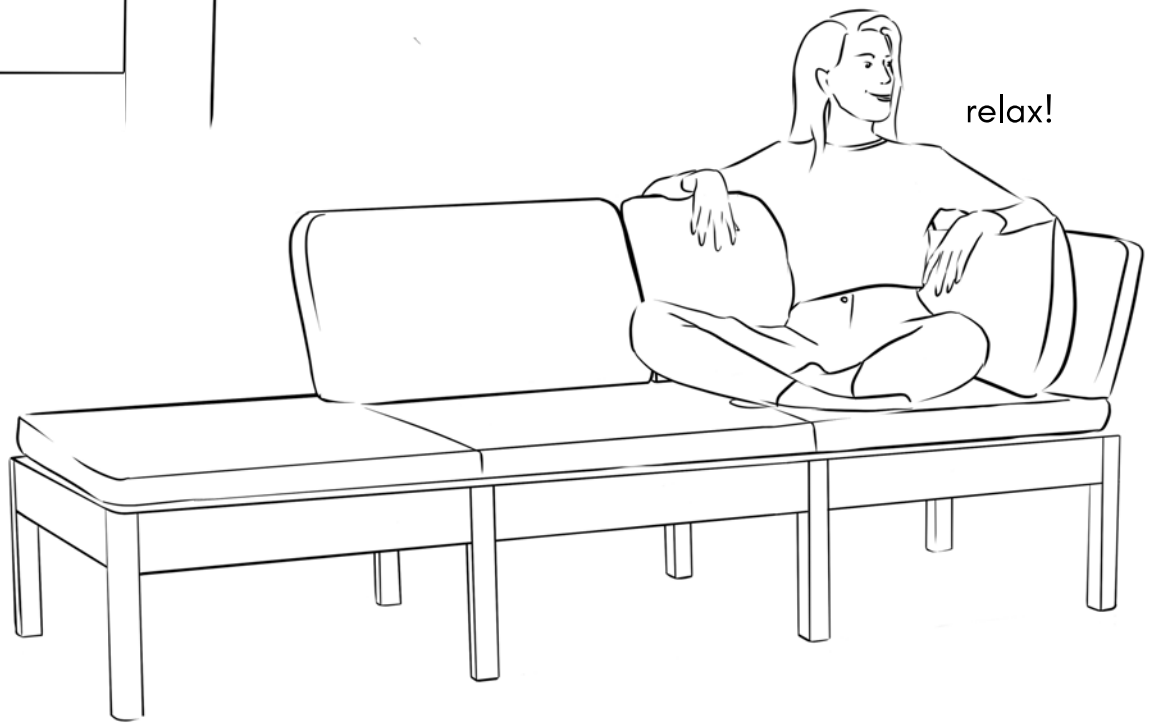
configure and order

bring home / get delivered

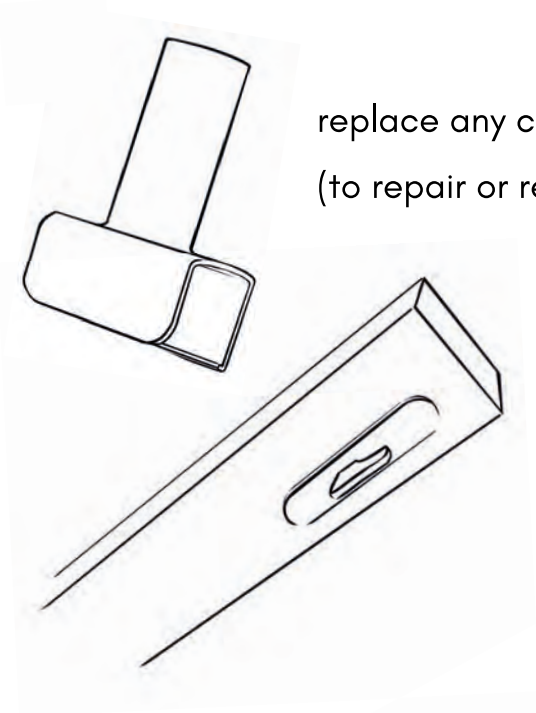




assemble

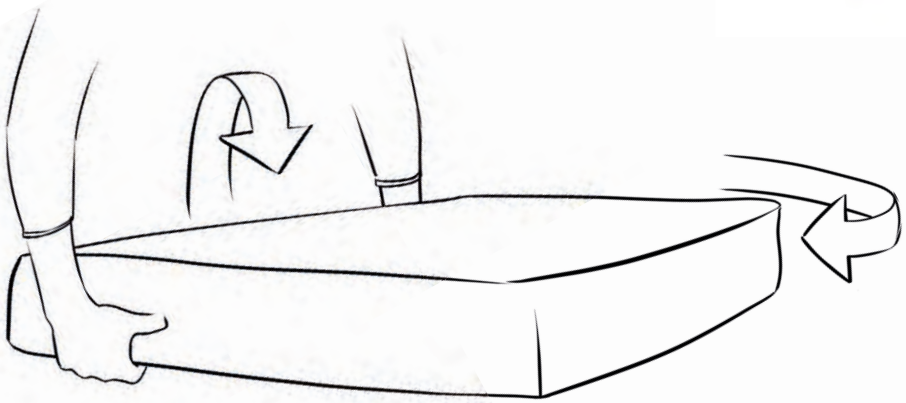


relax!

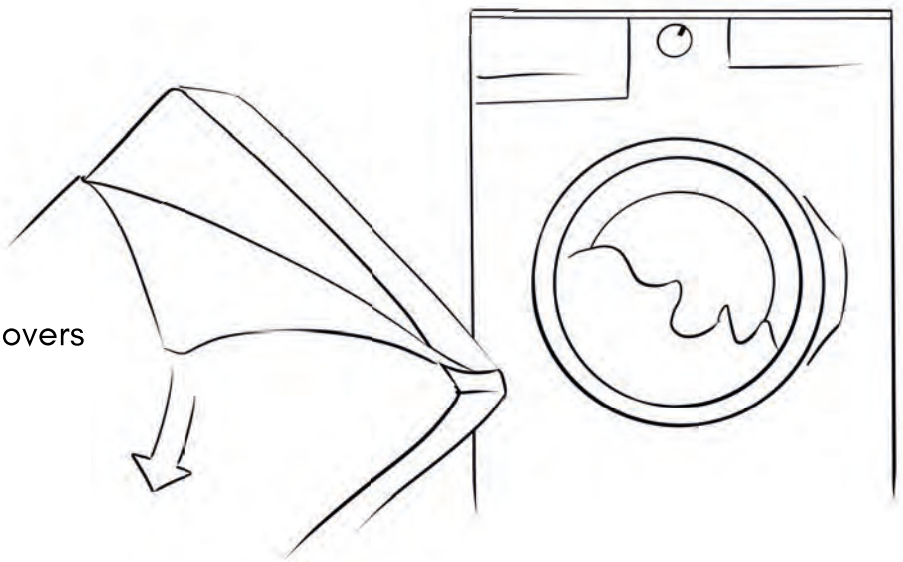


replace any component

(to repair or renew)



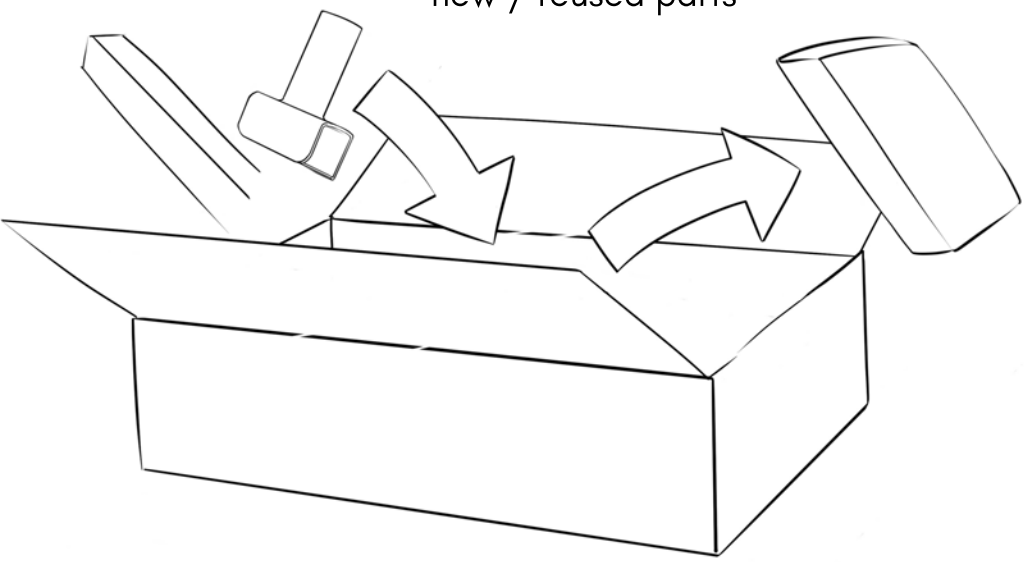
flip / rotate for even wear

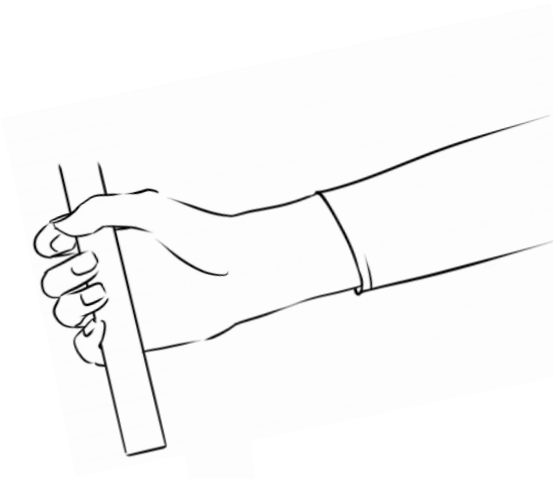


wash covers

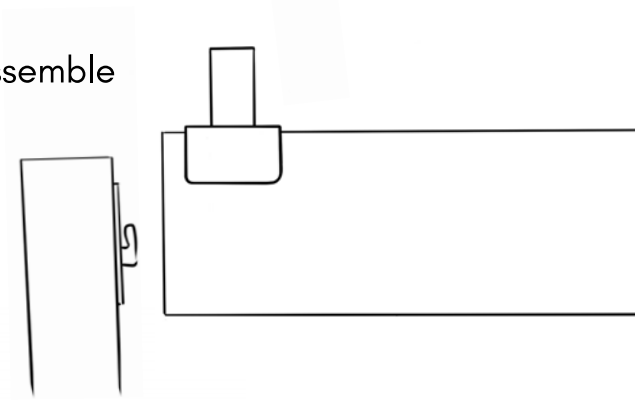
order / send back

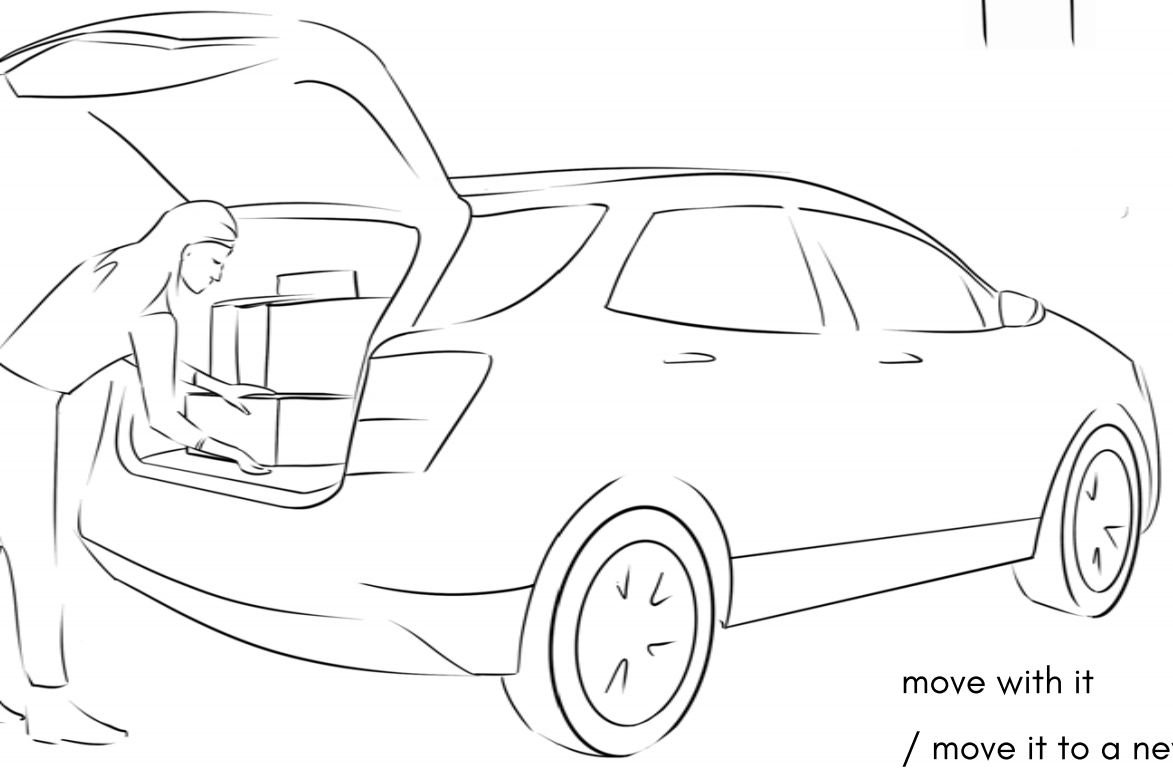
new / reused parts





disassemble



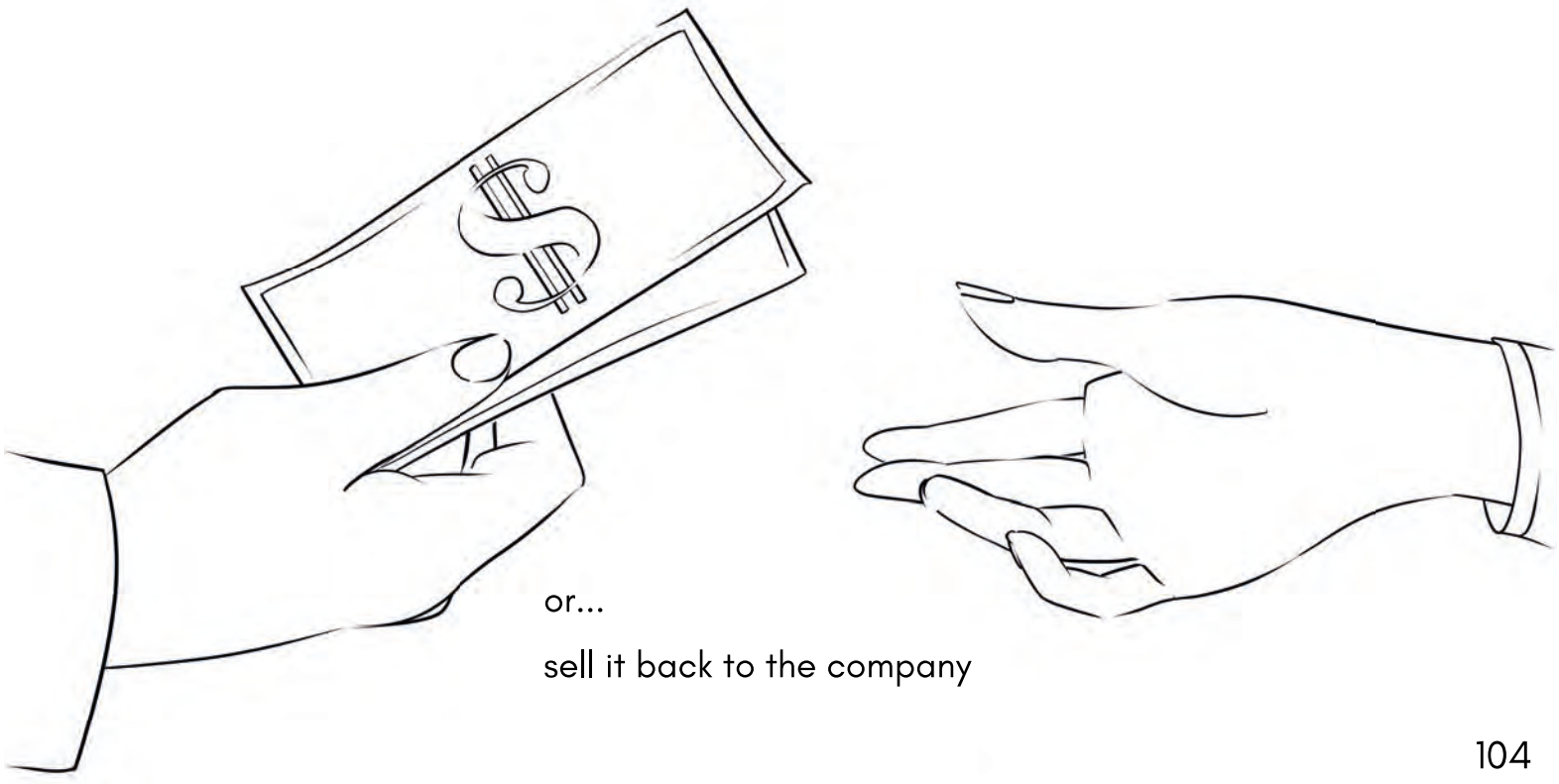


move with it

/ move it to a new owner

Buy / sell back system

Remain would be part of a buy / sell back system meaning that the user when finished with the product can sell it back to the company or send back and have new parts delivered. The company can then resell whole products or reuse and refurbish certain components. This would mean that the responsibility of recycling the product comes back to the company, but also the benefits of owning the second hand market. Further on the users will also be encouraged to take better care of the product since it will be rewarded.



or...

sell it back to the company

FINAL RESULT

Link to video:

https://vimeo.com/705647536

Sources

Research publications

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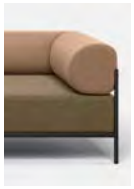


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