The Development of Elements for Creating Temporary Prefabricated Partition Walls

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A THESIS APPROVED
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Abstract

The use of partitions for space organization and zoning has a deep historical context. Temporary partition wall are a necessary component of spatial environment organization that designers are using as one of the solutions. Temporary partitions are an essential component in the design and organization of space, and they help to solve a wide range of problems, especially in open-plan layouts, providing flexibility in dividing loud and quiet private areas, or fast mobile spatial transformation. This thesis offers a vision of the design solution of three prefabricated partition walls.

This thesis suggests a solution and vision for the design of prefabricated spatial dividers, consisting of repeated elements. The goals for the project are to create a partition wall that will be inexpensive to produce, easily transported, quickly assembled and disassembled, made of recyclable materials, and that will not require extra components for construction.
Various approaches and technics are used for creating the prototype design. Three variant elements use different techniques, such as folding, laser cutting and molding forms. They allow users to assemble and build three different spatial wall dividers quickly with various assembly methods and bulk components. There are three existing elements fromExploration of the various assembly methods and bulk components.

There are three existing elements from which it is possible to create and assemble structures and spatial dividers for use in various applications. These prototypes are ready to be mass-produced. he wall designs involve 3D visualization, unique opportunities for marketing, and the implementation of alternative materials in creating the components.
As a result, the significant implication of this thesis is providing an effective solution for creating a design for the folding prefabricated spatial dividers, assembled through repeating elements. These dividers are inexpensive to produce, mobile in transportation and storage, and include the option of use as a beneficial marketing element.

Keywords: interior design, spatial partition wall dividers

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INTRODUCTION

01

This work focuses on interior spatial partitions and space dividers. It is surprising that such an essential element of interior design has not been fully developed and marketed given its critical nature and significant historical background.

The need to organize space separated for different uses is common to many living things, from birds that build temporary nests for hatching their young to humans who create inner spaces and divide using the partition wall.

Most people recognize the utility of partition walls as durable vertical surfaces or walls between spaces. Partition walls can be mobile, like, for example, folding screens or folding walls. Mobile folding screens, portable walls, or other interior elements are lighter than usual standard walls and constructed to divide space differently. The specific requirements for partition walls are:

1. *economy,*
2. *transformability,*
3. *durability,*
4. *lightweight,*
5. *soundproof,*
6. *moisture resistance, and*
7. *fire safety.*

Depending on the purpose of the walls, some of these requirements play greater or less importance. This area of design became of interest while I worked on a small research paper at the beginning of the MFA program. My explorations were expanded during the “Sustainable Design” class, where I started to experimen and developed the concept of the semi-transparent partition divider/curtain made from used plastic forks, knives, and spoons. With my previous expertise in interior design for commercial use, and supported by my research, I was able to experiment and use the data in a real interior design project. As a result, spatial dividers are

the critical design element used in my recent interior design plans for the Ellis Island cafe in Edmond, Oklahoma.

For my thesis, I decided to combine my previous knowledge and experience to develop my vision for a partition wall divider system. The goals of this work are as follows: First, I will briefly outline the historical background of interior spatial dividers and their uses in everyday life. Second, I will present three concepts of the partition wall systems, supported by an exploration of the form and materials. I will suggest three conceptual items-units and show three different partition wall systems that are possible to assemble and use in a real-time situation, using materials such as plywood, acrylic, paper, and cardboard. Third, I will highlight the sustainability of the three systems proposed.

My main goal for these three partition wall concepts is to create three different units (system blocks). By increasing the number of connections to build an ordered structure of links, it is possible to create three different individual partition wall systems. Moreover, the joints between do not require any adhesive or connection materials for their assembly. The concepts should answer the question of recyclability and sustainable development production, and they should be beneficial from the marketing viewpoint and use in real-life advertisement situations.

Although they may often go unnoticed, partition walls and spatial dividers play a vital role in pace organization. Partition walls create new area zones, divide space, organize pathways, and sometimes play a role in the critical decorative and design element.

This thesis will address the following:

1- Brand presentation and exhibition of the product.

2- The necessity of creating a temporary pathway (for example, in the cinema or at a cash register) with optional advertising elements.

3- The need for temporary spatial dividers as highlighted by the Covid-19 pandemic. Every open business and facility used as a public space needs to create spacial boundaries.

4- Residential/home decorative zoning boundaries.

The divider should be inexpensive to produce, sustainable, easy to assemble and transport, and should not require any specific building skills. Additionally, it should be possible to use the divider as a marketing element. Dividing spaces into areas for different uses is common to most living things, from birds that build nests and bears that hibernate in dens to humans who divide inner spaces with partition walls.

HISTORICAL OVERVIEW

- Prehistory
- Nomadic Peoples
- China and Japan
- Europe
- The Twentieth Century
- Contemporary Designs

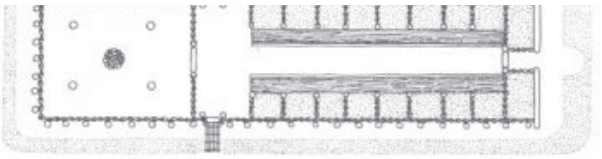
Prehistory

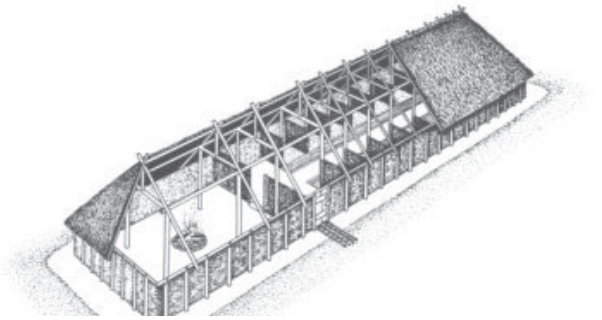
The idea of dividing space with walls dates back to prehistoric times. Tribes of Homo habilis, the oldest known ancestors of modern humans, may have been the first. Archeologists found evidence that shows the ability of Homo habilis to create light hedges to protect them from the wind. The next stage of the development of quickly building hedges can be found in places where Homo erectus lived. They used hedges to protect themselves from the wind, but they also constructed fireplace protections. For this purpose, they used stones. This was probably the earliest use of partition walls for direct functional use.

Another remarkable discovery was made in France in the Cave of Le Lazaret. According to excavation results, Homo sapiens used stone partitions to divide cave space into zones: they had a place for sleeping, a fireplace, a place to prepare food, and a place to make stone weapons.

Normadic Peoples

Further historical evidence of the use of partition walls and mobile walls can be found among our closer ancestors, the Vikings. According to the Hurstwic (2016), Vikings used partition walls to divide their longhouses. Rectangular buildings usually accommodated one family-tribe. Mobile partition walls made of animal skins usually divided a longhouse into threeparts (Ansuharijaz, 2016).





Creating light and simple constructions and walls has been traditional for nomadic cultures; it is still a common element of nomadic everyday life. The traditional principle of nomadic life, “Omnia mea mecum porto” (All that is mine, I carry with me), perfectly explains why Nomads build framed constructions using a method of framed

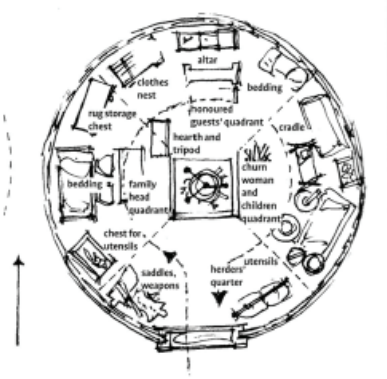
Picture (5) Nomad life in Somali Region (Guacamaya, 2011).

partition walls and often divide inner space with light foldings (Cellio, 1995).

Central Asian yurts are usually divided into zones by carpets or mats. Reindeer herders of northern and northeastern Eurasia use deer skins for these purposes (Association of World Reindeer Herders, 2016).

Dividing inner space by light materials helps keep warmth inside in cold winter months and keep the abode cool in the hot summertime. Besides that, light separation elements provide a calm, cozy, and relaxing environment and private space. Modern-day builders and architects use the principles of light construction developed and advanced by our ancestors. Contemporary engineers give a lot of credit to ancient builders for their savvy ingenuity and wit.

This type of structure is a common way of living space organization in the Central Asian region. Yurts are are usually divided into zones by carpets or mats.



Picture (10) Finished frame of yurt in Kazakhstan, before covering it with carpets or fabric.
Picture (11)1896 Picture of finished Yurt.

Picture (6), Picture (7) Nomadic people constructing yurt by light frame and deer leather as a wall

Picture (12), (13) Plan of the Yurt, with possible zone dividing,

The images show the process of assembling a yurt. The first type of yurt consists of connected slats that stretch like an accordion to create a light frame of the wall/partition. Then in the middle, supportive columns are installed to hold the slats that form the roof. After the frame is ready, everything is wrapped in cloth or deerskin. This type of yurt is very spacious inside and finds use during longer stays.

The second yurt type, which is very similar to the dwellings of the Native American Indians, is called A“Teepee” or the more common name for wigwam. These structures are assembled from several long planks and then wrapped in animal skins or fabric materials. Such frame structures are very resistant to steppe winds.

Picture (17) Inside in Japanese house. Example of the Fusuma sliding walls

China and Japan

The most remarkable and advanced results in the functional organization and use of the inner space with the help of partition walls and folding screens were achieved in some Asian cultures, such as Japanese or Chinese. Initially invented in China, early screens had only one panel. Folding screens were usually attributes of the interior; one of the earliest surviving multi-panel folding screens was discovered in the Han dynasty tombs (200 BC). According to Reyden (1988), Chinese folding screens were made mostly for stationary use, which is why they were usually heavy wooden panels, and most of their surfaces were covered with exquisite painted works. The Japanese absorbed a lot from the Chinese folding screen culture. They also perfected screens and expanded their applications. To improve and increase the flexibility of folding screens, Japanese craftsmen implemented the system of strong paper hinges fixed in the panel. That

Picture (13) Chinese early one panel screen. (14) early Chinese multi- panel screen mad

innovative system made it possible to connect more panels together, and it also made the screen more flexible. The purpose of those screens was the ultimate mobility and easy space transformation, that eventually influenced the final design. The lightweight nature of the structures was achieved by sturdy wooden frames covered with handmade paper layers. Notwithstanding their light weight, the folding screens were very durable and robust.

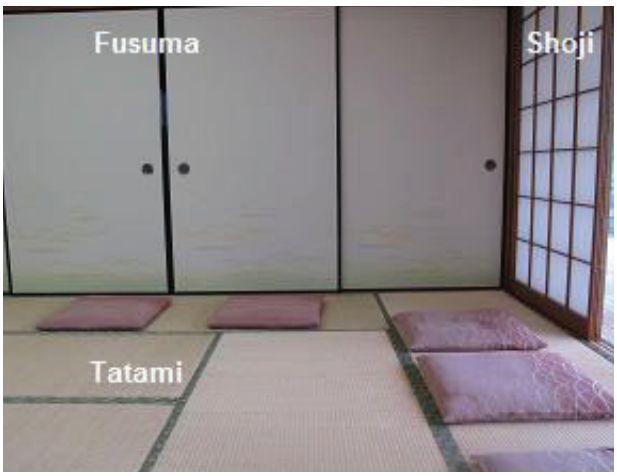
The use of light screens and panels with pleasing patterns became a major construction element in Japanese homes. The Japanese house has few walls, and as far as possible, all space dividers are movable (Burchell, 1989). Reyden (1988) divides Japanese screens into several types of so-called folding screens according to their function and use:

- ***"Byobu"**, a folding screen used as protection from the wind*
- ***"Tsuitate," the** single panel screen used for the entrance*
- ***"Fusuma," the sliding door***
- ***"Shoji," the modern term for translucent paper doors or windows.***

The main two types are ***Shoji*** and ***Fusuma*** (Burchell, 1989). ***Shoji*** is a frame assembled from thin rails and pasted rice paper. The purpose of shoji is to transmit light, but at the same time to be an obstacle to sight from the

Picture (18) Japanese house inside. Example of the Fusuma and Shoji sliding partition walls

Picture (19) Inside a Japanese house



other side. The ***shoji*** is often used as a telescopic mobile wall separating the interior of the house from the outer natural landscape. ***Fusuma,*** at the same time, is thicker, provides less light, and is used for inside partition walls, often decorated with ornaments or pictures

Picture (16) Chinese wooden highly decorated folding screen. 17th century

Picture (15) Chinese folding screen. Consists of screens. 17th century

Europe

Europeans became familiar with Chinese and Japanese screens in the mid-17th century due to trade development between countries and the popularization of Oriental cultures as something unique and not typical in the Western world. The screens were used mostly by women for changing clothes, or for creating private space with the elements that were stylish at that time. The folding screen fashion reached its highest point after the 1867 Industry and Arts International Exhibition in Paris, where European artists were inspired and influenced by outlandish screens and started to emulate them (Reyden, 1988).

Popular in Europe in the late 19th and early 20th centuries, the Art Nouveau style inspired beautiful decorative screens for dividing spaces.

Picture (12) Folding screen made in Rococo style

Picture (13), (14), (15) Decorative elements of the wall, that at the same time became a partition walls or screens, for dividing space

Picture (21), (22) Examples of the problem related with lack of self-space in the office space in 1920 – 1940.

The Twentieth - Century

The 20th century. At the beginning of the 20th century, just before World War I, Art Deco style appeared in France. The ideas of the modern Art Nouveau style forged metal and glass for use in the interior.Designers started to rethink complex and arduous elements of the Art Nouveau style, and the Art Deco style appeared. Art Deco brought to light new variants in ornament and forms. Elegant and unusual ornamented folding screens and screen partition walls became characteristic of the modern interiors of that time. Unfortunately, due to World War I, these styles did not expand broadly in Europe. While Europe was recovering after the war, the real climax of Art Deco was in the United States, where we can still find its most memorable examples. Artists and furniture makers used folding screens for various purposes in various space situations by providing plenty of ornaments and materials that were common for the Art Deco style. Folding screens were used mostly as decorative elements. Their design and decoration already had very little to do with the original folding screens from Chinese or Japanese antiquity except for the very idea of folding. Designers imbibed the atmosphere of the fresh flow of engineering

Picture (18), (19) Examples of the folding screens made in Art – Deco style, inspired by forms and shape of Skyscrapers

breakthroughs, the vast development of new lines and forms of contemporary architecture used in skyscrapers, automobile production, and the surrounding changing world, a world that required new design solutions. For example, the rapid construction of field hospitals and the division of spaces to accommodate the wounded, during the Great War (World War I). Mobile partitions on rollers appeared, structured with a light metal tube frame and covered with a fabric curtain.

At the end of the 19th century and the beginning of the 20th century, humanity faced tremendous social, economic, and cultural changes. The new method of establishing buildings and development of skyscrapers using steel, glass, and ferroconcrete allowed builders to avoid constructing walls in inner spaces and provide instead a lot of open spaces. Numerous corporations used new opportunities by accommodating employees in one area without spending money for separate offices.

Picture (23), Examples of the problem related with lack of self-space in the office space in 1950 – 1960.

Yet, very soon, a new challenge arose: as it became clear that employees needed private personal spaces. In this situation, designers turned again to light partition walls, which we now see in many office buildings. Interestingly, the first companies to create personal space zones were Japanese companies. Due to the development and economic growth of Japan and Japanese companies during the 1970s and 1980s, companies needed more office space and more employees. To accommodate more people in one area and not to waste space between desks, designers and companies started to use little walls between desks to create a more relaxing atmosphere for the employee.

That at the same time was useful for the companies, as employees were not distressed by the surrounding environment; as a result, they were more focused on the job, and office

space was efficiently used.

In the usual situation, the working desk was covered by the little wall, which created a sense of the private area.

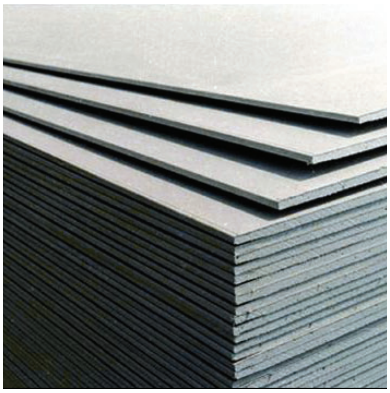
Conversely, it also became clear that not all departments required spaces connected into one ample open space. For this site, new construction materials and technologies were used. The most common material for partition walls was and still is gypsum plasterboard. If we take a careful look at the frame structures that such barriers were composed of, we notice some aspects from Japanese folding screens and sliding walls, and even elements used in yurts built by nomadic peoples.

Gypsum plasterboard was a real solution for the space planning challenges, but material production provided new options. Gigantic overlapping structures made of metal frames, glass, plastics, and other materials, large enough to cover expansive spaces, became readily available.

Partition walls made of matte glass became the reincarnation of Japanese walls and folding screens originally made of paper. Despite the benefits of using easy-to-create partition walls, designers faced with another problem: an aggressive visual field. The obstacle is that geometrically straight vertical and horizontal lines of partition wall frame elements, intersecting at right angles a the certain order, form the so-called “homogeneous” and “aggressive” visual field (Zvyagina et al., 2014). Moreover, the overabundance of unnatural materials and forms makes the atmosphere unfriendly.

With this in mind, interior designers began to examine other ways, materials, and methods of forming walls and partitions. Moreover, the use of gypsum plasterboard structures does not satisfy most tasks related to mobility and new trends in space organization.

Picture (30) Examples of aggressive visual field



Picture (28), (29) Examples of construction process of the gypsum plasterboard partition wall. Frame structure

Picture (27) Examples of principle of the cell partition walls in the office space during 1990

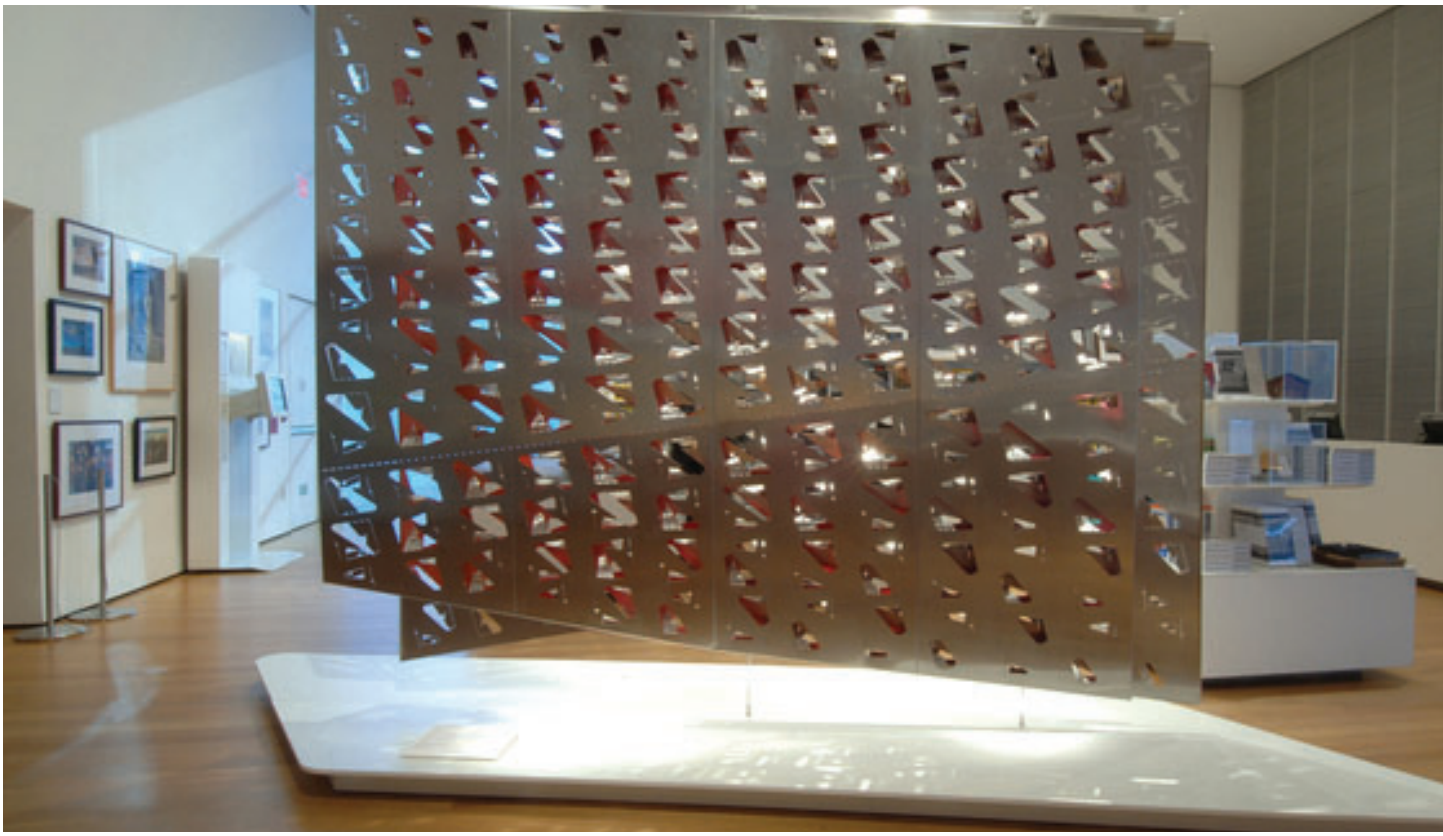
Contemporary Designs

What are the new creative approaches to creating cozy working zones today?

Firstly, it is rethinking the use of plants in the interior. Creating partition walls with the help of plants produces beautiful light solutions. Such a partition wall will be an active element in the interior, combining and establishing the feel of an outdoor park inside the working area. Moreover, developed by the Center for Architecture Science and Ecology, such live partition walls may act as a system for air purification and energy reduction in building systems (Schneiderman, 2012). Pod elements create the spacial divider. Due to the module system, it is possible to establish such walls in small or ample spaces.

Another look and another example might be the natural lines created by ropes and the emotion of lianas. This idea forms the impression of the natural lines and the feeling of cover beyond the leaves and trees.

Picture (31)(32)Examples of partition wallsmade with use of plants



The concept of transparency and semi-closed eye obstacles with the surrounding area is one of the main ideas of partition walls. Besides that, designers try to examine the concept of ready-made walls, which are possible to install by docking elements between them, taking them from the box, in an idea described by Schneiderman (2012). For instance, a flatform designed by Marble Fairbanks is metal panels that are precut and delivered in a flat package. The installation process does not require tools or hardware, and just precut tabs are folded and interlocked

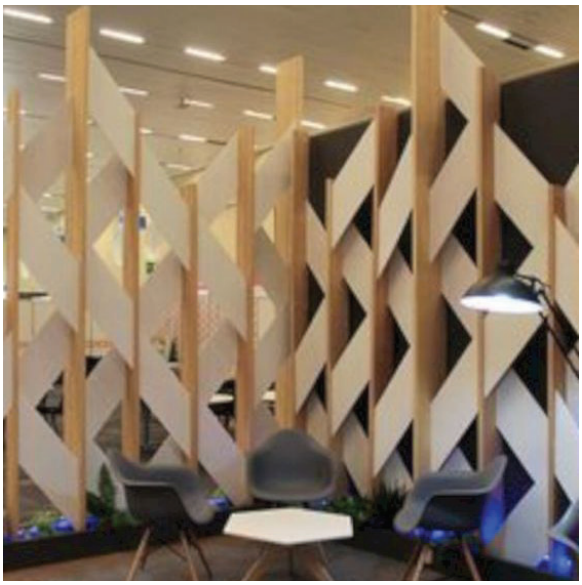
by hand. By assembling panels with folding tabs, it is possible to create wall structures. This type of grouped panels was not possible to develop without computer control fabrication.

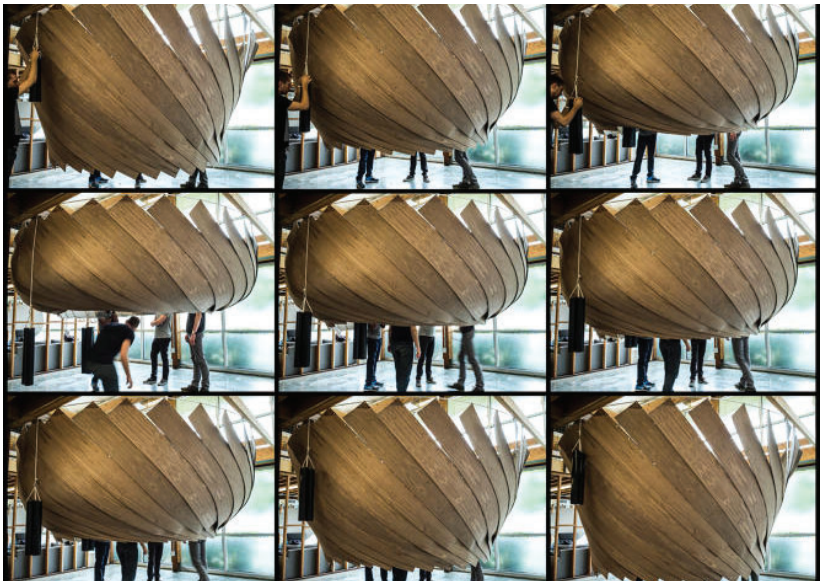
The conceptual idea of connection between light elements for creating partition walls is widespread. For this purpose, a lot of designers develop their parts and achieve excellent structures. Greg Lynn FORM shows such an odd arrangement, created with light plastic pod elements.

Refer to folding systems, designers, and architects, use the idea of folding systems to create various transformable structures. This approach is suitable for internal changes and even more for transforming the building itself. Currently, designers are exploring various options for folding systems and partitions, both for internal and external walls. Such implementations infinitely expand the use of space. Thus, architecture can use it to introduce folding walls of buildings, which allows us to change the entire appearance of architectural structures.

It is essential to consider a trend that represents the answer to the acceleration of life and the ability to work remotely from the workplace: individual partitions or personal capsules/screens designed for a single-use or a small group of people.

The need for barriers like this, situations where one needs personal space,places like airports, cafes, and lobbies, among others.





Picture (41)(42) (43) Example of MIT lab project

Cutting - edge solution for the folding spacial divider researched by a design team from the MIT Lab + Google Self-Assembly Lab. For the past seven months, the team has been working on the issue of textiles and materials that can be “programmed” for self-design. MIT’s latest project is a timber structure that folds up and down from the ceiling without any electronic components or electricity and creates a temporary workspace. After use, the structure folds up and hides at the ceiling level. This project represents a new look at partitions and will expand the way to use them, changing the interior design solutions for the vast range of layouts.

HARBINGERS OF THE PROJECT

- Revive Project
- Ellis Island Cafe

03

Revive Project

This chapter will showcase my work, a vision of three design concepts/solutions for partition walls. The main challenge for this project was to make the baffles easy to assemble so as not to have many different components (consisting of repeating elements). Moreover, their manufacture should be inexpensive.

The aim was also that the partitions could be used as promotional items. I also explored the possibility of creating a disposable partition; therefore, one of the essential characteristics is the possibility of disposal after use. It is also important to note that all three designs must be ready for mass production.

However, before moving on to the main projects developed for this dissertation, I would like to present and discuss projects that have been developed by me during the educational process, as well as my design for an existing cafe and commercial space. These projects will help show the stages of developing an idea and forming my vision and my interest in this topic before my thesis project.

These predecessors sparked my interest in the field. Indeed, the research and experimentation that took place during their design helped me understand the role of using dividers in space and how they can be useful in shaping the flow of people and zoning in a public area. Also, interest has arisen in the methods of application for non-standard materials. While I do not wish to exaggerate the role of these experiments, they are quite significant for my knowledge and skills.

The first predecessor of this thesis was developed in response to the challenge of the "Sustainable design" class, to find a product design solution with the approach of using recycled materials.

Disposable plastics, which too often end up in landfills, is a widespread example of garbage. Almost all fast-food restaurants, canteens, and gas stations use this type of tableware. Unfortunately, few people pay attention to the kinds of plastics, although not all types of plastics can be recycled. As a result, plastic forks, knives, spoons are sent for persistent storage to landfills with garbage. My idea was to collect this waste,

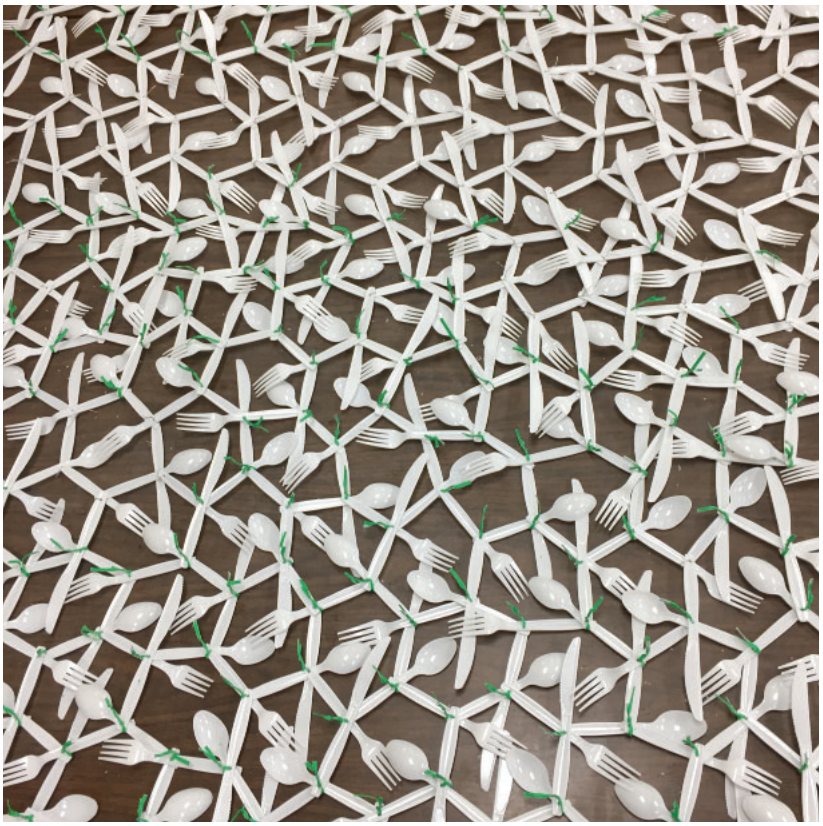
with subsequent use that does not require particular types of processing, such as remelting using heat treatment.

The concept is a combination of interconnected plastic spoons, knives, and forks using wire inserted through drilled holes. The metal wire also reused after being used by customers to twist around the bag when they pick up a bag of tomatoes or apples, for example.

As a result, this structure forms a network. Plastic items are connected and stacked on top of each other in a particular order. This net can be used either suspended from the ceiling or attached to a movable frame to make it mobile.

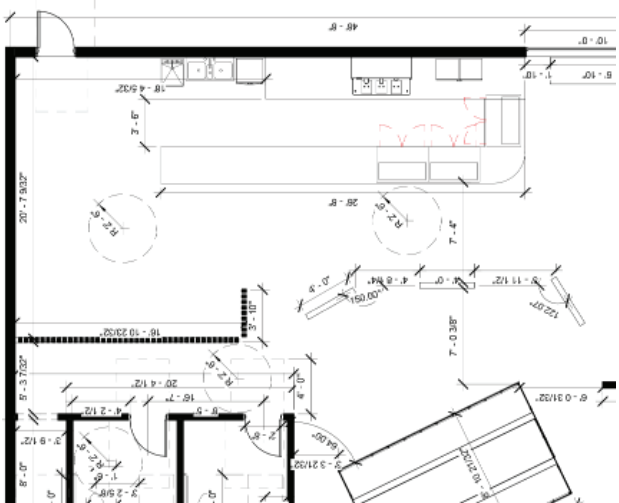
The concept was designed for use in cafeterias to to visually differentiate between tables. Also, due to the repetition of elements and methods of connection, a visual rhythm is created, which brings an intriguing decorative effect to this concept. Moreover, this network can hang over a zone, imitating fabric or canvas to hide the ceiling.

This project helped me by inspiring subsequent ideas involving alternation, serial connection of the same element, and the use of unusual and repurposed materials.It offered multiple opportunities for problem solving and innovation in structure, design, production, marketing, and sustainability.



Ellis Island Cafe

My next project, in which the use of spacial dividers was the vital design and layout base element, was at the Ellis Island Cafe in Edmond, Oklahoma. I decided to use partitions made of wooden planks as one of the principal design and decorative elements. Additionally, I incorporated the use of small pedestals with an inclined upper part to guide the visitor's view and form the horizon line to the bar area when visitors enter. In the development of the interior design of the Ellis Island Cafe, I wanted to create a feeling of openness in the space while at the same time dividing the space into different zones, leaving the feel of the united space. It was also important to direct the flow of the guests throughout the cafe.



After my work on these designs, I was interested in the use of partitions in space. The idea of creating a prefabricated, quickly erected section arose. My goal was to create a single element/ block that, when connected, establishes the structure and formation of the section without additional elements. At first, the plan was to create one concept/prototype that meets the task. But, while working on creating the first concept of “Stackable Systems,” research and experiments with shapes, materials, and methods of joint assembly, the number of ideas for researching concepts and prototypes expanded, and two more concepts appeared.

- Process
- Prototype
- Final Design

SLIDING SYSTEM THIRD CONC

SEARCH AND FORMATION THE ELEMENT SHAPE, ITS MANUFACTURE AND THE FINAL DESIGN

STACKABLE SYSTEM FIRST CON

- Process
- Prototype
- Final Design

FOLDING SYSTEM SECON

- Process
- Prototype
- Final Design

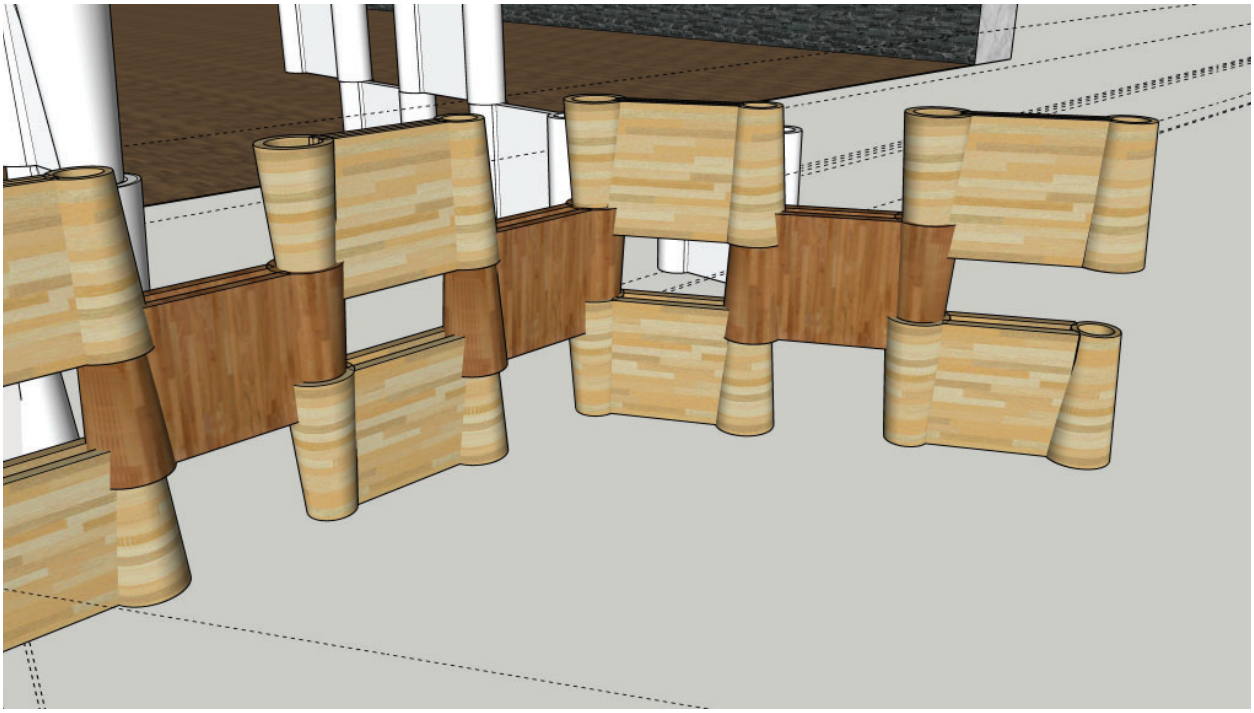
STACKABLE SYSTEM

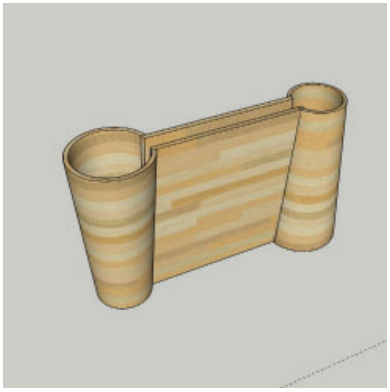
FIRST CONCEPT

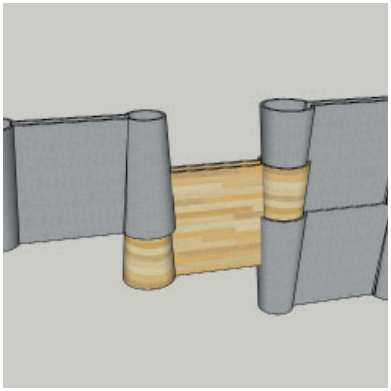
- Process
- 3D Visualization
- Prototype
- Final Design

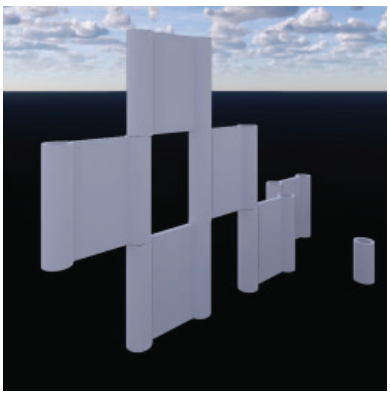
The first steps were to create preliminary 3D models to understand the shape. The original idea was to create a block with two cylinders with a connecting bridge in the middle. Although this option seemed quite simple, a question arose regarding the blocks' connection. The development of the idea proceeded on the assumption that the block will be inserted into one another.

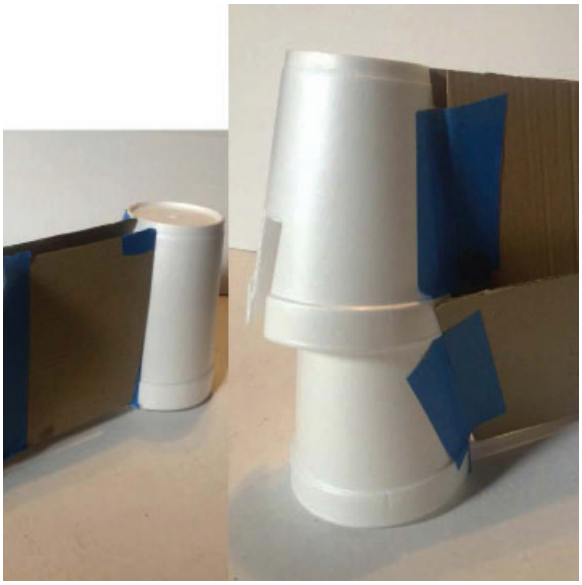
Disposable cups served as the starting point in determining how the elements would stack into one another, creating a secure connection. Using two cones instead of cylinders connected by a spacer would create a more stable structure. Moreover, the decorative aspect was also essential; in my viewpoint, cones create more eye-catching, intriguing movement when joined together. It also became clear that the blocks had to be hollow on the inside to make the block lighter.



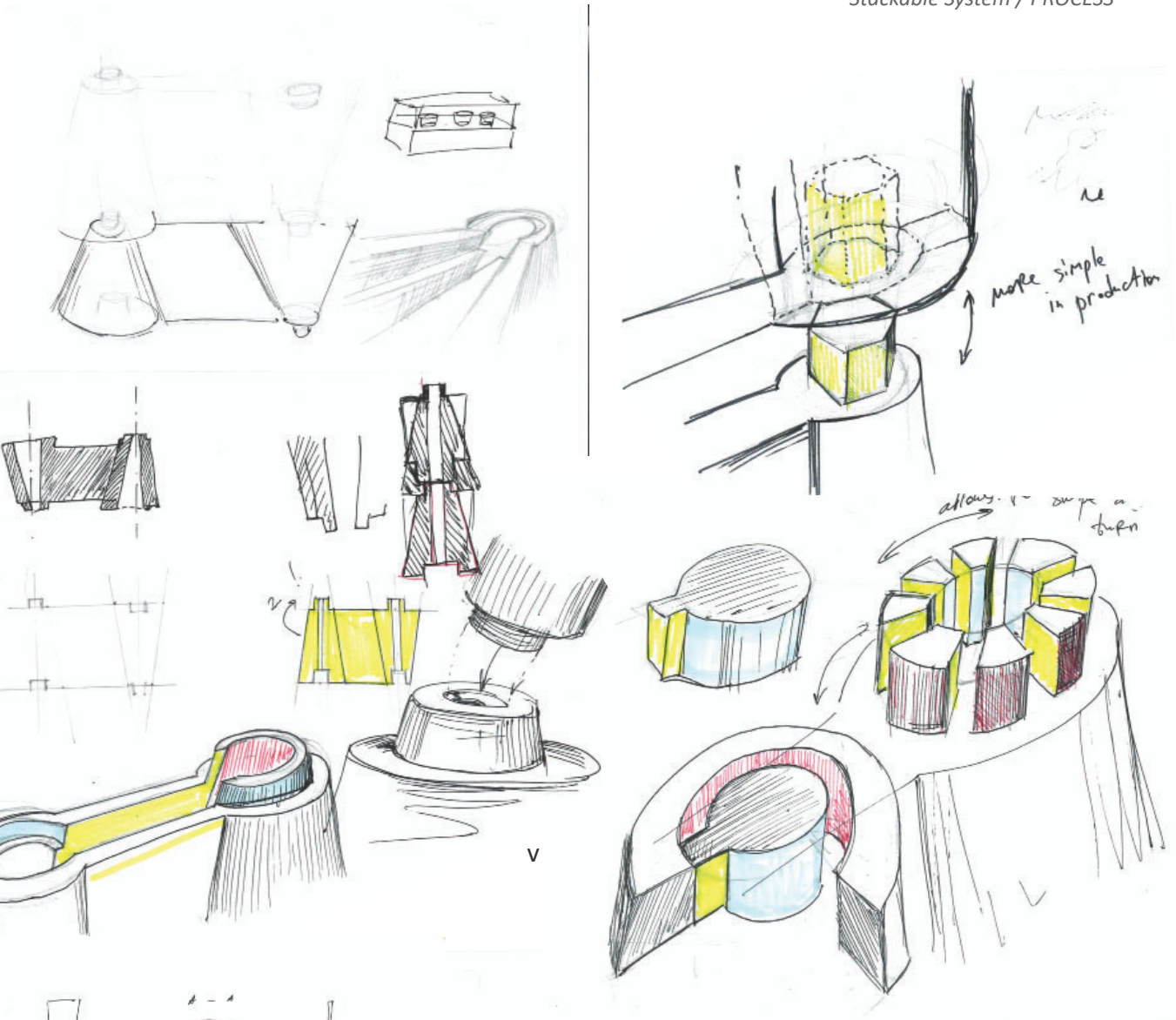








The use of sketch models were used for 3D visualization and form analysis. I used clay in order to understand the plasticity of the structures and the connections between the two blocks. The first problems appeared in the relationship between the blocks. I created a lightweight prototype with flat foam sheet insulation and cardboard.


make simple in production
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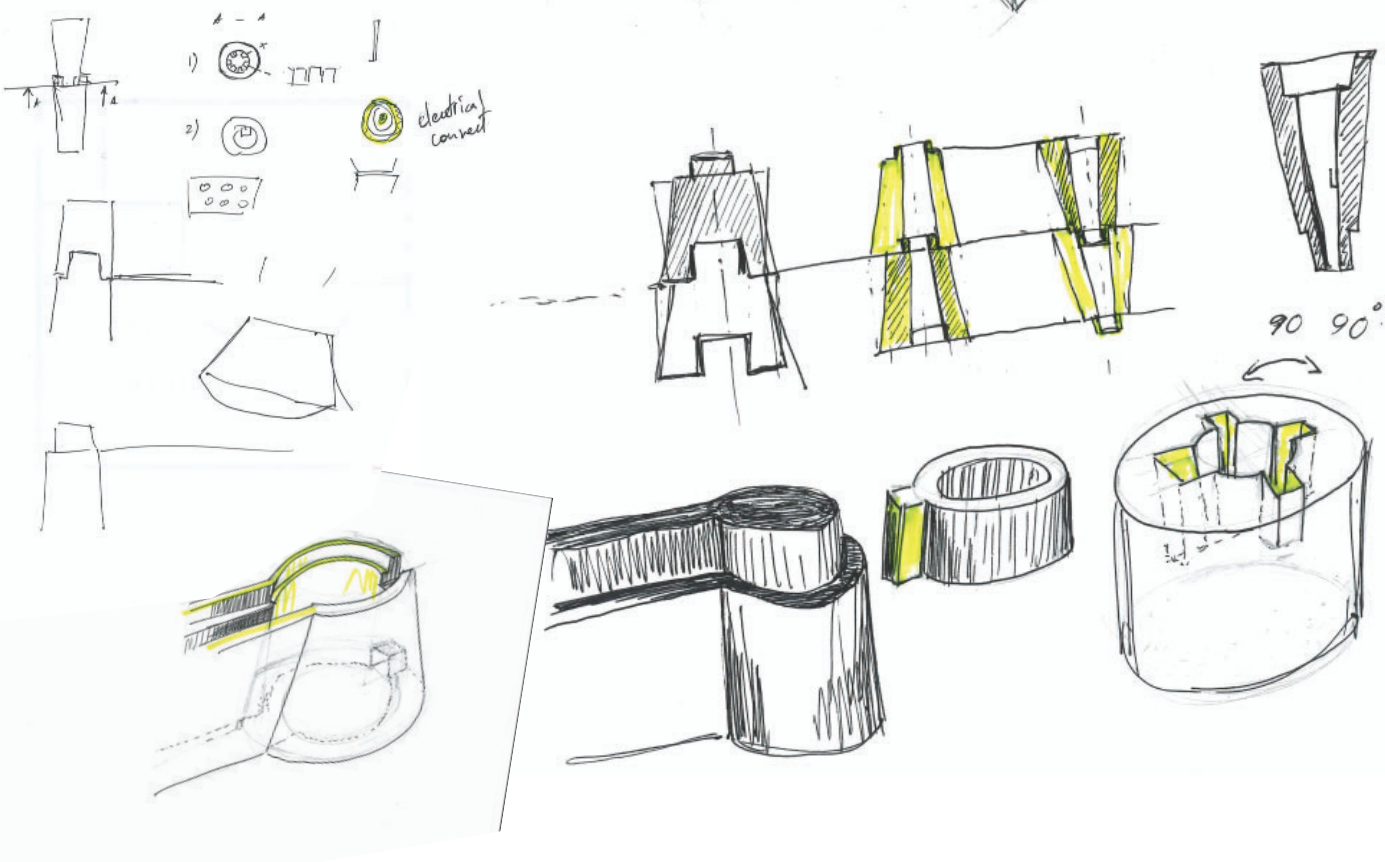
1)
2)
electrical connect
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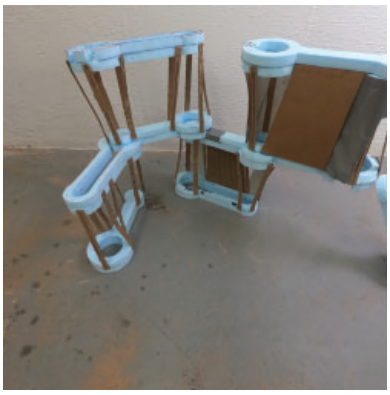
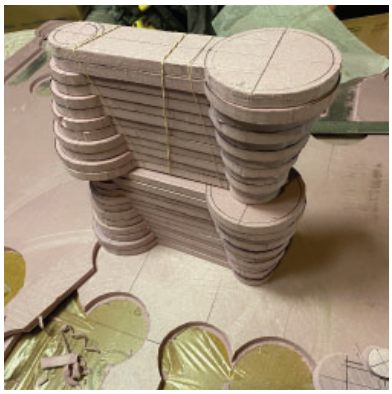
First Prototype

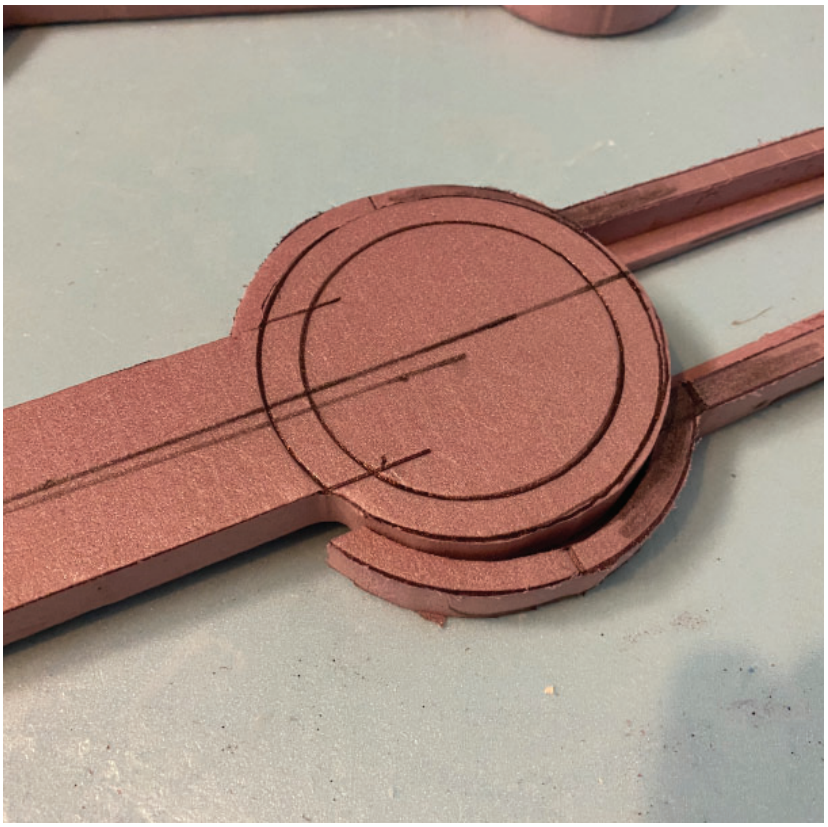


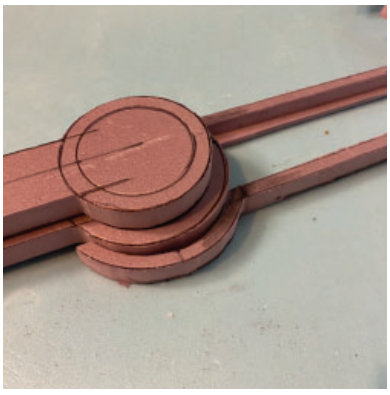
After making sketches, I created several rough elements/blocks to experiment with the ways of connections and to define the principle of the partition wall assembly. The above photos document the results of the first experiments.

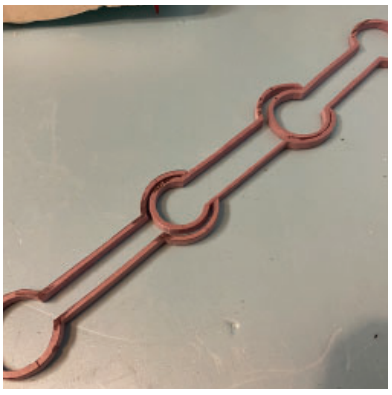
Formal Exploration / First Concept /
Stackable System / PROTOTYPE

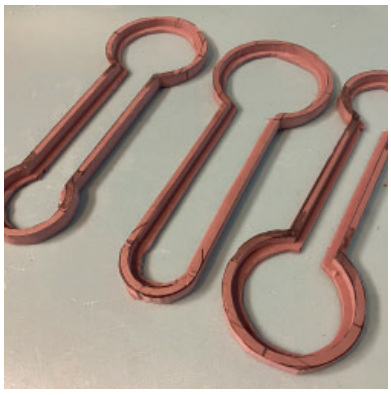
At this point, with essential progress achieved, the system of dimensions and relations between diameters of the cones was defined. The photos below show the prototypes for the stackable model. This is actually the first variant, which was not yet the best solution in ways of joints between blocks, but it was very beneficial for further research. For better understanding and definition of all the aspects of the model, it was made in layers. Each layer has previously defined dimensions.









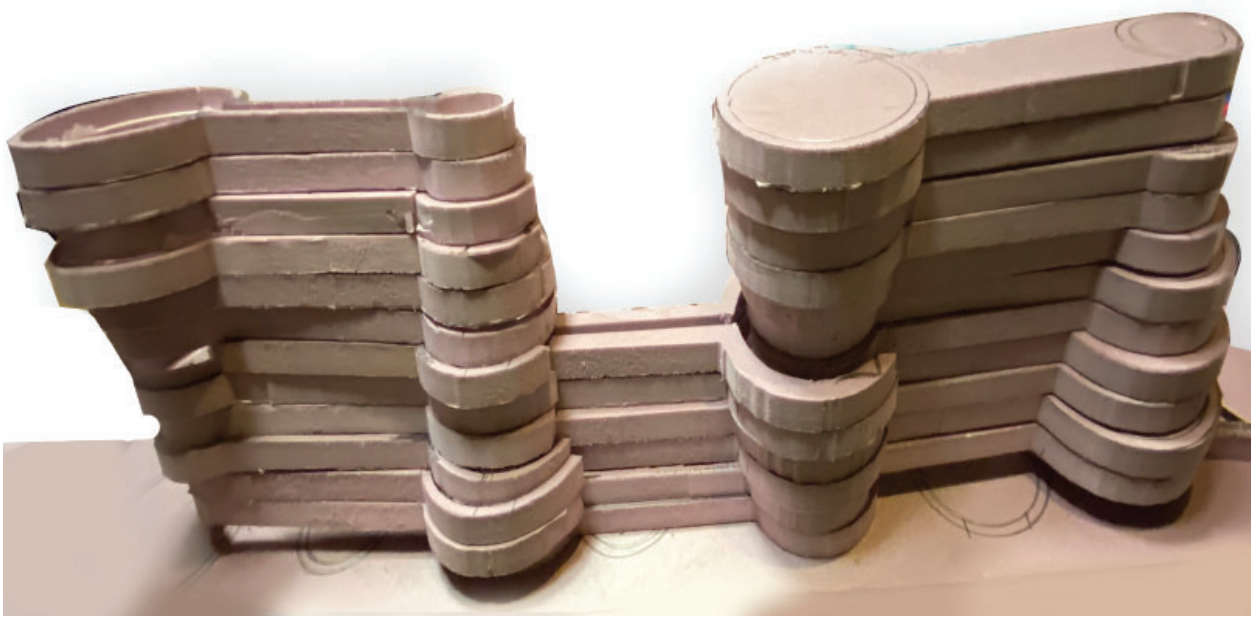


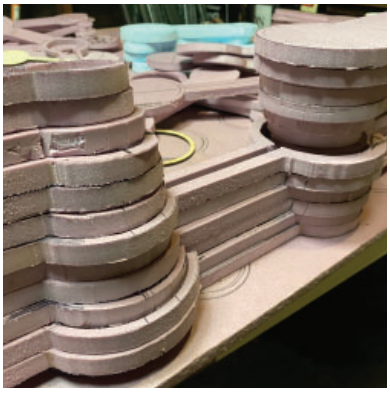
It became clear that the central obstacle to a successful result was finding a simple way to connect the elements. Photos depict process of finding a way to cut the layers of the block/ element presented. The parts are hollow inside for a more accurate view of the model. Unfortunately, this strategy was not the right answer.

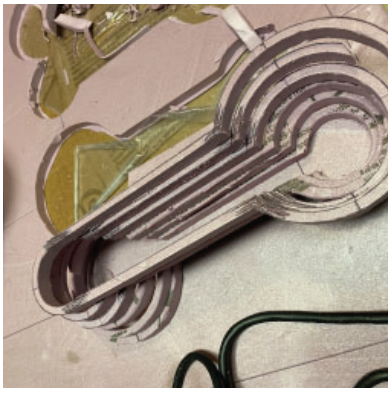
Such a way of joinery when the element is cut through was not beneficial, as it works only for the straight in-line connection or 90 degree angle. Unfortunately, the limitation of the path connections made the element structurally weaker.

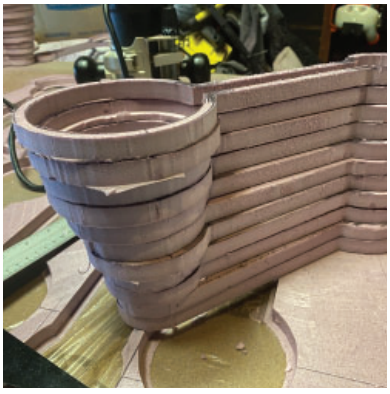
I developed several models and prepared to experiment with the joint and combination of assembly paths. One model was not completely hollow. The layers were connected by silicone. As you can see, the main pictures present how two elements stack and linked with the third element in the middle. However, it was clear that the model and structure were weak as well as arduous to produce.

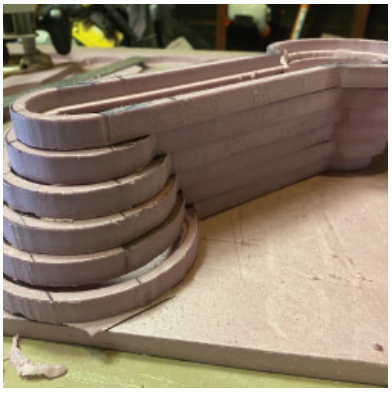
Nevertheless, the layered sliced edged line design was detected as the main inspiration for this concept. The look and feel of the Alessi Pulcina 3-Cup Espresso Maker influenced my decision to feature these sharp edges on this form.

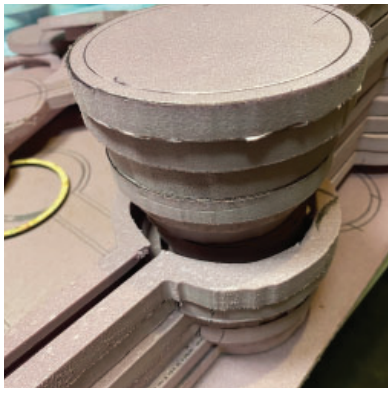






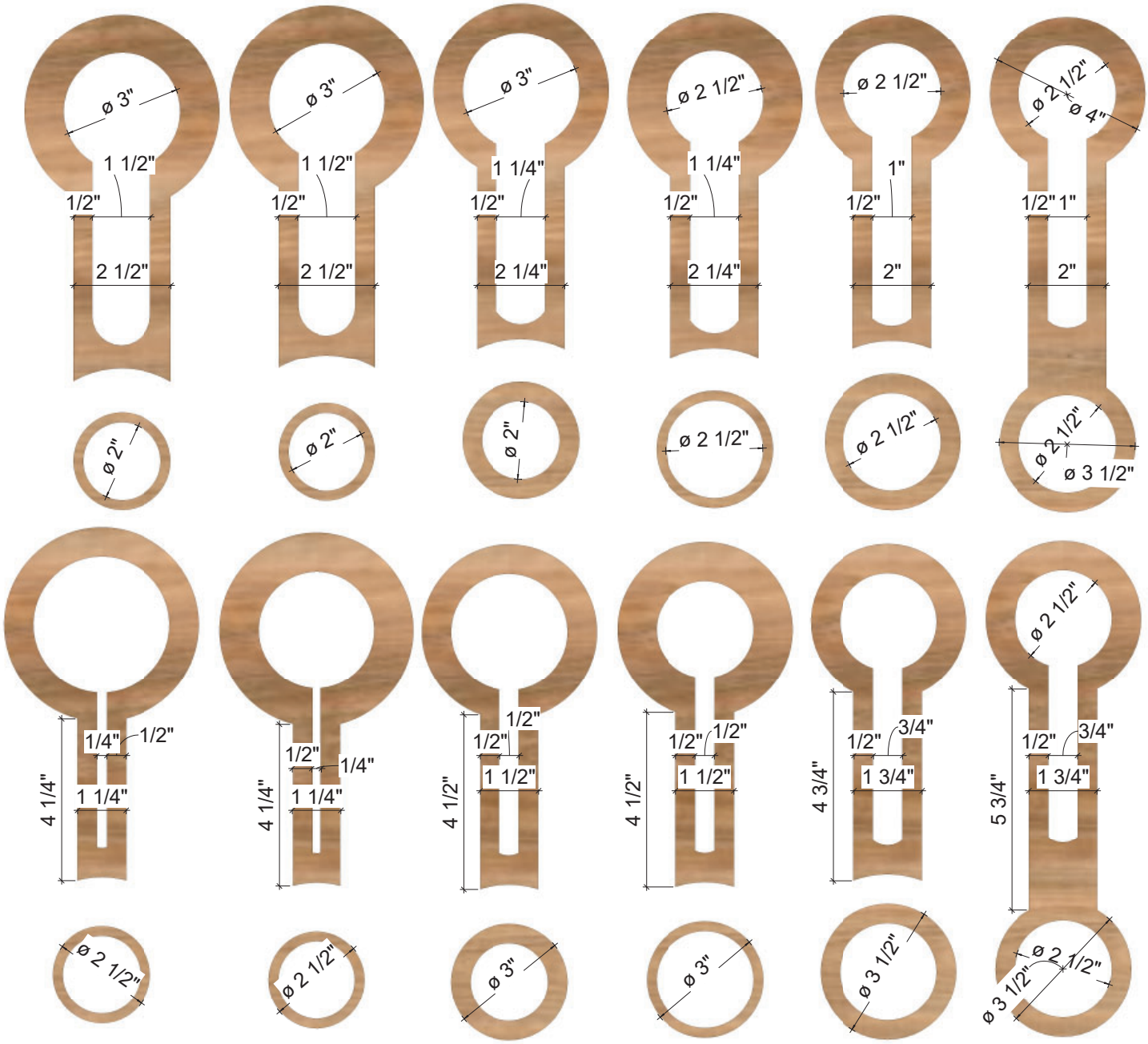






3D Visualization

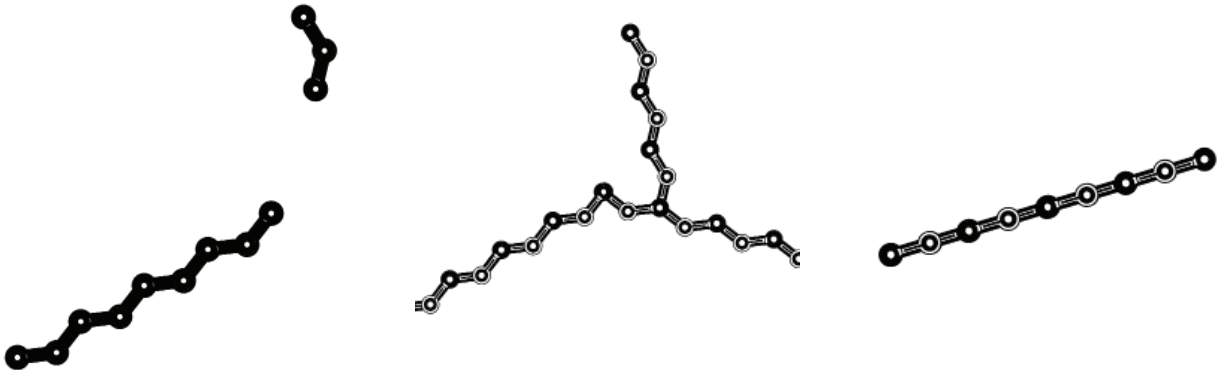
I returned to 3D modeling, analyzing previous experiments with form and communication between components, and I experienced a breakthrough. The solution was to separate the cones from the middle part. Also, the ends of the cones' radius are symmetrical, and the hollow shapes are symmetrical and repeat the cone diameters. Hence, cones can fit inside the hollow part of the element. The 3D model of the device is shown in the pictures.

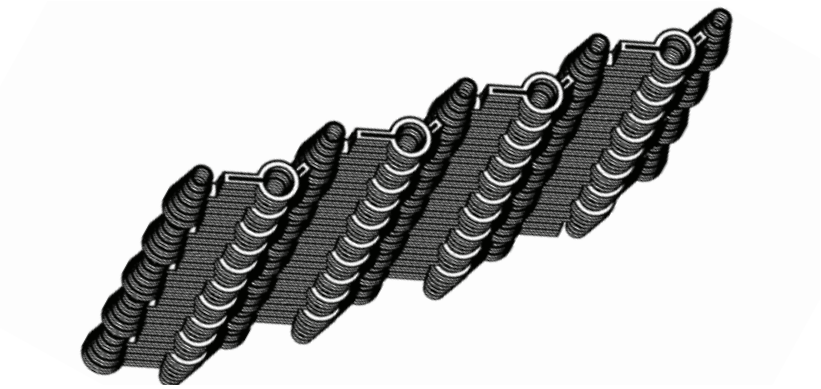


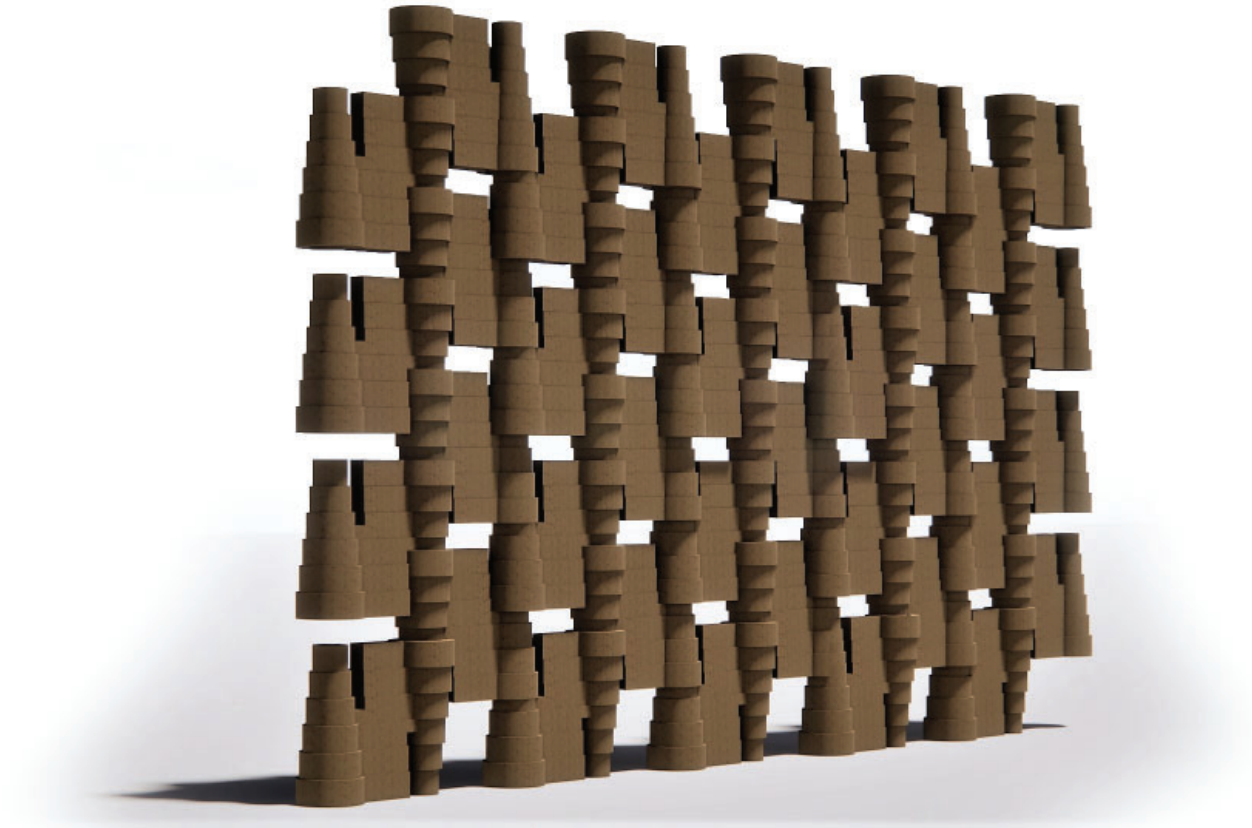
1 Level 1 Copy 1
12" = 1'-0"

For better visual understanding, the unit divided into layers that show all the aspects of the form changing. It is, essential that the central part of the element varies the size from narrow to full on the bottom. That makes the object more resistant to tipping or collapse.

To prove the suggestion and show how the connection and process of joining happens, this 3D model with assembled elements developed. Also, some sketches show the way in which the partition wall divider might be constructed. By gathering it with an angular connection between components, it is possible to achieve a visually appealing structure. The distinguishing feature is that it is possible to create structures using a variety of angles.







Close presentation of the way elements are connected, forming the different visual effects by using different angle relations.

This visualization presents how the concept of this partition wall might be used in a real life situation. When in the cafe, it is necessary to divide tables and provide borders between cafe guests. One of the aspects of this wall is that there are small gaps/spacing, which makes it less bulky and creates a feeling of transparency.

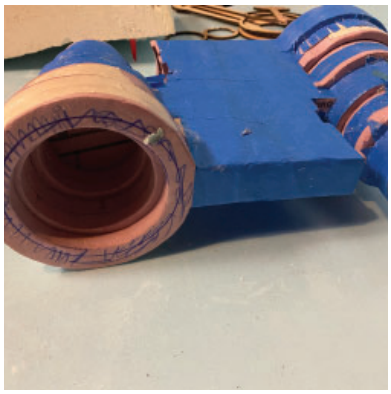
The joint elements create the rhythm and flow of the line, which is the aesthetic feature of this particular concept.

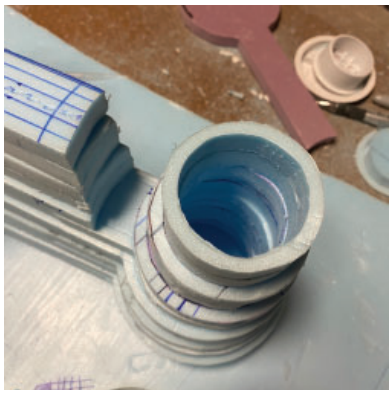
Formal Exploration / First Concept / Stackable System / 3D VISUALIZATION

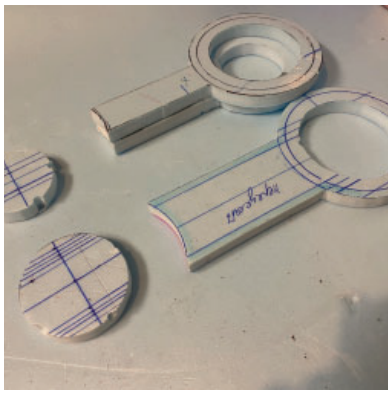
This partition wallmay be used separately as a screen or border. Sometimes, it is necessary to create temporary pathways to direct foot traffic, as in airports, for example.For this purpose, this type of system will be beneficial.

Second Prototype

Finding the results of the 3D visualizations positive, the next step was to make a real model prototype. Importantly, the height of the layers used in the 3D visualization was twice as high as the height used for modeling, due to the material availability aspects. Nevertheless, all other dimensions and parameters are the same. The unit was built and it is possible to see how the layers are formed and structured.

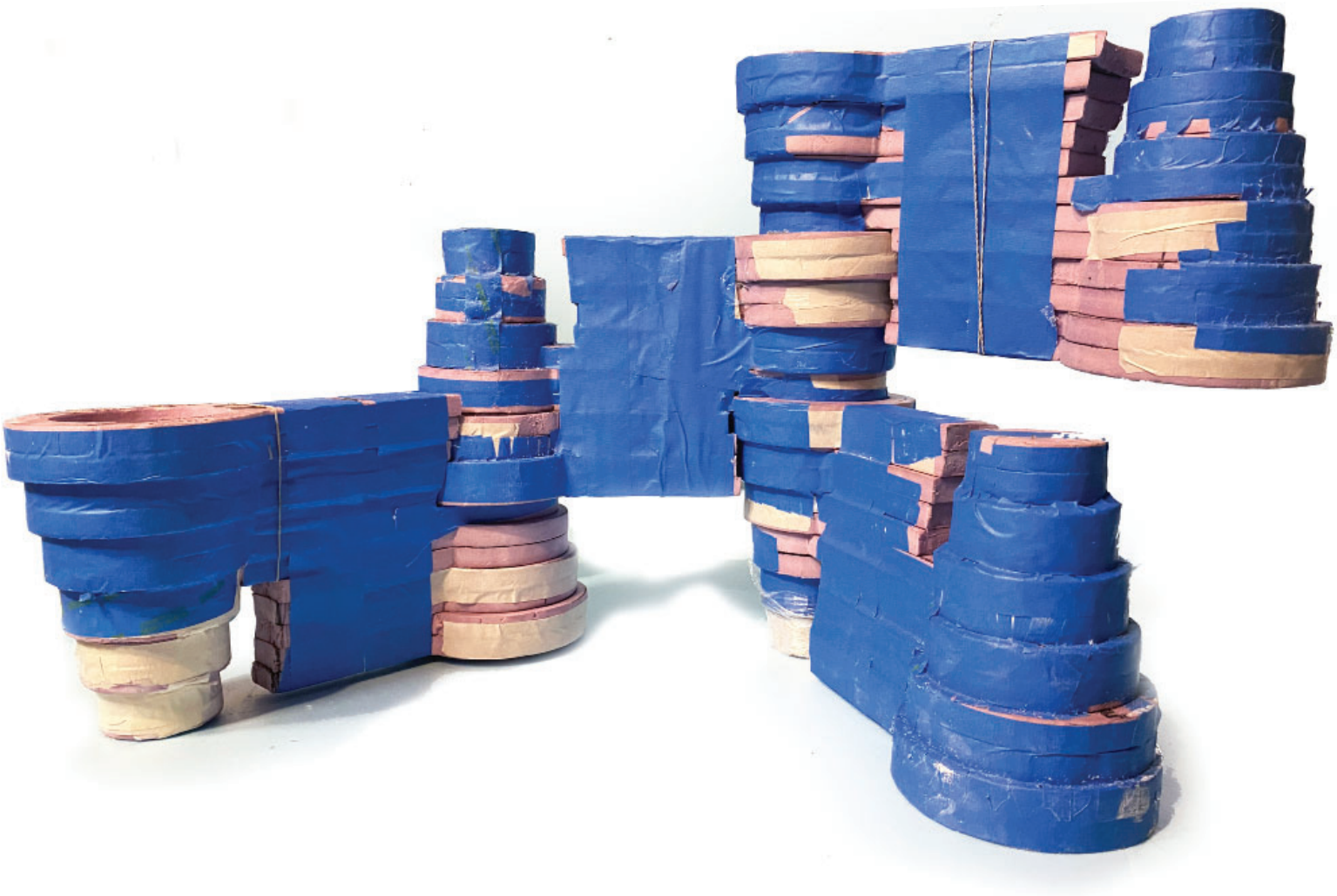






This is the first connection of prototype elements to each other.

Everything works and connects, you can also set almost any angle of the wall.



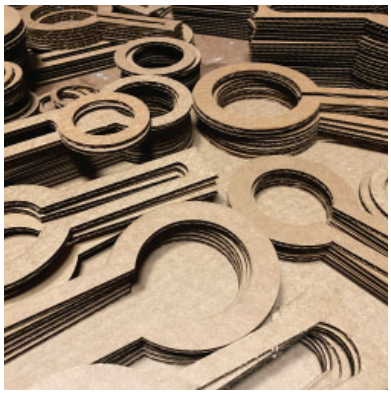
Final Design

The following is a demonstration of how the final model using plywood was created. Plywood was used to represent if the element might be produced from material on a wooden base, such as MDF or LDF. Creating a finished model involved lasercutting at the Laboratory of the University of UCO of the Art and Design Department, for which I am particularly grateful. Each layer was cut from plywood,, and then the layers were glued together, and the final presentation of the component was obtained. Several elements were made in this way.

Creating a model by layering glued pieces is a method for demonstration purposes only. The last element that will be used for sale on the mass market must be cast and represent a single monolithic solid form structure.

Finalized components.

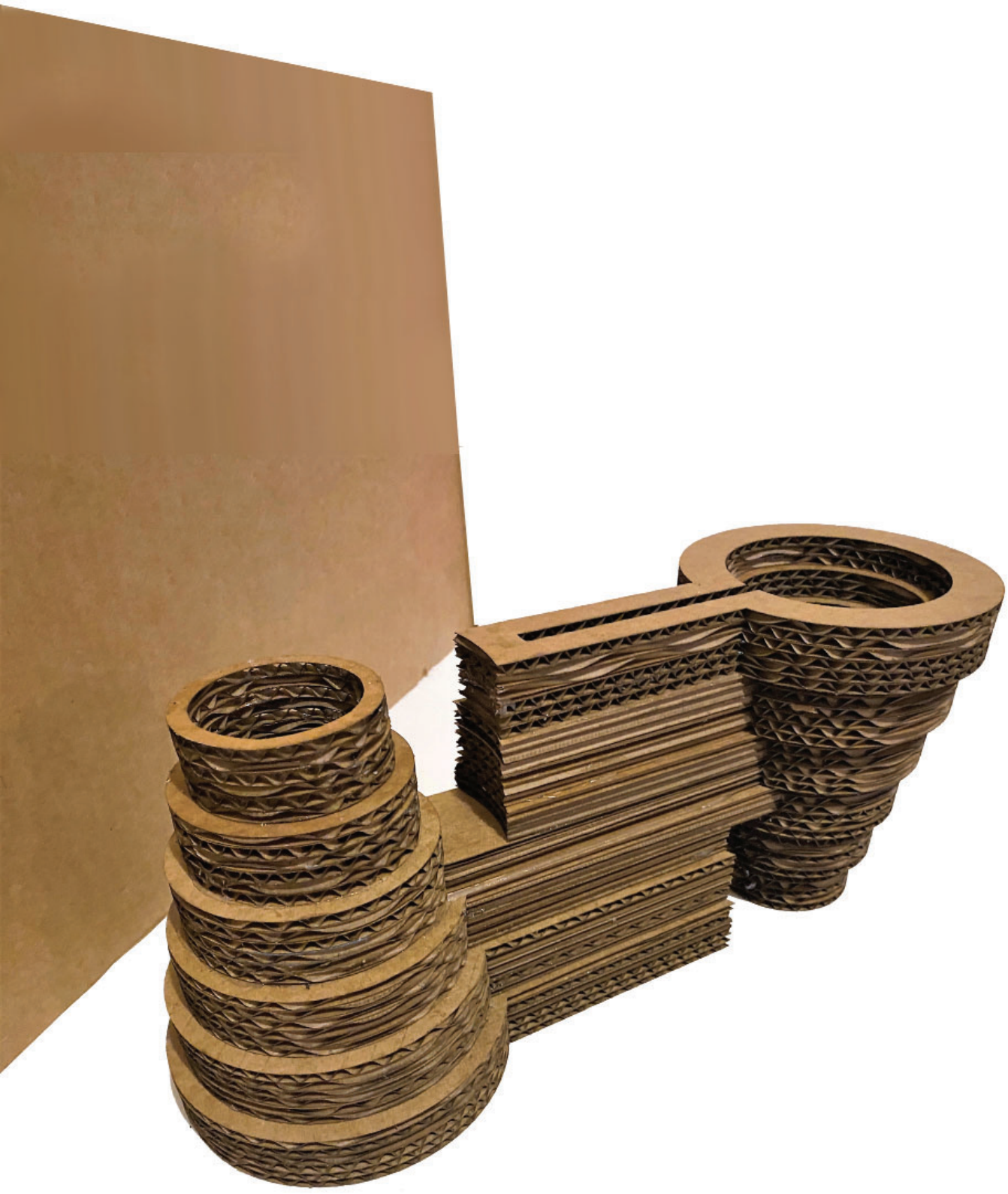
As planned, the elements connect with each other, establishing a durable joint.

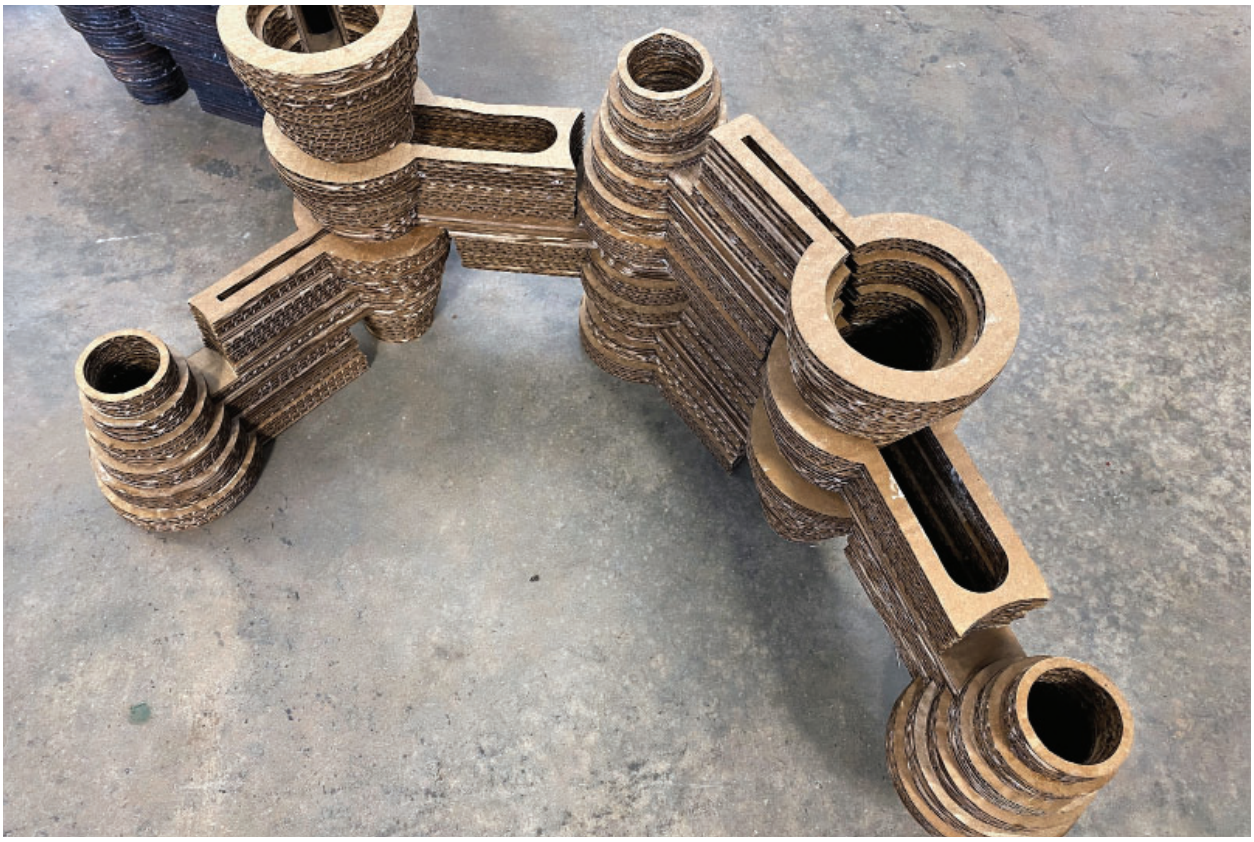


Laser cutting plywood is a time-consuming process, however.To speed up the component creation process, I chosecardboard, for the cutting time is three times faster. This allowed more components to be produced to create the structure of the partition wall.

The model, divided into layered parts, was cut from the flat sheet cardboard. For this purpose, the laser cut machine was used. It is a more effective and fast way to produce a vast amount of components for the purpose of this concept task. Then were connected and glued together with handmade glue, based on water, vinegar, and cornstarch.

Ready-to-use elements made from the cardboard. An interesting aspect of the used material is the ruffle edge and transparency of the element.





These top-view photos show how the folding wall structure is formed. Moreover, it presents the possibility of developing any angle. The structure is strong and sturdy.

Front view of the two and three assembled layers for the wall concept in a real-life situation.

I discovered some important aspects of the structure. It will not be a smooth link if you make the spread structure as a “branch of the tree.” Additionally, it seems that only half of the element or a separate cone is needed if the edges of the walls are to have a smooth end.

These photos offer a closer view of the connection and way of interaction between the elements of the partition divider.

This photograph reminds me of drawings of concepts developed by one of the leaders in the direction of constructivism, Alexander Rodchenko.

During the work on the first concept, the idea of the use of cardboard iintrigued me, and I considered how you can achieve the volumetric shape of the first concept but formed from single flat cardboard of paper sheet without the use of glue or molding shapes. I was next inspired by the process of folding flat sheets of cardboard into boxes.

I started to dig into the vision of the element that is possible by folding a flat sheet of cardboard or thick paper with prefabricated cuts and lines to be folded into the component. And after that, using the same principle of stacking connection (used in the first concept) one element upon another, resulting in a partition wall.

FOLDING SYSTEM

- Process
- Prototype
- Final Design

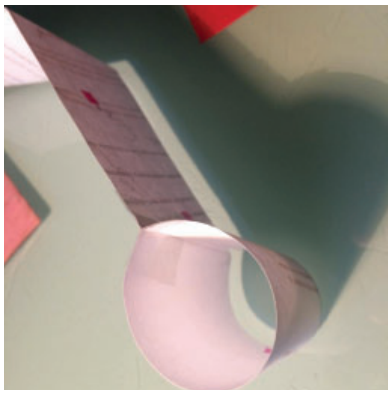
Process

During the work on the first concept, the use of cardboard intrigues me and incentivizes me to think about how you can achieve the volumetric shape of the first concept but formed from single flat cardboard of paper sheet without the use of glue or molding shape. The next inspiration I got from the process of folding flat sheets of cardboard into the boxes.

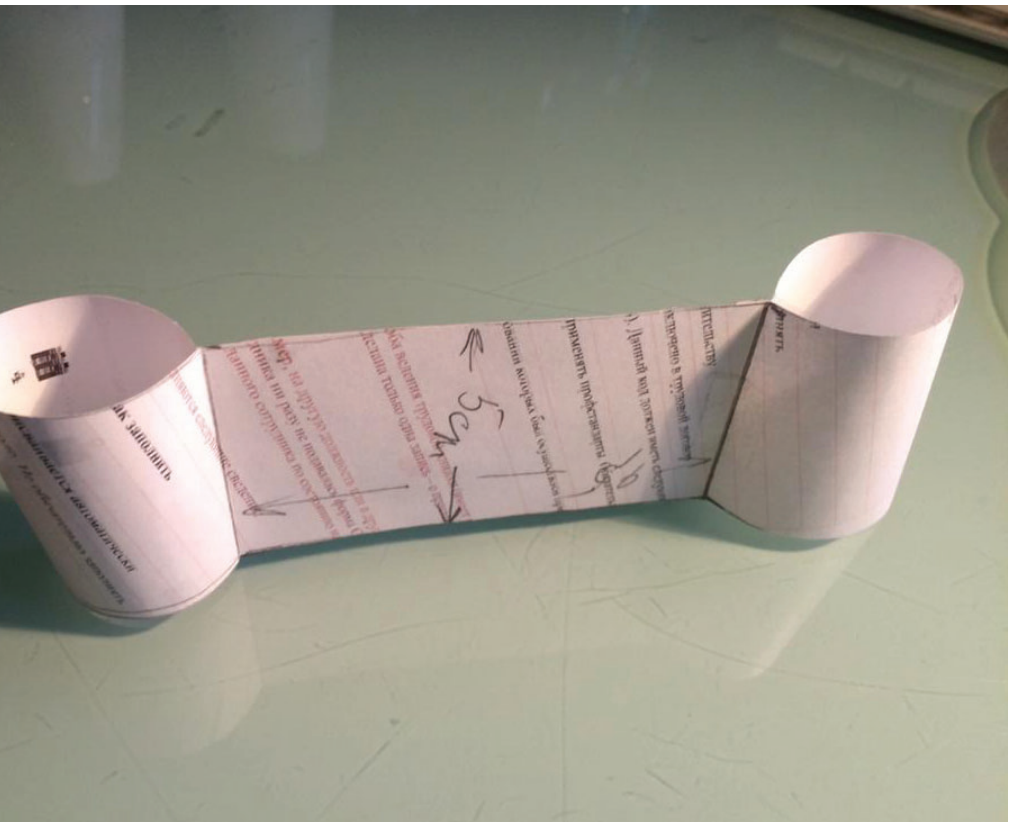
I started to dig into the vision of the element that is possible to fold from the flat sheet of cardboard or thick paper with prefabricated cuts and lines to be folded into the component. For example, in Ikea or stores selling household goods, flat sheets of cardboard with already cut holes are sold. from which the user folds boxes for storage or moving. This concept is pursuing the same idea. And after that, using the same principle of stacking connection (used in the first concept), one element joins another, resulting in a partition wall.

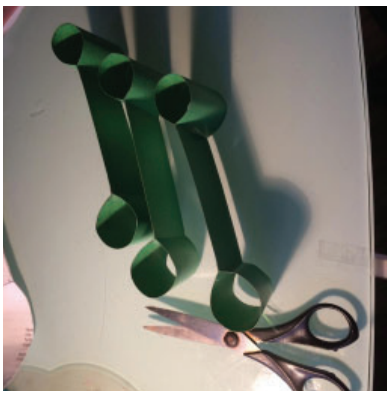
The second concept will demonstrate a unifying element, a prefabricated shape cut from a flat sheet, with marked lines for folding. A flat shape precast element that has precut slots and lines for folding is ideal for production (the use of a pre-cut mold allows one to speed up the production of thousands of flat items; hence the final product will be cheap), and transportation of flat sheets is affordable making these an ideal solution..

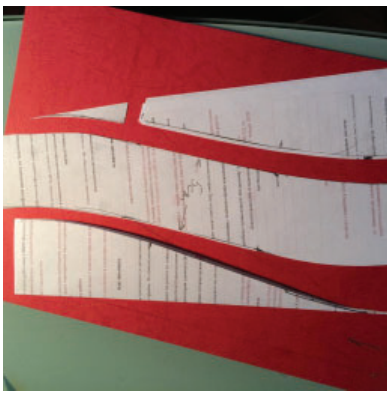
The scenario used in this iteration allows the user to buy flat, pre-cut pieces that can be easily put together independently and then assembled as a temporary space divider. After using the wall, the units made of cardboard or paper can be easily recycled especially since no glues will be used. Hence, the divider will be highly eco-friendly.



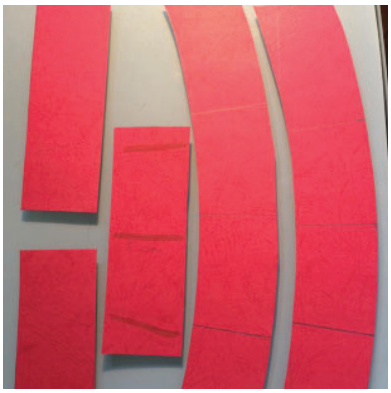
Early experiments with shape consisted of finding the correct bending lines of the sheet, which would form an even web and two cones. Fastening the ends with tape. The idea and the intermediate initial result looked very organic and even adequately responded to the set's tasks, but it was necessary to exclude the use of scotch tape. Moreover, it was even possible to form connections between the components, for this, it was necessary to make cuts in the plane in the middle between the cones.

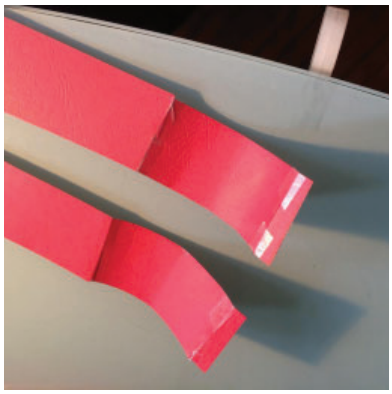


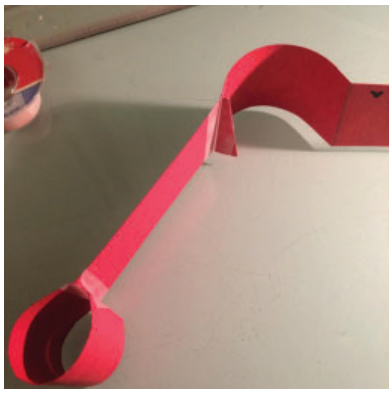




To form a connection excluding tape, an option was considered with slots that connect the ends of a flat shape after they bend—understanding that this structure is not stable and does not have a stiffener. This flaw leads to the idea of turning half of the plane with its subsequent twisting, which unfortunately does not lead to satisfactory results.

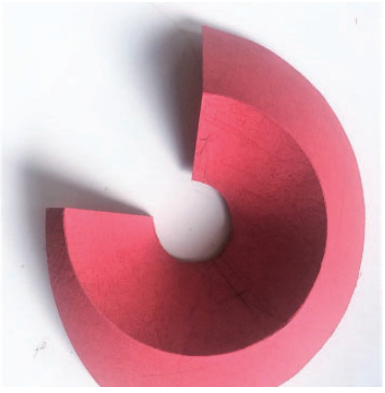


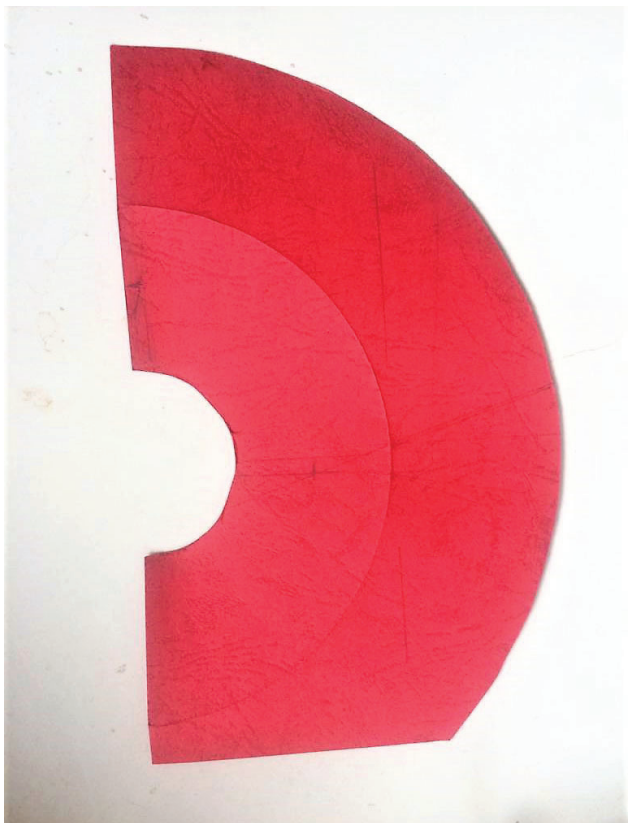




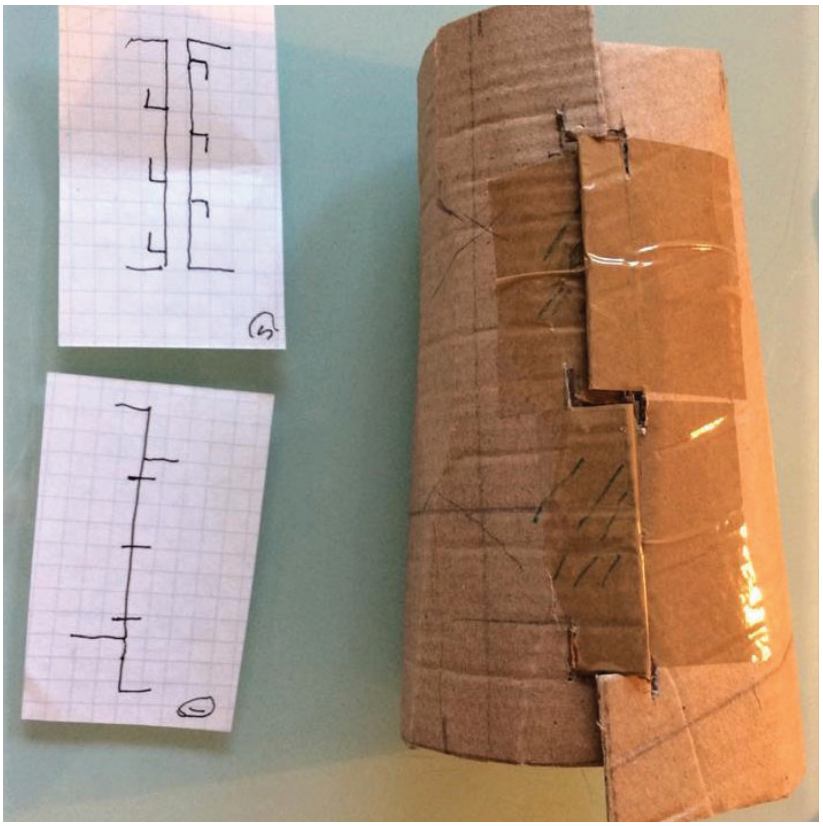
The next solution was to study the shape of the element if it would consist of a more rigid hollow plane in the middle. With this solution, I had to study the shape of the unit to make sure it would have a more rigid, hollow plane in the center component. To do this, I broke the form into planes and simply connected them with tape.

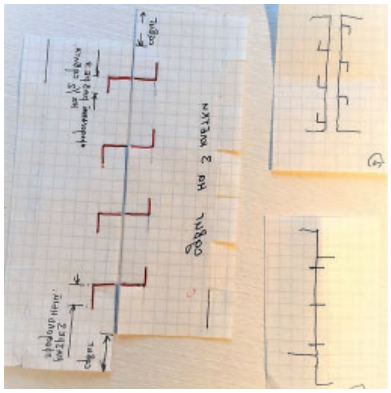
Bend cardboard inside, a second wall forms. Inside the cone. And the cardboard structure becomes stiffer. Also, the inside wall plays as a limiter for the next inserted cone during the join.

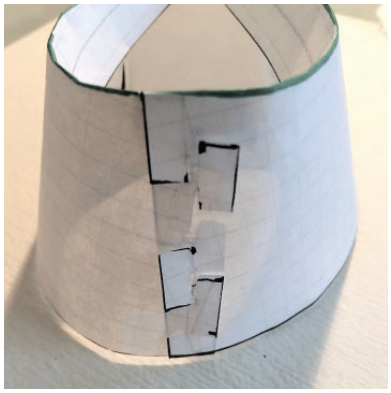


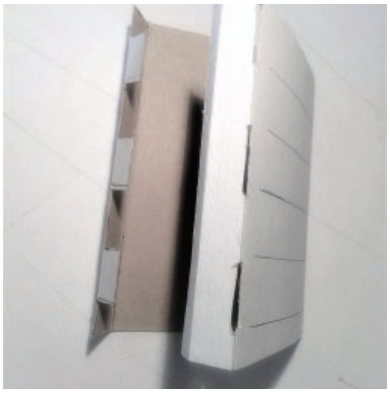


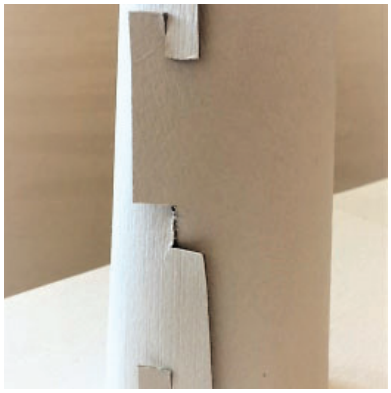
For further development, it's essential to explore the paper's ways with the precut locks/keys connection. This will help to create the form.

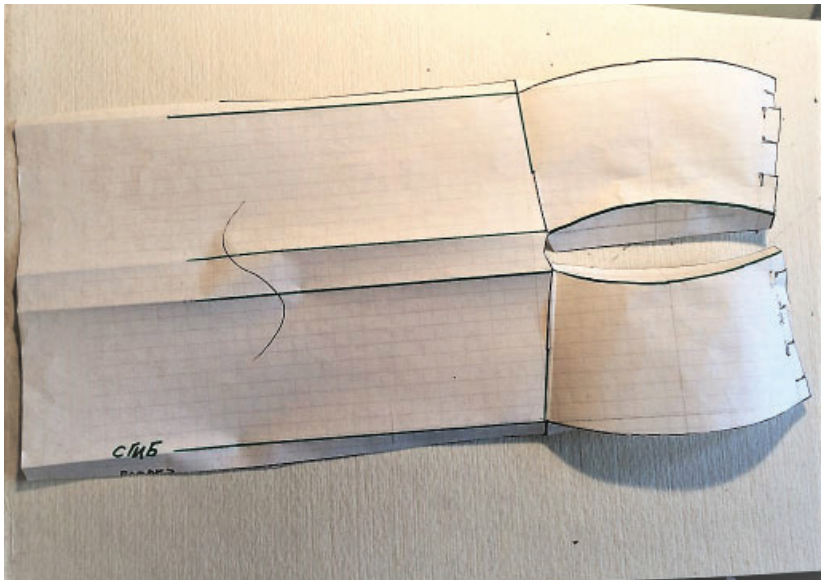


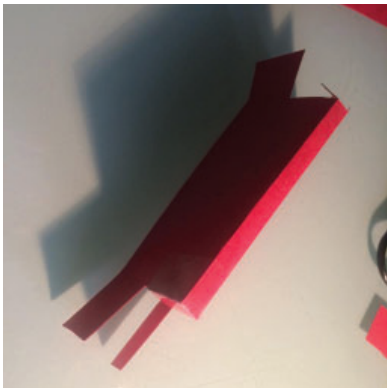


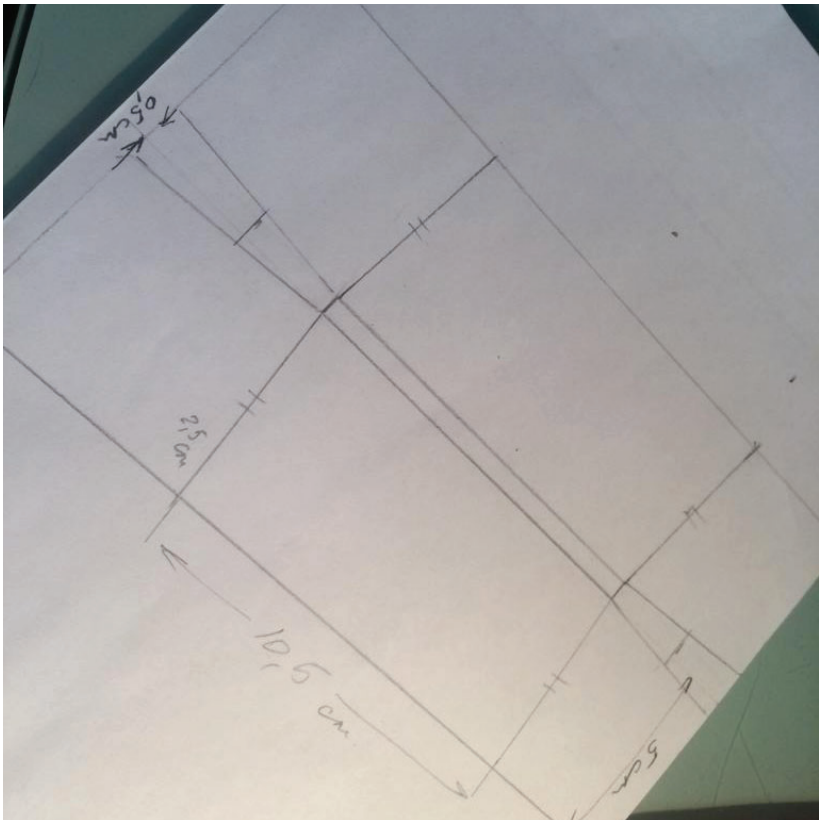











0,5cm
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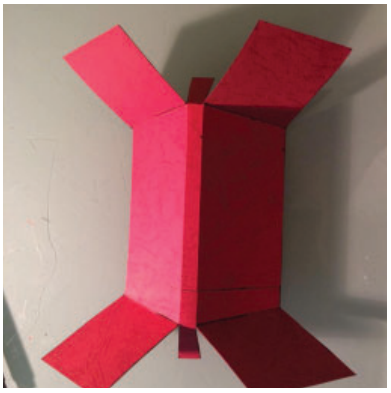
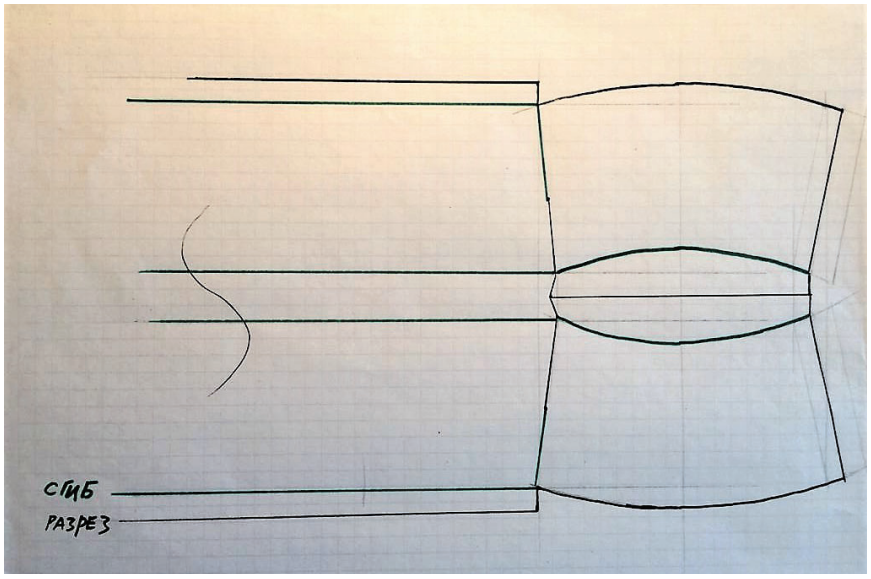
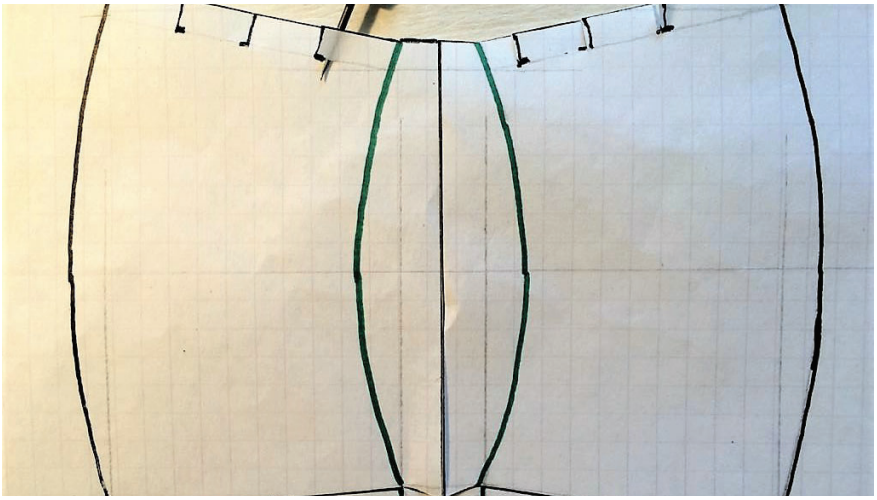
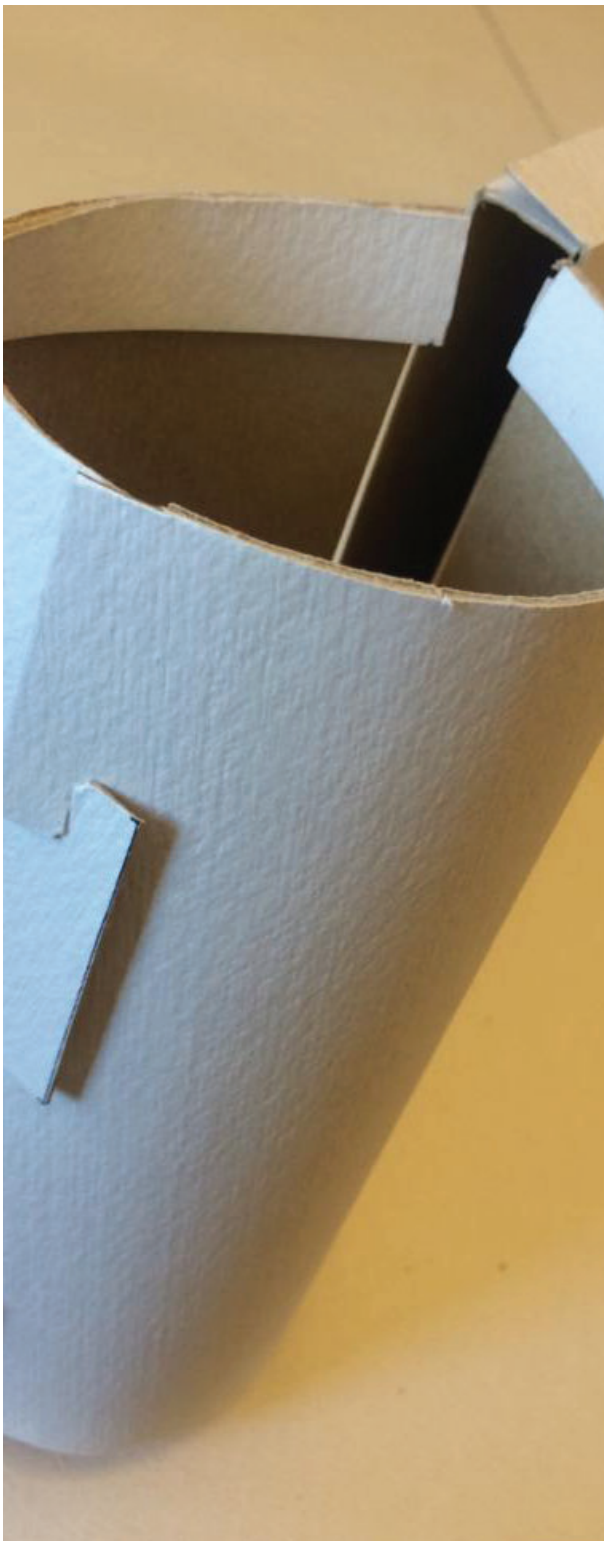


These photos show the cut of the element layout. The element is folded in the middle and then fastened in the middle of the cones using the paper locks/cuts shown on the previous page.
Nevertheless, while this element and this suggestion seemed right and finish design, the result is not very beneficial, as it is creating a connection. Still, It is not holding round shape, and the connection is not very rigid.

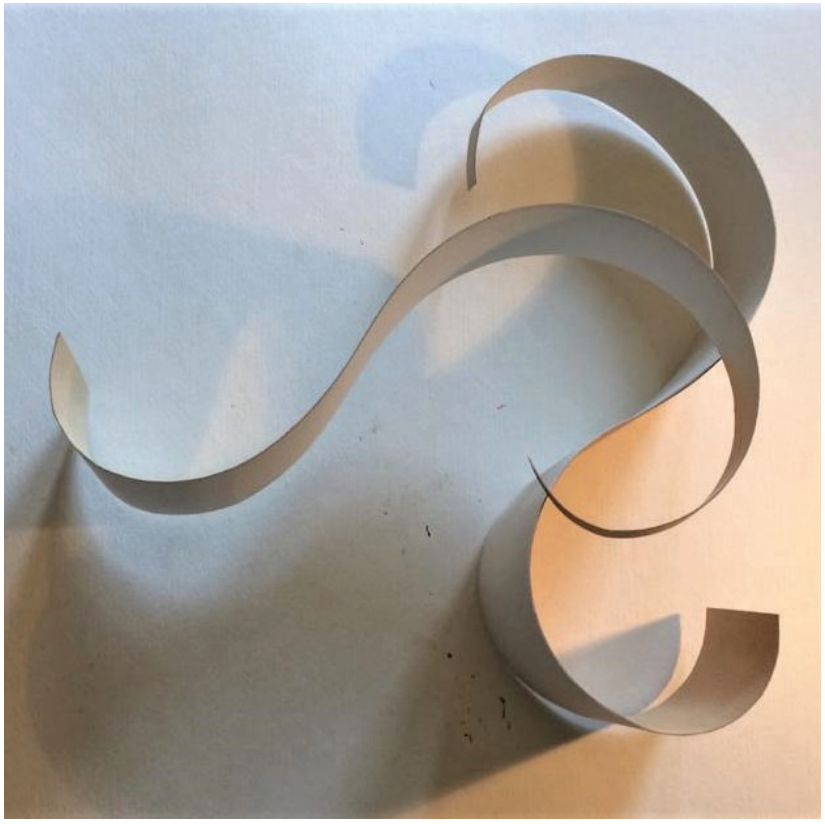


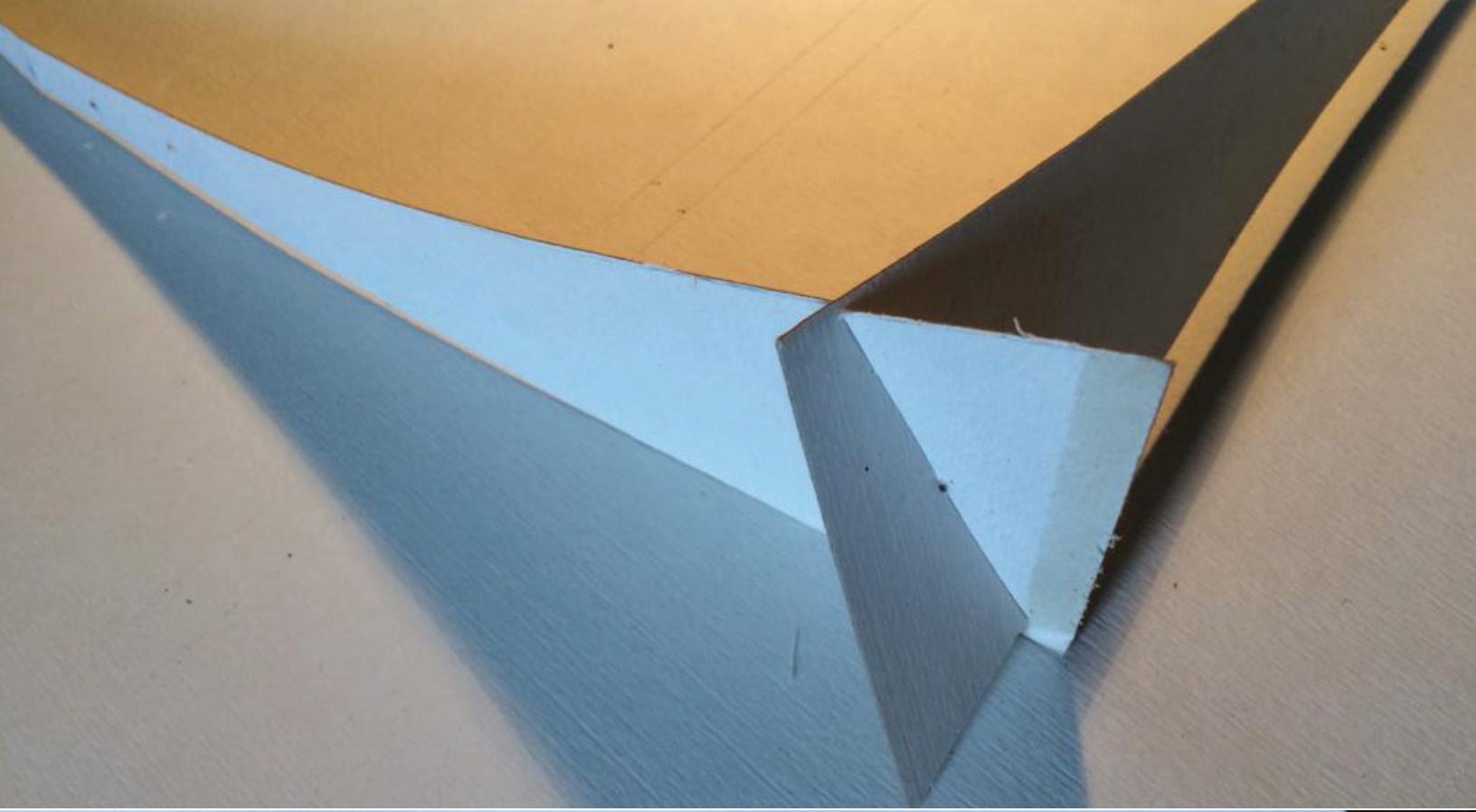


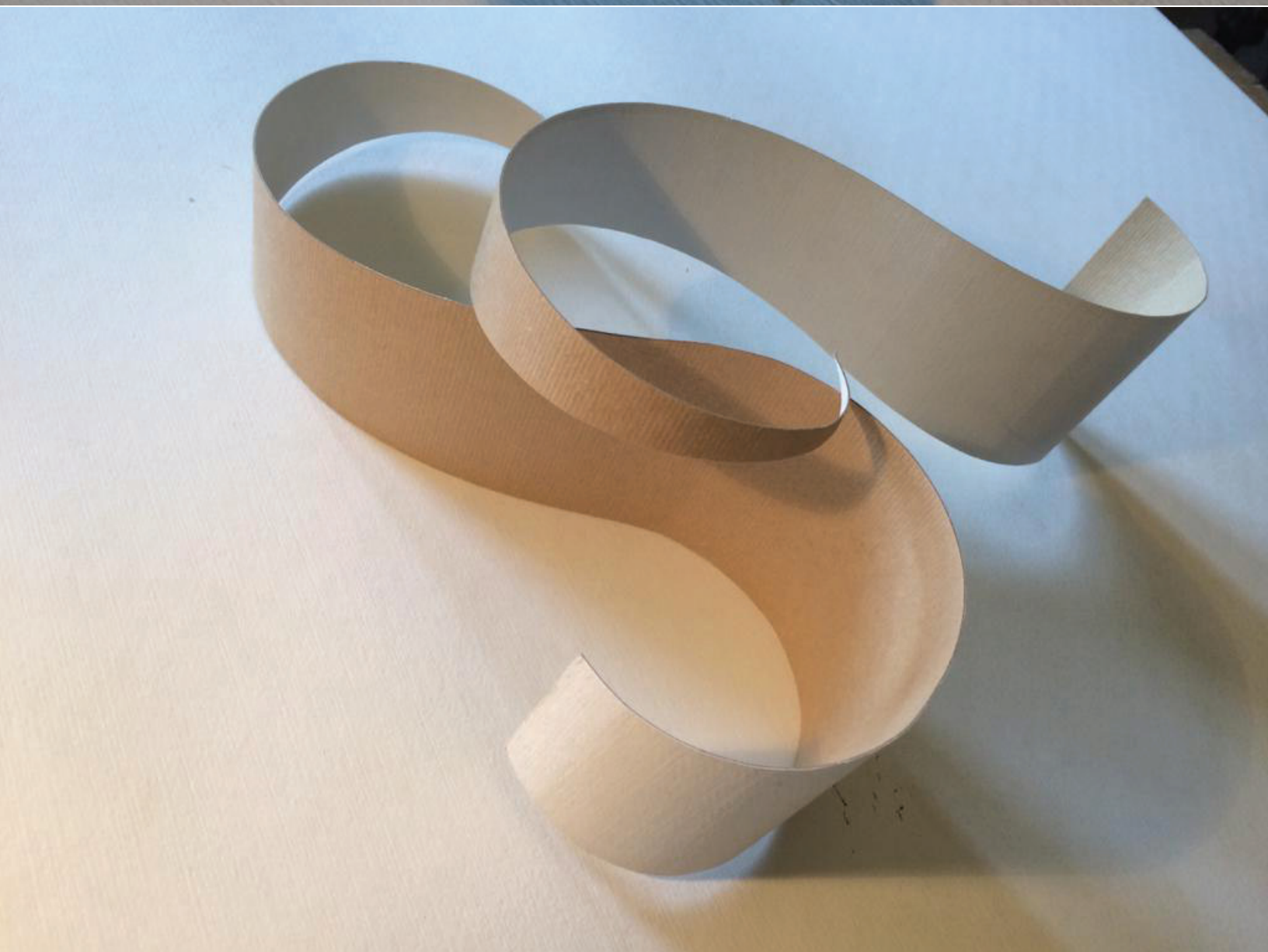
The problem with this solution is an unreliable design and wobbling connection between cones and the middle part. For the element to dock with the next one, it is also necessary to make cuts, thereby the cone or cylinder will have many breakpoints, hence the weak connection between element parts, for tapering results in too much stress.

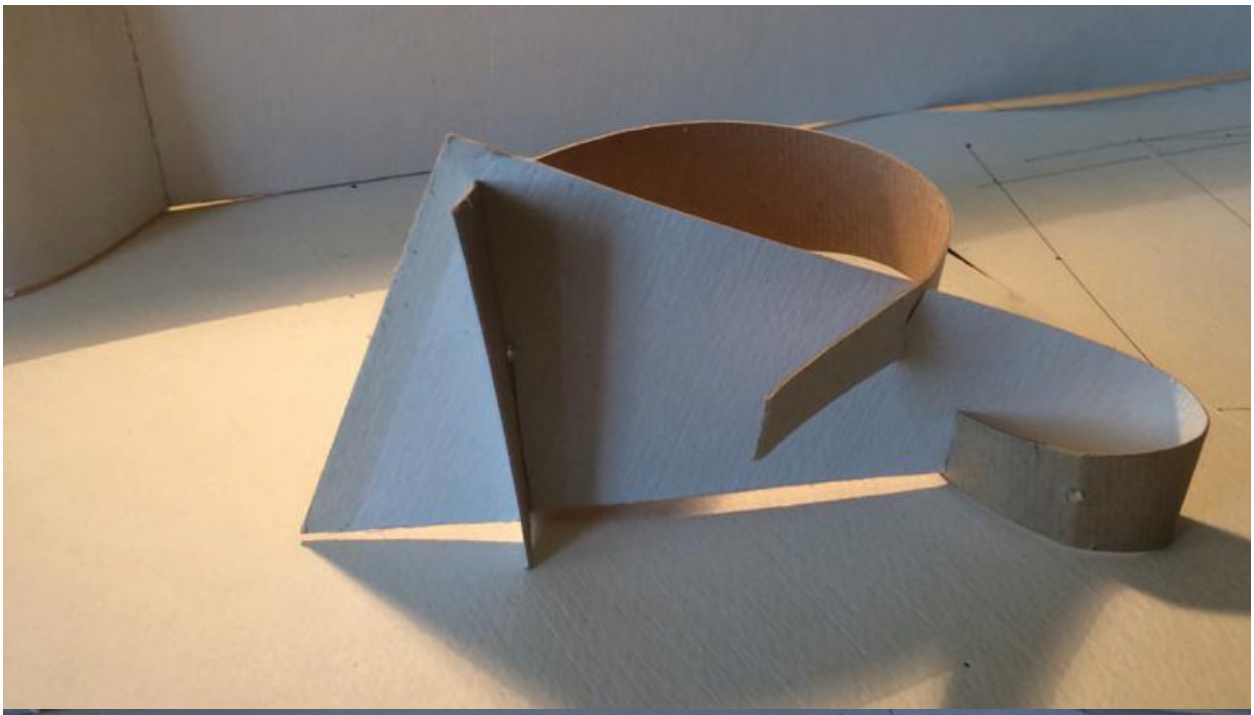


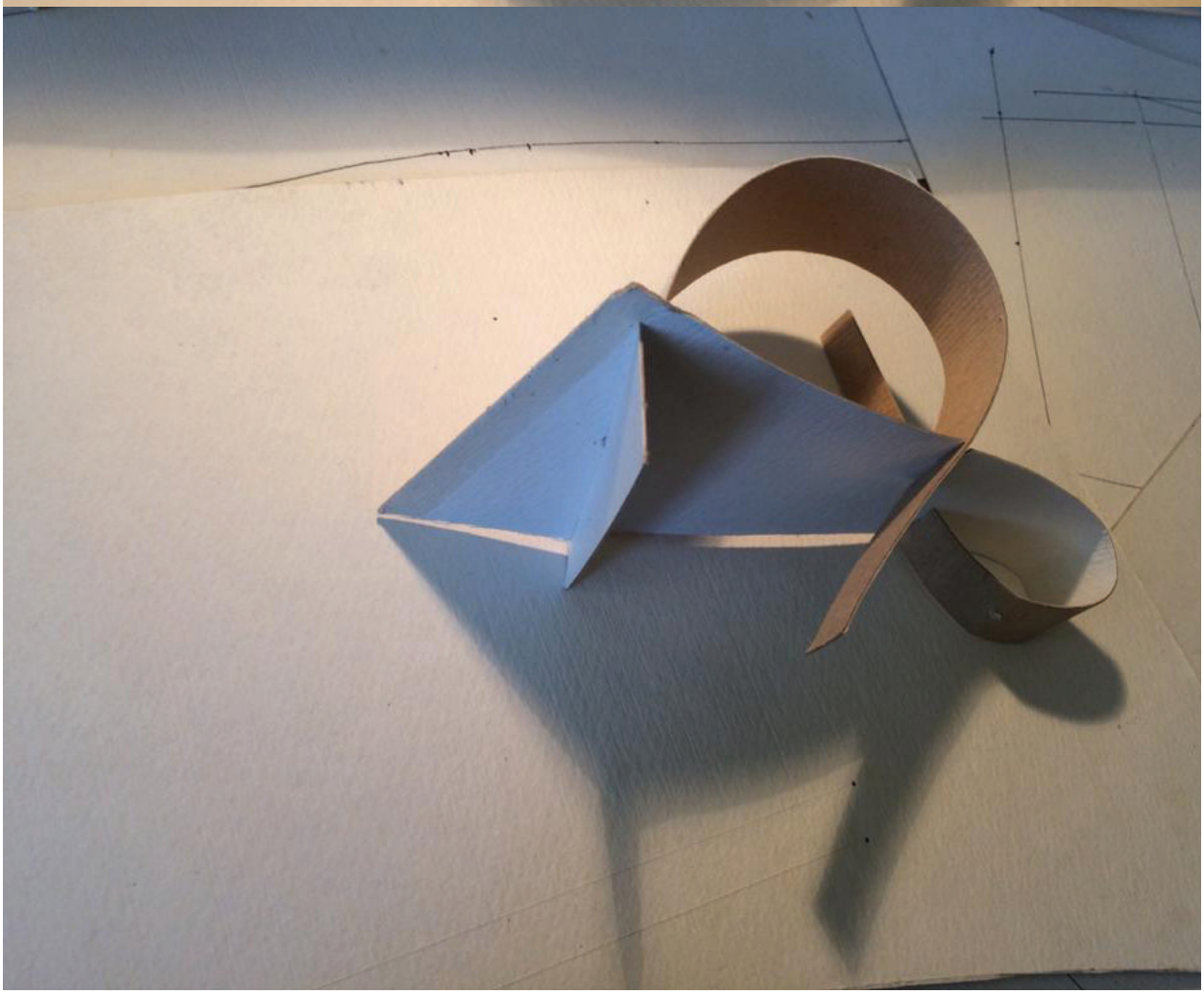
The unexpected findings and results in creating decorative elements after the papaer cut. While experimenting with the design, I found inspiration in exercises described in the book “Elements of Design” by Gail Greet Hannah (Hannah, 2006). Hence, such experiments are beneficial for the research of the concept of shape and design.





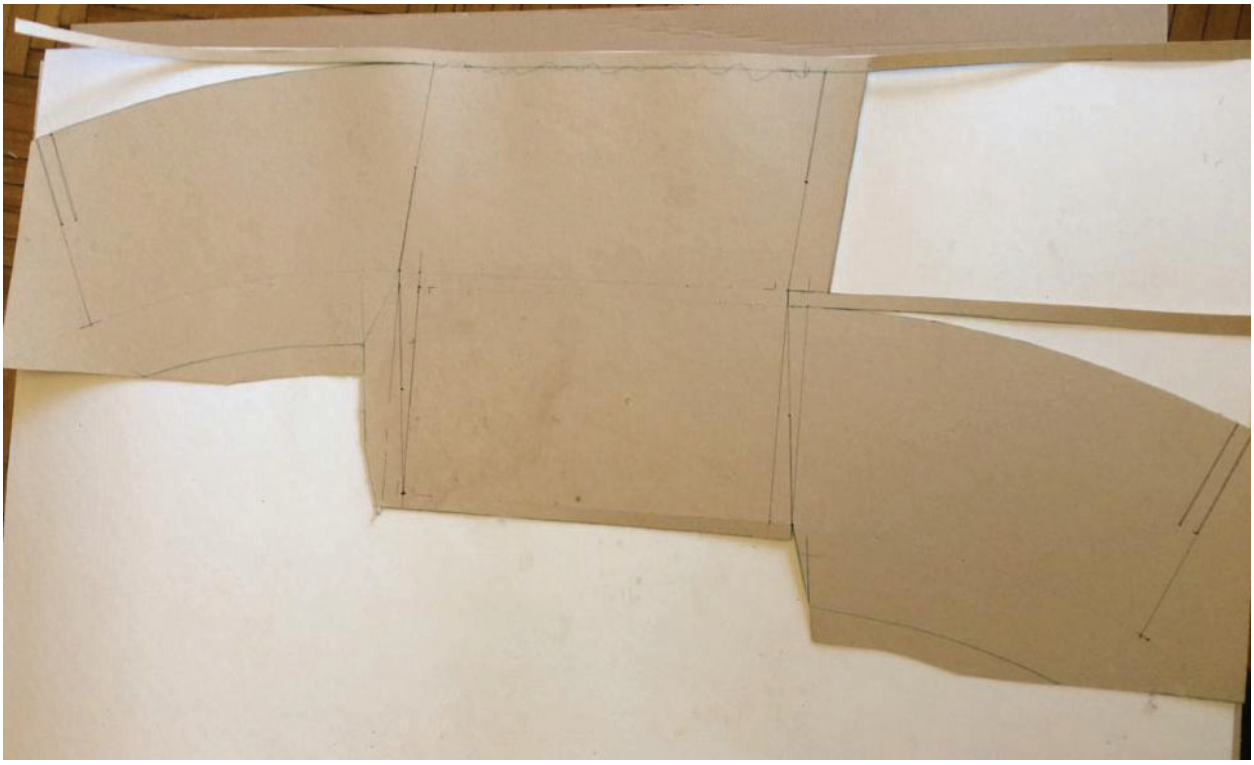


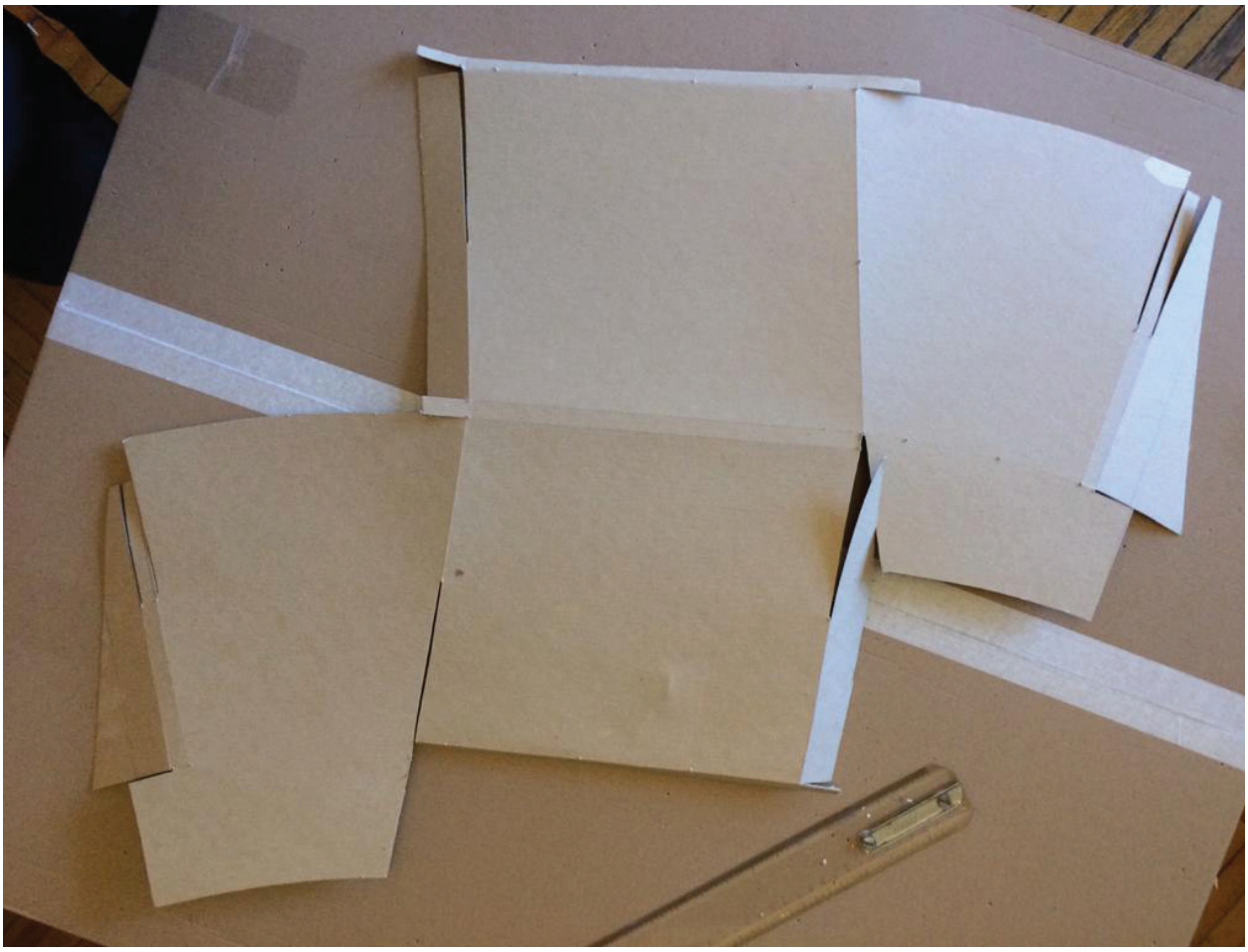


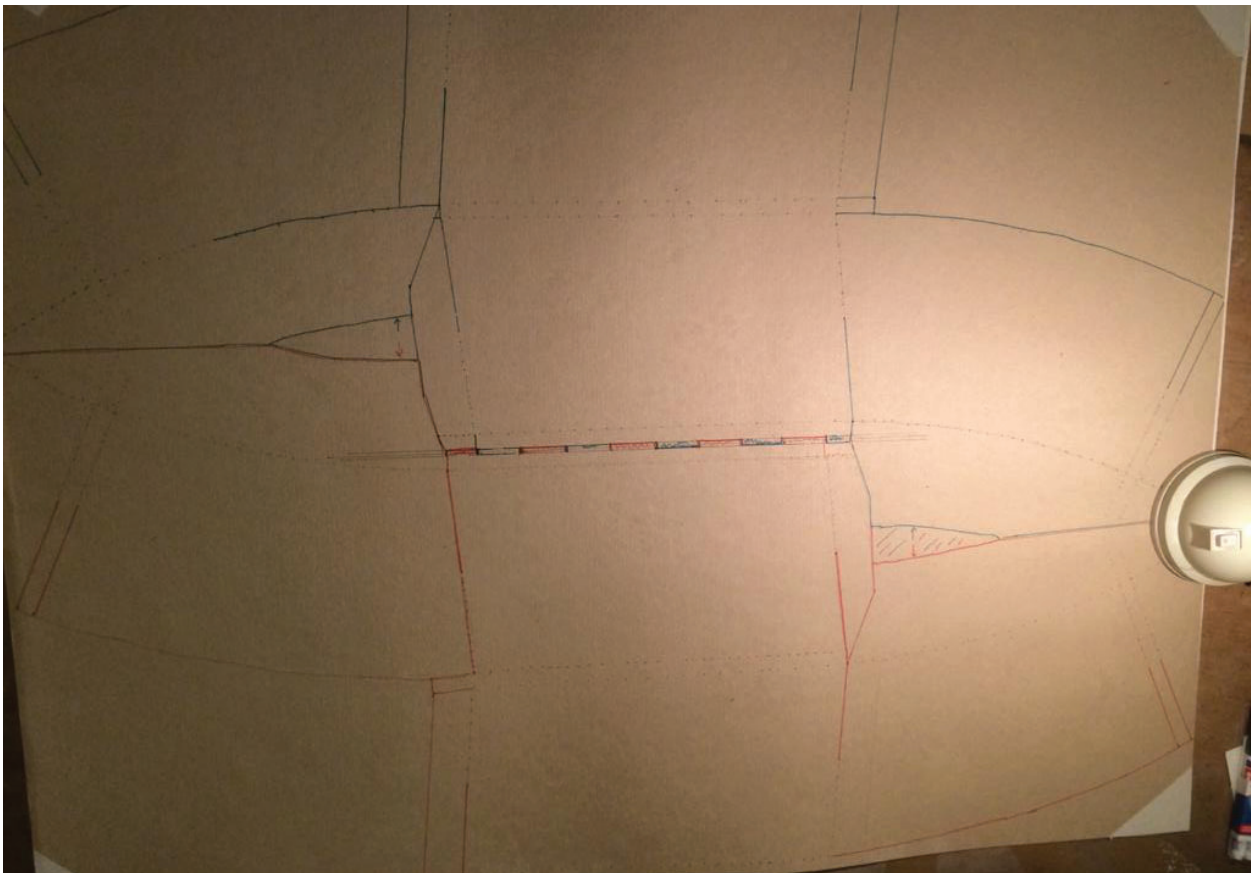


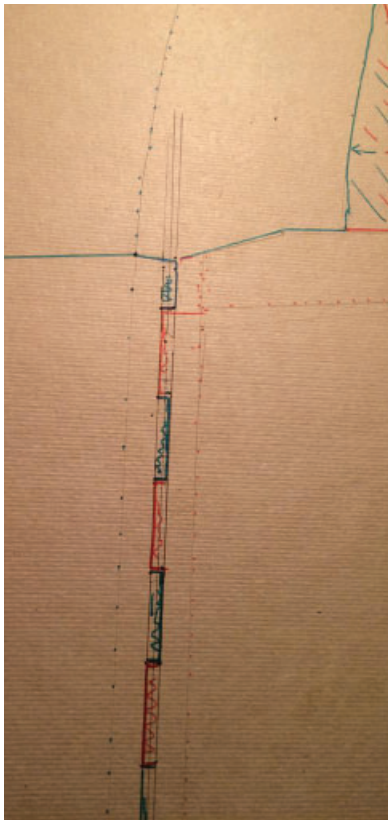
Here I combine all the previous approaches and the listed steps into one model; the cones are formed by connecting to the middle part using a cut. A central element part is created by folding and combining the ends with the help of protrusions-locks and cuts.

These photos show examples of cutting out experiments of the shape of the model, which was then folded.
Through these examples, it was possible to identify shortcomings and model issues and find the required dimensions.



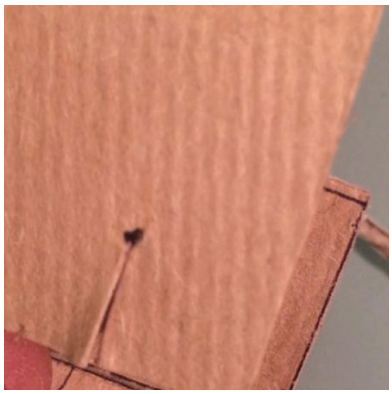


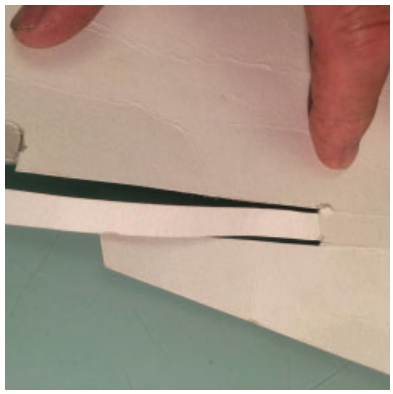




An element is formed from the pattern on top. The photos on the right show the work on the formation and cutting of the component, and ways to create cuts and folds. The element is formed by bending the flat part in the middle and then subsequent twisting of the cones connected by reductions.

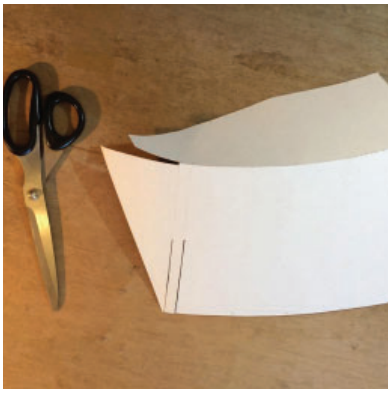


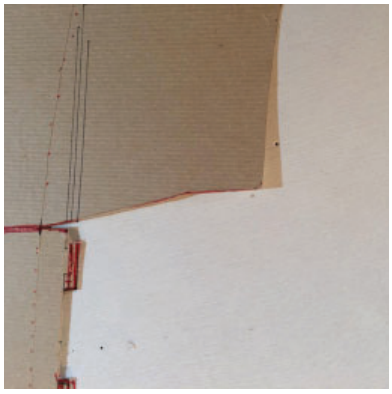





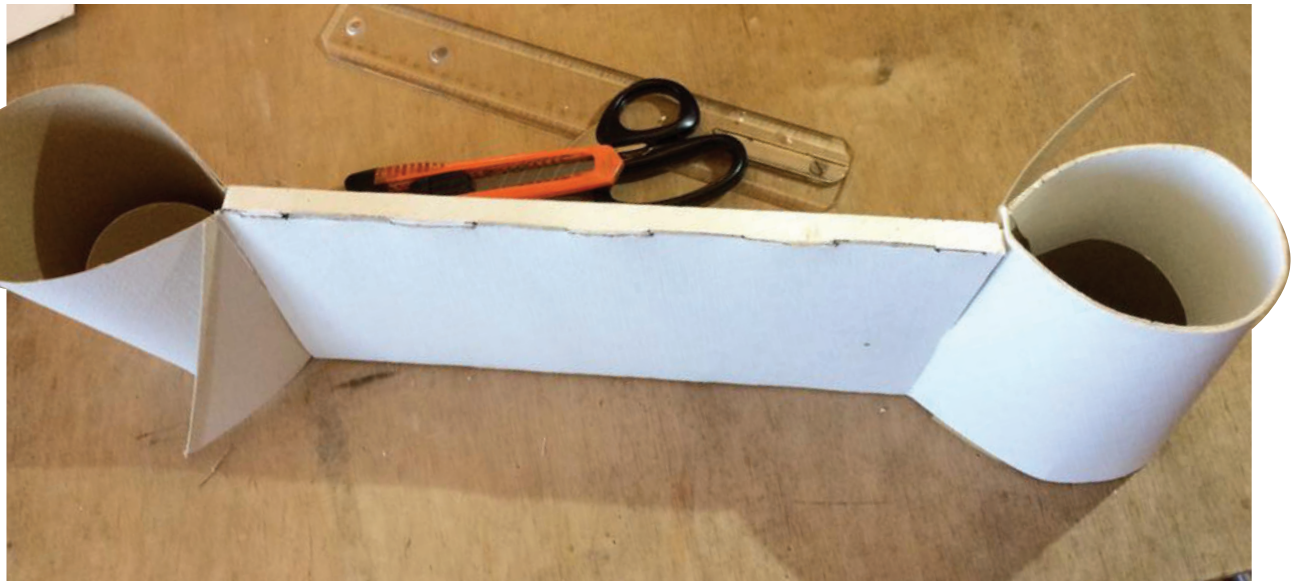




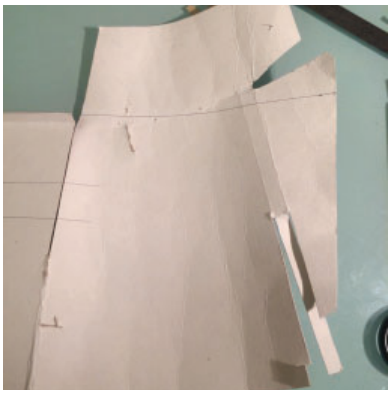
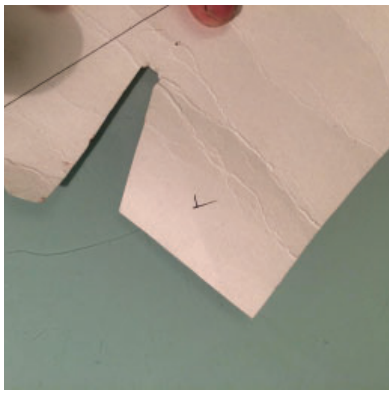




The process of the element formation. Different moments of the folding and element's prototype adjustments are pictured

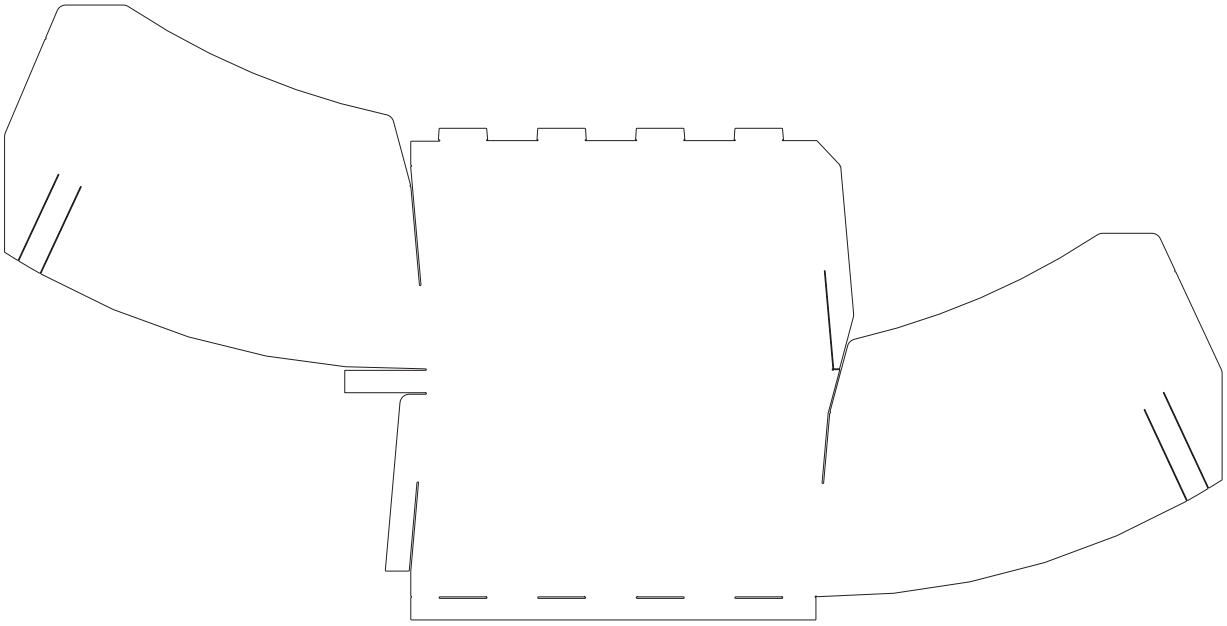


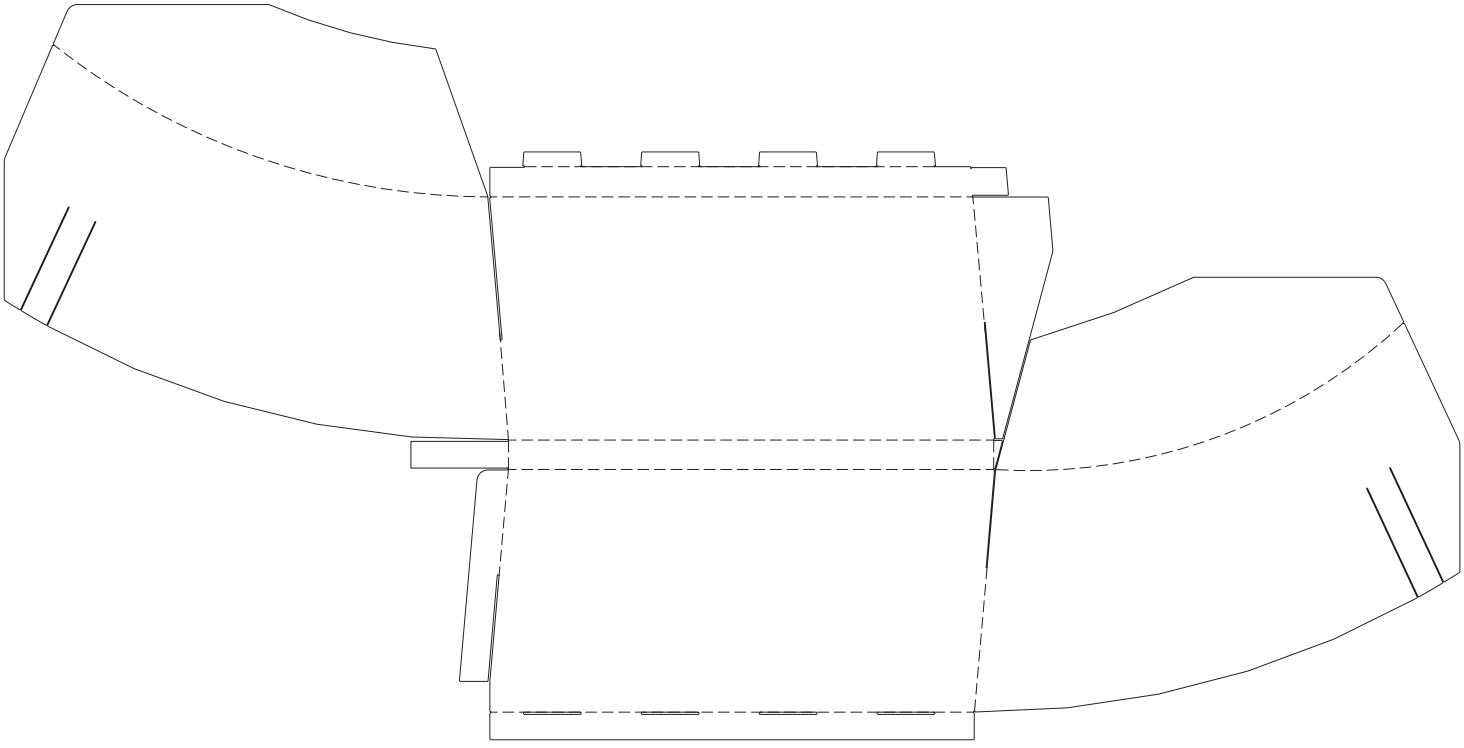


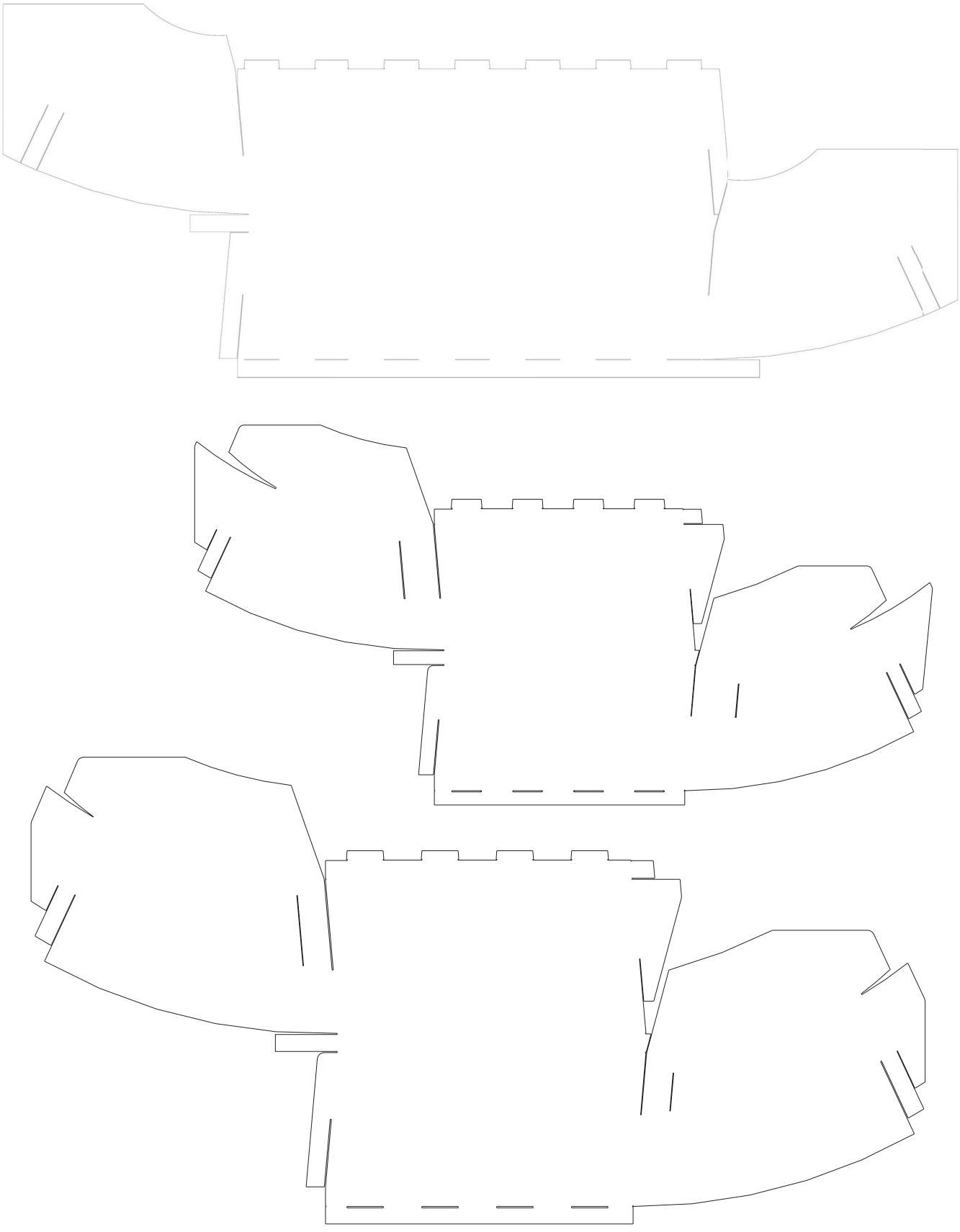








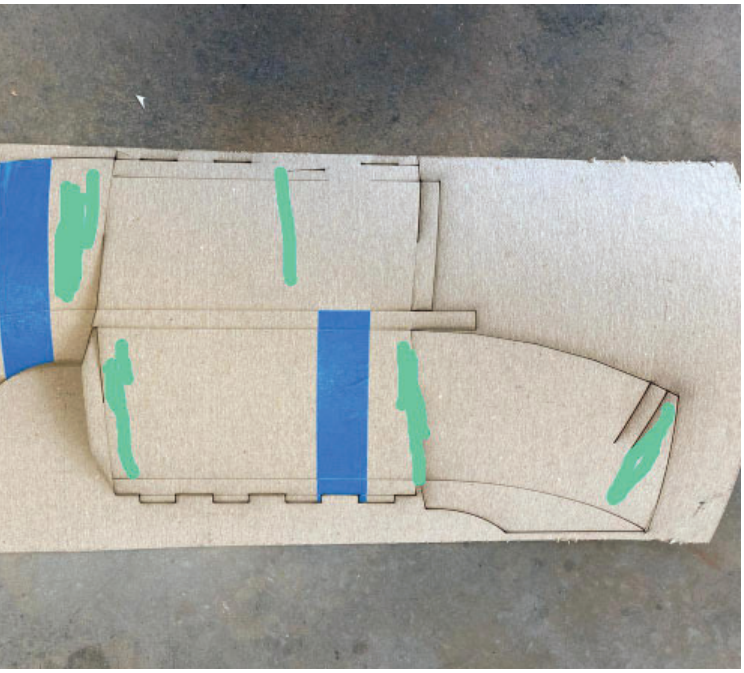




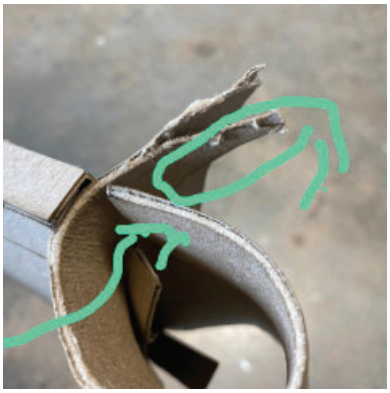


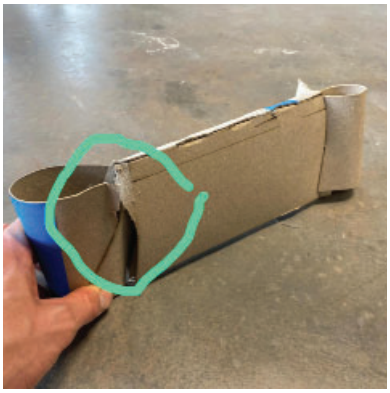
Prototype

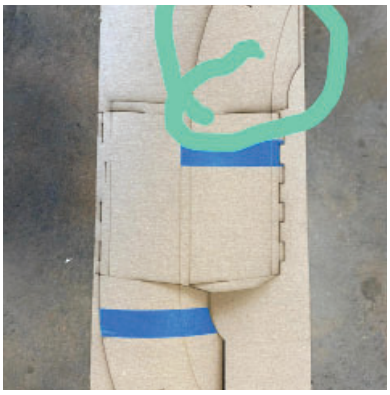
The first flat elements to be laser cut. Flat thick cardboard was used. And the first assembled element, then there is a photo presentation with details that have errors.



Items and elements of the design that required attention and correction.







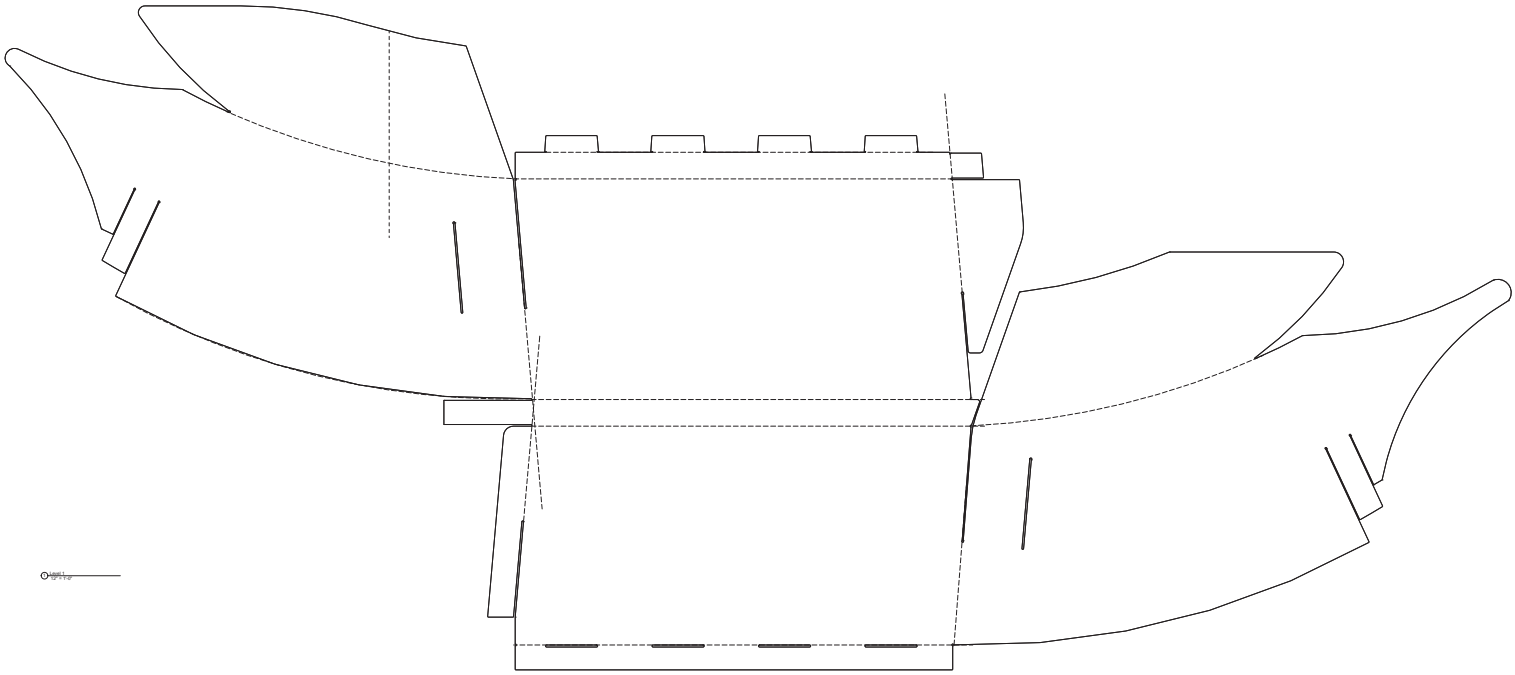
Nevertheless, even with shortcomings in the pattern of the element drawings, it is possible to assemble and connect several elements to understand the concept's functionality and understand the structure of the partition.

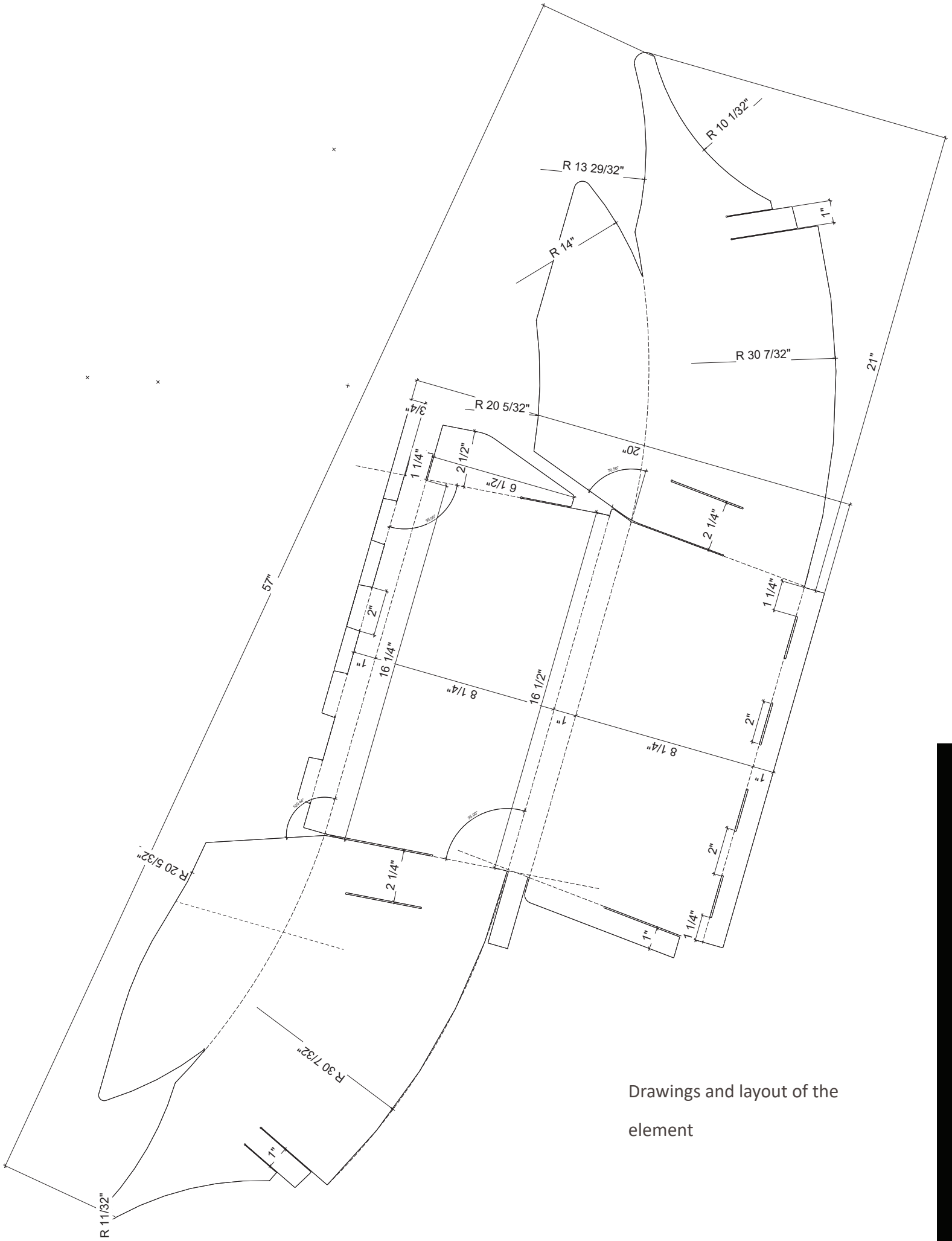
Below is the pictures representing the vision of the first combination and elements joined form that form the spatial divider's vision. The thickness of the used cardboard plays a vital role. Thicker, more robust chipboard will work better for larger, more substantial elements / units, while the material's density and depth should be reduced for walls that will be smaller in scale. This attention to the chipboard's density will help eliminate dents and keep the desired smooth form.

The cardboard's density and depth should be reduced for the parts with smaller-scale, to eliminate dents in the smooth form.

Final Design

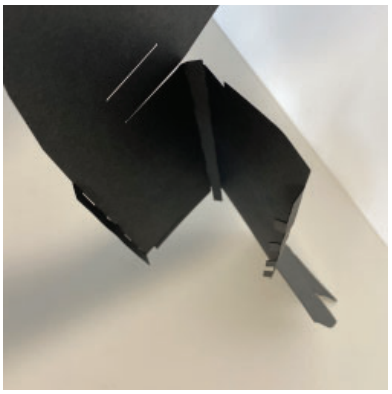
The flaws in the cutting were eliminated. Below is the final result for cutting from a flat sheet.

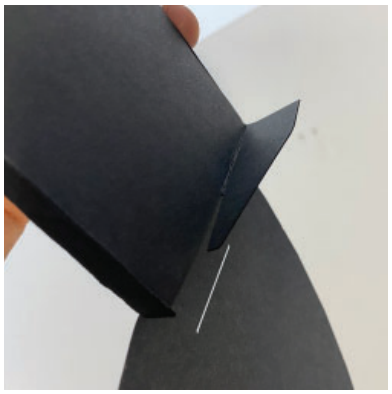


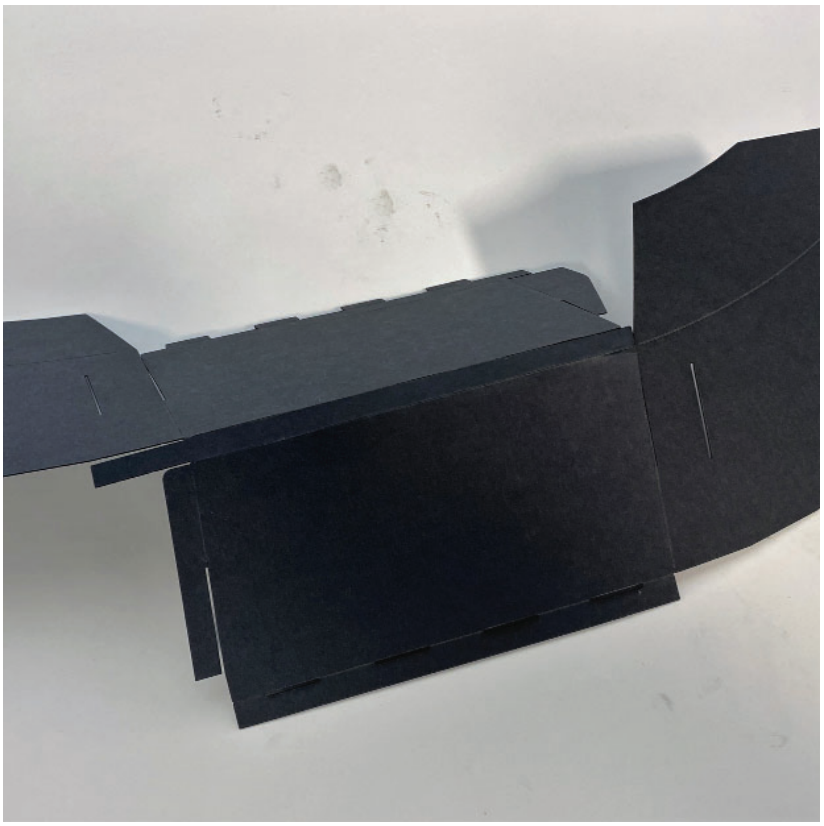


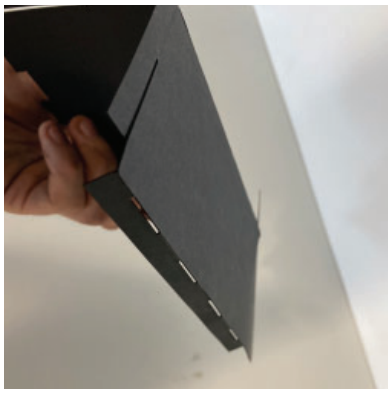
Drawings and layout of the element

Laser-cut elements that are not yet folded. Elements cut from the chipboard of different densities. Engraving is also used to improve assembly methods.

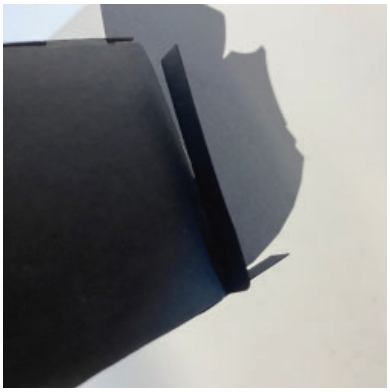


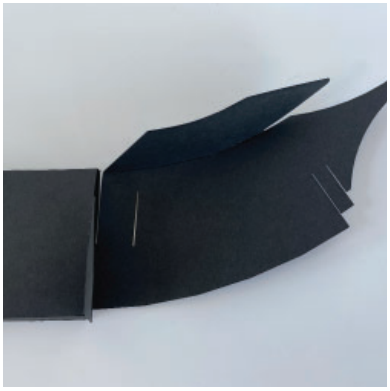


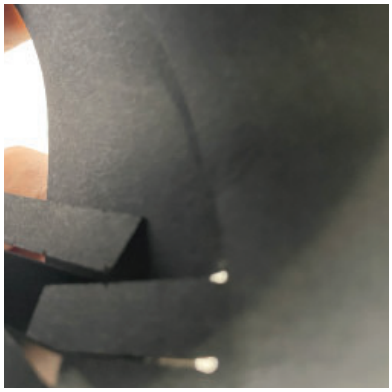


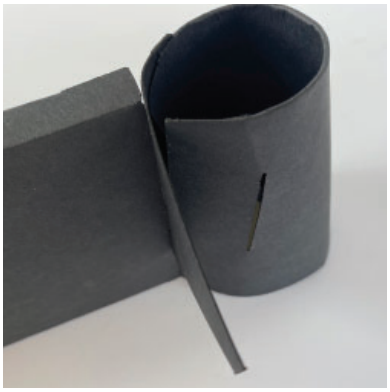
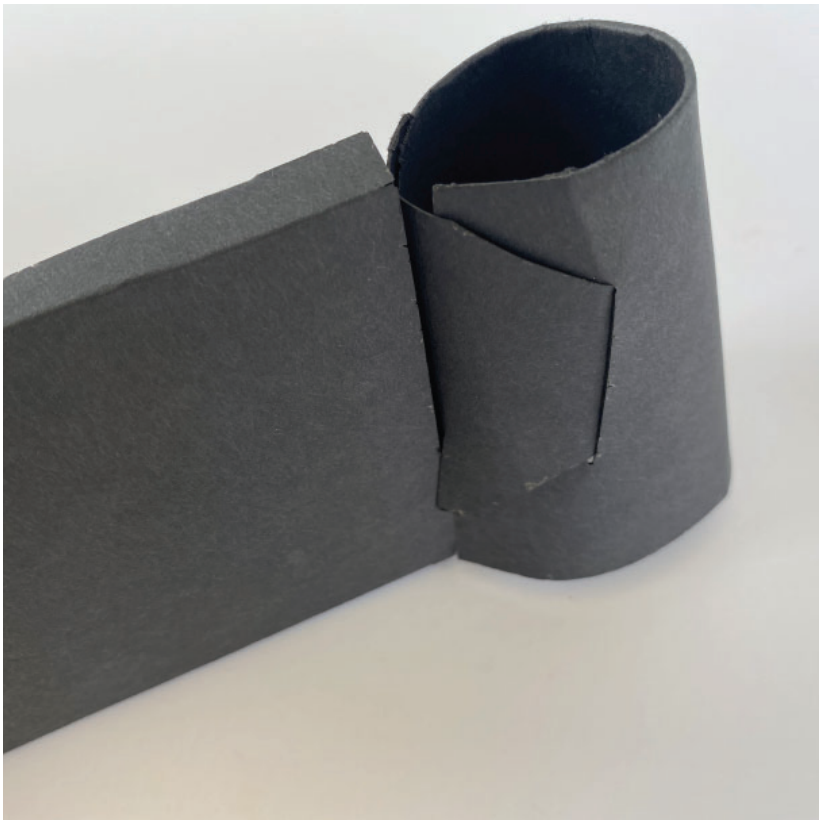


The process of folding the element



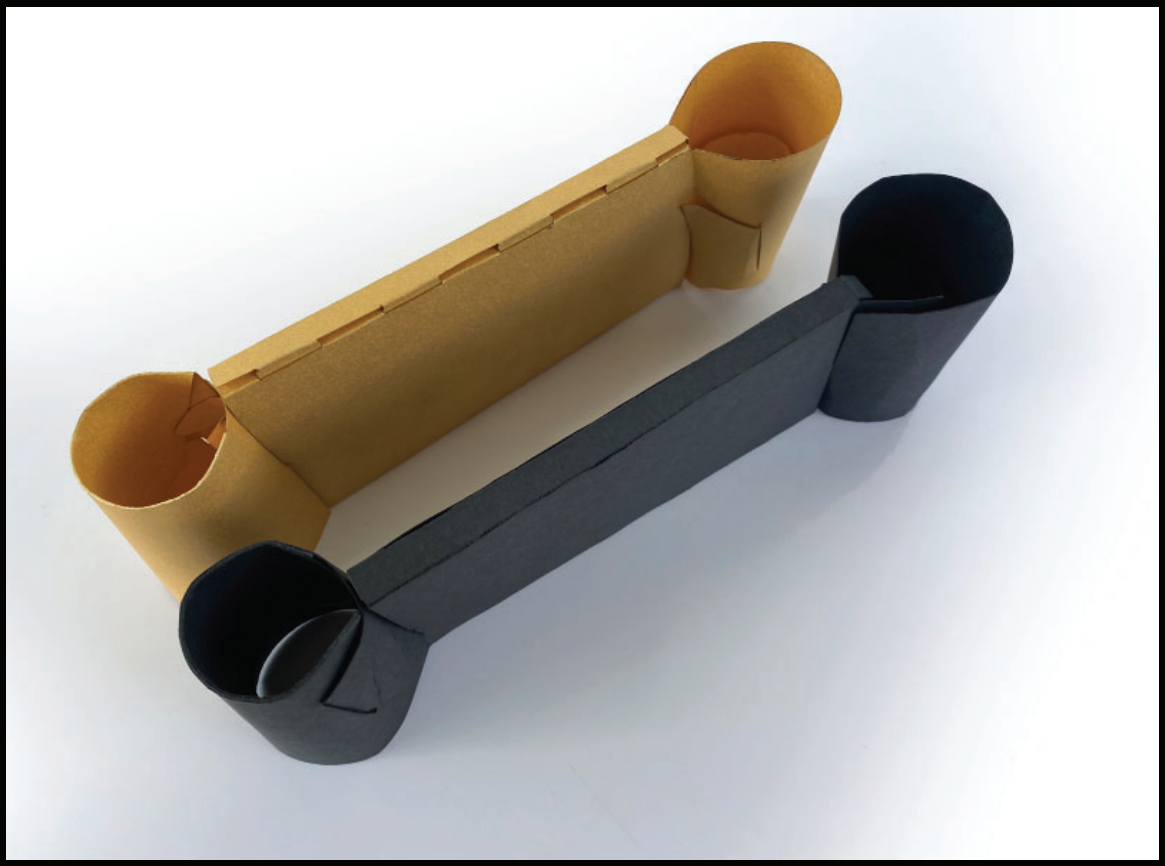





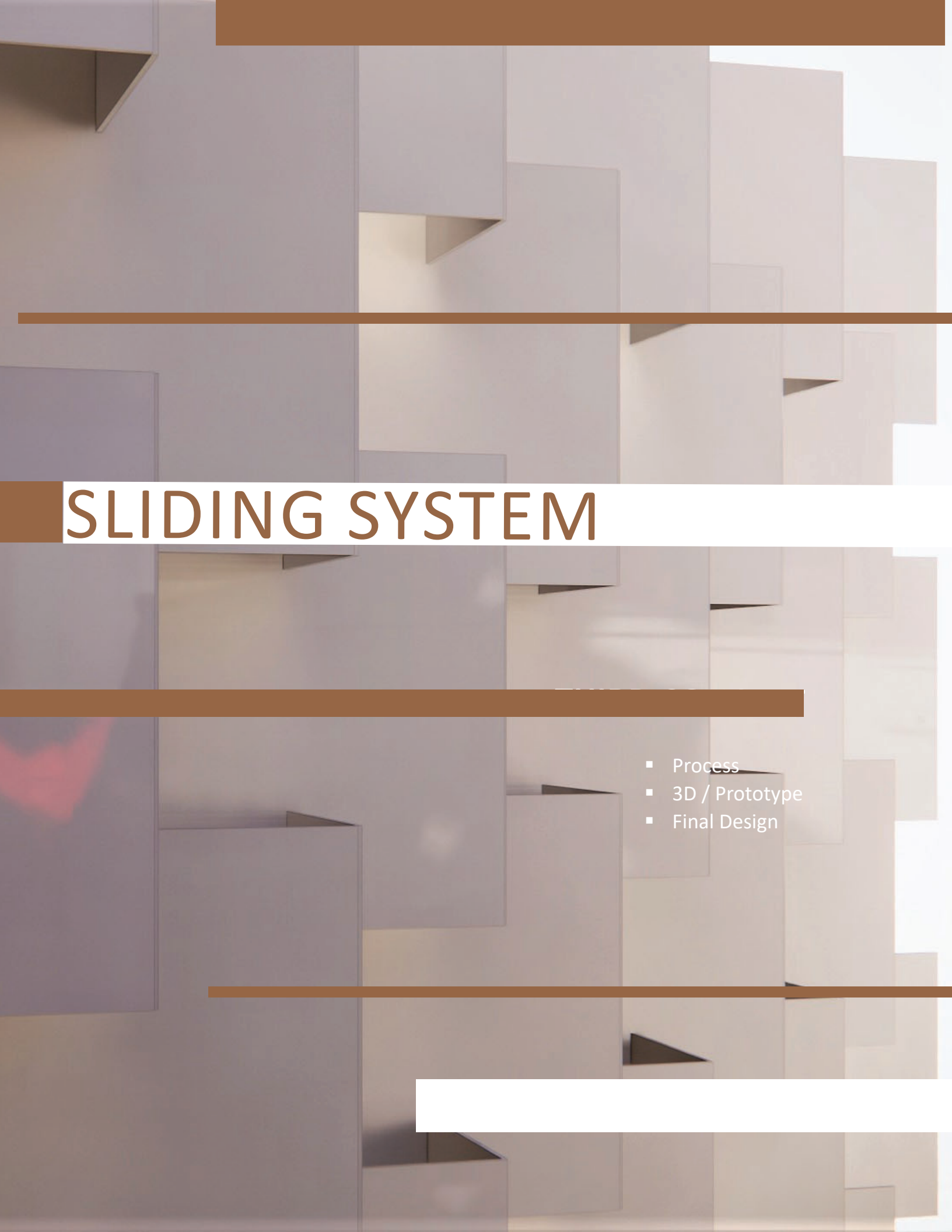
Final Design

The final version of the component, after folding the sheet. As you can see, 3 types of chipboard have been used, thanks to which you can create unusual additional accents in the partition.



In order for the extreme part of the wall to be strong and complete, it is necessary to supplement the model with an additional element - this is a connecting cone.

This is the final design represents the element connections and approach how the wall will be assembled



SLIDING SYSTEM

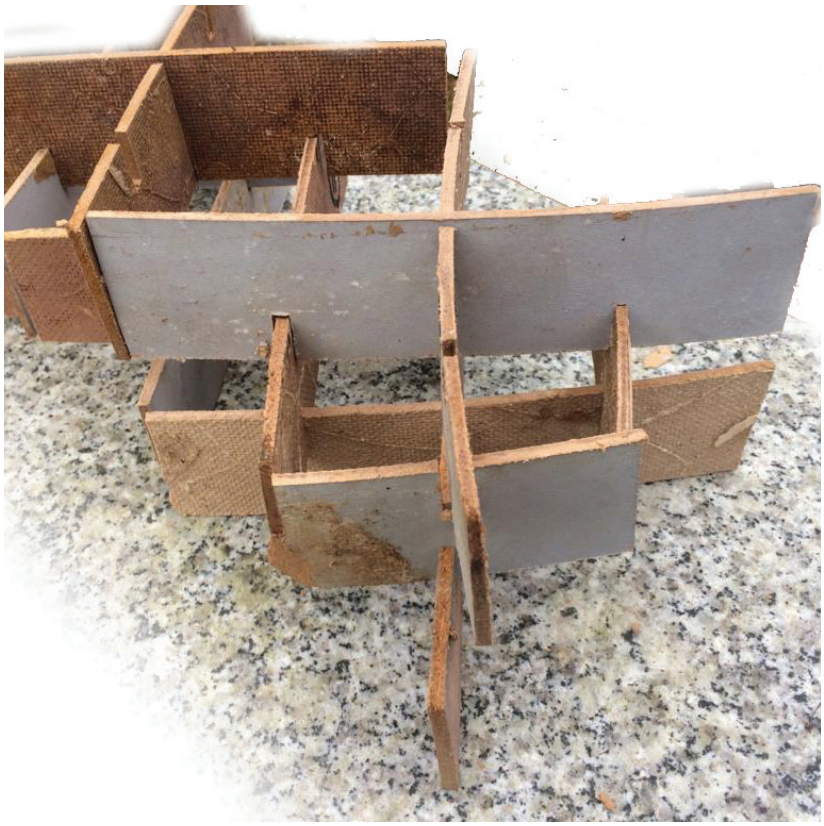
- Process
- 3D / Prototype
- Final Design

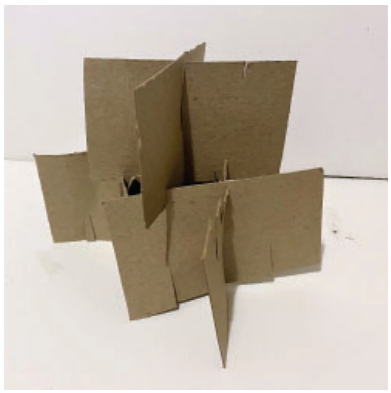
Process / Prototype

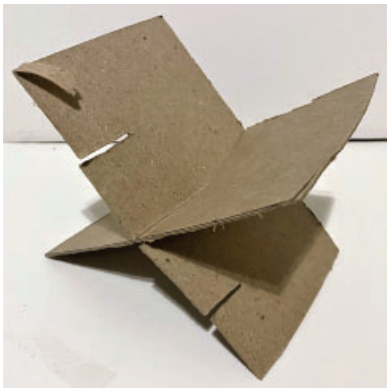
The third concept vision for the partition wall is, I believe, is the best-formulated answer for the task I set for this project. The idea about its development appeared during the second concept development when I was exploring the shape created by folding the flat sheet, the vision that a flat sheet itself can be the perfect element for creating a temporary prefabricated partition wall. The use of the laser cut particularly inspired the movement of developing this concept.

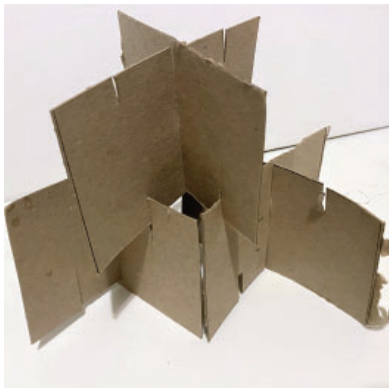
The design principles of this spatial partition are surprisingly simple, lightweight, unified, and easy and inexpensive to produce. Moreover, as it is a flat surface, it provides a prime opportunity to display branded information. These photos show the study of the form; this is a rough assumption and experiment on how elements can gather together and form the wall's structure.

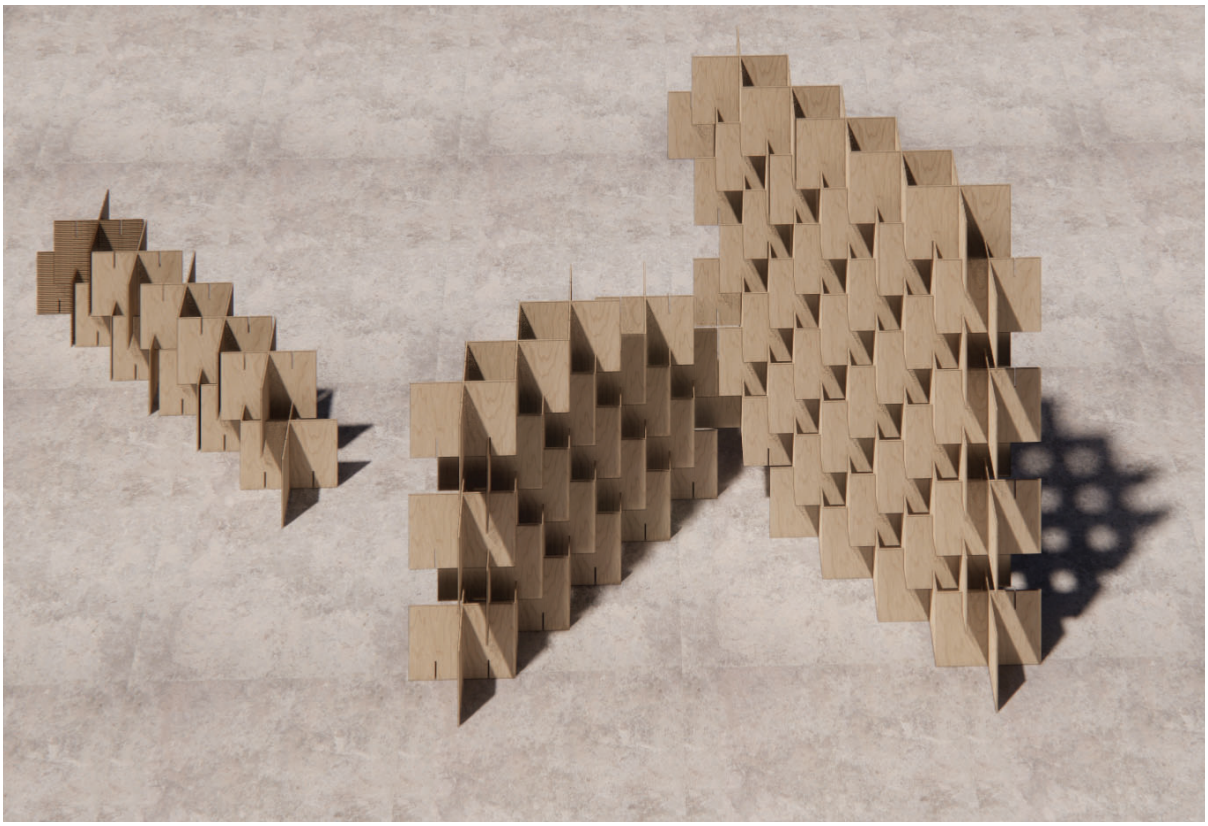
The distinguishing feature involves two cuts on the sides of the middle and finding the correct cut depth and interrelation between dimensions.

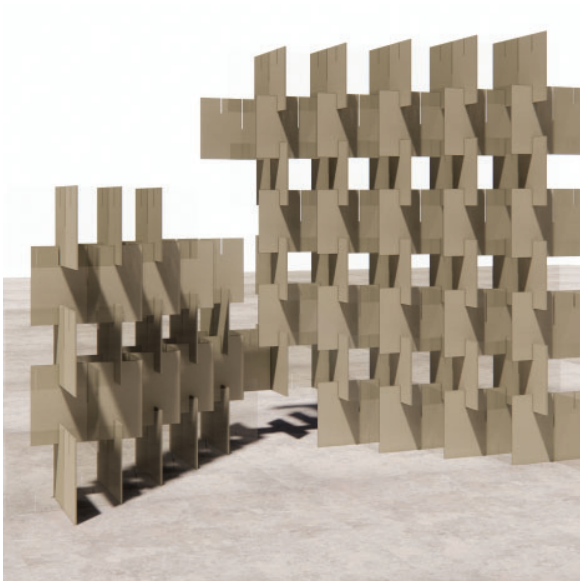












I used 3D visualization to discover the interaction of the elements before designing and cutting the components.

3D Visualization

To test the element with another implication of material Full-fledged large 3D visualization of the concept, for example, the glossy plastic acrylic texture is used.

This large 3D visualization of the concept uses a plywood texture.

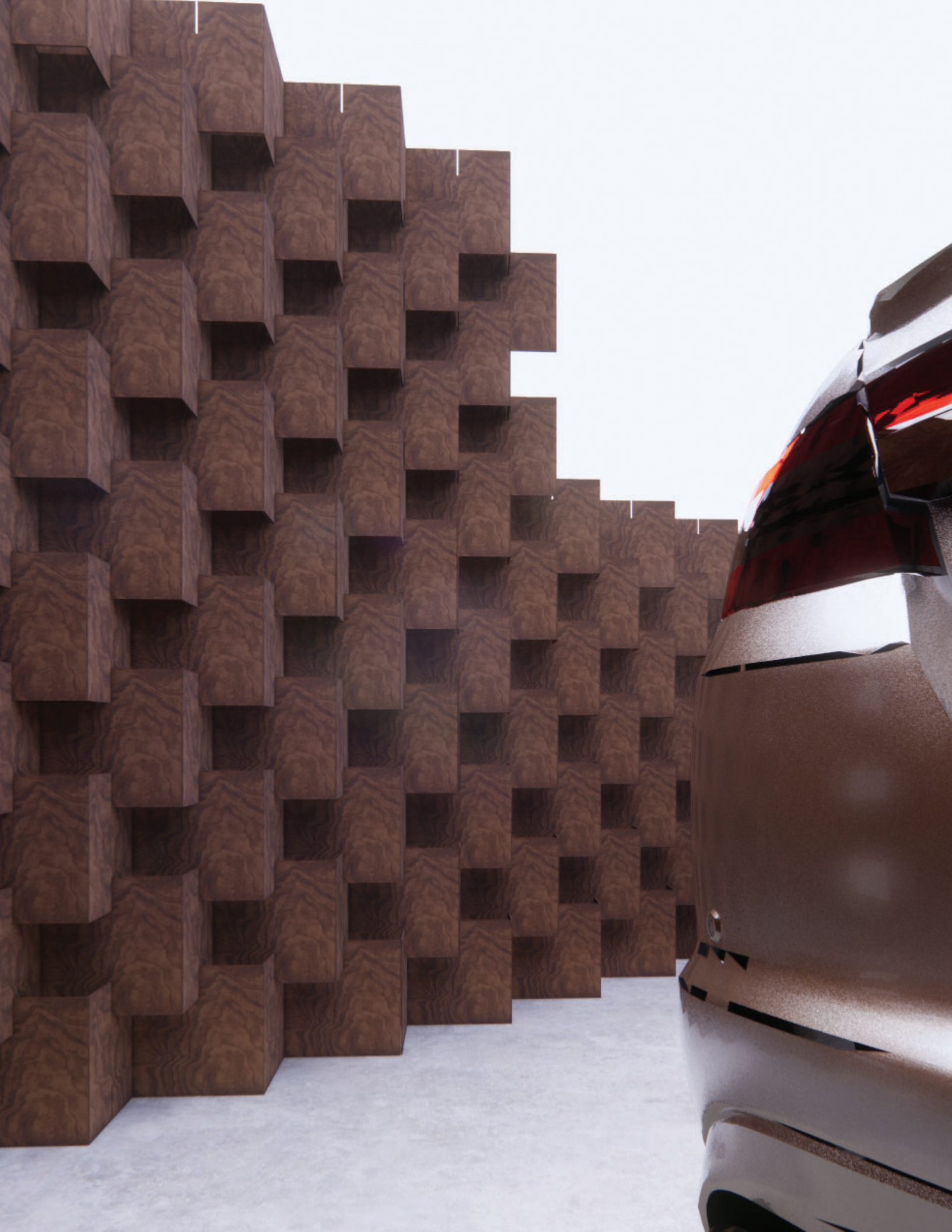
The 3d visualization shows the possible use of the system to create a fast mobile partition dividers to create the line pathways

Repeating the components in the same sequence creates a stunning geometric surface. Moreover, the refracting light adds volume and interest to the audience.

Repeating the components in the same sequence creates a stunning geometric surface. Moreover, the refracting light adds volume and interest. The 3D visualization shows the possible use of the system to create fast mobile partition dividers to create pathways.

This partition wall divider is a perfect solution for quick assembly in a situation of temporary use such as product presentations and exhibitions.

3D Visualizations show how one might detach the space to build a wall for a quick presentation. Unassembled wall elements are delivered and a barrier can be assembled quickly without any additional materials. Hooks can be attached to it, or background illuminated, achieving an interesting decorative light spot, due to the rhythmic repeating geometry of the wall.



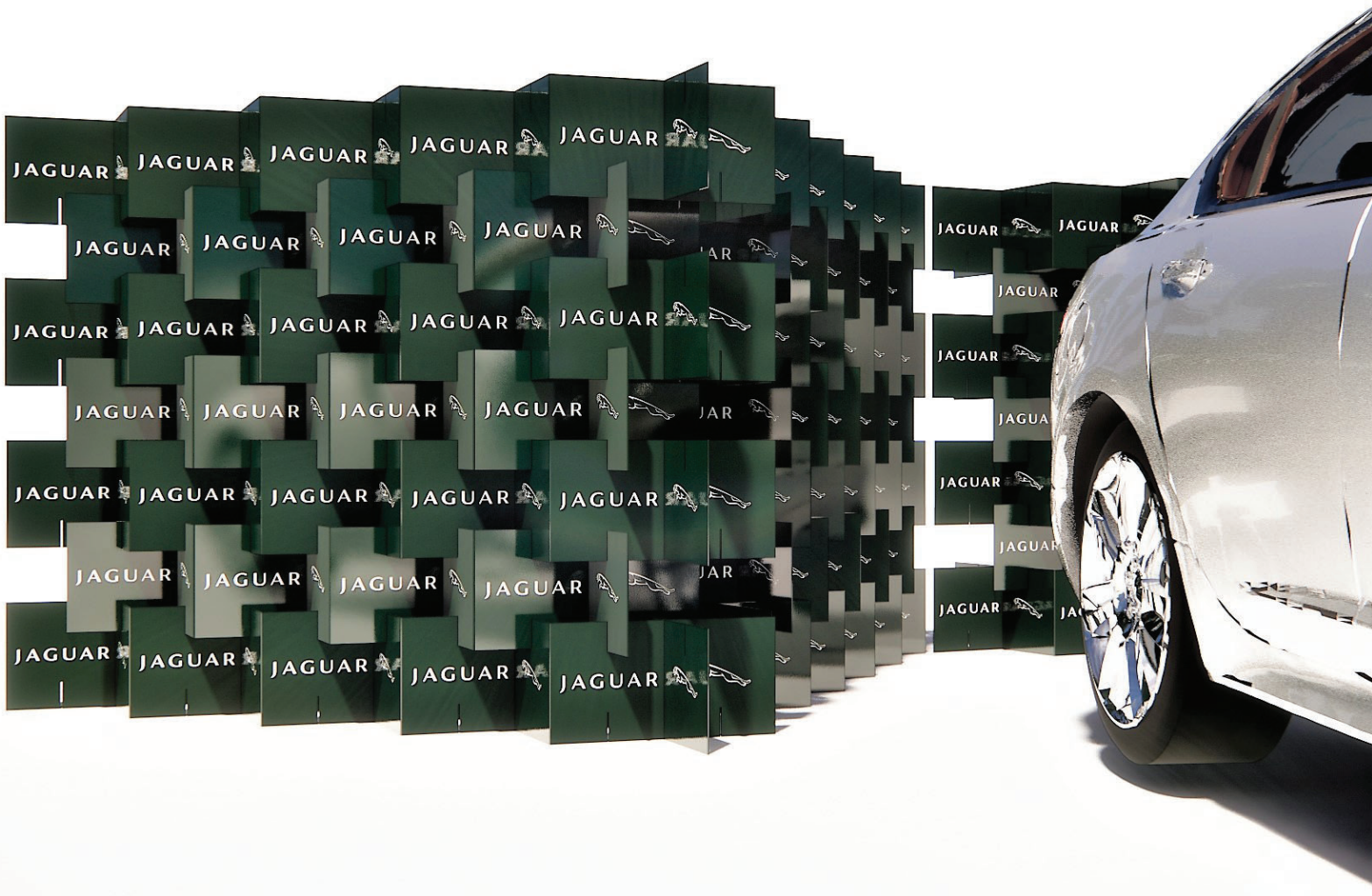
3D Visualization

This partition wall design is ideal for marketing purposes.

Branding information can be printed on each element to attract the attention of customers.

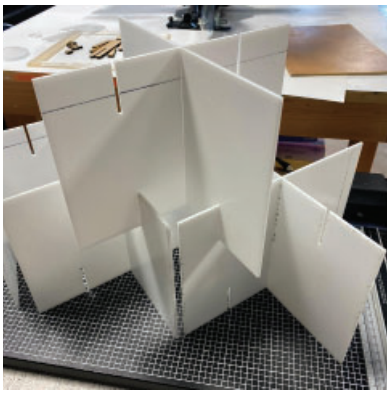

JAGUAR

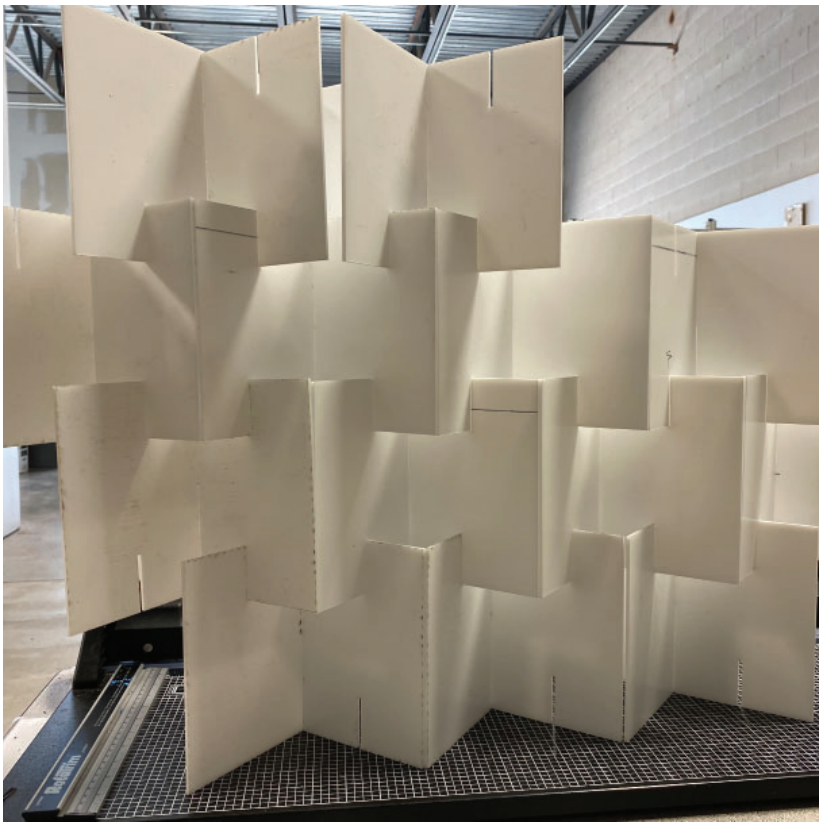
Below is an example of memorable brand presentation, achieved easily and inexpensively.

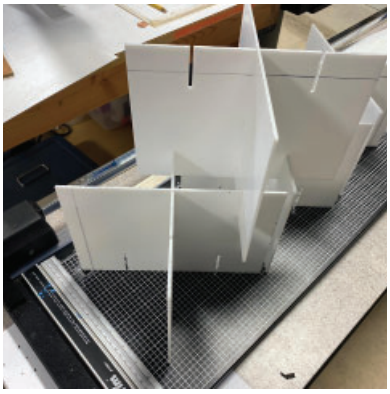

JAGUAR

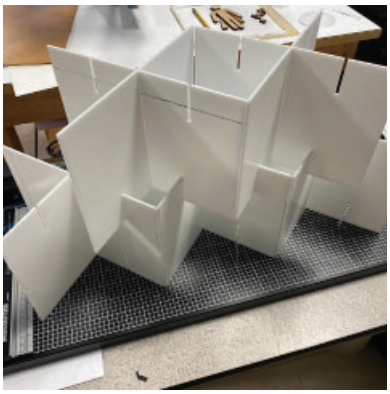

JAGUAR

Use to enclose the cafe. For example, the organization of separated areas includes the airports' lobbies between small cafes and the main corridor pathways.





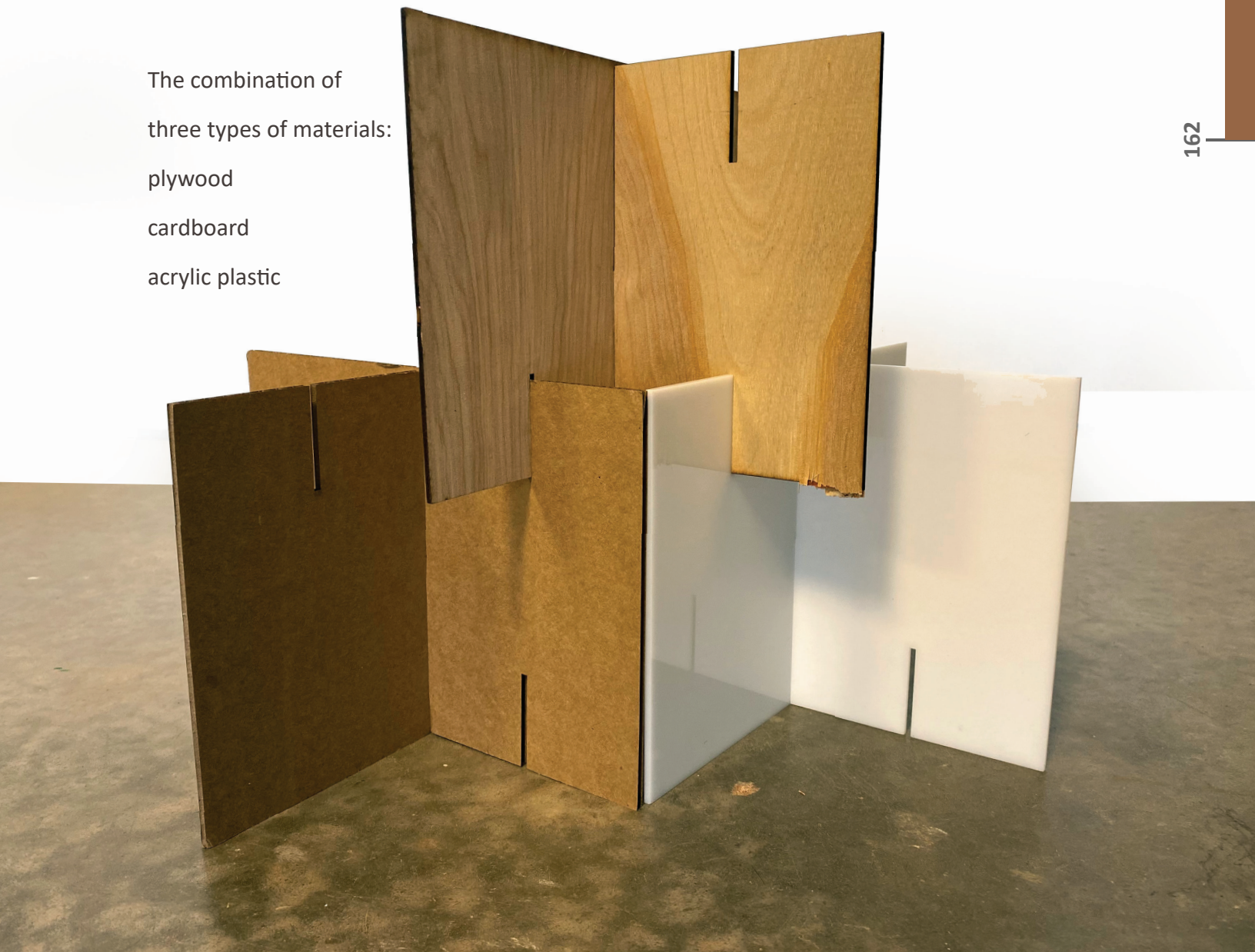


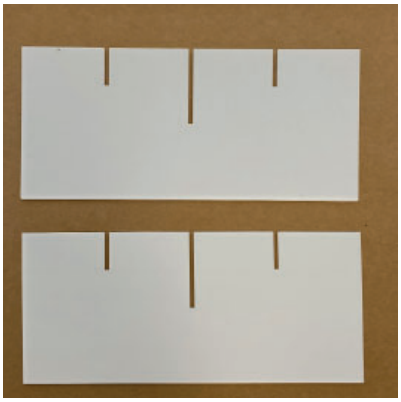


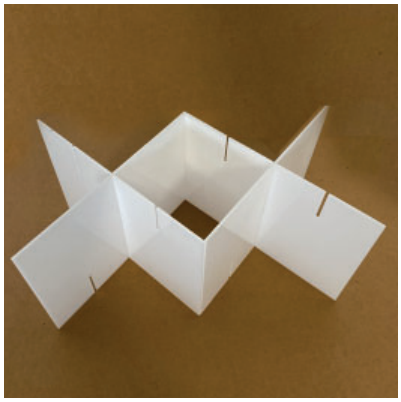
After testing this concept in a software program, I used laser cutting to fabricate elements. First, smaller-scale parts of acrylic were cut. Glossy white acrylic works well for this concept, for it creates unique light refraction and can be used for a long time. Also, if this structure is assembled from small components, then the partition can be used on a table as a screen, to divide a long office table, for instance.

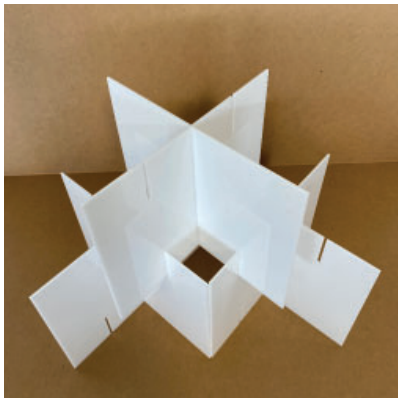
The goals for this thesis is to create the structure that follows the ideas of the book "Cradle to Cradle: Remaking the Way We Make Things," following principles of sustainability in production, use, and disposal. The pictures depict the resulting assembled wall.

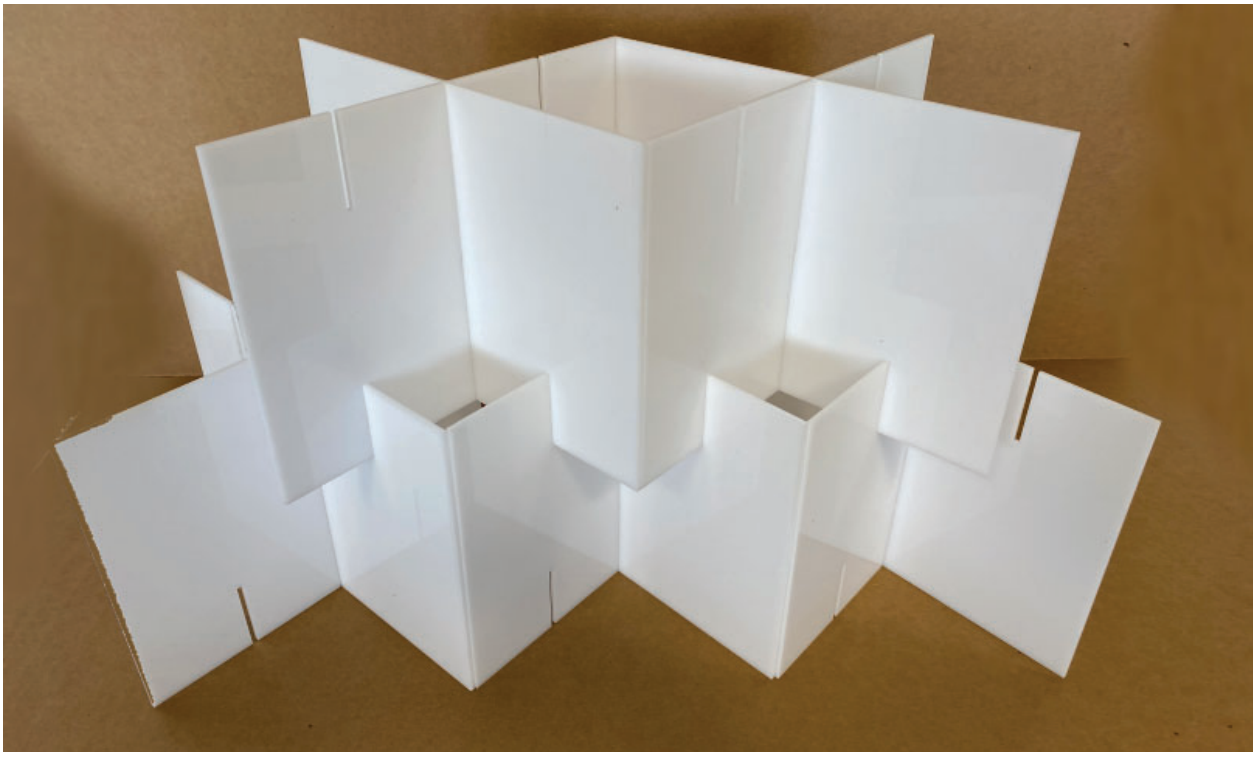
The combination of three types of materials:
plywood
cardboard
acrylic plastic





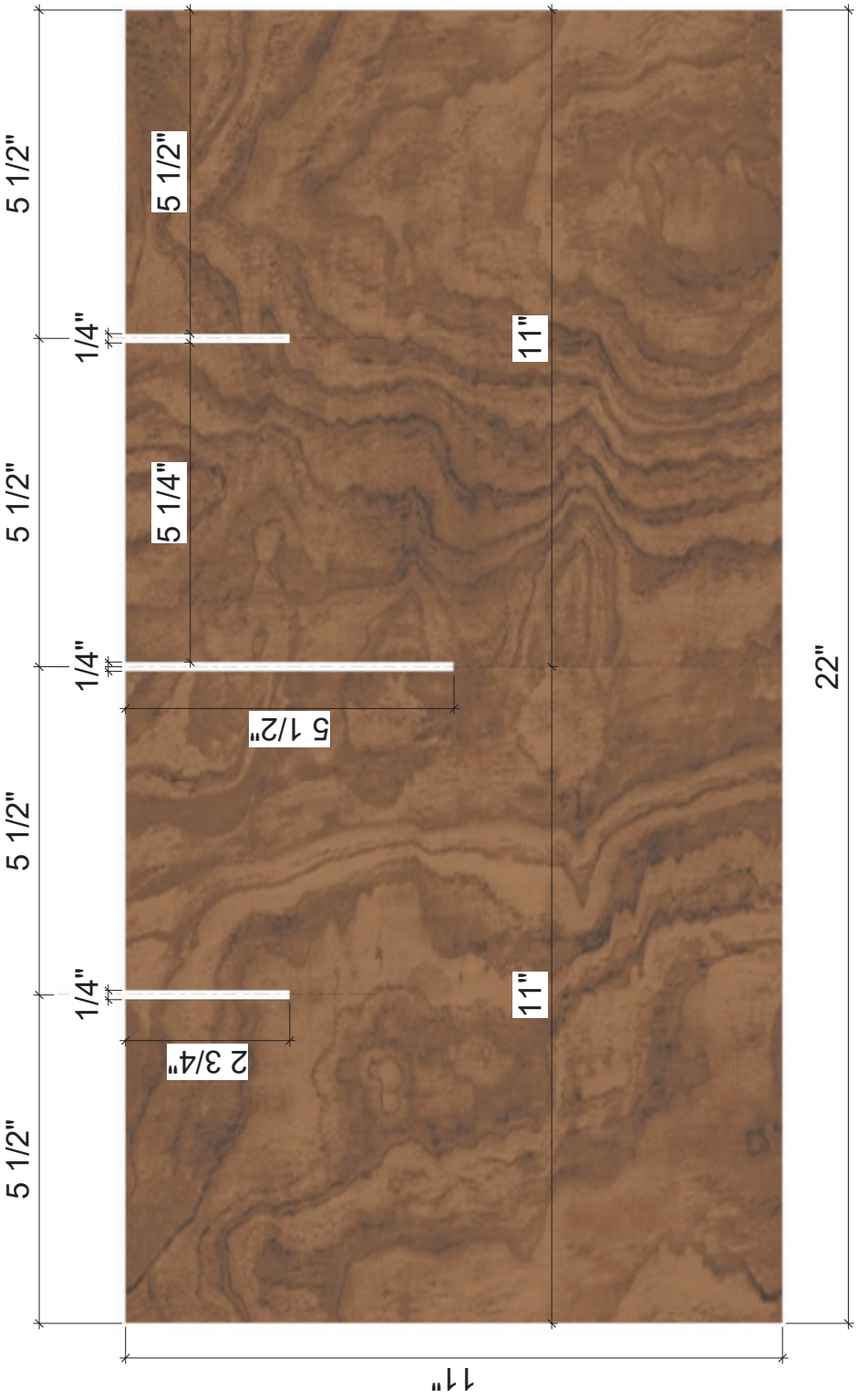






Assembly principle in steps.

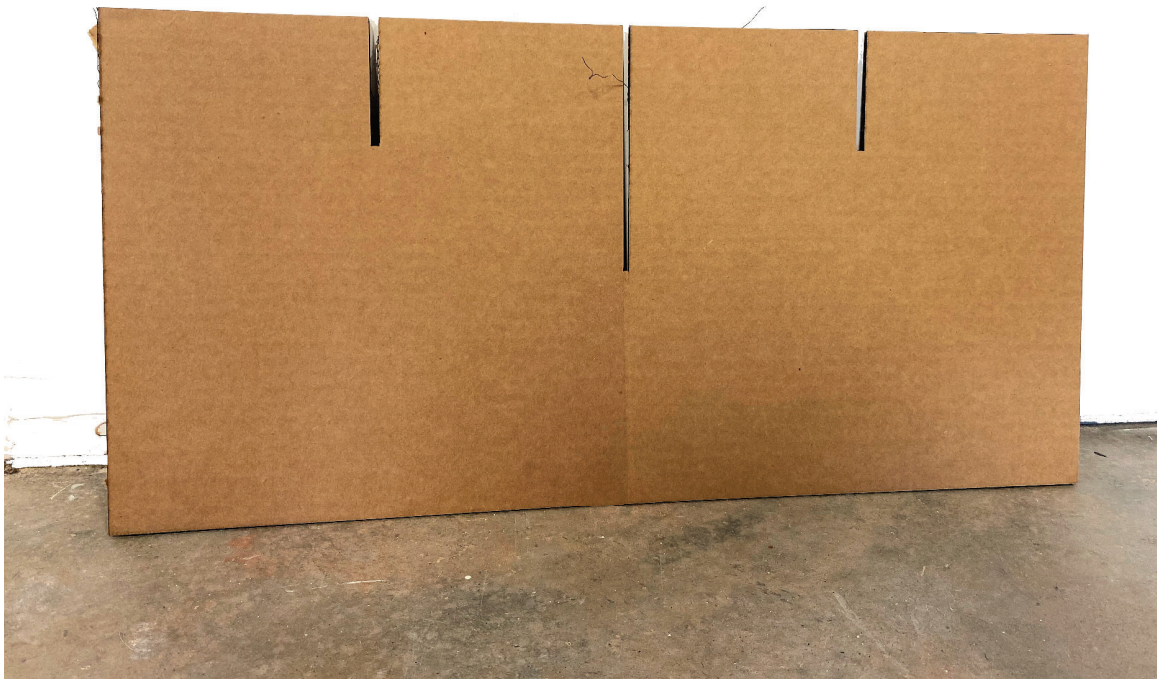
Element dimensions



Formal Eploration / Third Concept / Sliding System / FINAL DESIGN

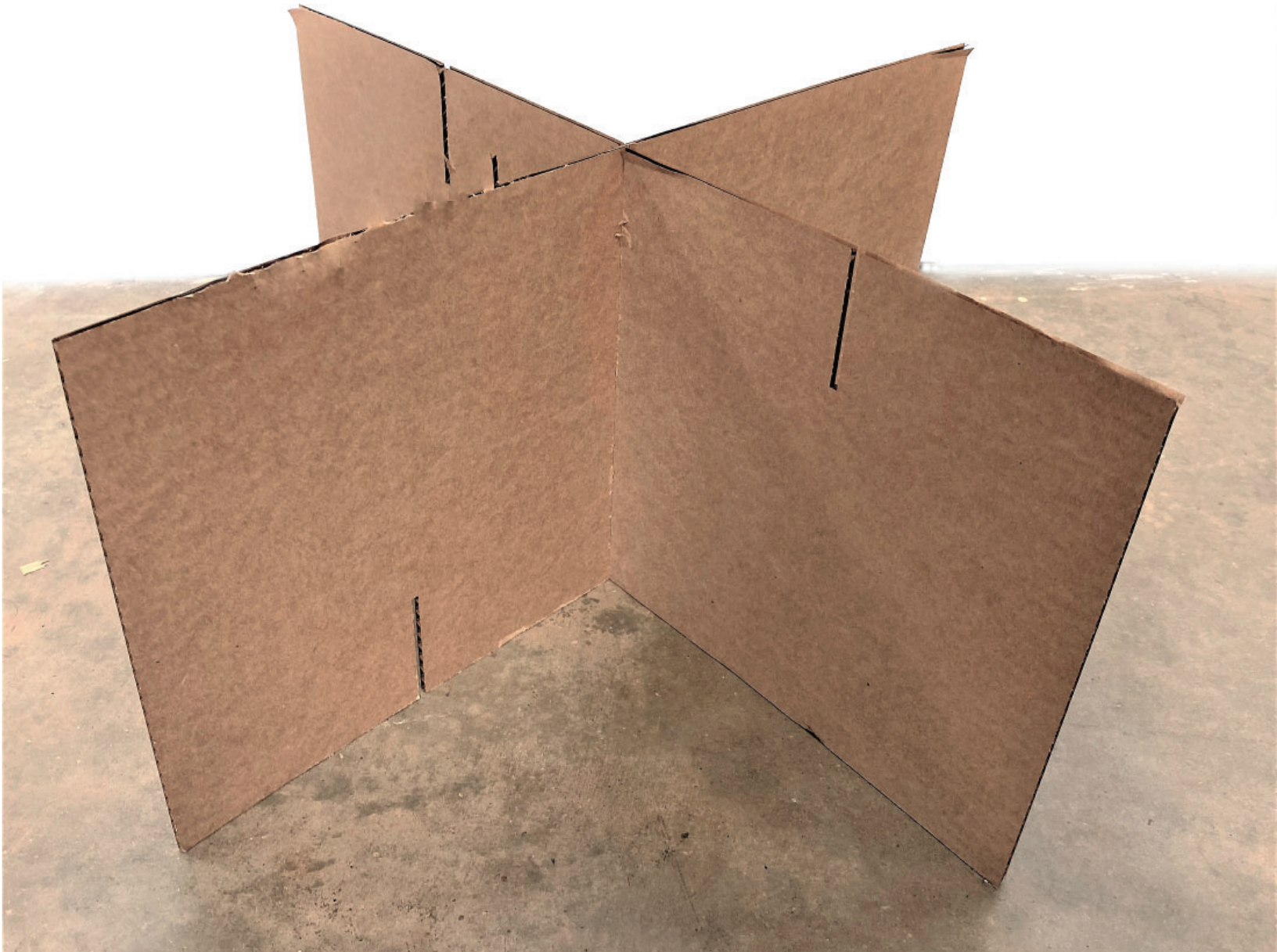
The use of prefabricated elements with different

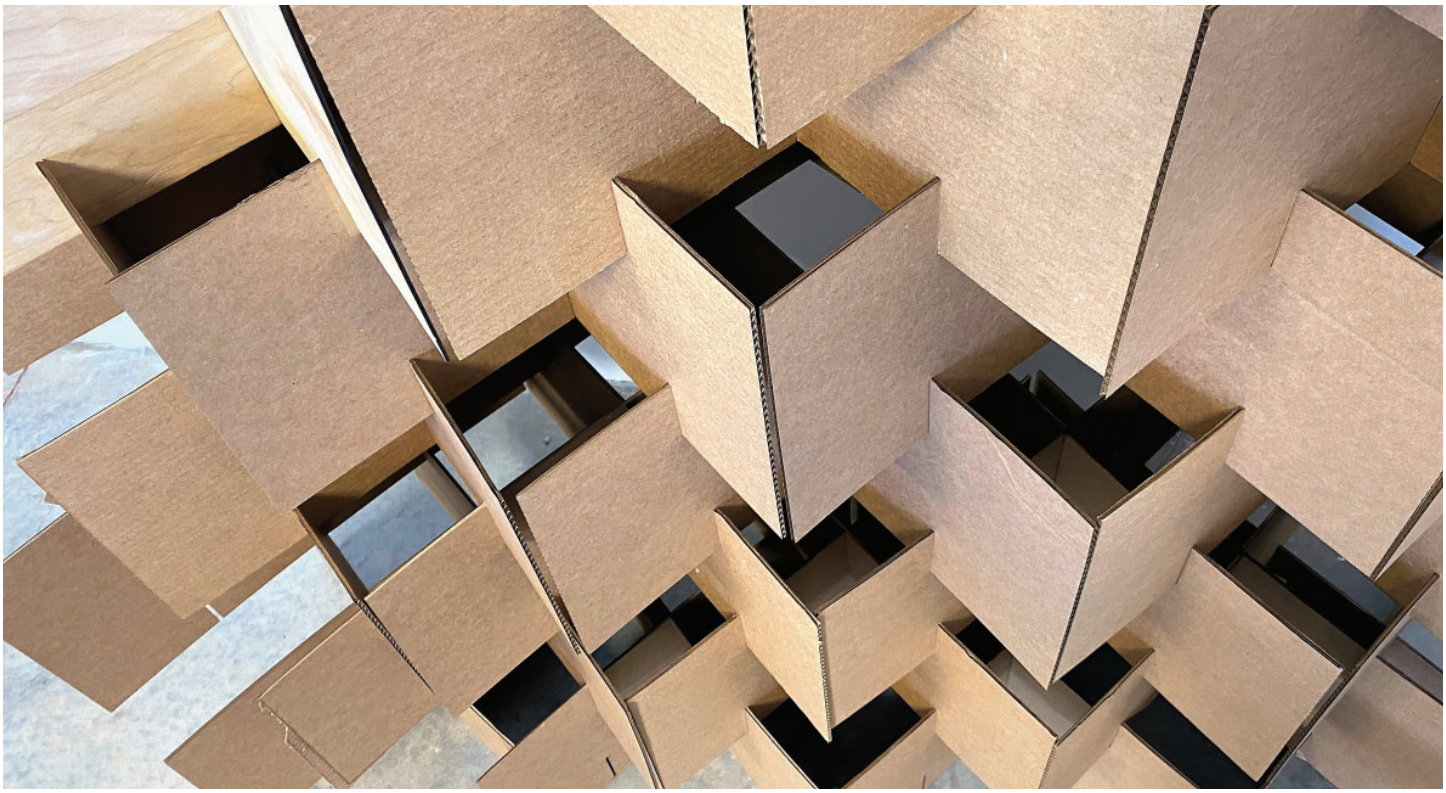
types of materials assembled together



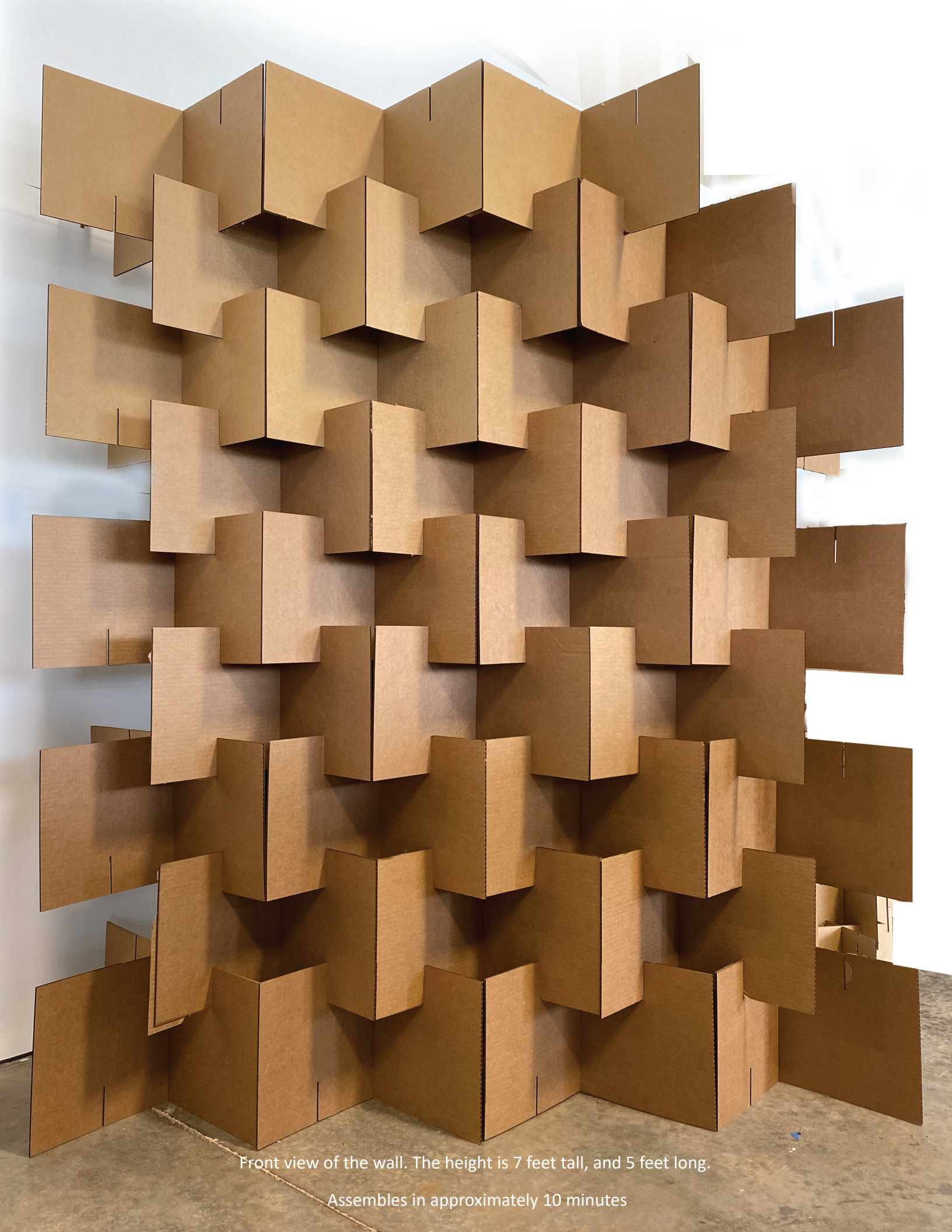
For this one single full-scale unit, cardboard can be used for temporary situations and then recycled. The texture of plywood or glossy acrylic brings a beautiful decorative effect, and being a more resilient material, they might be used as a permanent interior structure. When folded, the partition elements are easy to transport and store. When it is necessary to build the structure, slide one element into another through the prefabricated cuts on each element. After use, it is easily disassembled and stacks in storage.

First steps of the assembly process.





The closer look at the assembled structure.



Front view of the wall. The height is 7 feet tall, and 5 feet long.

Assembles in approximately 10 minutes

Final Design

As a result, I believe that this concept is highly efficient and has a lot of benefits and future implementations in interior design. Especially considering an option to mix various textures and colorscolors. Also, this spatial divider can be used as a marketing promo item by placing or printing a logo or brand identity directly on each unit.

MATERIAL EXPLORATION

One of the most important parts of the work on this thesis was the search and study of alternative materials. I tried experimenting to find materials that could be used for the further final production of the above 3 concepts. One of the main characteristics of the components being developed is the possibility of subsequent recycling.

For grasping and studying of elaborate processes that could be applied to produce elements, the information described in the book “Making it” was overviewed.

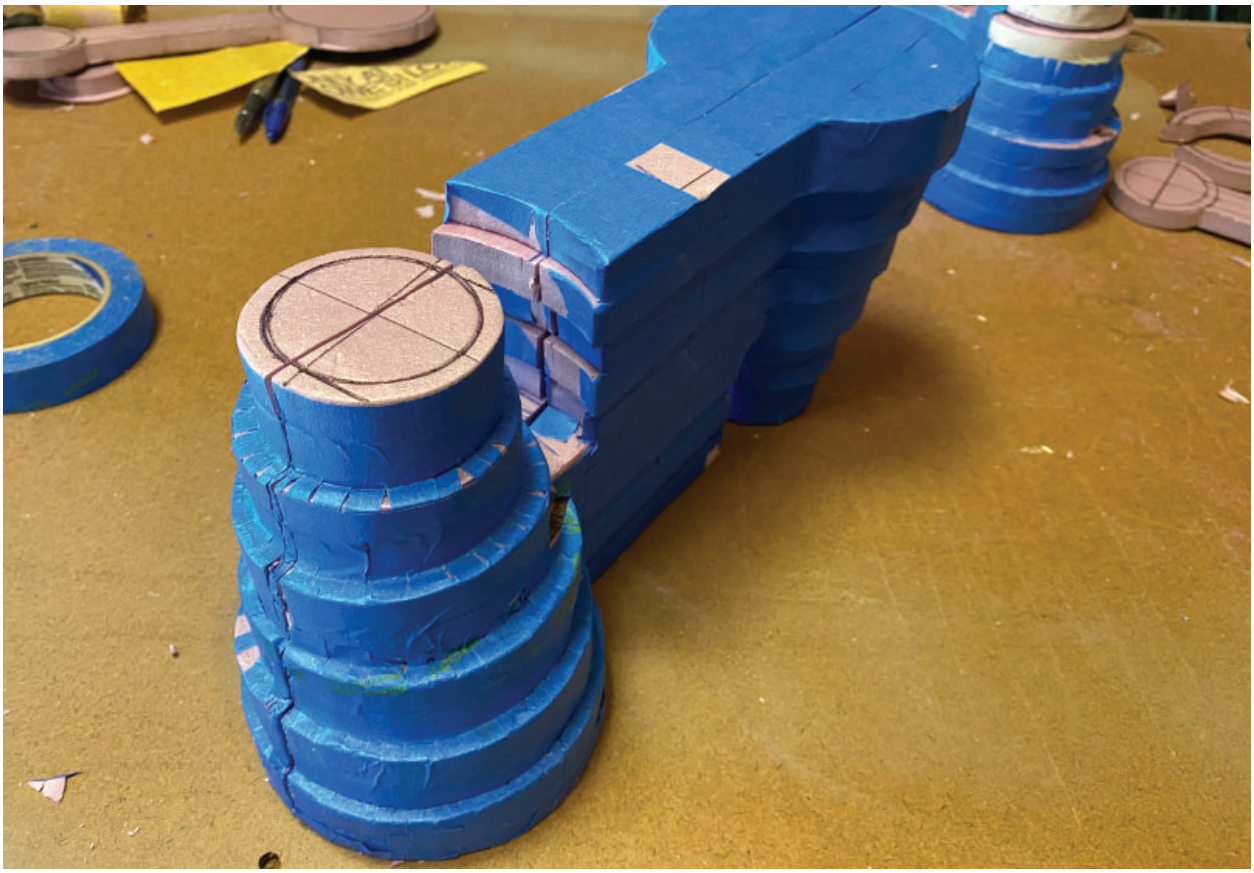
The basic principle for the production of the second and third concepts was already formed and found.

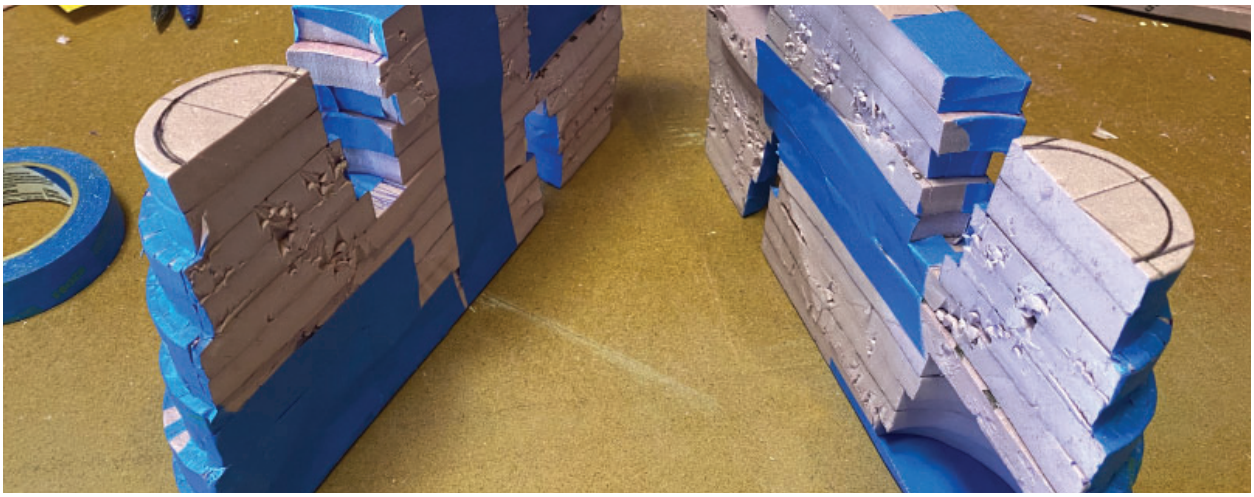
Also, the major suitable type of material for this concepts will be cardboard or paper. The process of the production defined: the elements can be cut using a press or laser cut from recycled cardboard or paper sheets. Of course, other environmentally friendly materials may be possible to use too, if they are suitable or similar in flexibility and flatness to cardboard/paper.

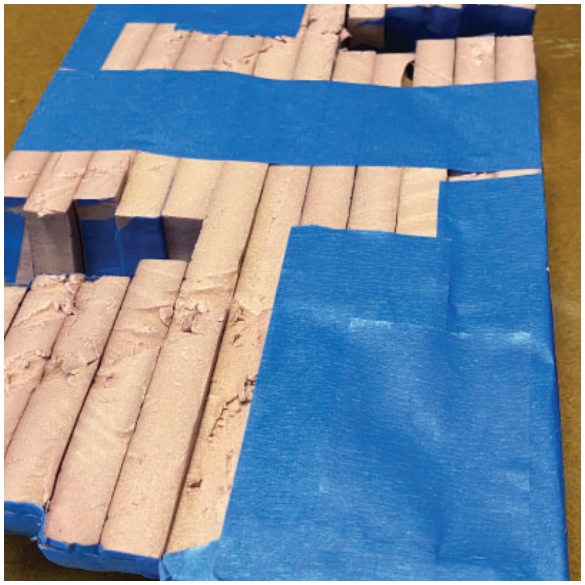
As in the first concept since, in its description, there was no finalized answer to the efficient method of the elements production, it is important to reveal the possible options for fabrication.

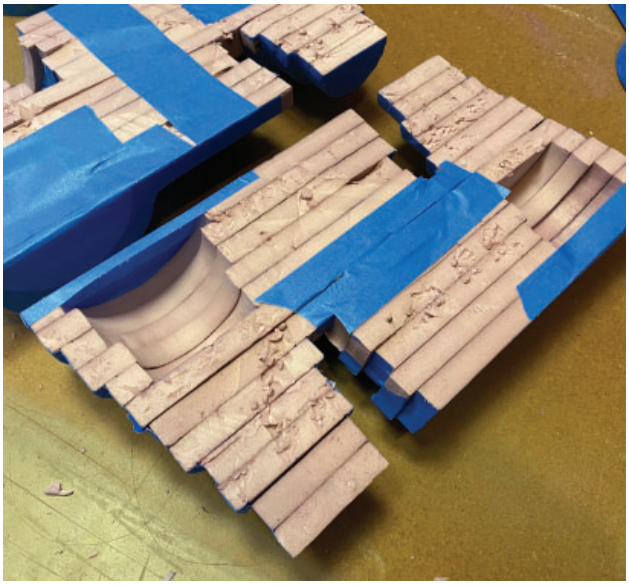
For finding the answer, a trip was made to the plant, engaged in casting materials. It has been found that the best way to produce the elements of the first concept is by casting, for example, plastic. This requires making the wall thickness of the element thinner in order to save casting materials. After that, make a metal mold, which will vary from eight to thirteen thousand dollars. However, after that, it will be possible to produce the element every ten seconds with its cost price on three dollars per unit. That is, this concept can be mass-produced.

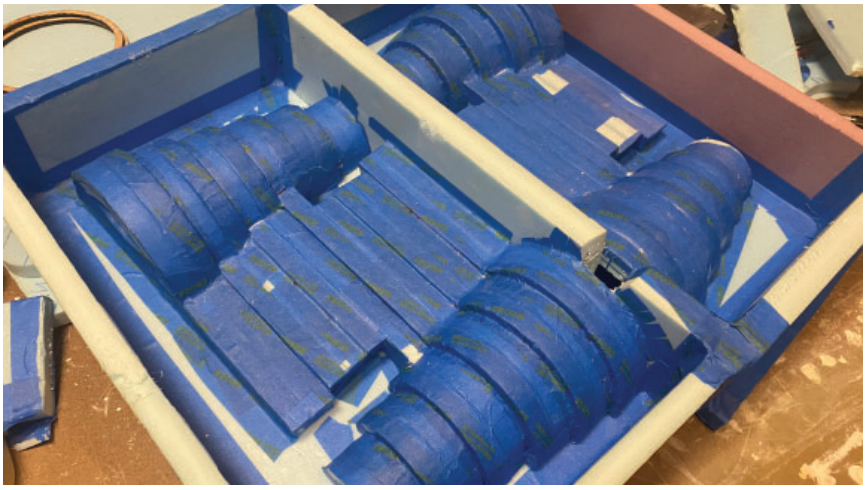
It was decided to experiment with creating an experimental casting mold from plaster. This mold will be used for the future experimental option cast from the alternative materials. For that purpose , the prototype was cut into equal two parts, followed by placement in a flat tank, followed by pouring gypsum. After plaster hardened, the resulting mold was cleaned of preparatory materials. After four experiments, with the identification and elimination of design flaws and pouring methods, two casts were obtained, which could be used for subsequent work.

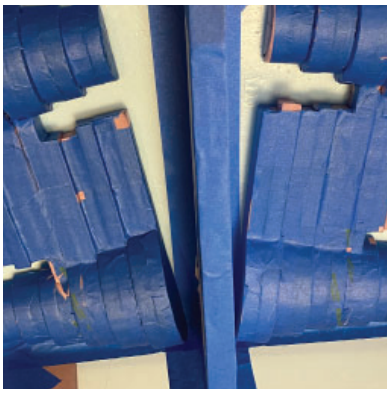


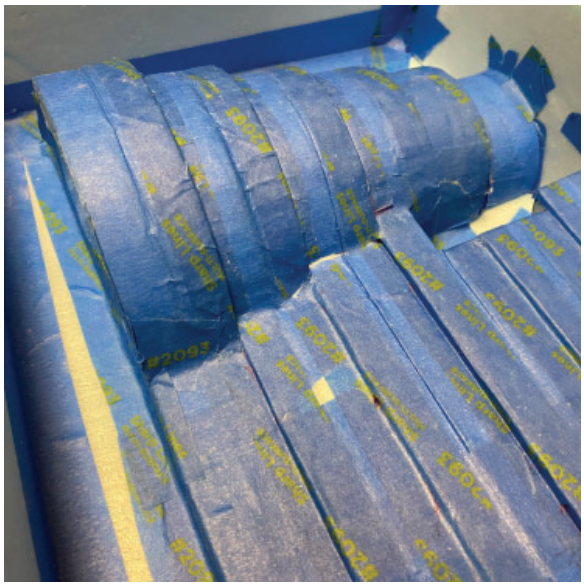


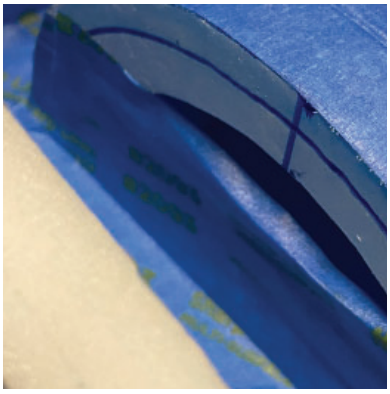


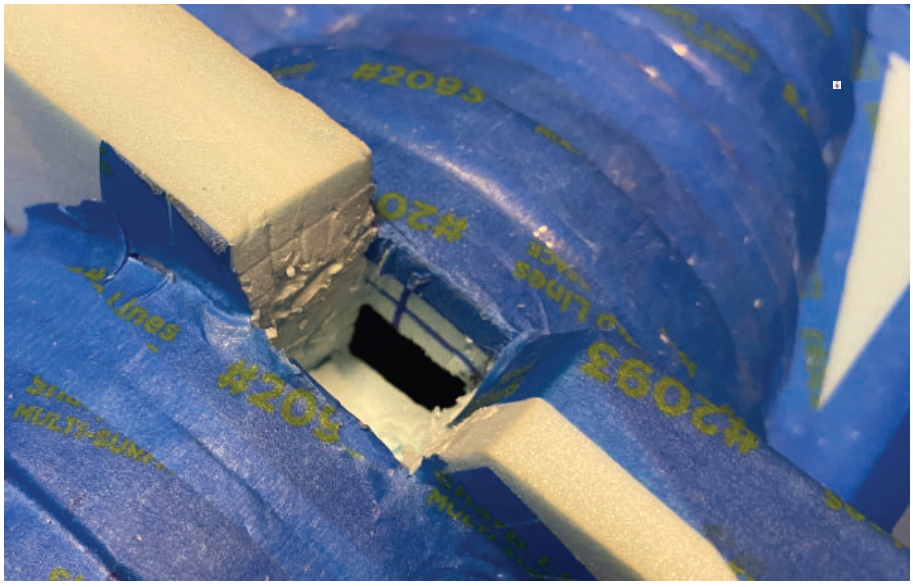


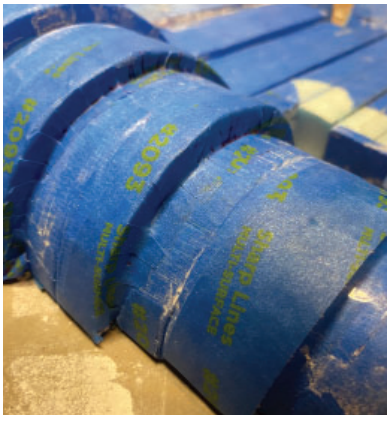


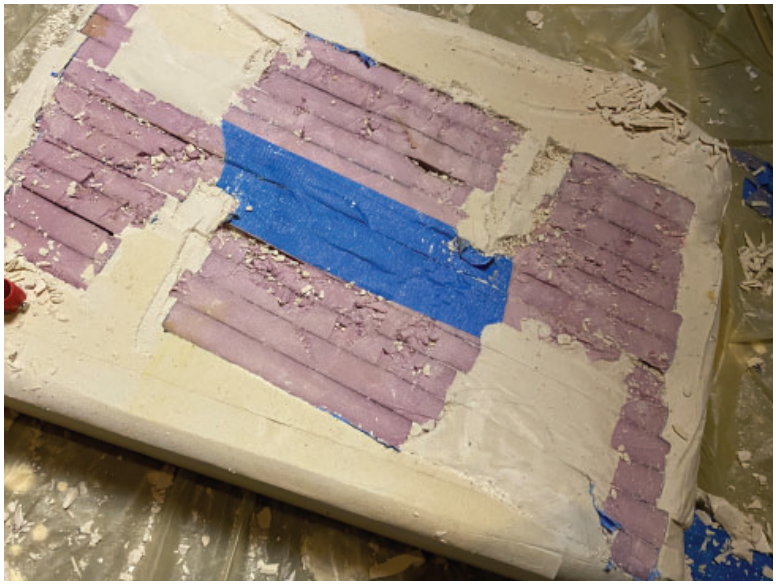








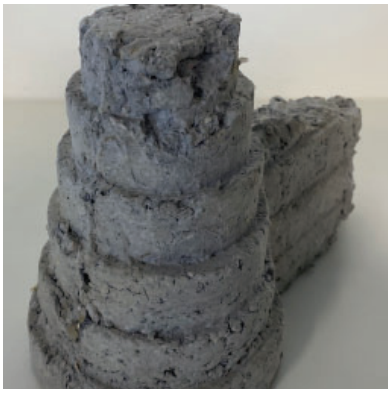




Final result of the cast, and internal view of the casting after cleaning. All the flaws of the prototype are visible. For further improvement, the prototype must be prepared more thoroughly. Along the seam line, a silicone sealant is used to prevent the plaster from flowing out when pouring.

Final mold form made from plaster. It is consists of two elements.
For further development of the production the central part of the molding form shoul be smoothed.

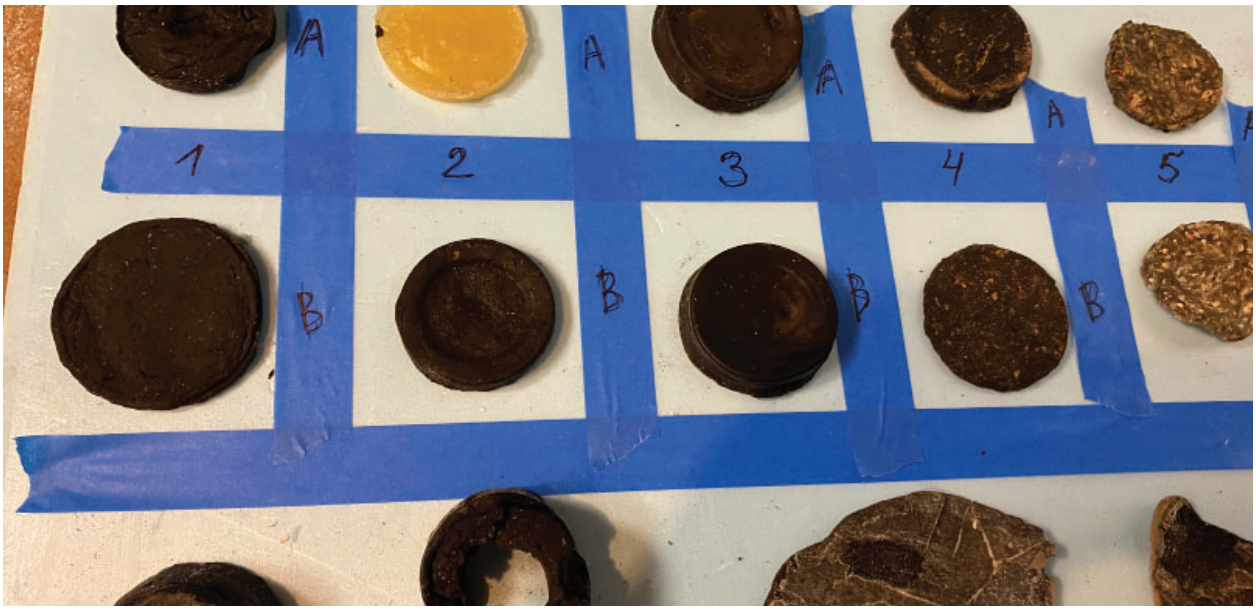
Recycled Paper / Paper Pulp

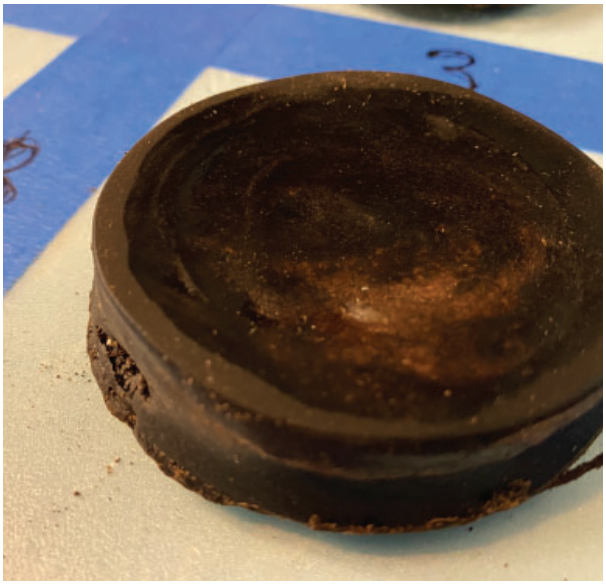


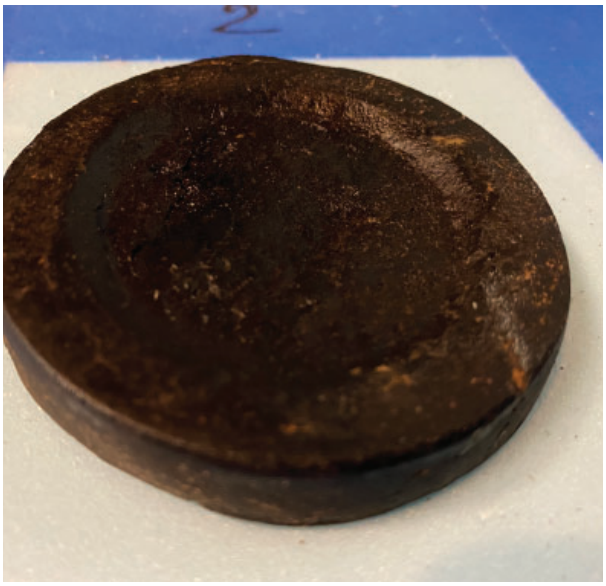
This mold is then used for casting the components. For one of these experiments, I used paper. Office paper has been shredded and mixed with water and starch. Then it is poured into a plaster mold. You can see the result obtained in the images above. The shape is robust and has degenerate edges and areas for connecting components. Unfortunately, due to insufficient drying time, the component is cracked. During the experiment, some defects in the plaster form were revealed. Also, for a harder texture and a higher density of the component obtained from recycled paper, it is necessary to apply pressure to the material when pouring and drying. The higher the drying pressure, the more it compresses and the stronger the final component.

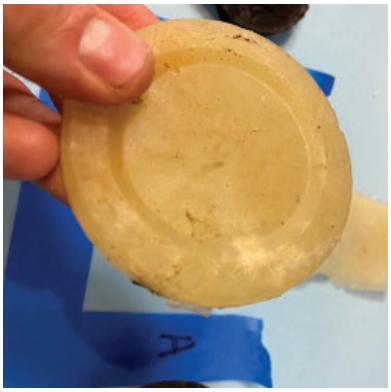
This technique is very promising in the production of components for the design of developed partitions. Of the three concepts presented, paper pulp and this technique will find its best application in the first concept. The color of the element can be changed by adding paint while mixing water and paper.

Coffee Grounds









Interest in the study and an attempt to create a material based on coffee grounds appeared after searching and studying modern alternative environmental materials. As it turned out, 2 companies make sunglasses, and another company focuses on the production of tableware, such as cups.

Having researched similar studies, I began to independently create a similar material, which should be robust and dissolve in water with difficulty.

The first experiments were unsuccessful, “but after correcting the ratio of the ingredients, I began to see some more promising results. The composition of the mixture is coffee grounds, glycerin, vinegar, water, potato starch and corn starch. It is required to mix, and after obtaining a single mass, it requires to heat and mix the composition. The mixture begins to thicken. After that, it is necessary to fill the mold with this mixture, applying compression after filling it. Drying occurs within a few days— about 6. The results began to respond to the desired characteristics. The photographs show the latest results, which are not final but intermediate ones obtained during this material study. The material can be polished, sanded.

Continuing the experimentation requires the creation of molding methods as large as that used in the first concept. Also, the exact maximum effective formulation of the mixture has not been identified. Therefore, it is necessary to continue experiments. This material will be promising for application in the production of the third concept, and the first concept. The production and consumption of coffee are growing every year, therefore more and more coffee grounds are thrown away, while it can be reused.

CONCLUSION

After all of the above mentioned, it is possible to say that all the tasks set for the development of this thesis of elements for creating prefabricated spatial partitions were implemented. This This thesis resulted in three versions of the design of spacial dividers which can be prefabricated and assembled on site. The units are easy to manufacture, transport, store, and recycle. The concept answers the problem of creating partitions that do not require additional elements or adhesive materials for their construction. Two out of three concepts are ready to be mass-produced.

In the beginning, when I was choosing the direction and topic of my thesis research - this direction and topic of research, I perceived as something strange and not entirely clear. It was not at the forefront of the list of research topics. But it turned out that as I immersed myself in the context, I felt more and more interested, the necessity and significance of the chosen theme, for the sphere of the interior design and myself as interior designers. I can confidently say that this thesis project and its implementation are at the intersection of several design areas and meet the following design tasks:

- historical context,

- mold research and development of the form (in the field of product design)

- market demand and ways of using the developed elements by consumers, the possibility of introducing into the mass market

- marketing significance and analysis of the attractiveness of the final design

- research and experiments with non-standard materials for their subsequent implication in the manufacture of elements - section materials.

I see the project's further development in finding material for the first concept, which will be cheap and can be poured into the mold. Also, continue research, and possible use of coffee pomace, recycled paper, which requires molds. It is possible to order the manufacture of molds and start mass production of plastic components. Because the laser that was available for use, did not fit larger-scale components and cutout of the part, the second concept requires an increase in the size of the element.
contributed.

I believe that this research paper will be beneficial for interior designers, as the approaches in mobility flexibility of the space use, and organization the separated areas in the united space, is trendy movement in the space organization.

I believe the unique patterns, and wide array of options these walls provide will give interior designers a multitude of options allowing them to experiment, and be creative in their own solutions. Moreover, the main contribution is thatthese designs are ready ready to be implemented and released to solve real-time tasks.

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