

The Oslo School of Architecture and Design

Diploma Project

Spring 2023

# Rethinking Clay

Exploring how design can contribute to the minimisation of clay-waste in the city of Oslo by offering solutions that promote the creation and consumption of locally-sourced products.

Romeo Rioverde





**Project Title**

Rethinking clay

**Diploma Candidate**

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**Supervisor**

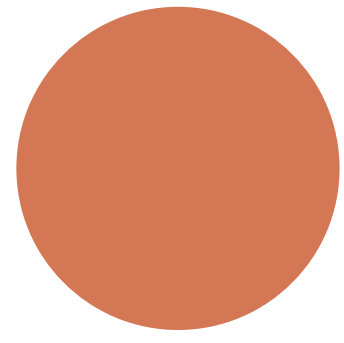
Hilde Angelfoss

**Field**

Industrial design

**Spring 2023**

The Oslo School of Architecture & Design



# Abstract

"Rethinking Clay" investigates the potential applications of blue clay, a material abundant and wasted in and around the city of Oslo. This project aims to transform the perception of blue clay from waste to a valuable resource by creating an intervention that adds value to the material. The objective is to explore innovative ways to utilize blue clay, thereby minimising waste and maximising its potential across various contexts.

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01

# Introduction

# Context

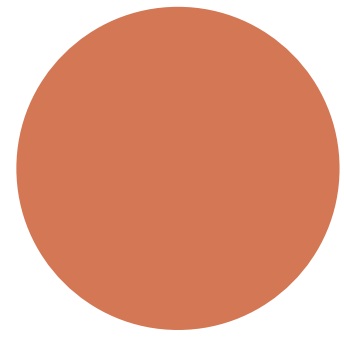
**A holistic approach to designing interventions or solutions should go beyond the creation of the products themselves.**

In this product, I address the whole journey of blue clay from origin to end; who is digging the material, who collects and process it, who is crating products, and how do those products reach the end consumer.

My aim is to explore how design can contribute to the minimisation of clay waste in the city of Oslo by offering solutions that promote the creation and consumption of locally-sourced products. I aim to explore the application of blue clay as a material in a variety of products that promote its value for society and the environment, and through this, convert this waste material into a valuable resource.

Through the implementation of holistic design processes, my contribution focuses both on the creation of products well as the context of which these products take place, answering questions such as “Where can blue clay be applied in ways that showcases the material in the best possible way?”.

I explore this question by creating products built primarily with blue clay as well as combining blue clay with other conventional materials like wood, metal, plastic, glass, and others.



# Target Groups

The project targets two societal groups:

Firstly, it aims to create meaningful activities for refugees that enhance their well-being and provide them with opportunities for financial and social benefits. By availing of the diverse refugee community's creativity and resourcefulness, this project in return aims to provide them with an enhanced sense of purpose here in Norway.

Secondly, the project aims to promote the production of sustainable products to attract environmentally conscious end-users. This includes individuals who prioritize sustainability in their choices as well as professionals in professional sectors. The goal is to offer alternatives that align with their sustainability values by contributing towards a more sustainable future.



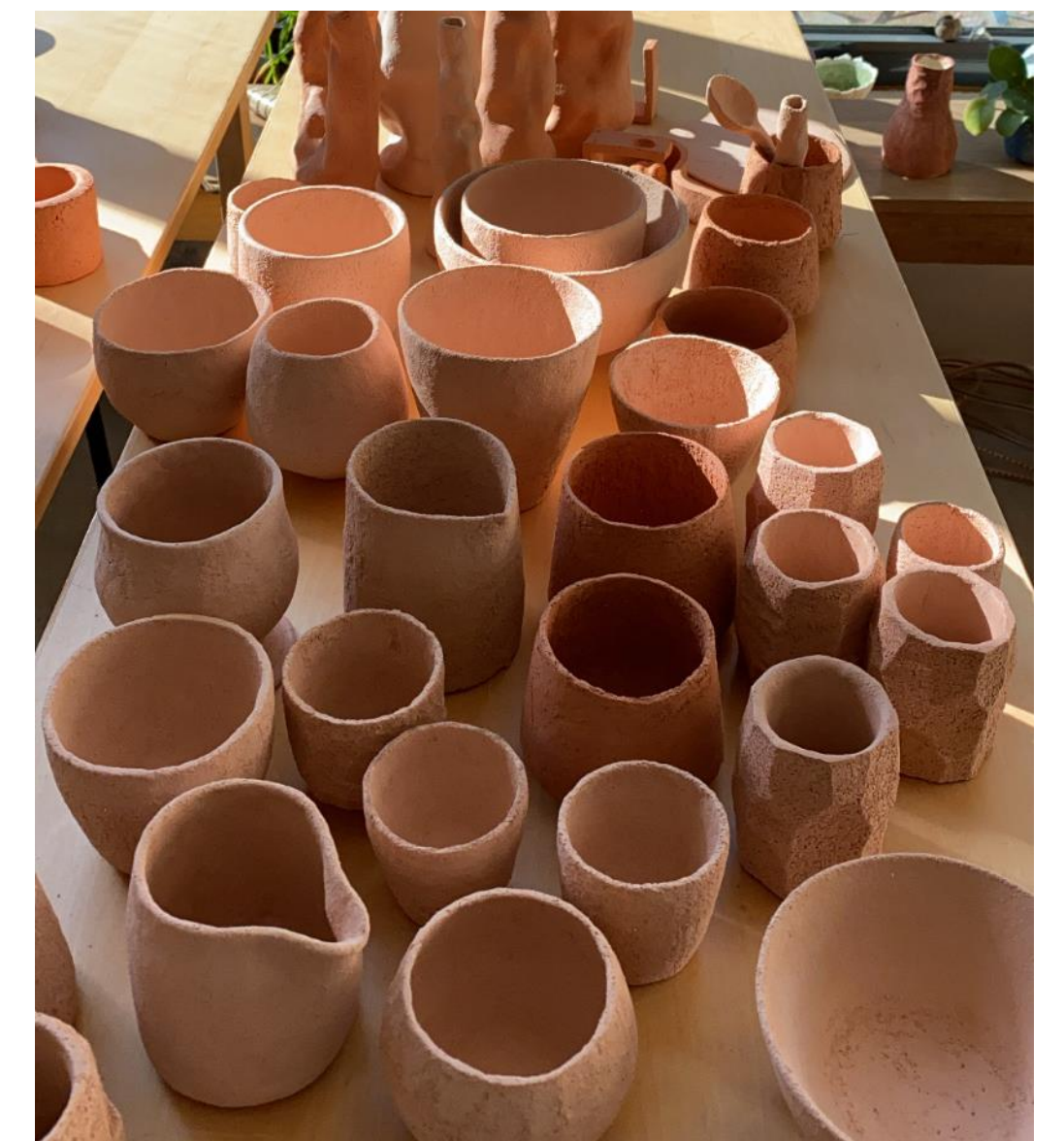
# Project Motivation

My interest in clay as a material started out with a trip to Marrakesh in December 2019, where I jokingly asking a ceramics vendor if he could teach me how to make things with clay. I had a blast crafting with clay that day and I told myself I would do more of this when I returned to Norway.

In early 2020, I took an introductory pottery course with Norwegian ceramist Mette Strøm. Since then, I have continued to explore this material recreationally and have made homeware products that I still use every day.

When I was first told that Oslo is built on clay foundations, my initial reaction was of living on unsolid ground. I am a visual thinker, so I could immediately see this vast expanse of soft material below me.

While I did not know immediately how this interest would impact my future work, my Master's diploma offered the perfect opportunity to learn more about this fascinating material and the wider role it plays on the society I live in.





# Methodology

## Research

Desk Research  
Mapping  
Observations  
Conversations with Target Groups  
Conversations with Experts  
Opportunity Areas

## Concept Development

Moodboard 1 (Function)  
Requirement Specifications  
Moodboard 2 (Material Combinations)  
Sketches  
Concepts

- Material-Driven Design Exploration
- Clay Furniture with Other Materials

Mockups  
3D Sketches  
Evaluation  
Moodboard 3 (Partition/Architectural Tiles)  
Sketches  
3D Sketches

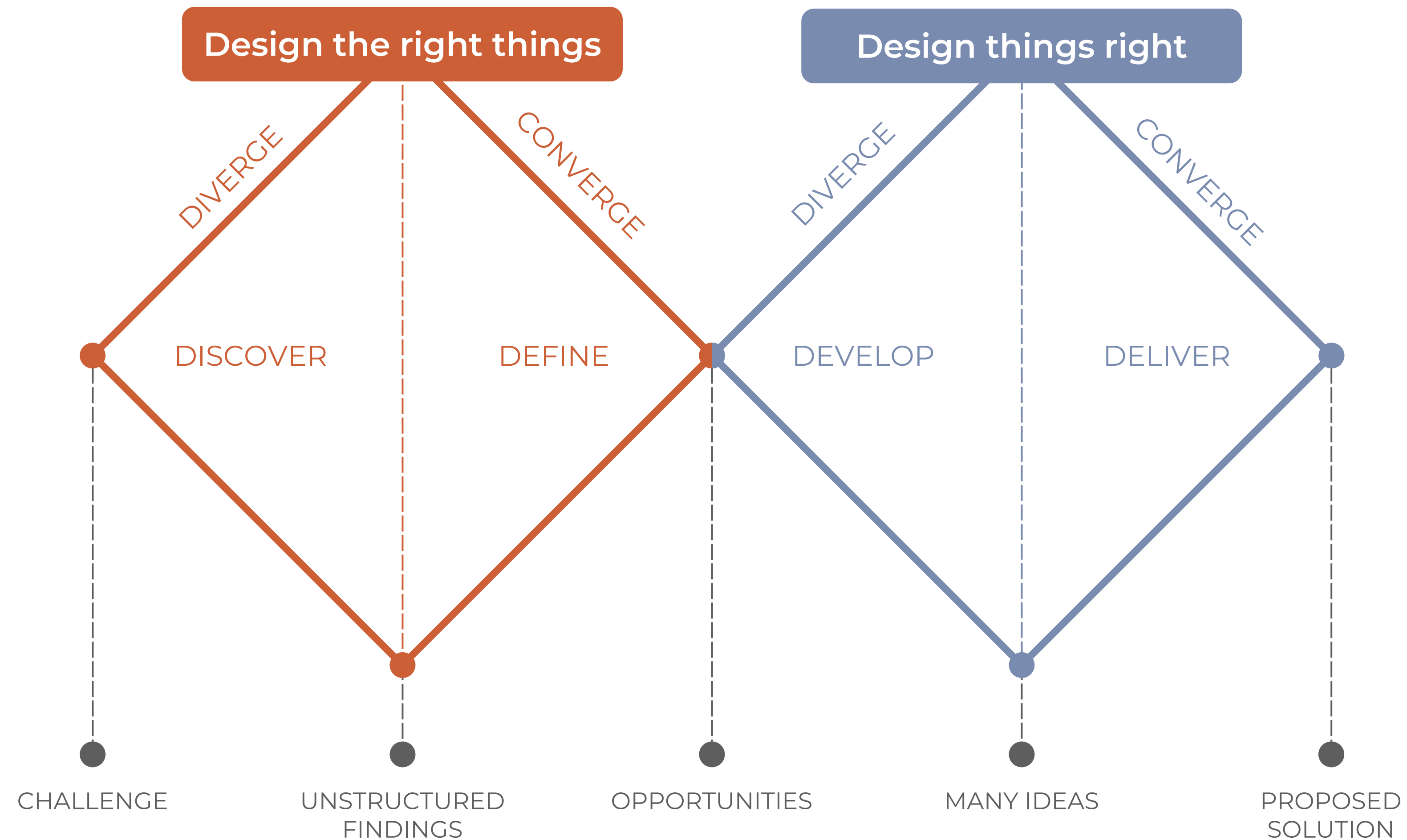
## Product Development

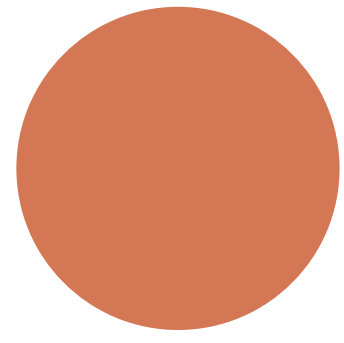
3D Modelling  
3D Printed Mockups  
Testing  
Product Feedback  
Exploring Production Methods

- 3D Printing

3D Print Prototypes  
Building Visual Model

# Approach: Double Diamond





# Contribution

This project offers a holistic overview of blue clay as a material, I have explored some opportunities within the material in different applications and have created an overview of the different actors involved in the process of sourcing, processing and implementing the material.

I Want to create products that are desirable not only because of their aesthetics and functionality. But because they are sourced and produced locally and sustainably.

02

# Research

# A Brief History of Clay

Clay is “an earthy material that is plastic when moist but hard when fired” (Merriam-Webster, 2023). It is composed of “soil particles less than 0.005 millimetre [in diameter]” (Britannica, 2023a) that contains hydrous aluminium silicates and other minerals (Britannica, 2023b).

Clay encompasses a wide range of materials like ceramic clays, mudstones, glacial clays, and deep-sea clays (which includes blue clay, the focus of my diploma).

Evidence of clay usage traces back to the Late Paleolithic period in central and western Europe, where clay figurines were crafted as a means of artistic expression. The earliest evidence of clay experimentation is the 30,000 year old Venus figurine 'Dolní Věstonice' (pictured right), located in the Czech Republic (Norman, 2023).

Britannica (2023a), “Clay Geology,” Encyclopaedia Britannica. Available at: <https://www.britannica.com/science/clay-geology> [Last Accessed 14/05/2023].

Britannica (2023b), “Clay Mineral,” Encyclopaedia Britannica. Available at: <https://www.britannica.com/science/clay-mineral> [Last Accessed 15/05/2023].

Merriam-Webster, (2023). “Clay,” Merriam-Webster.com Dictionary; Merriam-Webster Incorporated. Accessed via: <https://www.merriam-webster.com/dictionary/clay> [Last Accessed 14/05/2023]

Norman, J. (2023), “The Venus of Dolní Vestonice, the Oldest Known Ceramic Figurine”, HistoryOfInformation.com. Available at: <https://www.historyofinformation.com/detail.php?id=2124> [Last Accessed 14/05/2023].



Venus of Dolní Věstonice

# Blue Clay

Pure clays tend to be white in colour, but natural clays generally contain impurities which tint the color – for example, red or brown clays often contain some iron oxide (Blue, 2017). The blue colour of clay is created when iron in the soil (initially  $\text{Fe}^{3+}$ ) is chemically-reduced (becoming  $\text{Fe}^{2+}$ ) “by water that is oxygen-deprived and hydrogen-rich” (Burnham, 2016) – a process common in areas with bedrock formed by volcanic ash, as is the case in Oslo (Heeremans et. al, 1978) and Trondheim (Mathisen, 2021).

Norwegian clay deposits are the result of glacial erosion. The movement of ice age glaciers eroded the bedrock producing layers of decomposed rock. As glaciers melted, fresh groundwater stripped the clay of salt that had been locked in at formation. This loss of this salt creates structural instability in the clay, turning it into the landslide-prone “quick clay” responsible for various disasters across Scandinavia such as the Gjerdrum Landslide in December 2020 (Mathisen, 2021). The widespread presence of quick clay in the Oslofjord area requires excavation and disposal of enormous volumes of blue clay during urban construction projects.



Blue, M. L. (2017). “What Is Red Clay?” Sciencing.com. Available via: <https://sciencing.com/red-clay-22940.html> [Last Accessed 14/05/2023]

Burnham, R. (2016). “ASU scientists discover how blue and green clays kill bacteria,” Arizona State University. Available via: <https://news.asu.edu/20160106-asu-scientists-discover-how-blue-and-green-clays-kill-bacteria> [Last Accessed 14/05/2023]

Heeremans, M., Kirstein, L., Neumann, E. R., Obst, K., Spencer, E., Timmerman, M., Wilson, M., (2004). “Carboniferous-Permian rifting and magmatism in southern Scandinavia, the North Sea and northern Germany: A Review.” Geological Society London Special Publications. Available via: [https://www.researchgate.net/figure/Simplified-map-of-the-Oslo-Graben-showing-different-rock-types-after-Ramberg-Larsen\\_fig1\\_236506714](https://www.researchgate.net/figure/Simplified-map-of-the-Oslo-Graben-showing-different-rock-types-after-Ramberg-Larsen_fig1_236506714) [Last Accessed 14/05/2023]

Mathisen, G. (2021). “How the ice age turned quick clay into a Norwegian problem,” Science Norway. Available via: <https://sciencenorway.no/geological-mapping-geology/this-is-how-the-ice-age-turned-quick-clay-into-a-norwegian-problem/1883494> [Last Accessed 14/05/2023]

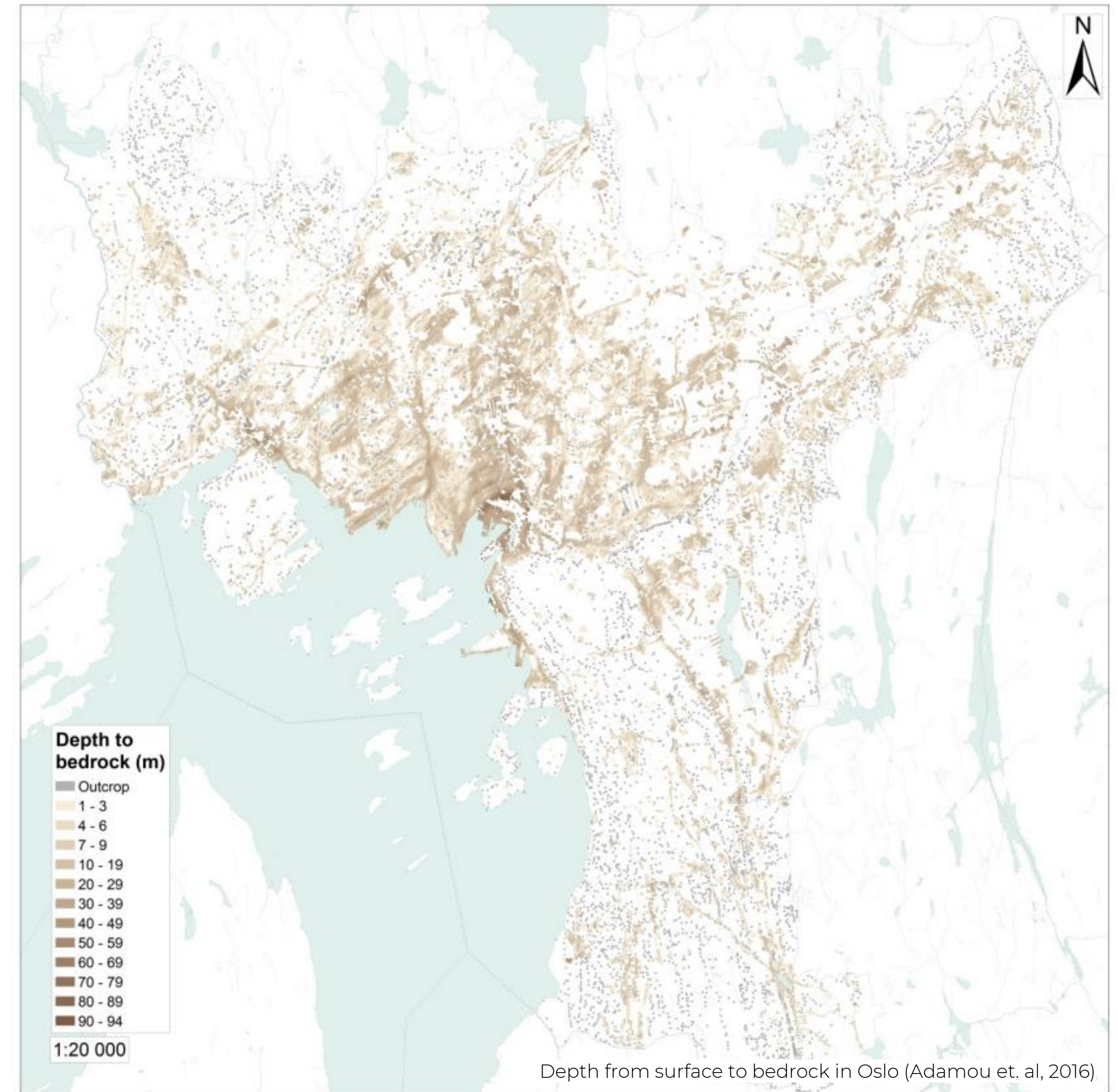
# Oslo: A City Built on Clay

“The thickness of the sediment layer in Oslo varies from 0 up to 100 meters.” (Adamou et. al, 2016)

The majority of Oslo's urban area is situated on a substantial deposit of ice age clay at the northern extremity of the Oslofjord.

The underlying bedrock displays a diverse topography, with the deepest sections located in close proximity to the central train station where geotechnical borehole measurements have recorded a maximum depth of 94 meters.

Adamou, S., Andresen, L., Borchgrevink, J., Daviknes, H. K., Eriksson, I., and Sæther, M. M. (2016). “COST TU1206 Sub-Urban Report,” European Cooperation in Science and Technology. Available via: <https://static1.squarespace.com/static/542bc753e4b0a87901dd6258/t/5707869ae707eb820b4118a5/1460111042910/TU1206-WG1-012+Oslo+City+Case+Study.pdf> (Last Accessed 14/05/2023)



“Dronning Eufemias gate in the newly developed area of Bjørvika is more like a bridge than a road. To deal with the deep horizons of clay, often containing a large amount of organic matter, the road is constructed on more than 1000 piles of steel and concrete.” (Adamou et. al, 2016)





# Oslo's Growth

Oslo is the 4th fastest growing European cities, both in population and economy.

Oslo's population has grown by more than 20% in the last decade (MacroTrends.com, 2023) and is expected to continue growing at a rate of 1.38% per year from 2020 to 2025 (Ghosh, 2021).

This growth can be attributed to a number of factors, including increased immigration, a booming economy, and the city's high quality of life.



Ghosh, I. (2021). "Ranked: The Fastest Growing Cities in Europe," Visual Capitalist. Available via: <https://www.visualcapitalist.com/fastest-growing-cities-in-europe/> [Last Accessed 14/05/2023]

MacroTrends.com (2023). "Oslo, Norway Metro Area Population 1950-2023." Available via: <https://www.macrotrends.net/cities/22028/oslo/population> [Last Accessed 14/05/2023]

# Fjord City

'Fjord City' (Fjordbyen) is an ongoing urban infrastructure project that aims to transform the city's former port and industrial areas into a dynamic and environmentally friendly waterfront district.

Production began in the 1980s and includes notable neighborhoods such as Bjørvika, Bispevika, Tjuvholmen, and Aker Brygge.

Key priorities for the project include sustainability, ensuring public access, and harmonious integration with the natural surroundings (Nordregio, 2018).



Nordregio, (2018). "Fjord City: A waterfront urban renewal project", Nordregio Sustainable Cities. Available via: [https://nordregio.org/sustainable\\_cities/fjordbyen/](https://nordregio.org/sustainable_cities/fjordbyen/) [Last Accessed 14/05/2023]

# Oslo's Clay Waste

According to a 2010 report, approximately 1.2 million tonnes of material were being excavated per year as part of the Fjord City project. Waste was distributed among four primary receiving sites, which removed any contaminated materials (Norges Geologiske Undersøkelse, 2009). After sorting, ~250,000 tonnes of clean material remained.



These figures predate the Bjørvika development, suggesting substantially more material was produced since then.

Although these numbers do not offer a definitive answer, they provide valuable insights into the potential volume of excavated materials and suggest a significant quantity of usable clay exists in the city of Oslo.

Geir-André, T., Malin, A. (2010), "Vigilance map for contaminated land in Oslo, sub-projects 10, 13 and 14; excavating materials and disposal solutions," Norges Geologiske Undersøkelse. Available via: [ngu.no/upload/Publikasjoner/Rapporter/2009/2009\\_043.pdf](https://ngu.no/upload/Publikasjoner/Rapporter/2009/2009_043.pdf) [Last Accessed 14/05/2023]

# What happens to waste clay?



## Excavated

Material is excavated from projects around Oslo.



## Collected

Material is collected by waste management companies.



## Relocated

Material is moved to landfill relocation sites.

## Classified

Hazardous material is separated for disposal.

# How can we convert this material from waste to valued resource?



# Processing Blue Clay

Processing methods vary depending on the clay's characteristics and its intended use.

**Extraction:** Blue clay deposits vary in consistency and location, so ensure you have access to a suitable source.

**Collection:** Collection is best done using shovels and other digging tools.

**Cleaning:** Stretching the clay, removing any insects or organic matter, rinsing with water, and screening to eliminate any remaining impurities.

**Wedging:** Kneading the clay by hand or with a wedging table improves its plasticity, removes air pockets, and creates uniform workability.

**Testing:** Before the clay can be used, some tests should be carried out to determine its properties, such as shrinkage and firing temperature. This will provide vital information to determine which techniques and processes should be used for the elaboration of products.

**Storage:** Processed blue clay should be stored in airtight containers or dry plastic bags to prevent it from drying out.



# Making Products with Blue Clay

Products made with blue clay can be hand-built, produced on a ceramic turntable, moulded, and 3D printed. Depending on the chosen method, blue clay is typically mixed with grog and fireclay to promote its strength and workability.

Blue clay is typically fired at lower temperatures compared to other clay types like stoneware and porcelain, usually between 999°C to 1140°C .

Kilns are most commonly used to fire blue clay, however, another technique called reduction firing can be employed. In reduction firing, the kiln is heated to high temperatures (typically 1000-1300°C). The oxygen in the kiln atmosphere reacts with the clay, leading to chemical changes that impacts the final appearance of the pottery in both color and texture.

In a reduction kiln, the reduced oxygen can cause the clay to darken in color, resulting in hues of deep red, brown, and black, and develop a matte or semi-matte finish, giving the clay a rustic or earthy aesthetic.



# Existing Oslo Clay Initiatives

Identifying multidisciplinary figures leading the way in converting Oslo's clay waste into valuable resources. X indicates people that I interviewed during my field research.



●  
**Osloleire**  
Pottery



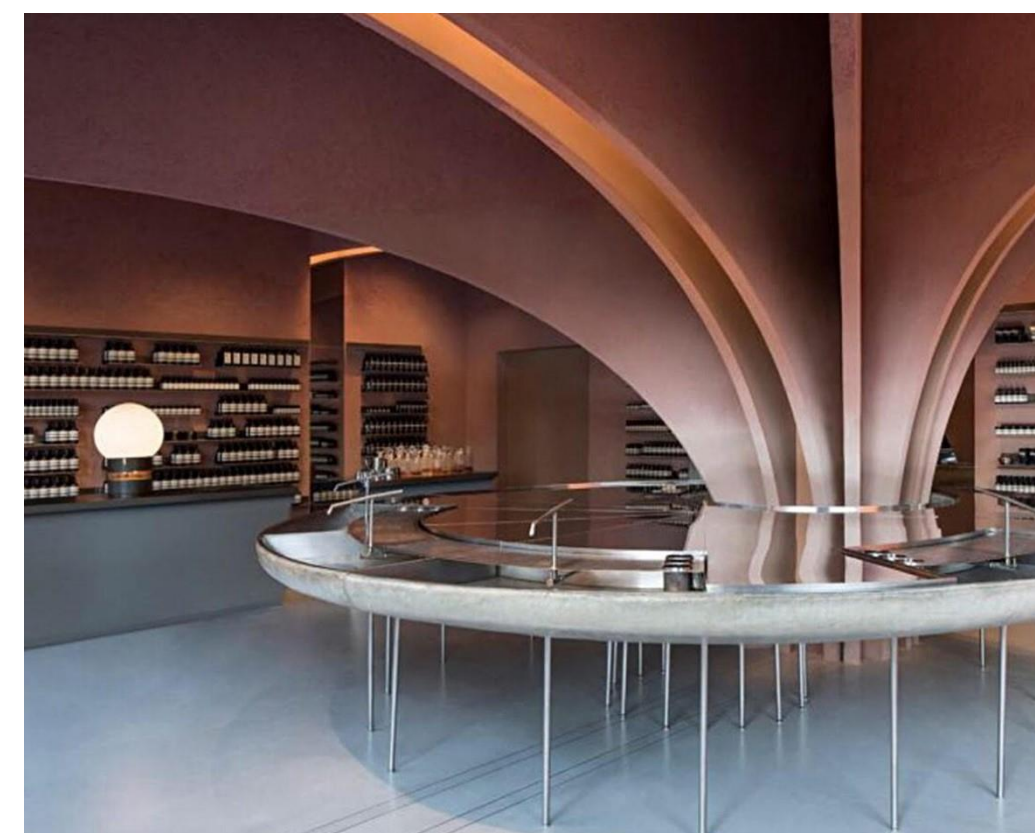
● X  
**Saferock**  
Architecture



● X  
**Halvår Skiftun Digernes**  
Pottery & Art



● X  
**Sigrid Espelien**  
Art



●  
**Snøhetta**  
Architecture



# 1. Sigrid Espelien



My first interview was with Sigrid Espelien. Sigrid is currently pursuing a PhD at the Art Academy in Oslo (KHIO) and is deeply immersed in her long-term project "Bjørvikaleire: Research fra en kunsthåndverkers perspektiv" (Bjørvika Clay: Research from a Craftsperson's Perspective).

Sigrid provided a concise overview of the process involved in transforming raw blue clay into a malleable mass suitable for creative use. She emphasized that the collection and processing of blue clay are not overly complex procedures.

During our discussion, Sigrid highlighted several key stakeholders responsible for the waste management of clay in Oslo. Notable

among them were Feiring Bruk, Multiconsult, and Lekafabrikken, each of whom I contacted as part of my field work

Sigrid offered to introduce me to her former student, Halvår Diggerness, who she said had extensive knowledge and experience working with blue clay, and architect Stian Alessandro Ekkerness Rossi, who has unique experience working with blue clay, from his time at architectural firm Snøhetta s and more recently as the founder of his clay-focused firm, Saferock.

Sigrid's personal introduction was invaluable in securing follow-on interviews with Halvår and Stian, both of whom impacted the trajectory of this project significantly.

## 2. Halvår Skiftun Digernes



Halvår Skiftun Digernes played a pivotal role in the development of this project. I met Halvår at his café, Fuglen Coffee Roasters, in early March 2023. During our meeting, Halvår shared insights into his career and the various projects he is currently involved in. His passion for blue clay is immediately evident, as is his enthusiasm to share his extensive knowledge with others.

During our conversation, Halvår guided me through the process of collecting and processing clay. His explanation validated Sigrid Espelien's explanation of blue clay's simple collection and processing nature.

I had the pleasure of accompanying Halvår to Losetter in central Oslo, where he guided me through the collection of clay

from an active construction site. We then proceeded to Waldemar Eleffsen, a prominent ceramic shop on the outskirts of the city, where Halvår introduced me to fire clay and chamotte. Halvår explained that combining fire clay and chamotte with blue clay is crucial for achieving desired properties. Fire clay enhances elasticity, while chamotte binds with blue clay particles to strengthen the clay when fired – together they create a resilient material capable of withstanding the firing process.

Halvår's valuable knowledge expanded my understanding of working with blue clay, laying a solid foundation for my future exploration of this remarkable substance.

# 3. Stian Alessandro Ekkerness Rossi



My final interview was with architect Stian Alessandro Ekkerness Rossi. Stian has an impressive background, having worked at Snøhetta – one of Norway’s most renowned architecture firms – from 2014 to 2021.

During his time at Snøhetta, Stian and his team embarked on a research program titled "Clay," which explored new avenues for sustainable design and construction using clay. This research led Stian to establish his own firm, "Saferock," in 2022.

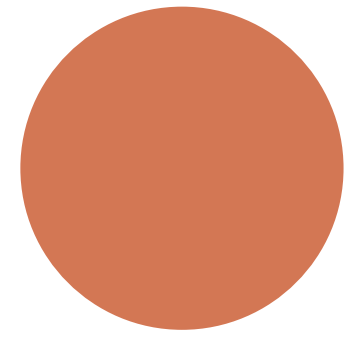
At Saferock, Stian’s team has developed a sustainable concrete utilizing clay waste, emphasizing their commitment to sustainability and innovation in materials.

Stian highlighted the challenges of working

commercially with clay. He voiced concerns over the failures of traditional approaches to tackle clay waste and recognised the ongoing efforts to find solutions for these problems.

Stian challenged burnt clay as the default production method, pointing out its differences compared to unburnt clay. While he noted lower firing temperatures contribute to more environmentally friendly production, he also asked “How many thousands of mugs need to be created unburnt to truly make a significant impact?”

Stian’s perspectives on the clay industry encouraged me to continue exploring innovative and sustainable opportunities.



# Sustainability

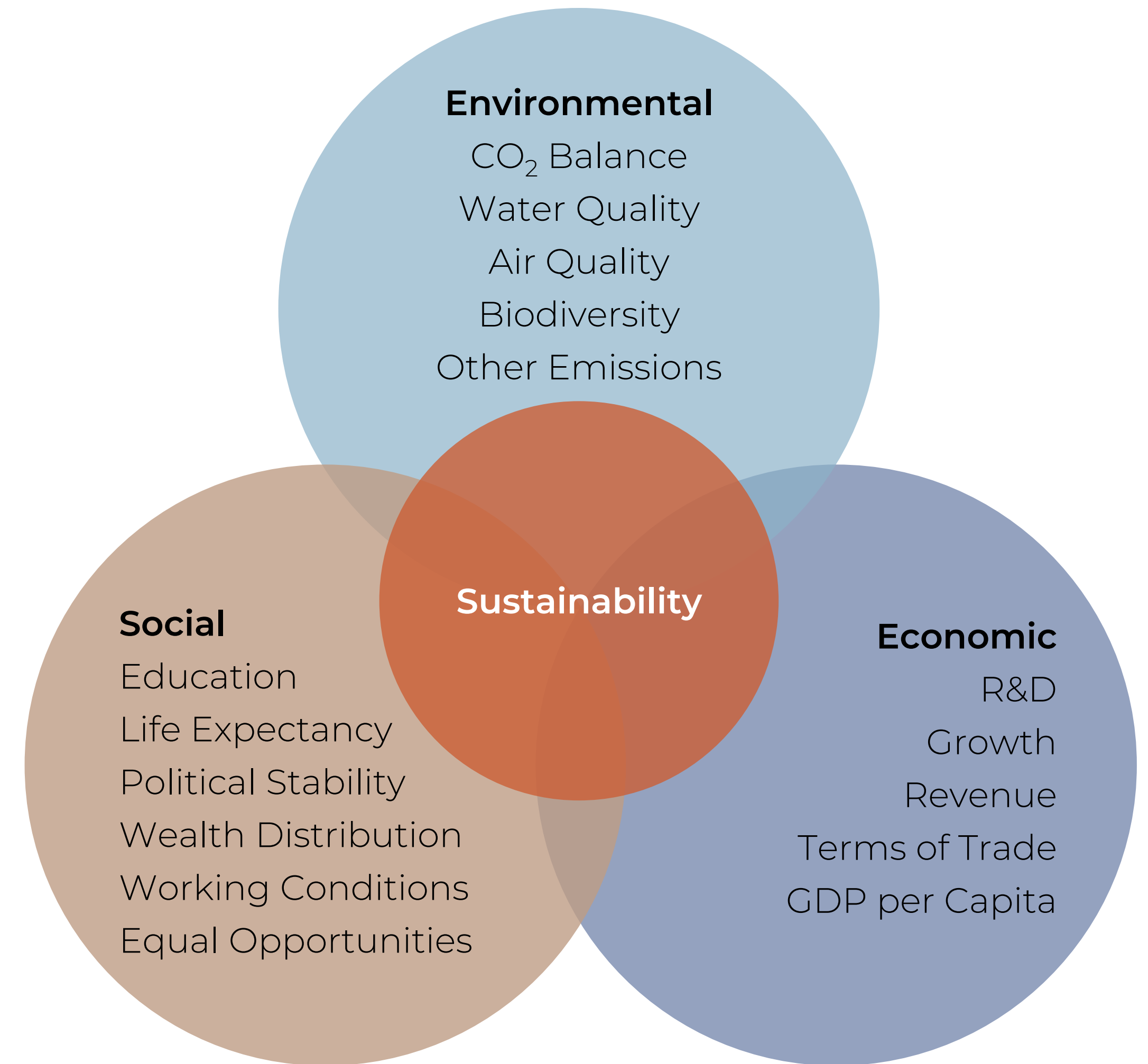
# What is Sustainability?

Sustainability is the practice of “meeting the needs of the present without compromising the ability of future generations to meet their own needs” (UN Brundtland Commission, 1987). It involves a balanced approach that integrates environmental protection, social equity, and economic development.

Sustainability aims to address the interdependence between ecological, social, and economic systems to create a harmonious and enduring future. Sustainable practices encompass various aspects, such as resource conservation, renewable energy adoption, waste reduction, biodiversity preservation, fair trade, and social justice (MyClimate, 2020).

UN Brundtland Commission (1987). “Our Common Future: Report of the World Commission on Environment and Development”, United Nations. Available via: <http://www.un-documents.net/our-common-future.pdf> [Last Accessed 14/05/2023]

MyClimate (2020). “Climate Change and Protection; Climate Booklet,” Foundation myclimate. Available via: [https://www.myclimate.org/fileadmin/user\\_upload/myclimate\\_Klimabooklet\\_2020\\_EU\\_Updated.pdf](https://www.myclimate.org/fileadmin/user_upload/myclimate_Klimabooklet_2020_EU_Updated.pdf) [Last Accessed 14/05/2023]



The Primary  
Dimensions & Indicators  
of Sustainability

# Aspects of Social Sustainability

“Social sustainability occurs when the formal and informal processes; systems; structures; and relationships actively support the capacity of current and future generations to create healthy and liveable communities. Socially sustainable communities are equitable, diverse, connected and democratic and provide a good quality of life” (ISF, 2021).

To achieve social sustainability, issues such as poverty, education, healthcare, gender equality, and social cohesion must be addressed to reduce inequalities and ensure that no one is left behind. This includes promoting fair and inclusive economic systems, providing affordable housing, improving access to education and healthcare, and fostering community engagement and participation in decision-making processes.

By focusing on social aspects, sustainability seeks to create a society that is just, resilient, and supportive of all its members. It recognises the interconnectedness of social well-being with environmental and economic considerations (Missimer, 2015).



ISF, (2021). “Social Sustainability,” Institute for Sustainable Futures; University of Technology Sydney. Available via: <https://www.uts.edu.au/sites/default/files/cap-stat-social-web.pdf> [Last Accessed 14/05/2023]

Missimer, M. (2015). “Social Sustainability Within The Framework For Strategic Sustainable Development,” Department of Strategic Sustainable Development, Blekinge Institute of Technology. Available via: <https://www.diva-portal.org/smash/get/diva2:852857/FULLTEXT02> [Last Accessed 14/05/2023].

# Sustainability goals I am addressing

United Nations Sustainable Development Goals (SDGs) are a set of global targets aimed at addressing various social, economic, and environmental challenges to achieve sustainable development by 2030 (UN, 2023). After researching the 17 goals, I concluded that my project is most aligned with UN SDGs 11 and 12:



SDG11 aims to make cities and human settlements inclusive, safe, resilient, and sustainable. It focuses on creating sustainable urban environments by promoting affordable housing, access to basic services, sustainable transport systems, green spaces, and disaster resilience.

The goal also emphasizes the importance of cultural heritage preservation and sustainable urban planning.



SDG12 promotes sustainable consumption and production by encouraging the efficient use of resources, reduction of waste, and adoption of sustainable practices in business operations.

This goal calls for sustainable management of chemicals and waste, promoting sustainable lifestyles, and enhancing awareness about sustainable practices among individuals and businesses.

UN, (2023). "United Nations Sustainable Development Goals", United Nations. Available via: <https://sdgs.un.org/goals> [Last Accessed 14/05/2023]

# Oslo Sustainability Goals 2030

In 2016, Norway's Prime Minister Erna Solberg presented Agenda 2030, Oslo's vision for a climate-friendly future (MFA, 2016). Among its goals was Oslo's goal to become a city with minimal greenhouse gas emissions by 2030 (Oslo City Council, 2022).

Oslo serves as an innovation hub for the commercialisation of climate solutions, influencing environmental policies internationally. By sharing solutions, Oslo seeks to accelerate emission reductions globally.

By 2030, Oslo aims to be a "carbon-negative city," contributing to the reduction of greenhouse gases through carbon capture and storage technologies.

MFA, (2016). "Norway's follow-up of Agenda 2030 and the Sustainable Development Goals," Ministry of Foreign Affairs, Government.no. Available via: <https://www.regjeringen.no/en/dokumenter/follow-up-sdg/id2507259/> [Last Accessed 14/05/2023]

The plan identifies 16 priority areas for facilitating daily climate-friendly choices for individuals and businesses, plus strategic and long-term decisions made by the city to create an environment conducive to sustainable practices. Of the 16 areas, this project could best contribute towards:

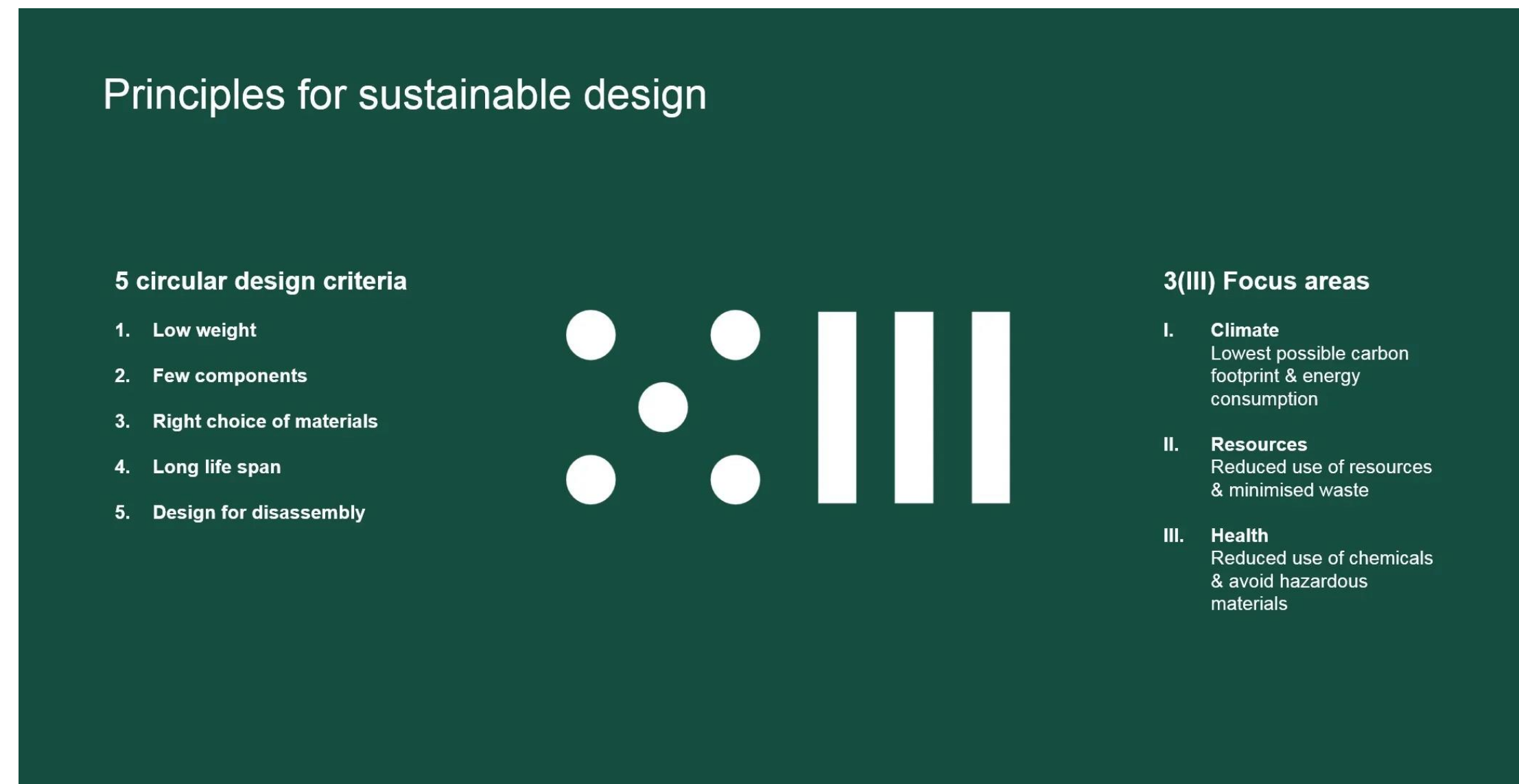
Priority 8: Oslo is dedicated to establishing a circular waste and wastewater management system centred around reuse, material recycling, and energy recovery... that minimizes resource depletion and maximizes the utilization of materials and energy.

Priority 11: Oslo will minimize emissions from building materials in construction projects, emphasizing the importance of sustainable practices within the construction sector.

Oslo City Council, (2022). "Klimastrategi for Oslo mot 2030," Klimaoslo.no. Available via: [https://www.klimaoslo.no/wp-content/uploads/sites/88/2020/09/Klimastrategi2030\\_langversjon\\_web\\_enkeltside.pdf](https://www.klimaoslo.no/wp-content/uploads/sites/88/2020/09/Klimastrategi2030_langversjon_web_enkeltside.pdf) [Last Accessed 14/05/2023]



# Project Sustainability Principles



## Flokk Principles for Sustainable Design

- Choose recycled and recyclable materials.
- Products being repaired, reused and recycled.
- Explore and phase-in resources astray.
- Reduce air travel (and travel at all).

Flokk (2022). "Principles for Sustainable Design," Flokk Sustainability: Our Promise. Available via: <https://www.flokk.com/global/about-us/sustainability/our-promise> [Last Accessed 14/05/2023]



## Thorn Lighting: Principles for Sustainability

Circular Economy: "Improve resource efficiency through better waste management. Focusing on minimising and preventing waste throughout a product's lifecycle and recycling valuable materials."

Thorn Lighting (2023), "6 Principles for Sustainability," thornlighting.com. Available via: <https://www.thornlighting.com/en/news/6-principles-for-sustainability> [Last Accessed 14/05/2023]

# Sourcing Blue Clay

In Losetter, Halvår explained the process for collecting blue clay. Processing these samples was the key to understanding raw blue clay's fundamental properties.



This hands-on experience was one of my highlights of this project. Not only was it a rich first-hand experience of my research topic, but I was lucky enough to have been guided through it by one of the most knowledgeable people in Oslo on the subject.

# Unprocessed Losetter Samples



# Raw Sample Processing

Following the guide I learned during desk research:

## 1. Stretching

I stretched the material out on a flat space to inspect it in detail.

## 2. Refining

Once spread out, I could easily find and remove the insects and worms naturally found in the clay.

## 3. Rinsing

To prepare the clay for further processing, I mixed it with water until it had a workable consistency.

## 4. Screening

Lastly, to ensure that the clay is clean and free from impurities, I screened the material to remove any remaining organic matter.







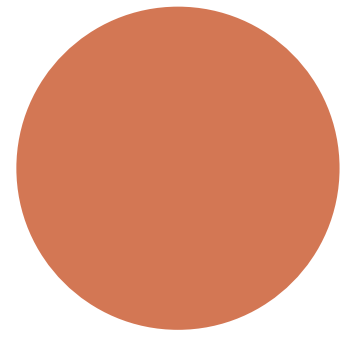


# Field Research Conclusions

My experience of converting raw blue clay into a malleable material matched Sigrid and Halvår's testimonials that the process is not complicated. This simple process creates ample opportunities for blue clay's application and fosters creativity in designing innovative solutions.

While my research into blue clay so far has been done as an amateur ceramicist, it is important to remember that the aim of this project is to leverage the possibilities offered by the clay, not to conduct a comprehensive analysis of its properties.

Despite my limited expertise, the knowledge I've gained thus far has made me considerably more excited about working with blue clay beyond this project. The journey has ignited a desire to learn more, improve, and find even better applications for blue clay in the future.

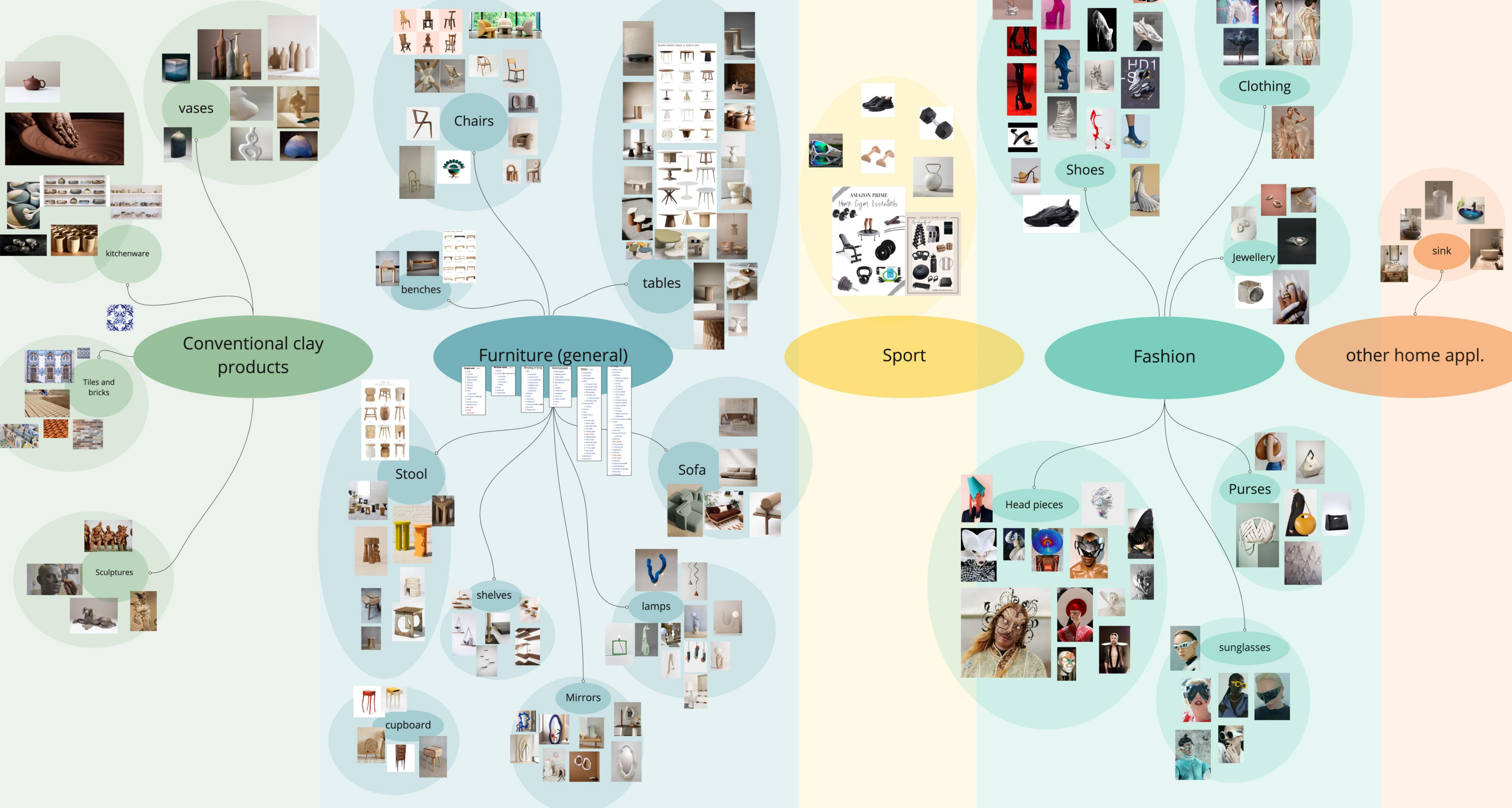


# Opportunities

With the blue clay material prepared and at hand, I began to map out potential applications. In addition to conventional uses, I explored opportunities in sports, fashion, furniture, and other home applications.

By considering these diverse areas, I aimed to uncover new and innovative ways to utilise blue clay beyond its traditional applications. This mapping process allowed me to envision the versatility of blue clay and its potential to contribute to different industries and creative fields.





# Furniture

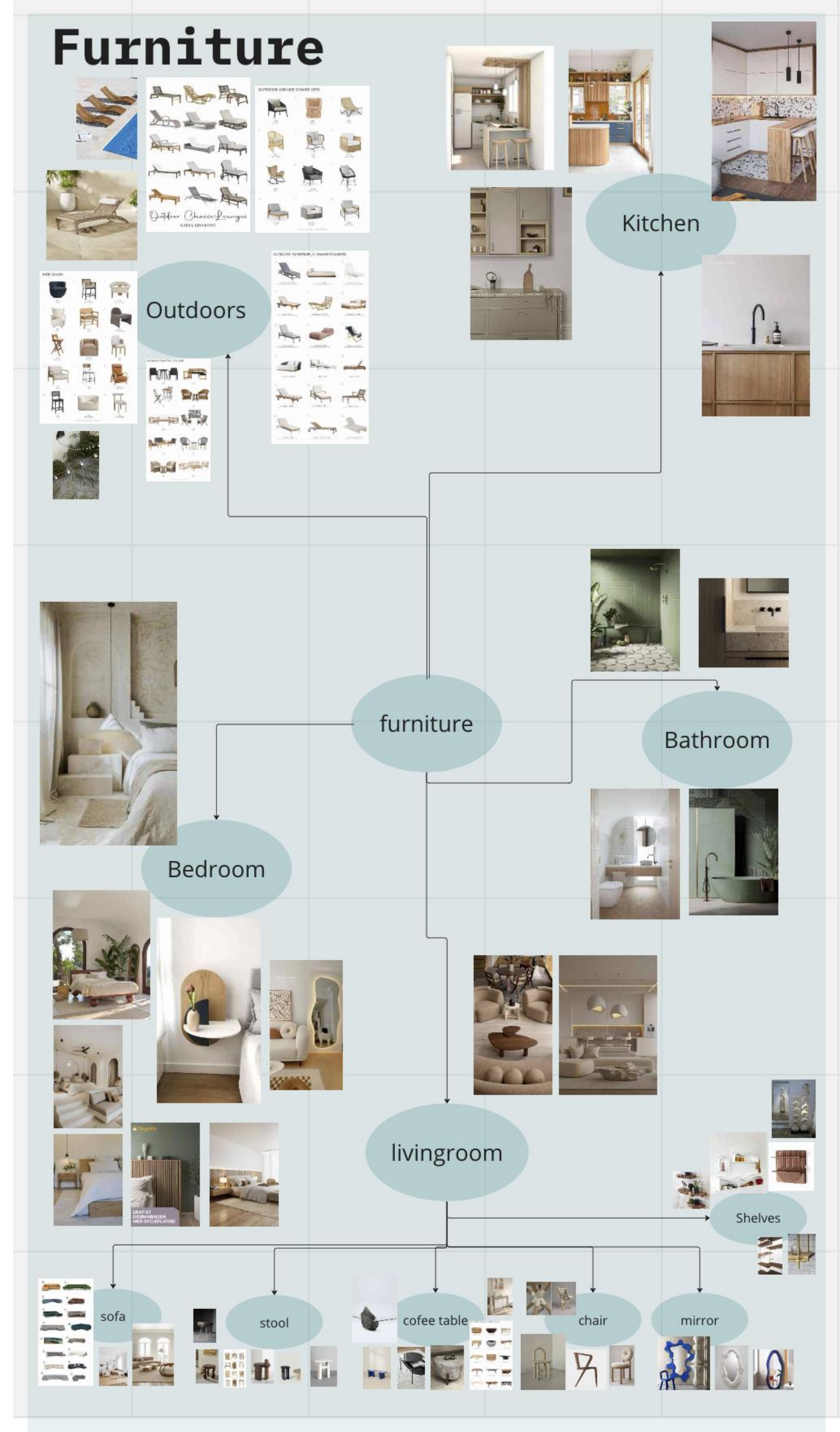
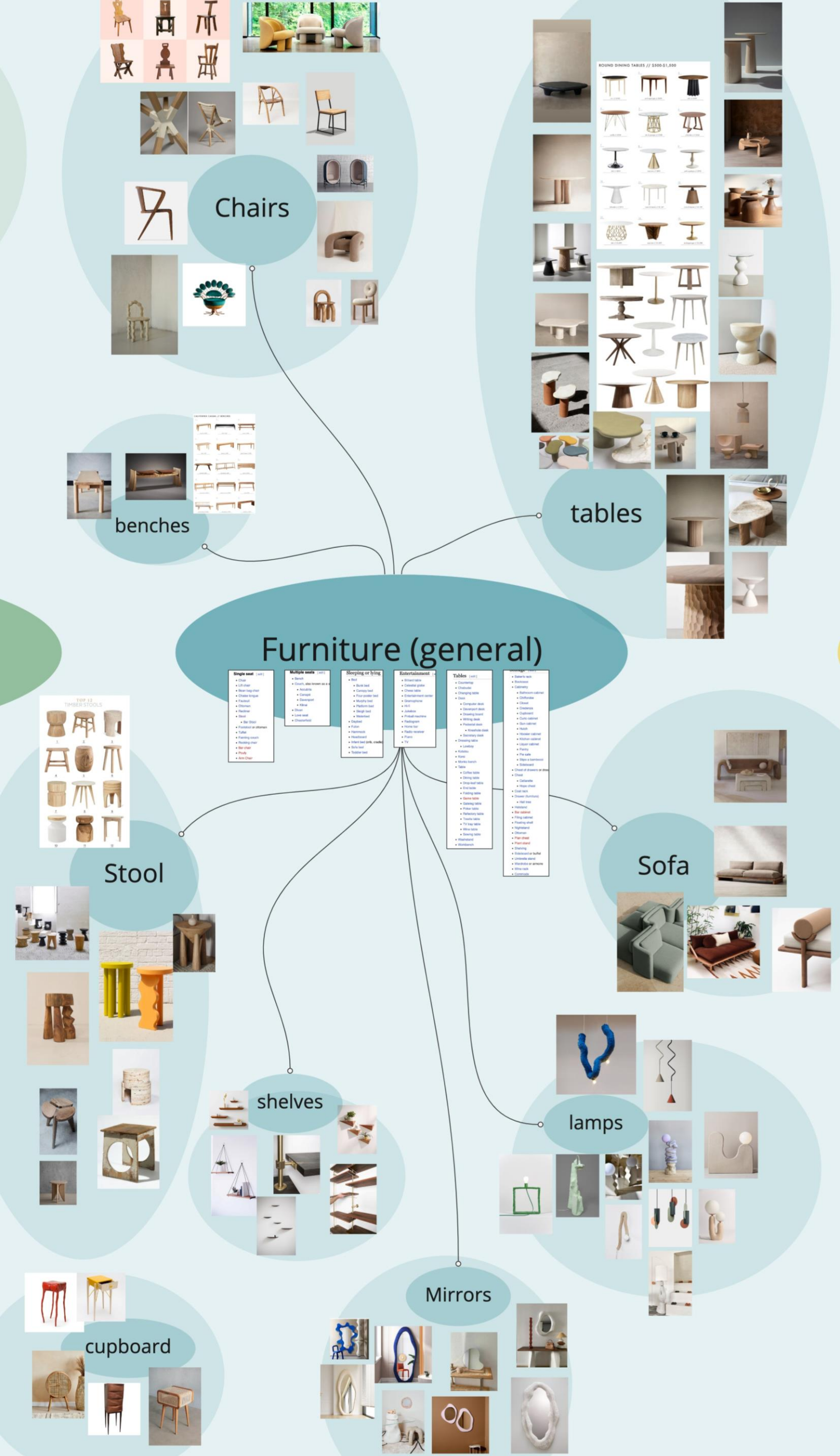
After careful consideration, I found particular interest in exploring furniture design using blue clay, as it is an area where clay is underrepresented as a design substrate.

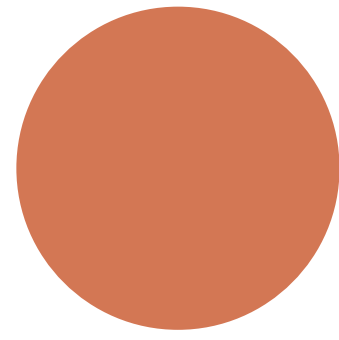
Despite the historical reputation of clay products being brittle and prone to breaking upon impact, I found the challenge of exploring furniture design with blue clay fascinating.

By addressing the inherent fragility of clay and investigating innovative techniques and structural approaches, I aimed to push the boundaries and discover new possibilities in this underexplored domain.

← by product category

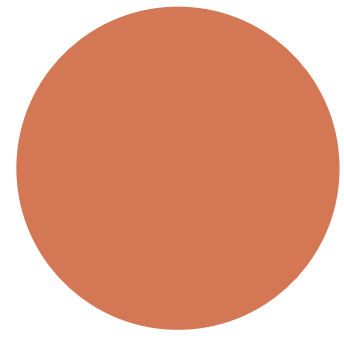
by product location →





# Key Insights

- A vast amount of blue clay is being wasted.
- Blue clay does not require a complicated refinement process.
- Sustainable firing process when burned in low temperatures.
- Strong and durable.
- Sustainable lifecycle of blue clay
- Prolonging the life of the material by recycling. Utilising the broken the products as an additive material (Chamotte) to straighten the clay to elaborate new products.
- Potential development of a sustainable micro-economy or circular economy that promotes local production and the creation of sustainable products that challenge consumer patterns by the creation of attractive and sustainable products.



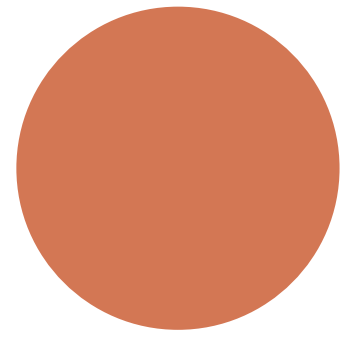
# Problem Statement

**How can design contribute to the minimisation of clay-waste in the city of Oslo?**

“I want to create products that are market relevant and desirable not only because of their aesthetics and functionality, but also because they are sourced and produced locally and sustainably”

03

# Concept Development



# Workshops

# Workshop Initiatives

My research led me to the opportunity to develop community-driven initiatives, potentially subsidised, that provide working spaces for marginalized groups who can contribute to preventing the wastage of clay, such as refugees or prisoners. These initiatives can take the form of clay workshops, for instance:

- Collecting raw clay materials from construction sites after excavations.
- Processing the excavated clay to improve its cleanliness and usability.
- Strengthening the clay by incorporating fire clay and reclaimed chamotte.
- Designing and manufacturing products using the repurposed clay.
- Distributing, and possibly selling, the created products.



By establishing such initiatives, it becomes possible to create a profitable, circular, and sustainable micro-economy. This approach has the potential to be scaled up and semi-industrialised, offering opportunities for economic growth and environmental sustainability. It not only addresses the issue of clay wastage, but also fosters social integration, skill development, and empowerment within marginalised communities.

# Project Beneficiaries

By involving societal groups in the development and implementation process, a diverse range of perspectives, skills, and experiences can be tapped into, leading to more holistic and inclusive solutions for utilizing clay waste effectively.. I identified several societal groups with potential for meaningful impact by participating in blue clay workshops:



**Refugees:** Providing refugees with training and creative outlets during their time in Norway could empower them to utilise skills otherwise neglected due to current circumstances.



**Prisoners:** Offering training programs in Oslo's correctional facilities could equip inmates with valuable skills while providing them with vocational training and a chance for rehabilitation, reducing recidivism rates.



**Education:** Partnering with universities and vocational schools offering art or design programs could open new opportunities for students to engage in clay-based projects and research, surfacing fresh perspectives and innovation.



**Craft Communities:** Engaging local artisans or crafters could leverage their existing knowledge and expertise in clay-based products while ensuring traditional techniques are preserved for future generations.



# Why I chose to focus on refugees

Before concluding that refugees were the most suitable beneficiary for the workshop initiatives, I conducted a thorough analysis of each of the potential target groups, which can be found in full in Appendix A.

Workshops have the potential to provide refugees with opportunities to feel connected to their new surroundings. By leaving their mark through creative expression, they can develop a sense of ownership and belonging in their new community, helping them feel more integrated and less alienated.

Through the creation of tangible products, refugees can showcase their skills and unique perspectives. This active involvement with materials so interwoven in the story of the city of Oslo fosters a sense of pride and mutual understanding in their new home. It encourages refugees to embrace their new environment and feel valued as individuals with meaningful contributions to offer.

The workshop also introduced elements of Oslo's professional landscape, providing refugees with valuable context on the working environment in Oslo. This initiative not only promotes sustainable practices but also facilitates the integration of refugees into the local community and empowers them with valuable skills for their future endeavours.



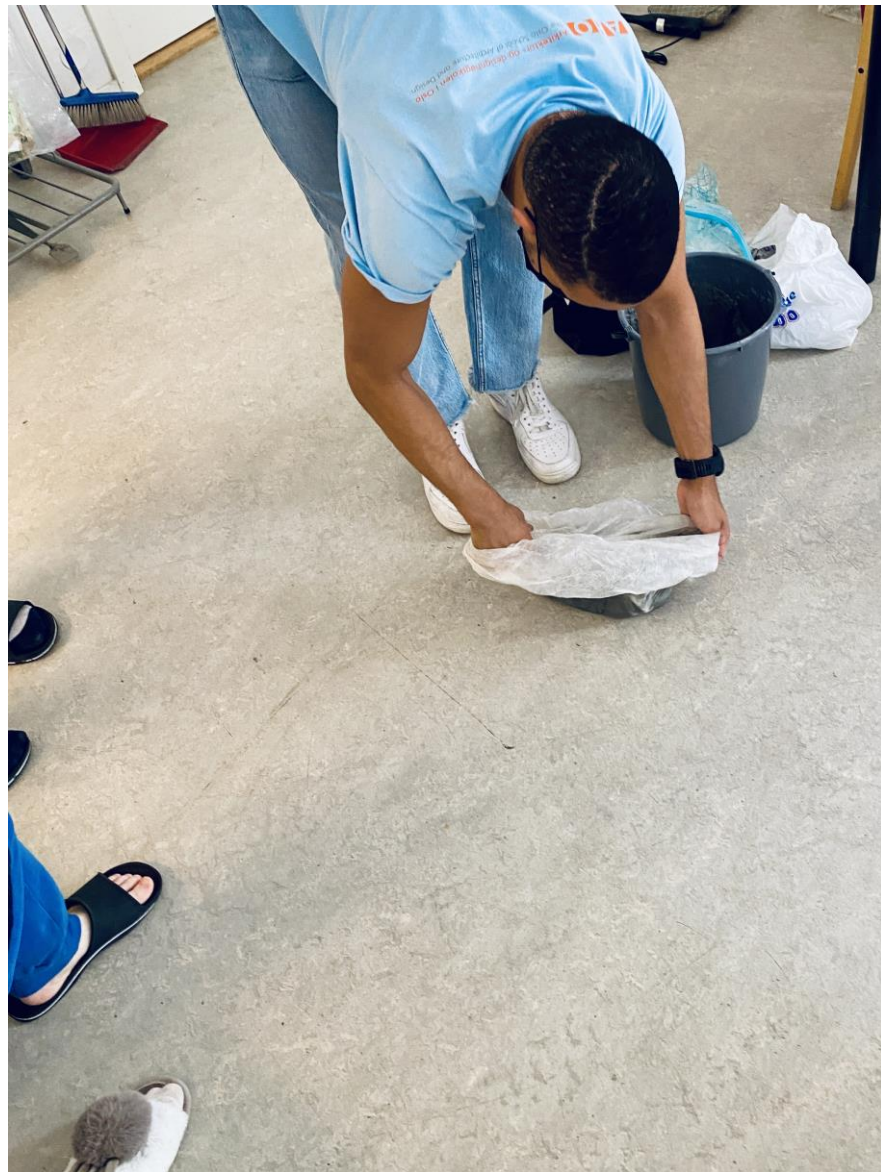


# Workshop for Ukrainian Refugees

The workshop took place at a refugee centre for Ukrainians in Oslo, with a diverse group of 10 participants ranging in age from 4 to 65 years old. Two translators facilitated communication between myself and the participants.

Initially, there was a sense of curiosity and intrigue among participants. They conversed in hushed, shy tones. I conducted a presentation to introduce the workshop, providing a brief explanation of the theme of my diploma project. I shared why this specific material, blue clay, was chosen and highlighted its potential, both in terms of recreational activities and economic benefits. The aim was to convey the various possibilities and advantages that working with this material can offer.

I brought the material that had been collected earlier at Losetter in the Bjørvika area and, together with the participants, we began the process of transforming it from its raw state into a workable and malleable mass.





Following my introduction, participants were shown a range of clay works to demonstrate the various possibilities with the material. These examples varied in size and complexity, showcasing the potential outcomes (pictured left).

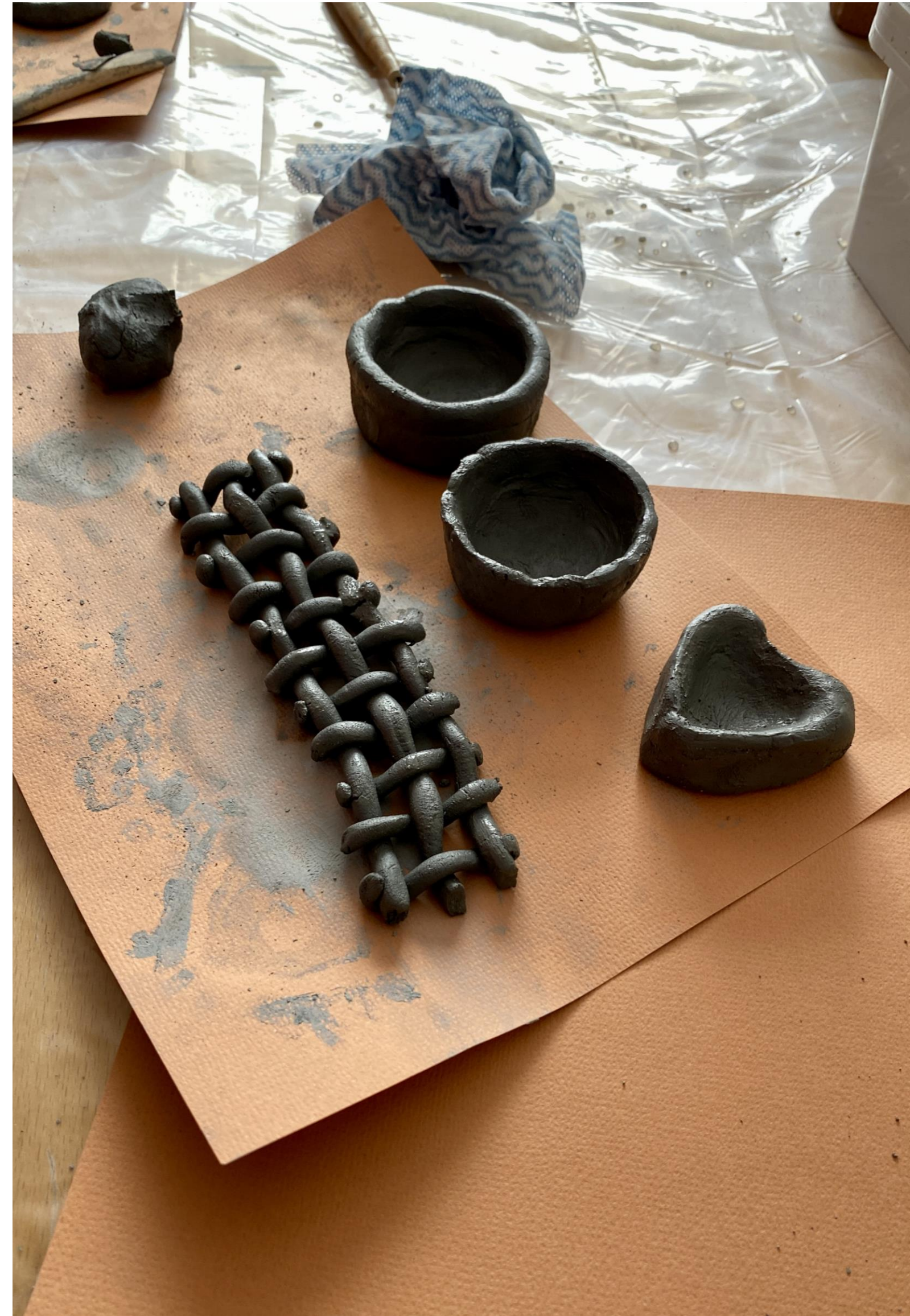
Each participant received a piece of processed blue clay. From that moment, an infectious enthusiasm filled the room (pictured right).

Excitement grew as they began selecting ideas from the examples and immersing themselves in the material. Laughter filled the air as they playfully tackled challenges, openly shared their thoughts, and enthusiastically set to work on their creations.















# Workshop Reflections

The workshop experience reaffirmed the significance of my chosen theme and user group.

Collaborating with this particular group further ignited my passion for and commitment to this project. The energy and enthusiasm displayed by the participants validated their involvement and the wider potential of blue clay.



# Technical Requirements

## **Sustainability**

Emphasis should be placed on utilizing sustainable materials and production methods throughout the design process.

## **Design Options**

Products can be designed using blue clay both as the sole material (to explore its unique properties and possibilities) and supplementing with other sustainable materials (to enhance functionality and aesthetics).

## **Material Combination**

Designs should incorporate no more than three main materials to ensure simplicity and facilitate the ease of repairing and recycling processes for the product's end-of-life.

## **Repair and Recycling**

Consideration should be given to selecting materials and assembly methods that enable disassembly, reassembly, and recycling without compromising quality or performance.

## **Ease of Creation and Assembly**

The products should be designed to be easily created and assembled. Consideration should be given to simplifying manufacturing processes, minimizing complex techniques or specialized tools, and ensuring clear assembly instructions for ease of production and end-user assembly.

# Ergonomic Requirements

## Short-Term Sitting Arrangements

Given the nature of clay and its inherent hard surfaces, the furniture products should be designed to offer short-term sitting arrangements. This is to ensure that users are comfortable during their interactions with the furniture, considering the material's characteristics.

## Ergonomic Comfort

Organic shapes can be utilized to enhance the comfort level of furniture. By incorporating ergonomic principles and organic forms, the products can provide a more comfortable seating experience, accommodating the human body's natural curves and promoting ergonomic support.

# Aesthetic Requirements

## Showcasing Blue Clay

Blue clay should be the primary material highlighted as the focal point of the aesthetic presentation, drawing attention to its unique color, texture, and characteristics.

## Supporting Materials

Any secondary materials used in the design should be chosen and incorporated in a way that complements and enhances the blue clay, which should remain the dominant aesthetic element. The supporting materials should not overpower or distract from the inherent beauty of the blue clay.

# Moodboard<sub>1</sub>





To leverage the malleability and versatility of blue clay, I began by sketching objects made exclusively from clay.

The primary objective was to explore the interplay between shape and function within the material itself. By focusing solely on clay as the medium, I aimed to push the boundaries of its potential and create designs that highlight its unique properties.







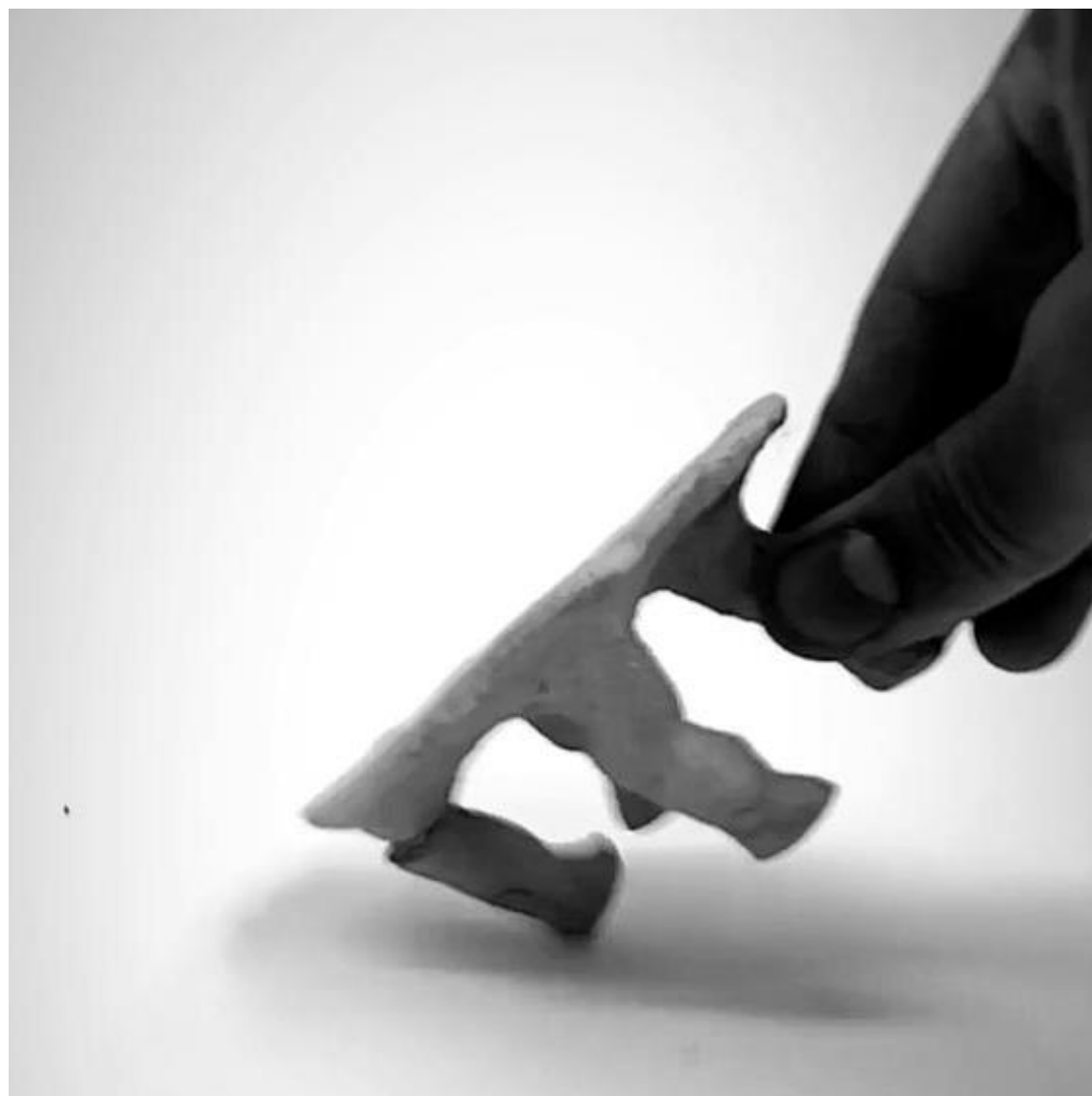


# Sketching Insights

Sketching proved to be invaluable in gathering insights about the material.

It quickly became evident that constructions made exclusively of clay lacked flexibility, strength, and shock absorption, which would render them impractical and inconvenient for everyday use.

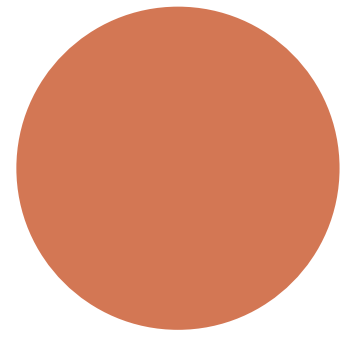
This realization solidified the need to consider alternative approaches and materials to ensure final products meet functionality and durability requirements while still incorporating the unique qualities of blue clay.



# Moodboard<sub>2</sub>

Showcasing designs comprising of multiple materials, highlighting the potential synergy and enhanced-functionality that can arise from materials integration. It serves as a visual inspiration for incorporating complementary materials alongside blue clay in my final product designs.



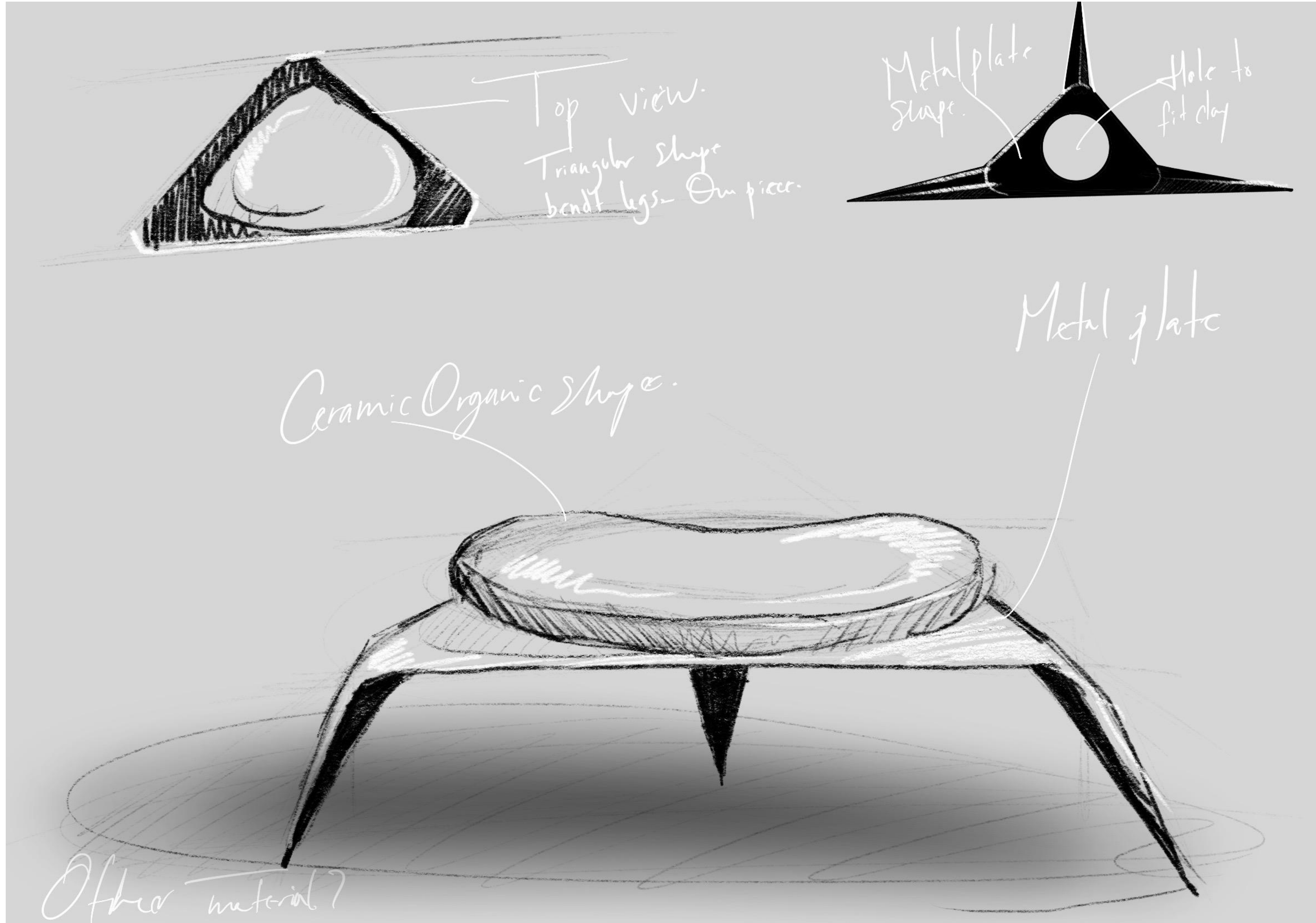


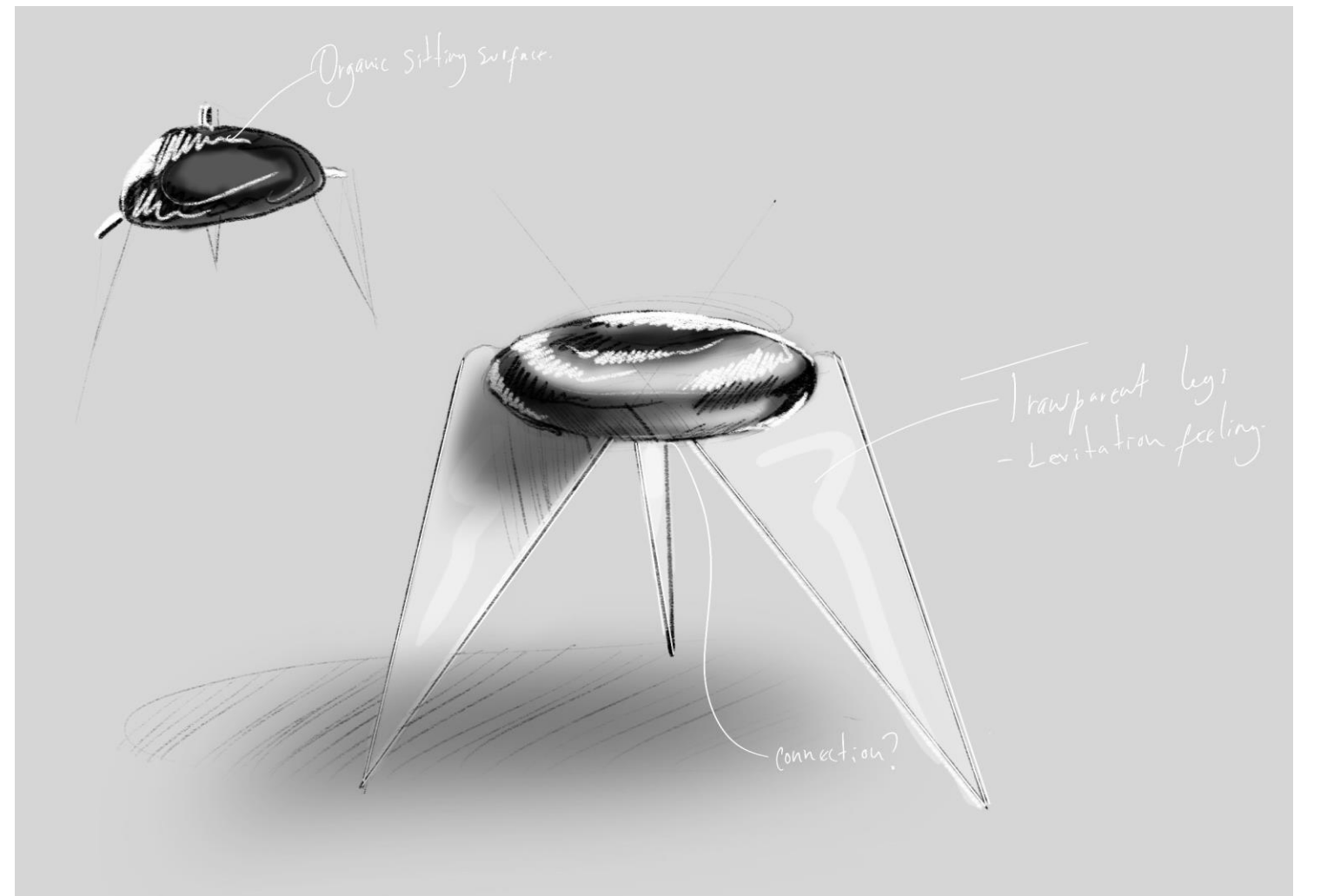
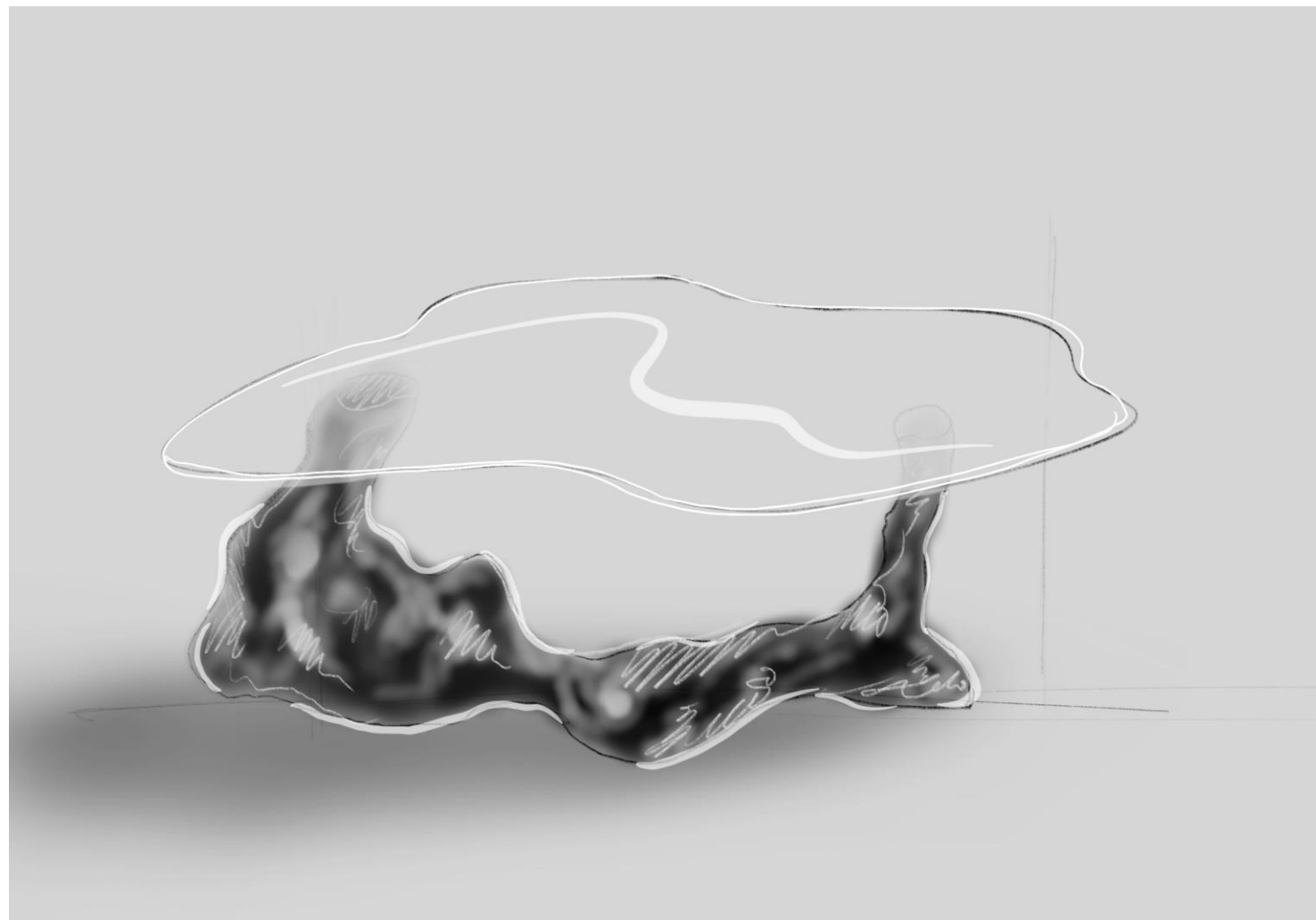
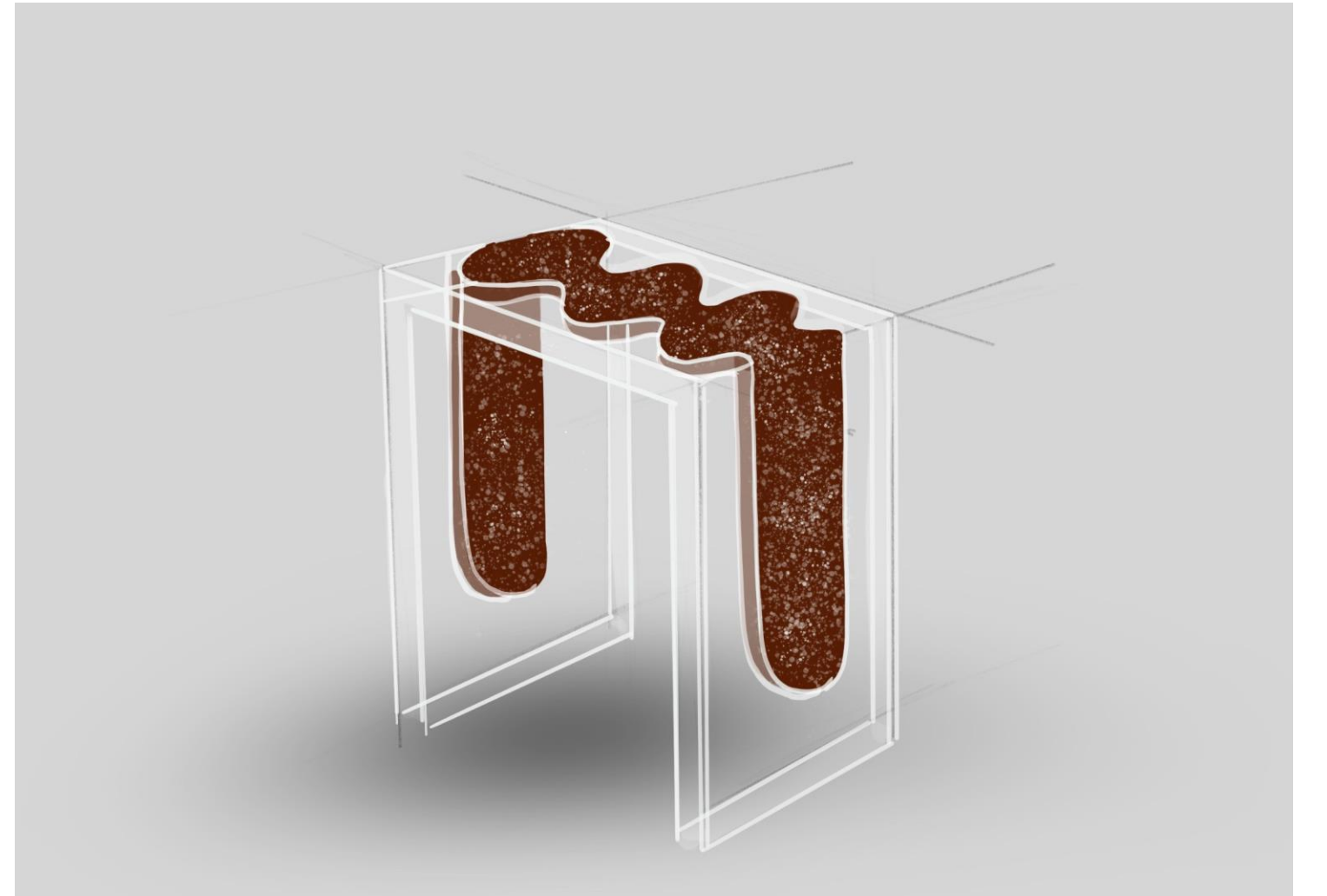
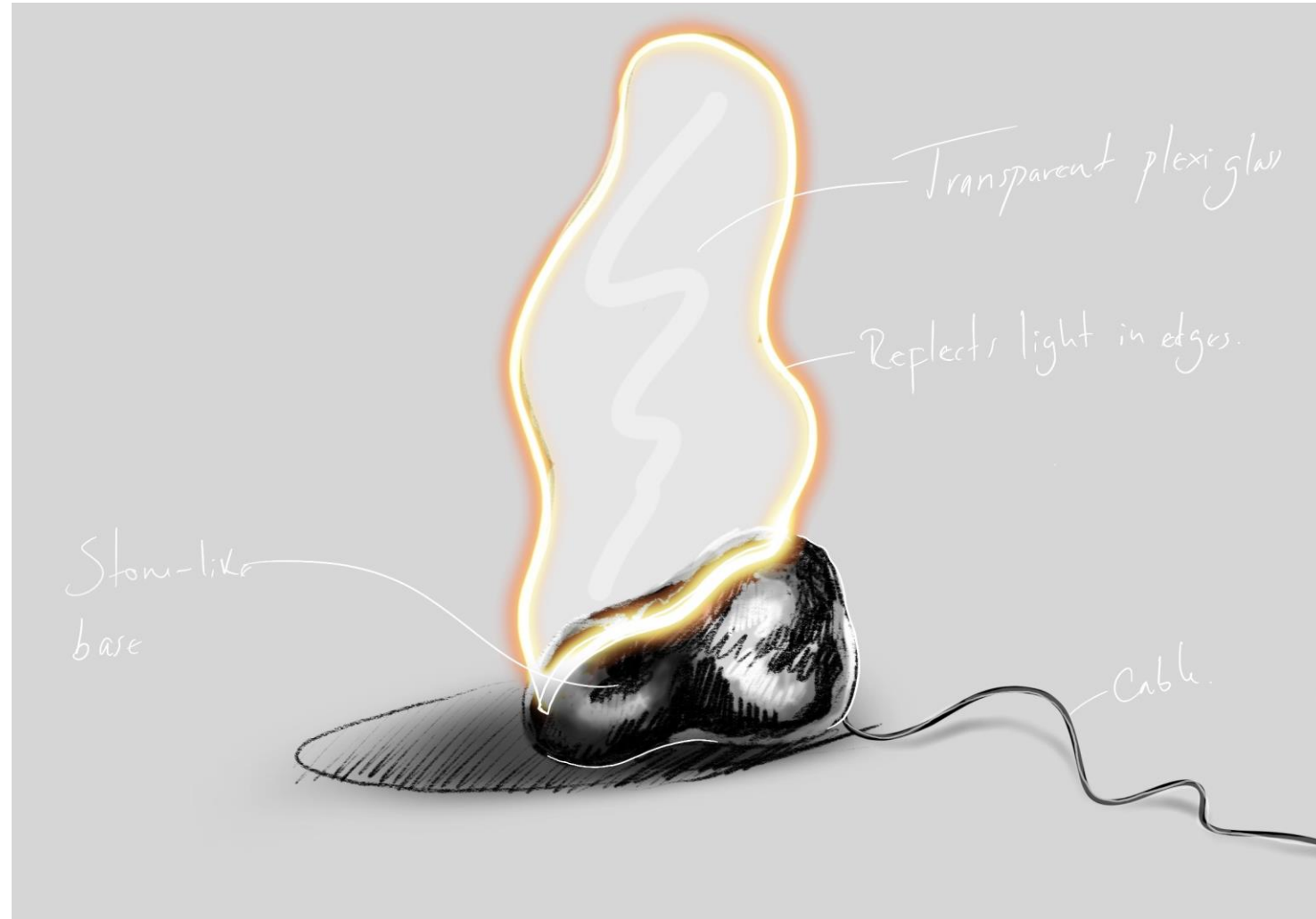
# Sketches

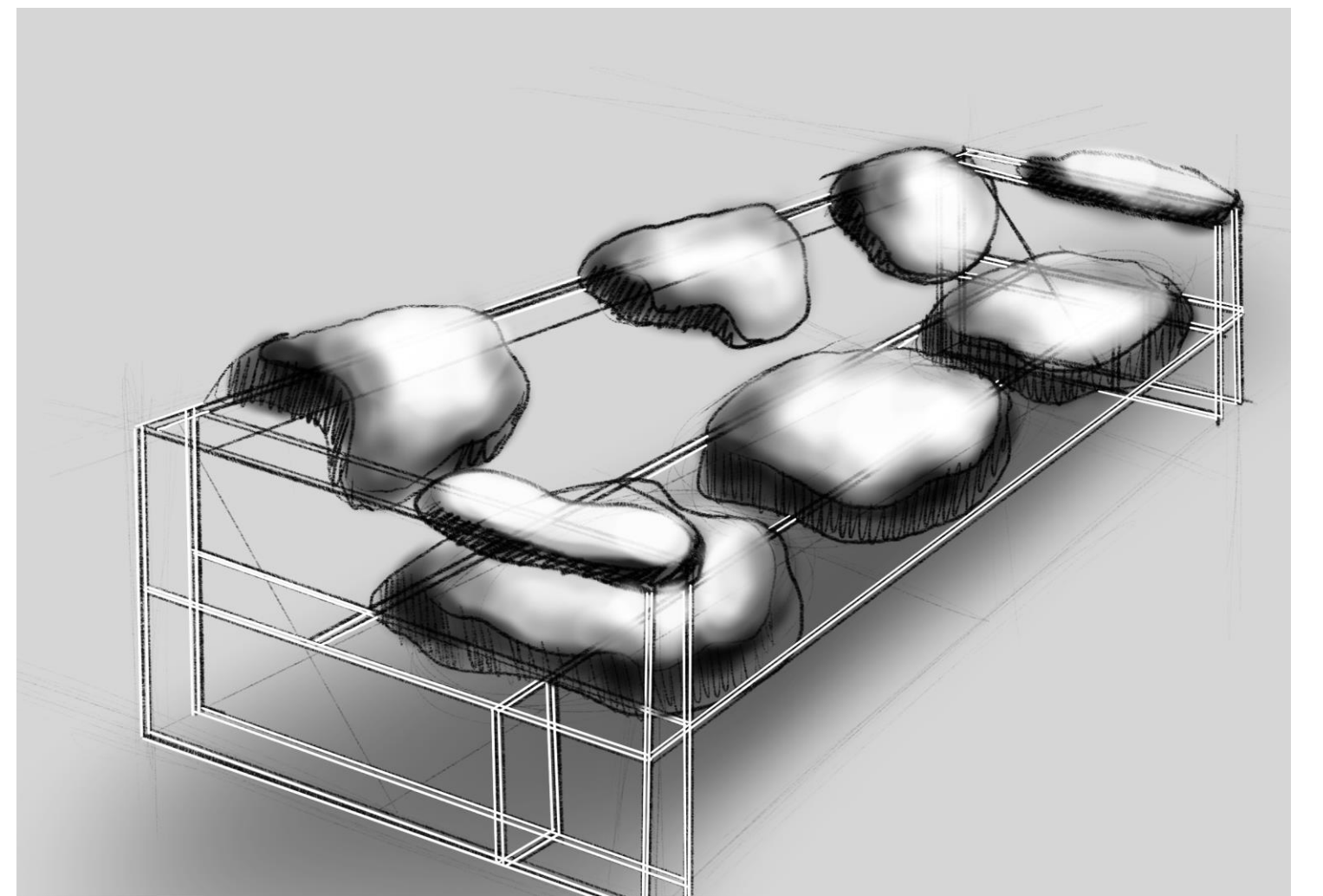
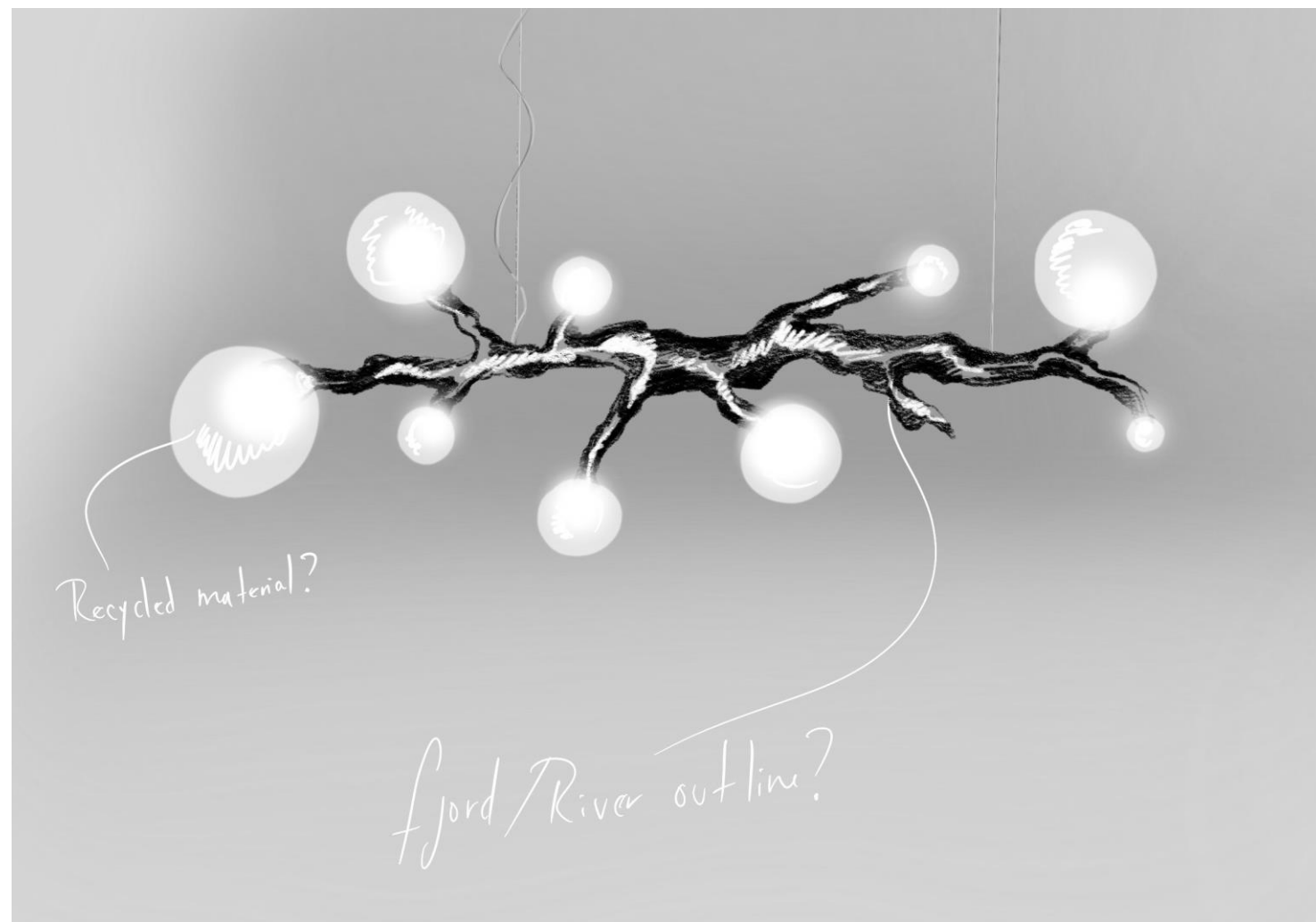
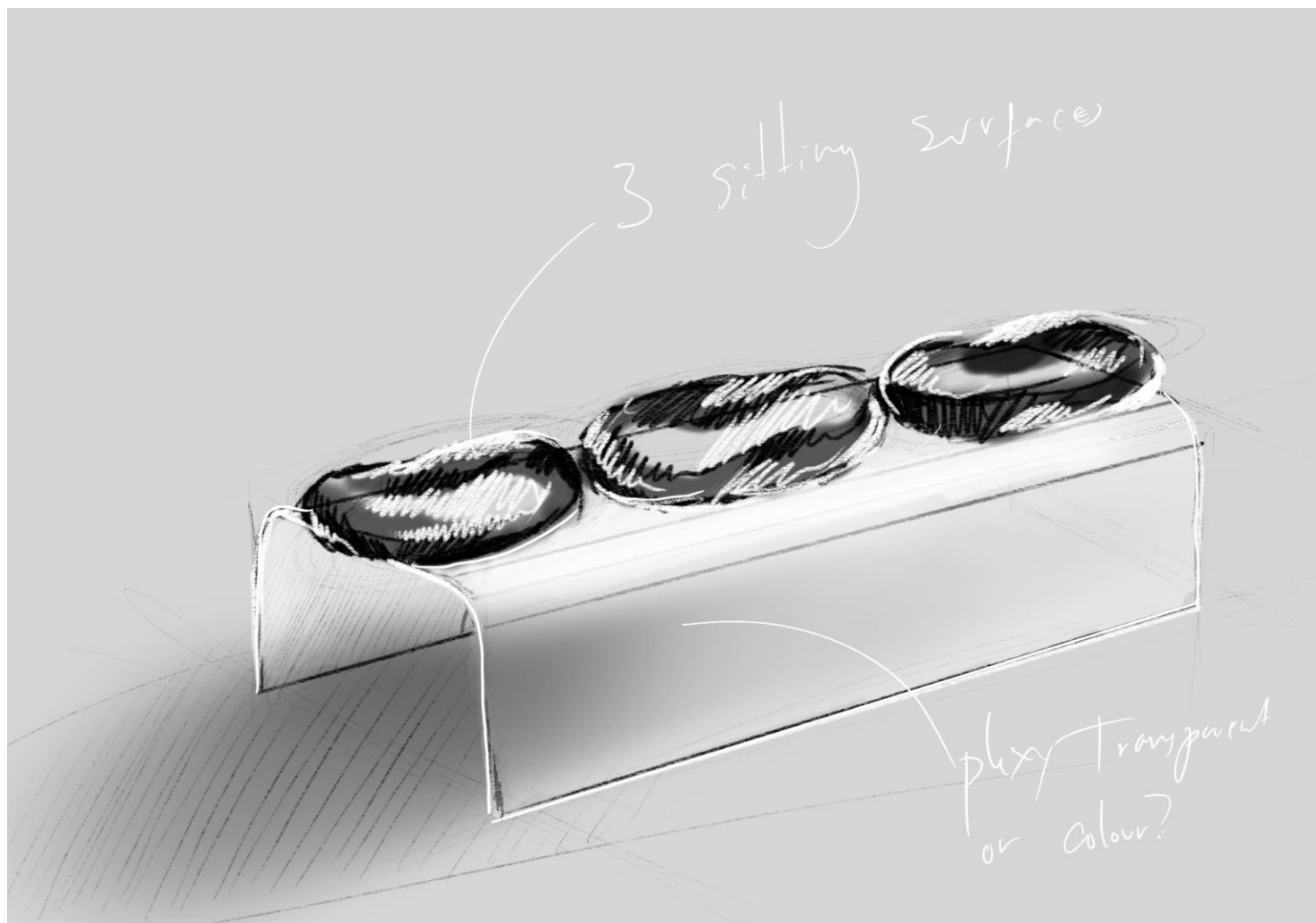
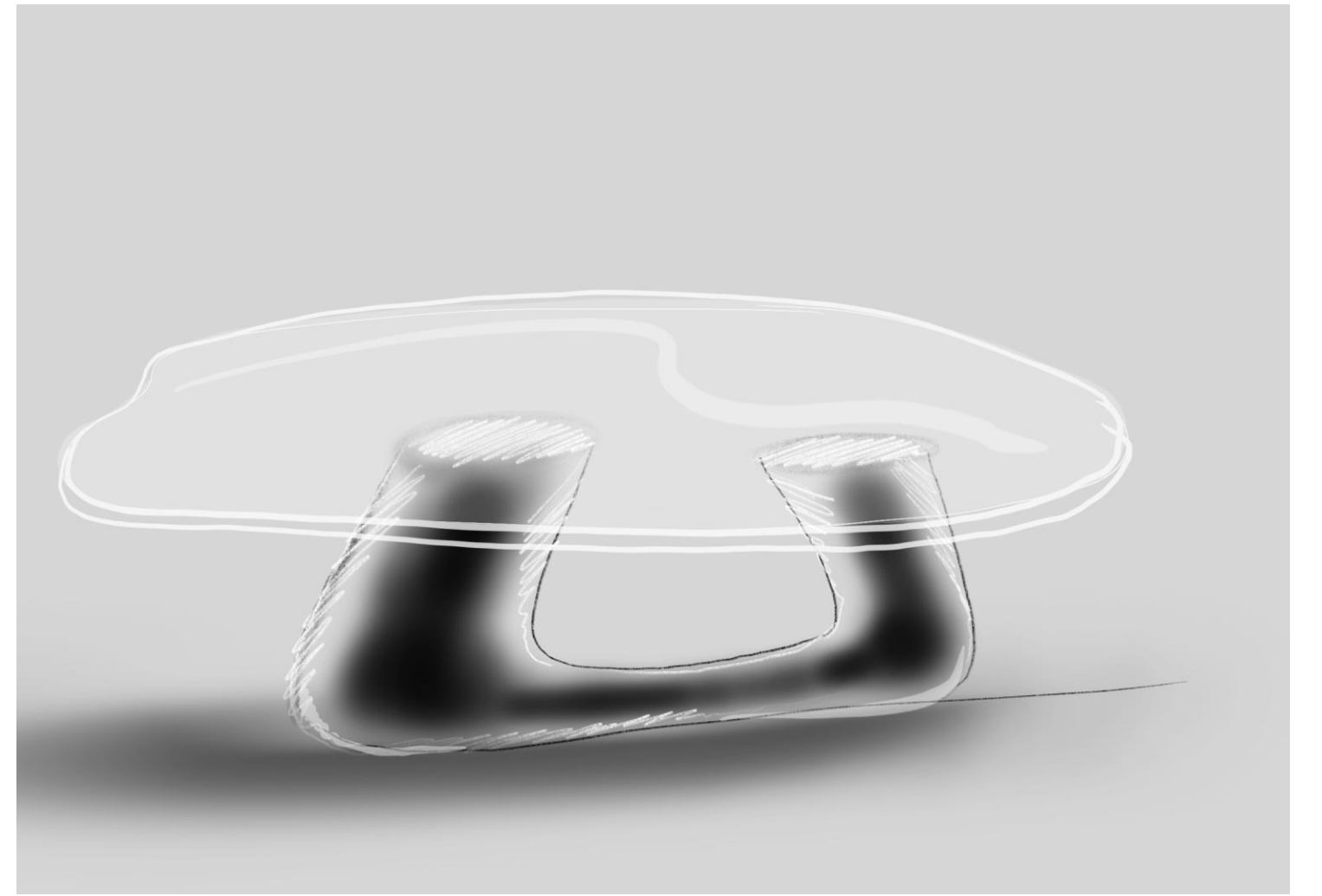
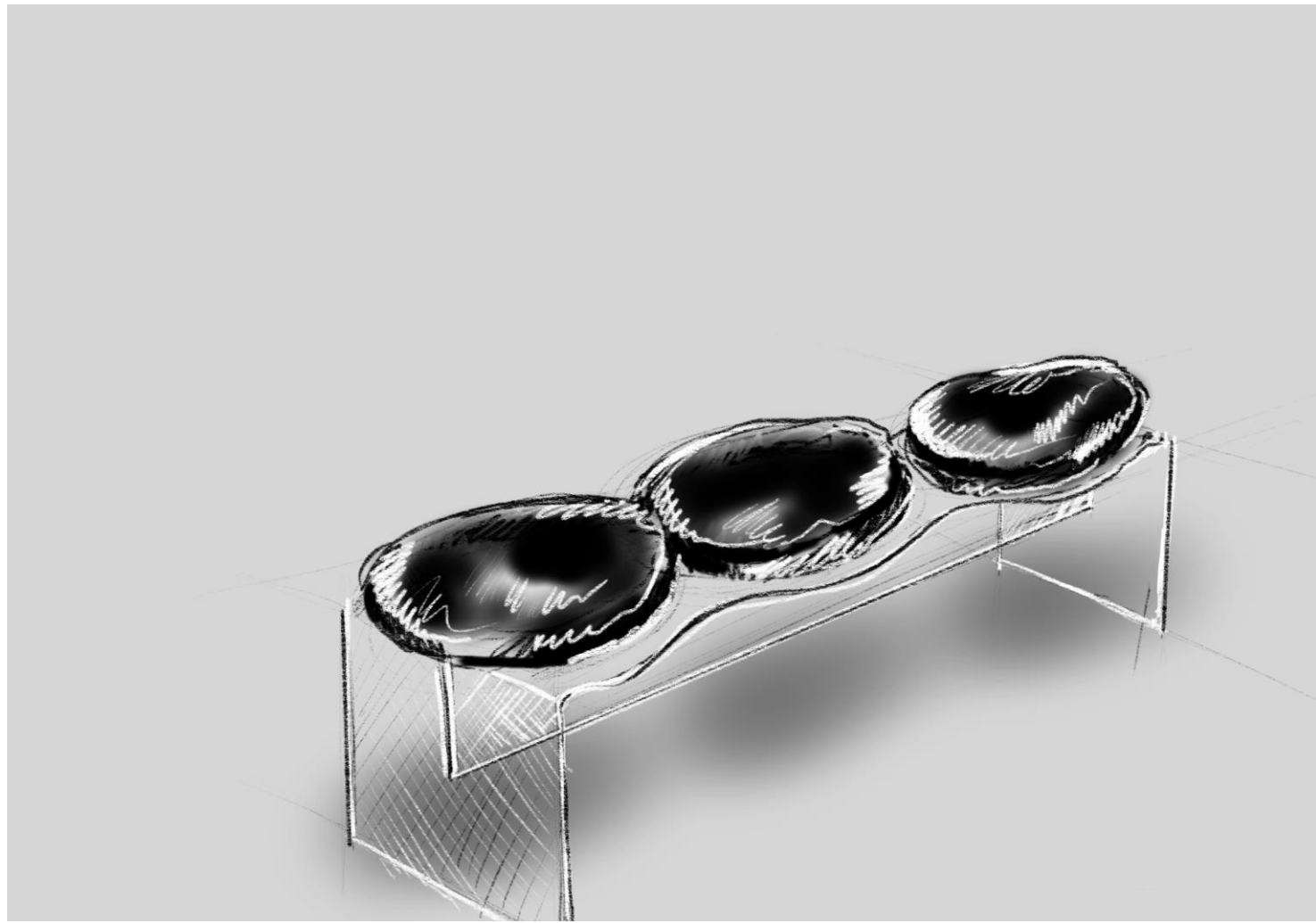
I sketched various furniture products featuring a combination of blue clay and other materials.

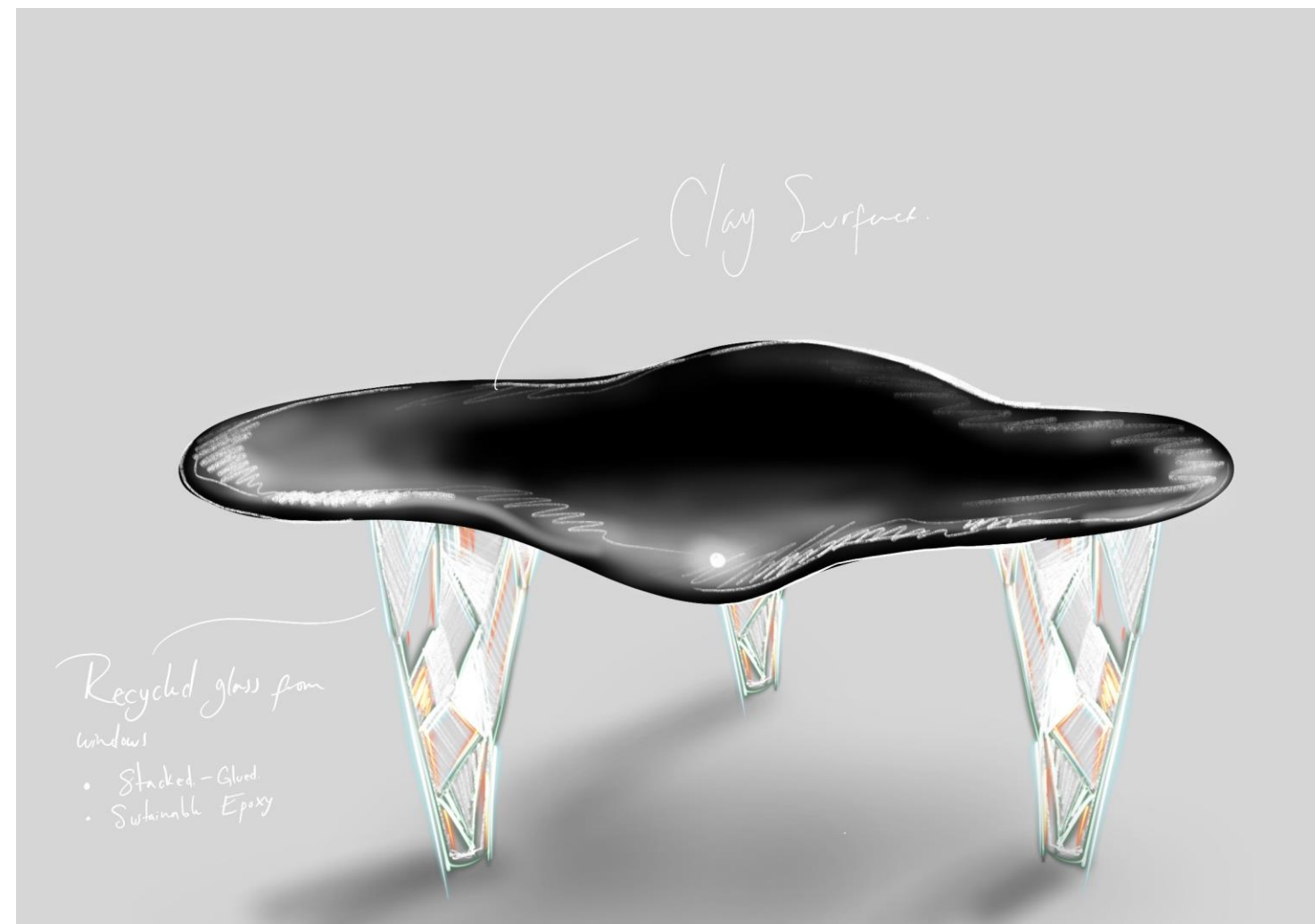
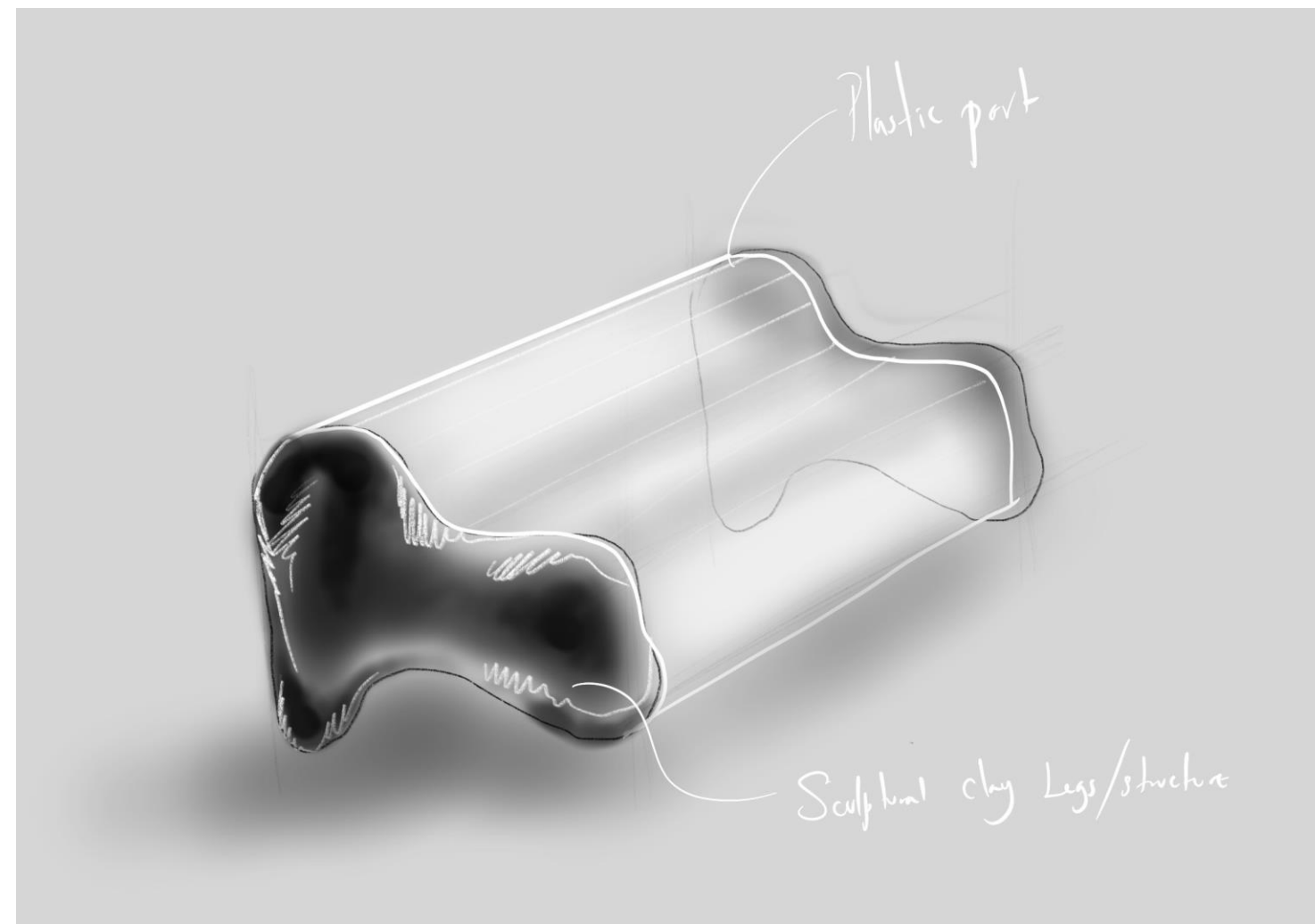
These sketches aimed to explore the possibilities of incorporating different materials alongside blue clay to create unique and visually appealing furniture designs, enhancing the functionality and aesthetic appeal of the products while showcasing the distinct characteristics of blue clay.



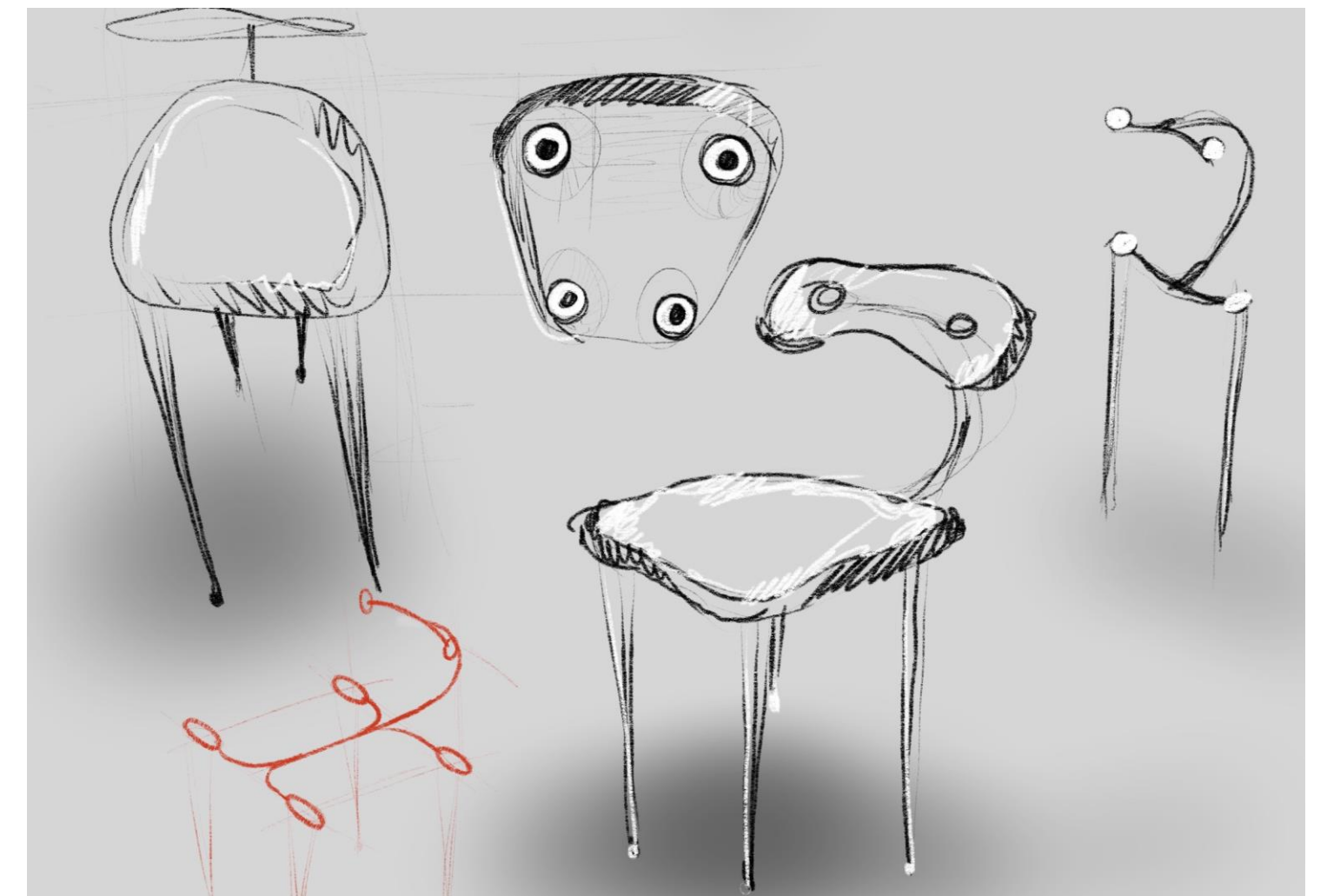
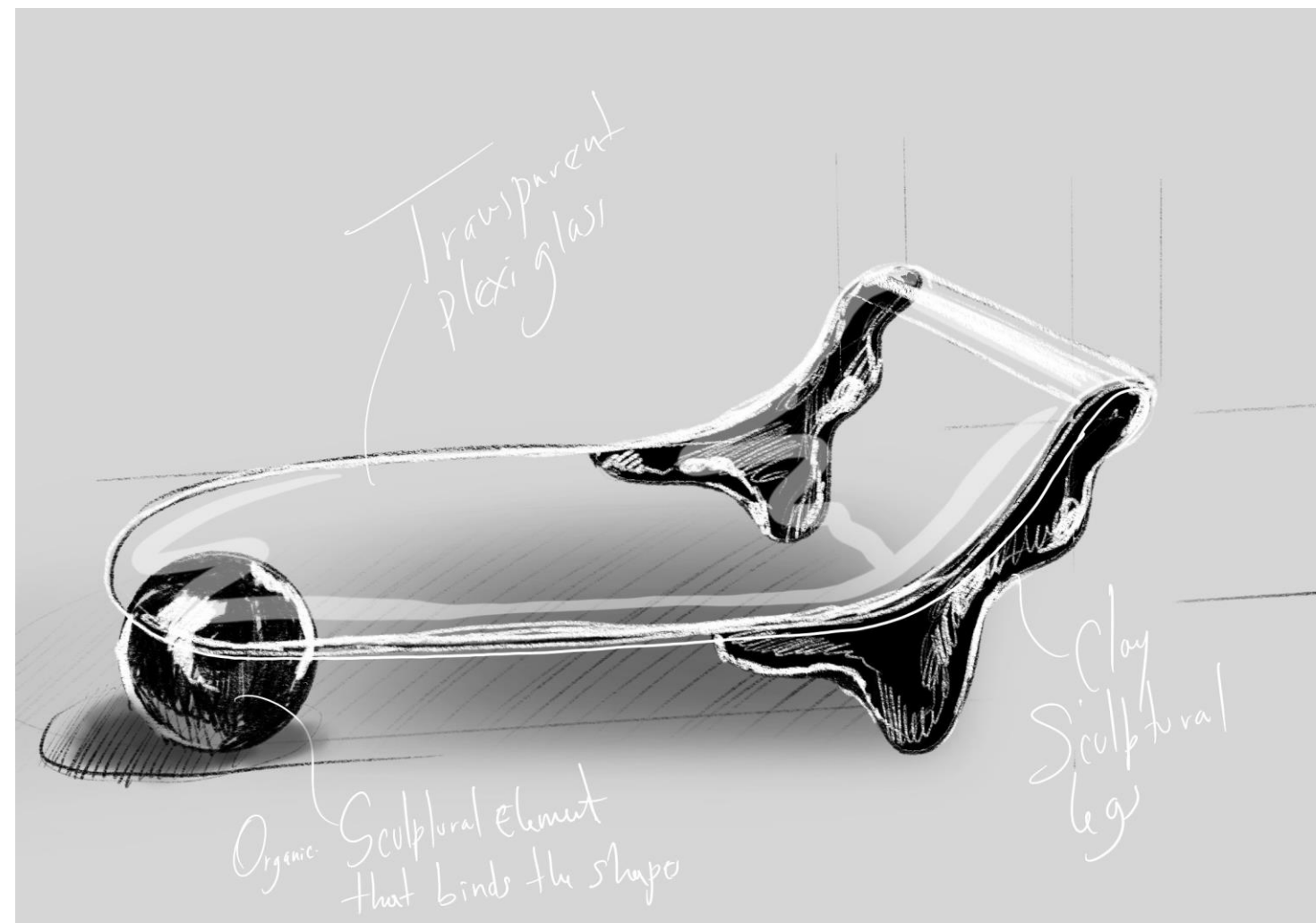
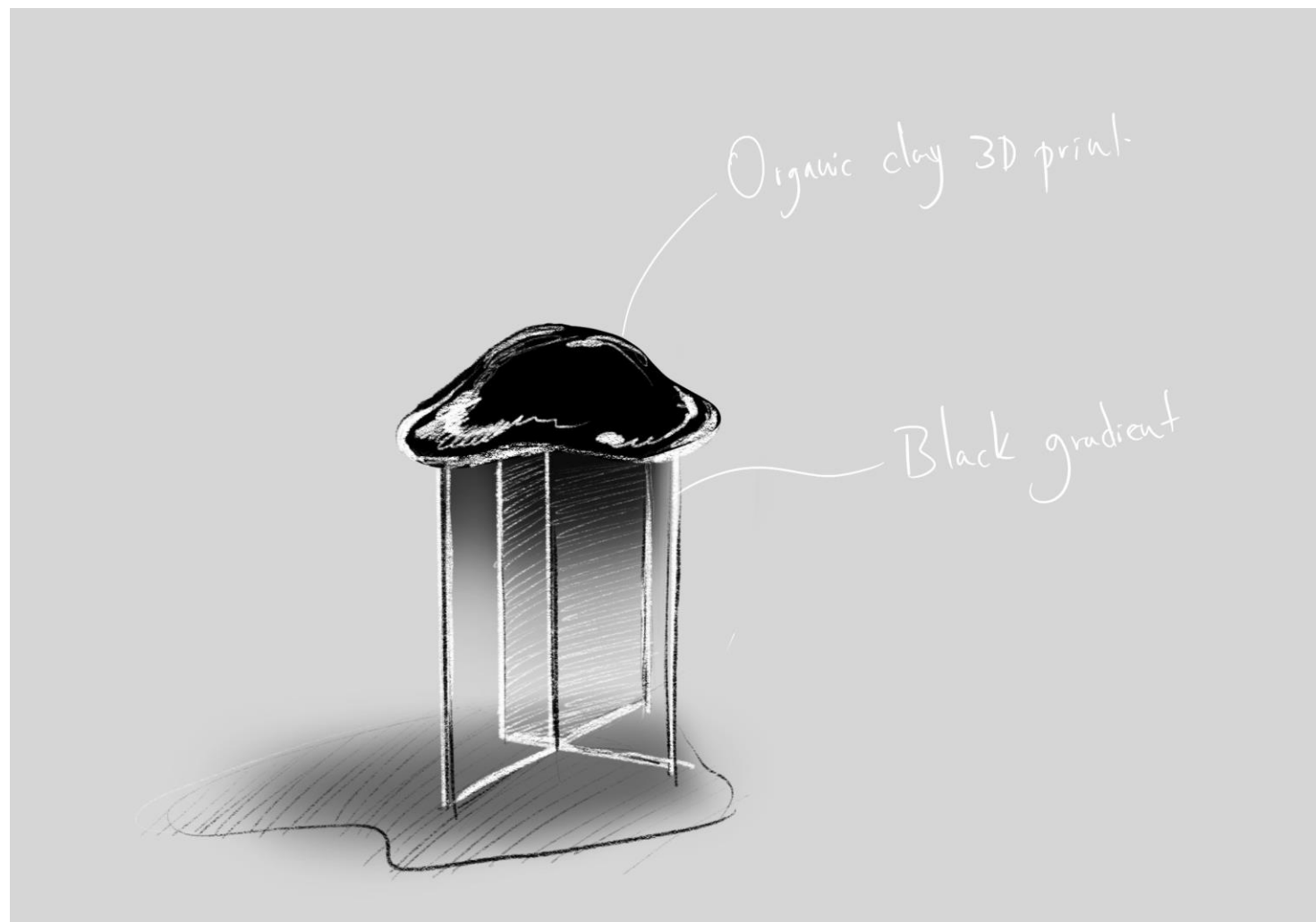
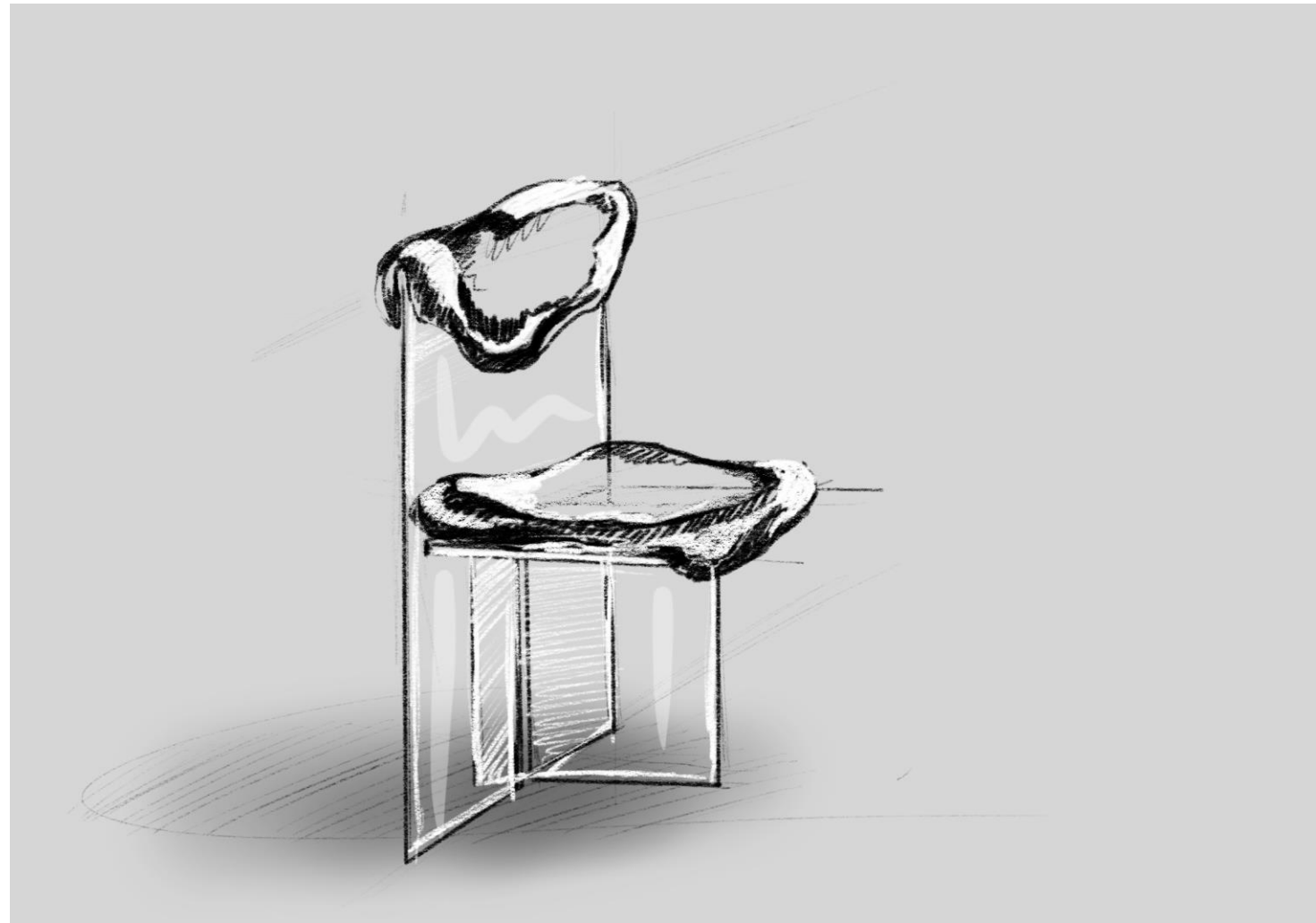


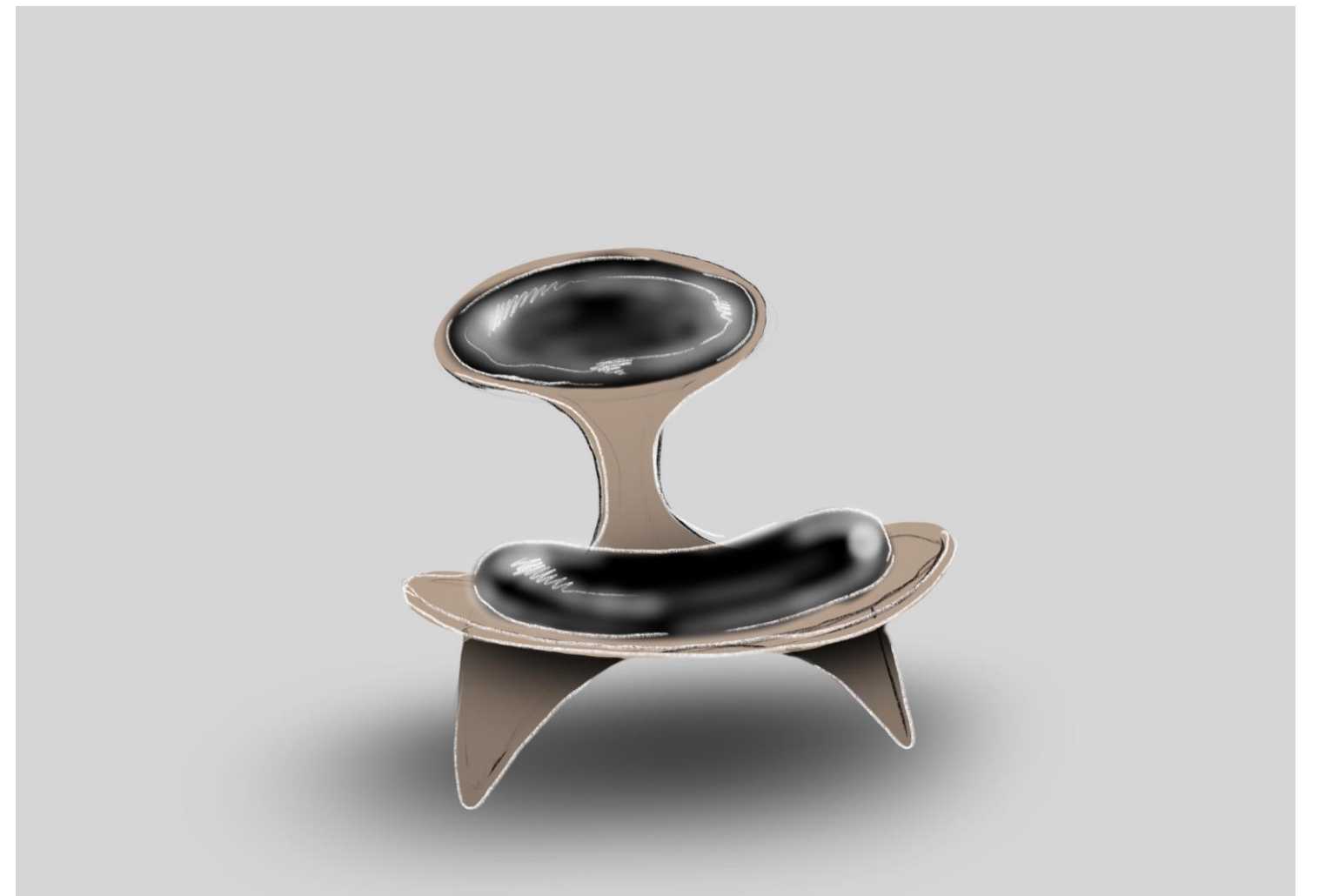
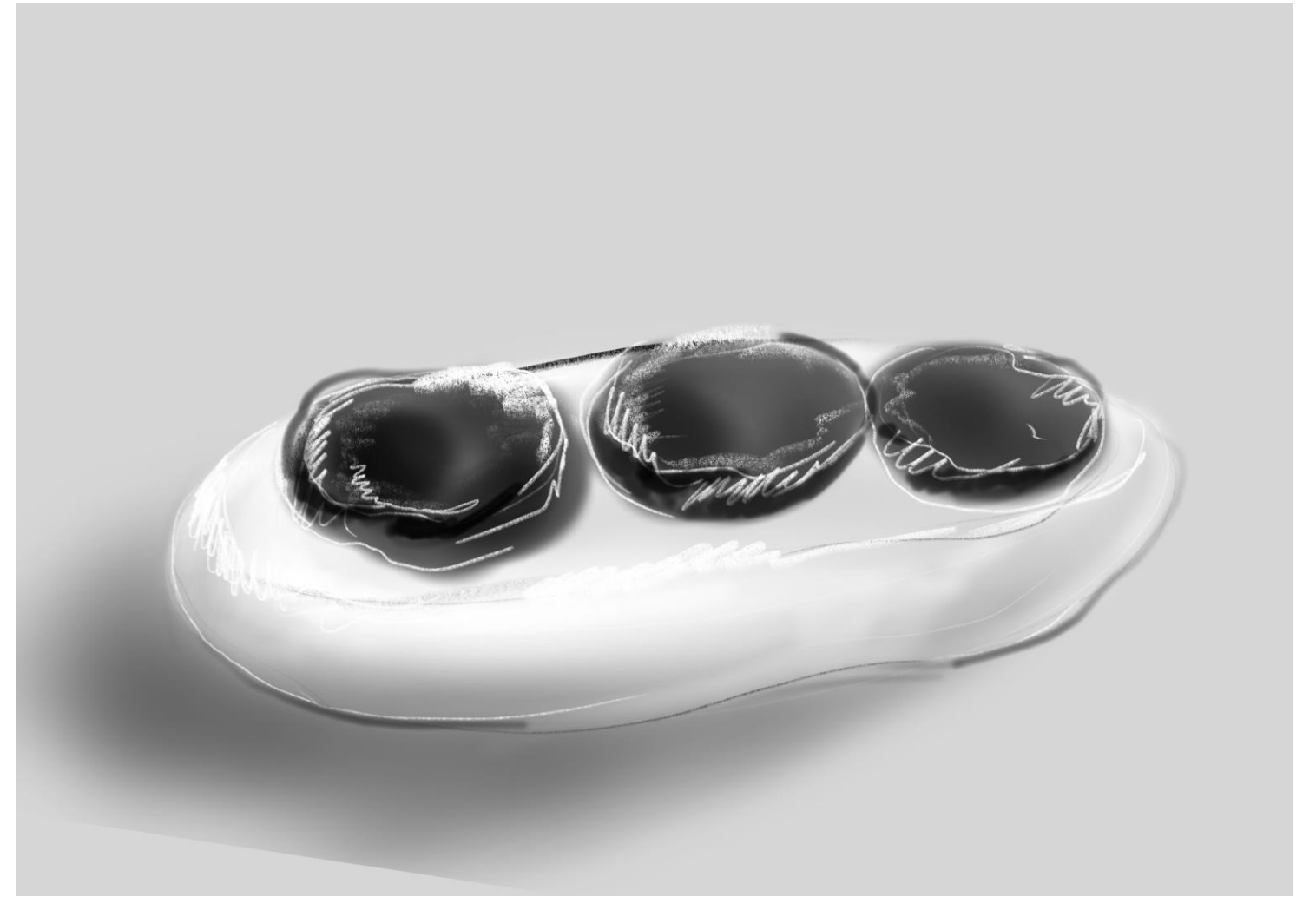
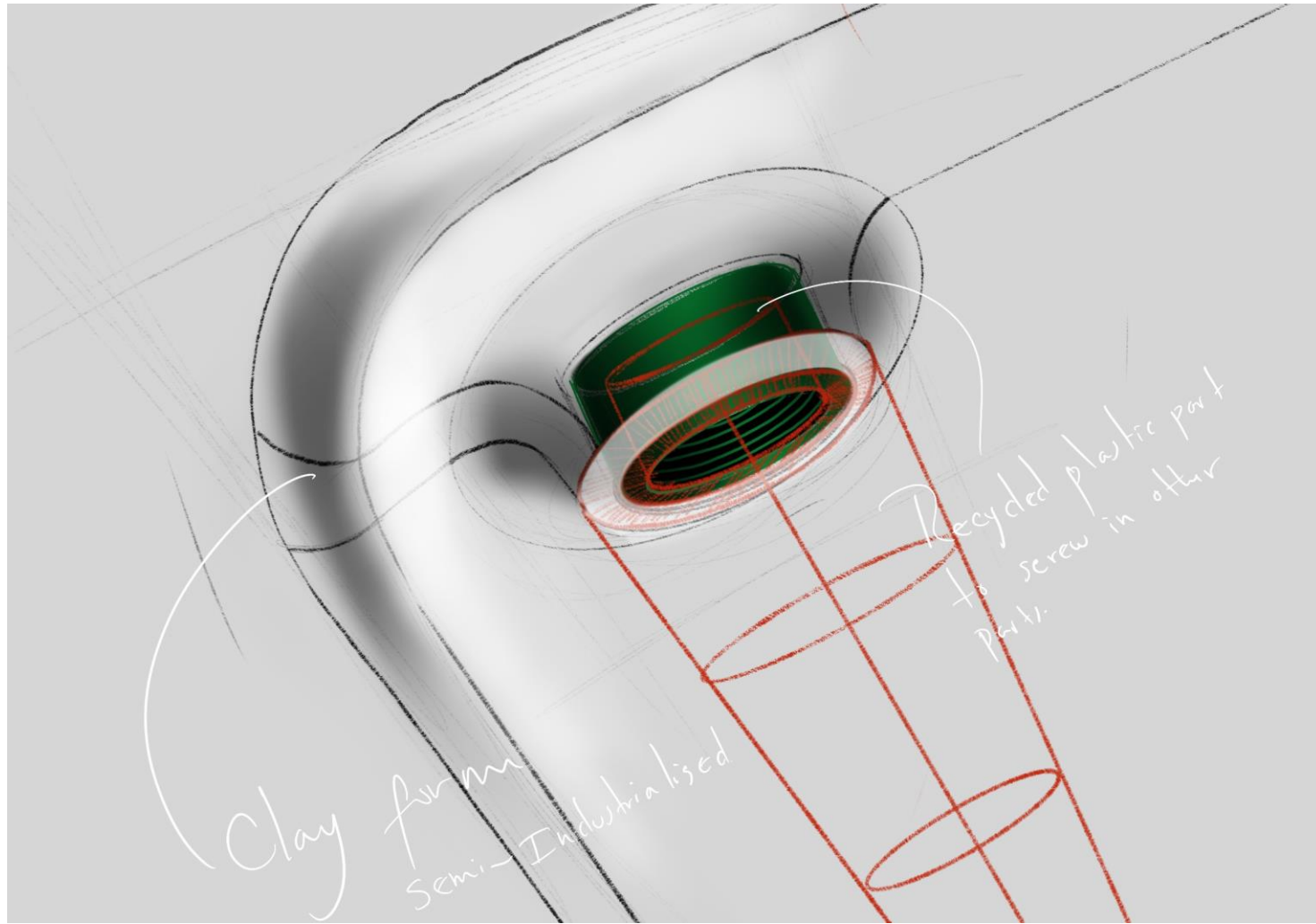


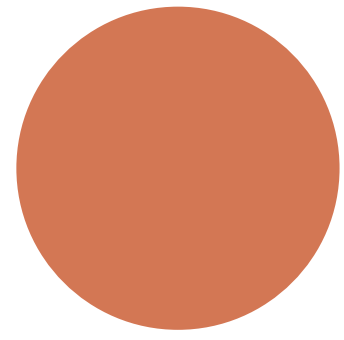












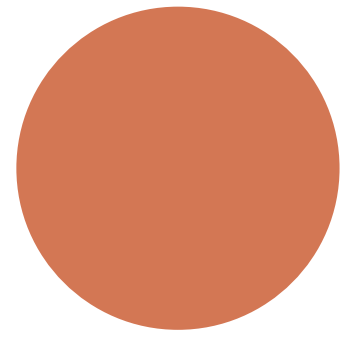
# Mockups

I transformed the sketches into mockups to obtain realistic representations of the furniture designs and gather feedback on their visual appearance.

Creating mockups allowed for a deeper exploration of the designs and provided an opportunity to refine and iterate on the concepts.



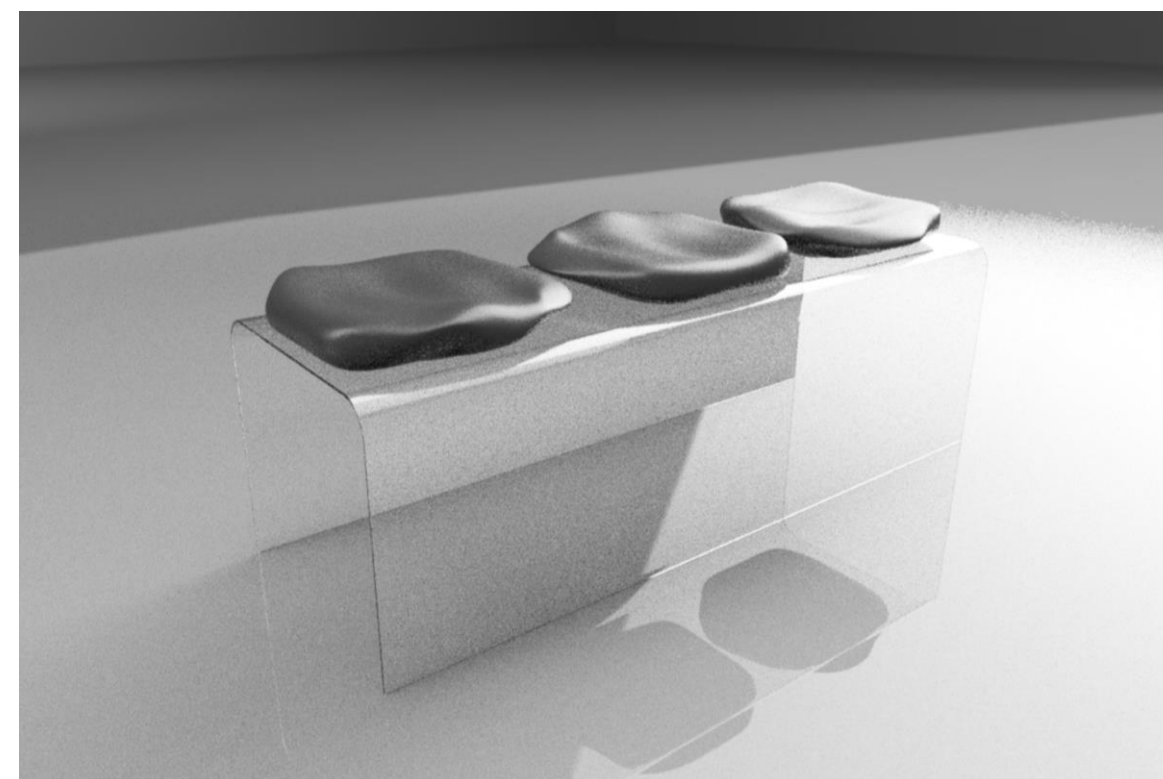
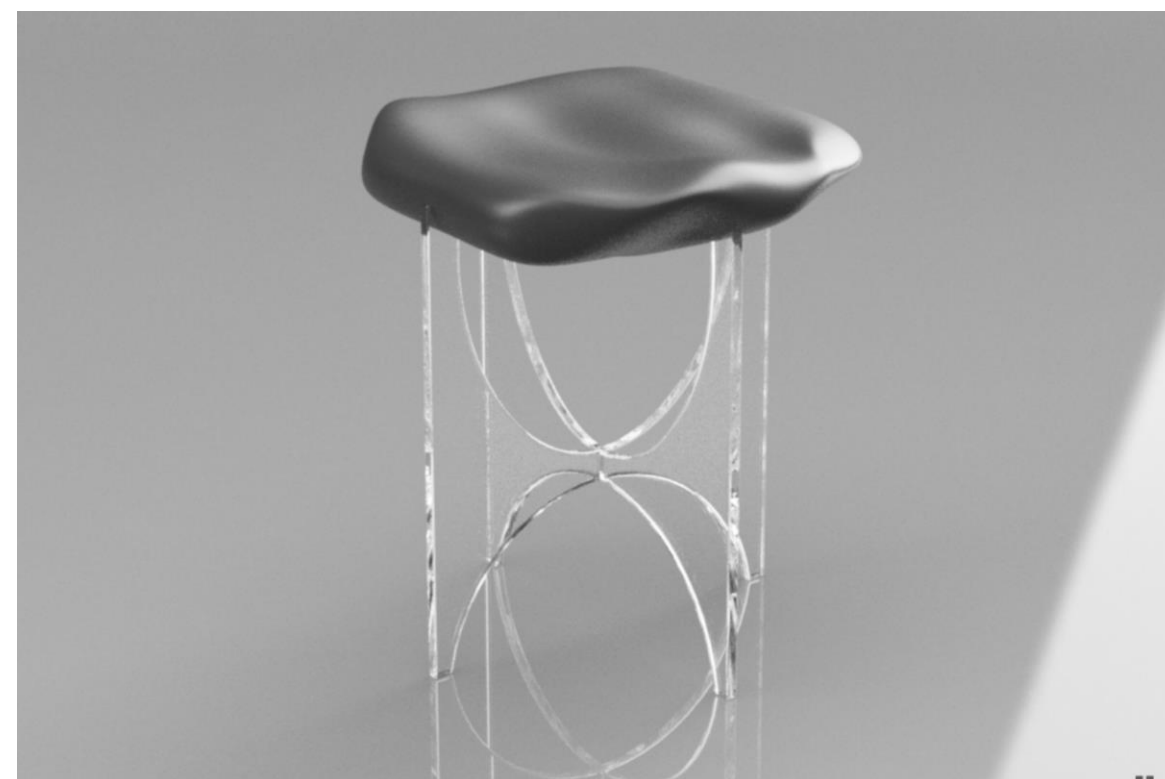
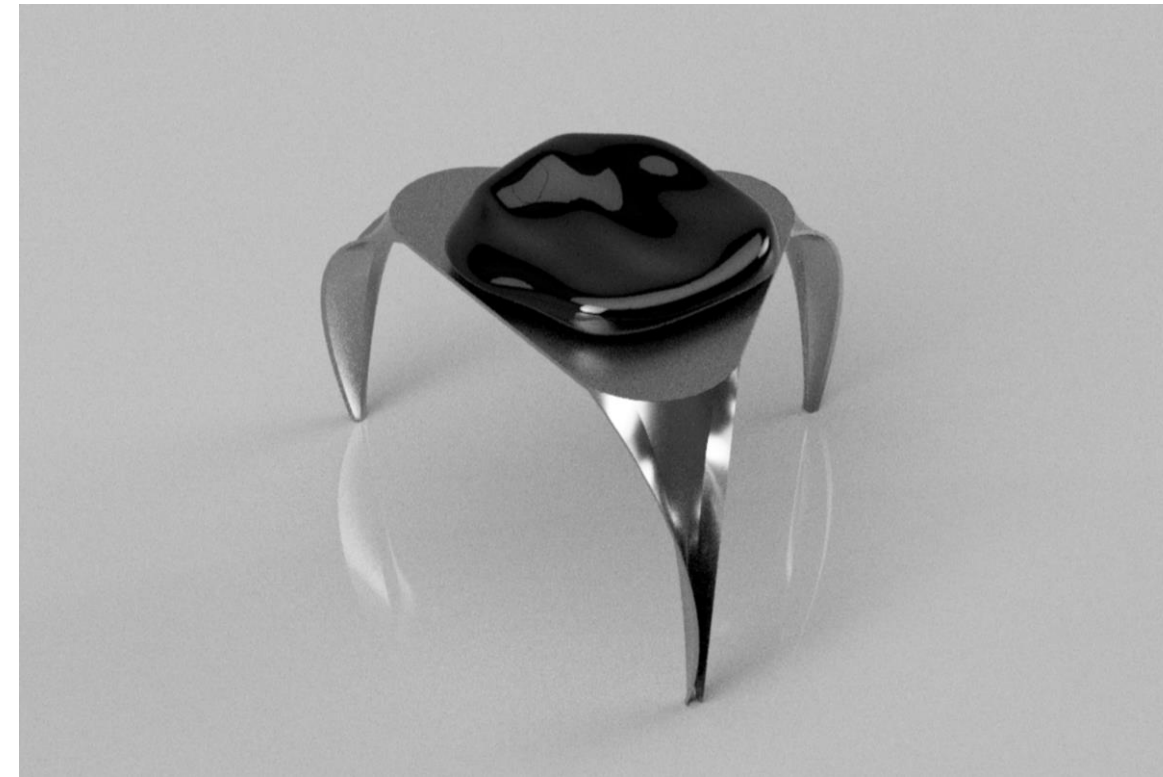
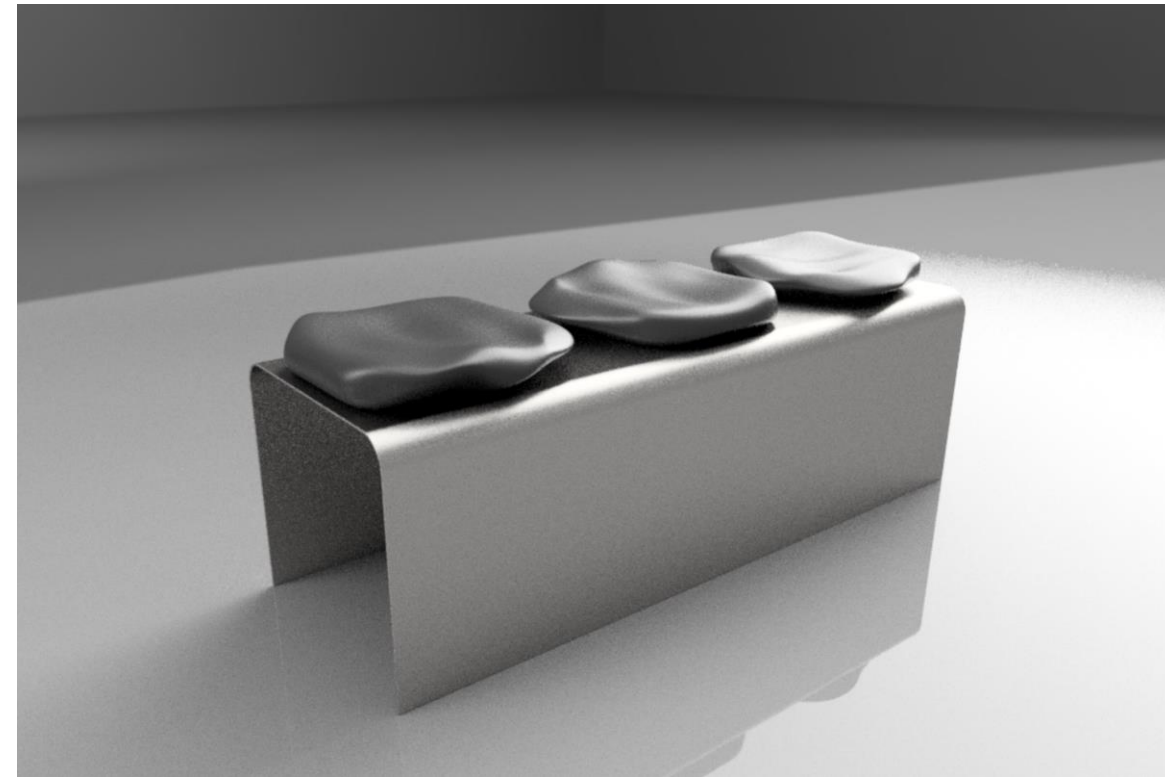
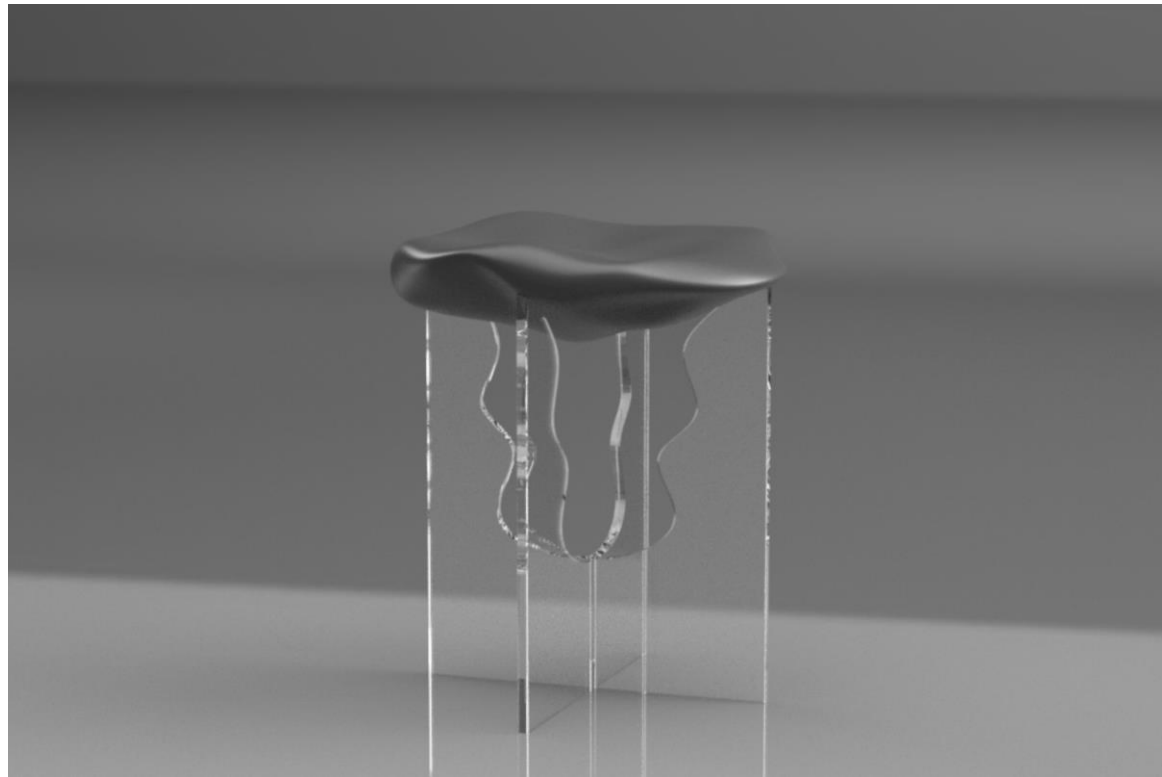
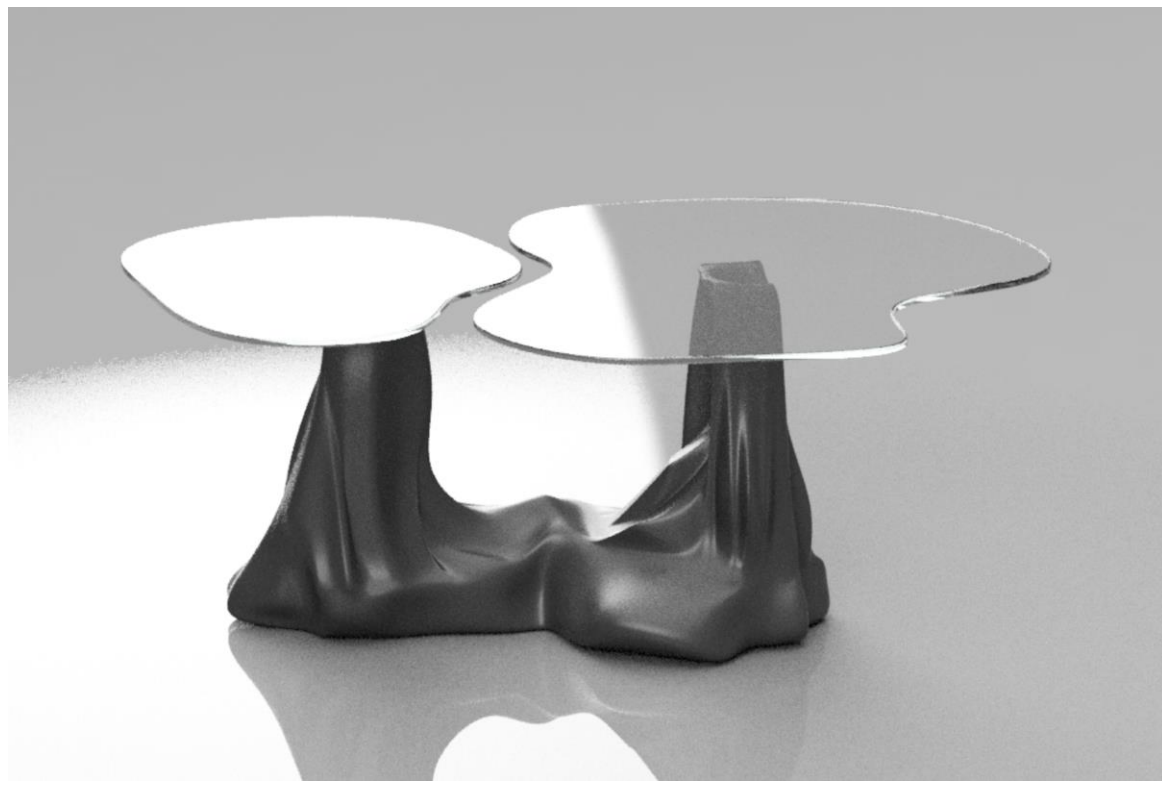


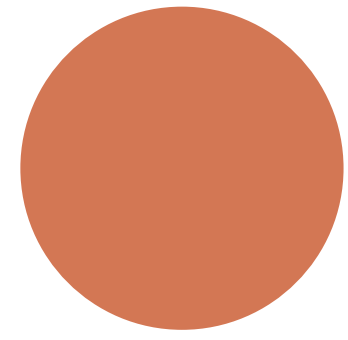


# CAD Sketches

To enhance the feasibility and visualize the furniture designs in a more realistic manner, I utilized computer-aided design (CAD) software.

By translating the sketches into digital models, I could assess the structural integrity, dimensions, and overall functionality of the products. CAD allowed me to experiment with different angles, lighting, and materials to create a more detailed and accurate representation of the designs.





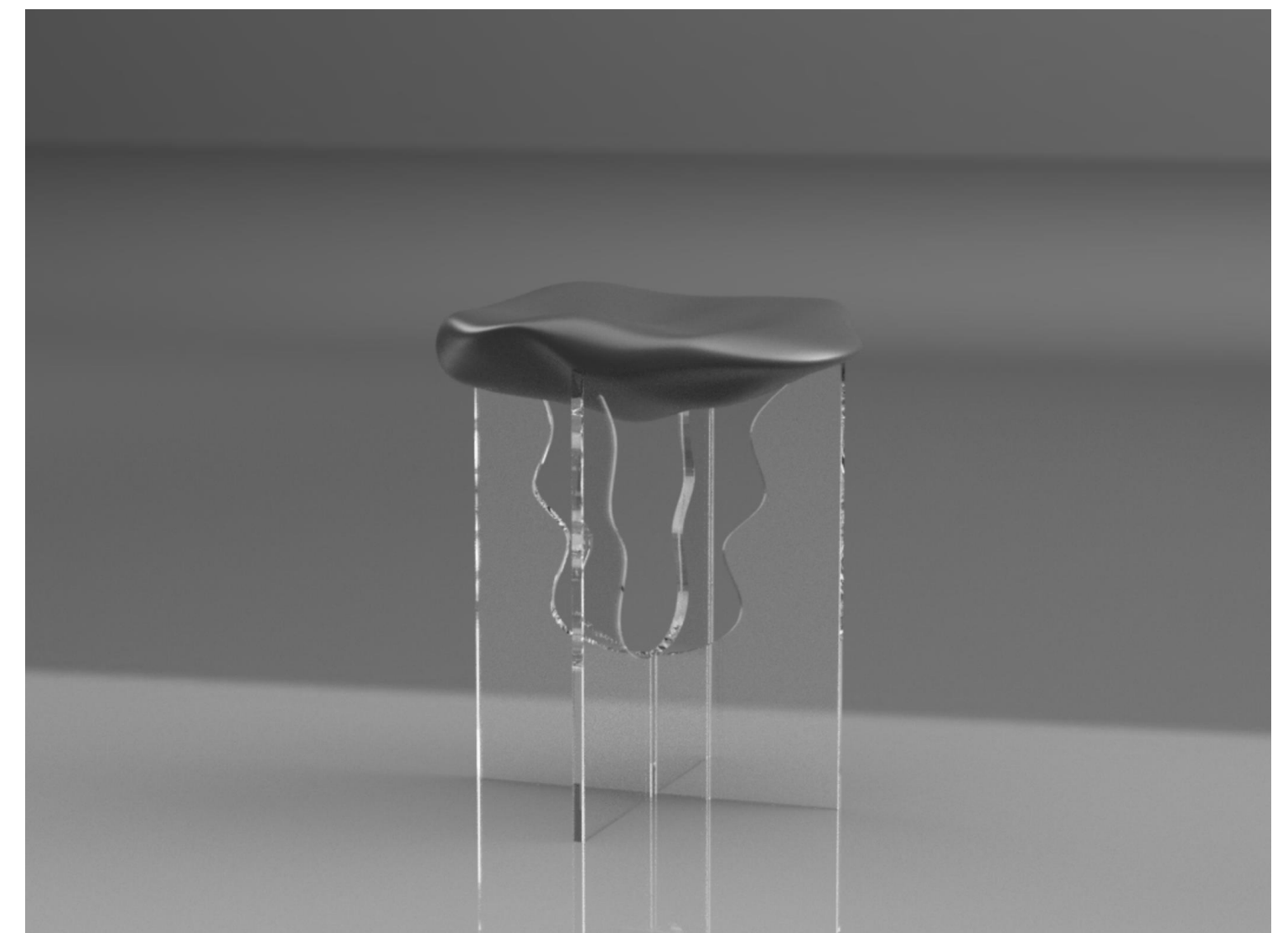
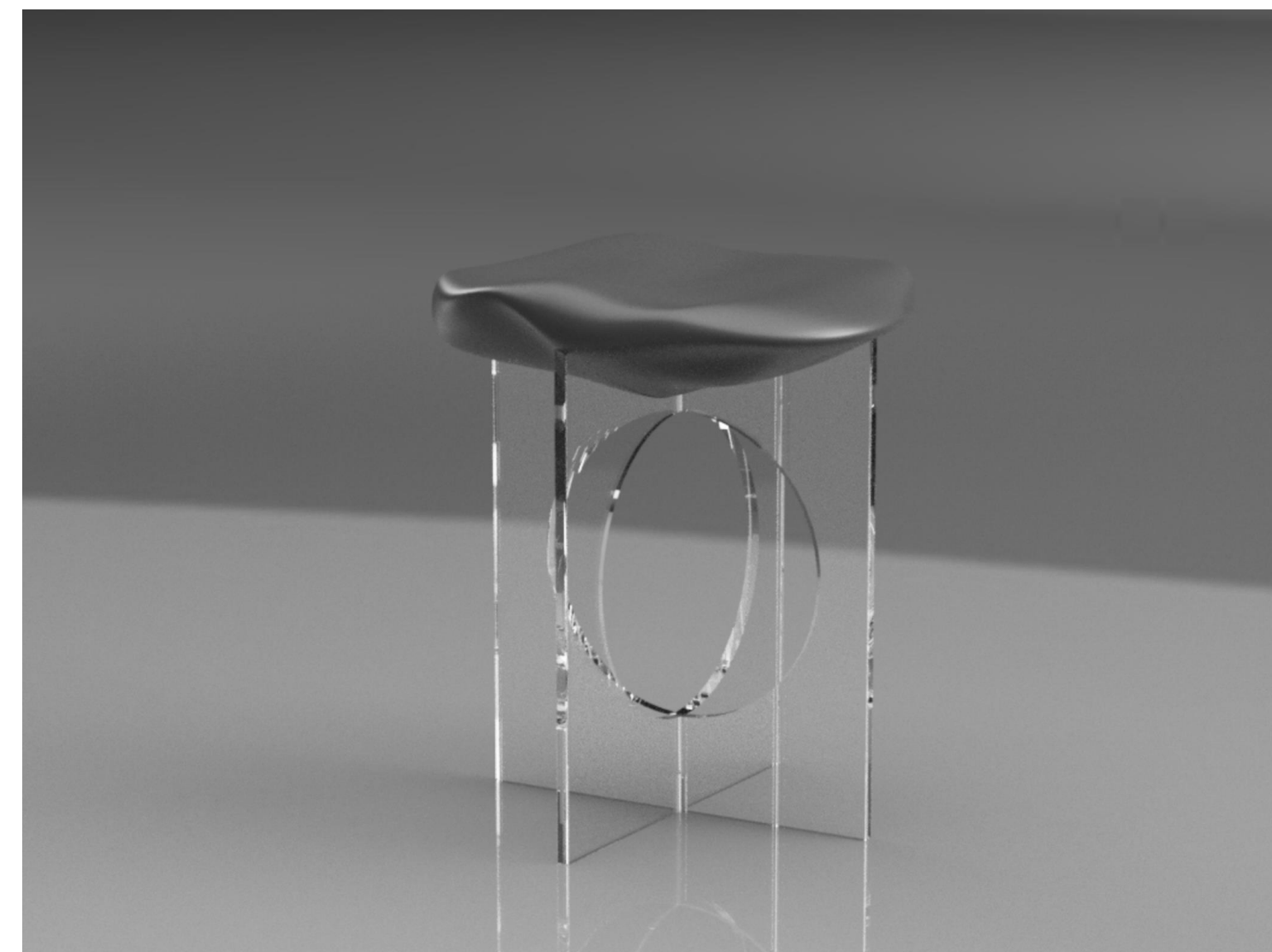
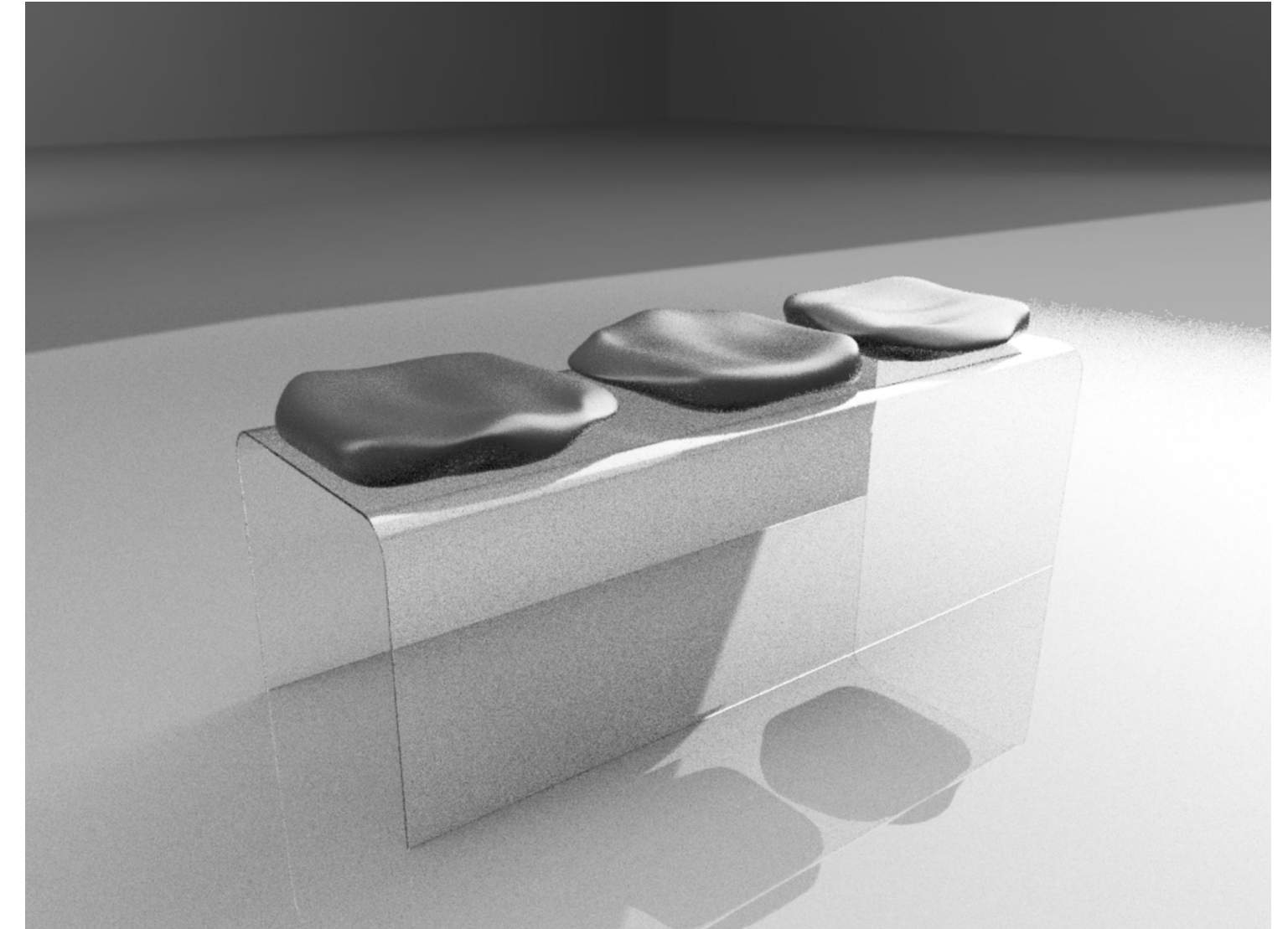
# Concept Directions



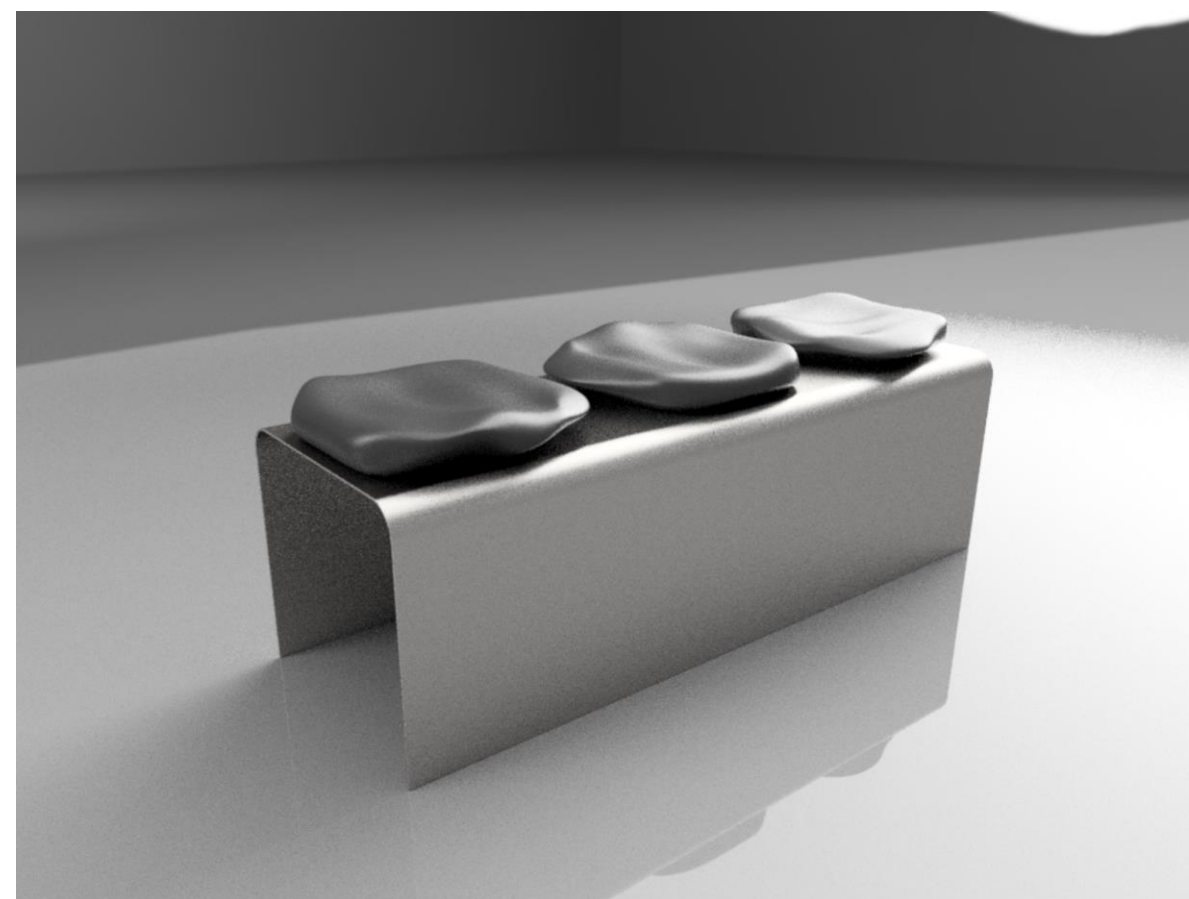
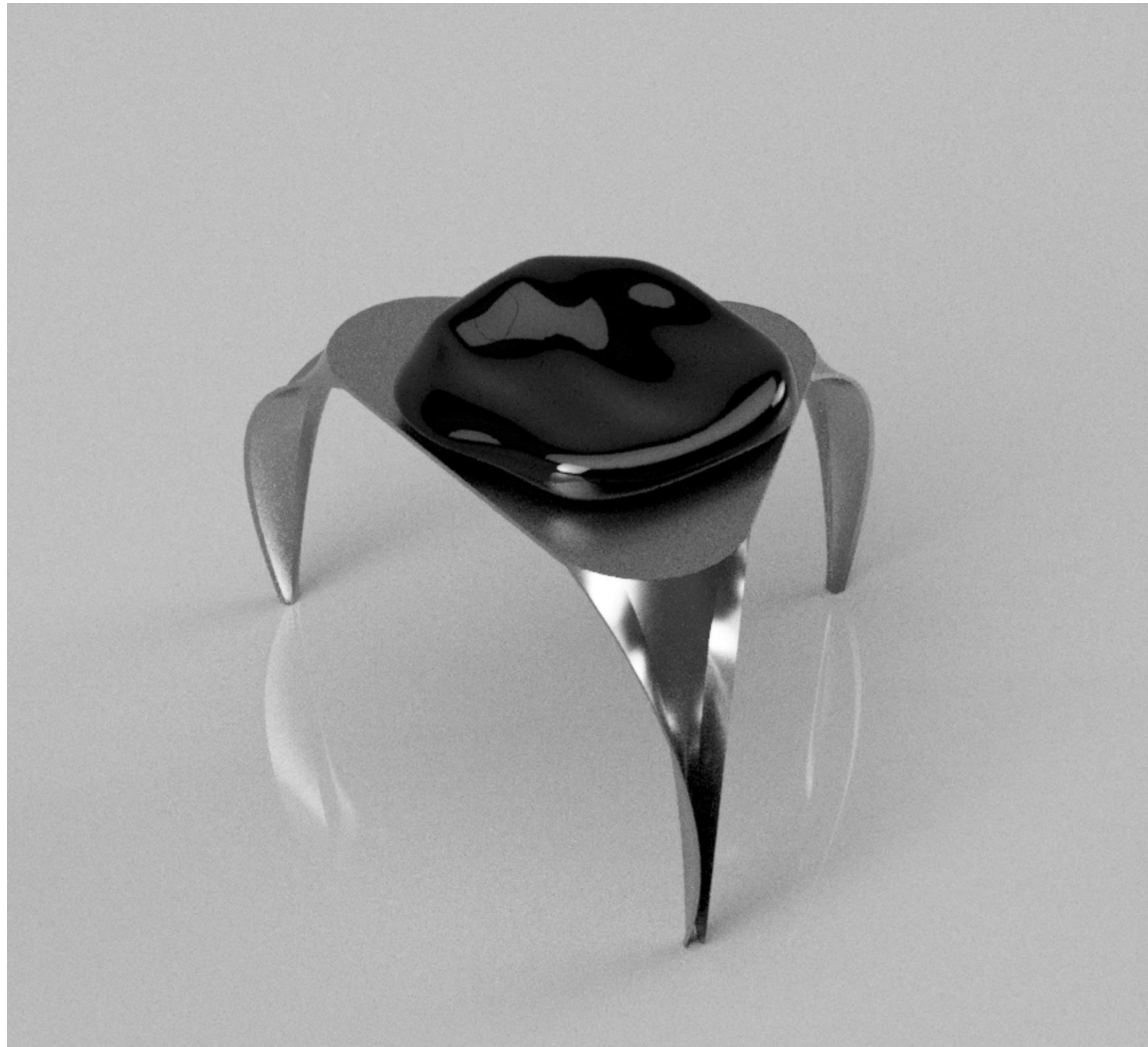
● Clay + Wood

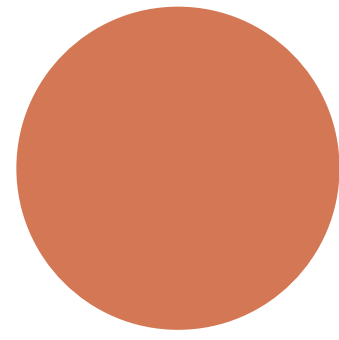


# ● Clay + Plexiglass



# ● Clay + Metal





# Secondary Materials

The three chosen directions in the concept development phase, incorporating wood, plexiglass, and metal, offer a multitude of possibilities.

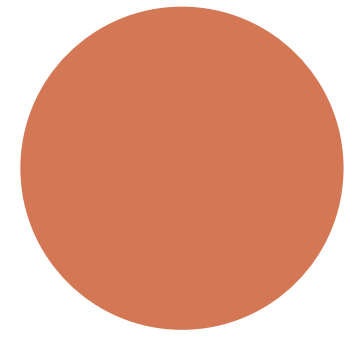
In line with the sustainability requirements, it is crucial to source these materials responsibly. For instance, plexiglass can be obtained from waste generated by the building industry, while recycled aluminium can be utilised for the metal components. This approach ensures the use of environmentally-friendly materials and supports the circular economy.

If materials should be bound, the binding agents should also be sourced organically wherever possible.

# Choosing Metal + Clay

Inspired by the potential of combining clay with metal, I am drawn to the idea of utilising the strength and stability of metal as a base material while exploring the malleability, strength, and aesthetic properties of clay.

This combination allows for diverse design possibilities, where clay can be moulded and shaped to showcase its unique characteristics, while the metal provides a solid foundation and structural support. The fusion of these materials creates a visually captivating and functionally harmonious combination.



# Questions from Midterm Review

**Are these products solving the problem?**

These questions were asked at the end of my midterm presentation.

**How much material is being used in the elaborations of this products?**

While the products I intended to develop may not offer a complete solution, the challenge regarding material usage prompted me to explore alternative opportunities for utilizing blue clay in larger quantities.

**How can you use more of it?**

This led me to consider the building industry and architecture as potential avenues for its application. However, I realized the importance of defining my role as a designer within these contexts and began contemplating how I could effectively incorporate blue clay into architectural projects from a designer's perspective.

# Moodboard<sub>3</sub>

## Partition/Architectural Tiles

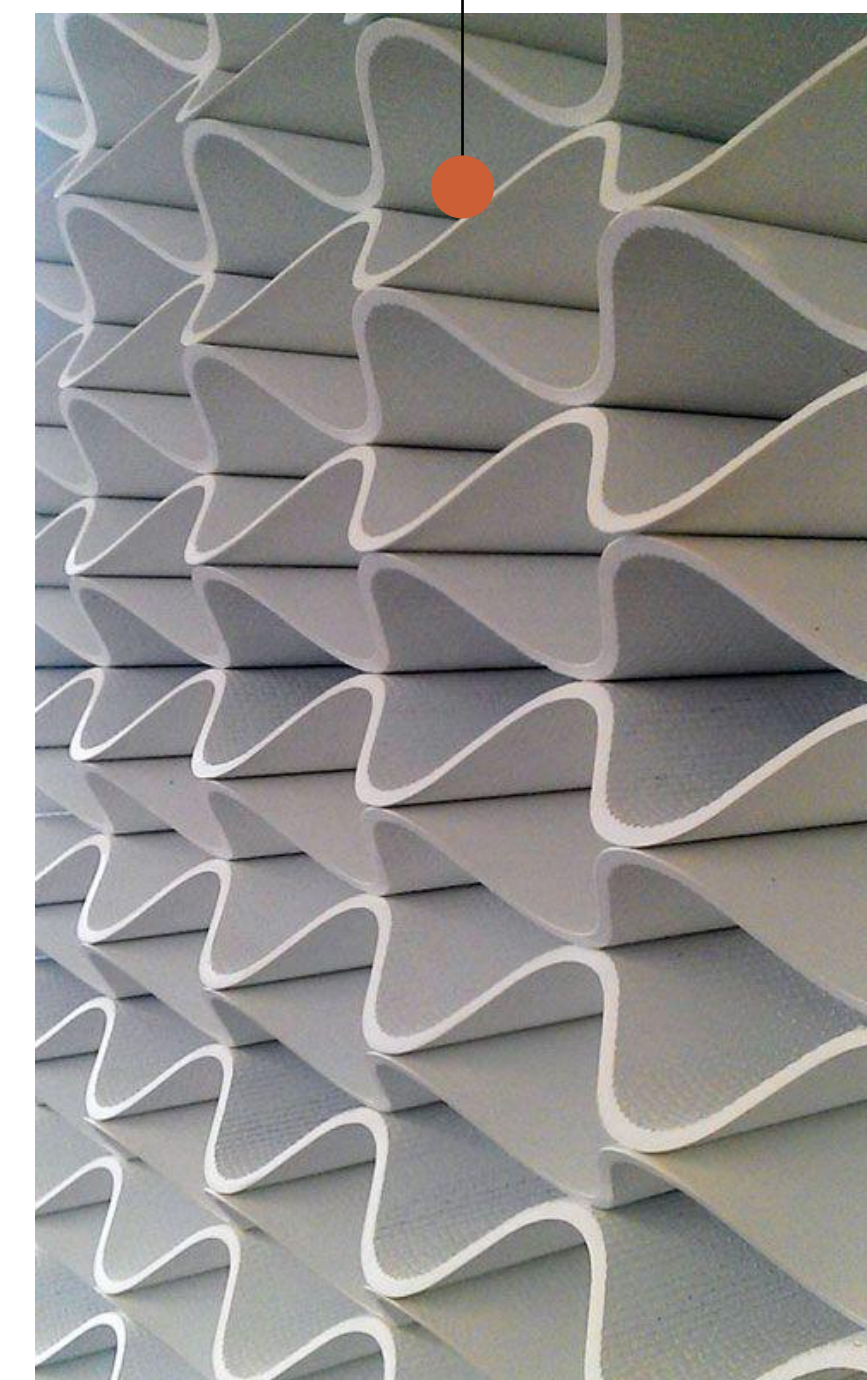
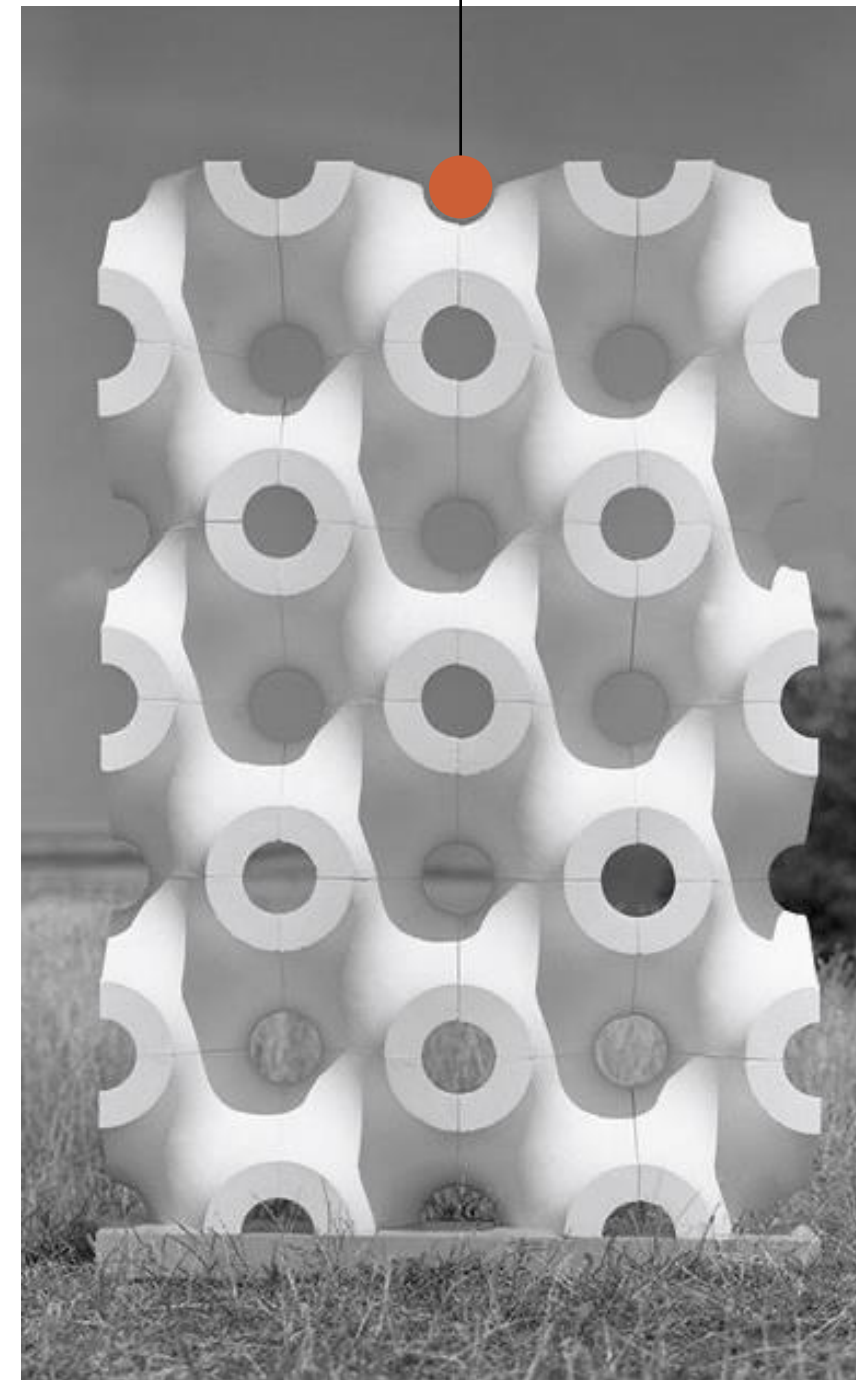
Visibility Through Construction



Dynamic Light + Shadow

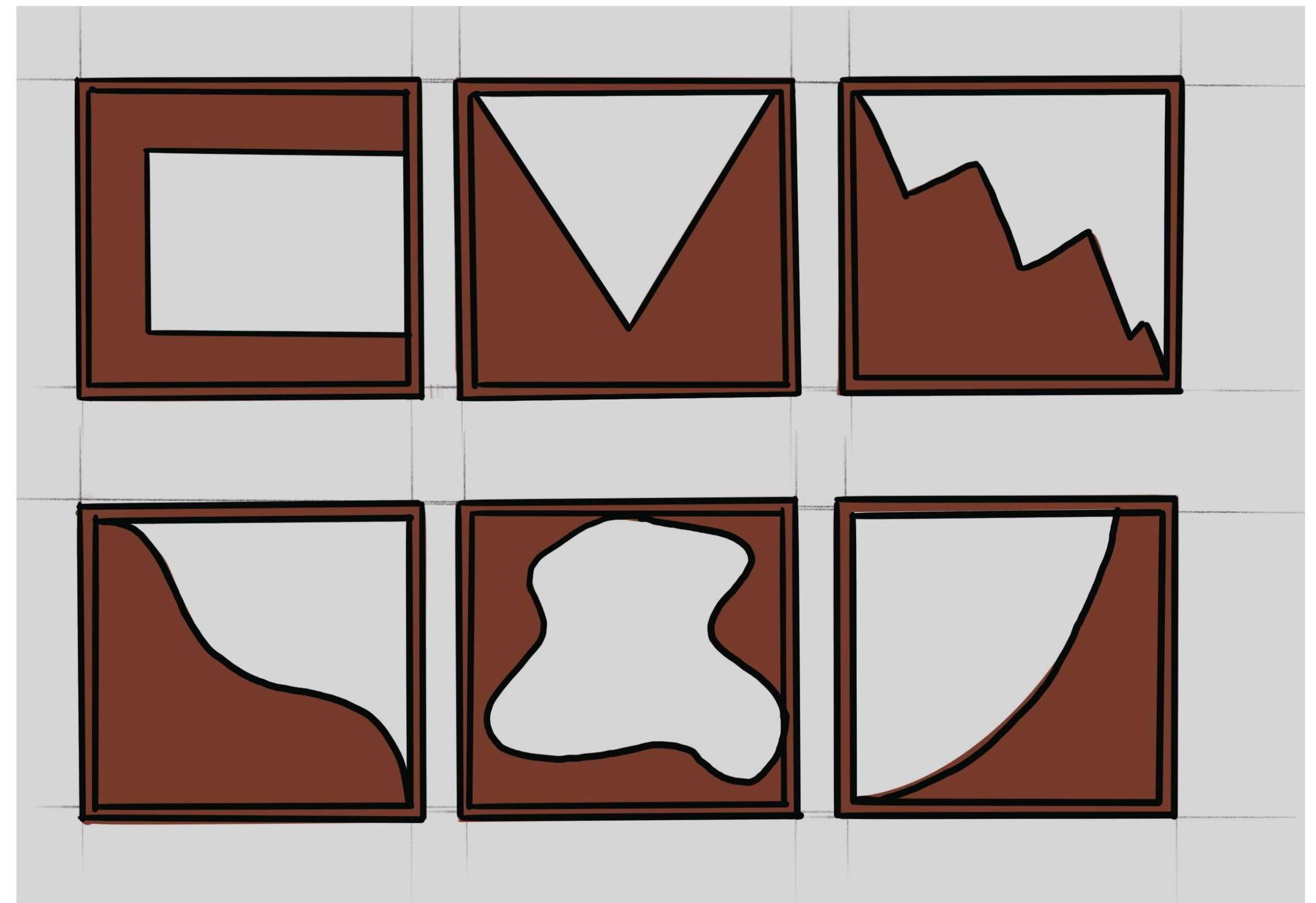
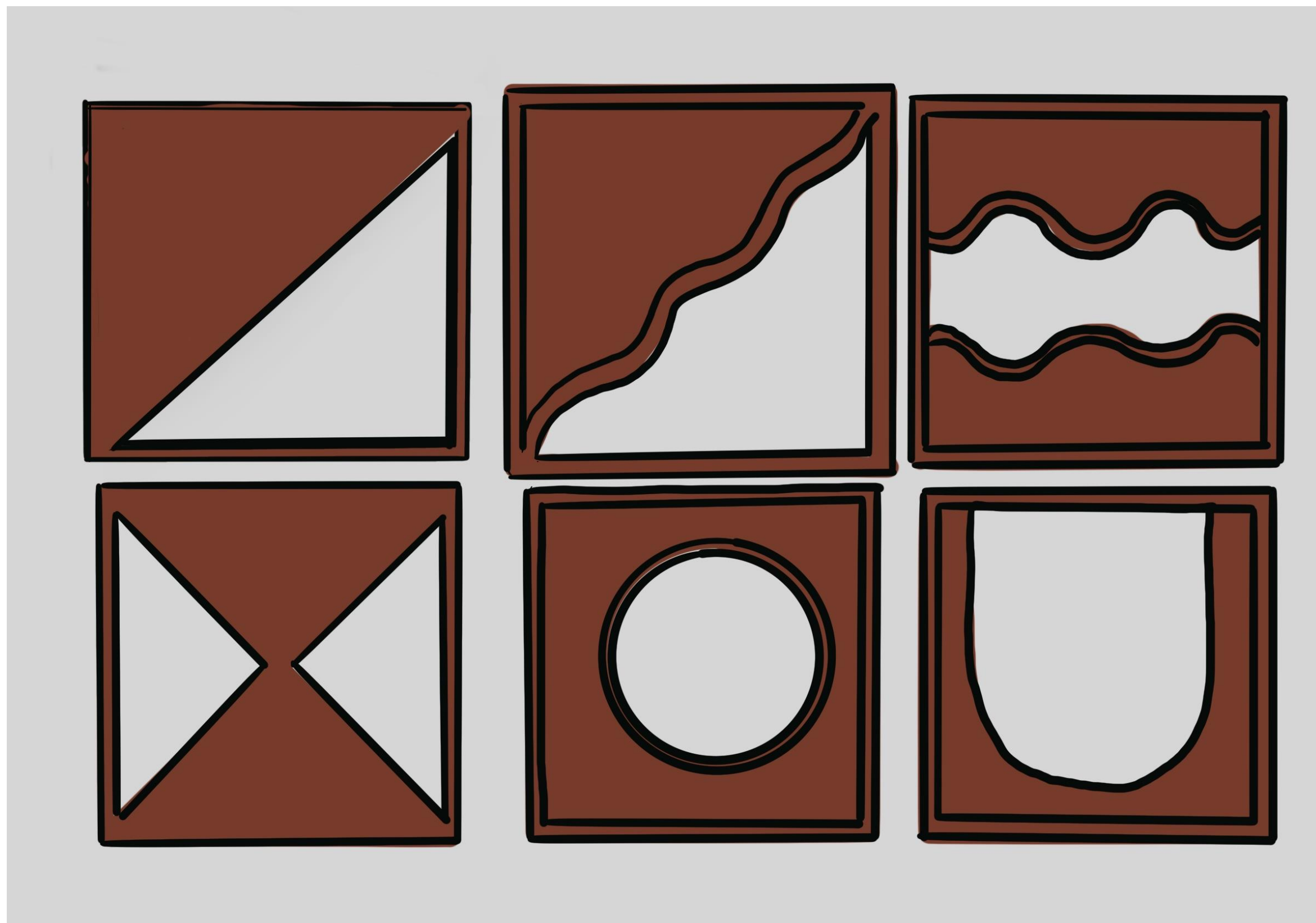


Organic Shapes

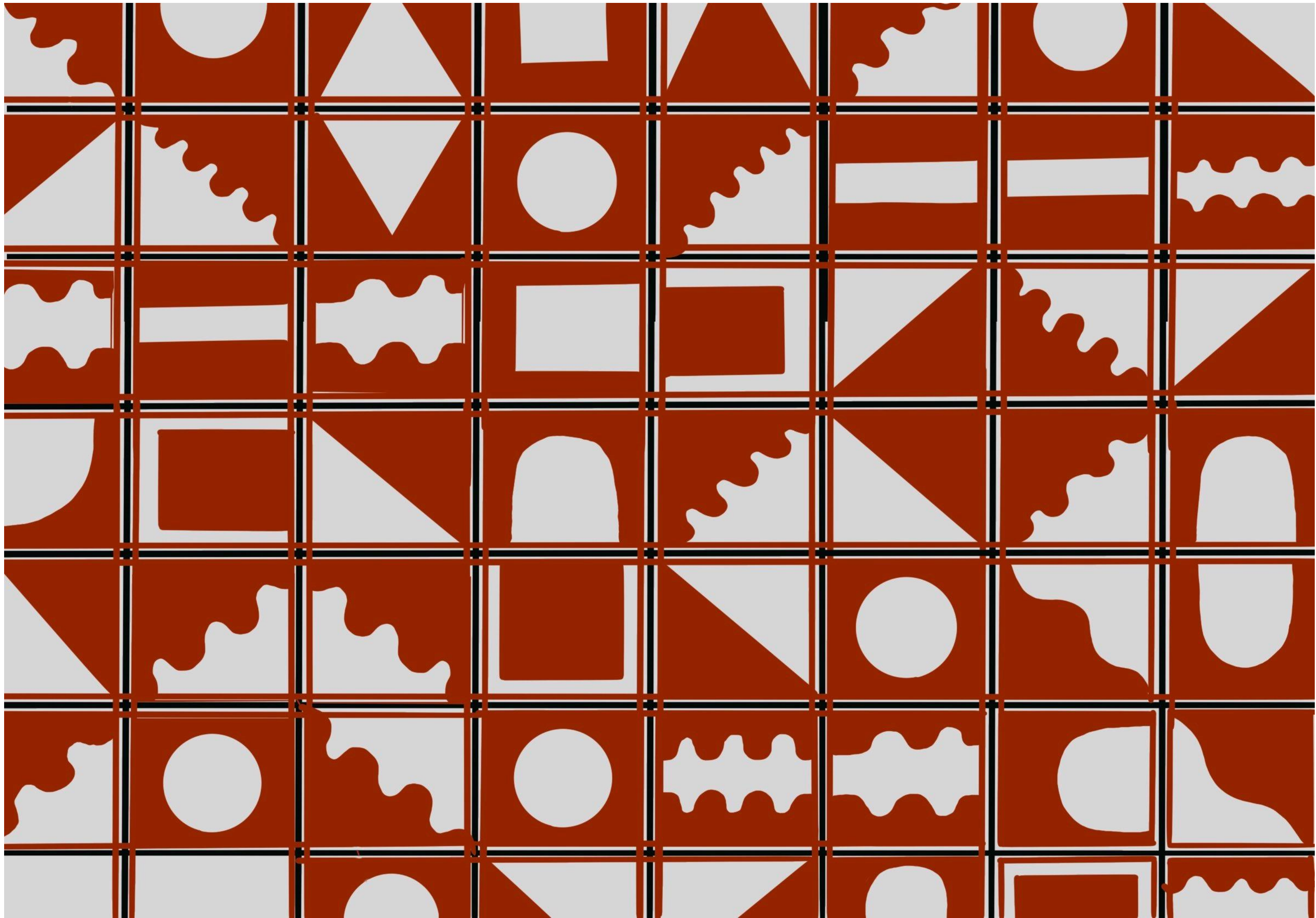


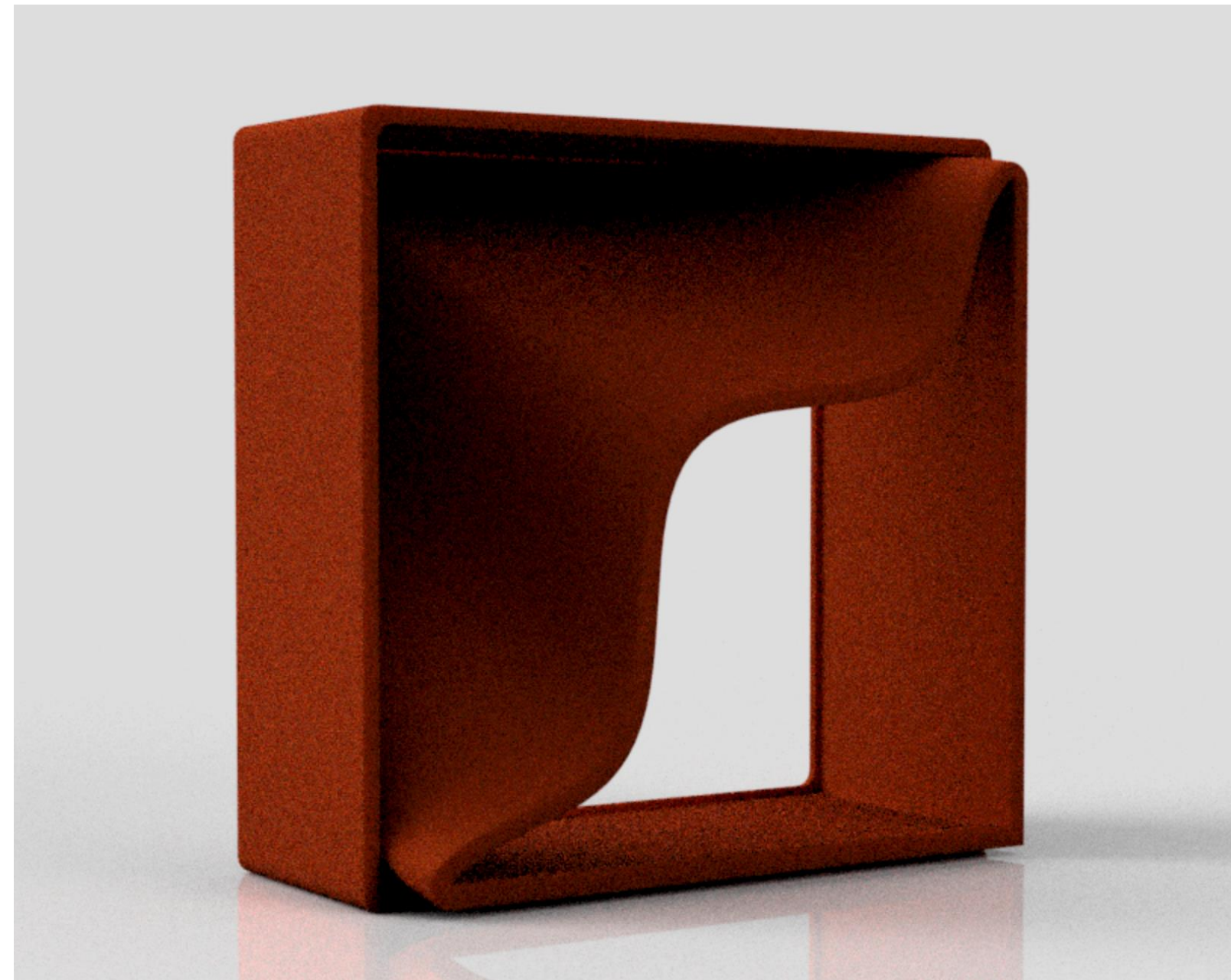
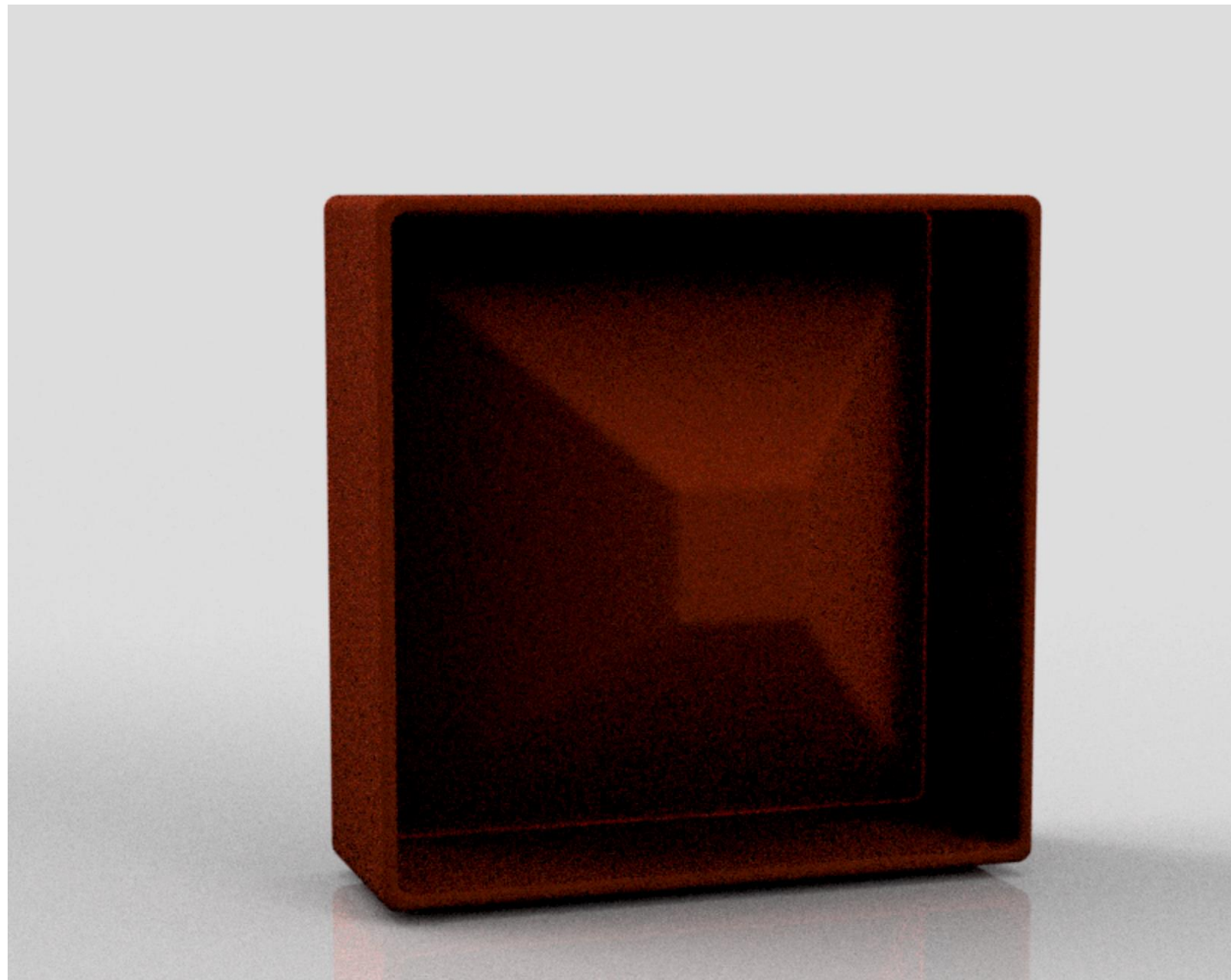
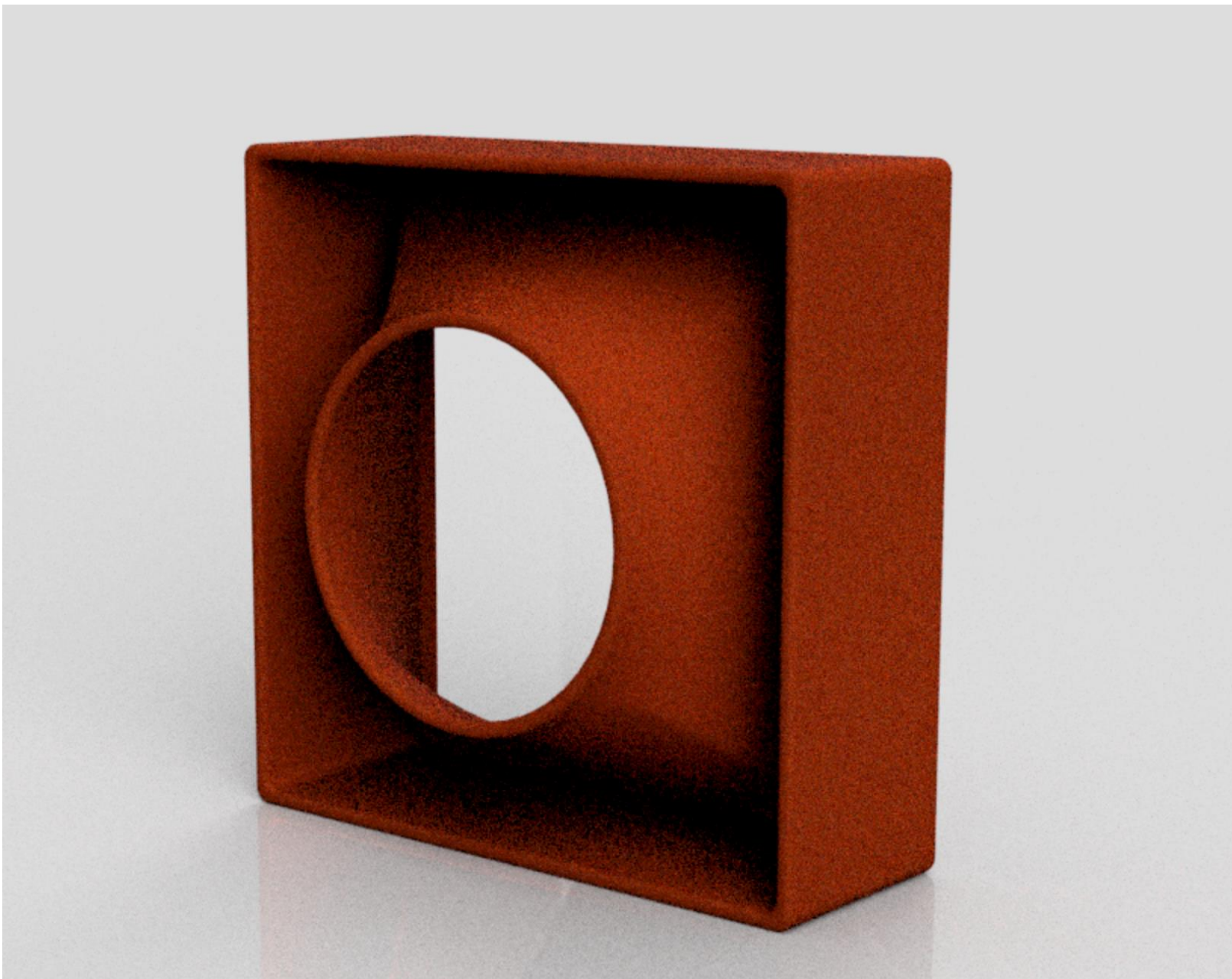
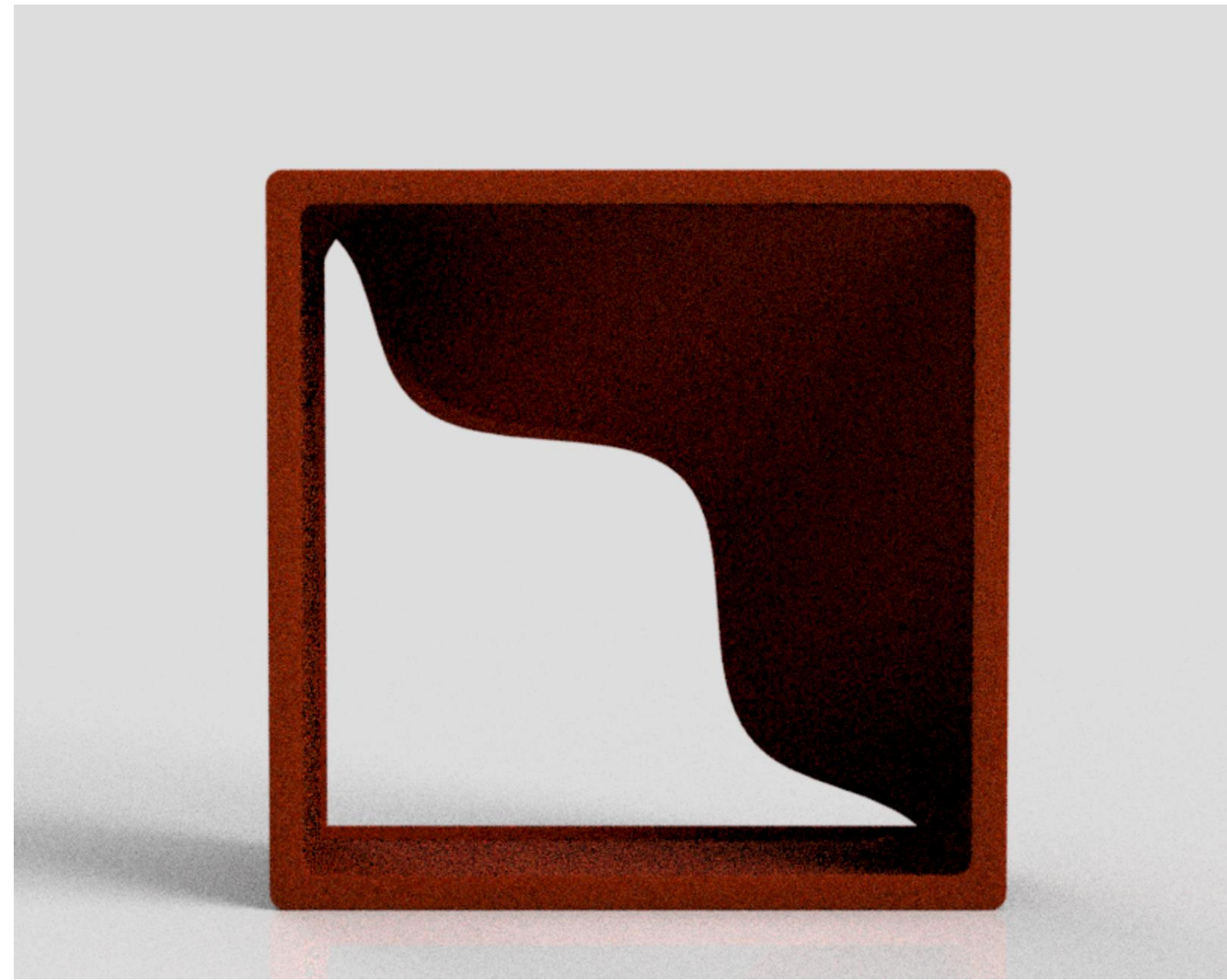
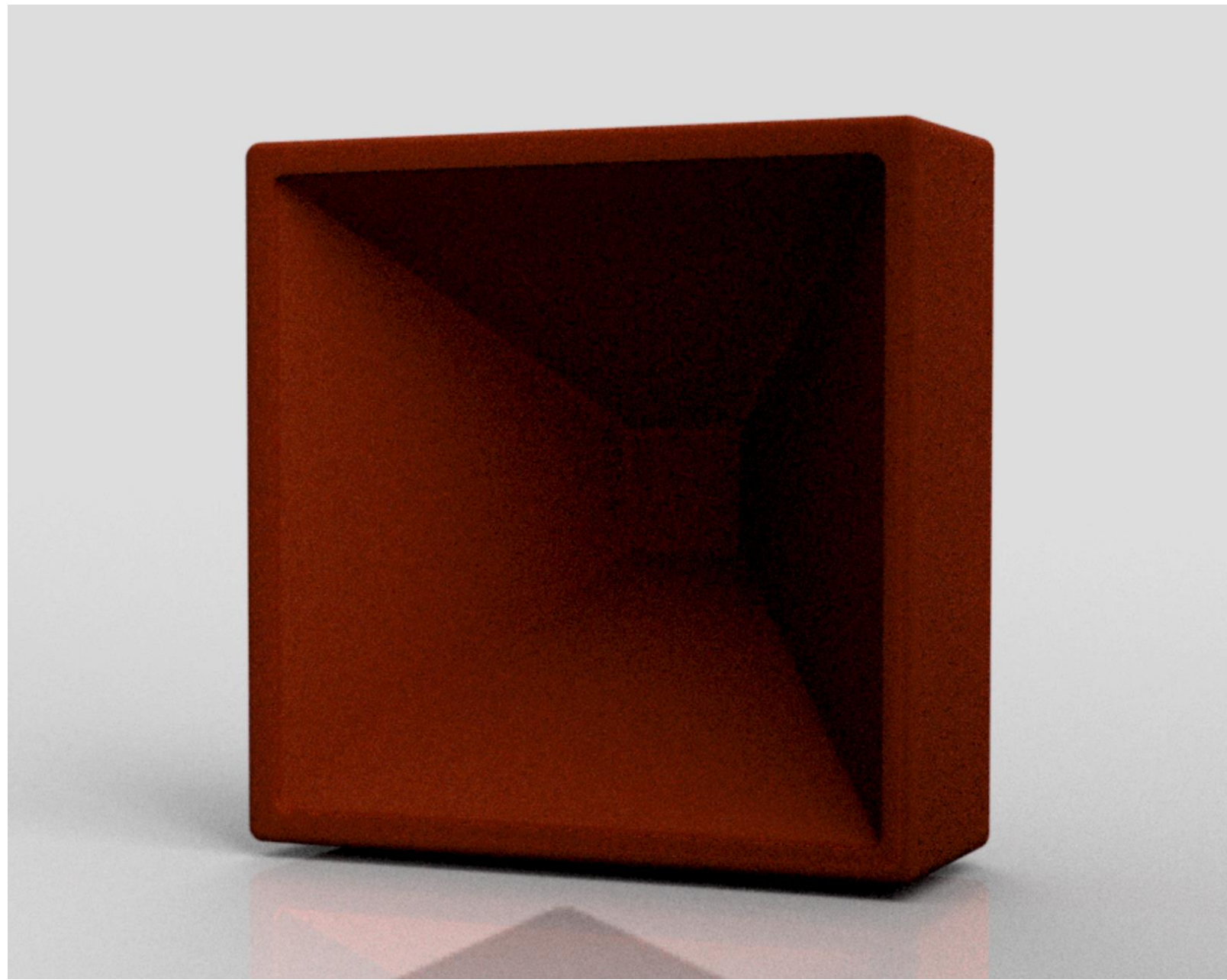
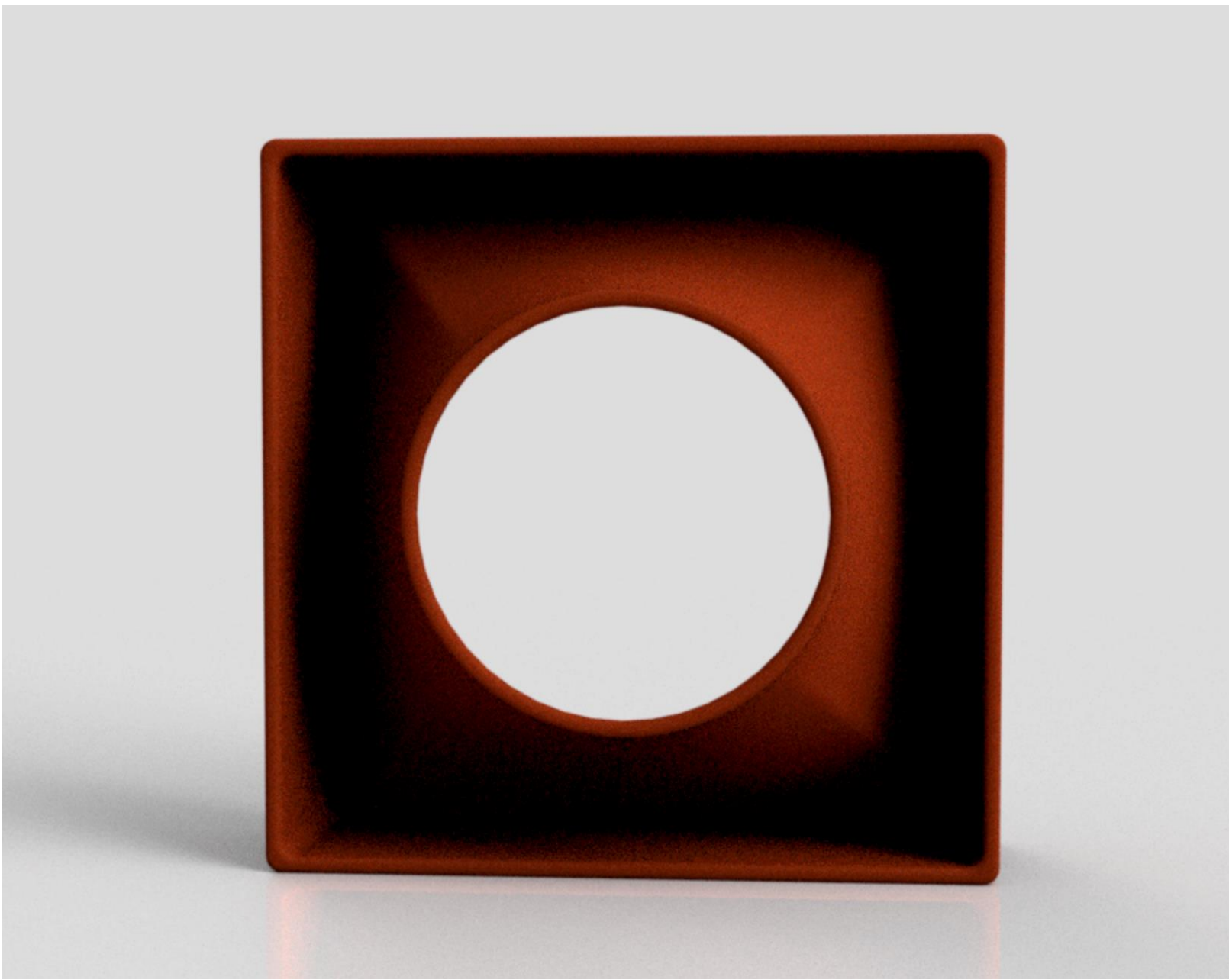
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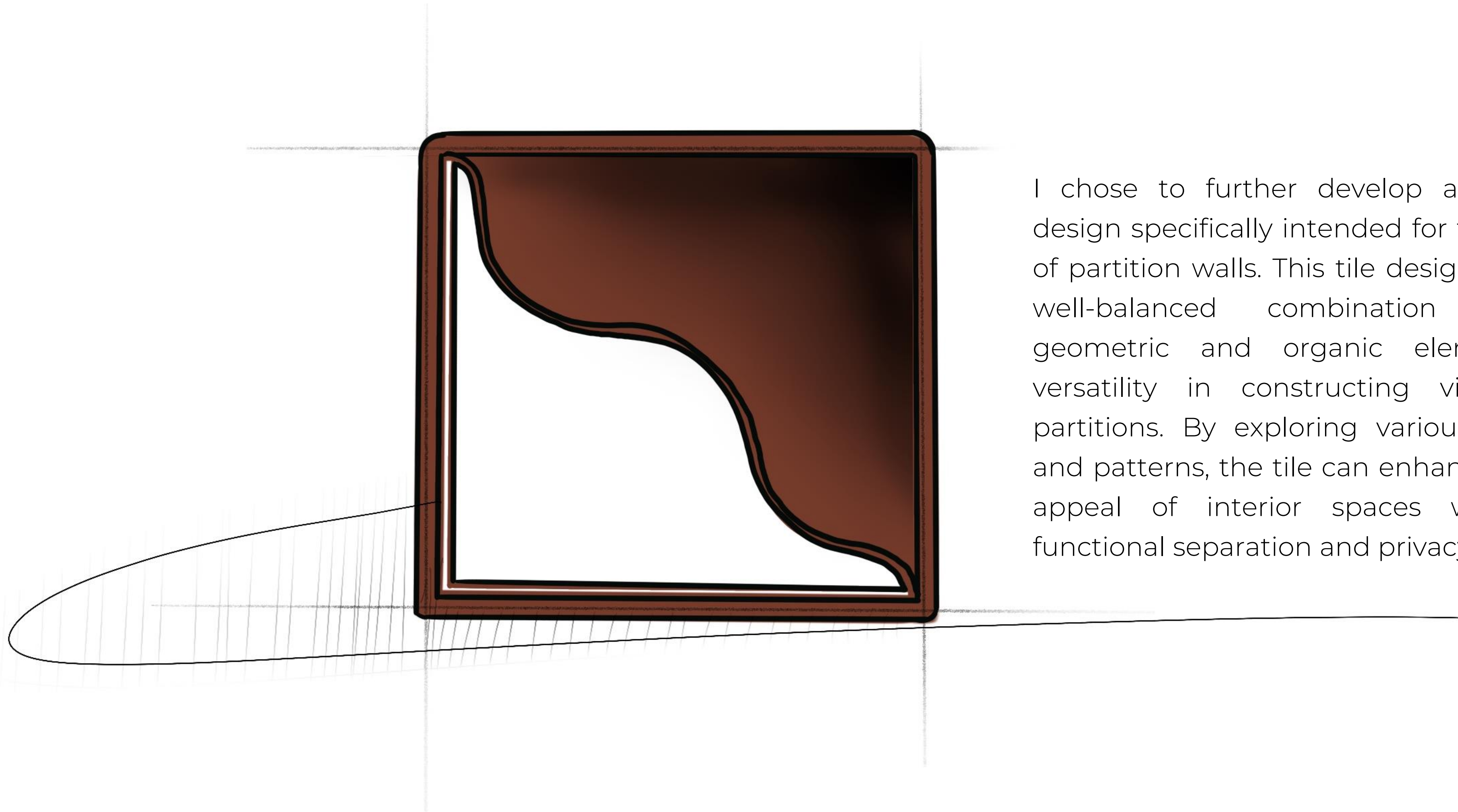




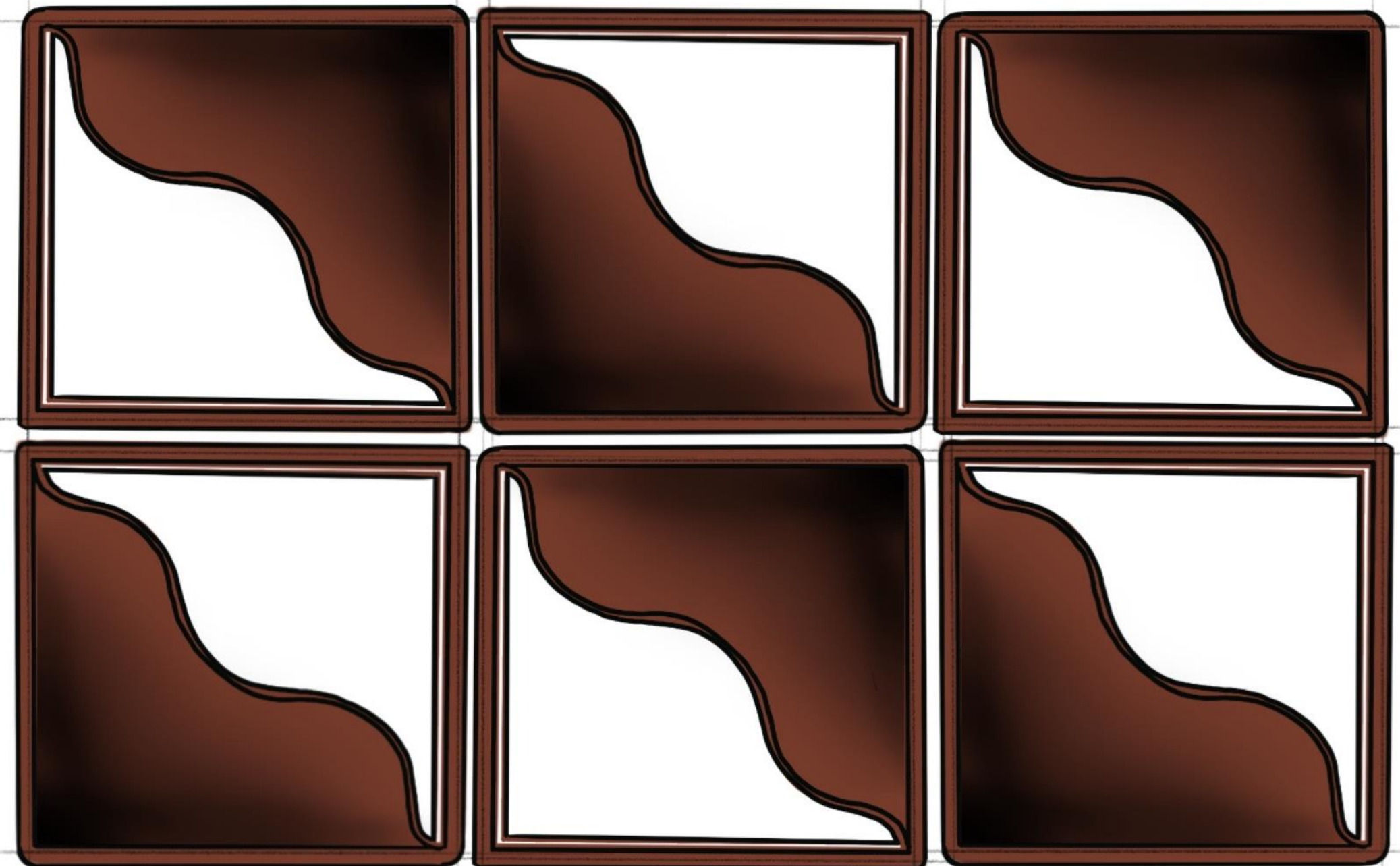
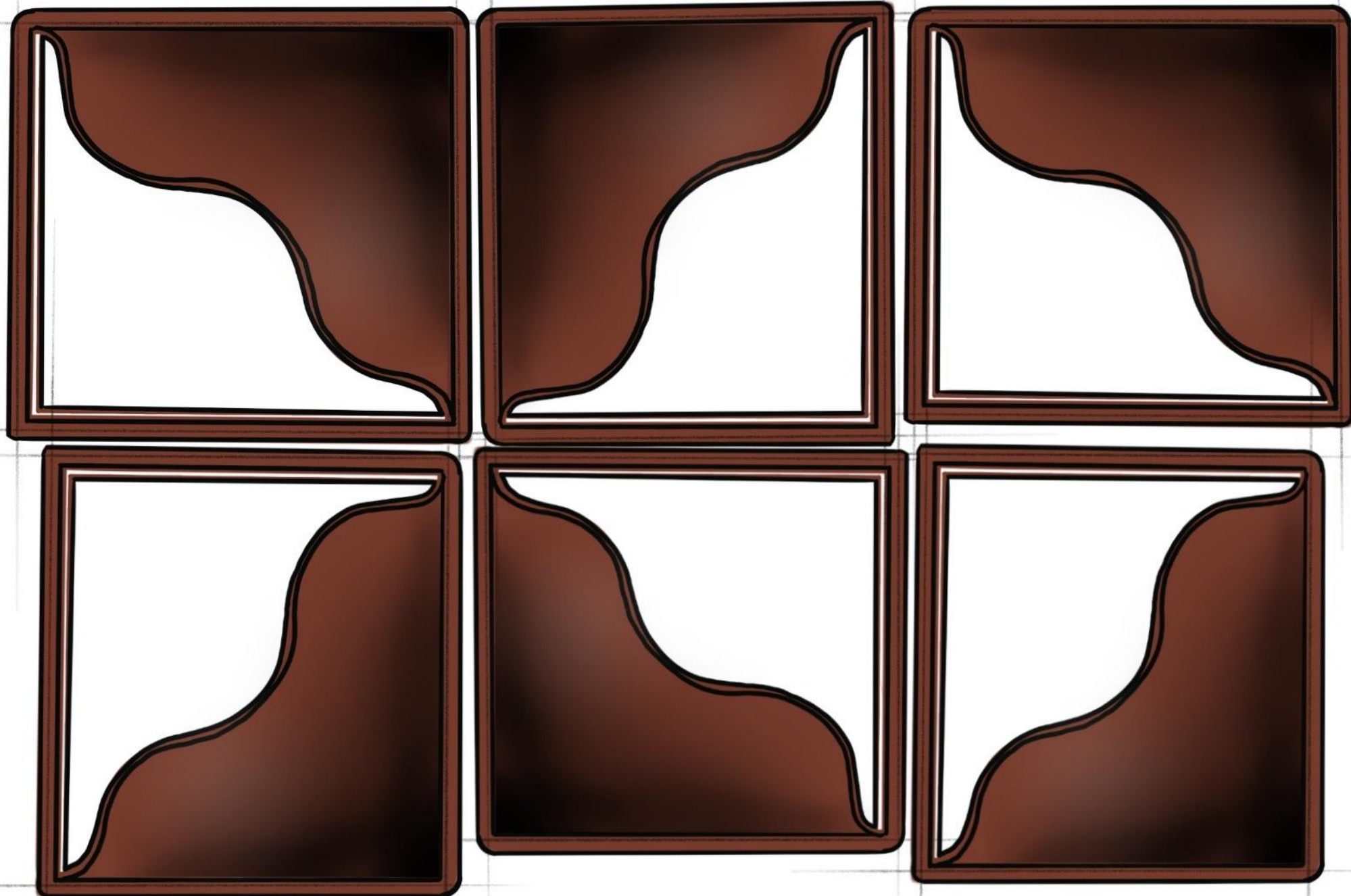


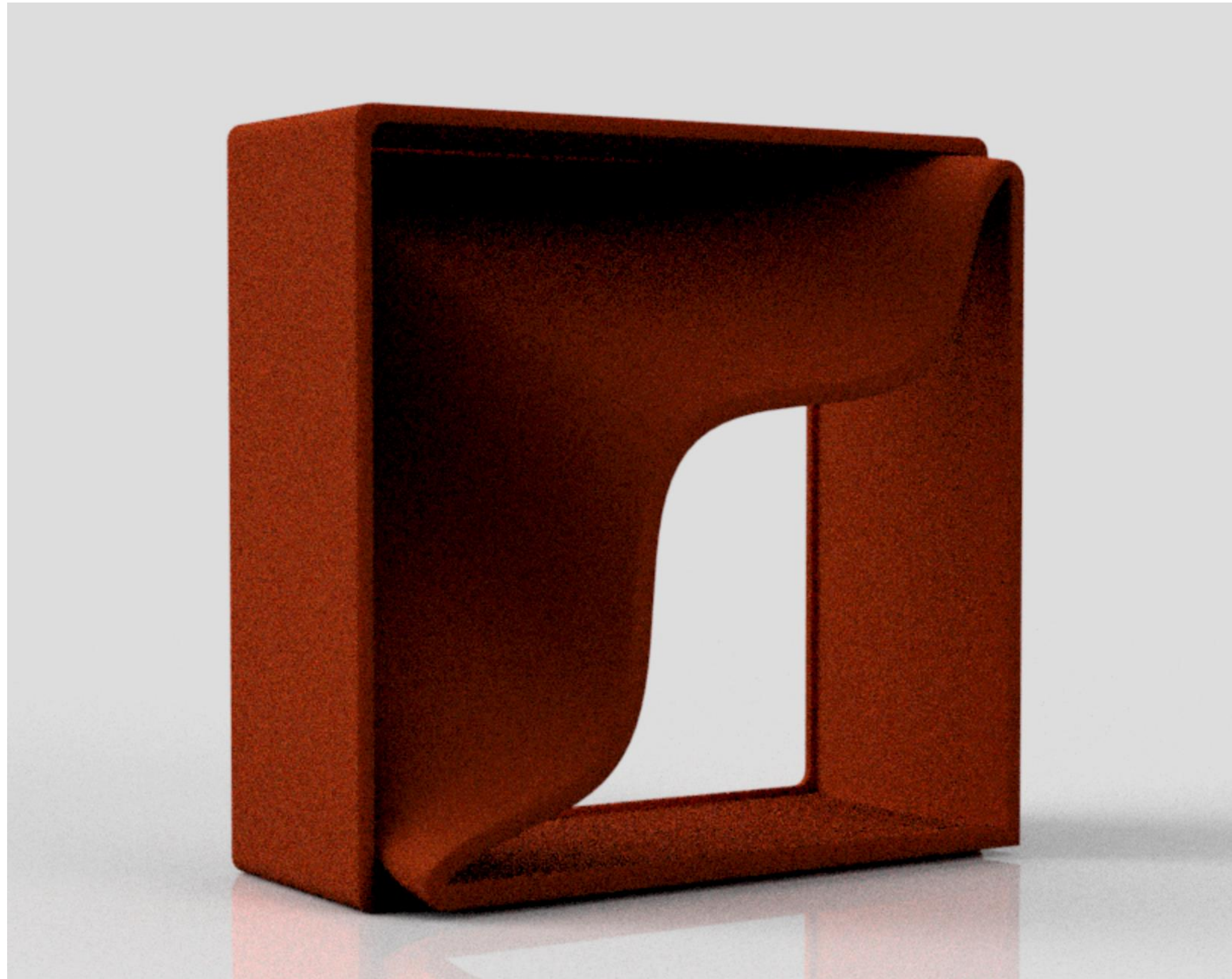




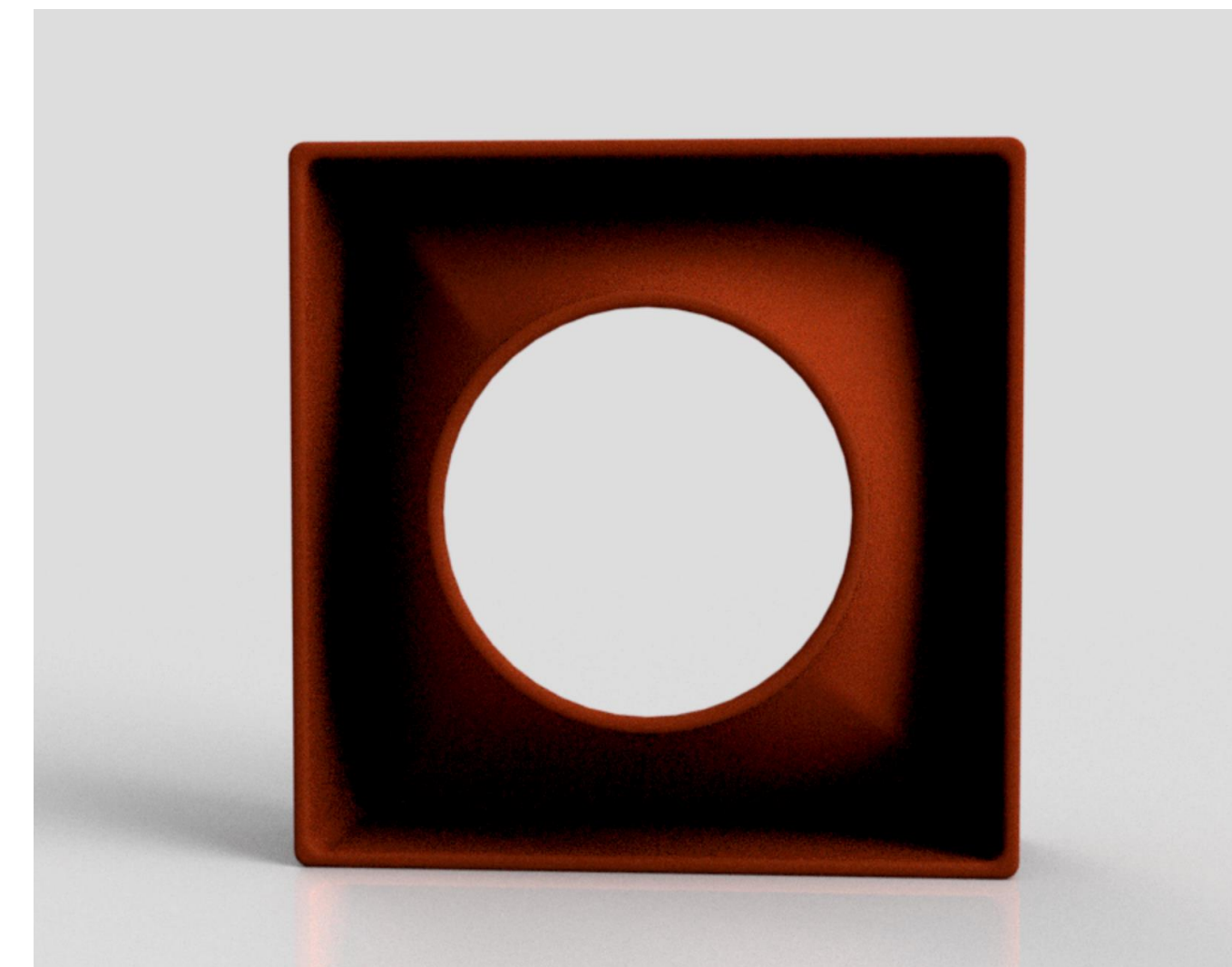


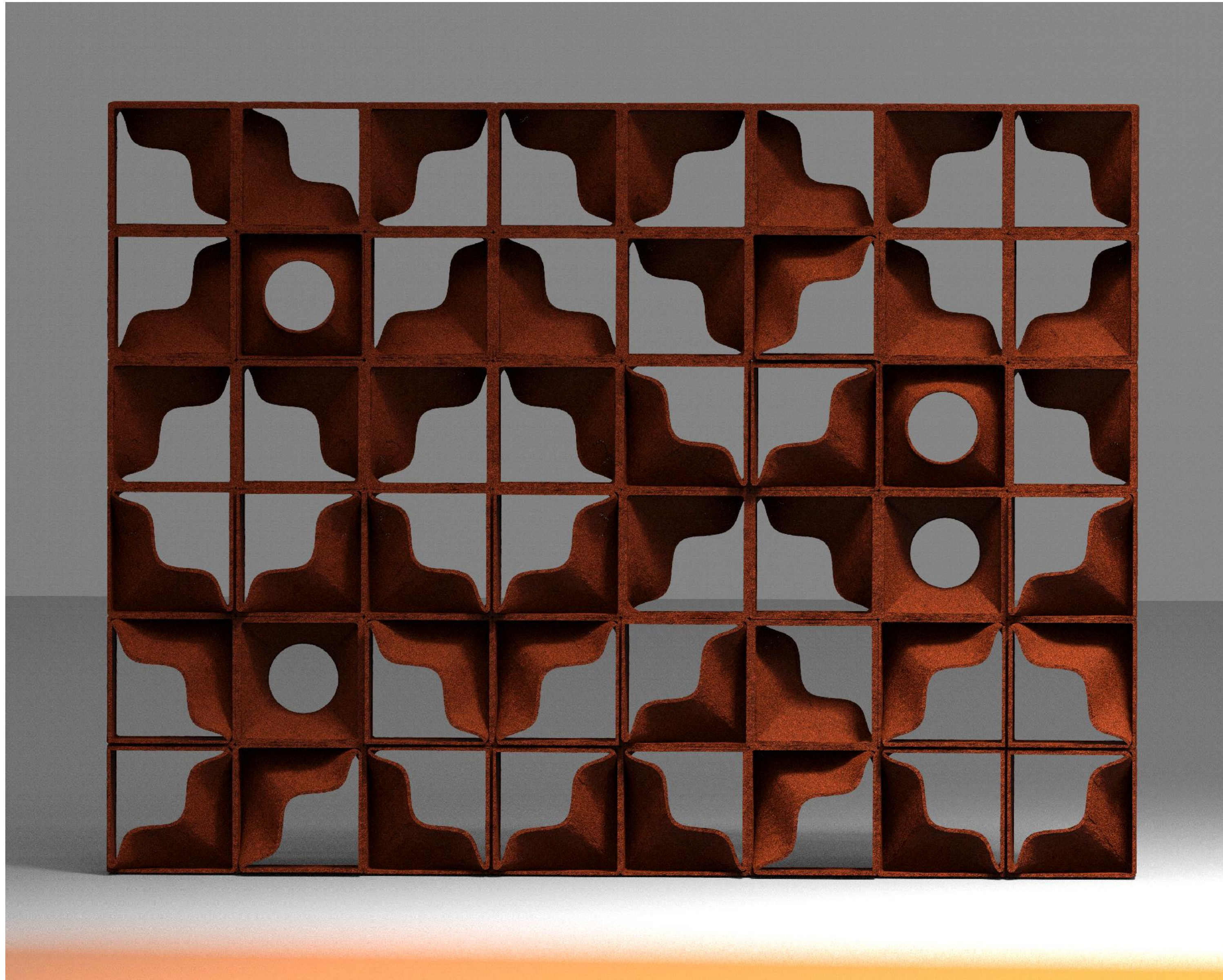
I chose to further develop an aesthetic tile design specifically intended for the construction of partition walls. This tile design incorporates a well-balanced combination of dynamic geometric and organic elements, offering versatility in constructing visually-appealing partitions. By exploring various arrangements and patterns, the tile can enhance the aesthetic appeal of interior spaces while providing functional separation and privacy.





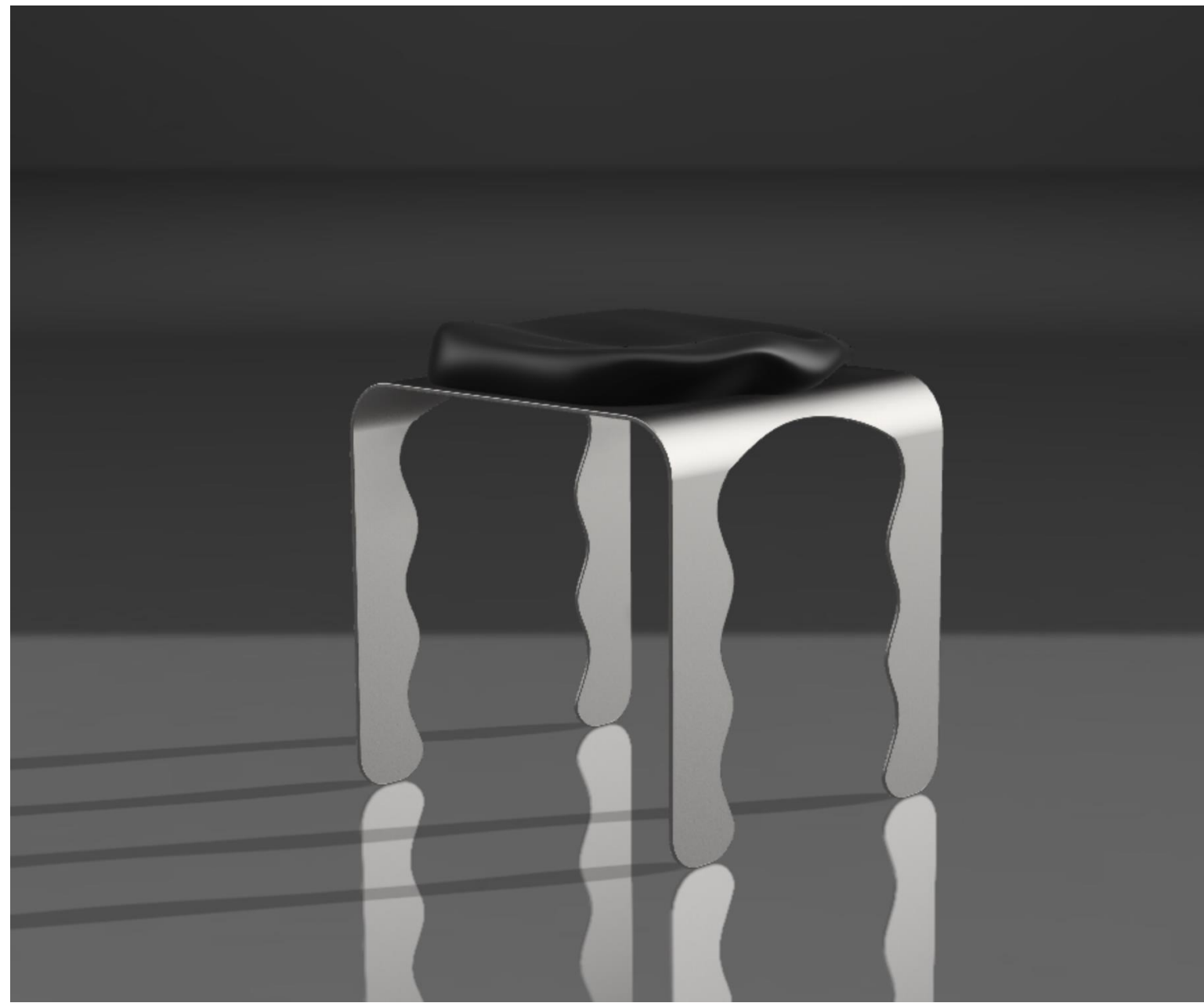
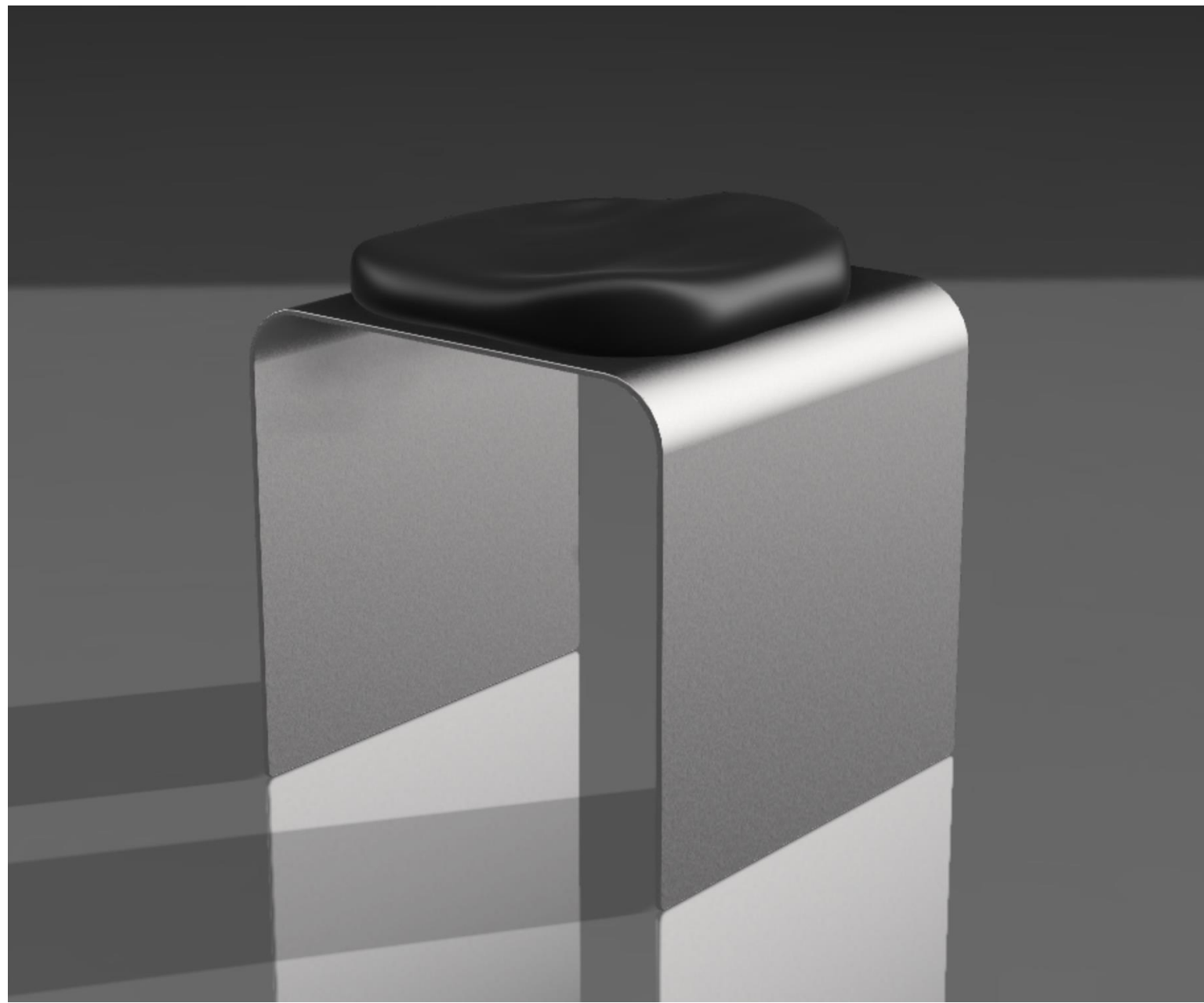
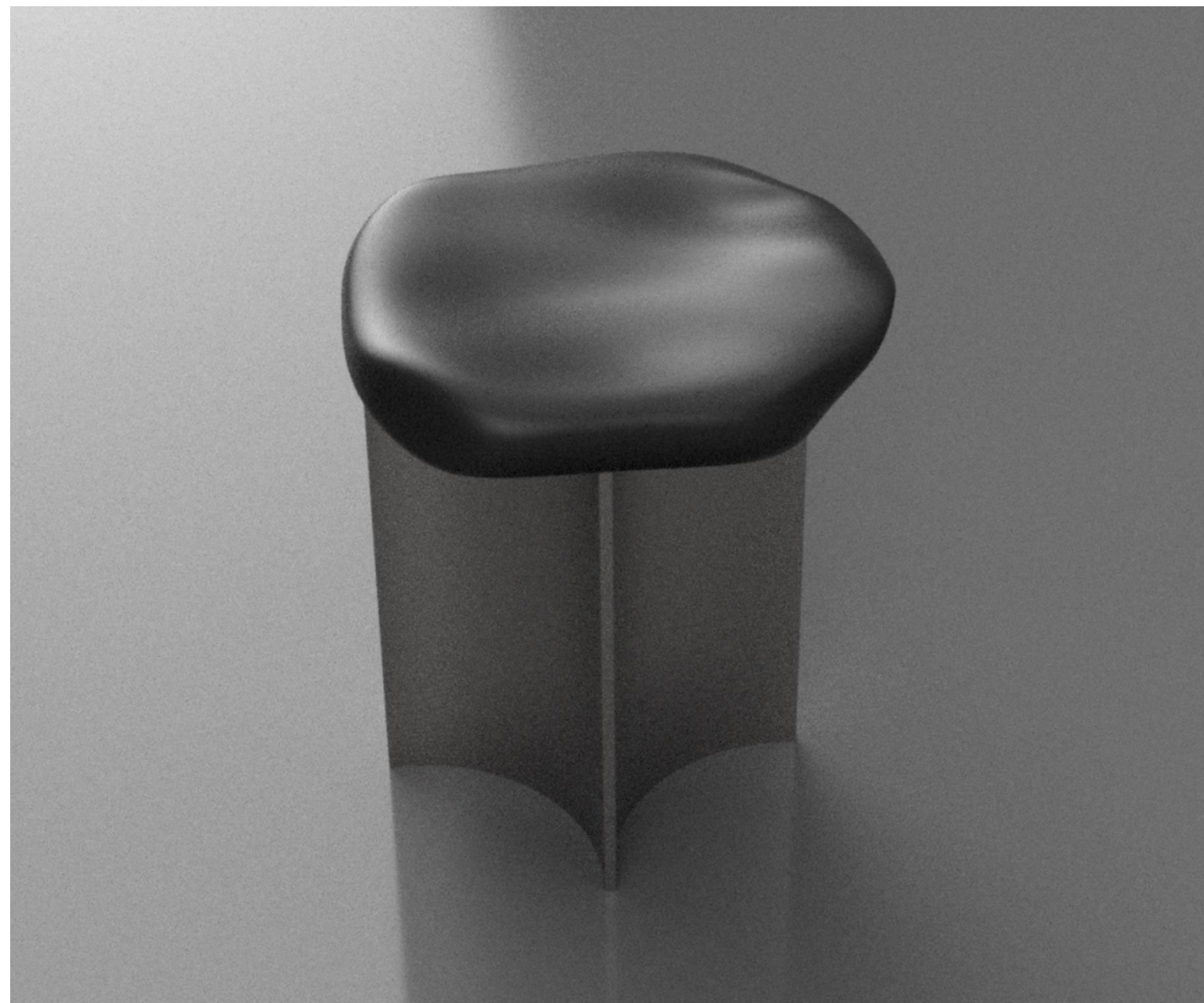
I focused on further developing tiles that incorporates a fusion of geometric and organic lines, while incorporating the circular tile as a complementary element. This combination provides a unique opportunity to create an extensive range of visually appealing partition walls.



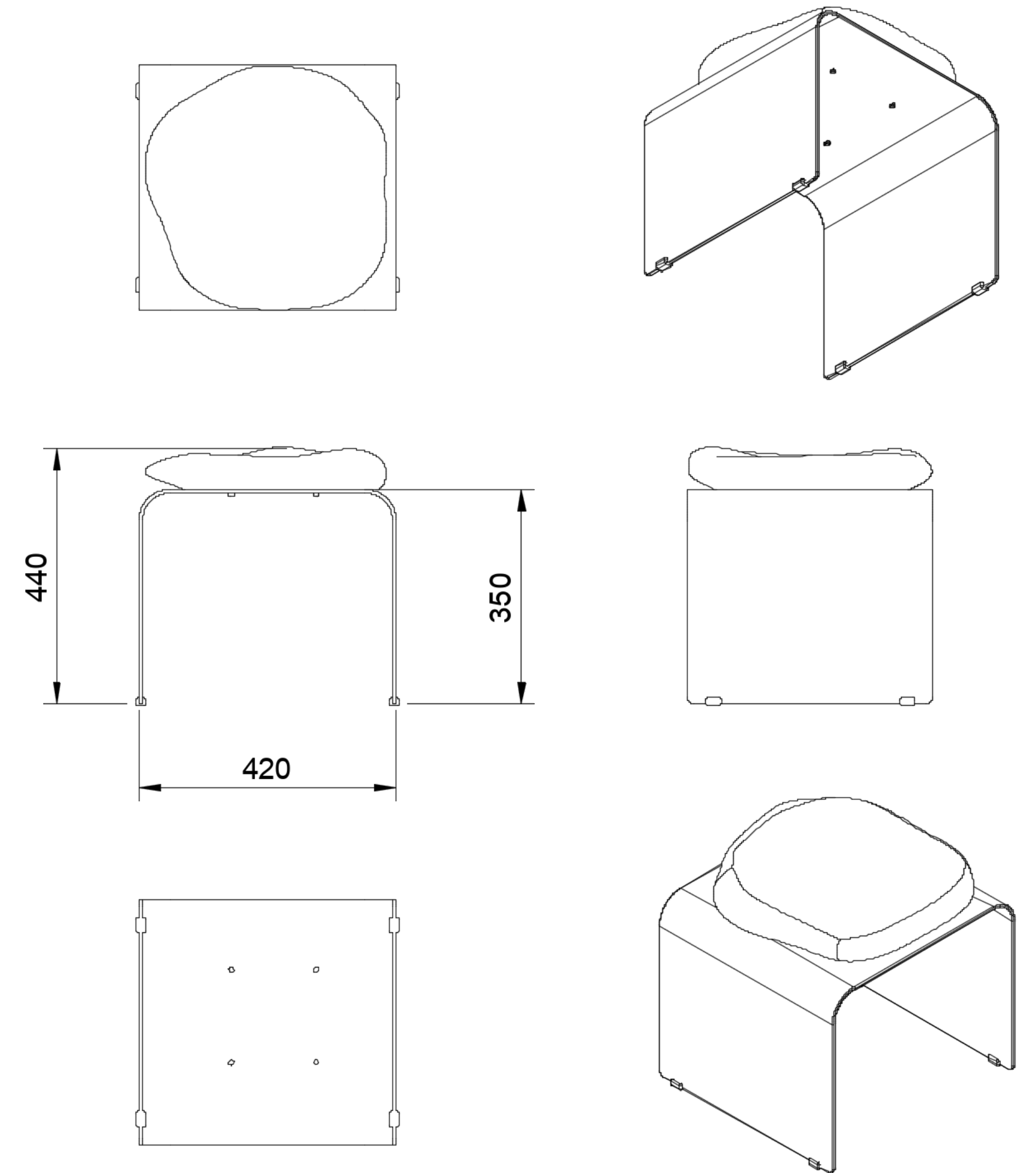
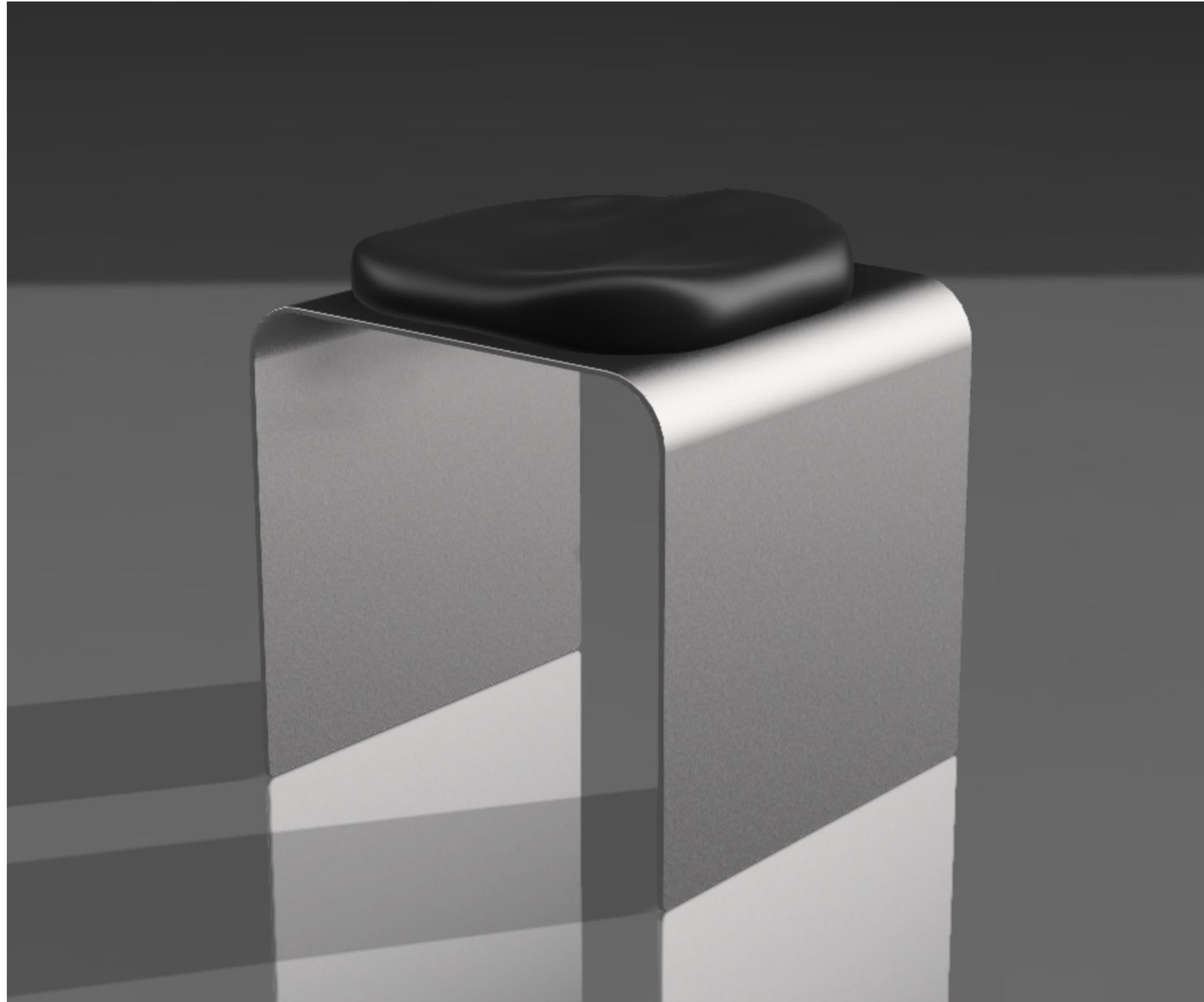


04

# Product Development







# Aesthetic Model





Light + Dark

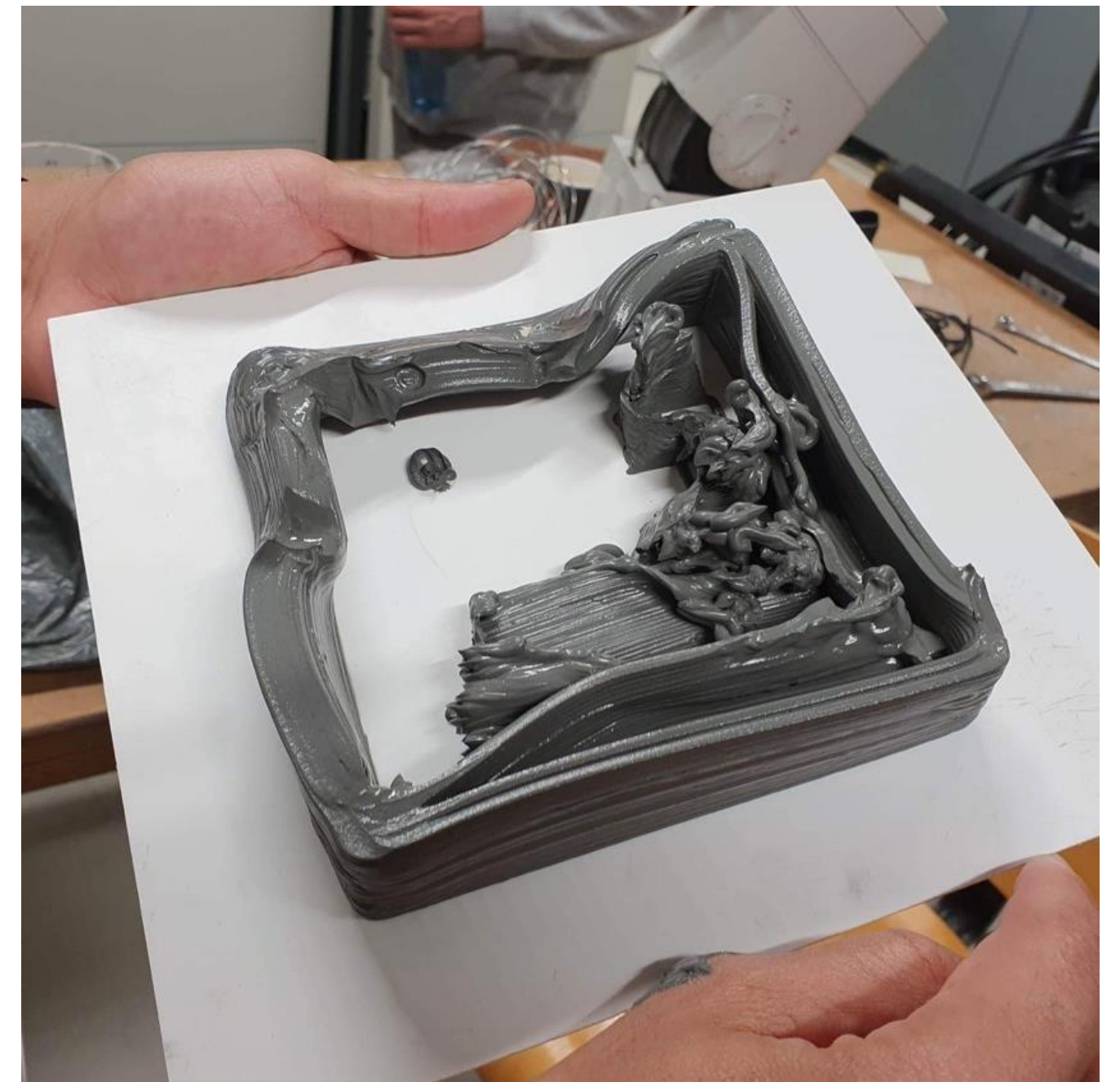
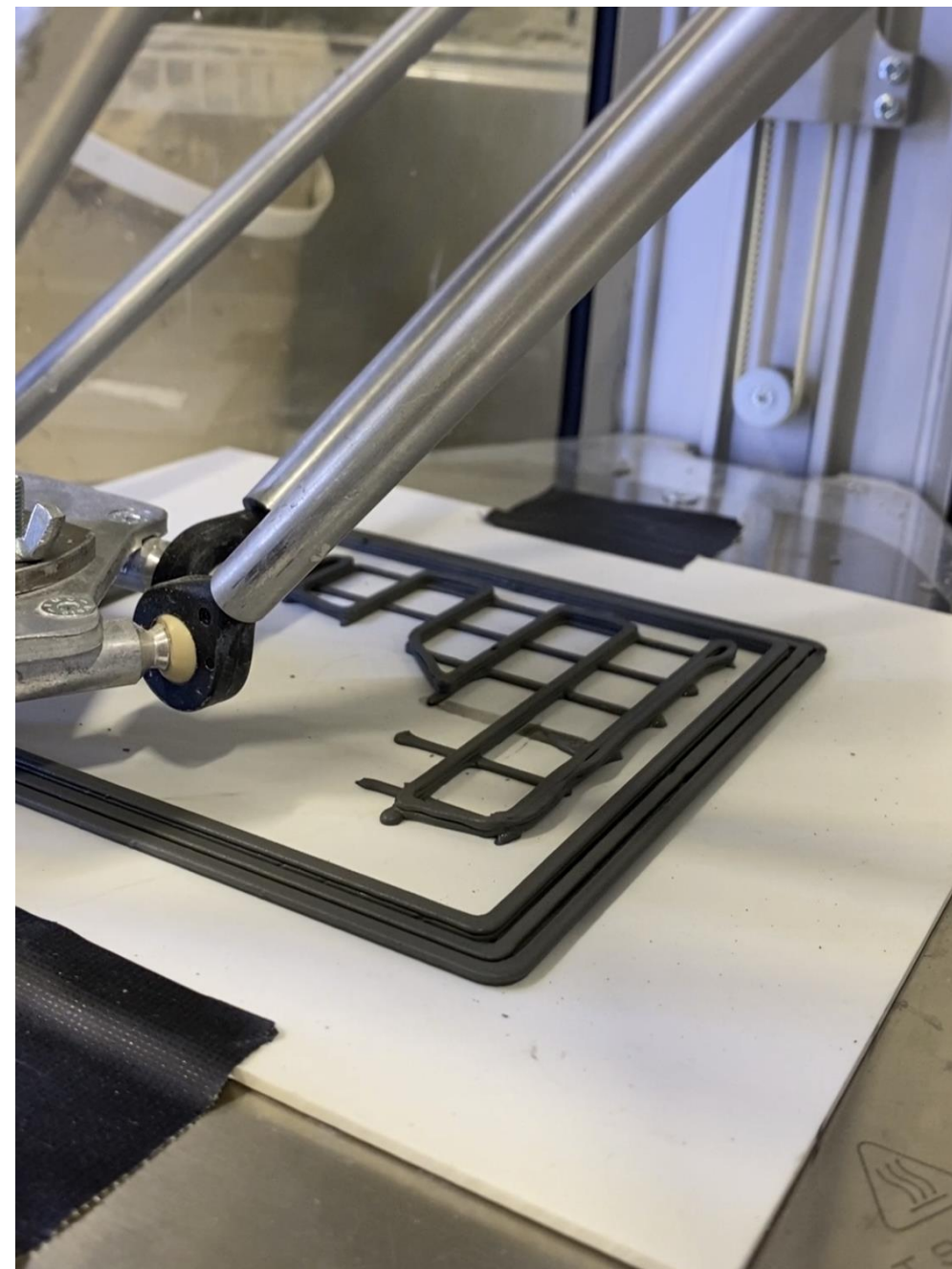
Pure dark

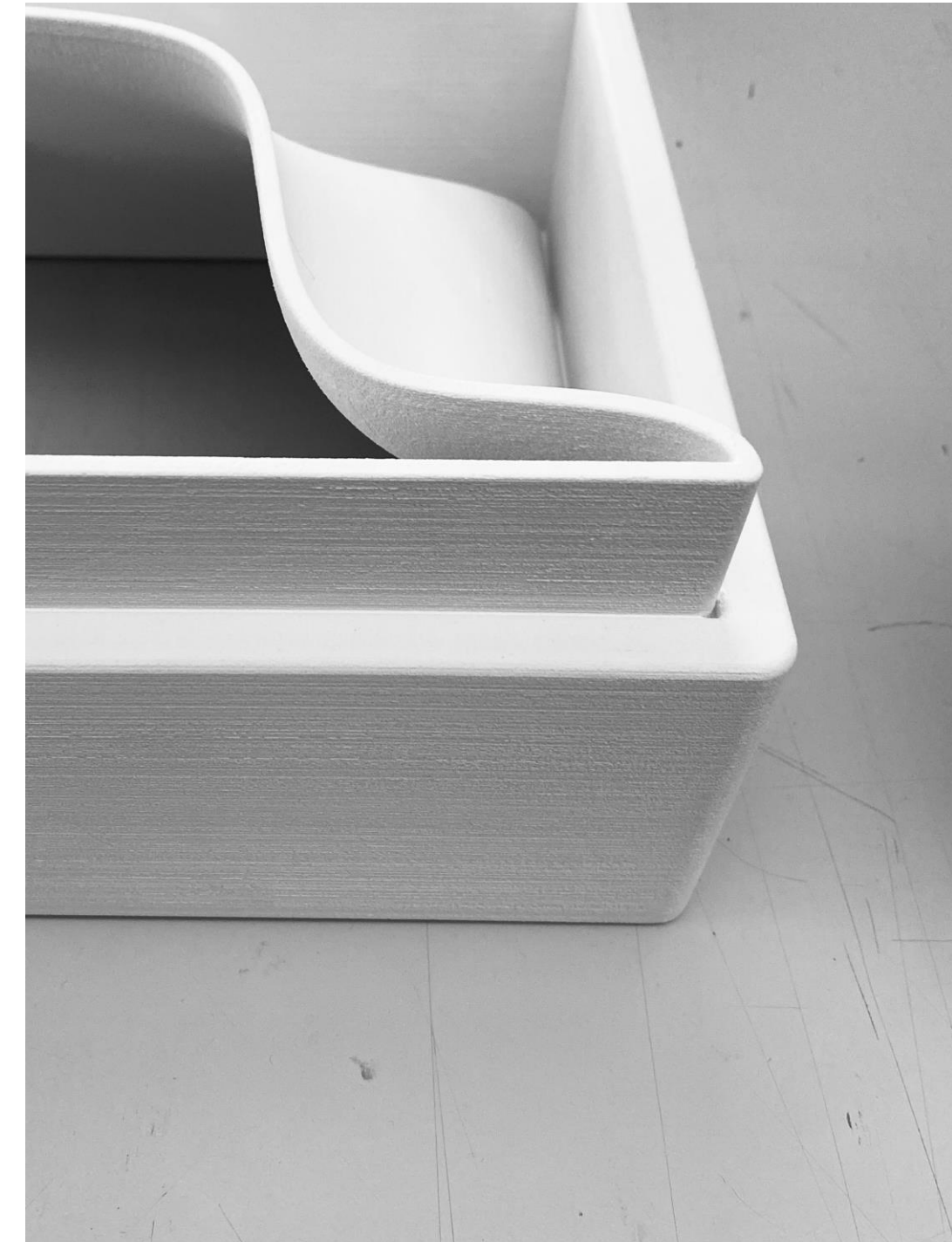
Dark + Light

Pure light

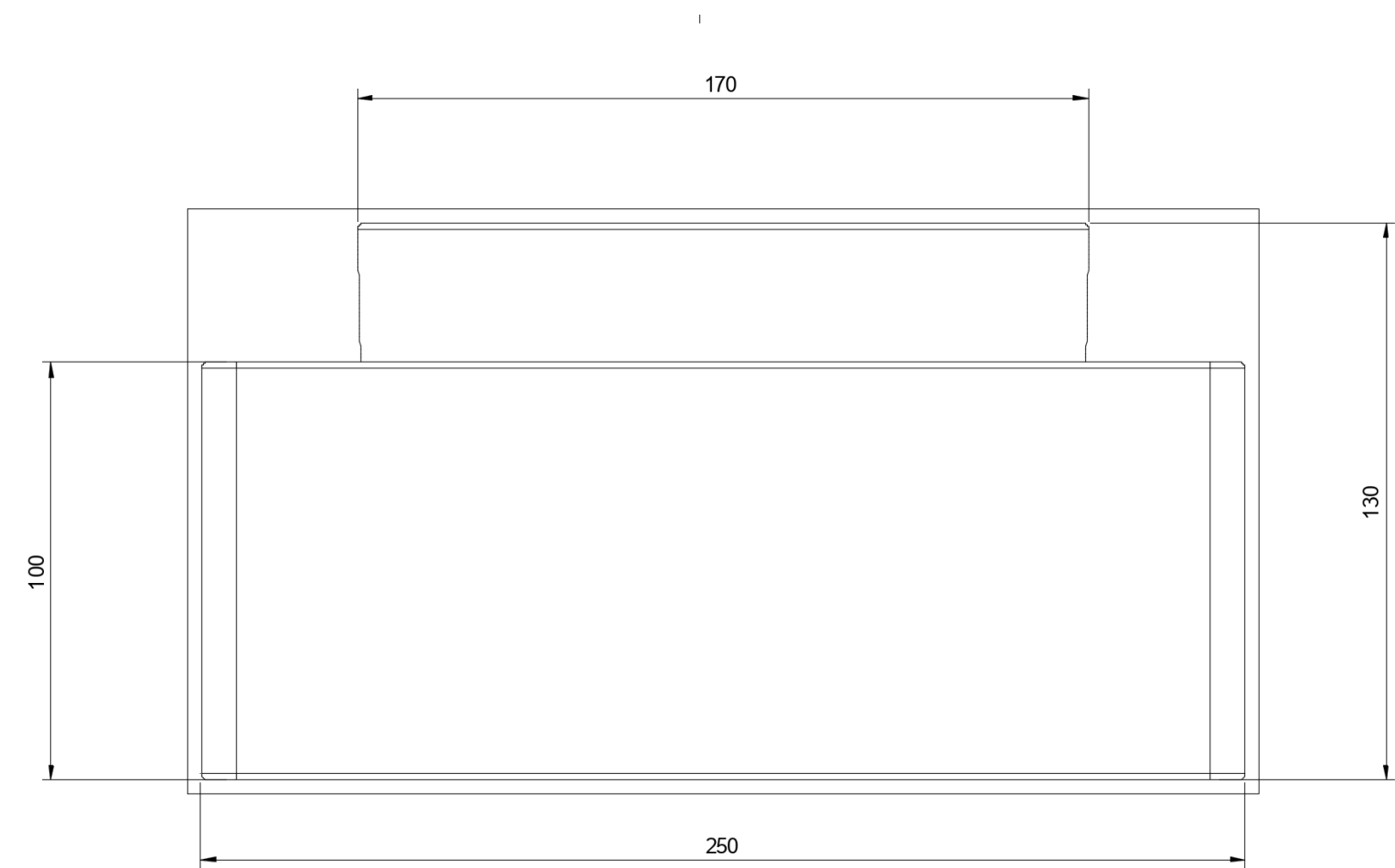
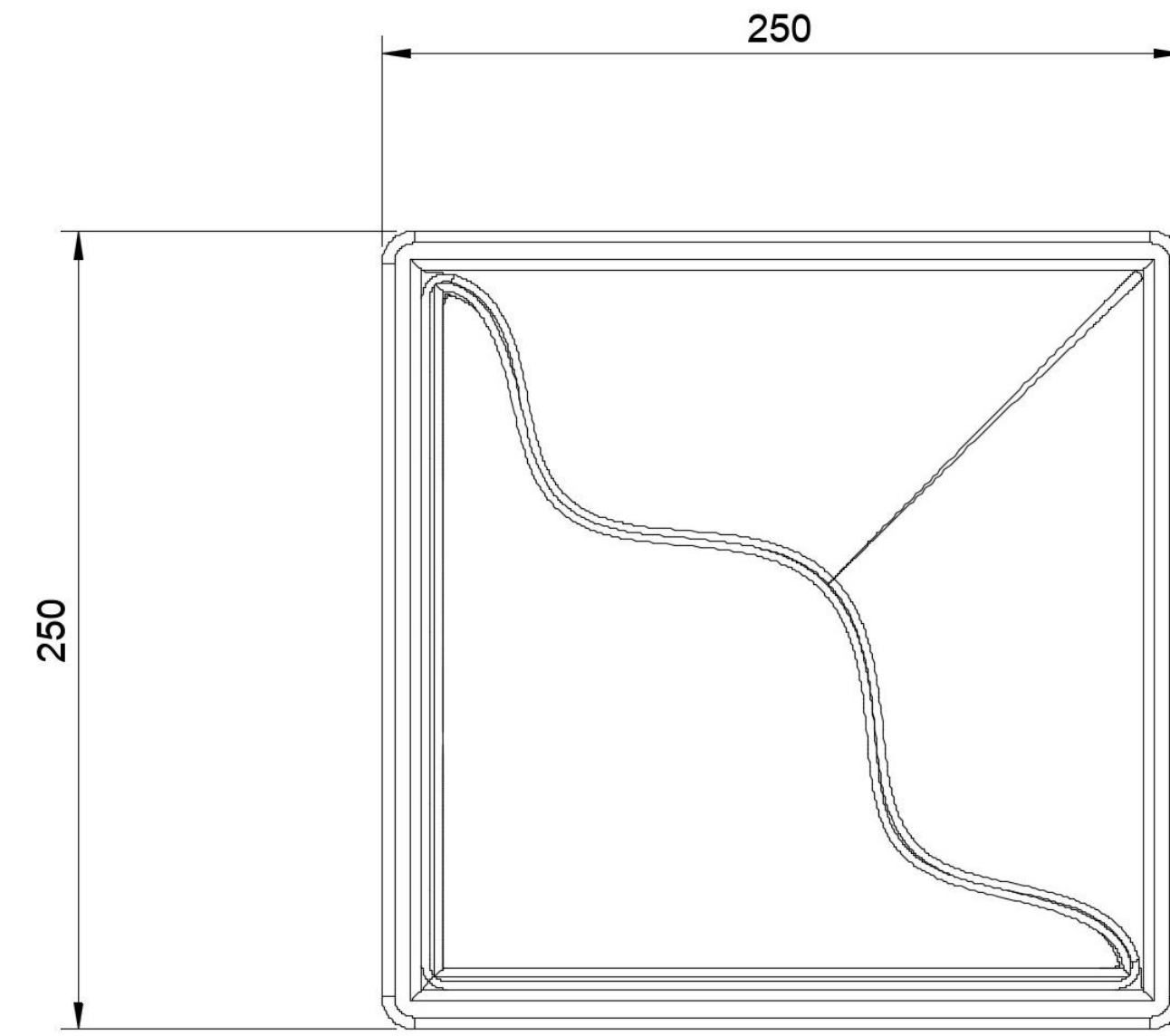
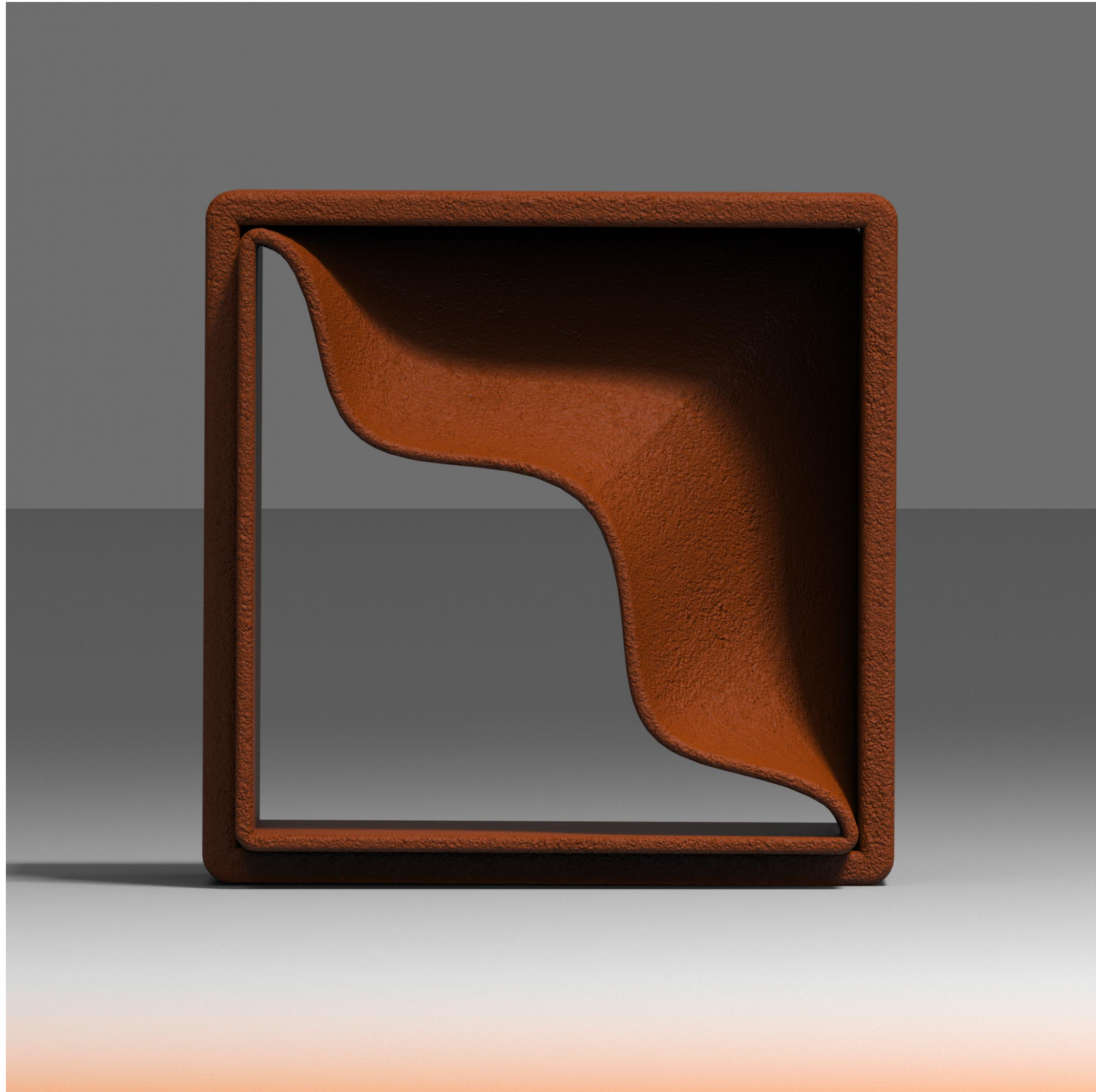
Matt lady

# Exploring production methods for partition tiles





After multiple failed attempts at producing the tiles using 3D printing, I proceeded to hand-build a tile in the original dimensions. For the final aesthetic model, I 3D printed four models with gypsum (1:1) and painted them to look like realistic finished models produced from blue clay.



# 05 Results

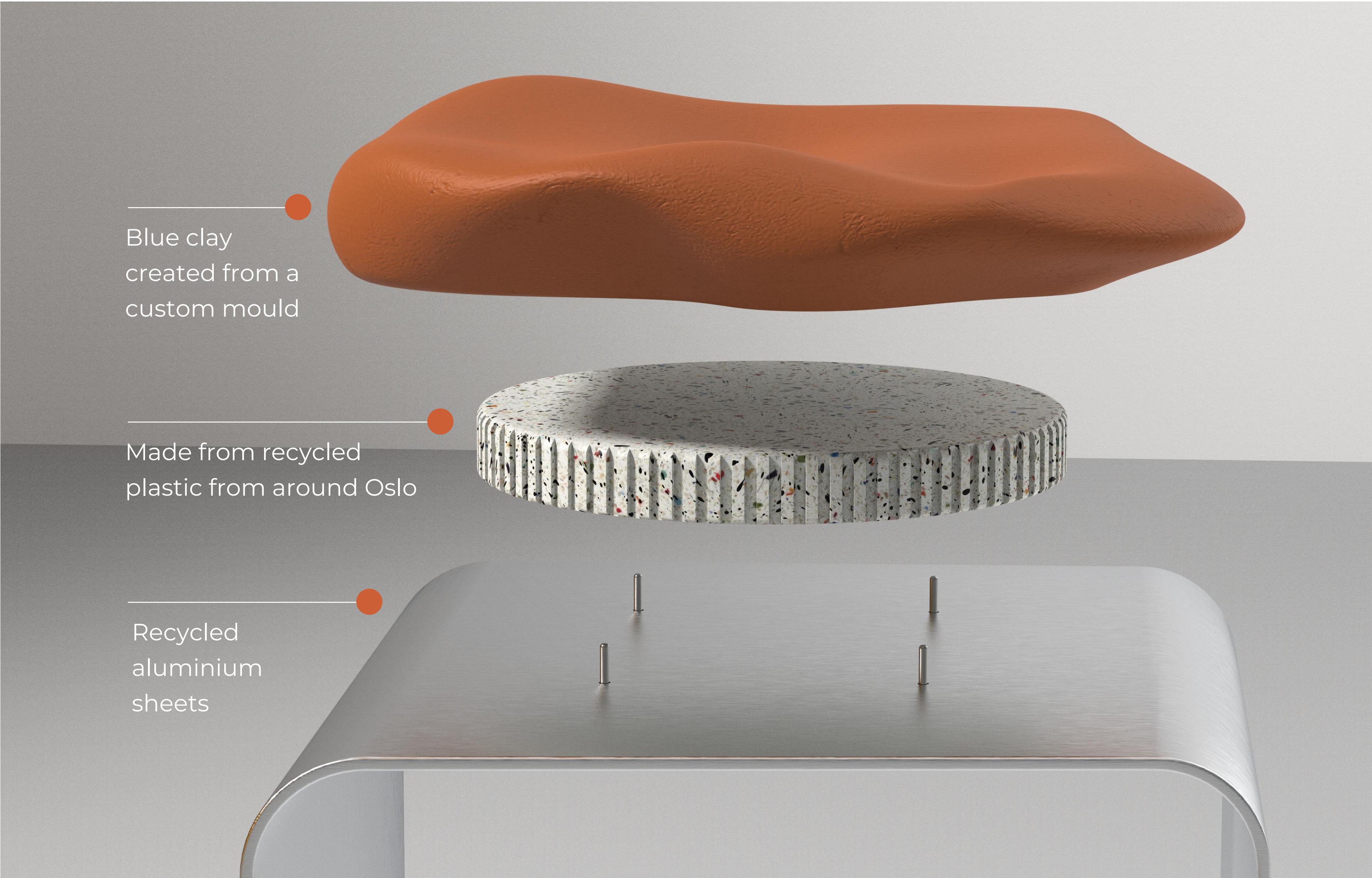


# The Stool

This decorative and functional stool is made primarily of sustainable materials. The top cushion is made of blue clay sourced from the Oslo area. The base is made of recycled aluminium sheets. They are connected with an additional part made from recycled plastic, as shown on the next page.





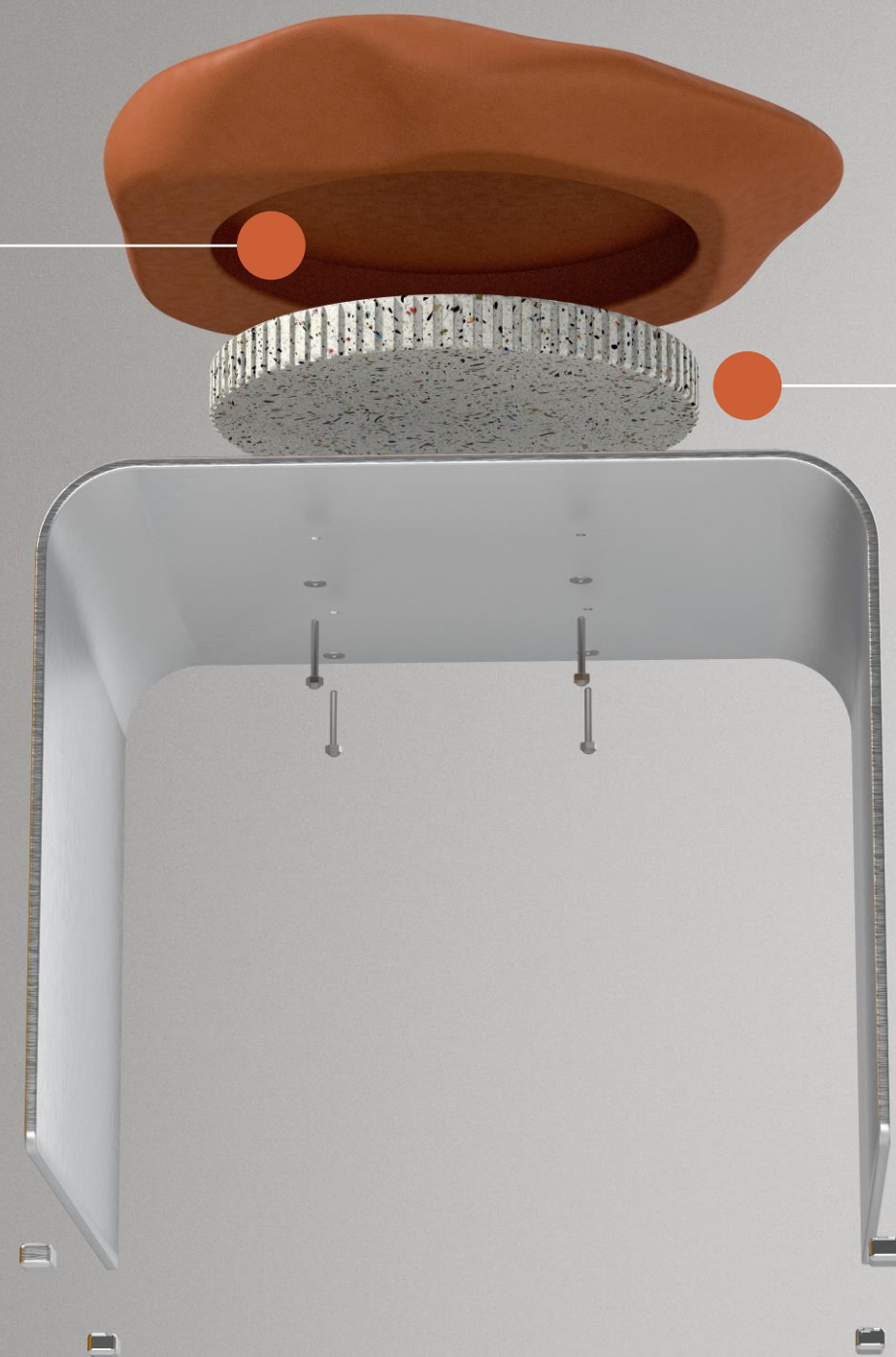


Blue clay  
created from a  
custom mould

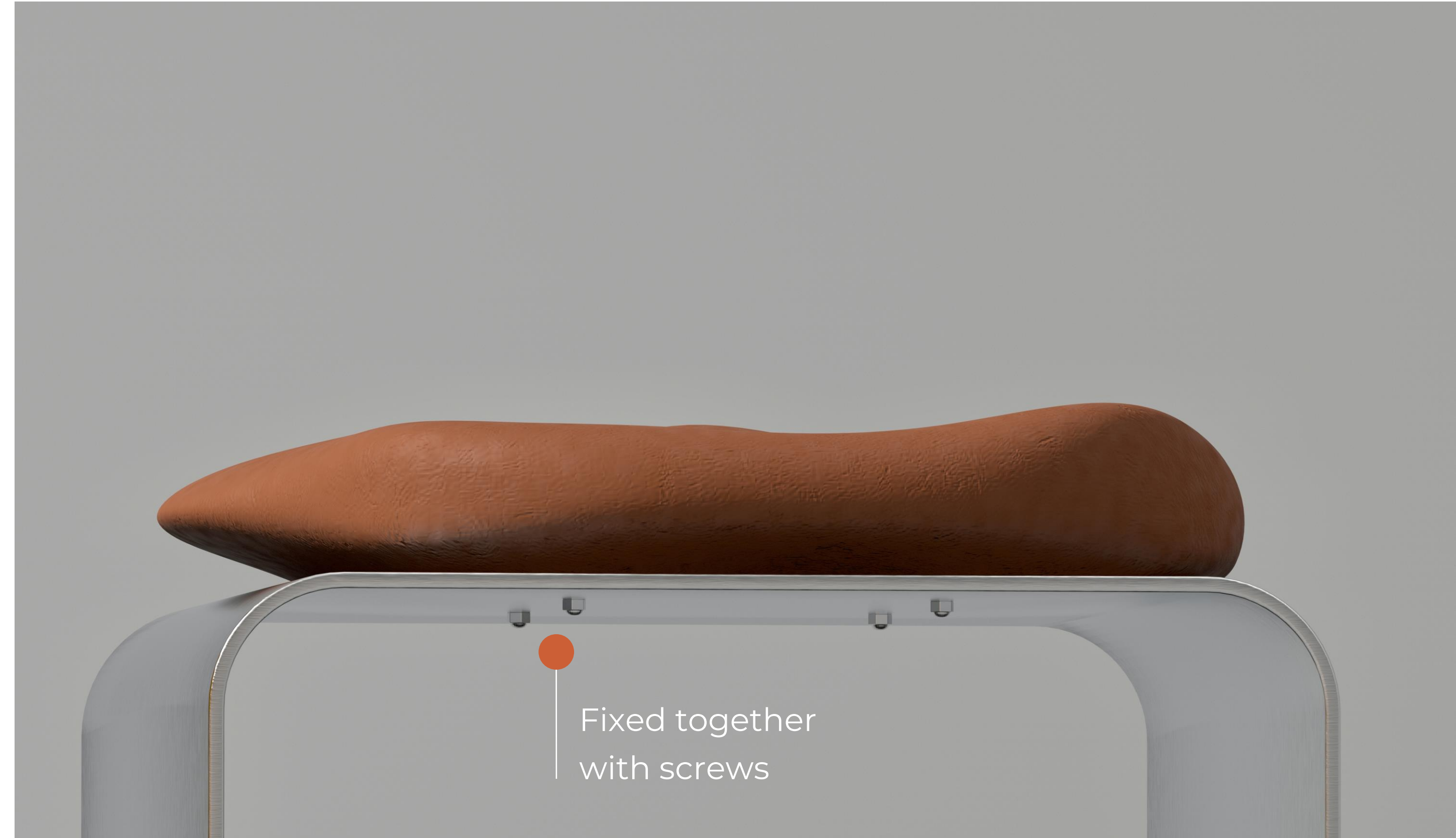
Made from recycled  
plastic from around Oslo

Recycled  
aluminium  
sheets

Moulded  
hollow for  
plastic base



Secured  
to clay  
part with  
organic  
glue



Fixed together  
with screws





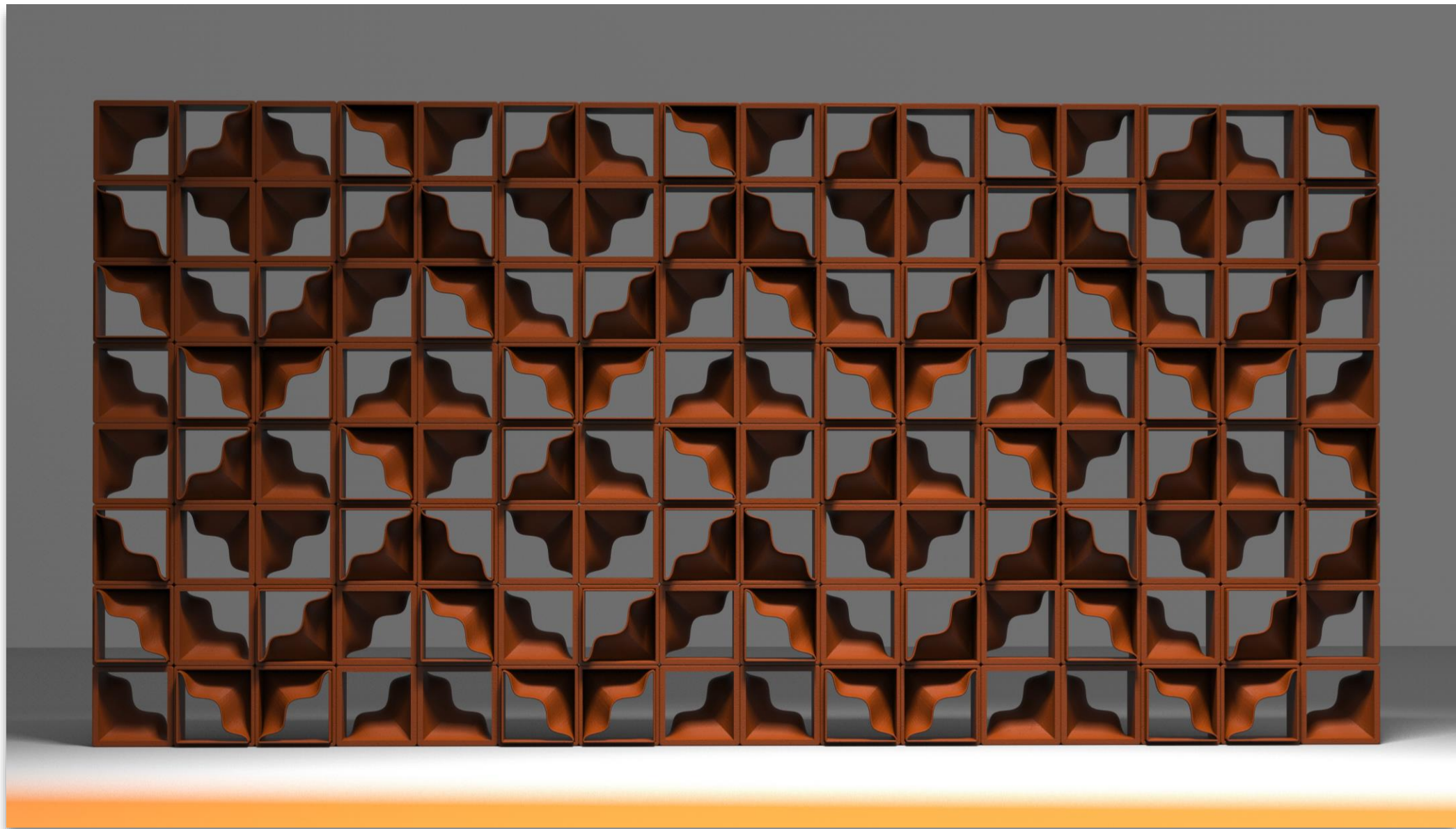
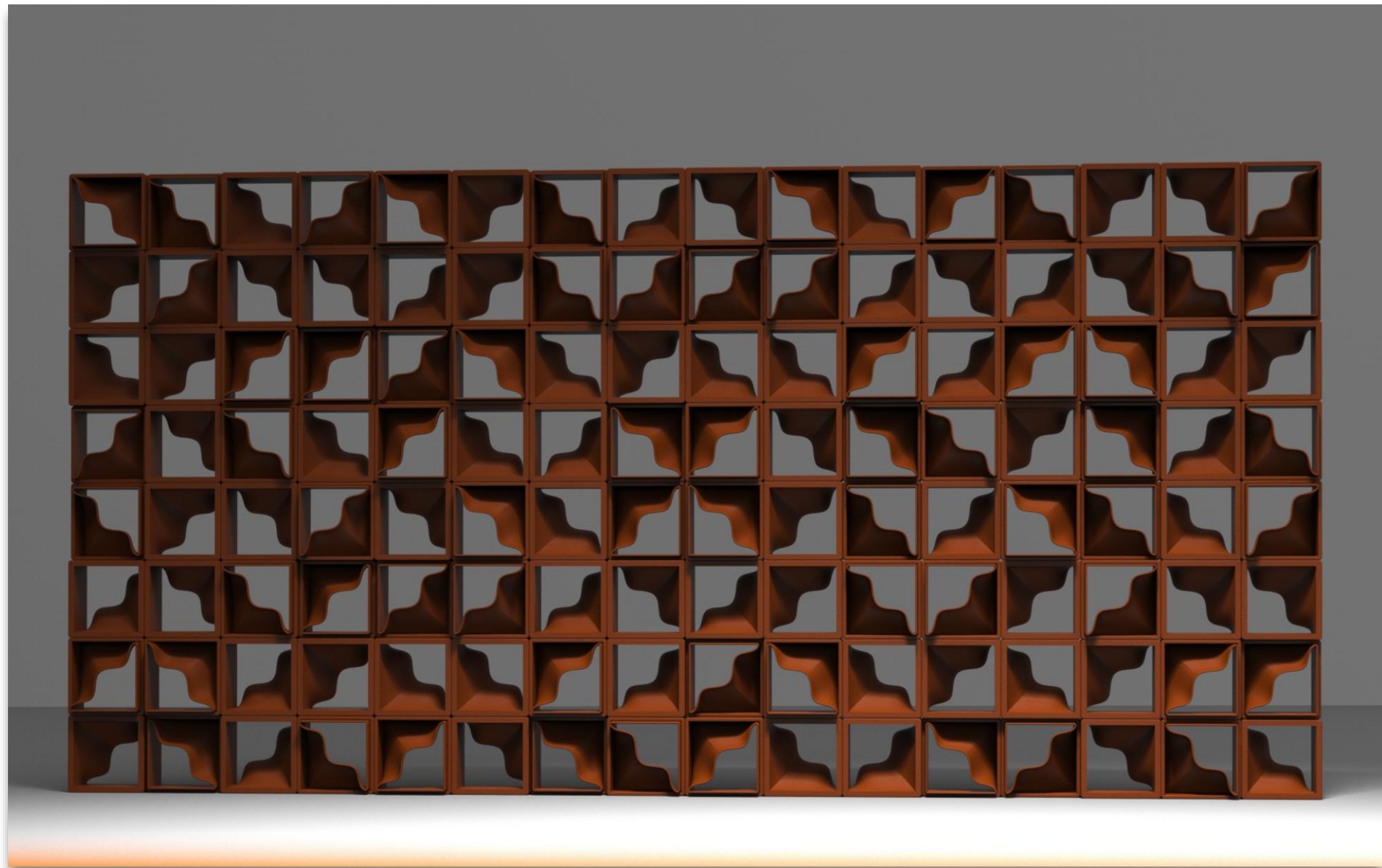
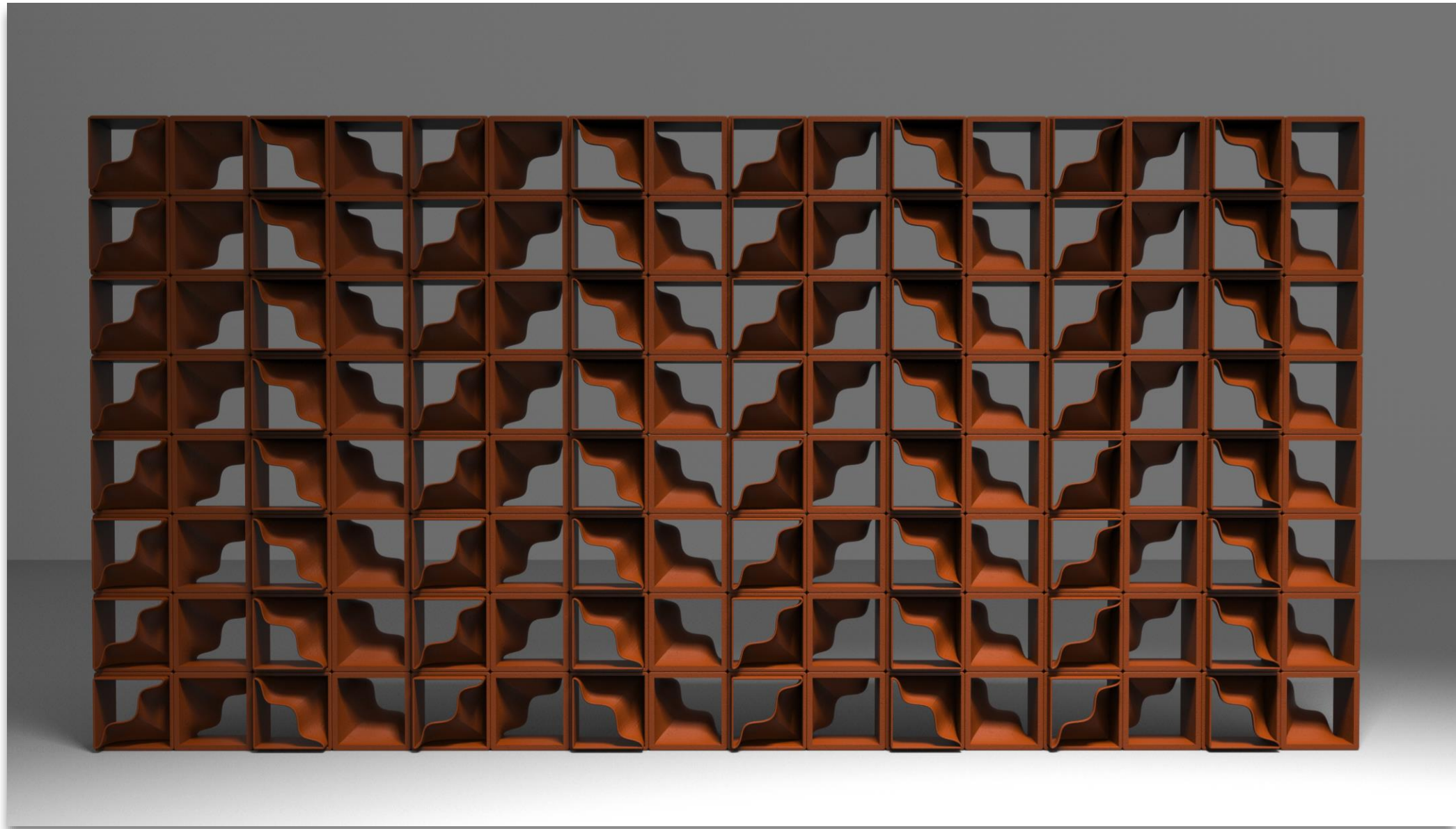
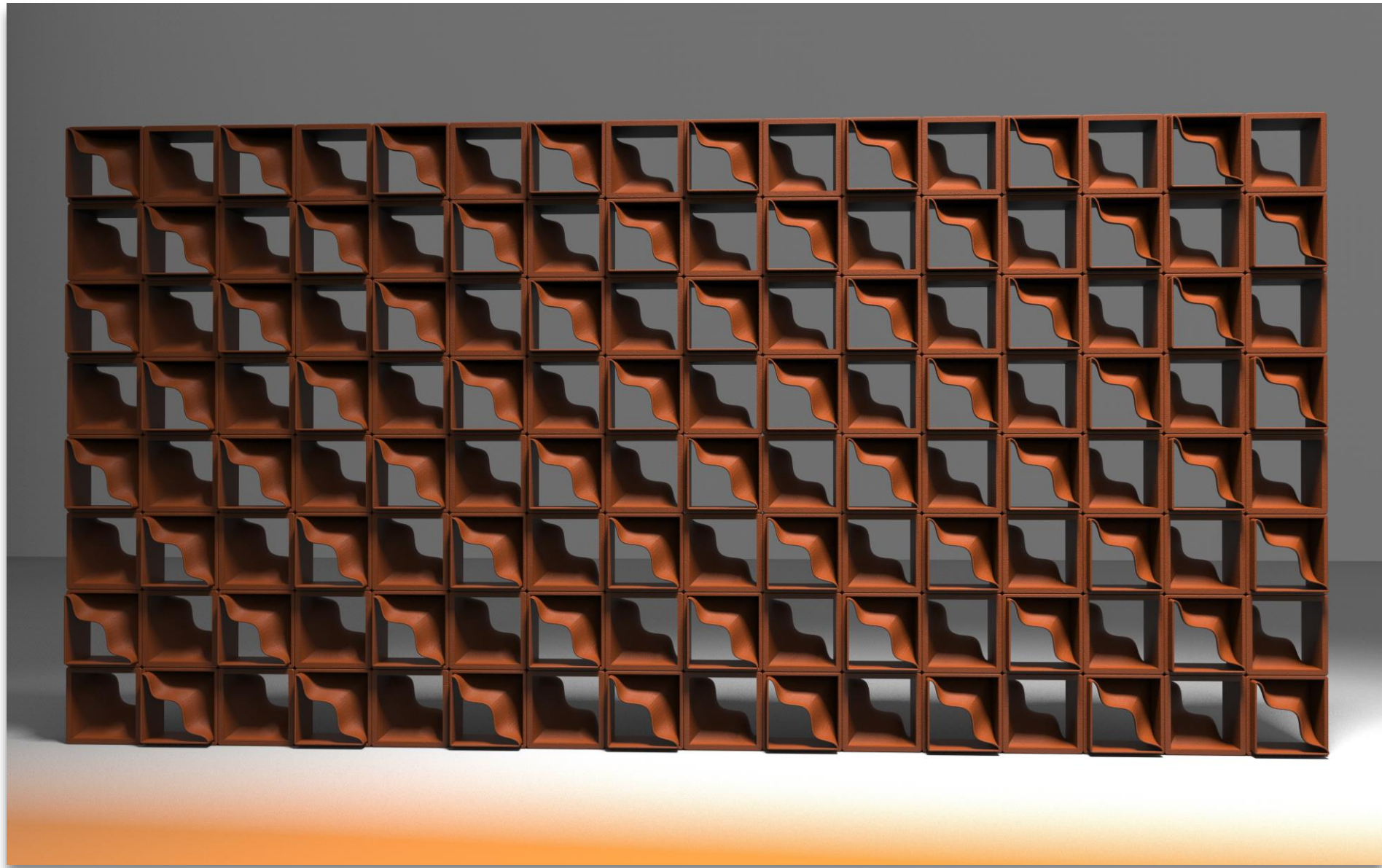
# Partition Tiles

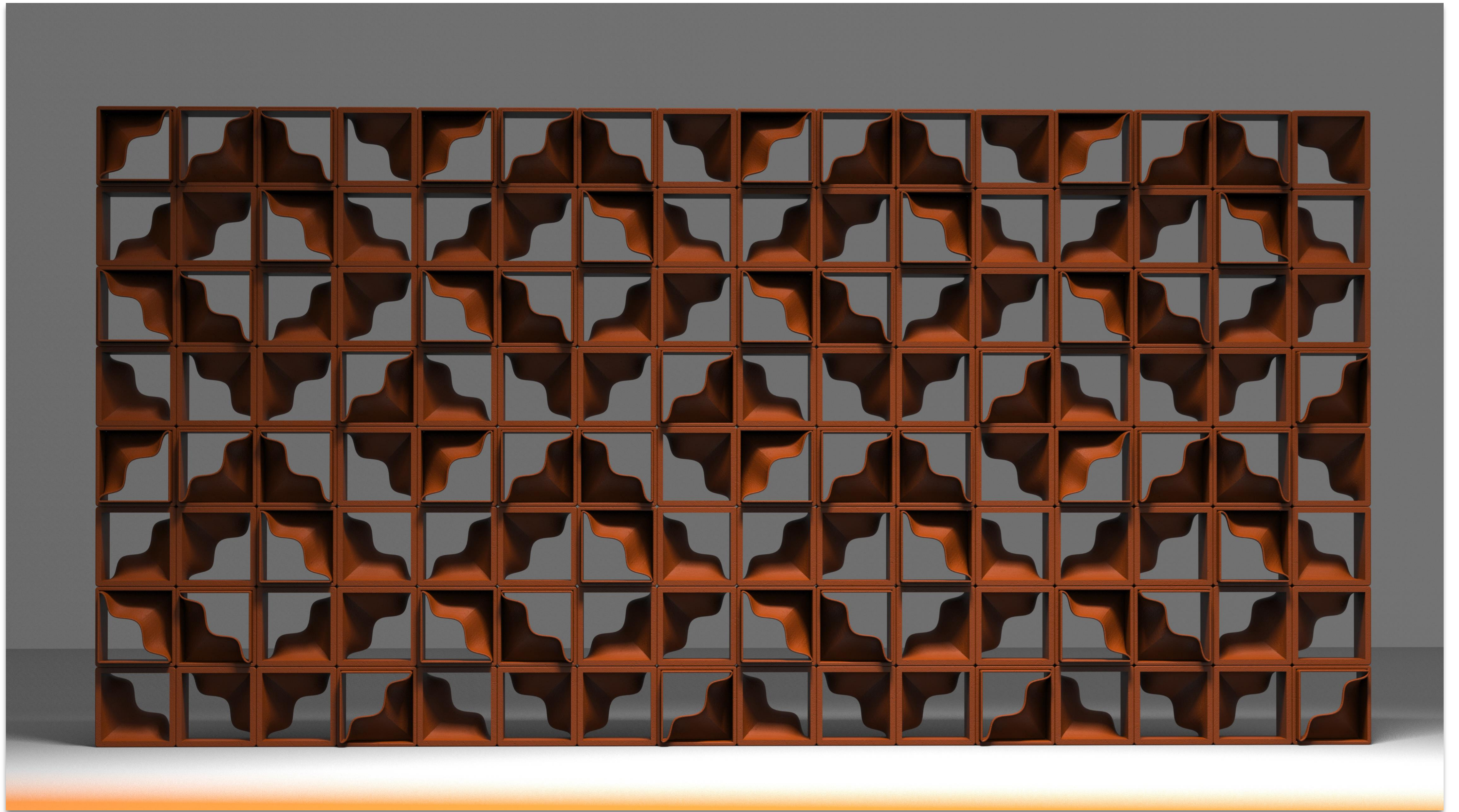
These dynamic structures offer a variety of benefits, both visually – as it can be arranged in different compositions – as well as for acoustic isolation, due to the inherent qualities of blue clay.

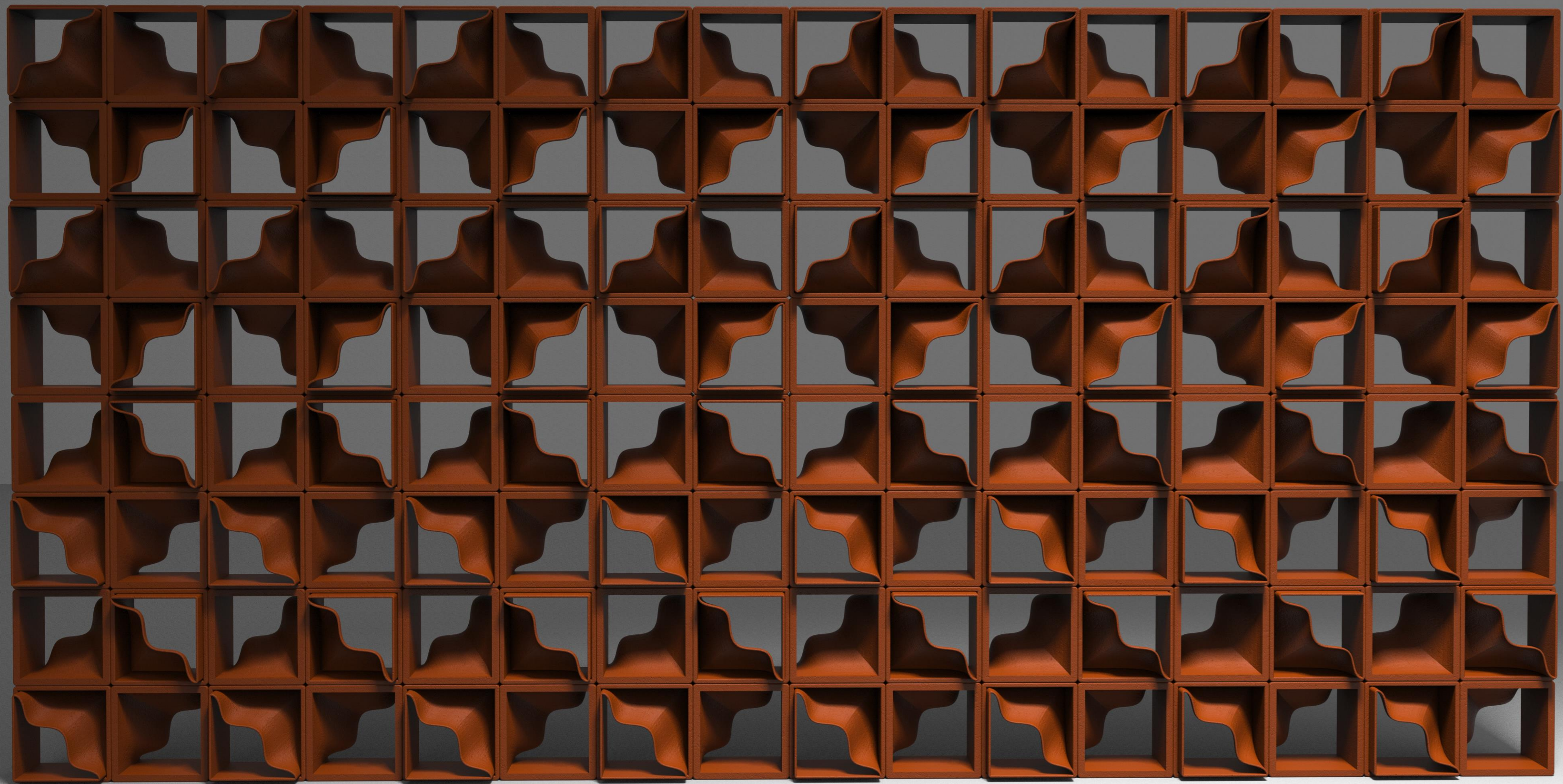


The three dimensional elements of the tiles, with their raised-relief, creating a playful dynamic in the space through their interactions with light.

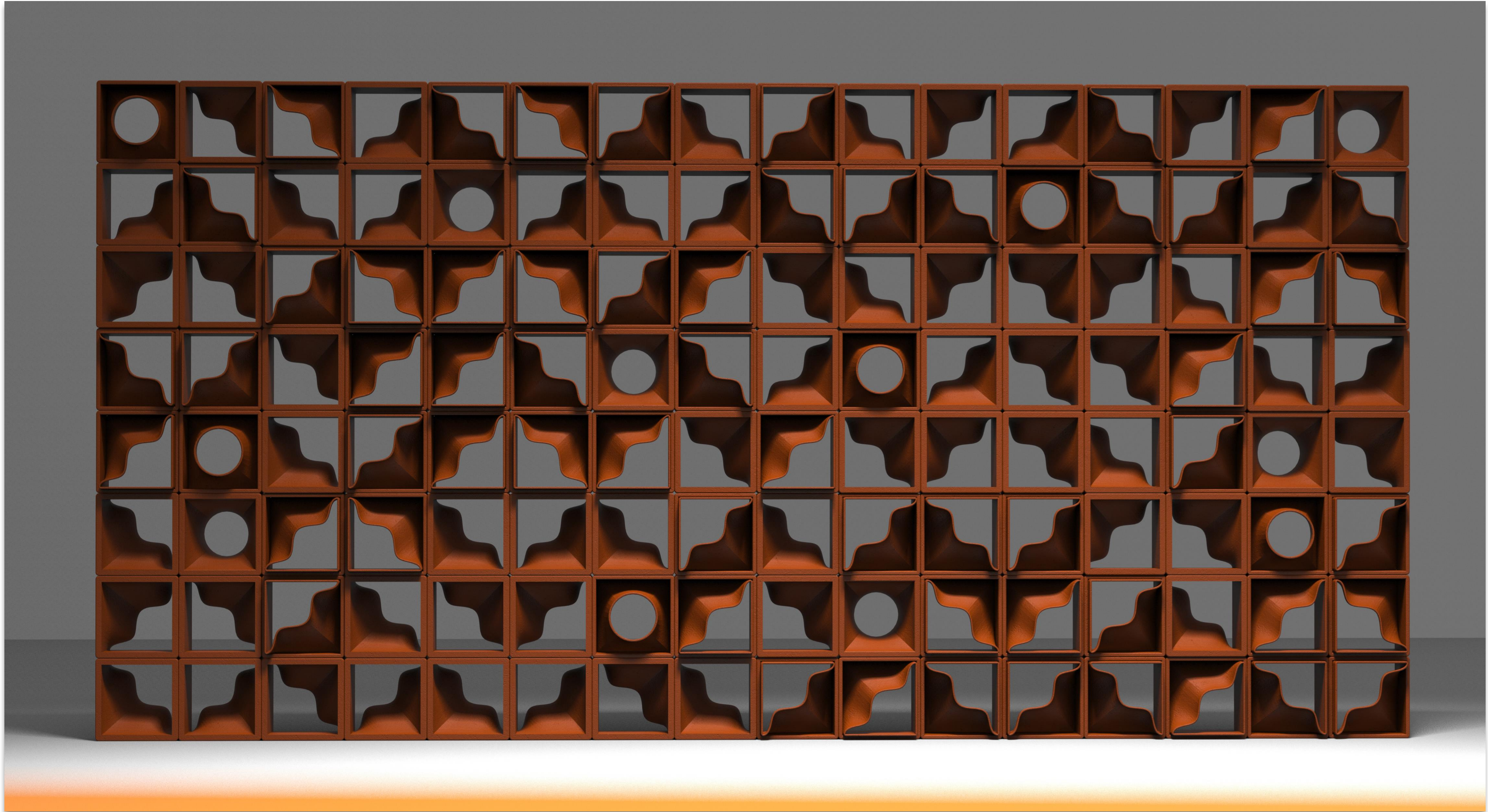






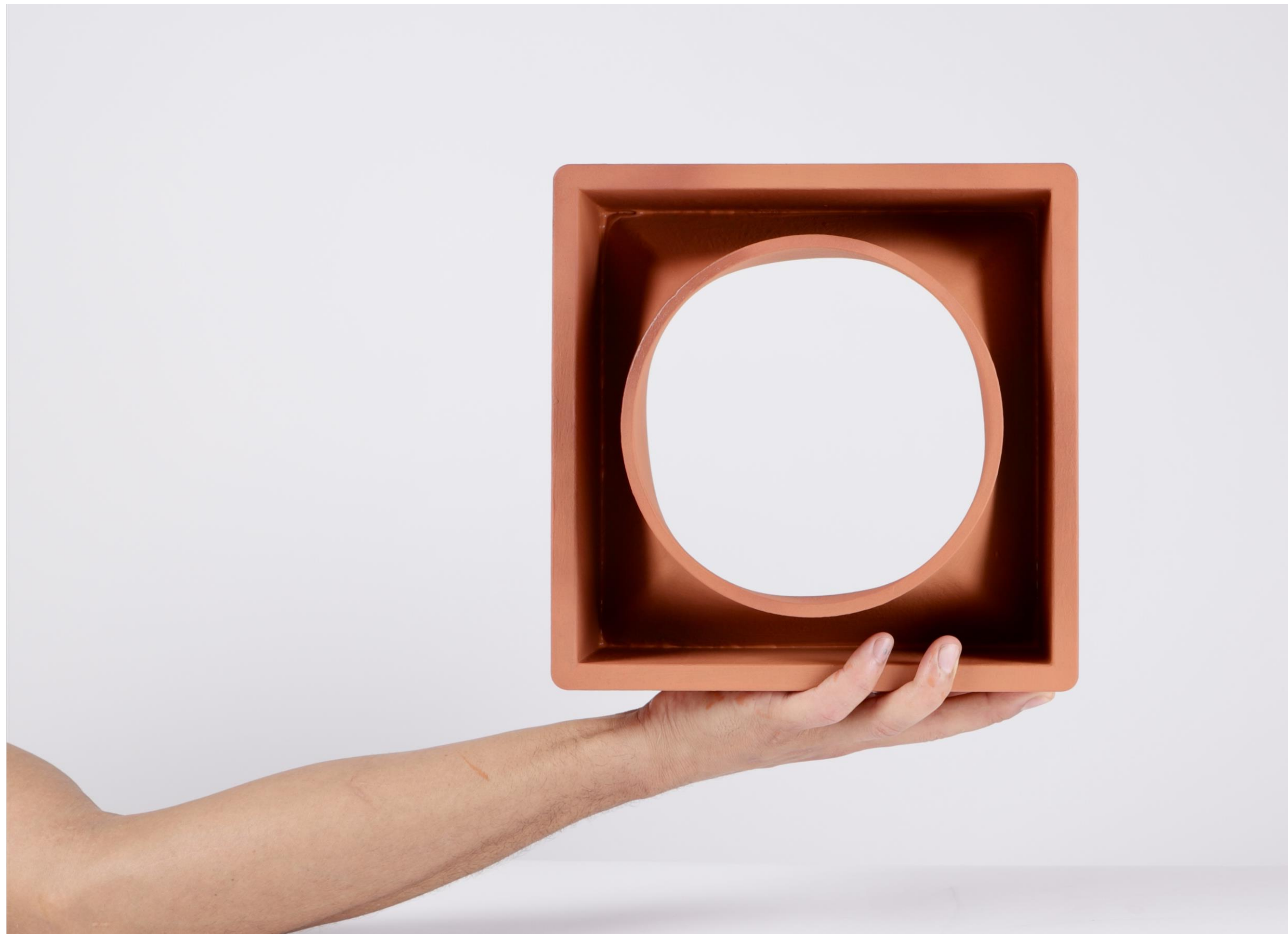












These products are meant to serve as an indication of potential implementations of products made by refugees from reclaimed Oslo blue clay.

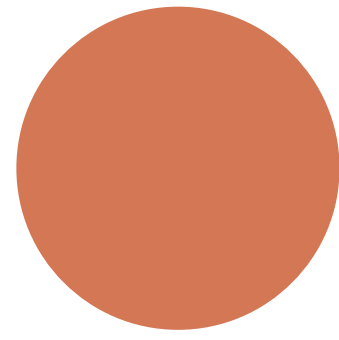
The room shows additional furniture concepts from blue clay which could be further developed.





06

# Conclusion



# Key Takeaways

The exploration of this project offers an overview of the journey of clay as a material. It serves as a reminder to question the unused materials discarded as waste in society today and investigate opportunities to transform them into valuable resources.

Similar to Oslo's blue clay, many societal groups have more skills and energy to offer than they are currently given the opportunity to exercise. Combining their manpower together with blue clay through workshop initiatives gives them a platform to share their stories, become better integrated in their adoptive home, and create products that have an impact on society both economically and culturally.

The combination of making products with blue clay and involving refugees in the creation process could offer attractive alternatives for the end-consumers and a reminder to question the linear ways of consumption.





# Gudrun Brækkan

Romeo Rioverde presents ideas for new uses of clay, which is surplus material from construction sites. Blue clay is currently considered waste in the construction industry.

The shape and material evoke associations with clay building bricks, while the organic element brings to mind the historical use of brick for modelling facades and details.

Brick is well-known and has a long tradition. Exploring new uses for it is exciting. The composition and variation make the product dynamic and versatile. I am particularly fascinated by the combination of the shape with conventional bricks.

The concept is innovative and also contributes to the circular economy. It has exciting potential and can be further developed for new applications – such as building blocks, decoration, room dividers, acoustic elements.

**Gudrun Brækkan**, Architect at MNAL AS



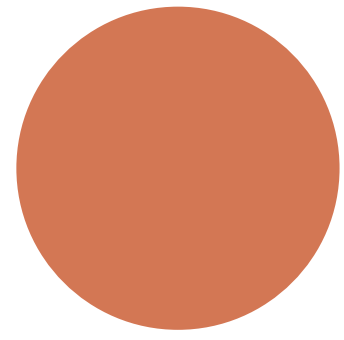
# Dorna Lakayan

The form and texture of three-dimensional clay tiles provide an opportunity to add depth and visual interest to a flat surface. Whether used to create a grid wall display as an artwork or utilized as a partitioning element to divide a space while still allowing for natural light and air to permeate, 3D tiles offer a dynamic and contemporary design option.

The versatility of these tiles is further accentuated by their playful nature, which gives designers the ability to create furniture pieces, creating a captivating texture that effortlessly captures attention. With practical application in both commercial and residential spaces, 3D tiles offer designers an exciting option to incorporate an element of modernity and aesthetic appeal into their projects.

The potential for creativity with this product is immense, making it an ideal choice to add a unique and eye-catching element to any interior architecture/design project.

**Dorna Lakayan**, Founder of Studio Lakayan



# Reflections

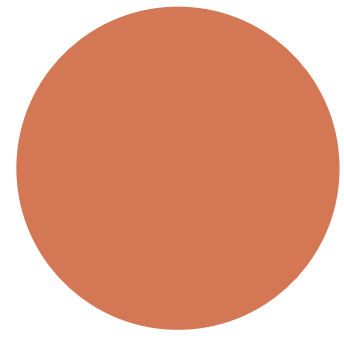
This was the right theme to write a diploma project for me. I feel like I have explored a way of designing across disciplines to create a more holistic approach.

I originally explored a different theme and scope for this project, focused primarily on the asylum process in Norway. After pivoting to explore blue clay, I recognised the parallels in these two stories – both were full of potential that is not fully recognised here in Oslo.

Even though I feel like I did not go in depth in all aspects I wanted to, I believe I have told a compelling story – not only of products, but also the journey of the material in a way that is hopefully cohesive enough for you, the reader, to understand.

I'm proud that the products created in this project seemed feasible even at this early stage to receive validation from industry experts, which was very rewarding to hear.

Since hosting the clay workshop with Ukrainian refugees, I have been asked numerous times when I will be returning next. Participant's clear enthusiasm for the subject further confirms the potential of the workshop aspect of the project.



# Acknowledgements

I would like to thank my supervisor Hilde Angelfoss for guiding and inspiring me throughout my time at AHO over the past years, the workshop masters for sharing their knowledge and accompanying me on some of my crazier ideas during this project, and my classmates for the support network and knowledge they shared with me throughout our studies at AHO.

To the Furnes family, Gudrun, Madalen, and Daniel, for their unwavering love and support, not only in pursuing further education but also throughout the ups and downs of my life since making Norway my new home. Thank you for your generosity and for coping with me until now.

# References

Adamou, S., Andresen, L., Borchgrevink, J., Daviknes, H. K., Eriksson, I., & Sæther, M. M. (2016). "COST TU1206 Sub-Urban Report," European Cooperation in Science and Technology. Available via: <https://static1.squarespace.com/static/542bc753e4b0a87901dd6258/t/5707869ae707eb820b4118a5/1460111042910/TU1206-WG1-012+Oslo+City+Case+Study.pdf> [Last Accessed 14/05/2023]

Britannica (2023a), "Clay Geology," Encyclopaedia Britannica. Available at: <https://www.britannica.com/science/clay-geology> [Last Accessed 14/05/2023].

Britannica (2023b), "Clay Mineral," Encyclopaedia Britannica. Available at: <https://www.britannica.com/science/clay-mineral> [Last Accessed 15/05/2023].

Blue, M. L. (2017). "What Is Red Clay?" Sciencing.com. Available via: <https://sciencing.com/red-clay-22940.html> [Last Accessed 14/05/2023]

Burnham, R. (2016). "ASU scientists discover how blue and green clays kill bacteria," Arizona State University. Available via: <https://news.asu.edu/20160106-asu-scientists-discover-how-blue-and-green-clays-kill-bacteria> [Last Accessed 14/05/2023]

Flokk (2022). "Principles for Sustainable Design," Flokk Sustainability: Our Promise. Available via: <https://www.flokk.com/global/about-us/sustainability/our-promise> [Last Accessed 14/05/2023]

Geir-André, T., Malin, A. (2010), "Vigilance map for contaminated land in Oslo, sub-projects 10, 13 and 14; excavating materials and disposal solutions," Norges Geologiske Undersøkelse. Available via: [ngu.no/upload/Publikasjoner/Rapporter/2009/2009\\_043.pdf](http://ngu.no/upload/Publikasjoner/Rapporter/2009/2009_043.pdf) [Last Accessed 14/05/2023]

Ghosh, I. (2021). "Ranked: The Fastest Growing Cities in Europe," Visual Capitalist. Available via: <https://www.visualcapitalist.com/fastest-growing-cities-in-europe/> [Last Accessed 14/05/2023]

Heeremans, M., Kirstein, L., Neumann, E. R., Obst, K., Spencer, E., Timmerman, M., Wilson, M., (2004). "Carboniferous-Permian rifting and magmatism in southern Scandinavia, the North Sea and northern Germany: A Review." Geological Society London Special Publications. Available via: [https://www.researchgate.net/figure/Simplified-map-of-the-Oslo-Graben-showing-different-rock-types-after-Ramberg-Larsen\\_fig1\\_236506714](https://www.researchgate.net/figure/Simplified-map-of-the-Oslo-Graben-showing-different-rock-types-after-Ramberg-Larsen_fig1_236506714) [Last Accessed 14/05/2023]

ISF, (2021). "Social Sustainability," Institute for Sustainable Futures; University of Technology Sydney. Available via: <https://www.uts.edu.au/sites/default/files/cap-stat-social-web.pdf> [Last Accessed 14/05/2023]

MacroTrends.com (2023). "Oslo, Norway Metro Area Population 1950-2023." Available via: <https://www.macrotrends.net/cities/22028/oslo/population> [Last Accessed 14/05/2023]

Mathisen, G. (2021). "How the ice age turned quick clay into a Norwegian problem," Science Norway. Available via: <https://sciencenorway.no/geological-mapping-geology/this-is-how-the-ice-age-turned-quick-clay-into-a-norwegian-problem/1883494> [Last Accessed 14/05/2023]

Merriam-Webster, (2023). "Clay," Merriam-Webster.com Dictionary; Merriam-Webster Incorporated. Accessed via: <https://www.merriam-webster.com/dictionary/clay> [Last Accessed 14/05/2023]

MFA, (2016). "Norway's follow-up of Agenda 2030 and the Sustainable Development Goals," Ministry of Foreign Affairs, Government.no. Available via: <https://www.regjeringen.no/en/dokumenter/follow-up-sdg2/id2507259/> [Last Accessed 14/05/2023]

Missimer, M. (2015). "Social Sustainability Within The Framework For Strategic Sustainable Development," Department of Strategic Sustainable Development, Blekinge Institute of Technology. Available via: <https://www.diva-portal.org/smash/get/diva2:852857/FULLTEXT02> [Last Accessed 14/05/2023].

MyClimate (2020). "Climate Change and Protection; Climate Booklet," Foundation myclimate. Available via: [https://www.myclimate.org/fileadmin/user\\_upload/myclimate\\_Klimabooklet\\_2020\\_EU\\_Updated.pdf](https://www.myclimate.org/fileadmin/user_upload/myclimate_Klimabooklet_2020_EU_Updated.pdf) [Last Accessed 14/05/2023]

Nordregio, (2018). "Fjord City: A waterfront urban renewal project", Nordregio Sustainable Cities. Available via: [https://nordregio.org/sustainable\\_cities/fjordbyen/](https://nordregio.org/sustainable_cities/fjordbyen/) [Last Accessed 14/05/2023]

Norman, J. (2023), "The Venus of Dolní Vestonice, the Oldest Known Ceramic Figurine", HistoryOfInformation.com. Available at: <https://www.historyofinformation.com/detail.php?id=2124> [Last Accessed 14/05/2023].

Oslo City Council, (2022). "Klimastrategi for Oslo mot 2030," Klimaoslo.no. Available via: [https://www.klimaoslo.no/wp-content/uploads/sites/88/2020/09/Klimastrategi2030\\_langversjon\\_web\\_enkeltside.pdf](https://www.klimaoslo.no/wp-content/uploads/sites/88/2020/09/Klimastrategi2030_langversjon_web_enkeltside.pdf) [Last Accessed 14/05/2023]

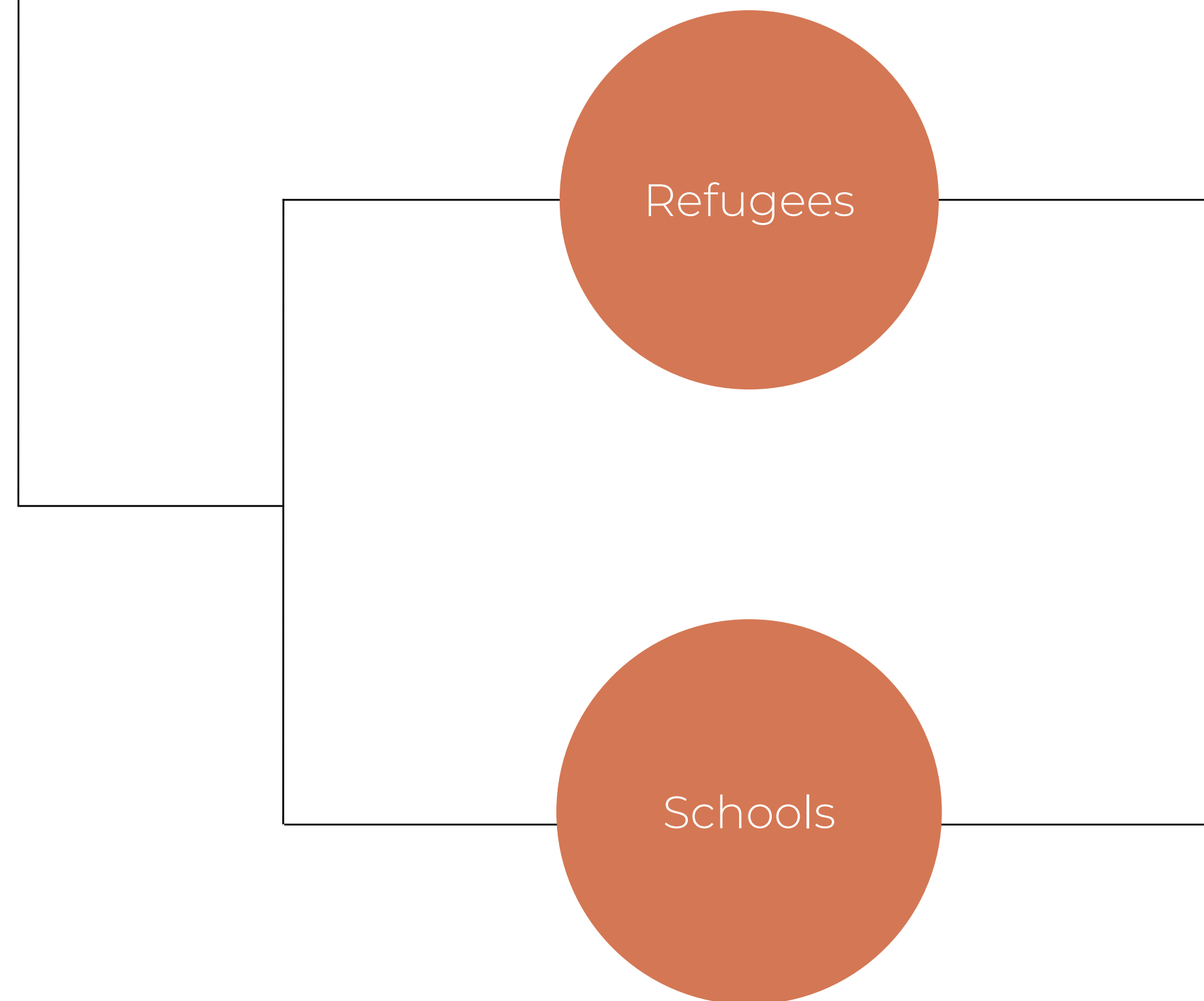
Thorn Lighting (2023), "6 Principles for Sustainability," thornlighting.com. Available via: <https://www.thornlighting.com/en/news/6-principles-for-sustainability> [Last Accessed 14/05/2023]

UN, (2023). "United Nations Sustainable Development Goals", United Nations. Available via: <https://sdgs.un.org/goals> [Last Accessed 14/05/2023]

UN Brundtland Commission (1987). "Our Common Future: Report of the World Commission on Environment and Development", United Nations. Available via: <http://www.un-documents.net/our-common-future.pdf> [Last Accessed 14/05/2023]

# 07 Appendices

# ● What groups will participate?



After closer consideration, focusing on working with schools and refugees to address the issue of waste management and utilize blue clay seems like a promising approach. Schools can provide a platform for educational initiatives, raising awareness about waste management and involving students in creative projects using blue clay.

Engaging with refugees can tap into their skills and provide employment opportunities, empowering them while utilising their expertise in clay product creation. This collaboration can create a context where the products made with blue clay can take place to promote sustainability and social integration.

# Workshop for Schools

The Blue Clay workshop could be designed to be implemented in primary, secondary, and high schools, providing an engaging and interactive learning experience. The workshop encompasses all the necessary steps involved in collecting, processing, and creating products with blue clay. Its main objective is to offer a dynamic and contextualized approach to learning, combining various subjects such as natural sciences, math, geometry, history, and geology.

Working with clay not only facilitates academic learning but also promotes mental and physical well-being. The tactile experience of molding and shaping clay can have therapeutic benefits, helping students relax, focus, and develop patience while fostering creativity and self-expression.

The workshop will be conducted as follows:

- Schools will schedule a date and allocate a suitable space for the workshop.
- Students will be provided with protective gear, including gloves, aprons, and masks, to ensure they are safe during clay collection and processing.
- Essential tools like shovels, screens, water sources, tarp or plastic sheeting, and mixing tools will be supplied for the clay processing stage.
- A designated drying area will be needed for the clay to dry thoroughly.
- A kiln or firing equipment may be required to fire the finished products.
- Adequate space should be provided to accommodate the workshop activities.
- By offering this workshop, schools aim to provide an enriching educational experience while fostering creativity, practical skills, and an understanding of sustainable material utilisation.



# Schools

## Educational Purposes

A workshop program can be developed and implemented in schools at various education levels, including primary, secondary, and high schools. These workshops would be designed to guide students through the entire process of collecting clay, processing it, and creating products.

By incorporating hands-on activities and interactive learning, the workshops would offer an enjoyable and engaging experience while promoting awareness of material sourcing and sustainability. It would also serve as an opportunity to revive and preserve the ancient tradition of sourcing local materials and creating products from start to finish.

The workshop could be structured as a combination of subjects, such as arts and crafts, and natural science. This interdisciplinary approach would allow students to acquire parallel knowledge in a dynamic and contextualized manner. By integrating different subjects, students can develop a holistic understanding of the clay-making process and its connections to various fields of study.

Overall, the workshop program would not only provide a valuable learning experience but also foster a sense of responsibility towards sustainable practices and appreciation for local resources.

## Schools

After receiving the workshop manual, schools can choose a suitable day for the session. The workshop design allows for flexibility, including the option to skip the clay collection step. Instead, a video presentation about the clay's origin and sourcing can be shown on the workshop day. This alternative approach ensures that students still gain knowledge and context about the clay material, even if they don't physically collect it. By offering this flexibility, schools can adapt the workshop to their specific circumstances and resources. Students will still have an engaging and educational experience, combining subjects like arts, crafts, and natural science in a dynamic and contextualized learning environment.

## Students

In the workshop, students will learn about the importance of sustainable material usage and the process of creating products from start to finish. They will be motivated to contribute to their school spaces by creating meaningful products and have the opportunity to sell them to finance school trips or activities. This dual motivation encourages students to actively engage in problem-solving, develop practical skills, and contribute to their school community.

## Kilns

The government can provide subsidies to support the utilization of blue clay through this program. The program will oversee the collection, transport, and firing of the clay products. The products will be fired in kilns and subsequently delivered to the respective schools. This service ensures that the entire process, from collecting the clay to delivering the finished products, is efficiently managed. By subsidizing this program, the government encourages the sustainable use of blue clay and promotes its incorporation into educational settings.

## Marked

A dedicated webpage and social media accounts will be created to promote these products and create a market for them. These platforms will showcase the various products made from blue clay by students in the workshops. The webpage will provide detailed information about the products, their features, and pricing. Social media accounts will be used to share engaging content, photos, and updates about the workshops and the products available for purchase. By utilizing these online channels, the schools can reach a wider audience and potentially generate income from the sales of the blue clay products.

## Potential Outcomes

Schools have the flexibility to choose whether to create social areas for students, both indoors and outdoors. These areas can include various elements such as sitting arrangements, partition walls, shelves for storage, and unique constructions that showcase students' talents and expressions. These spaces provide students with functional and visually appealing environments where they can socialize, relax, and showcase their creativity. The design and arrangement of these areas can be tailored to the specific needs and preferences of the school and its students.

# Who?

Refugee Centre

## Healthy, Recreational and Profitable activities

Working with clay can offer numerous benefits for mental and physical health, as well as for creativity and self-expression. Clay can be a great way to relieve stress and tension. The physical act of molding and shaping the clay can be very therapeutic, and the tactile experience of working with clay, can help you relax, focus, develop patience and the feeling of mastery.

Beside all these potential benefits that comes from working with clay, there is a possibility to convert this recreational activity into a profitable one. This offers the opportunity to introduce and, in some case, reintroduce refugee groups to a working space where they can thrive as they create profit.

Beside all this potential benefits that comes from working with clay, there is a possibility to convert this recreational activity into a profitable one. This offers the opportunity to introduce and reintroduce refugee groups to a working space where they can thrive as they create profit.

Working with clay can indeed have numerous benefits for mental, physical, and emotional well-being. The therapeutic nature of clay work has been recognized for its ability to reduce stress, promote relaxation, and improve focus. The tactile experience of molding and shaping clay can be calming and provide a sense of satisfaction and accomplishment.

Moreover, engaging in creative activities like working with clay allows for self-expression and exploration of one's artistic abilities. This can boost self-esteem and confidence, as individuals see their ideas take shape and witness the tangible results of their efforts. Clay work also fosters patience and perseverance, as it often requires time and practice to master different techniques and achieve desired outcomes.

In addition to these personal benefits, working with clay can offer opportunities for economic empowerment and social integration, particularly for marginalized groups such as refugees. By transforming clay work from a recreational activity into a profitable venture, refugees can develop skills, generate income, and gain a sense of purpose and independence.

Creating a working space that facilitates clay-based entrepreneurship can provide a supportive environment for refugee groups to explore their talents and build sustainable livelihoods. It may involve offering training programs to develop technical skills in clay artistry, business management, and marketing. By empowering refugees with the knowledge and resources to turn their clay creations into marketable products, they can establish their own enterprises or participate in collective initiatives.

Such initiatives can have multiple positive outcomes. Firstly, they offer refugees an avenue to showcase their creativity and cultural heritage, fostering a sense of identity and pride. Secondly, the economic benefits generated through the sale of clay products can contribute to the financial well-being of individuals and their communities. Thirdly, by participating in entrepreneurial activities, refugees can develop transferable skills, expand their social networks, and integrate into their new societies more effectively.

Overall, the combination of the therapeutic benefits of working with clay and the potential for economic empowerment makes clay-based entrepreneurship an appealing avenue for refugees. By harnessing the therapeutic and creative aspects of this medium, individuals and communities can not only enhance their well-being but also create sustainable income opportunities, ultimately leading to greater self-sufficiency and a sense of belonging.

## Refugee Centre

Since the workshops vary in length and difficulty, The person in charge of the refugee centre will agree upon which level of workshop would be held as an introduction. The time would be reserved and an introductory presentation would be held to for the group of refugees attending. The tools needed for the excavation and collection the clay material that is gonna be processed and used the workshops, would be provided by the workshop holders. The refugee centre is in charge of providing a space for this workshop to be carried on.

## Refugees

Refugees will be equipped with the necessary gear for this workshop. They will be guided on how to make predesigned products with different types of functionality and then how to proceed to elaborate individual projects where they could express themselves through sculptural pieces with or without function. In this way the refugees will learn how the material behaves and through this insights and observations, create a set of expectations for the material, understand its qualities and possibilities.

## Possible outcomes

The potential products that would be created by the refugees are both predesigned objects and objects that are a result of their creativity, spontaneity and self expression. The predesigned products will vary in form and function as well as in complexity. For the products that will be created without templates and moulds, the participants in these workshops will be guided through.

- Some possible outcomes could be:
- Sitting arrangements
  - partition walls
  - Shelves for storage
  - Vases and bowls

## Kilns

This program can be subsidized by the governmental entity to promote the utilisation of blue clay. This service will be in charged of the collection, transport and burning of the clay products. The products will be burned in kilns and then delivered to the corresponding refugee centre.

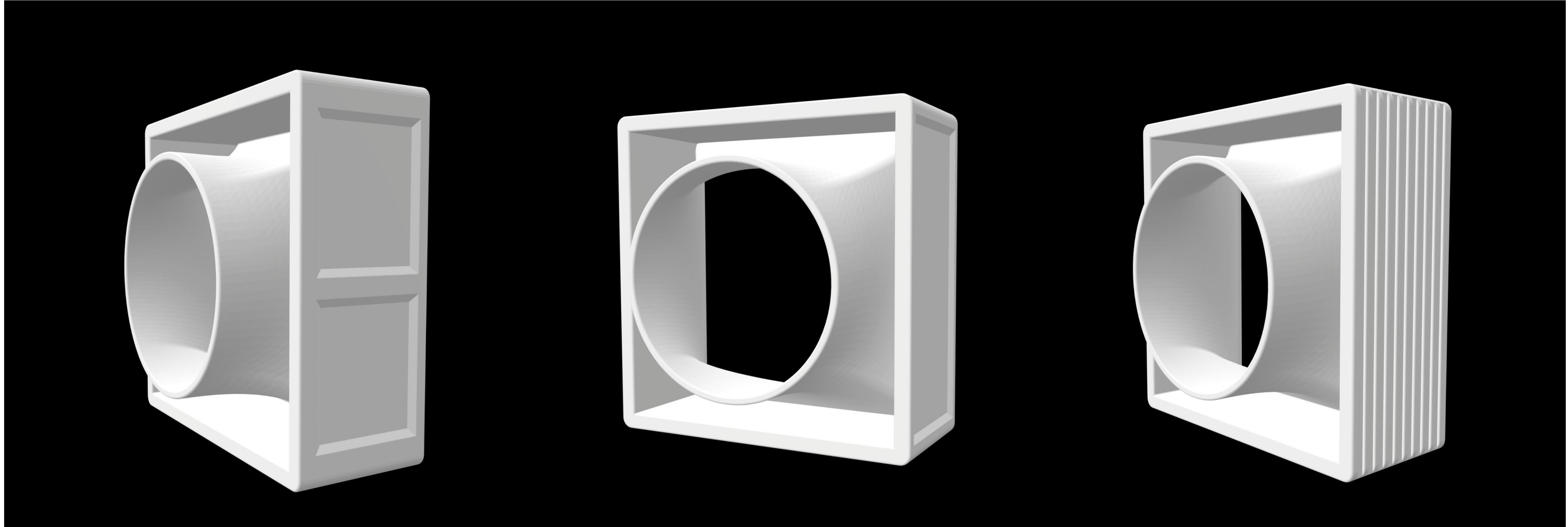
<https://www.psychologytoday.com/us/blog/demystifying-talk-therapy/202003/7-unexpected-ways-clay-is-therapeutic>

## Marked?

There will be a webpage and social media accounts that promotes this products to create a market that can potentially bring income to the refugee centres. This products will be showcased in exhibitions and marked places that take place year around in the city of oslo.

# ● Workshop Journey

- Participants will be assigned a date and time when the blue clay workshop will take place. They will be informed of the kind of clothes and gear they should bring with them.
- At the day of the workshop, the course holders will present the workshop in two different parts:
  - —the issue, story of the material the participants are gonna be working with,
  - — the task itself. There will be a detailed explanation of the different tasks and the level of difficulty they will present at any stage of the workshop. The tasks will be divided in three main parts: Material sourcing, Material processing and the potential and challenges this material presents. In other words, Collect, Process and create.
- The participants will be accompanied to the site where the material will be collected from and will collect as much as is required to realise this workshop. All the tools required to do this step of the workshop, will be provided... This part is optional. Participants can be presented with the material at the day of the workshop to prevent the inconvenience of traveling to a different site.
- The participants will be guided on how to process the clay. The goal of this stage of the workshop is to purify the material.
  - The blue clay will be passed through screens to to remove any unwanted organic matter like stones, shells, pieces of wood and others, that can naturally be found in the raw state of blue clay.
  - Once the purified clay has reached the desired state, it will be mixed with pipeclay and chamotte to strengthen the material. In some cases, like when the blue clay is gonna be used to 3D print objects, the clay will be mixed only with a small amount of pipeclay and not chamotte since the coarse texture of the chamotte grains won't be suitable to be used in the 3D printer.
  - The participants will be guided to produce simple objects, normally small plates, mugs or small sculptures. This process is carried out to create understanding of the material. By creating small, manageable objects, the participants will understand the potential and limitations of blue clay
  - The next step will be to reproduce predesigned products. First in small scales and low levels of complexity too create a feeling of control and mastery. Later, the participants will be introduce to moulds to teach them how to replicate products.
  - They will sign the objects they create with their own names and preferred way of leaving their mark in the product they create, regardless of it being predesigned or spontaneously created.
- When the products are done, they will be moved to a suitable area where they can dry safely without the risk of cracking or warping.
- After dried, the products will be collected and transported to a workshop equipped with a kiln where they can be burned in the right temperature suited for the material (which is up to 1100)
- In some cases, the predesigned products and those created and manufactured by the participants will be used locally if agreed upon. These products could be elements for the creation of a social area, storage, decorative elements, or a partition wall in a school or a refugee Senter.
- In some other cases; in example when the goal of this workshop is the introduction and reintroduction of refugees into a working space that can produce profits, there will be an array of elements predesigned that are marked relevant. These products will be promoted through social media and websites designed to reach **..potential buyers**. These products present a major potential for consumers around the city of oslo since these products are more connected to the place where they live, as well as the the products having more value being created by a group of people that is eager to be integrated in the Norwegian society and are presenting a contribution in form of products that are sourced and produced locally and sustainably. Not only because the environmental impacts that the creation of these products present, but the social aspects of sustainability that are being implemented in this type of intervention.



Further development of the partition tiles can be made to make them more suitable for use in real world construction projects.

