ARCHITECTURE BORDERING FASHION

TAILORING SPACE BY DRAPING

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ABSTRACT

Everyone has a relationship to textile and an ability to understand it; recognising folds and creases. Architecture bordering fashion is a study in methods of creating three dimensional spaces from flat textiles; inspired by the work flow of designing clothes in the world of fashion. The methods of tailoring and draping are brought into architecture. Using the edges and the surface of textile, in combination with solids and fixed points - the purpose is to explore ways to expand textile use in architecture. To inspire a soft kind of architecture, which can benefit from the beautiful qualities of textiles.

Analogies between the design processes in fashion and architecture are described and the pattern of a garment is defined as equivalent to the blueprint of a building. Working in various scales, the toile is draped onto walls placed in different compositions. Defining the walls as the solid elements a kind of inverse draping is made, from inside the space, around you. Folds and cuts are marked onto the toile, from which the pattern of the space is made. Thus enabling recreation of the space in different scales.

Explorations of how the geometry of a flat textile can be altered by an action in the centre of the surface is carried out. By cutting out regular polygon shapes, folding the cut edges and sewing it together the geometry is dramatically altered. Thus creating a kind of corner on the midpoint of a surface; a textile corner. The flat textile is made into a three dimensional form, in one continuous mesh, creating interesting shapes and geometries.

In the concluding step, draping on solids is combined with these textile corners, with the aim of creating a textile space with a single textile mesh. The resulting spaces are soft and dramatic, with interesting plays between curves, points, creases, folds and seams. The geometries of the obtained space are not immediately understood, adding one more dimension of interest. The end result is the pattern - a guide of how to recreate the space in different scales, similar to how the blueprint can be translated into a building.

Figure 1. *Wedding Dress*
By Linda Wallander, summer 2018. Authors own image.

STUDENT BACKGROUND

My educational experience started in 2012 with the Bachelor programme Architecture & Engineering, at Chalmers. With this multidisciplinary education as basis I continued on to do a double master's degree in Architecture and Urban Design and Structural Engineering.

The main strengths I bring with me from these years are the combination of an artistic and logic or mathematical way of thinking. Regarding both architecture and other kinds of problem-solving I like to find solutions based on different ways of thinking. The theme of textile in architecture is one scenario which I have, partly in collaboration with Malin Borgny, worked with from different points of views, with various methods.

I have long had a private interest in sewing, dress- making in particular, where I use draping as the main method of designing. I also find textile an interesting material with much potential in the field of architecture. Textile is a material present in our everyday life. Everybody has a relationship to textile. We have an ability to read textile - recognising folds and creases - and we can understand them. This strong relationship people have with textile sets it aside from other building materials.

The exploration of textile in the architectural context started in a preparatory study that Malin Borgny and me made last spring in the Matter Space Structure studio, called Static Motion, where we studied interpretation of motion in still images. Using photography of moving textiles, we identified factors which makes us read motion, in a per definition, still image

We continued on to doing a Master Thesis in structural engineering on textile informed structures. How one can build structures inspired by the assembly methods of textiles, seeing textiles as a material composed as a repetition of joints. These joints where made inspired by structure systems as tensegrity, reciprocal and scissor structures as well as the thread path in woven, braided and lace textiles.

In this thesis my private interest in sewing and designing clothes merges with architecture and textile in the architectural context is explored from yet another perspective with another working method.

PREVIOUS PROJECTS

Textile Informed Structures - How to Braid a roof

Master Thesis in Structural Engineering, Chalmers 2019.

Static Motion

Preparatory study completed in the Matter Space Structure studio in the spring of 2018 at Chalmers.

EDUCATION

Architecture and Engineering

Bachelor. Chalmers 2012 - 2015

Architecture and Urban Design

Master. Exchange at the EPFL 2015-2016. Chalmers 2018-2019

Structural Engineering and Building technology.

Master, Chalmers 2017 - 2019

Figure 2. *In Textile*
Inside a space of textile forms . Authors own image.

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ARCHITECTURE BORDERING FASHION

Introduction

There are analogies between the design process in fashion and in architecture. Both often start with sketching the vision of the design. In architecture these sketches are made into models, digital or physical, and blueprint are made as a guide to building it. In fashion a test garment, the toile, is made, either by tailoring a pattern to the intended design, or by draping on a model form; from which the pattern is made. The pattern of a garment, within fashion, is the equivalent of a blueprint of a building, in architecture.

The methods of draping and tailoring, are brought into architecture in this thesis. Using the ***edges*** and the ***surface*** of textile, in combination with ***solids*** and ***fixed points***, as anchoring elements, with ***draping*** and ***tailoring*** as methods of designing a space.

Since I work with a method where Architecture is bordering fashion some terminology should be explained.

TERMINOLOGY

Tailoring - making fitted garments sewn to the measurements of mine specific person. Here referred to as designing using flat patterns and pieces of fabrics which also can be altered to the required measurements.

Draping - Refers to the method of designing garments by pinning fabric and making the design onto a form of the body.

Toile - is a test garment usually made in a cheap cotton or canvas material. Here it is used as the draped fabric which is cut and marked and from which the pattern is made.

READING INSTRUCTIONS

This booklet is structured in the same way as the work process. Each chapter corresponds to one step of the working process. Read from start to finish.

Figure 3. *Static Motion (Borgny, M & Wallander, L , 2018) . Repetition of a shape, motion model Model recreation of motion blur, done in Static Motion.*

PURPOSE

Textile is a soft, billowing, often light and sometimes transparent material which, so far is not highly regarded in the world of architecture. In this thesis, the methods of draping and tailoring textile architecture is explored - with the objective of expanding textile use in architecture. As well as to inspire a soft kind of architecture, which could benefit from the beautiful qualities of textiles.

DEMARCATION

In architecture today the main usage of textile is in static tensile constructions where the soft properties of textile are not present at all. The billowing properties of a textile among other features are properties which could influence the use of textile in architecture resulting in a more lively spatial experience. The term textile also comprise such a large field of materials build up by fibres, assembled as a repetition of joints. In this study, textile is however only treated as a mesh, or surface material. The internal composition of textile is disregarded.

THEORY

In this thesis the main source of inspiration is from fashion; design methods in fashion and fashion designers. A description of the working methods of draping and tailoring as well as a presentation of the most influential designers in this thesis will be presented in the following chapter.

Figure 4. *Neoprene draping*
Draping of a space using neoprene fabric. Authors own image.

METHOD

The edge and the surface of textile, in combination with solids and fixed points, as anchoring elements, with draping and tailoring as methods are use to design space.

OPEN- END METHOD

Inspired by the working method used in the previous study, Static motion, the method used here is an open- end method. Where one step is allowed to influence the next, and not working towards a set goal from the start.

Therefore, even though the project started out as an exploration on spatial orientation and direction in textile architecture, with the initial title of; A Sense of Direction. Along the way, it took a turn towards how one can work with textile in the field of architecture, taking inspiration from fashion working methods, rather than what kind of spaces and functions could be built in textile.

PROCESS

This study is divided into 6 parts. First the initial experiments of direction in textile. Secondly draping on solids, where directed spaces are draped onto solid walls using a working model where these wall elements can be places in different compositions. In the third step, Draping 1:1, the idea of draping onto solids is taken into full scale. The fourth step, Tailoring a surface, includes experiments of how one can alter the geometry of a flat textile to a three dimensional form using cut out shapes. The fifth step, Textile corners, is a continuation of these cut out geometries, where focus is more on which form could be used as a kind of corner to create a three dimensional space. Lastly, in the sixth step, tailoring a space by draping, the methods form all the previous steps are combined in a set of experiments of tailored spaces. Here the tailored textile corners are made on the surface. These are then draped to be fixed in certain points whereas the edge of the cloth is draped onto solids. The same working model is used only using larger scale wall modules.

ARCHITECTURE BORDERING FASHION

Common for all steps in the process is that a kind of inverse draping is used, where one can imagine being inside the for example, dress, and drape the space around you. Rather than wrapping textile around a form.

In this working method in between architecture and fashion, the cutting pattern in combination with the composition of the wall elements serve as the blueprints of this textile architecture.

TEXTILE TODAY

Discourse

As previously mentioned, the starting point of this thesis originated in a preparatory study called Static Motion. Made in the Matter Space and Structure studio, in the spring of 2018, this study has influenced this thesis mainly by the use of a similar working method and the general enhanced understanding of textile as material. This study as well as a presentation of architectural examples where textile is used will be presented in this chapter. The textile architecture of this chapter is not direct inspiration to the textile architecture made in this these but rather a way of positioning this work.

Fashion methods including draping and tailoring will be introduced in the following chapter. As well as a selection of fashion designers which have been very influential during this work. These include; Cristóbal Balenciaga, Iris van Herpen and Usha Doshi.

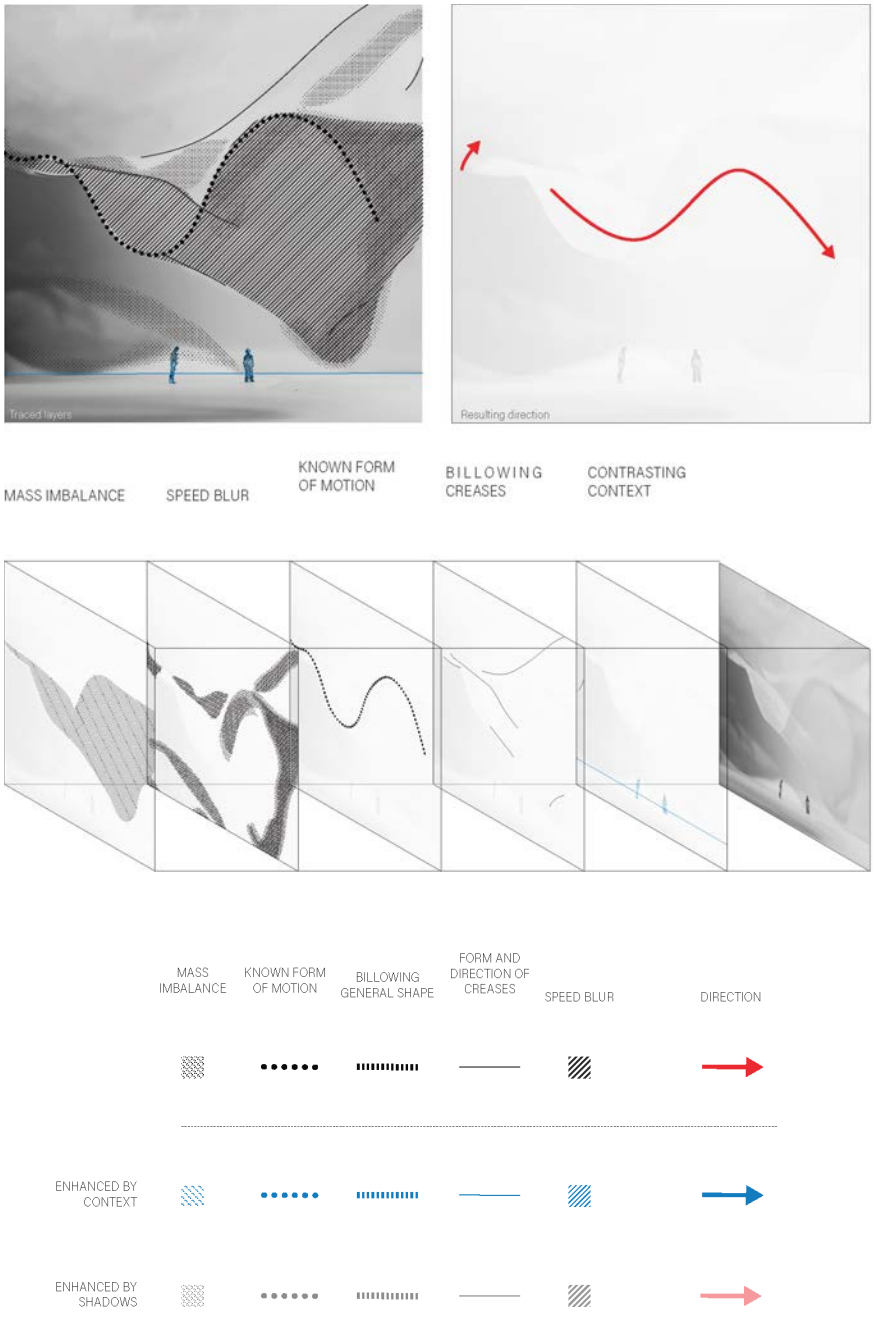


Figure 5. *Static Motion (Borgny, M & Wallander, L , 2018) Dictionary Traced layers in an image of a moving fabric.*

STATIC MOTION

Static motion is a study of the interpretation of motion in still images, conducted by Linda Wallander and Malin Borgny. Using photography of moving textiles, factors which makes us read motion were identified, in a per definition, still image. By categorizing and tracing different layers a dictionary was created to communicate the essential features to interpret motion.

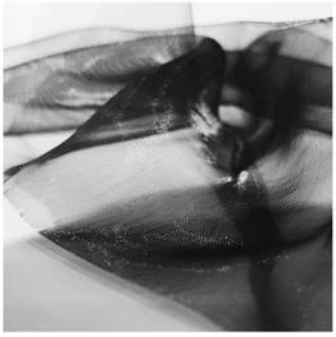
Details were traced and represented by three categories of figures. The combination of the lines and surface layers resulted in a direction. This was represented by an arrow. The colour and opacity of the figures depend on if it was an effect in the fabric or was enhanced by its shadows or the contrast to the context.

Small scale models were then built to recreate these layers of motion. Extracts from some of these different experiments that were made is seen on the right.

BLUR

From the layers of motion identified when producing the dictionary, blurriness as a means to communicate motion was the hardest one to interpret in 3D. Likely due to the fact that in photographs this is achieved by actually snapping a photo of an object in motion, whereas in real time experiments the fabric is static.

Furthermore the fabric used was both black and quite translucent on a white background board. This meant that whatever effect of blurriness that occurred was enhanced and thus this effect is likely hard to achieve with an opaque textile.

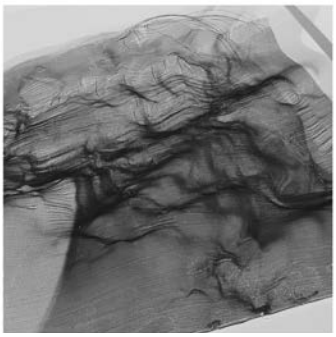


MOIRÉ BLUR

As the fabric used was quite translucent a moire effect could easily be created by overlapping or folding the fabric so that the pattern that the threads in the weave make is slightly offset in relation to each other.

DIRECTION BLUR

The pattern of the weave was manipulated for this experiment as well, when the fabric was tensioned in two directions - with every other tension point on opposite sides of the fabric. The result resembles that of water ripples or timber veins, and is almost three dimensional, even though it is flat.



SPEED BLUR

To create speed blur an attempt was made by repeating the same shape one closely after the other. The result however was perhaps to organized to appear as an object in motion.

SHADOW BLUR

The shadows cast by the fabric was manipulated by breaking up the weave of the textile through moving and pulling threads in different directions. The effect was quite successful as it resembles the blurry effect from the workshop with flowing fabric, chapter 0402.

DIRECTION

For some of the models an evident direction was achieved immediately through producing creases in the fabric that were directed in either one distinct direction or in a more wavelike manner. For the ones that are in one distinct direction the direction appears to follow the creases. However, for wavelike or parallel creases the direction is perpendicular to the crease direction. Once again, the shadows cast by the translucent fabric enhances the effect.

Photo: Linda Wallander

LARGE SCALE EXPERIMENTS

One of the most important layers was identified as direction, however, we often interpreted two different directions in one and the same image. So as a last step in this study we built a large scale installation where textile was used to direct a space. This idea of giving a sense of direction to a space, using textiles, was really the starting point of this thesis.

A general feel and understanding of the textile material as well as the working method used in Static motion are the main features brought into this thesis.

In Static Motion a kind of open-end method was used were one step of the process was allowed to influence the next, instead of working towards a set goal from the start. One could also say that the method used in Static motion was one of "do first, think after". Analysing the result of one step was always done after the experiments were made and this analyse led the process onto the next step. This way of working was essential to obtain unexpected results.

FULL SCALE EXPERIMENTS

Figure 6. *Static Motion (Borgny, M & Wallander, L , 2018)*
Using long bands of 1,5 meter wide fabric some large scale experiments were done to explore ways of giving direction to a space.

Figure 7. Form- finding model. Copyright; Frei Otto

TEXTILE IN ARCHITECTURE

Textile is one of our oldest building materials and have been used in the earliest architecture; the dwelling for most nomadic people dating from the Ice Age to present day, the tent.

Despite the long history of textiles, it has in architecture long been seen as a temporary, incendiary , fragile, unstable material with high maintenance and low performance. Even though the technology of making metal meshes and tensile structures has been available in the ancient worlds, it was continuously unexploited in the field of architecture. In addition to this, fashion and textile were, as Garcia, M describes; "traditionally associated with crafts, the feminine, frivolity, the ephemeral and the sensuous". This yielding a trivial view on textile use in architecture where textile was connected to more manual vocations in contrast to the more intellectual discipline of architecture. (p.12-20)

LIGHT TENSILE ARCHITECTURE

Many of the built examples of textile architecture today comprise a tensile textile structure. The modern era of these kind of structures began with Frei Otto who became one of the most influential voices in textile architecture. In tribute of him being awarded the Pritzker Architecture Priza, Foster, N, writes in tribute; "Frei Otto showed us that architecture need not be burdened by the weight of its own traditions, but could instead be free to express itself through simple but innovative sculptural forms — his was an architecture inspired by lightness."

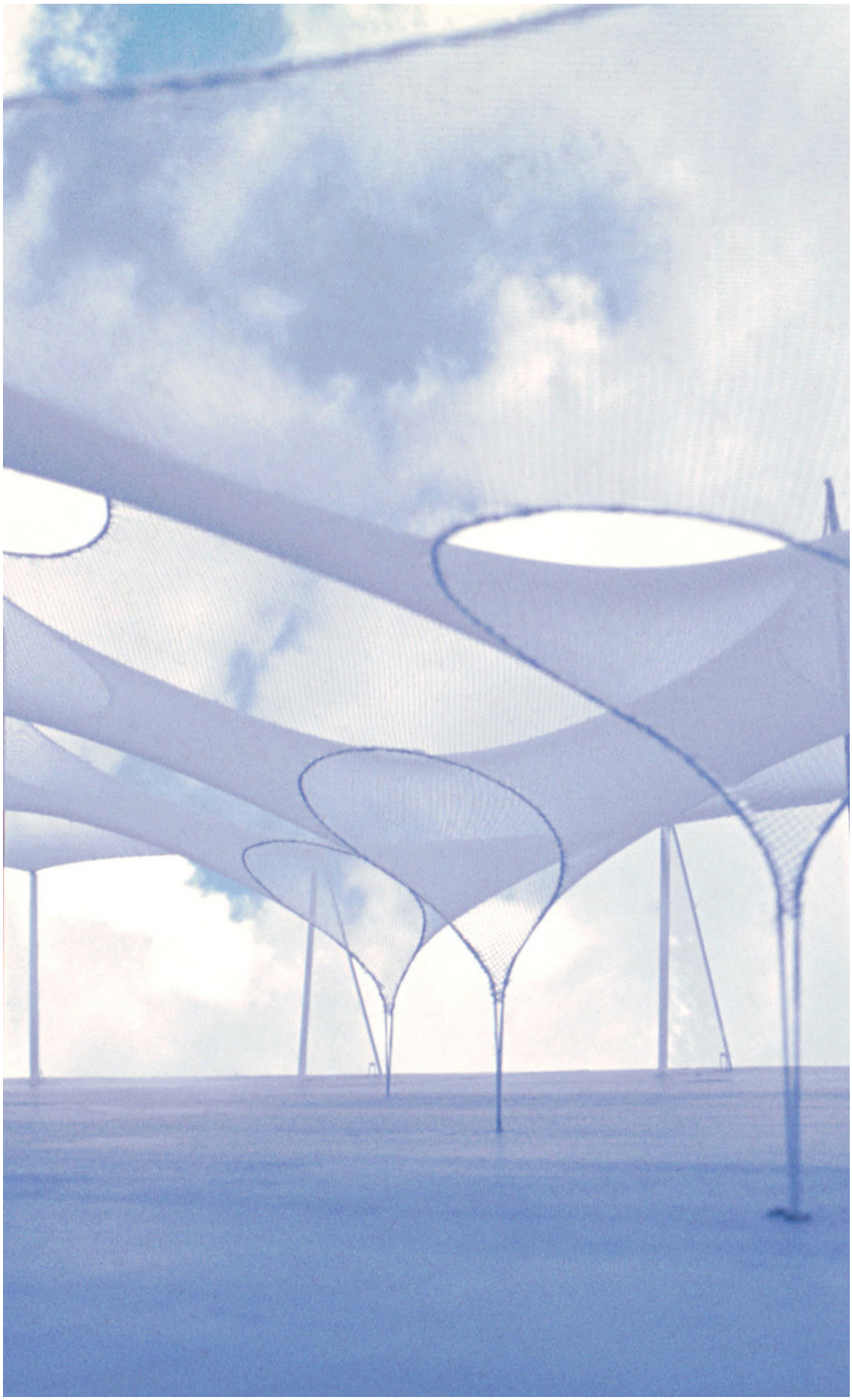


Figure 8. KnitCandela. *Concrete pavillion using textile as framework. By Zaha Hadid Architects in collaboration with Block Research Group ETH Zürich. Photo: Philippe Block.*

NON PERPENDICULAR ARCHITECTURE

Textile is not by definition a perpendicular material, nor is it rigid in its own state as for example concrete. It is also a material which may be produced as an irregular surface from the start unlike many materials. And the possibility to make textiles into three-dimensional weaves or knits etc. is well under way. *KnitCandela*, the concrete pavilion using a knitted textile as framework is an example of this.

These properties of textiles in general serve as a wide range of possibilities when it comes to design. In the temporary exhibition space by Magma Architecture, there are no perpendicular angles, The space created by the large textile construction gives a spatiality which is more free and playful than the regular box.

Figure 11. *Berlinische Galerie. (Magma Architecture,2007)*

Figure 10. *Wrapped Reichtag (Christo, 1995)*

Figure 12. *ArcInTex Workshop (Wolstenholme, G. 2018)*

Figure 9. *COS x snarkitecture (designboom, 2015)*

Figure 13. *COS x snarkitecture (designboom, 2015)*

TEXTILE ON A FORM VERSUS AS THE FORM

In the examples above it is evident that textile can be used to wrap around and accentuate a form, as in the example of the wrapped Reichtag, seen in figure 10, by Christo and Jeanne Claude. It can also be used to form a space, as in figure 11, of Magma Architecture, in a landscape of textile formed by a patched surface similar to the example from the ArcInTex workshop, figure 12, were a knit is instead used to form the space. In the lower examples, figure 9 and 13, the space is instead formed by a number of layers of textile or strands of textile.

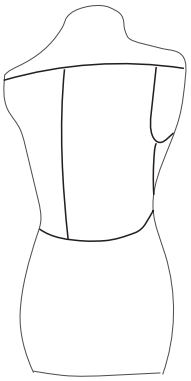
INSPIRATION FROM FASHION

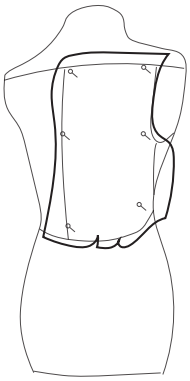
Similar to the process of designing a building. The process in fashion when designing a garment often start with the sketch of the vision for the design. As one in architecture would built a model to test the design, in fashion the toile is made. Miller (2007, p185) says that the toile are "garment prototypes used to try out patterns are referred to by this term, probably because they are usually made of a cheap cotton". From the toile, the cutting pattern of the garment can be retrieved, to recreate is in its intended material.

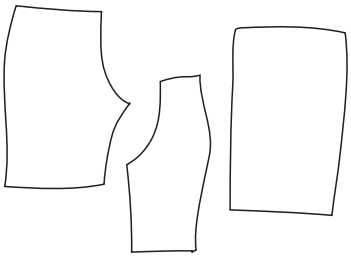
The toile and the pattern can be obtained in different ways using different methods. One way is to tailor a pattern, from flat pieces of fabric. For this method, an understanding of the transition of the flat pattern pieces to the finished garment is required. Often the design is made by altering a ground pattern.

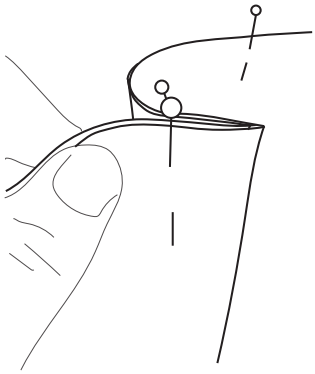
Another way is by the method of fashion draping. Fashion draping, is an essential working method in clothing design. It is the creative method where the fabric is pinned directly onto a form of the body, the mannequin, to create the design.

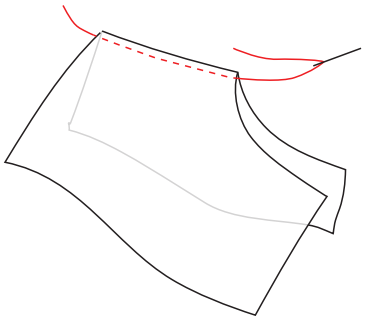
The pattern of a garment enables the reproduction of the design, in different materials as well as sizes.

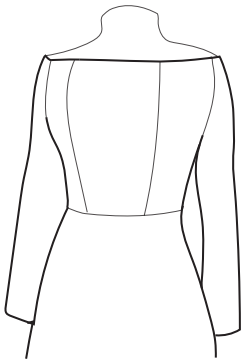












DRAPING PROCESS

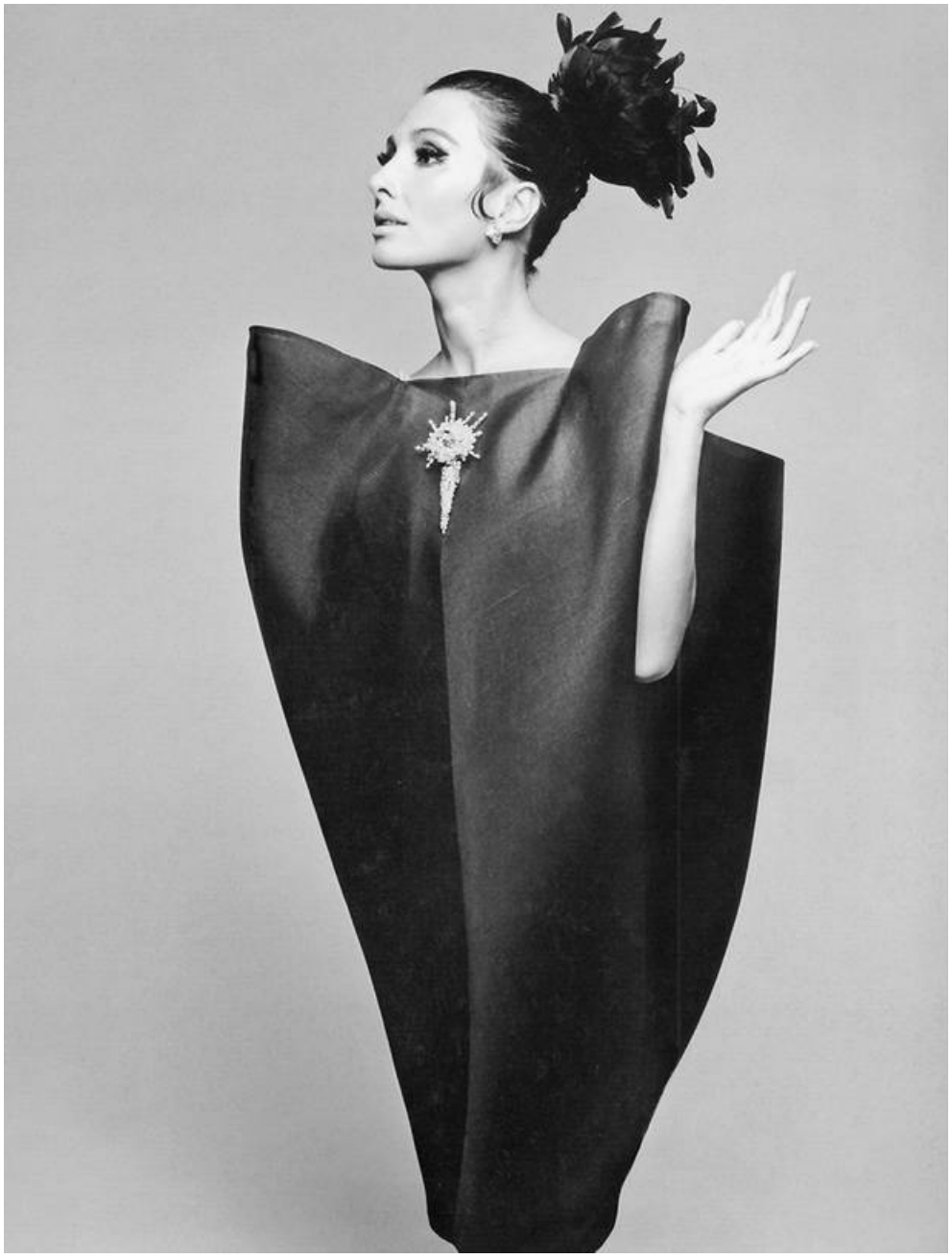
The draping process starts by pinning the fabric onto the form of the body. Markings on the pinned fabrics are drawn and the pieces can be taken off the mannequin, to be cut. By sewing these pieces together the toile of the garment is made. Authors own image.

Figure 14. *Le Chou.*
Sue Murray in evening dress of black silk crépe with "chou" wrap of black silk gazar by Balenciaga, Vogue, Sept. 15, 1967, photo by Irving Penn

BALENCIAGA

Haute cotour master Cristóbal Balenciaga was a Spanish designer and founder of the Balenciaga fashion house. In a time of very fitted fashion Balenciaga, as Miller describes; "paired away superfluous detail and achieved simple sculptural form" (2007, p.50) Starting with the fabric and letting the material inform the design - he lead the way in letting the women's fashion leave the form of the body. In the example of the envelope dress (cross reference) the dress does not follow the body but is carried instead by shoulder straps, only the hand is visible, (Miller, 2007, p.72)

Balenciaga has a characteristic ease in his garments where "the fasteners on his dresses were seldom too complex for the wearer to deal with herself", and his tweed suits were shaped but loose in cut. (Miller, 2007 p.60-62)



BALENCIAGA

Figure 15. *Alberta Tiburzi in 'envelope' dress by Cristóbal Balenciaga. Harper's Bazaar, June 1967. © Hiro 1967*

Figure 16. *Dress for Syntopia collection. Photo by Morgan O'Donovan.* *Image source: https://www.irisvanherpen.com/behind-the-scenes/syntopia*

IRIS VAN HERPEN

Iris van Herpen is a Dutch fashion designer who uses technology as "one of the guiding principles in her work". Being widely recognized as one of the most forward thinking creators she is constantly pushing boundaries of fashion design.

In July 2018 her haute cotoure collection SYNTOPIA was shown in the Paris fashion week. The collection combines traditional weaving with digitally designed intertwining weaving in a series of "Syntopic" dresses and coats. Working with laser cut layers of silk organza she worked with slowing down the movement in the garments by overlapping the fabric in different directions.

Van Herpen's multidisciplinary approach yield creations which go beyond fashion. She herself describes her vision as "Within my work I search for symbiotic relationships; looking at the hidden beauty at the intersection of precision and chaos, art and science, the artificial and the organic, that are blending into infinite hybrids. "

Figure 17. *Draping made by a cut out square and folding of the edges. (Doshi, 2017)*

USHA DOSHI

Usha Doshi is a Fellow at the Royal College of Art. Working in the RCA's fashion department for over twenty years as a Senior technician, in a role which encompassed pattern-cutting, draping, garment construction and tailoring. She has also worked in the COS design studio since its inception in 2007.

In collaboration with COS, the book "creating with shapes" was published in 2017. Doshi writes that "this book outlines a new concept aimed at all designers and pattern cutters at every level: that of creating drapes with shapes. (2017) Here she introduces a method of cutting out regular shapes from large pieces of cloths, folding and sewing the cut edges together to create interesting drapes. Her method offer "a solid starting point for creative solutions with fabric" (Doshi, 2017) addressing application of pattern making theory onto complicated design.

Figure 18. *Textile landscape*
Authors own image.

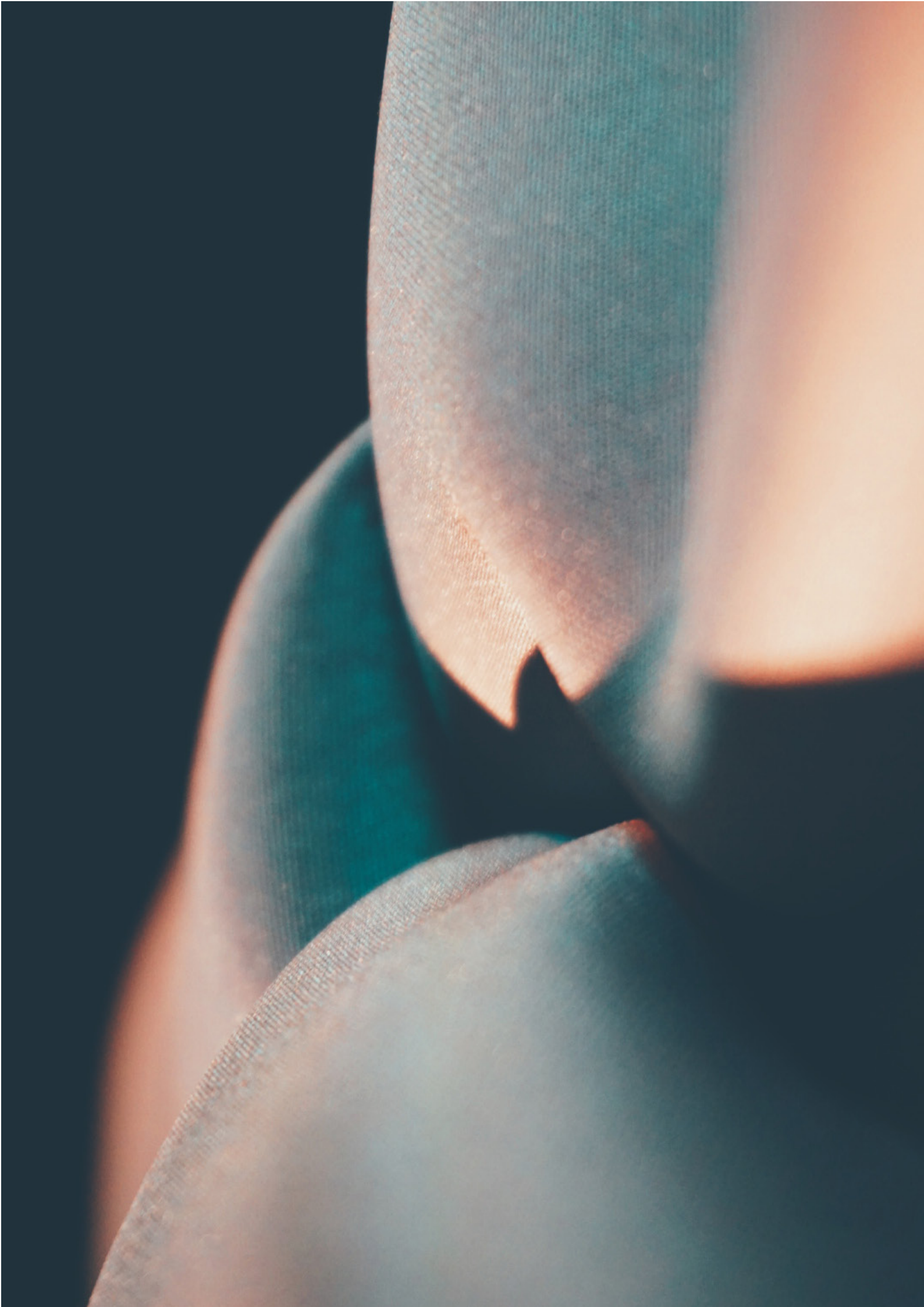
REFLECTION

There are clear parallels between design process in fashion design and architecture. In the way one starts with the vision, to continue on to make a test design of it, be it in architectural models or in a test garment or toile, and finally create a guide to construction. The pattern of a garment as a guide to making a piece of clothing can be seen as the equal of the blueprint in architecture informing how to construct a building.

The method of tailoring a space by generating a flat pattern which can be sewn to a three dimensional form is already used in architecture. In one way in the constructions of Frei Otto and another in the example of the KnitCandela pavilion. Still both examples are in a sense tailored from separate forms. The method of draping is however, mostly used as a way of accentuating a form in architecture by wrapping textile around it, visual in the art of Christo and Jeanne Claude. The method of draping could however be expanded further in the field of architecture. The method of draping is thereby seen as a potential method to introduce in architecture to draping a space, rather than on a form.

It is evident that there are multiple sources of inspiration in the field of fashion; design methods in fashion and fashion designers. The three main designers that have influenced this thesis are as previously mentioned;

Haute couture master Balenciaga, and his way of starting with the textile, and letting the textile inform which shape it "wants to take". As well as his, at the time, novel way of letting his pieces "leave the body" in contrast to previous the fitted fashion. Iris van Herpen, and her layering of fabric, and way of working with the edges of textiles as curves and Usha Doshi's work of creating interesting forms in the middle of the fabric using simple cut out shapes.



DIRECTION IN TEXTILES

Initial experiments

The study started out as an exploration of direction in spaces, textiles, and textile architecture. So in the initial experiments, the aim has been to find some directions in textile models. By repetition of the edge or by creases and shadows in the textiles.

This chapter include experiments of direction using soft billowing creases in organza fabric, pleating of multiple color weave. Some experiments include textile as a surface material in a regular space whereas other are more general models of only textile. This step in the process also include a drawing workshop conducted in the Matter Space ans Structure studio this spring. Here the focus was on ways of presenting the project in drawing.

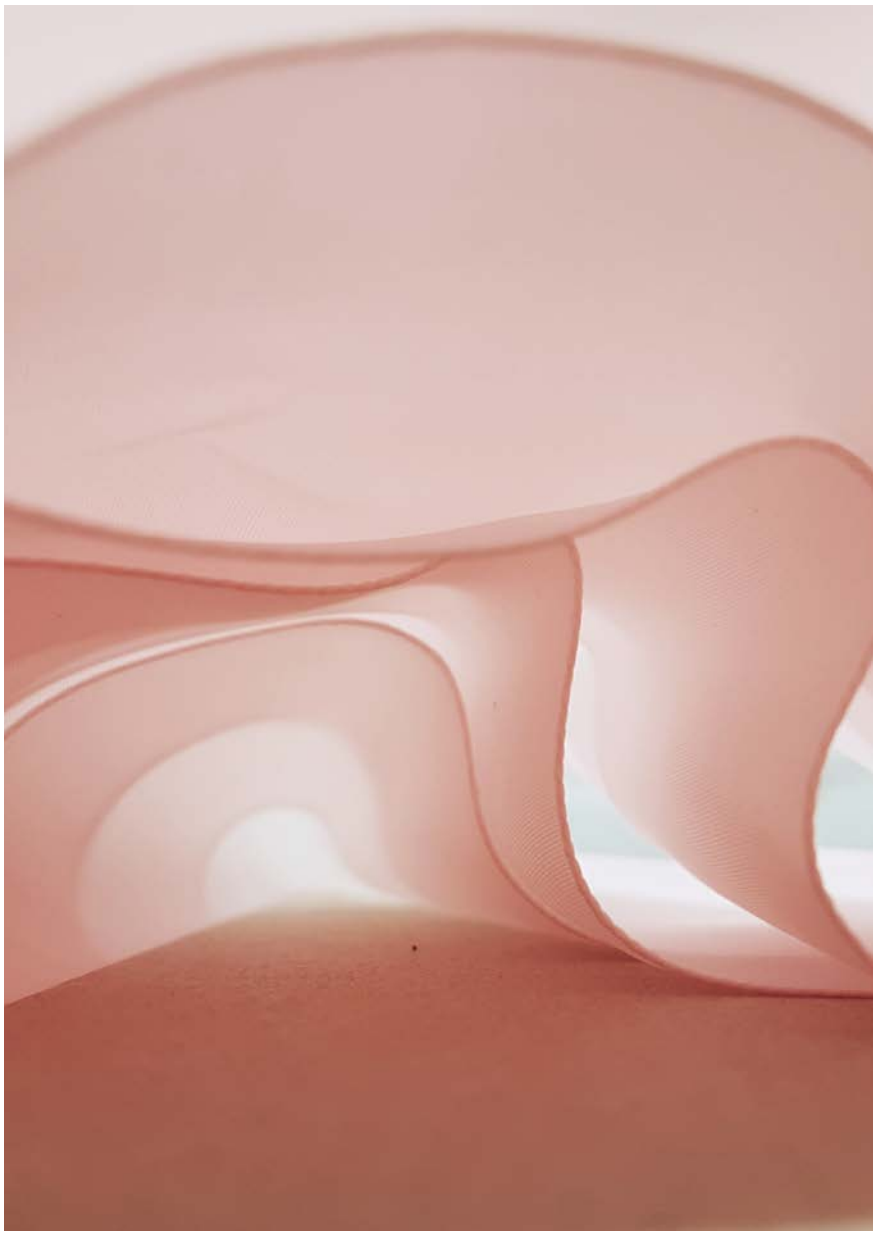


Figure 19. *Layering organza.*
A number of bands of semitransparent organza textile, sewn together to stand on the middle. Authors own image.

ORGANZA MODELS

In the first experiments. The aim was to find directions within the structure or view of textile. Which could be used to add direction to a space. At first, textile was creased and glued on flat model elements which were used as wall and ceiling elements in small model photos. This may have enhanced the illusion of direction in the space but the effect was not as strong as the aim was.

To work more with directions in textile and not only replace the material of a wall with a later of textile, some models of organza fabric were made. Both layered and creased pieces of organza were made. The structure of organza fabric give some transparency and enhances the effects of folds and creases in the pieces.






LAYERING AND FOLDS

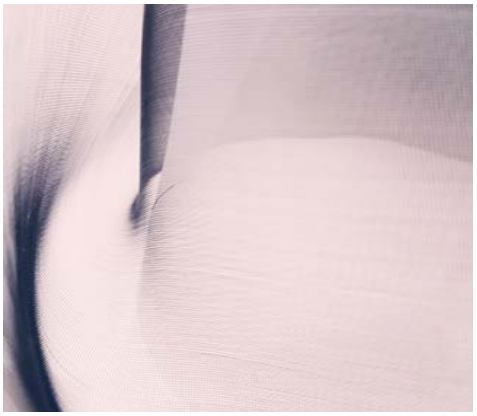
Direction in textile models explored using layering and folding of a semitransparent organza. Authors own image.

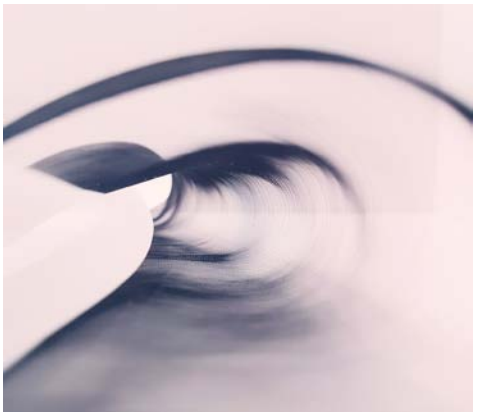





DIRECTION BY CREASES AND FOLDS

The effect of direction in creases and folds in textile are tested in these models. Made in a textile woven in two colors in the two direction of the weave, the warp is red and the weft is green, the color effect or the creases is enhanced. Authors own image.



INSIDE THE TEXTILE

The photos above are taken inside pieces of organza fabric. The effect of darker lines are made by the perspective and the light woven structure of the fabric. Authors own image.

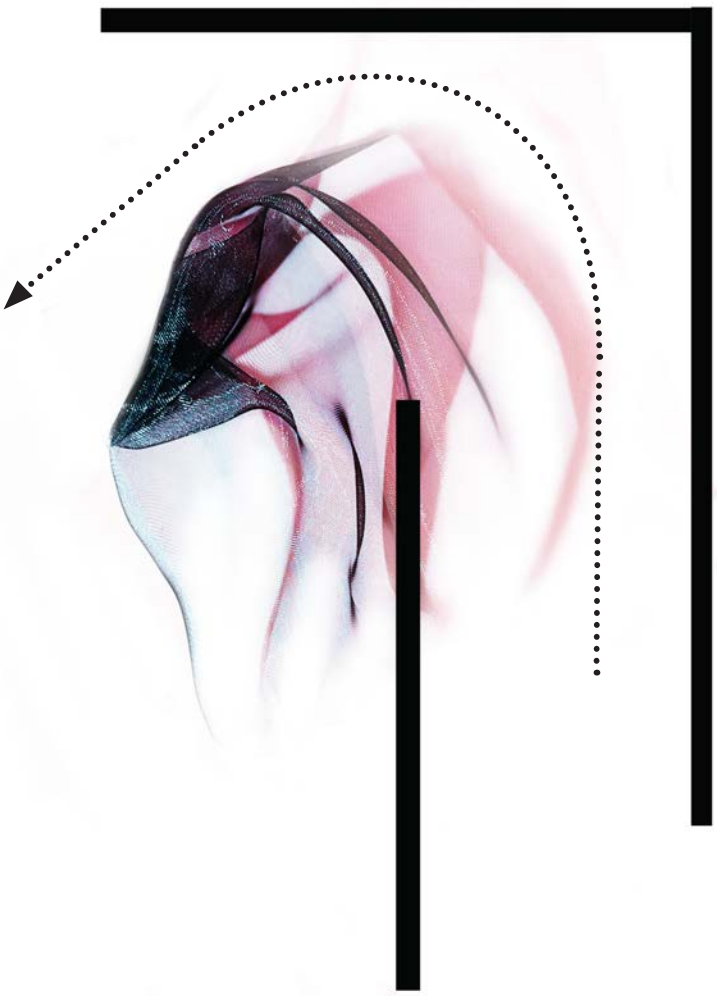


Figure 20. *Piece of a Path*
One element of motion in a plan. Solid lines as the walls in a plan drawing and textile to enforce the sense of direction. Authors own image.

DRAWING WORKSHOP - SOLIDS VS TEXTILE

In a drawing workshop,, conducted in the studio Matter Space Structure, at Chalmers in the spring of 2019, the ways of presenting one's project was in focus. Continuing on the theme of direction in textile I explored this in imaginary plan drawings see figure 20. Constructing plans of simple solid walls in black, images of textile from previous experiments as well as Static Motion, were used to enhance the feeling of motion in the plan.

Three motions were defined in plan, as the image above. These three motions were then puzzled together to a path. The aim was to enhance the sense of direction in the plans, ensuring that the potential user would know in which direction to move at all times. Even when there is an opening in the plan, the direction created by the textile ensures that the user keep to the path.

DRAWING WORKSHOP

Figure 21. *Textile and solids in plan*

A random plan which is puzzled together from the elements on the left side. Images of textile has been edited into the plan to contribute a visual sense of direction to the drawing.

Figure 22. *Textile draping*
Space draped using textile corners Authors own image.

REFLECTION

Having left the aim of creating direction in textile architecture. Two features from this first step is still found important. The first is the change of view from textile as a material on a surface in ordinary spaces to being inside the textile. The textile should form the space rather than be a texture on the wall.

The second feature is one obvious fact, that textile is compiled as a surface with an edge. And these two parts of textile give different possibilities when working with textile.

The relationship between the solid black lines and textile images from the drawing workshop is also interesting. Going from a perpendicular space where the walls are not enough on their own to direct the space, textile could be used to give both a more lively experience, as well as a sense of direction to the space.

The aim going further would be to bring this combination of solids and textile into three dimensions. The black solid lines in these drawing can be imagined as walls, and textile draped onto and in between them. Drawing parallels to Balenciaga's way of working; as the body carries the clothes, the walls carry the textile architecture around them. As his garments leave the body so can the textile leave the solids.

INVERSE DRAPING OF SPACE

Draping on Solids

Moving forward with the solid walls in combination with textile to provide direction, the results from the previous workshop is here taken into three dimensions. The solid lines in the plan is made into solid walls, and the images of textiles are replaces by actual textiles.

To make these of textile space, the method of draping was used. In the same way as draping in dress-making, where a toile is draped onto a form and from this the pattern is made. Here a kind of inverse draping is used instead, draping the space around you rather than draping around a form. Inspiration is taken from Haute Couture designer Balenciaga; as his garments leave the body, so can the textile leave these solid elements. Folds and cuts are marked onto the toile and it is released from the walls. From the toile the pattern of the space in question is made. Thus enabling recreation of the space in different scales.

The draping is made onto walls in a flexible working model, where the walls can be placed in different compositions, and they are made of one layer of foam to enable pinning fabric onto them. Seeing the walls as the solid elements on which the textile can be draped, it is similar to draping on the body.

Starting with non - complete wall composition, where the walls are standing in the right directions, but are not prominent enough to provide a clear sense of direction .The textile is draped onto and in between them to create a space with a sense of direction, using creases and folds mainly.

In the same way as Balenciaga started with the textile material itself to inform the design so is the draping made in this step of the process. The draping is not based on an initial sketch but is made directly onto the walls and the feel of the textile used is rather what informs the design of the space.

The cutting pattern can be extracted from the draped fabric, when taken away from the walls,serves as the blueprint of this soft architecture.

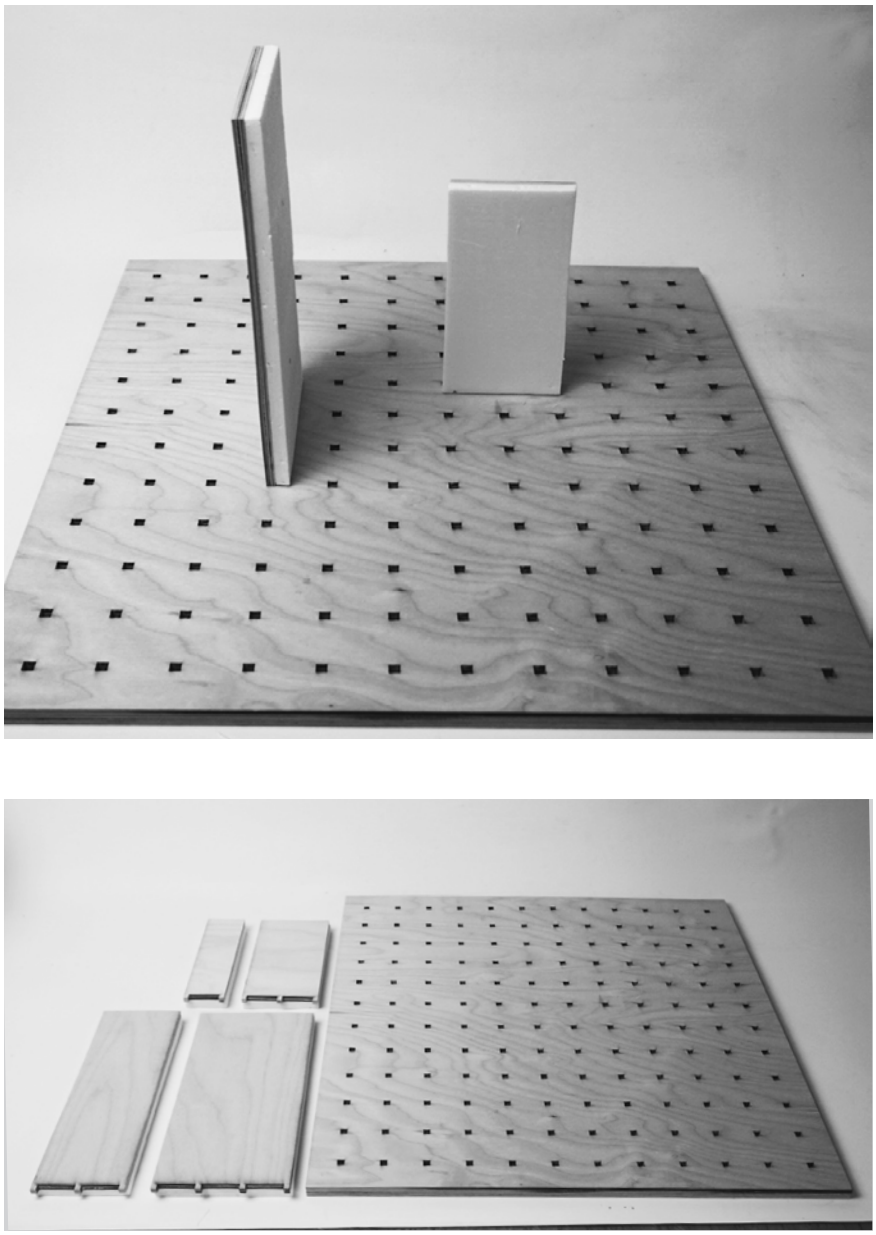


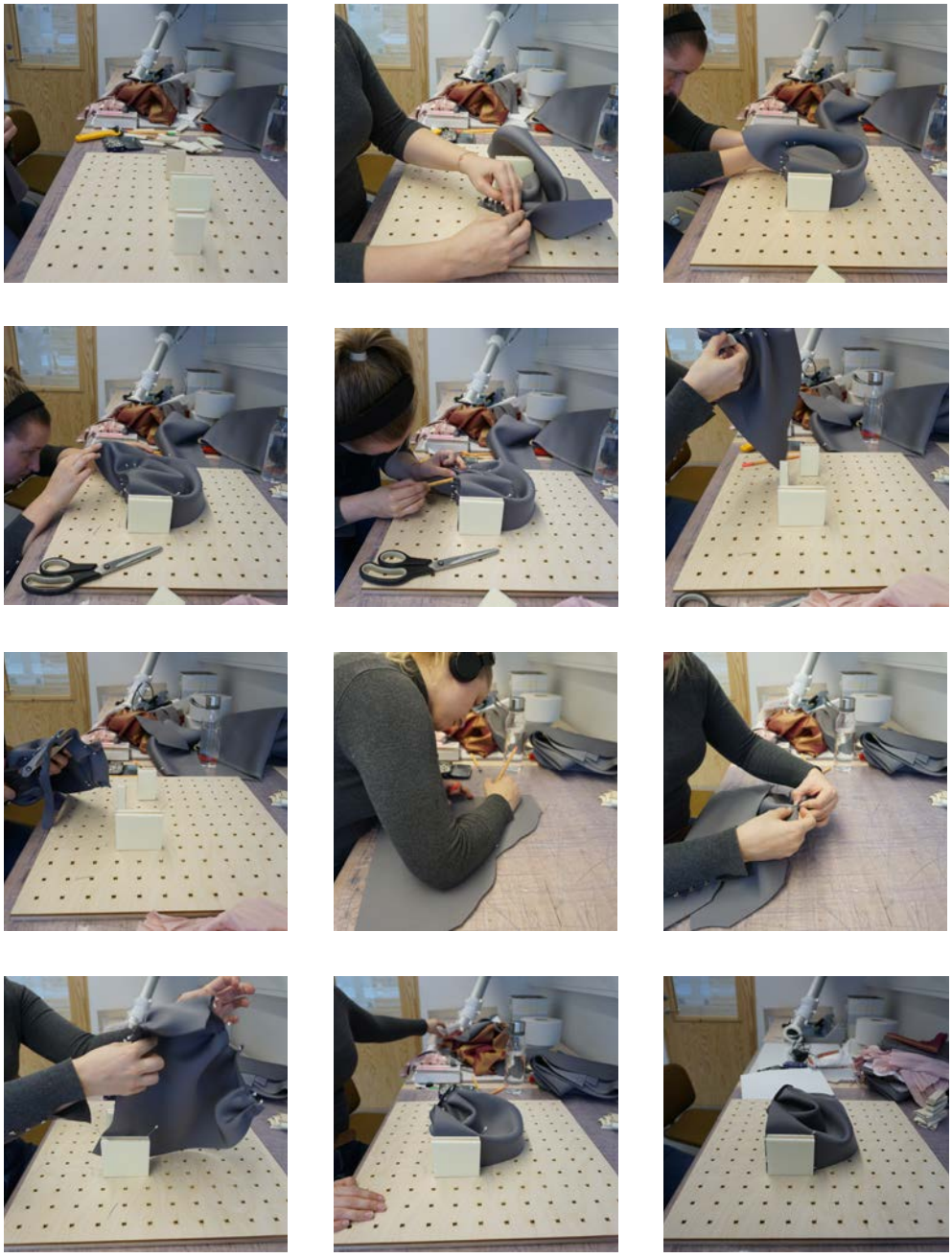
Figure 23. *Working model*
With a base consisting of a semi-perforated plywood piece in a grid with 6x6 mm holes, the wall elements can be attached in different compositions. Authors own image.

WORK MODEL

The work model used in these experiments, seen in figure 23, consists of one plywood base plate and a number of solid walls. The base plate, with the dimensions of 50x50 cm, has is semi-perforated with holes in a twelve by twelve grid. The holes in the base plate are 6x 6 mm and correspond to the "teeth" of the solid walls. The walls can thereby be pushed down into the perforations and stand on their own.

Using a grid of holes enables placing the solid walls in different compositions, even though they will be perpendicularly placed.

The walls are made out of one layer of plywood and one layer of foam to enable pinning of fabric onto them.



DRAPING PROCESS

Figure 24. *Time-lapse over the draping process of this model.*
Beginning with the walls, the neoprene.

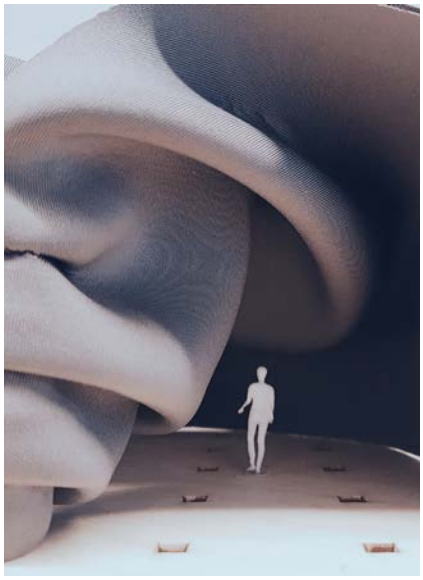


Figure 27. *Right: Toile*
Test drape cloth on which the attachment and folds are marked. Authors own image.

Figure 26. *Left: Reverse space*
Interior perspective of draped model. Authors own image.

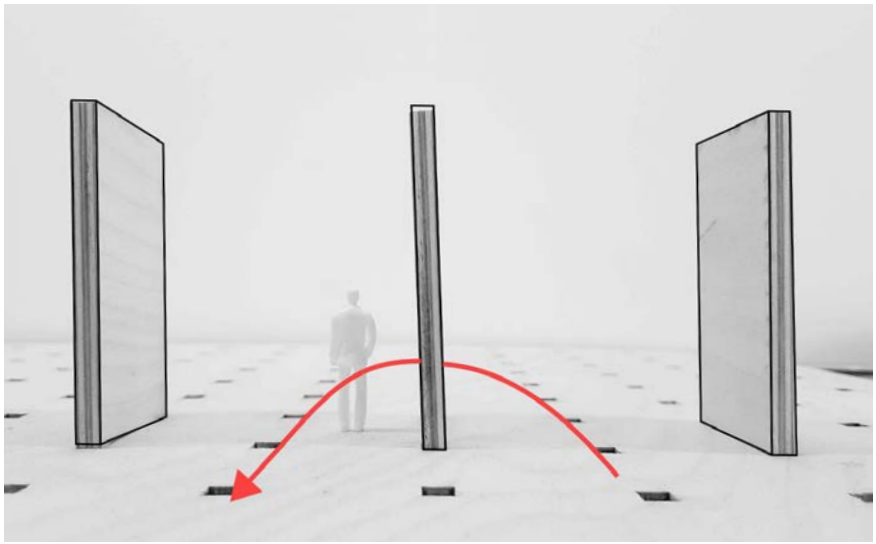


Figure 25. *Wall composition*
Arrow show the intended direction of the space. Authors own image.

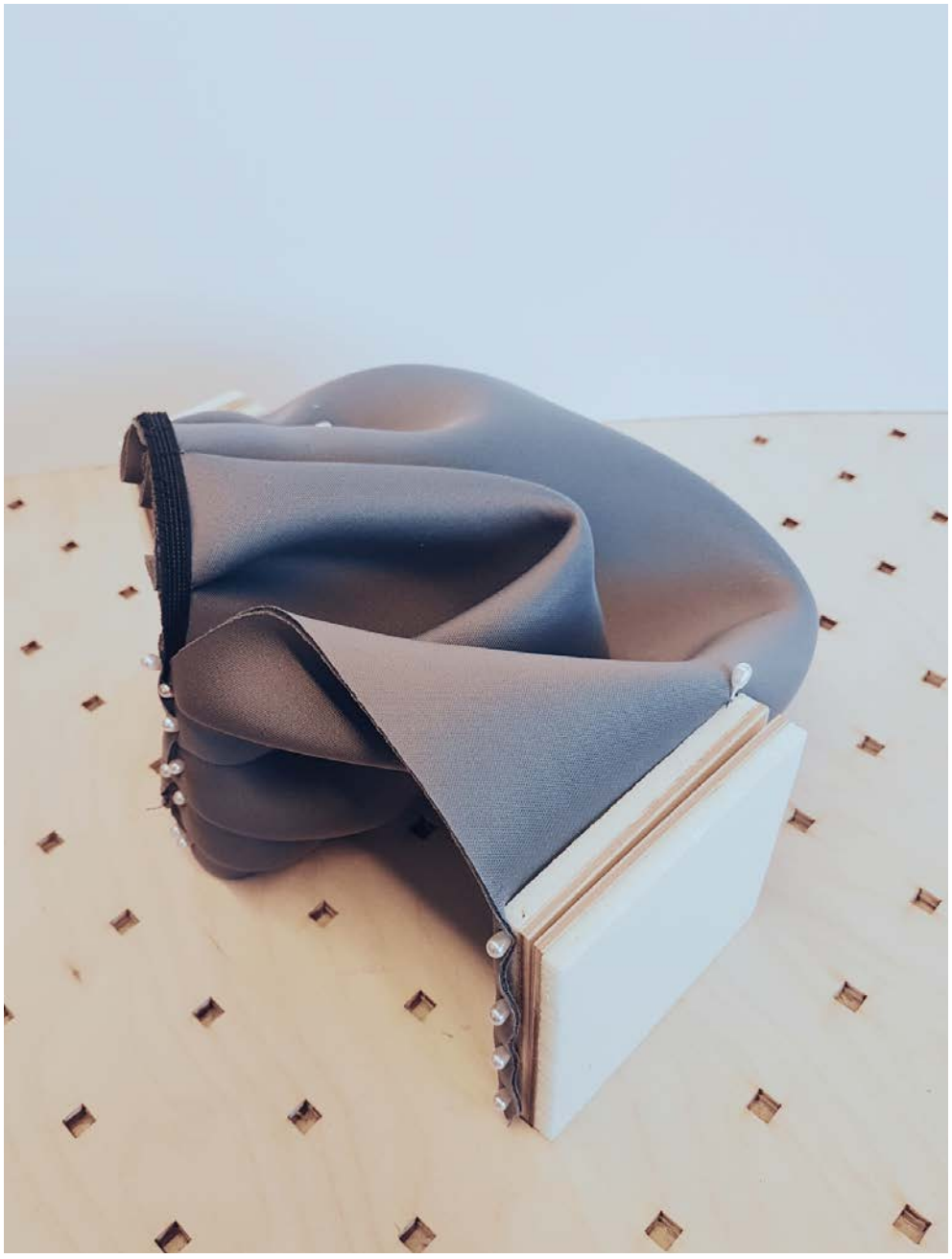
REVERSE SPACE

In this experiment three walls are used, see figure 25. The aim is to create a space in which you would move and turn around in, around the middle wall. The walls on their own do not provide this sense of direction.

A single piece of grey neoprene fabric is used to drape onto the walls. The fabric, being of neoprene has some stiffness in itself and thereby some soft horizontal creases could be made to provide direction along the creases.

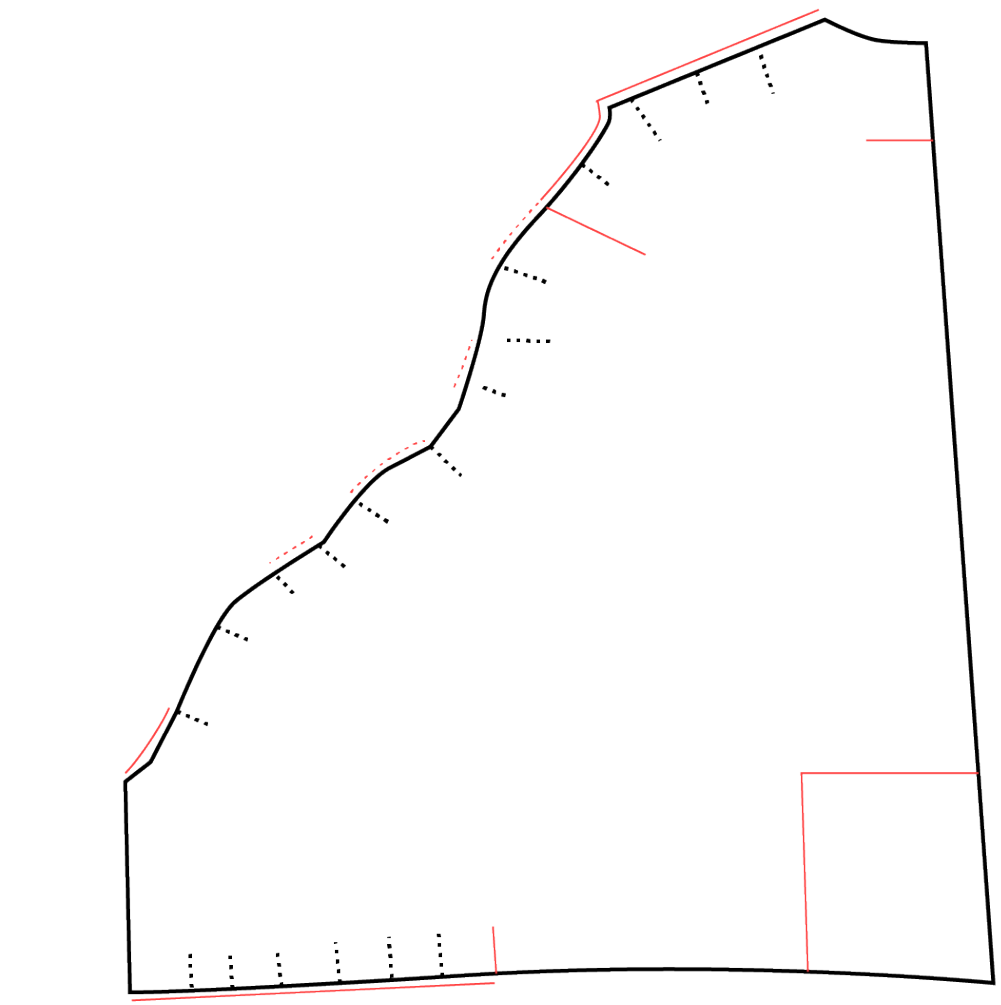
The process of draping this space can be seen on the previous page and the final recreation is seen on the right page.

As is visible in figure 26, the toile is made of one single piece where one piece of stiffener is used to strengthen the material over one of the openings of the space.



DRAPED MODEL

Figure 28. *Photo of the draped toile model.*
Neoprene fabric pinned onto foam layered walls. One stiffener is used between two walls on which the toile is sewed. Authors own image.



FOLD

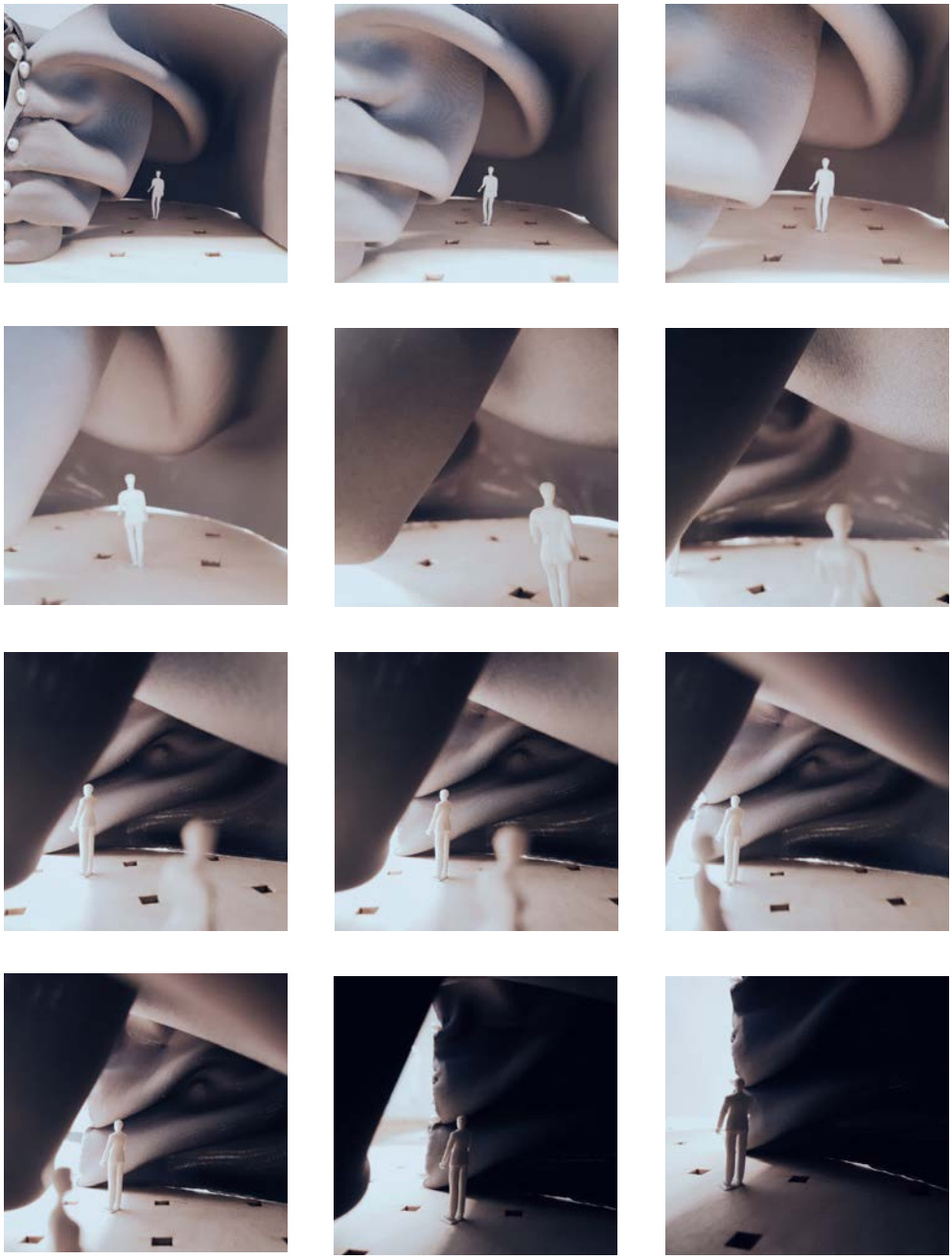
CUT

ATTACH TO SOLID

SEW TO STIFFENER

CUTTING PATTERN

Figure 29. *Cutting pattern for this reversed space. Authors own image.*



SEQUENCE

Figure 30. *Image sequence.*

Moving through this reverse direction, or reverse motion space. Authors own image

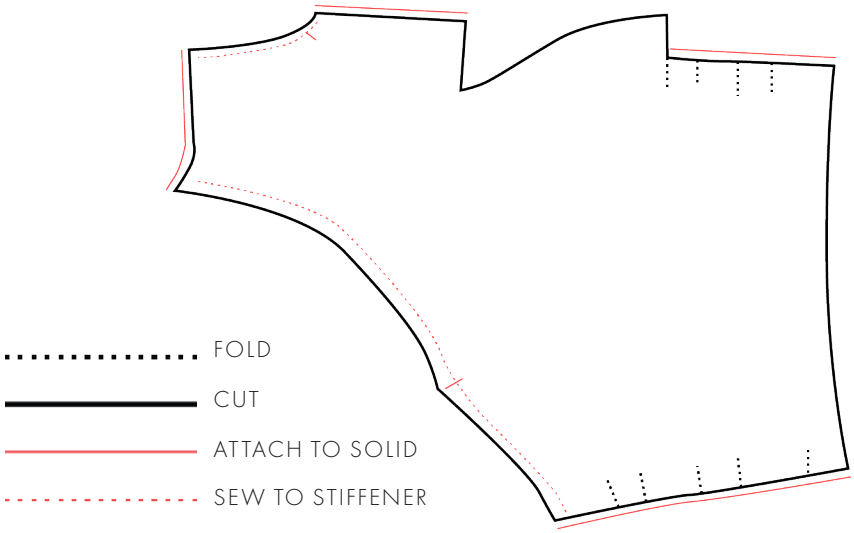


Figure 31. *Cutting pattern*
Dotted black lines indicate folds, red lines attachment to the solids and dotted red lines, attachment to stiffeners. Authors own image.

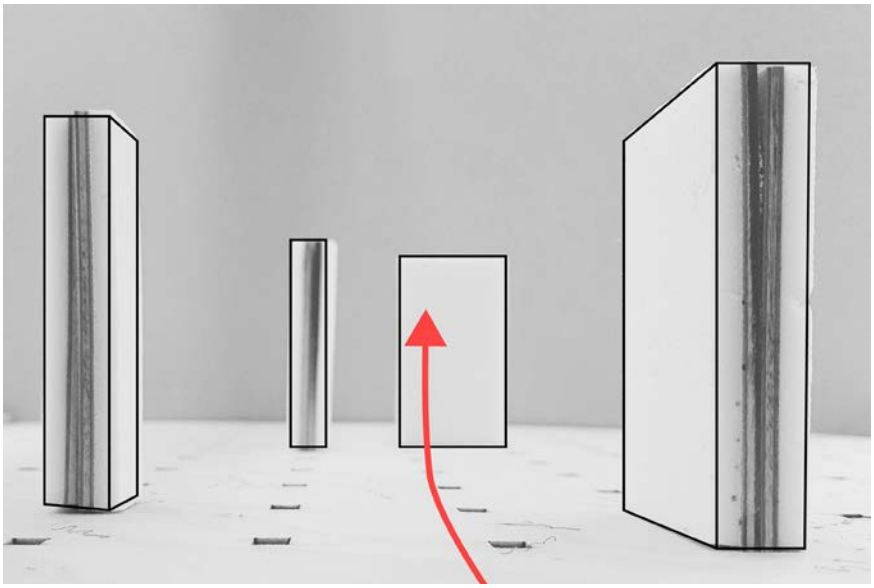
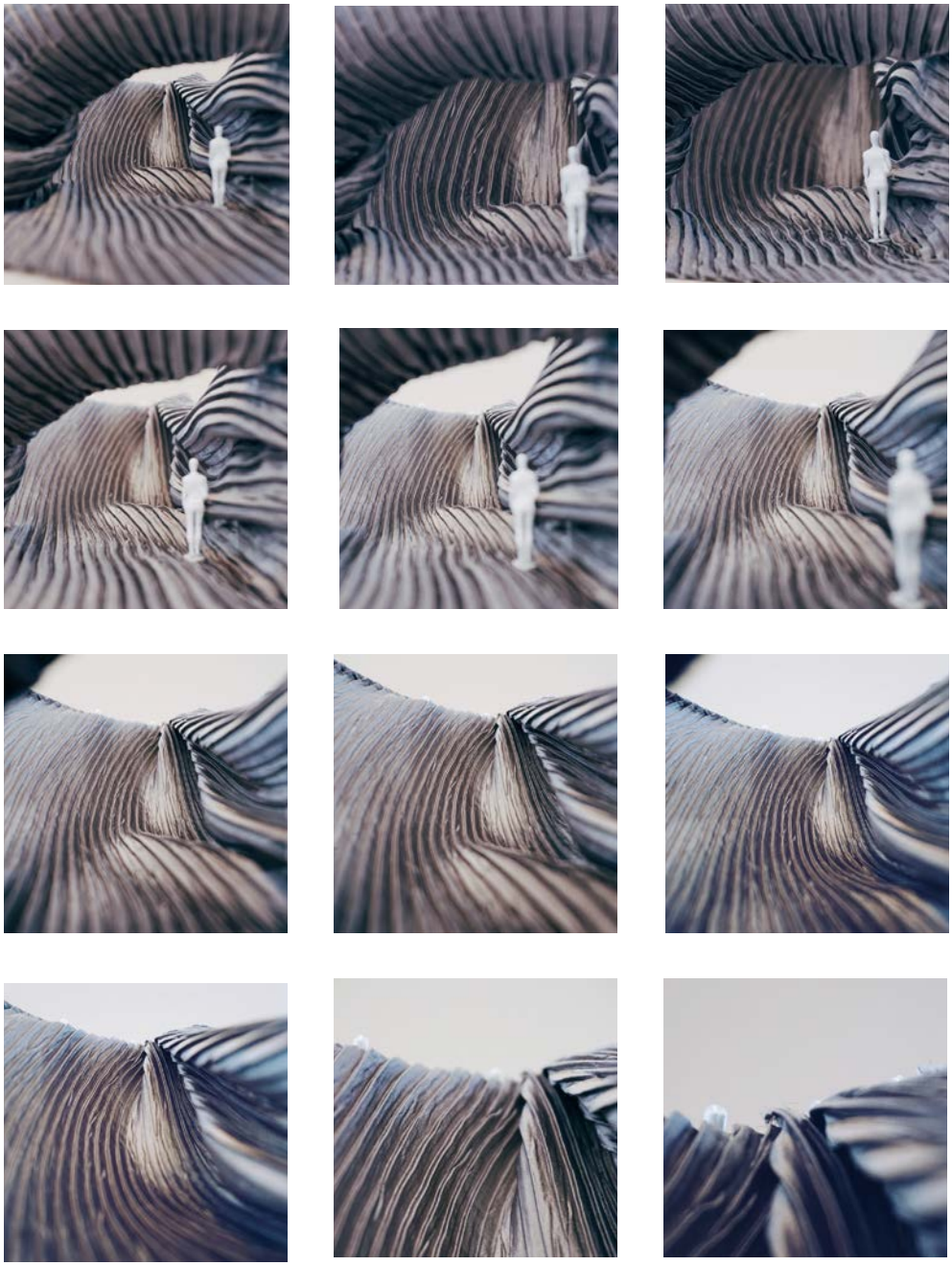


Figure 32. *Wall composition*
Walls placed in working models. Red arrow indicates the aimed for direction. Authors own image.

UPWARDS DIRECTED SPACE

Four solids are used in this experiment the draping of an upward motion is aimed for. In contrast to the previous experiment, the fabric used here is soft and pleated with very low stiffness. This makes it more difficult to create creases in the horizontal direction, though the pleat itself provides some folds.

The process of making this space is the same as the previous experiment. In this space however, the fabric forms the entire space. One can even walk on it.



SEQUENCE

Figure 33.

The images above are a sequence showing the space as it is when moving through it.

Authors own image.

Figure 34. *Textile Landscape*
Textile form made from circles cut out from the cloth and sewn together after folding. Authors own image.

REFLECTION

The idea of draping direction is quite effective in the experiments where the direction of the space follow the direction of the creases in the space. Here as well as in the previous study, Static Motion, it is evident that people naturally read direction in creases and it comes natural to follow the direction of the creases.

The draping of direction is however not the most interesting feature in these experiments. The most interesting feature in this part is the method. The method of draping onto solids. There is an interesting play between the soft textile and the solid walls.

The spaces that are draped show potential for be it not directed spaces, then for soft ans lively spaces which you could possibly interact with as well. Especially the experiments using neoprene are interesting when there is a certain stiffness to the textile. The designed creases can be larger and more dramatic at the same time as softer due to a lower curvature.

The pattern of a space gives the potential for scaling the structure and space up to full scale spaces. Even if it is not enough on its own. The properties of textile on a larger scale, or an exchange for another material must also be thought of when addressing the issue of making full scale versions of these spaces.

The solids themselves are in these experiments only formed as classic rectangular walls. The draping in fashion, which is done on the form of the body, is made around this composition of many different forms. The draping onto the solids can give many other possibilities adding to what is shown here if the form of the solids are also explored.

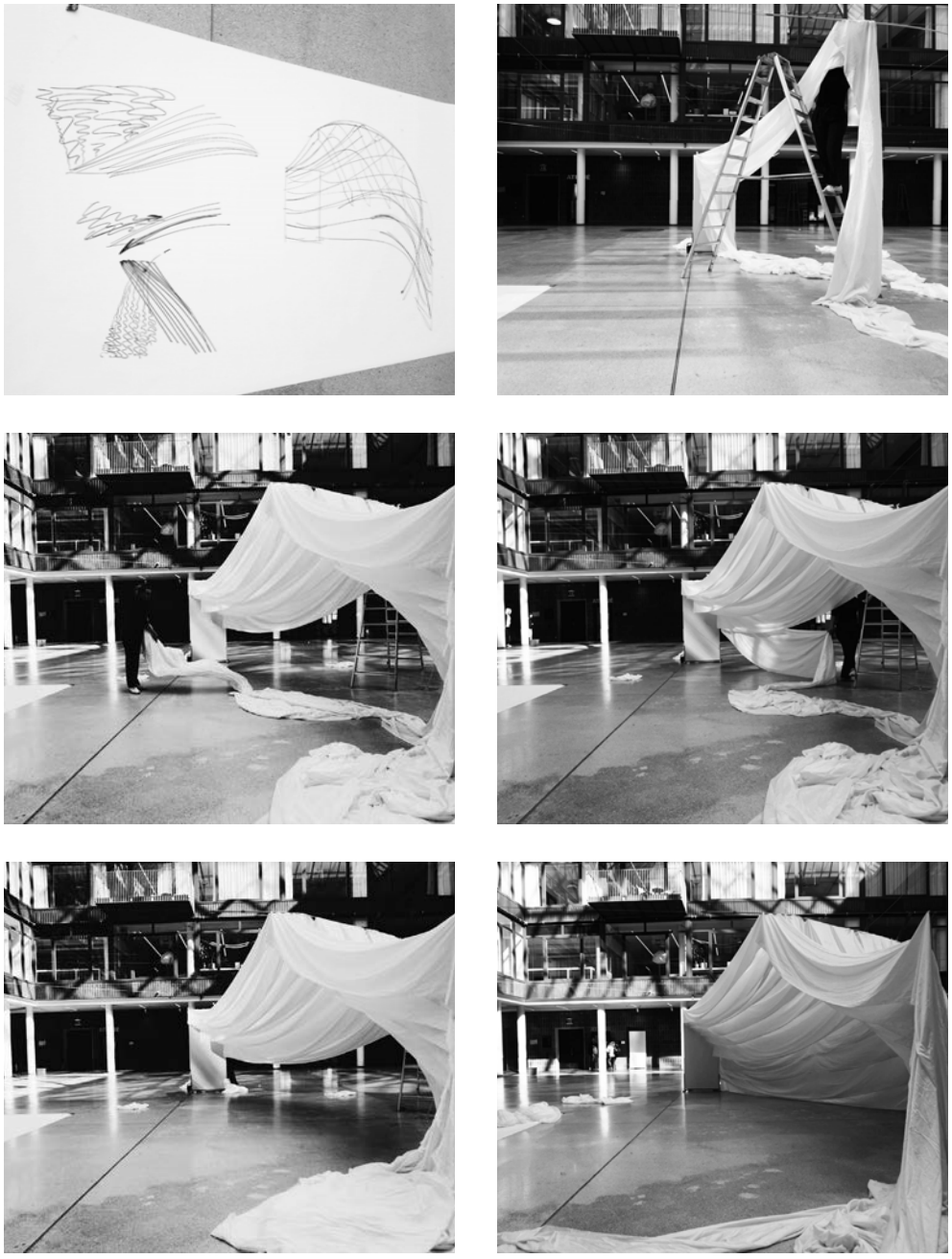
FULL SCALE DRAPING ON SOLIDS AND POINTS

Draping 1:1

In this experiment, the idea of draping onto solids is taken into full scale. Two 0,8 x 2 m "walls" are used on which these long bands of fabric is pinned. The draping is here also made in some specific points in the air. The textile is pinned onto the solids and the fixed points along one edge. The other edge is left free, inspired by the flowing edges of Iris van Herpen. The aim being to create some form of direction along the edges of the bands of fabric.

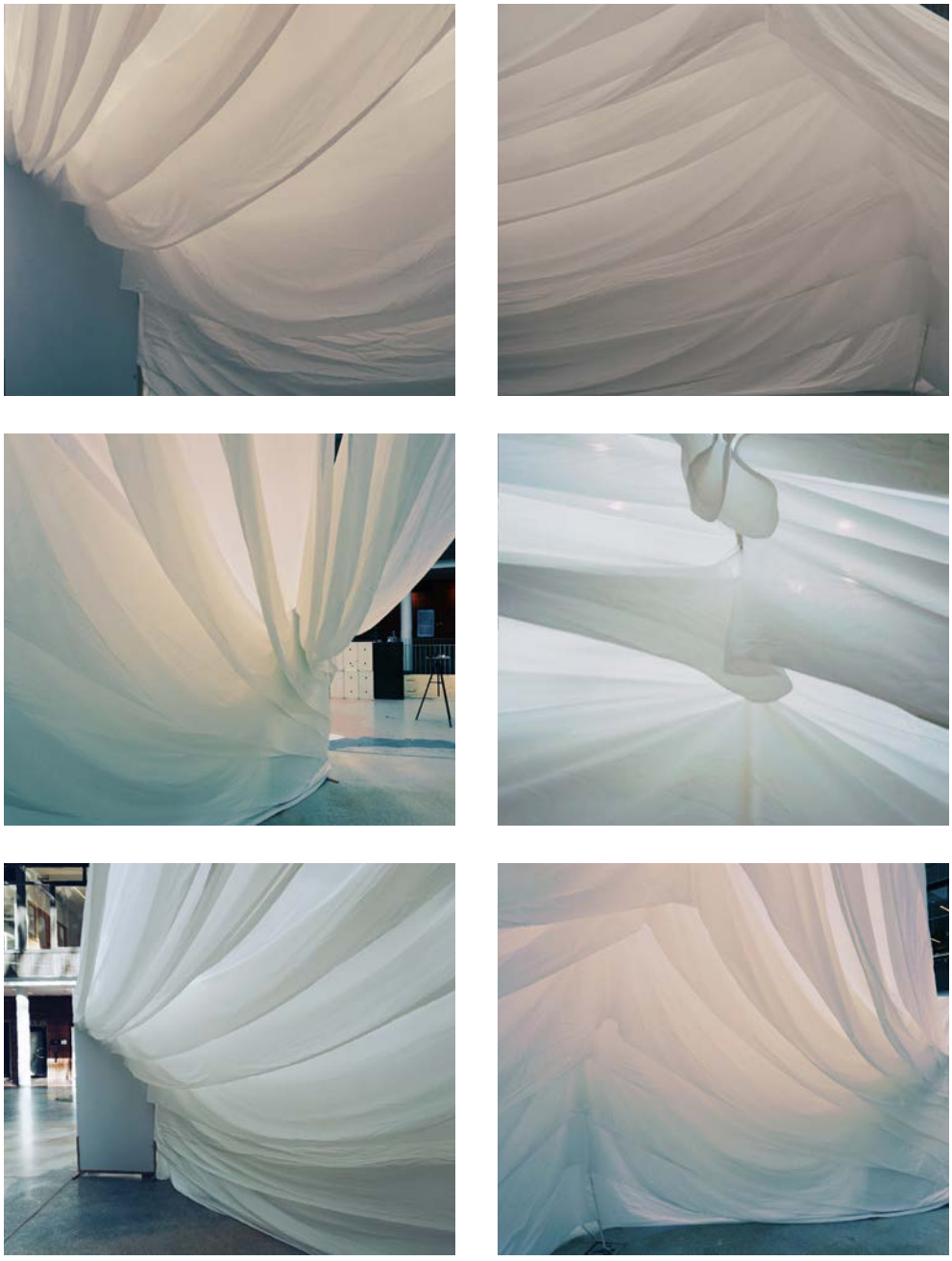
The draping is made by pinning the textile band onto one of the walls and around the other. The second draping aiming to give a hint of something hiding behind the second wall. This hint was thought of as a possible point of continuation if one would keep on draping other spaces to form a path.

Draping 1:1



PROCESS PHOTOS

Figure 35. *Draping process of the full scale draping.*
Starting with a large scale sketch on the floor.Two walls are used and the textile is draped from one and around the other. Plastic pipes are used to set points in the air. Authors own image.



FULL SCALE

Figure 36. *Details of the 1:1 draping.*
Where the bands of fabric are attached at points in the air, there is a clear change of direction of the fabric. Authors own image.

Figure 37. *Textile Curves.* *Geometry created by folding and sewing three cut out circles together. Authors own image.*

REFLECTION

In this experiment, the softness of the textile affect the outcome greatly. The intended direction along the edges is perhaps, not very clear. Since all points are attached by a bent plastic pipe, they are all fixed points are all set along a curve. This curve is quite visible in the finished draping, by the clear bend of the fabric on the middle. This could also be seen as giving a direction perpendicular to the intended one. In the end, some attempts to add multiple attachment points where added to work against this clear bend. The concept of adding points is a good way of achieving softer curves of the edges. However, in this experiment the number of attachment points where not enough.

In the same way as in the previous step, whether or not the intended direction is successfully draped or not, may not be the most important feature of this experiment. The most engaging feature is again the method. In this experiment the draping of the space was truly done around a person. And thereby the method of draping a space in 1:1 scale holds much potential. When draping in full scale, there is no question of how to translate one material, or which other material it could be made of in another scale. You simply work with the material at hand and let it, itself inform the design along the way.

Up until now, the draping in this thesis is made along the edge, on solids or attached to fixed points. This is what is most often done in dress making as well, both within the method of draping and tailoring, you work along the edge of a fabric. The pattern is made in separate pieces and the edges are then sewn together to make the garment, to fit the form of the body.

In architecture, the textile is often treated in the same way; A pattern of separate pieces is generated and the flat pieces are sewn together to create a form of a be it a shell or a roof.

PATTERN MAKING IN THE MIDDLE

Tailor a Surface

Usually draping a fabric is done along an edge - cutting pieces which are sewn together along the edge. Sometimes a pattern of a garment include some folding in the middle of a piece, to accentuate a waist for example. But seldom is the pattern cut within a surface.

Drawing inspiration from Usha Doshi and specifically her book "Creating with Shapes", for COS, where she introduces a way of making clothing patterns by cutting regular shapes, as the square, circle and pentagon, etc. By cutting out a shape in the middle of a cloth, folding and sewing, the geometry is altered by an action on the surface. The flat textile is made into a 3 dimensional form, within a continuous mesh, creating very interesting shapes and geometries.

This idea of pattern-making on the middle of a cloth is explored in this step of the process. This chapter includes a number of experiments done by cutting out basic geometric polygons and folding and sewing the cut edges together. By this kind of action, the 2 dimensional textile is made into a three dimensional form.

The chapter also include some investigations of how the fabric around the action of a cut out form is affected. Trying to answer; how is the global geometry of the cloth altered by a local change of form?

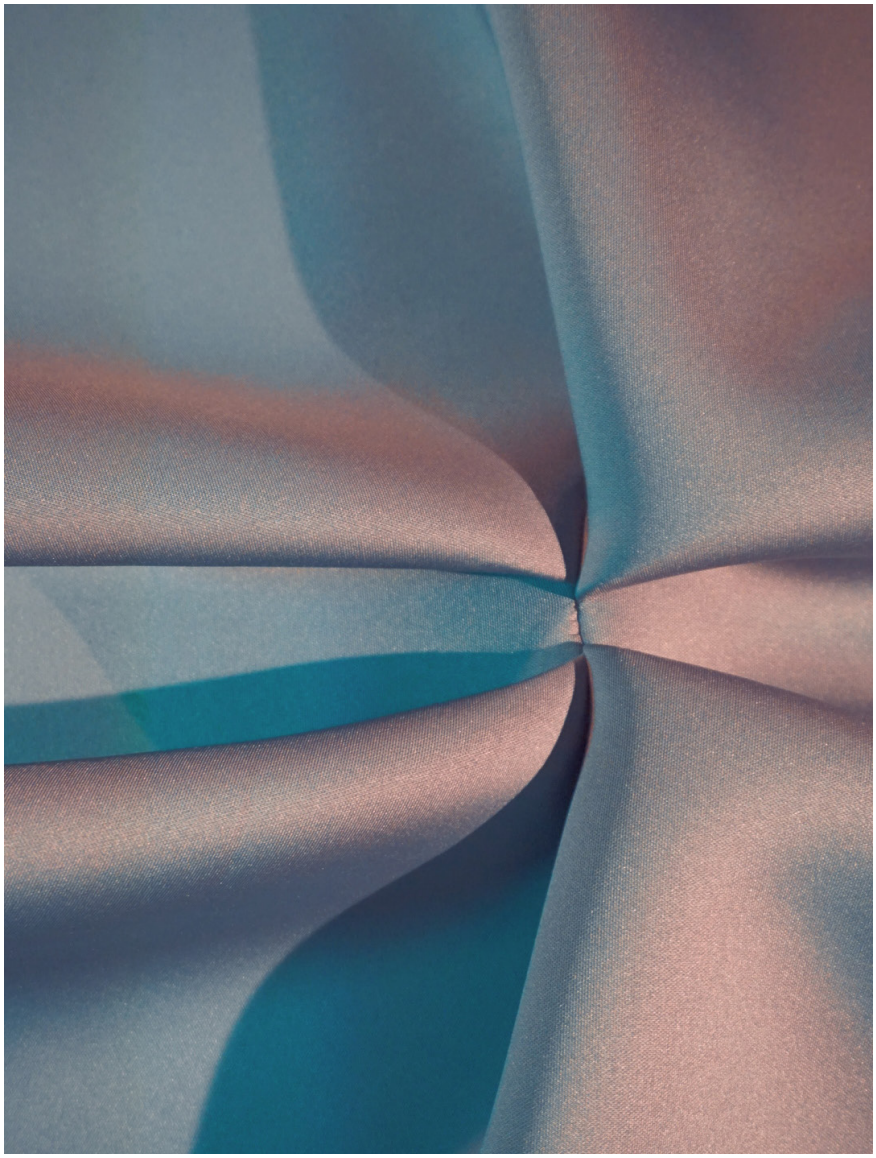
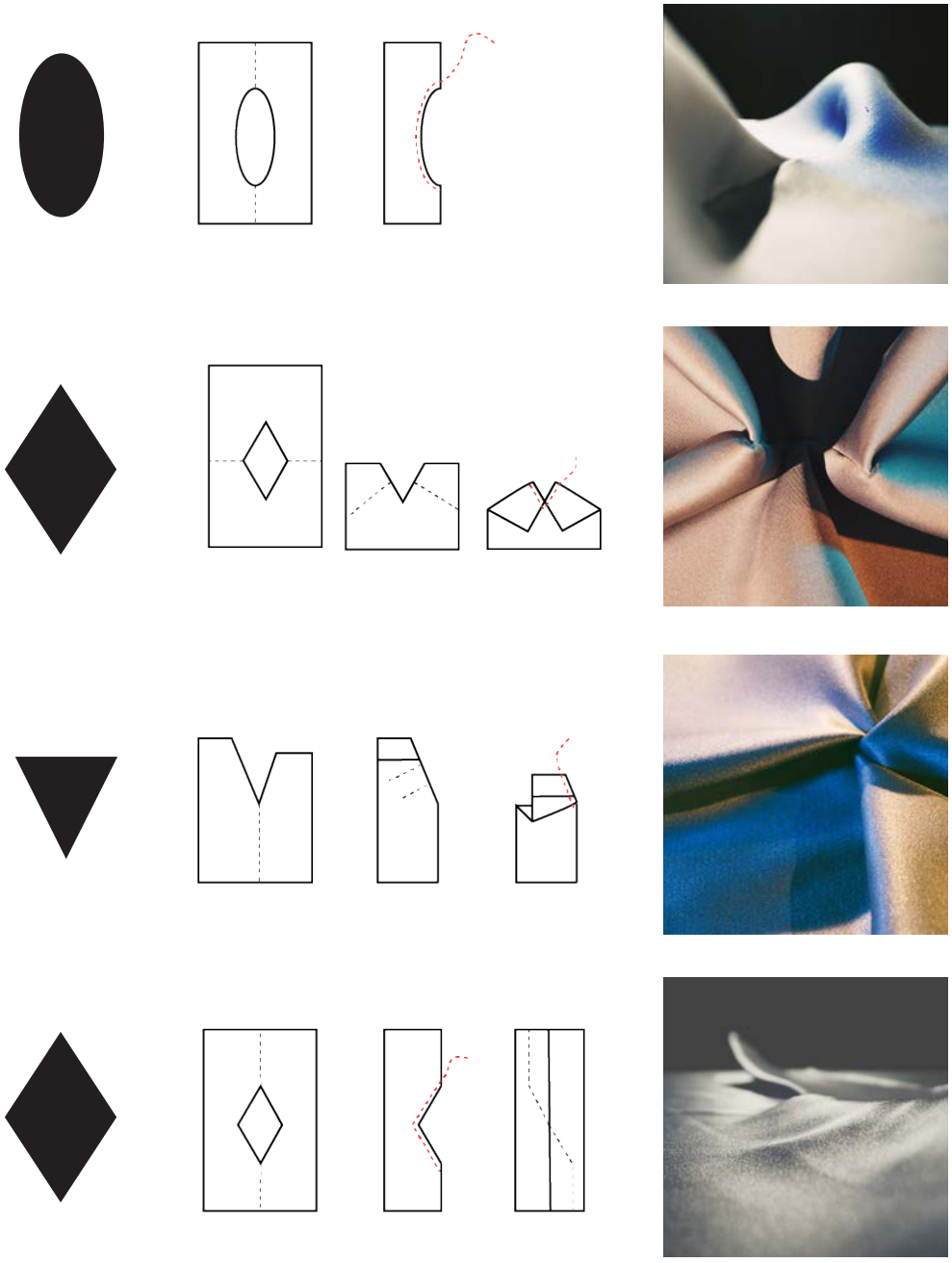


Figure 38. *Oval*
Textile sketch of oval cut out. Authors own image.

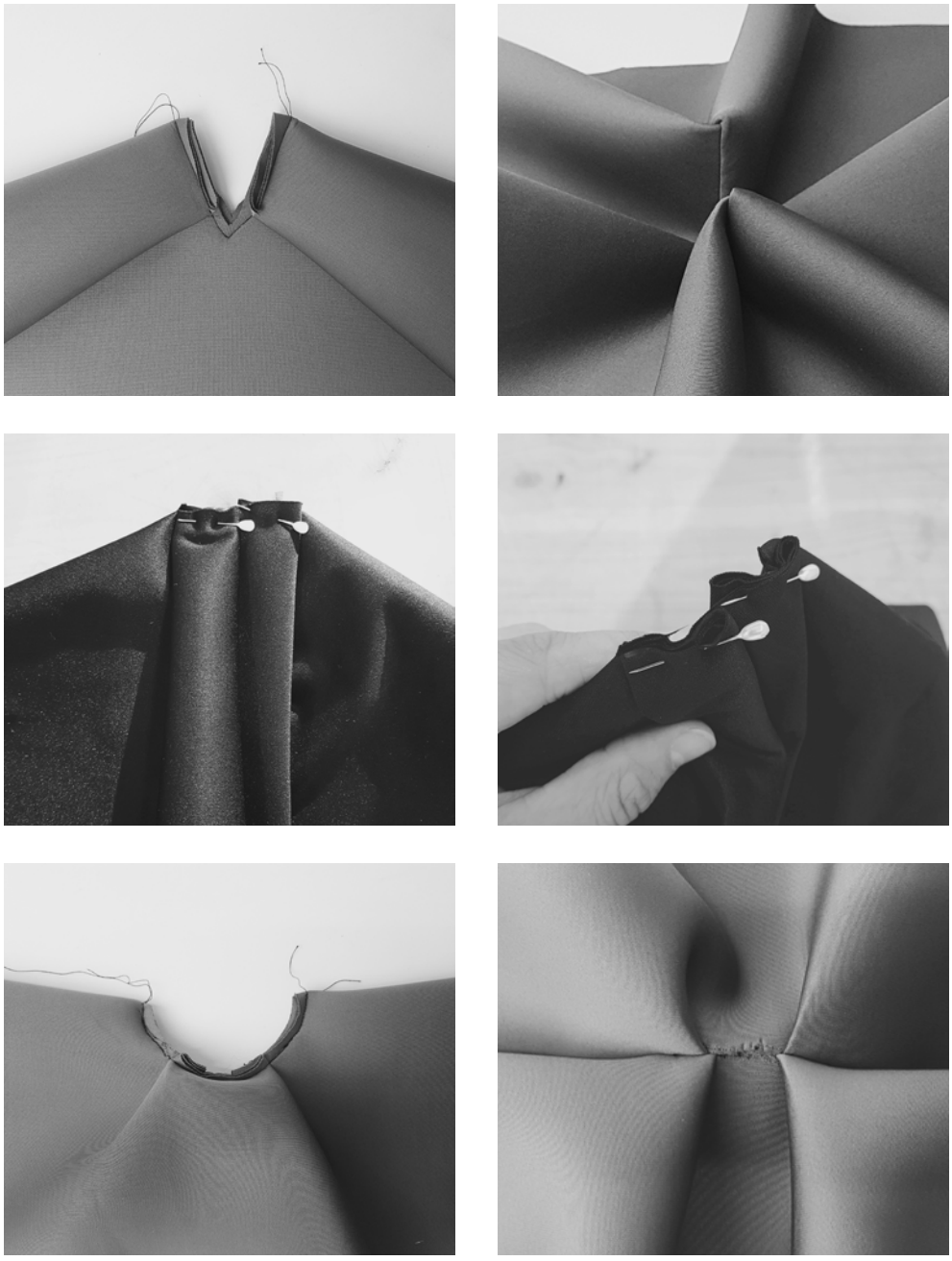
CREATING WITH SHAPES

Cutting out a simple shape - folding the edges and sewing it together, various interesting geometries can be made. On the images on the right, the process of such an action is explained in figures. The shapes used here are an oval, a diamond and a triangle.



CREATING WITH SHAPES

Figure 39. *Cut out shape, folding and result of model studies.*
Inspired by Usha Doshi's work in Creating with shapes. Authors own image.



ONE ACTION UNRAVELED

Figure 40. *Behind the folds*

The images above reveal the back side of the form and the folding and seam made to create the geometry on the right.

ONE ACTION ON THE SURFACE

Figure 41. *Triangle cut out of a rainjacket fabric.* Authors own image.

Figure 43. *Diamond*
Neoprene fabric and diamond cut out. Authors own image.

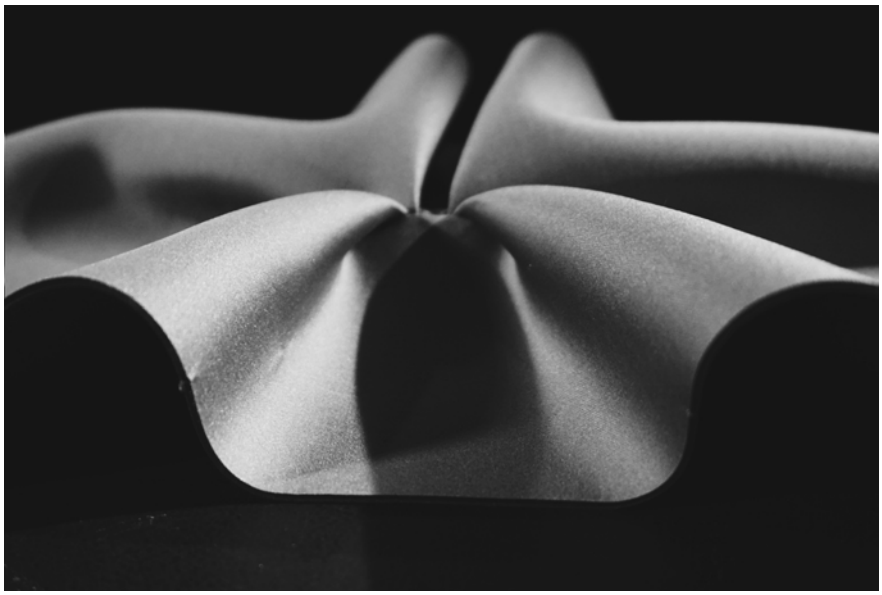
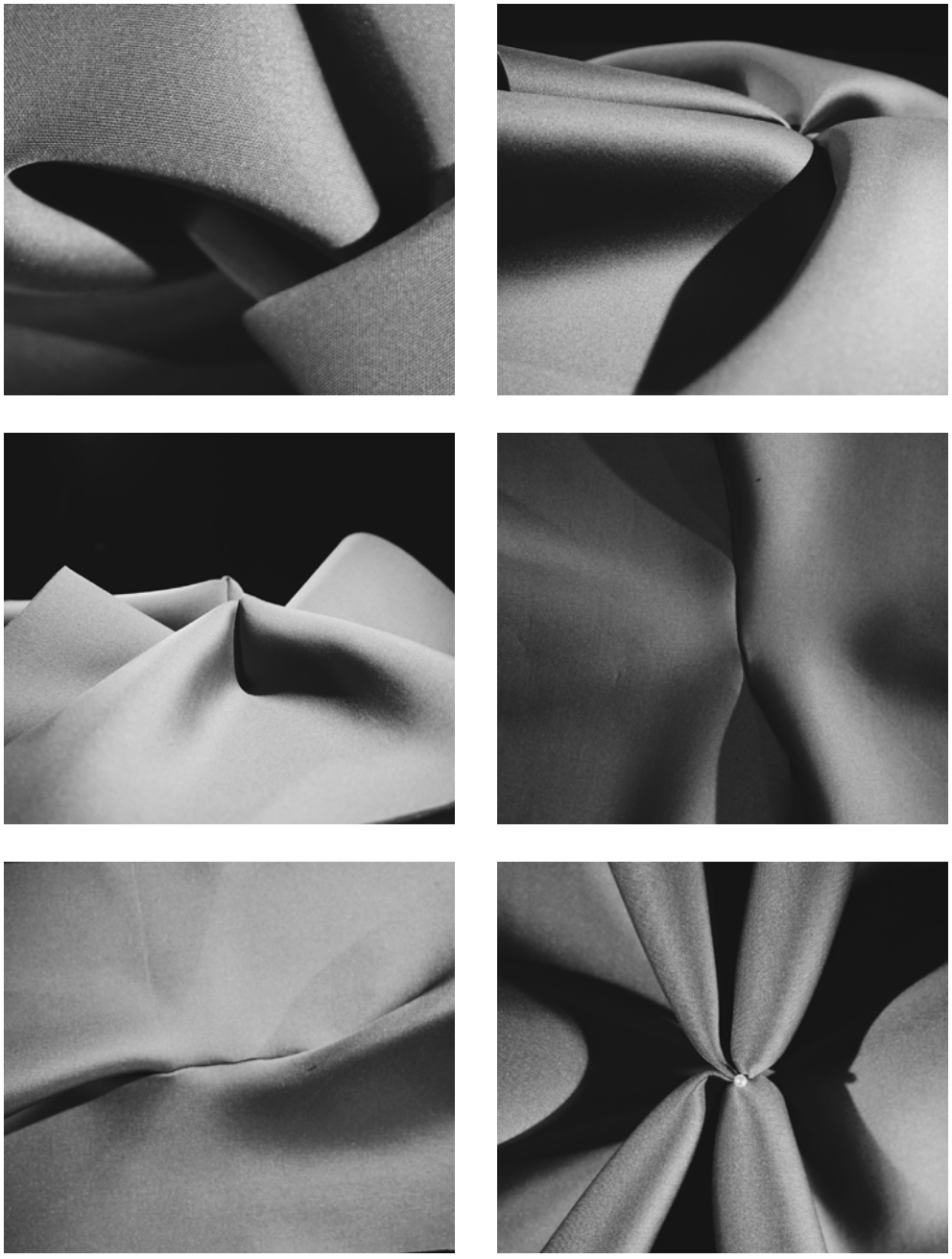


Figure 42. *Oval*
Neoprene fabric and oval cut out. Authors own image.

3D GEOMETRY OF 2D MESH

In the experiments done in this chapter, one single mesh is used. The geometrical forms created by the cut out shapes are interesting and scale-less.

The form of the single cloth is at first cut as a rectangle. But after the action is made, the form of the outer edge is clearly affected. The affect of these foldings on the middle of the surface is not quite comprehensible.



THREE DIMENSIONAL GEOMETRY IN A MESH

Figure 44. *Three dimensional geometries created by cutting out regular shapes in a neoprene fabric.*

The images include geometries made by ovals, diamond and circular shapes. Authors own image.

WHAT HAPPENS TO THE EDGE?

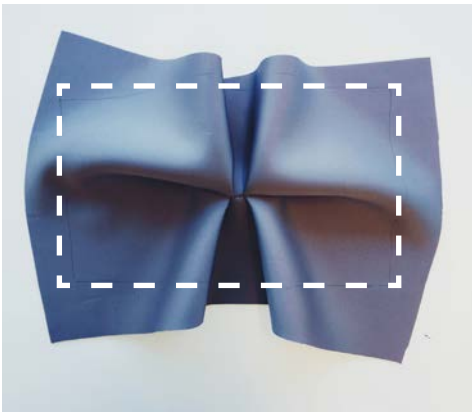
This technique is as mentioned a kind of patten making on the middle of a surface. This alters the entire geometry from a two dimensional mesh to three dimensional geometry. The edge of the initially flat and rectangular cloth will take another form. To be able to use this technique in draping or even more so when tailoring spaces, one needs to understand how an action of these cut out shapes, affects the textile around it. In particular in these experiments - how it affects the edge.

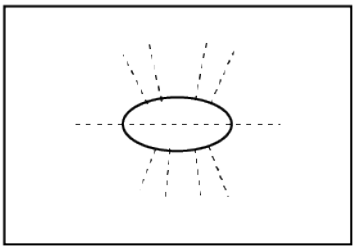
To understand this, a set of experiments is carried out. A shape is cut out and the cut edges are folded and sewn together. The draping and altered geometry made by this action causes the outer edge to go form a rectangular form to an irregular one. This outer edge is therefore cur again to a rectangle. After this, the stitches holding the middle geometry is released and the flat form of the piece is revealed.

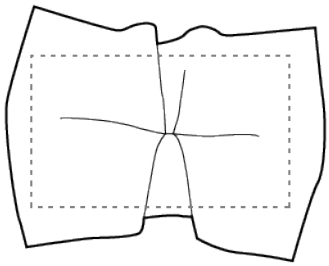
This shows how certain folds "demand" more fabric in certain directions or sections of the cloth. To obtain a rectangular section of one of these kinds of three dimensional geometries, the starting cloth will have another shape. This shape is shown in the following examples.

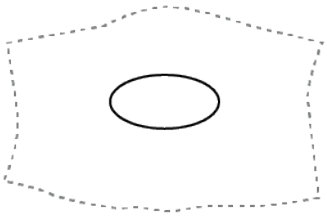
SQUARE

Figure 45. *Cut out square form on a rectangular piece of cloth.* Authors own image.





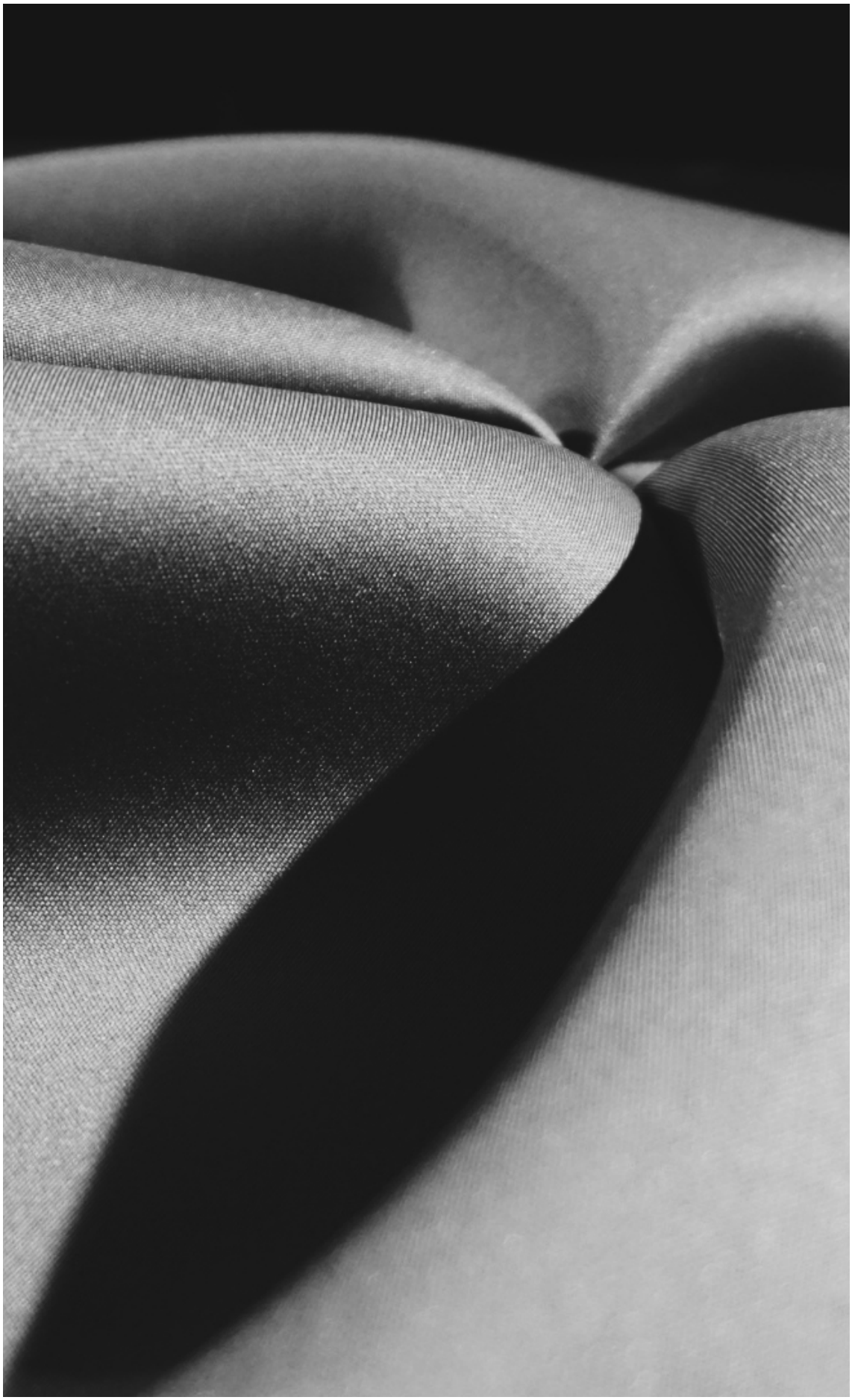


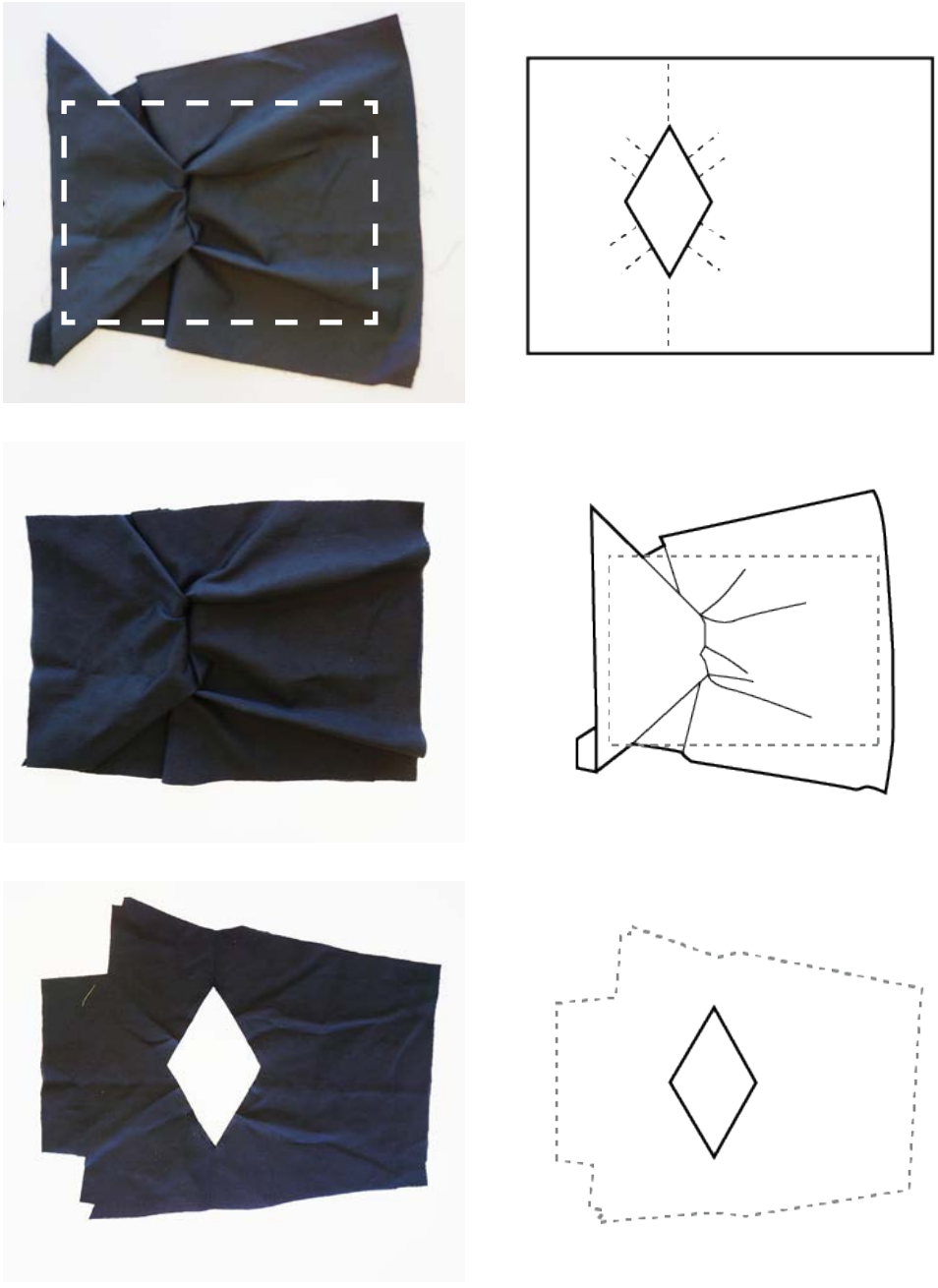


OVAL

Figure 46.

The oval shape need more material almost as an enlargement of its own form using this kind of folding. Authors own image.

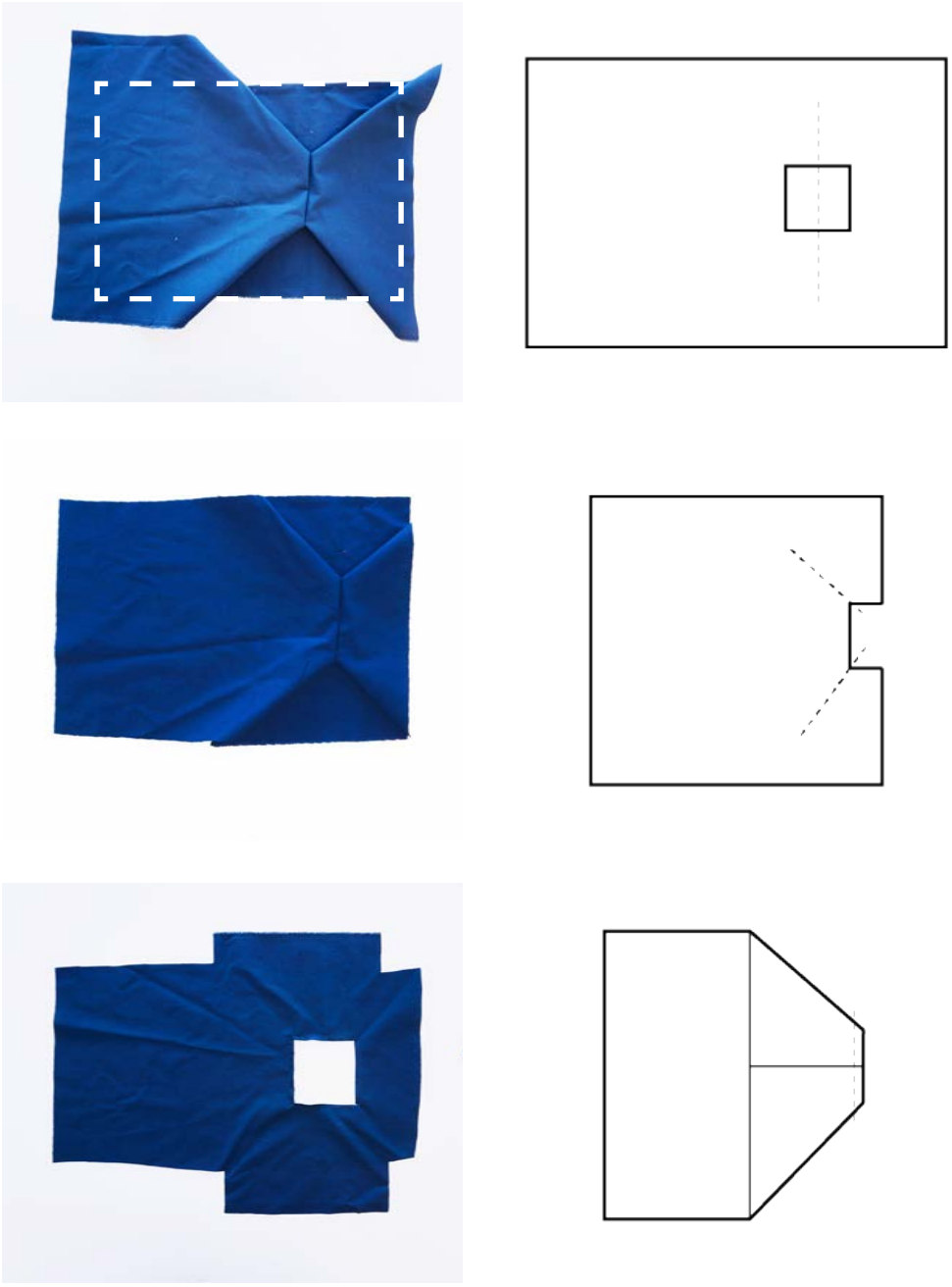




DIAMOND

Figure 47. *Diamond cut out, and diagram of how the cloth is affected by the folding of this shape.*

To obtain this shape a cloth with a rather irregular shape is needed as a start. Authors own image.



SQUARE

Figure 48. *Square foldings.* *Authors own image.*
To the left: drape of rectangular cloth is cut to rectangle again, stitches released and the flat form of the fabric revealed. On the right: Folding to obtain this drape.

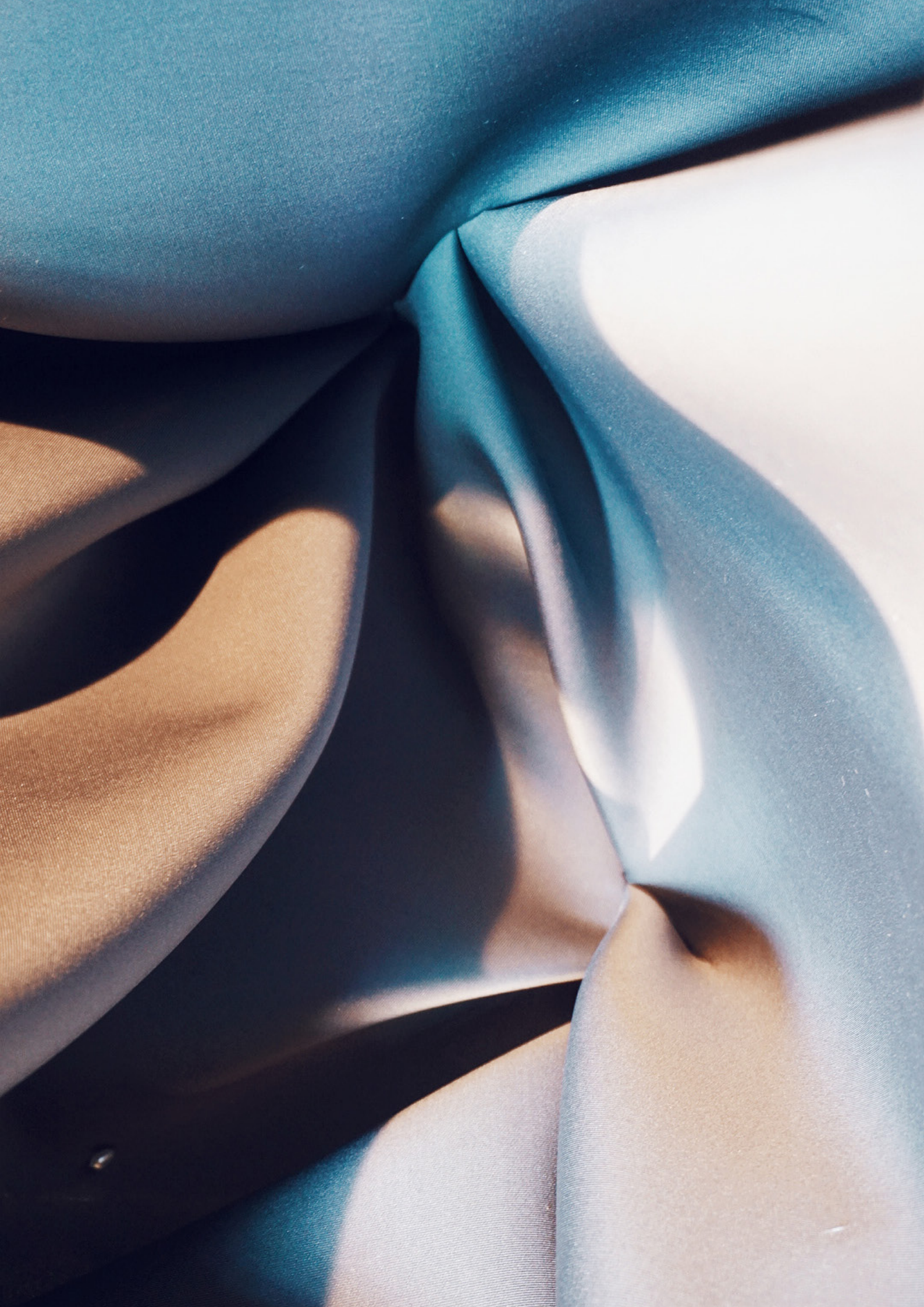
Figure 49. *Curves in textiles*
Geometry shaped by three cut out diamond shapes. Authors own image.

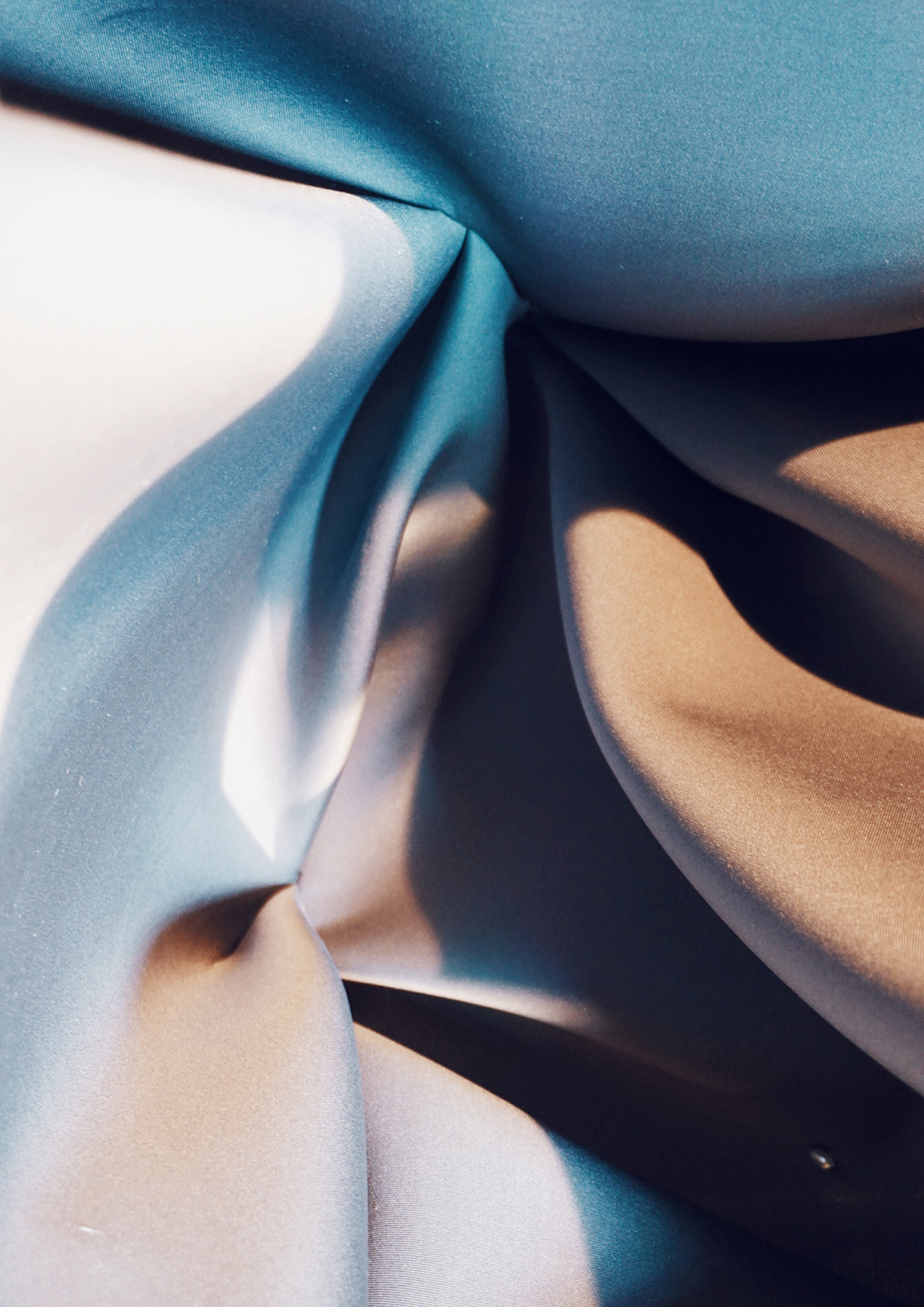
REFLECTION

The geometries shaped by the action of cutting out shapes and sewing the cut edges are very interesting. They are in a sense without scale and can appear almost architectural. The application of these forms in architecture therefore seem very plausible. By the use of this kind of pattern making on the middle, one can bring a regular textile mesh into a three dimensional form without changing its internal composition.

From the experiments on what happens to the edge it is clear that different forms need more material in different directions. The shape of the edge, in a flat cloth, corresponding to the rectangular edge of one with a geometrical form on the middle, varies both between the shapes of the cut outs, and the folding. The number of folding actions ie.g. folding first in half, then fold this again, affect the edge more than a equal number of adjacent folds. For each set of folding action, the prediction of the shape and thereby also the fold of the outer edge is more and more difficult to make.

To understand the affect of the cut out shapes and the different foldings of these, is essential for their potential to tailor spaces. Knowing this, a pattern of an already draped space, can be altered to add these kind of geometries.





DRAPING THREE DIMENSIONAL SPACE

Textile Corners

Continuing with the knowledge gained form previous model studies where flat textiles were made into 3d forms, this part of the process address the application in architecture. The idea of cutting shapes and tailoring a surfade on the middle give 3d shape. In this chapter, this shape is seen as a kind of corner. A textile corner. This does not mean a classic perpendicular corner, but rather an action on the textile that changes the direction of the fibres within. And with a combination of a number of textile corners, one should be able to design a space - from a, from the start, flat piece of fabric.

Textile corners could be attached, or lifted at fixed points and thus enable making a three dimensional space on the middle of a from the start flat surface.

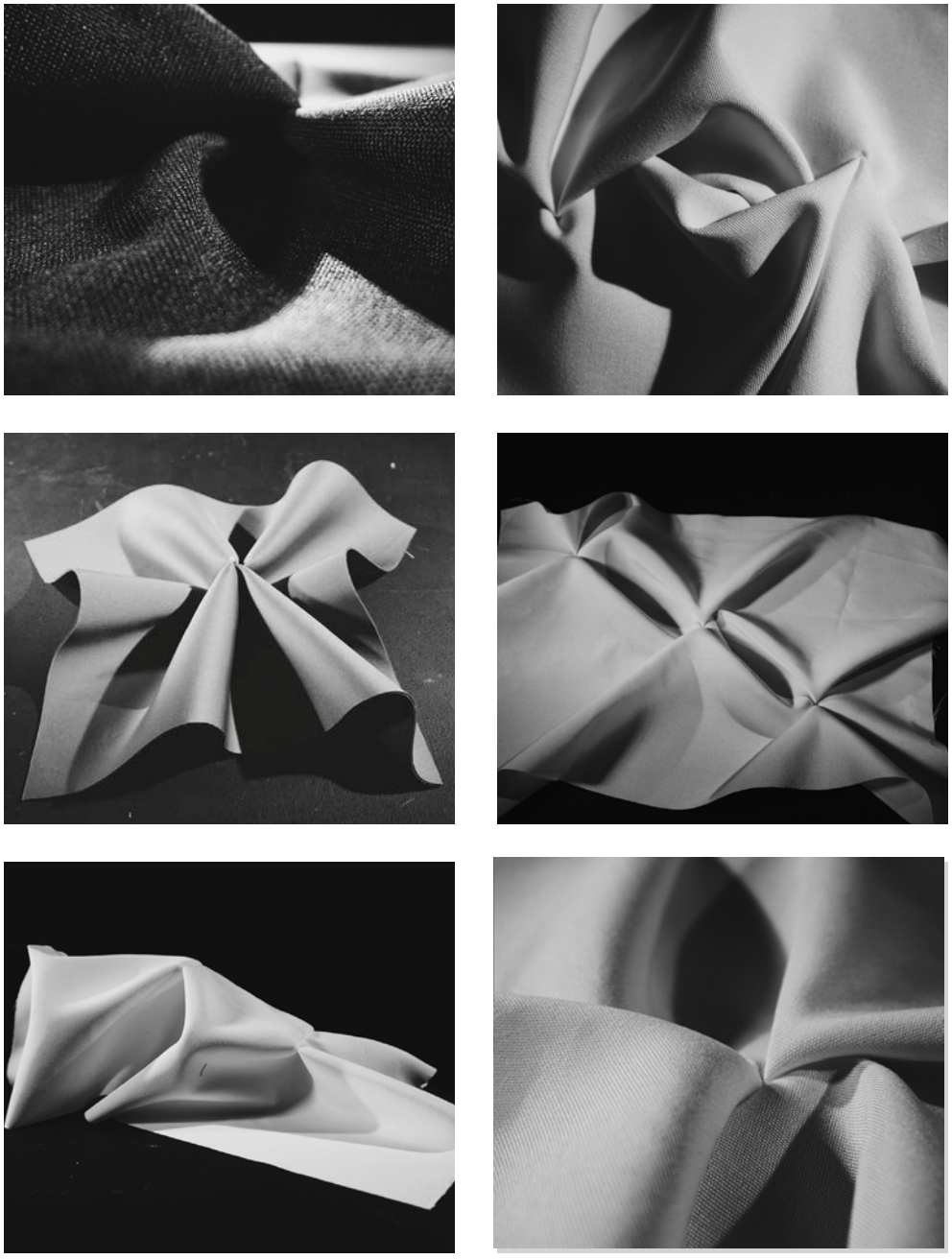
This chapter include some more spatial experiments using the same method of creating geometries as in the previous chapter.

Figure 50. *Pentagon corner*
Pentagon cut out, folded and pinned. Authors own image.

DIFFERENT TYPES OF CORNERS

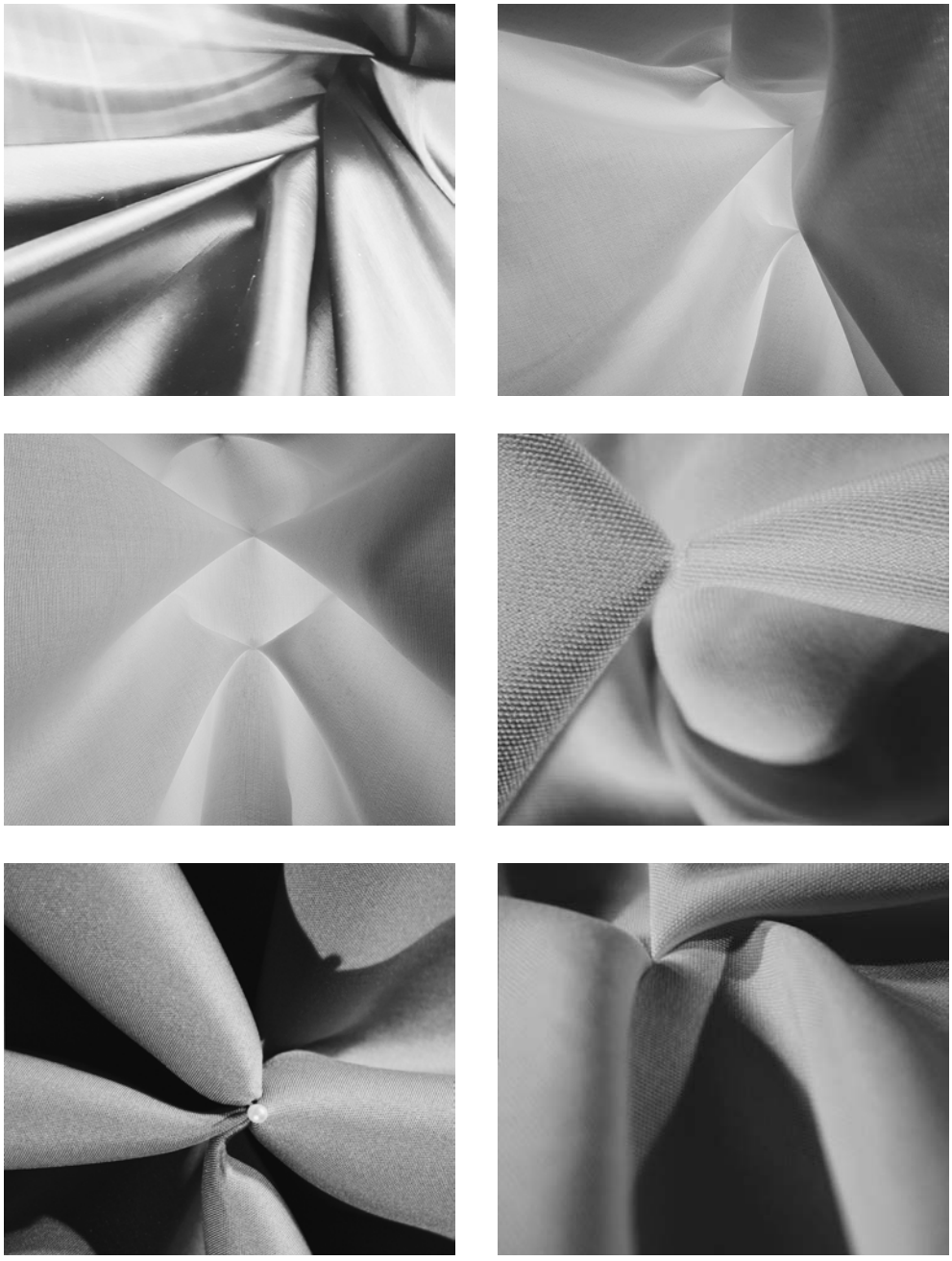
The textile corner can be made from one cut out shape. The pentagon example shown above could almost be used as a classic corner, if the folding of the fabric was allowed further out.

The shapes form the previous chapter can also be combined or repeated in different manners. Some examples of this are shown on the right.



REPETITION

Figure 51. *Repetition of the same cut out shape and folding.* *Authors own image.*



TEXTILE CORNERS

Figure 52. *Combinations or repetitions of cut out, folded squares give a set of corners where the textile is almost pinched together at the seam.*
The other examples shown here are made by diamod cut outs, and a trianguler one, top left image. Authors own image.

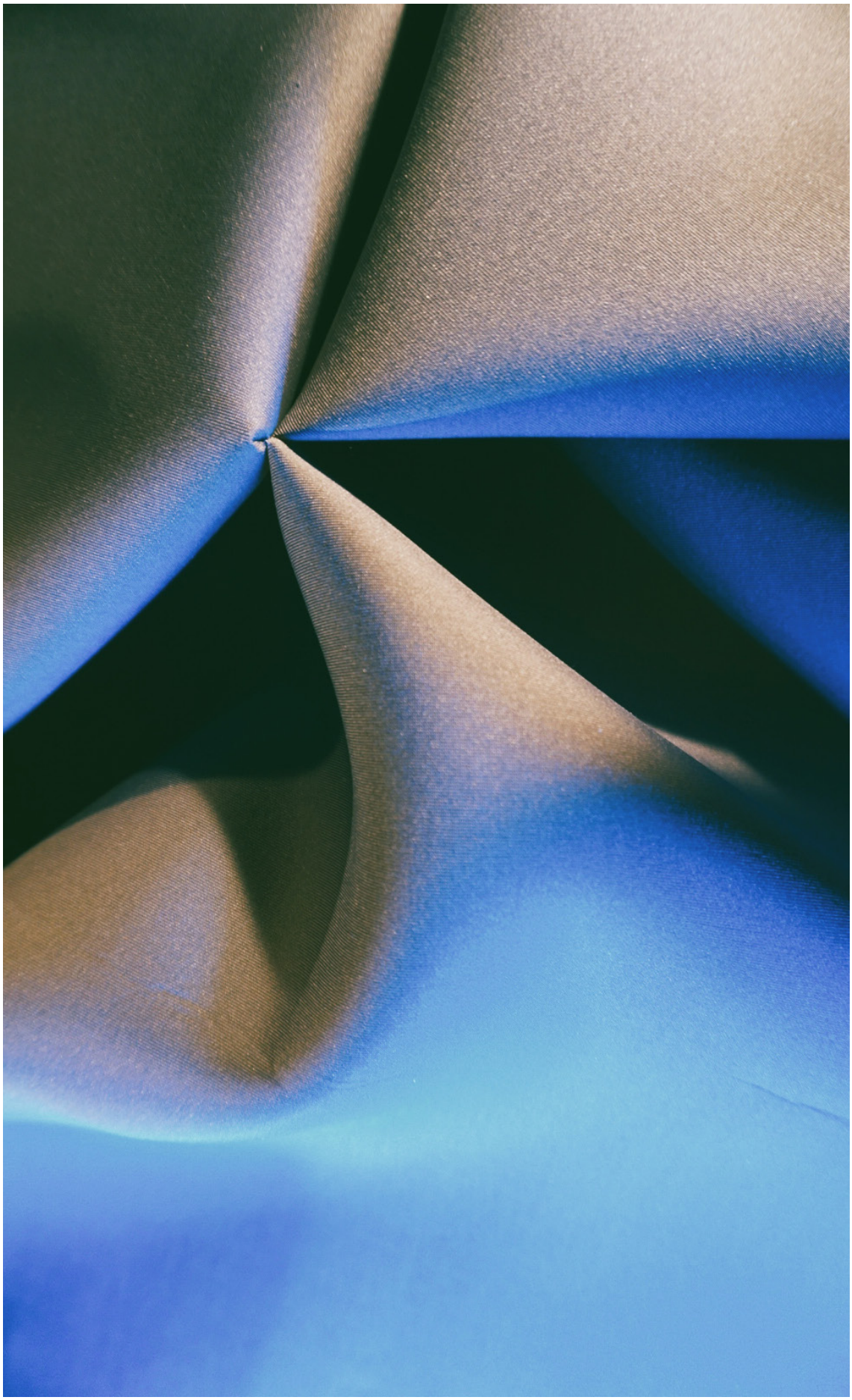


Figure 53. *In a soft world of textile*
Tailored textile corner draped to a space. Authors own image.

REFLECTION

Textile corners are not regular corners as one would find in an ordinary perpendicular room. They should therefore not be expected to fill the same functions either. It is however evident that they can be used to change the direction of the textile fibres and thereby alter the entire geometry.

In textile architecture, where fold are allowed, these kinds of corners can be used fully to form a space. Using a repetition of textile corners, one could for example reduce the size of the space in certain section, almost as a waist on a structure.

The textile corners and their geometry are so far scale-less. Imagining the application of this in architecture, one single large scale corner could form the entire space. It can just be a small part of a space, the focus points where all folds come together. Or, there can be hundreds of small textile corners combined becoming almost a texture on the surface.

Textile corners, no matter which size, should be used in combination with draping of spaces.

TEXTILE EDGE ON SOLIDS, SURFACE AT POINTS

Tailor a Space by Draping

To tailor a space by draping is the concluding step of this study. Here the different methods of draping on solids, and tailored textile corners on the surface are combined. The edge of textile is draped onto solids and the textile corners are attached at specific points. Two methods of tailoring a space by draping are defined, similar to designing positive or negative space.

In the first alternative you first drape on solids, to get the toile and make a pattern. Then introduce a cut out shape and alter the pattern knowing what happens to the edge.

The second alternative means starting with a large piece of cloth, make the textile corner from a cut out shape. Then drape this altered piece of fabric on solids to get the toile and make the pattern.

Either way it is done, the end result is the pattern. A guide of how to make the space, which can be recreated in different scales, as the blueprint can be translated into a building.

In this process, the second working method is used. The following chapter includes experiments of this way of tailoring a space.

The drapings made in this chapter are made using the same working model as in the part of Draping on Solids. However the wall elements are scale up.

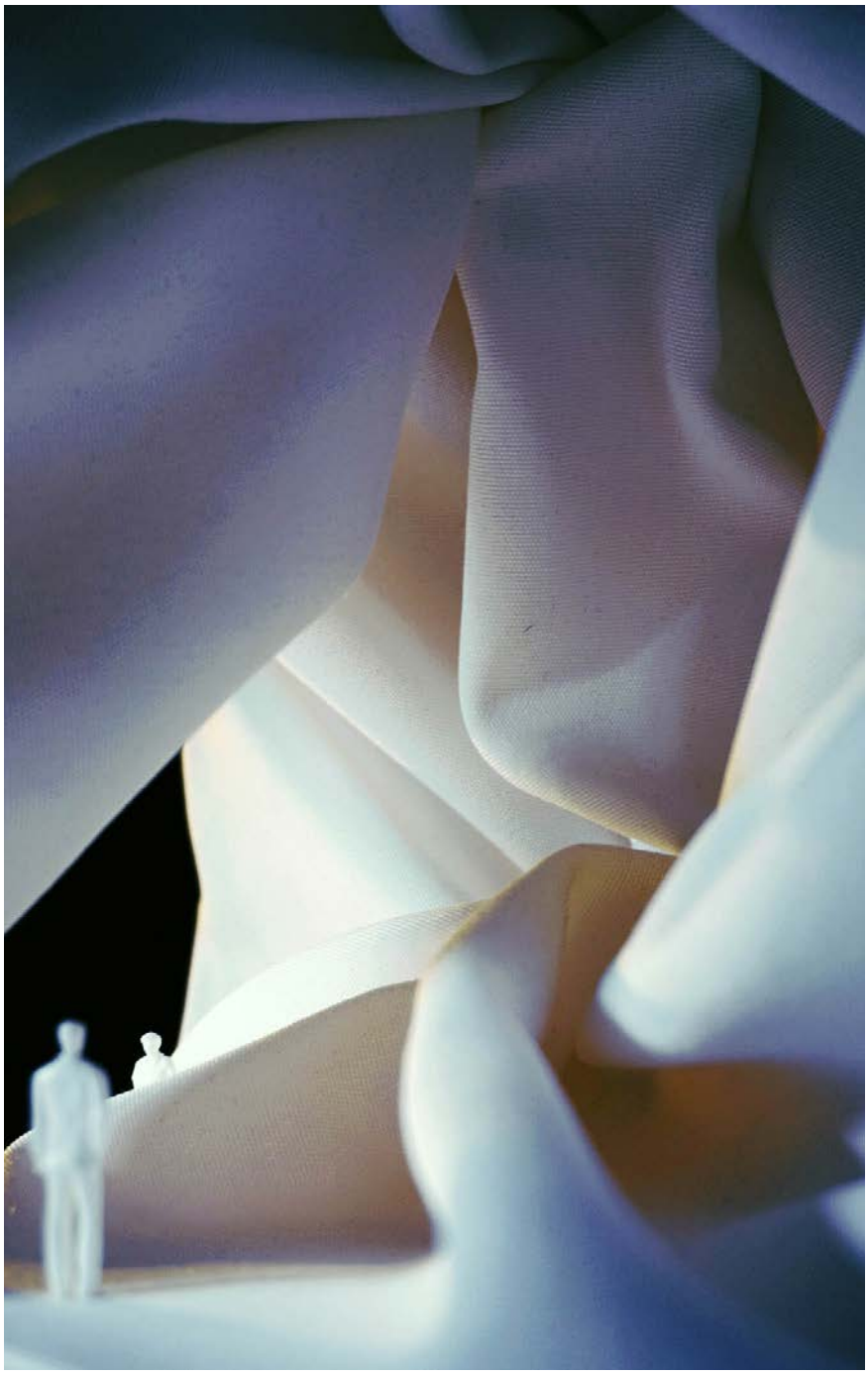
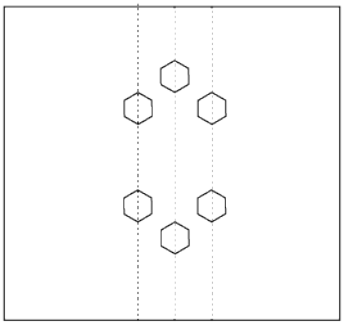


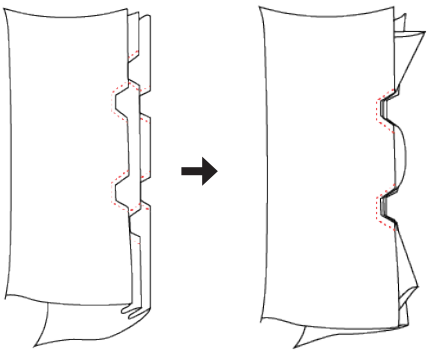
Figure 54. *Tailored space*
The resulting form of the cut out hexagons is placed vertiacally in the draped space, yielding a kind of textile pillar. Authors own image.

PROCESS

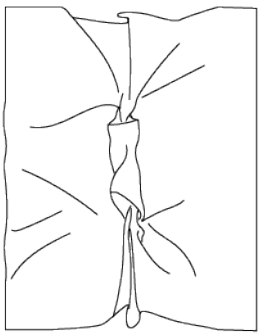
On the right, the process of tailoring a space by draping is explained. Above is the resulting space featured where a rather sturdy woven fabric is used. In this particular case where six hexagons are cut out, folded in half and sewn together three and three, an increased stiffness of the cloth is obtained by the action. This extra stiffness inspired the draping of the space - using the form created by the cut outs in the cloth vertically, giving the impact of being a textile pillar.



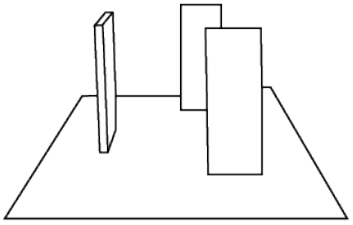
1. Cut out shapes on the surface.



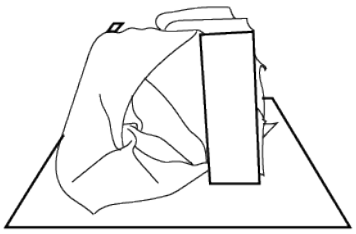
2. Fold and sew the edges together.



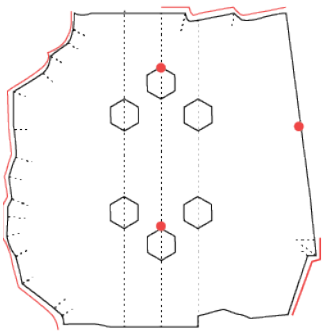
3. Reveal the altered geometry of the fabric.



4. Place walls in wanted composition.



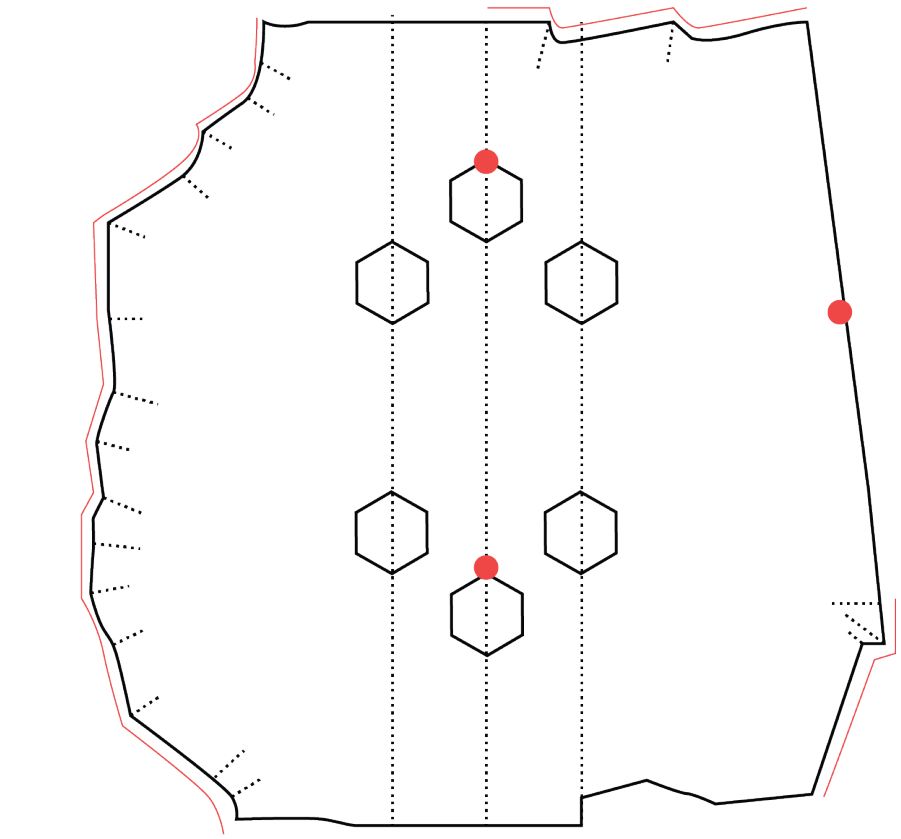
5. Drape onto the solids, mark folds, attachments and cuts.



6. Release the toile and make the pattern.

TAILORING A SPACE BY DRAPING

Instructions on how to tailor a space using both cut out shapes and draping.



FOLD

CUT

ATTACH TO SOLID

xx

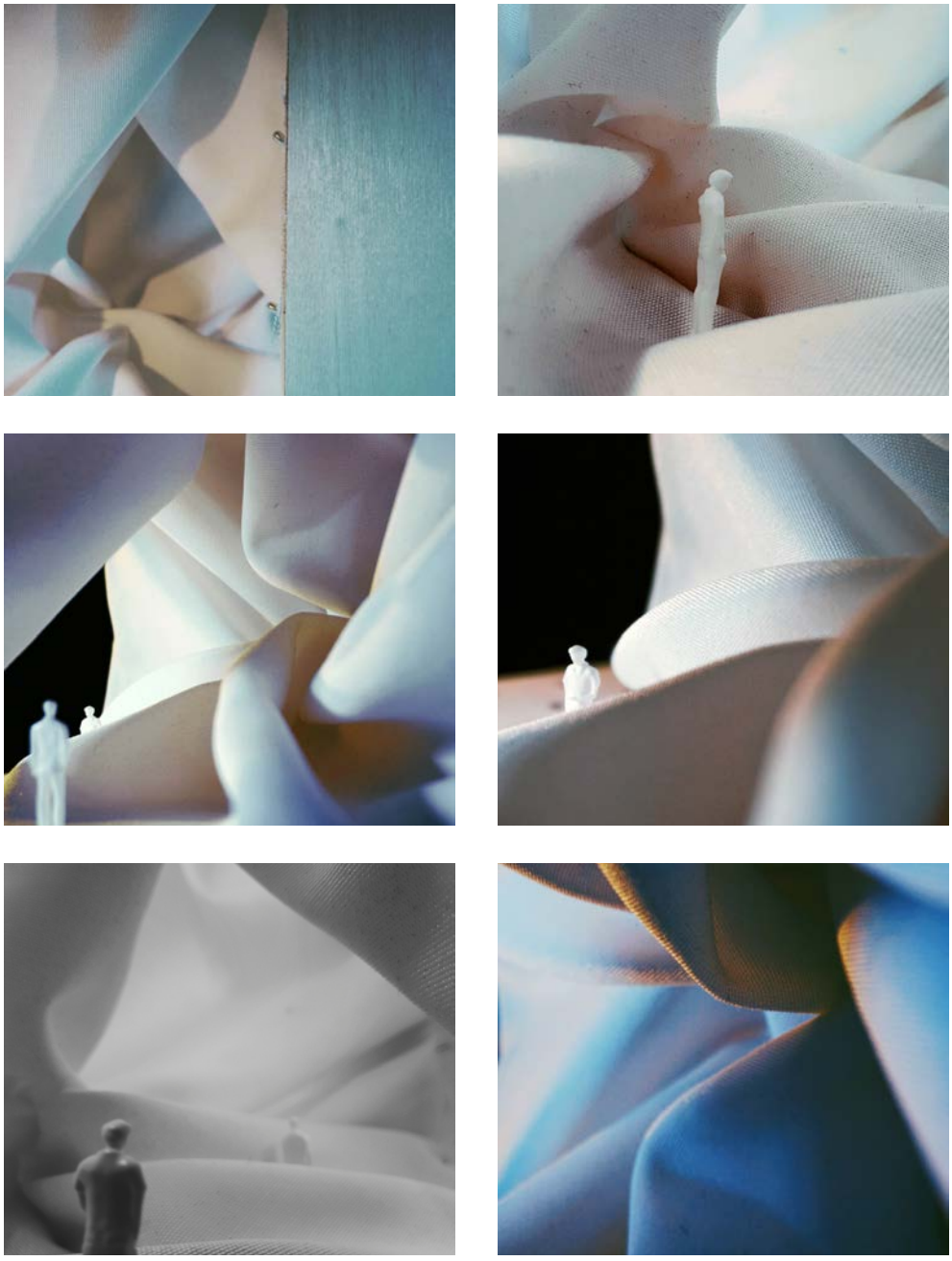
Xx

CUTTING PATTERN

Figure 55. *Corresponding cutting pattern for the draping on the right.*
Including cut out polygons and folds of the draped edge. Authors own image.

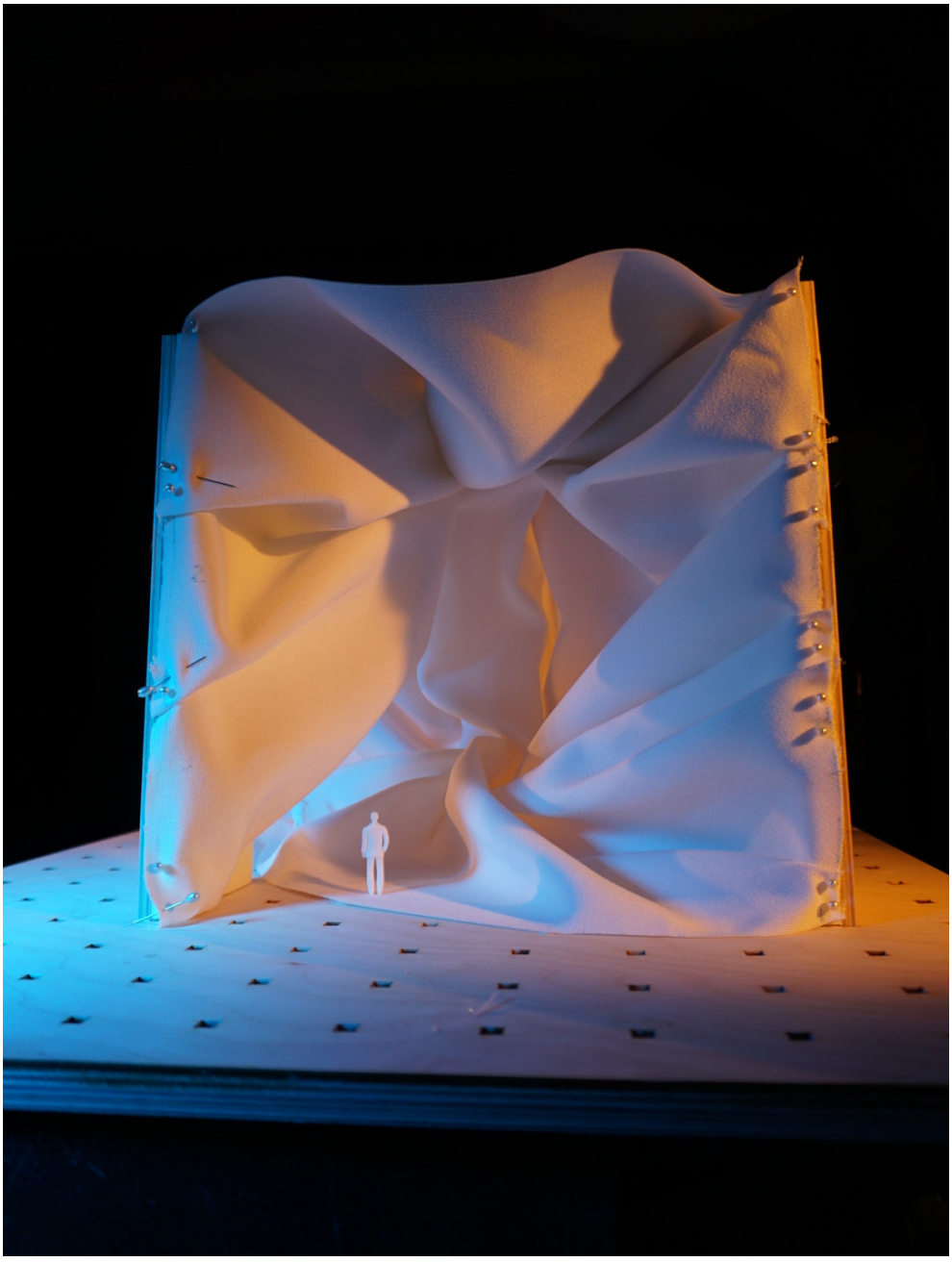
DRAPING PROCESS

Figure 56. *Draping process of the space.*
Here the fabric used is already altered by the addition of textile corners. Authors own image.



DETAILS

Figure 57. *Spacial views form the draped model seen on the right.* Authors own image.



DRAPED MODEL

Figure 58. *draped model*

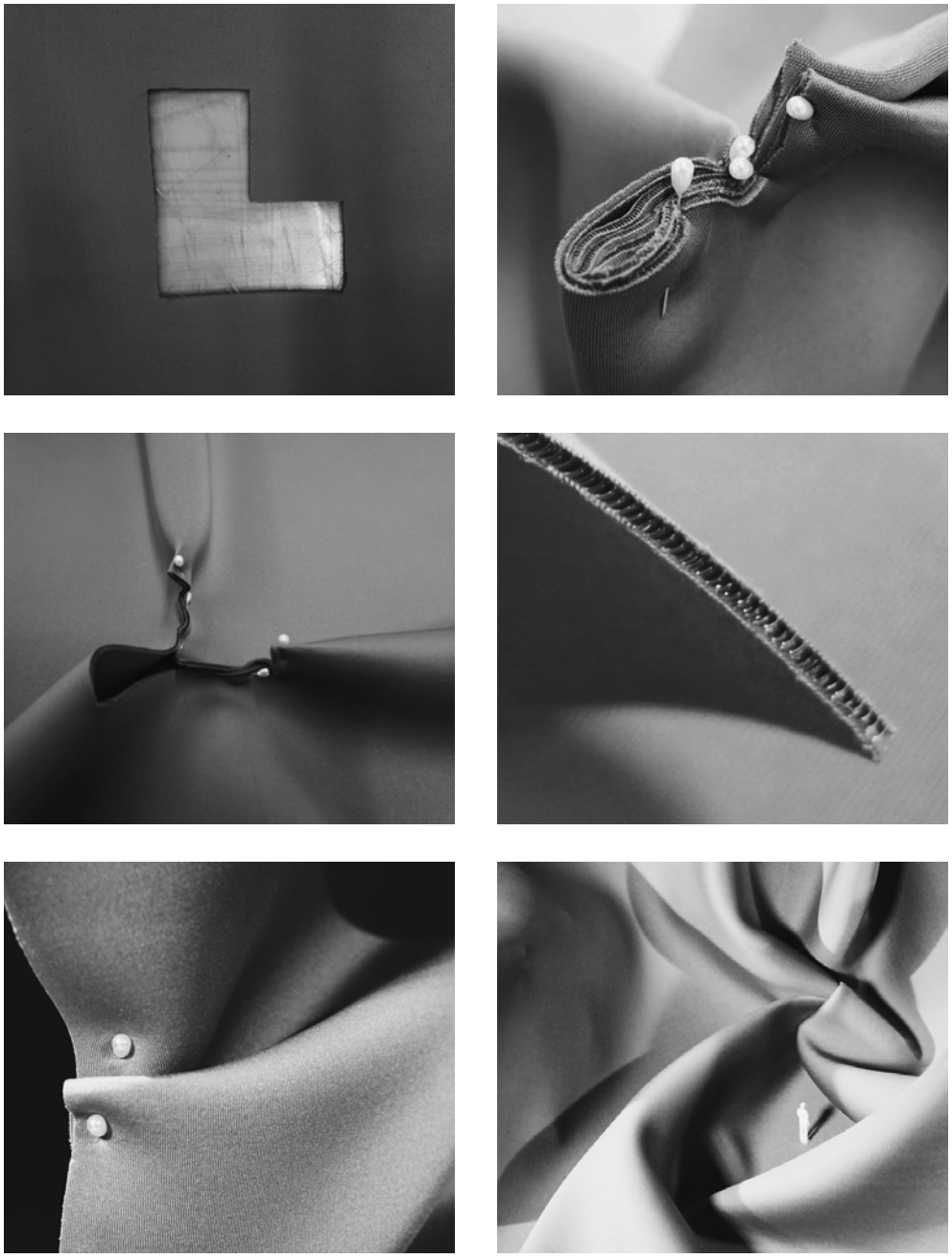
Using a cloth with six hexagon cut outs which are sewn together three and three, the altered cloth can be draped onto solids. Authors own image.

DRAPING SPACER FABRIC

In the second examples, a neoprene spacer fabric is used, giving a softer yet more stiff basis. The following pages will show some experiments where the method of tailoring space by draping is applied to spaced fabric. A spacer fabric is knitted in two layers with an almost truss like structure inbetween.

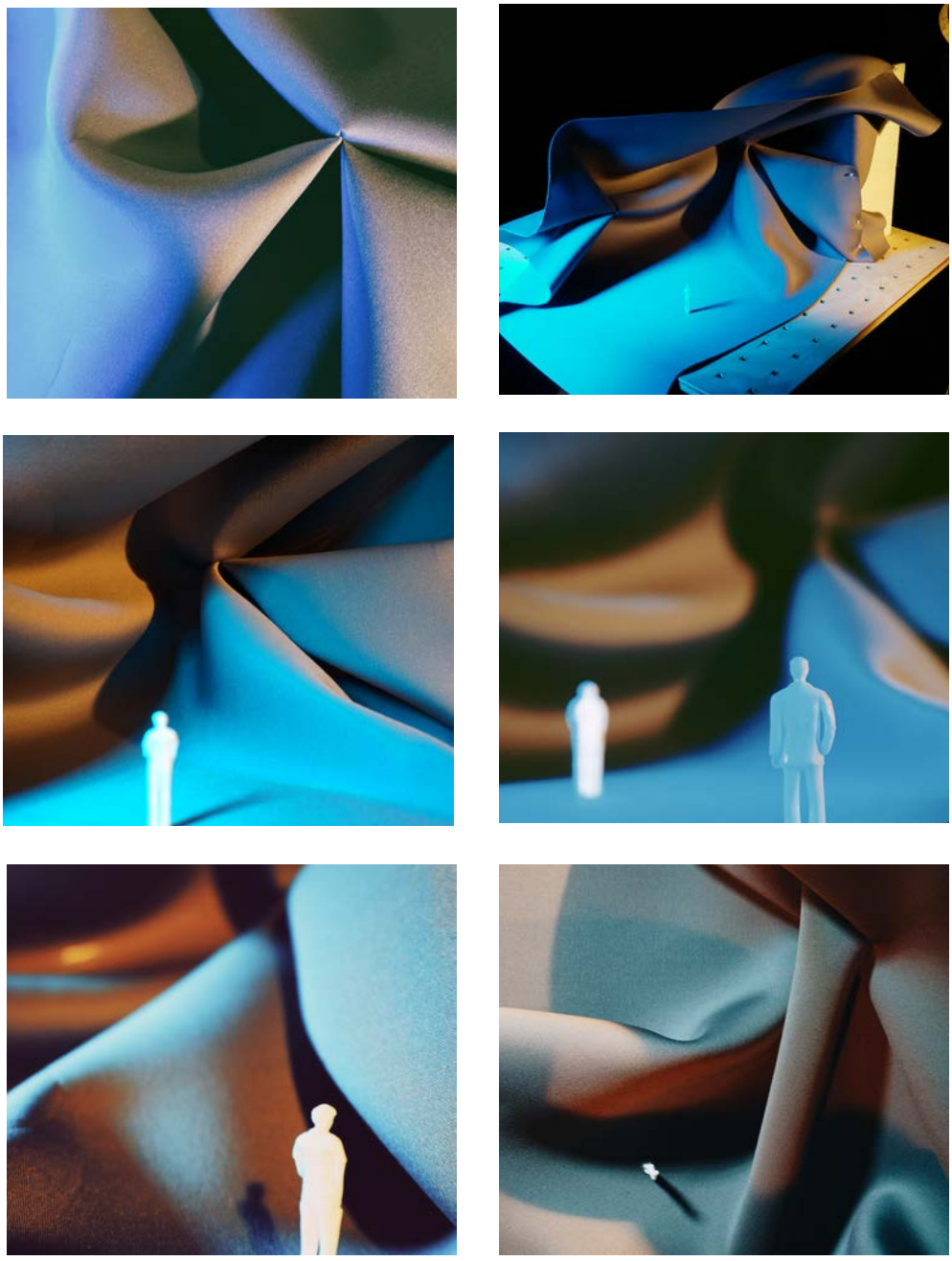
These spaces are made by draping textiles, with corners constructed using triangle, circular and L-shaped cut outs.

The same workflow as before is used where one shape is cut out, folded and sewn together first on a larger cloth. This piece of fabric is then draped on solids in the work model from before, only with larger scaled walls.



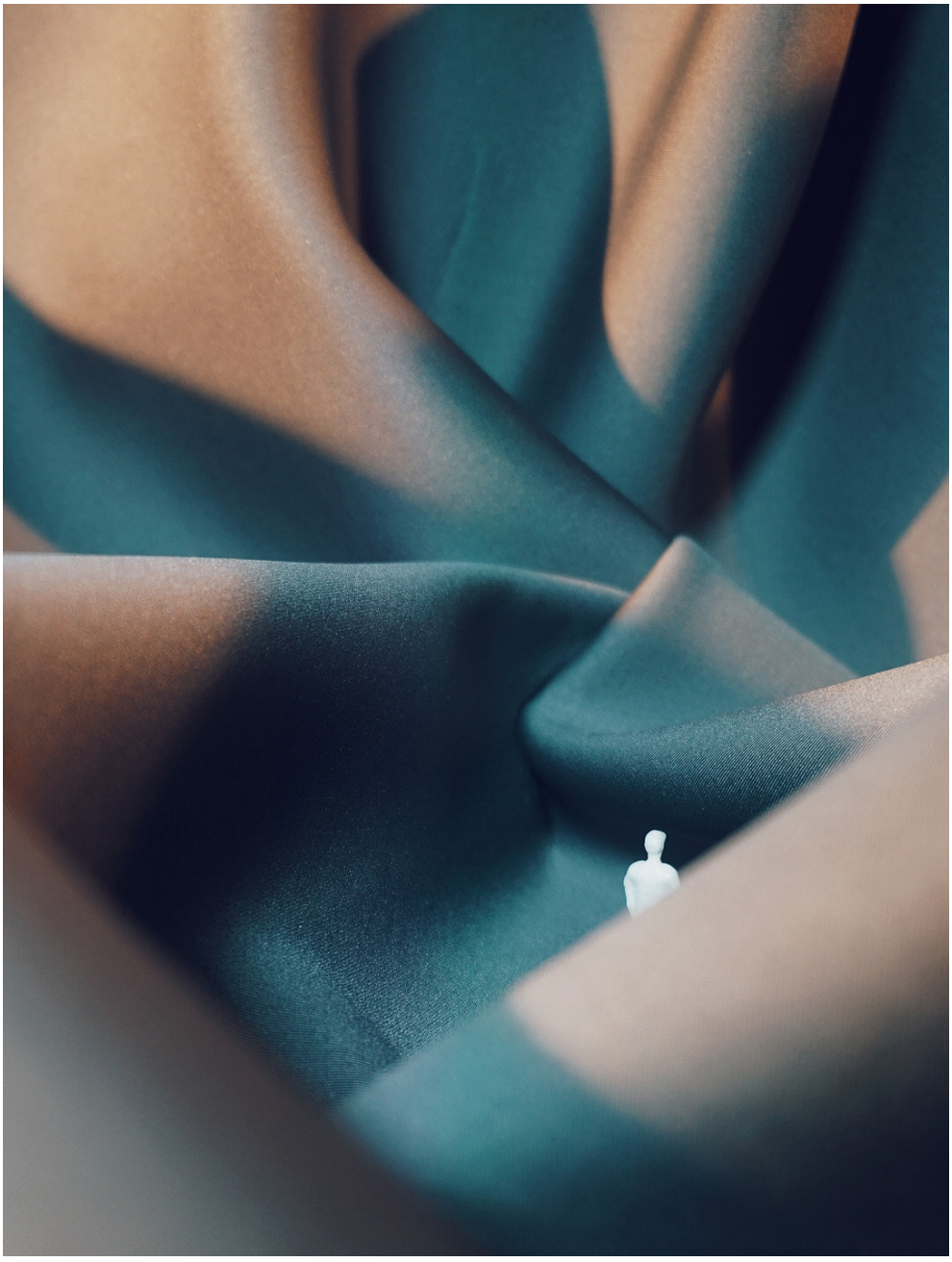
L-SHAPE

Figure 59. *Cut out shape of an L pinned and sewn together in a neopren, spacer dabric. Draped onto solid it yields the geometry seen on the low right image. Authors own image.*



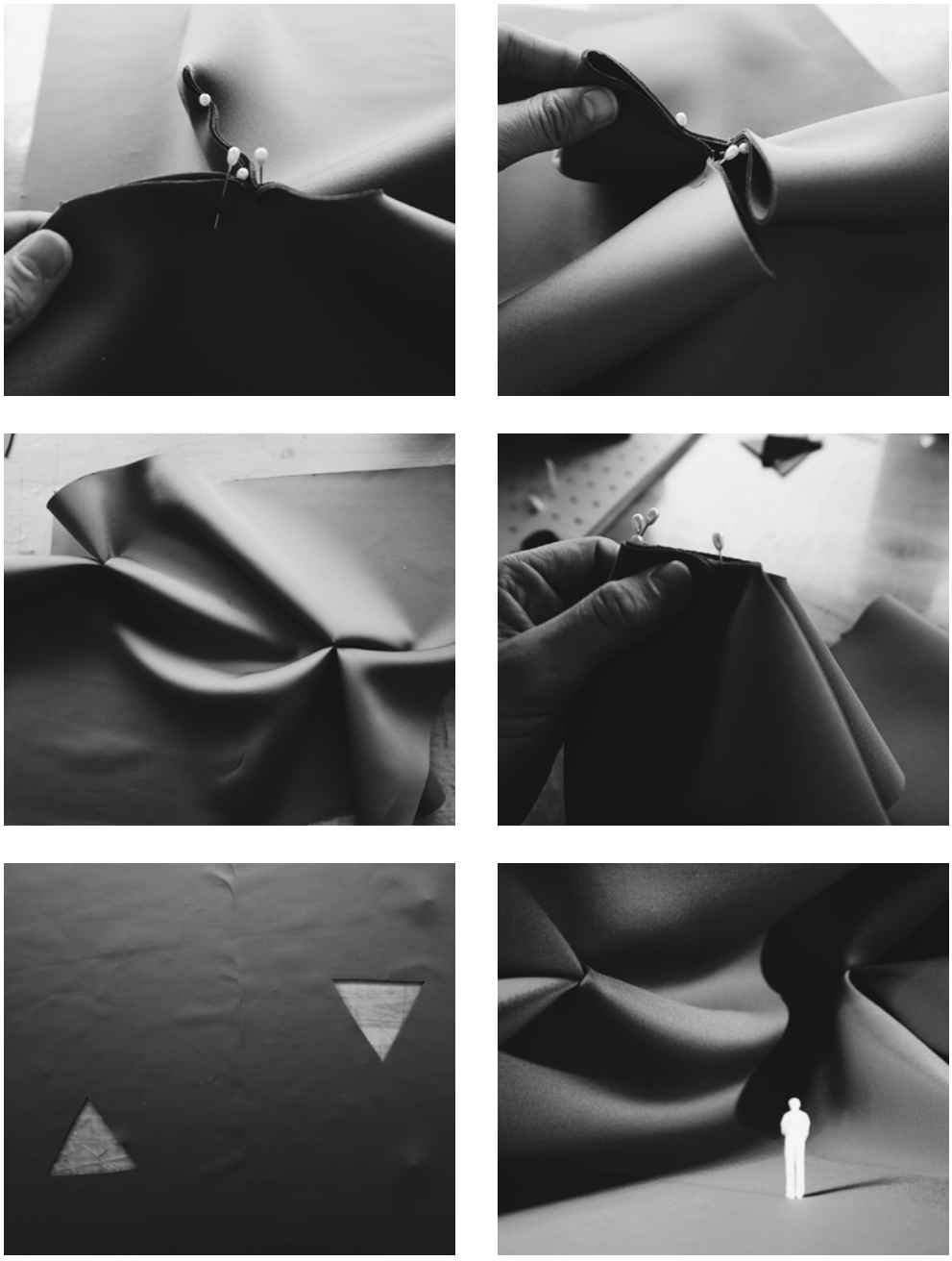
L - DRAPE

Figure 60. *Perspective views inside the draping of an cloth with a first, cut out L-shape.*
Authors own image.



TAILORED SPACE

Figure 61. *Tailorid space of neoprene* *Authors own image.*
The draped space is a soft dramatic space with the play between curves and focus points.

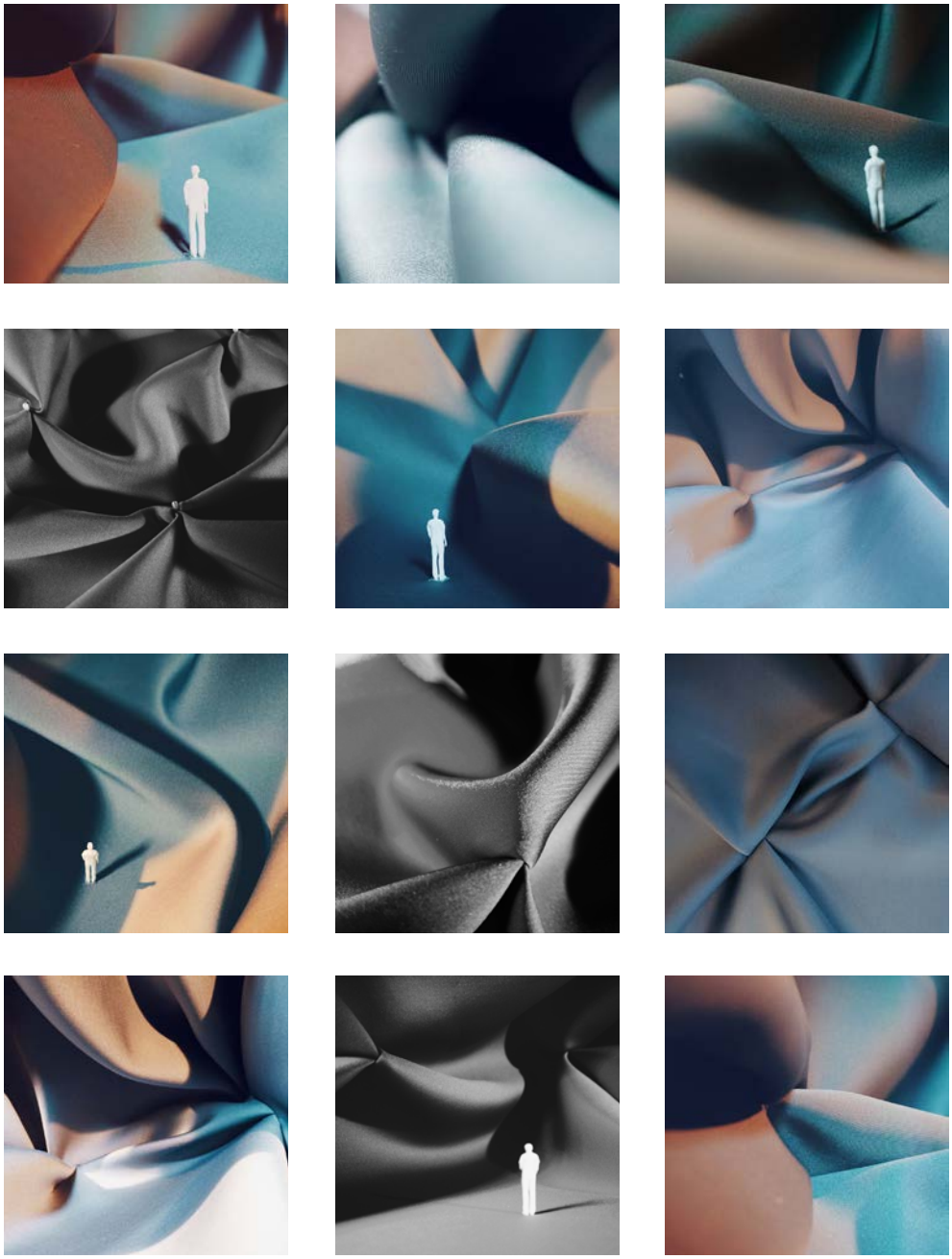


TWO TRIANGLES

Figure 62. *Triangle drapings.* *Authors own image.*
Two identical triangles are cut from the cloth. The edges are folded in different manners and sew together. the revealed drape show soft creases between the original triangles. This piece is then draped onto solids.

TRIANGLE DRAPING

Figure 63. *Perspective of triangle draping.* *Authors own image.*
Perspective of the draped space using the fabric on the left.



TAILORED SPACES

Figure 64. *Images of experiments of tailored space by draping.* Authors own image.

THREE CIRCLES

Figure 65. *Three circles draping.* *Authors own image.*
Tailored space using the cloth with three circles cut out, folded in half and sewn together.

Figure 66. *Focus point in textile*
A textile corner made froma diamond cut out shape. Authors own image.

REFLECTION

The resulting spaces are soft yet dramatic, with interesting plays between curves and focus points, creases, folds and seams. The geometries of the space are not immediately understood, adding one more dimension of interest. The use of textile corners, with their geometry and folds, also show potential as natural room dividers which could give a hint of where to go next. Thereby these tailored spaces, with their draped folds and creases, might also be used to give this soft kind of architecture a sense of direction.

Conclusions

There are clear common features, in the methods used in fashion and architecture. There are similarities primarily in the work flow, in which order things are made, and ways of thinking. In both fields the demand for understanding the transition from a flat drawing or instruction to a three dimensional form is high. Architects see a space in a blueprint and designers a garment in a pattern.

The architecture methods and spaces proposed in this thesis are quite different from the textile architecture examples seen today. They are not made as patches generated from a computer program, nor are they tensile structures. The spaces proposed here are made from a continuous mesh, rather than creating one. This way of working with actions on the middle, enables a simpler construction method, using material which is constructed as flat from the start.

The tailored and draped spaces from the last concluding step show that architecture can benefit from the soft and beautiful qualities of textile and still be dramatic.

If these shaped where scaled up directly - with the aim of an exact replica of the small scale models, a new kind of semi static textile architecture could be achieved. This would however set a high demand on the textile used. Though the construction and further development of spacer fabrics in particular show great potential to bridge this gap in scale.

The spaces draped in the small scale modelled could however also be used only form the form. The aim of this thesis is not strictly to make textile architecture but also inspire a soft kind of architecture which can benefit from the beautiful qualities of textiles. These qualities include the soft creases in textile and these forms could also be replicated in other materials in larger scale structures.

As a final note, it is worth mentioning the value of taking inspiration from other field of knowledge. By taking inspiration from the textile industry and fashion in particular, one can derive spacial concepts, perhaps not possible otherwise. And there is always a value in being able to turn to other places for inspiration when one is stuck.

Figure 67. *Textile with a twist*
Twist constructed by a triangle cut out, folded and sewn. Authors own image.

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As a final note, I would like to thank my grandmother, for all the sewing expertise she taught me and all the inspiration in her absence.

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