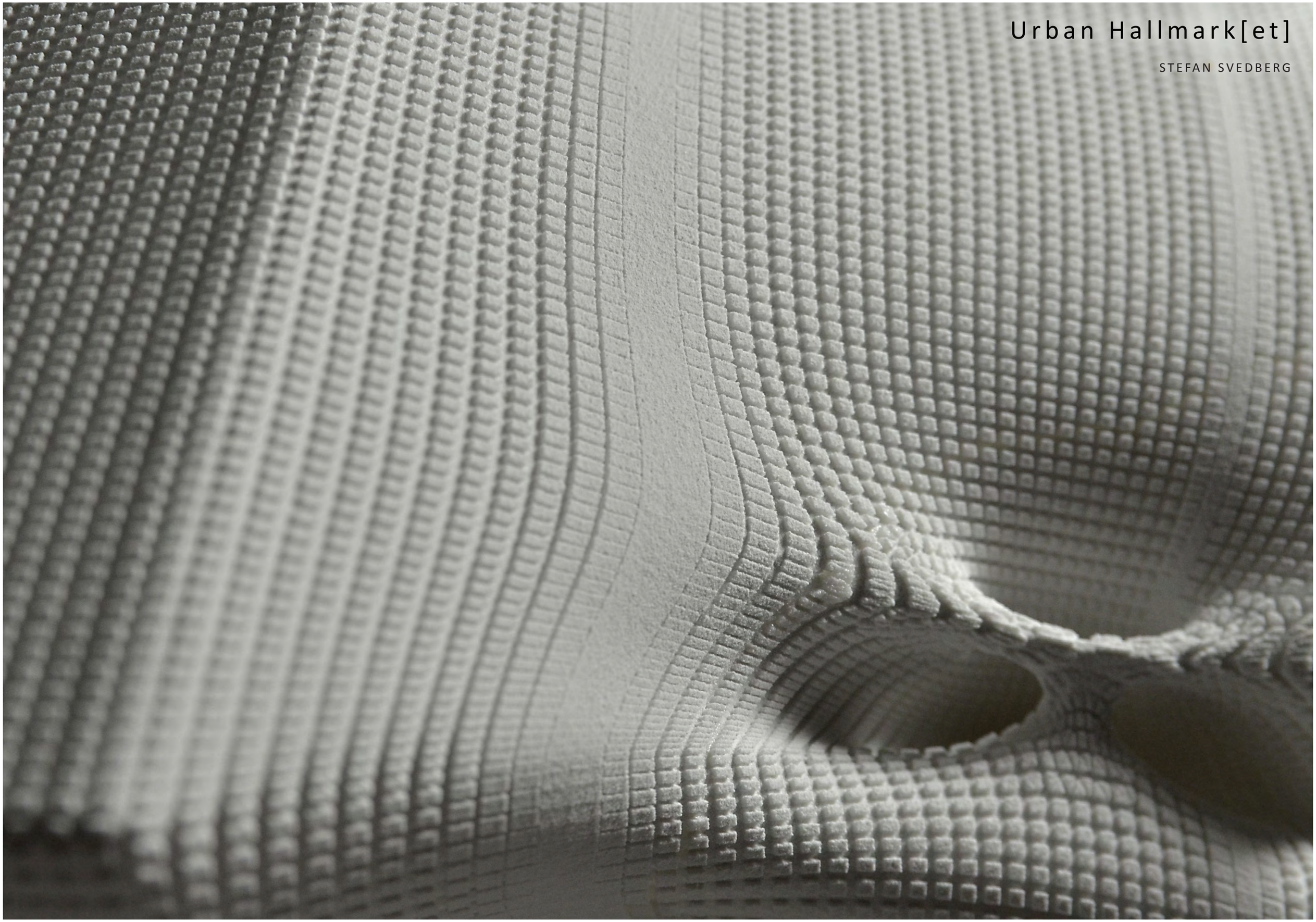
Urban Hallmark[et]

STEFAN SVEDBERG



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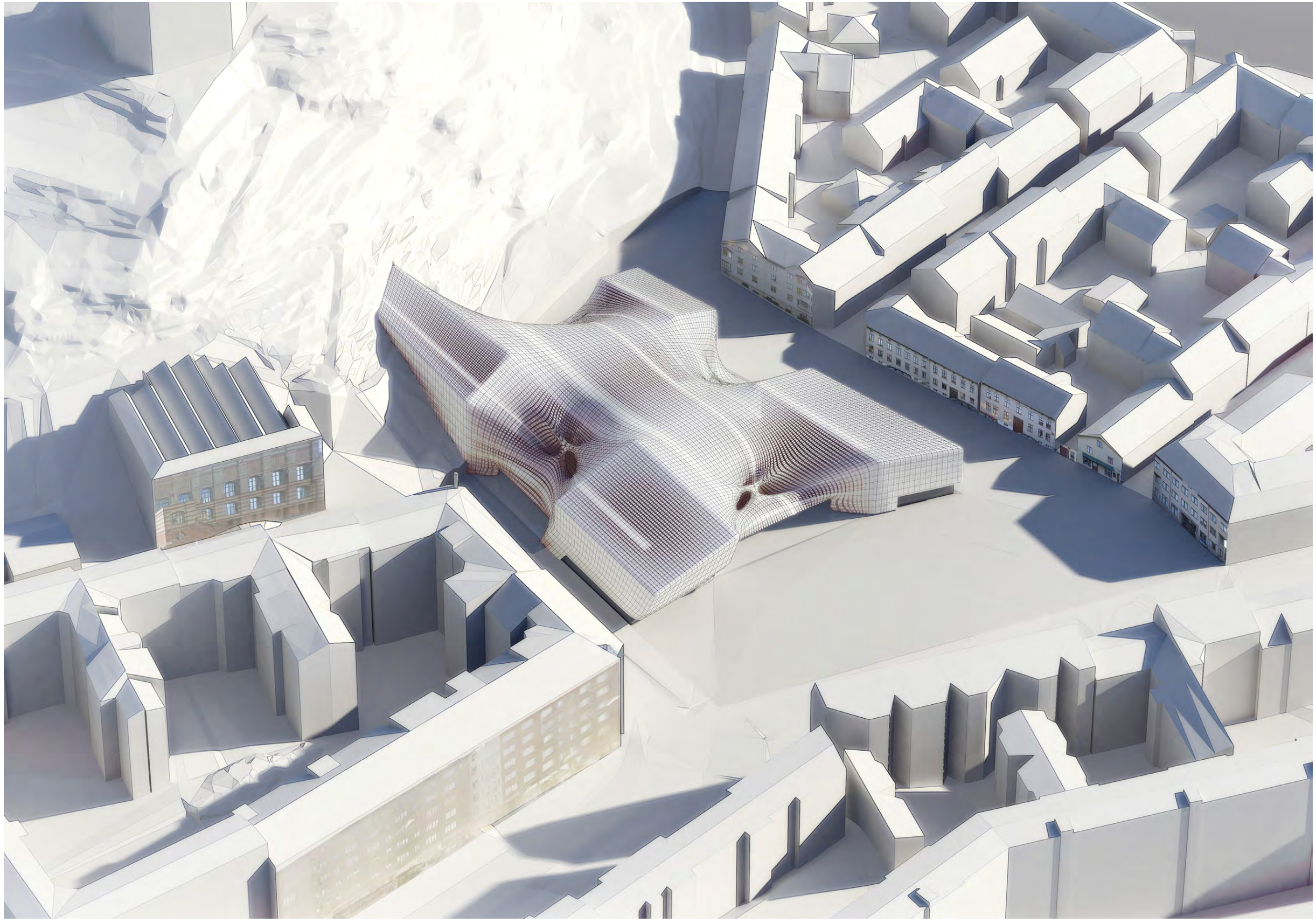


ABSTRACT

Urban Hallmark[et]

Location: Skanstorget, Gothenburg, Sweden
Duration: Jan 17 - May 11 2012
Status: University project

The project's title is a play on the words, hallmark and market hall – bringing together the function of a market hall with the quality and excellence brought on by a hallmark. Today's food market halls are commonly associated with maintaining a higher understanding of craft in food preparation, production and quality and they are known as places of knowledge and expertise with regard to common as well as rare produce. Skanstorget Hallmarket aims to provide this platform of knowledge in food craft and produce whilst instigating a deeper appreciation and understanding of food by incorporating local production initiatives and acting as a centre for exchange between urban and rural societies through the celebration of food.

Site activation and regeneration

The project and its associated programming has been strategically located in order to activate underused sites within the central urban fabric; Skanstoget, a square which has been dormant since the mid 20th century, and the terraced South-eastern hillsides of Skansberget, which have become a sort of wasteland.

Skanstorget is situated between the central zones of Haga, Linne, Vasa and Annedal and the activation of the site will play an important role in bridging together these zones and intensifying the area, transforming it into one of Gothenburg's leading food districts.

Introducing urban farming to the South-eastern terraces of Skansberget will both regenerate the area and provide a place where organised local initiatives can grow their own food. The proximity to the market hall will result a close relationship between production and distribution, further strengthening the food knowledge bank.

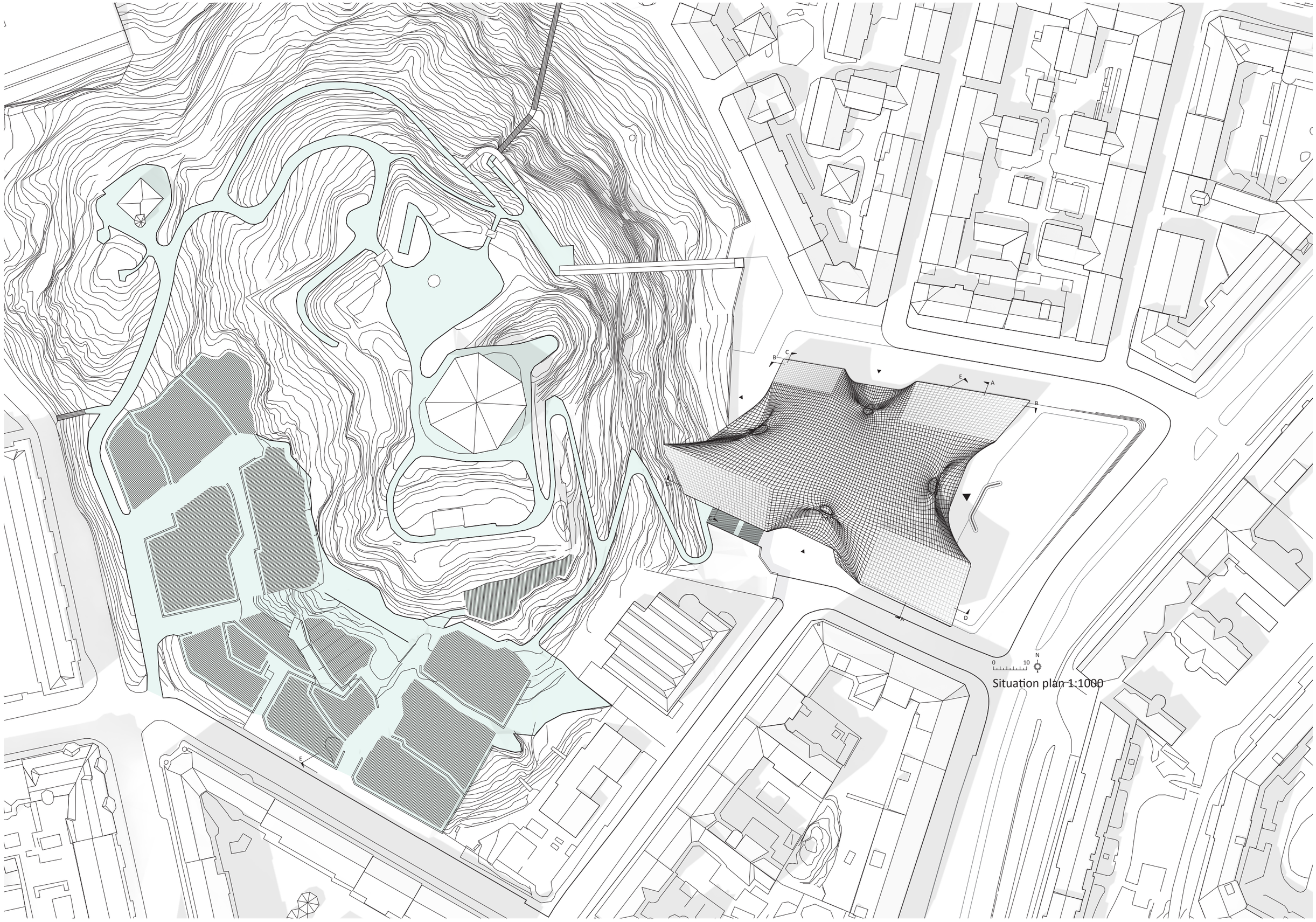
Process | Design research background

The central focus of this project has been the research of long span roofs and the use of fabrics as a means of generating design articulations. The generation of these articulations are derived from the fabric's own physical properties. A series of tests have been carried out in order to study behaviours and qualities in the fabric that incorporate a greater structural complexity with the creation of geometric events to enhance aesthetic variation.

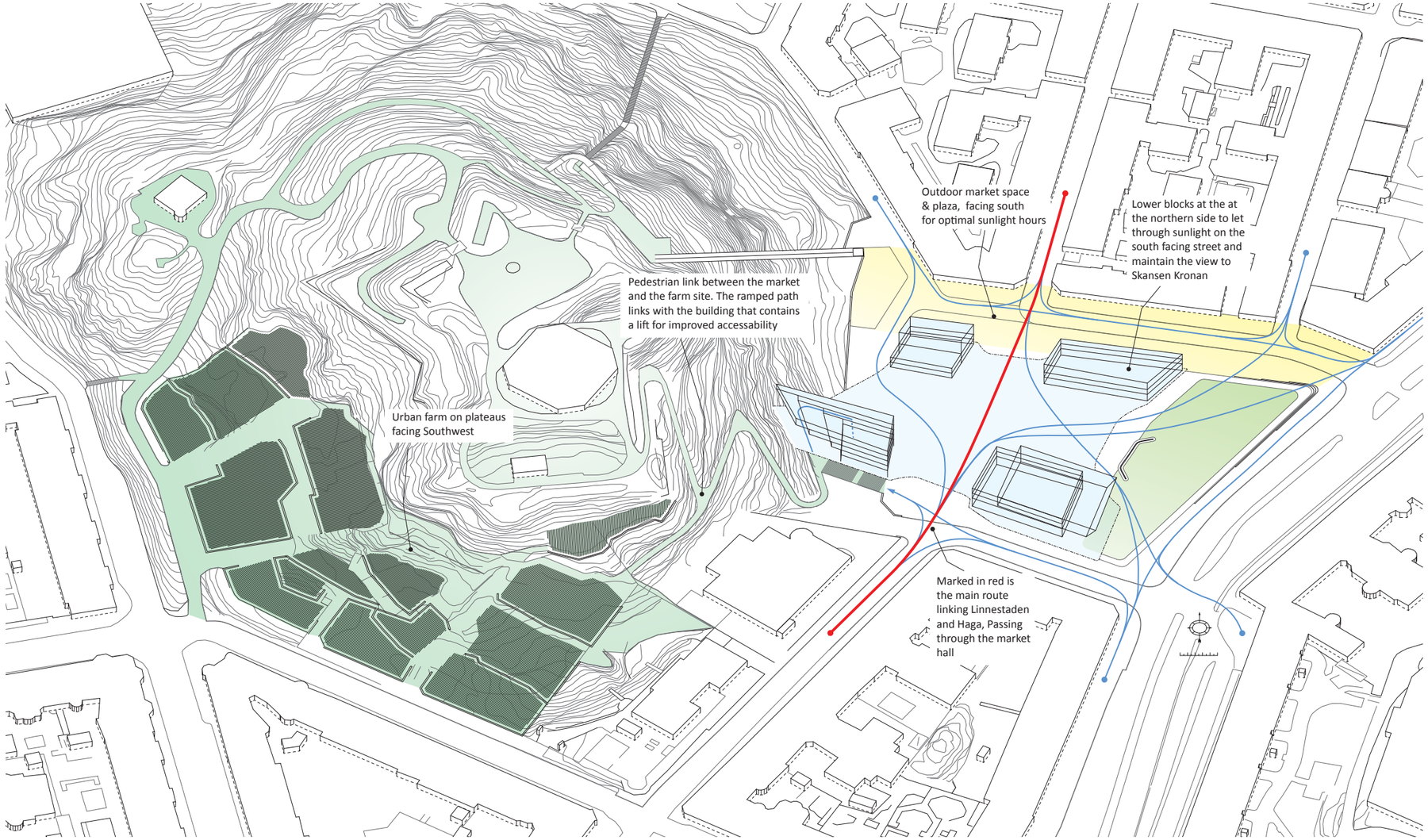
Design outcome

The design and programmatic strategy lies in the interplay between the forces of two elements: the membrane and the volumes. The membrane envelopes the volumes in an inwards pulling force while the volumes push the membrane outwards. This results in a spatial quality where there is a constant tension between the solid volumes and the membrane. To enhance the appearance that the entire membrane is held up by the outwards force of the volumes, the articulations in the membrane force the membrane into alternative directions.

The membrane's diffuse texture gives the space a cloudy quality, exposing spangled glimpses between the exterior and interior. From street level, the building's relationship to the neighbouring sites can be seen through its fluctuating hight which reflects an adaptive response to the adjacent buildings.



Situation plan 1:1000



Site analysis

Day light study

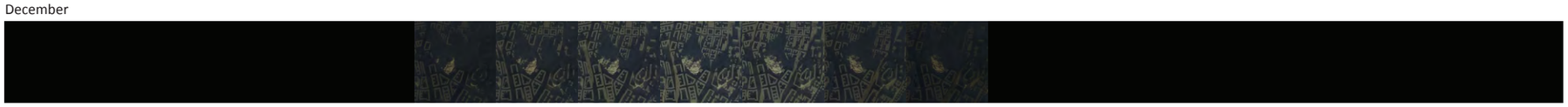
04.00 05.00 06.00 07.00 08.00 09.00 10.00 11 .00 12.00 13.00 14.00 15.00 16 .00 17.00 18.00 19.00 20.00 21.00 22.00

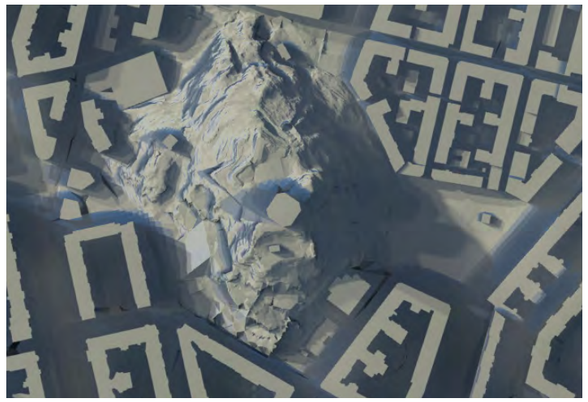
March

June

September

December





Jun 08.00 - 20.00

Dec 10.00 - 14.00

Natural light on skanstorget (Skans square) and Skansberget (Skans hill)

Sunlight is an essential aspect to consider in the design of the market hall on Skanstorget and the location of farming on Skansberget.

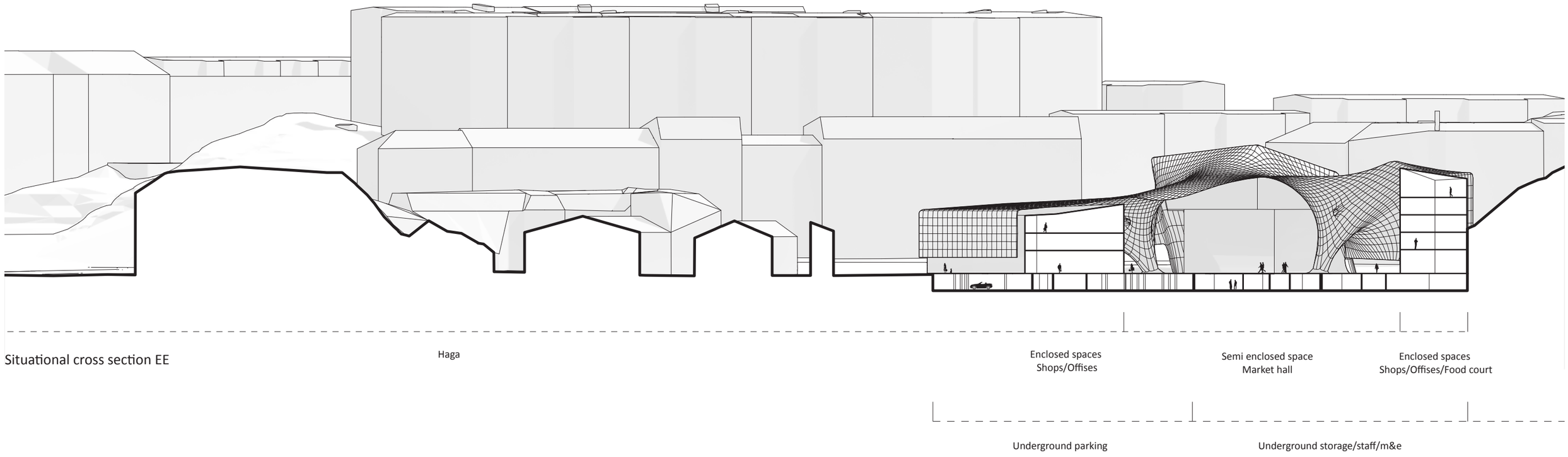
Synopsis: Skanstorget

- In the darkest months of the year, Skanstorget has little sunlight.
- In the spring, summer and fall, the south, east and west facing sides of the square have sunlight

Synopsis: Skansberget

- The north of Skansberget is the most shaded
- During the summer days, the sun reaches most of Skansberget because of the angle of the hill
- During the darkest month of the year, only the hill's southern sides receive sunlight

* For more information refer to project research base



Situational cross section EE

Project site

Skanstorget is located south of Gothenburg city centre along one of the main routes between the southern suburbs and the city. On a pedestrian scale, it is located in a dull buffer zone between Slottskogen, Haga and Vasa.

Although the square itself currently lacks activity and is used primarily as a parking lot, the surrounding areas are popular and attractive residential neighbourhoods comprising of restaurants and inner-city commerce.

The immediate surroundings of the square however, are devoid of vibrance and businesses located there do not put forth an impression of thriving.

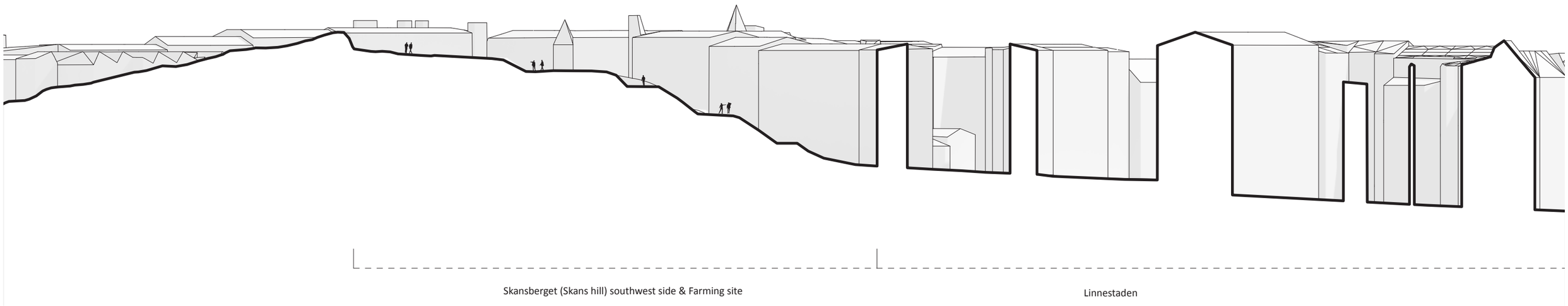
A number of architectural interventions have been proposed in order to activate the square but decisions have yet to be made.

Farming on Skansberget (ref. research base)

The southwestern face of Skansberget has a number of hillside plateaus (ref. section EE) which are remains of an old Landshövdingehus neighbourhood built between 1899-1905. The last of these buildings was demolished in the 1970s and all that remains of these houses are the plateaus on which they stood.

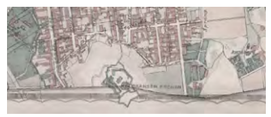
When it comes to selecting a site for farming, not only do these plateaus offer an existing level ground, they are ideally located in terms of the reception of sunlight and proximity to the square.

There has been increasing interest in urban farming amongst citizens of Gothenburg, which is reflected in small scale initiatives that have sprung up in places such as Högsbo, Majorna, Kvillebäcken and Nya Varvet. The majority of these examples have been supported by an organisation known as Stadsjord (*City soil*).




1790

1890


1860


1921


Kommendants ängen 1896


Skanstorget 1910


Spottkoppen, skanstorget market hall


Skanstorget current

Skansen Kronan

The construction of Skansen Kronan began in 1687 but it was not until 1698 when it was provided with 23 canons that it came into proper usage. During this time, Skansberget was already populated by inhabitants living in slum-like dwellings on the hillside.

In 1899 -1905, housing developments were built on the southwestern face of the hill and they were later demolished during the 3rd quarter of the 20th century.

Building on Skansberget has for a long time been a debated topic due to the proximity to Skansen Kronan. The topic has been soiled with regret and criticism regarding the maintenance and care taking of the buildings, infrastructure and greenery on and around the hill, which makes it a sensitive and therefore rather challenging topic.

Skanstorget

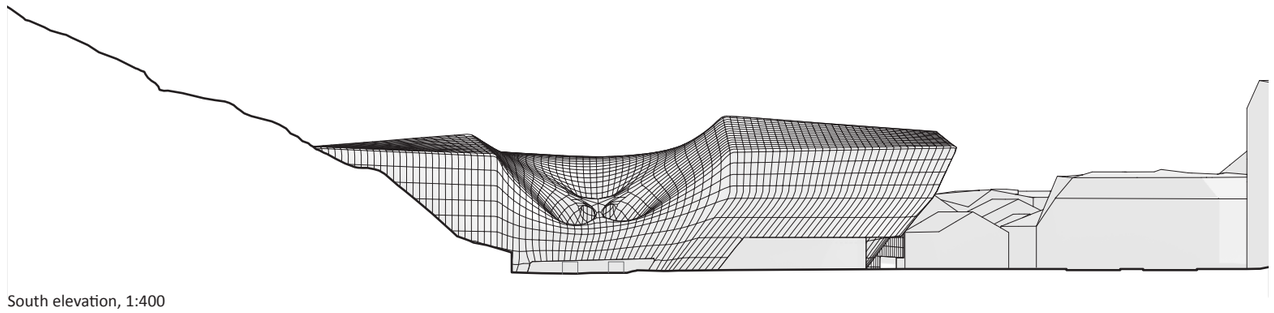
Once called “the most beautiful square in the world” by people in Gothenburg, today, Skanstorget is forgotten and neglected.
During the early 17th century, Skansen Kronan was primarily surrounded by green and hilly grazing fields for cattle. Kommendatns Ängen, a grazing ground for military horses, was located on the south side of Skansberget and towards the east lay a hill called Spekeberget. The hill was later partly flattened to allow for building and the site is where Skanstorget is located today.

In the mid 19th century, the site was transformed into a garden with flowers and fruit trees by the landowner, Åke Nilsson. Some time later, the site was split in two to make way for a new road, Övre Husargatan, and Nilsson further divided up his land into lots for buildings which climbed the southwestern hillside of Skansberget. In 1885, when the neighbouring areas, Haga and Annedal, reached a population of about 25000, Gothenburg City bought Nilsson’s land and plans for a new square were set in motion. By 1890 Skanstorget was completed and in 1898 a circular market hall, which was demolished 1941, was built at its centre.

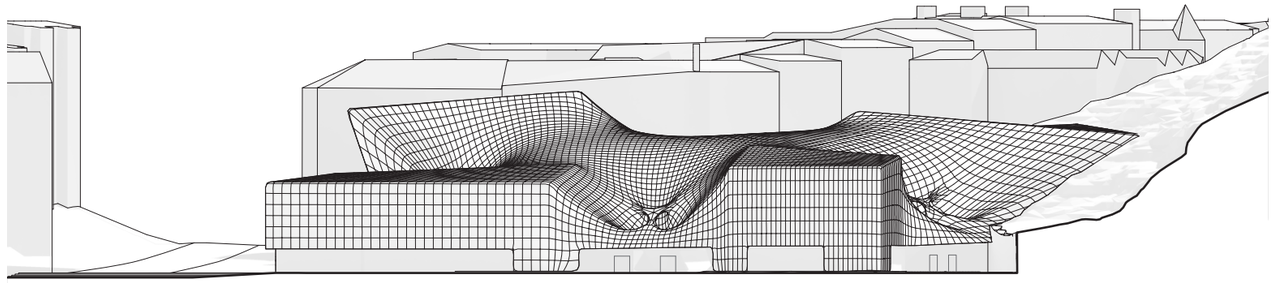
Meanwhile, with the emergence of social democracy and workers’ unions, the square was becoming politically charged and in 1882, Gothenburg’s first public speech was held there. The first Scandinavian workers’ union congress was also held there with members from Sweden, Denmark and Norway. Events surrounding these movements led to the founding of Gothenburg’s first union building, Folkets Hus (People’s Building) which was located on the square and whose purpose was partly to strengthen bonds between the Social Democratic Party and the unions. At this point, Skanstorget had become a gathering spot for demonstrations.

In 1917 the City of Gothenburg bought Folkets Hus and the participants relocated to Järntorget. The expansion of Gothenburg saw a shift in social situations and workers began to move out of Haga and Annedal. Despite these shifts, demonstrations and activist gatherings continued to be held at Skanstorget through the 20’s and 30’s to the Second World War.

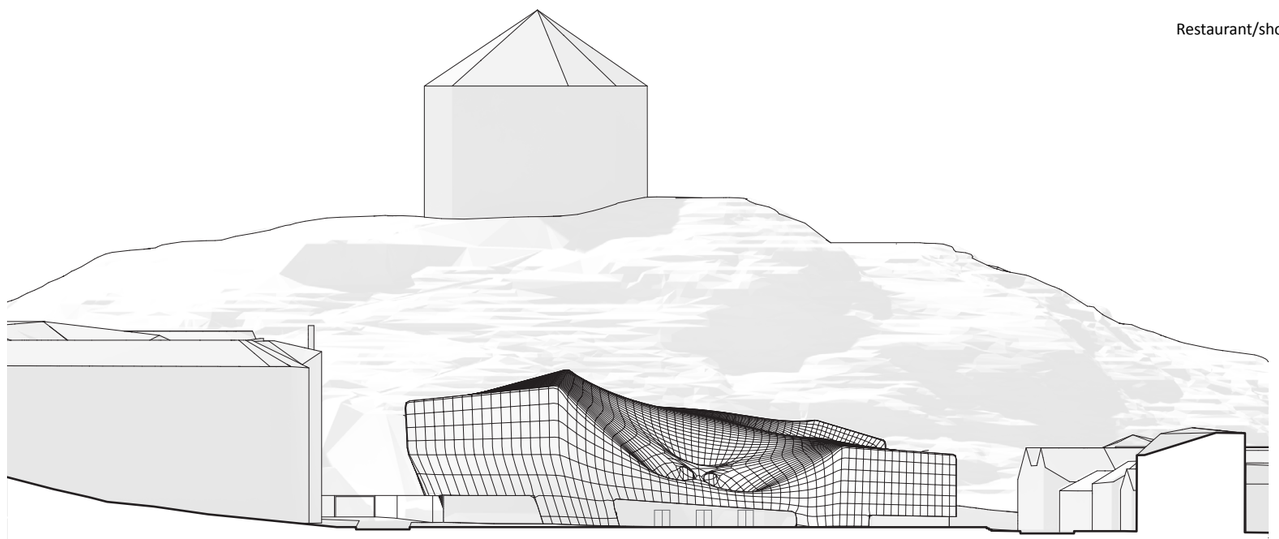
When the market hall was demolished in 1941, a memorial, Arbetets Brun (The Well of Work), dedicated to the history of the workers’ union was proposed, incorporating a well surrounded by a large pond with engraved workers motifs. However, the project ground to a halt with the debate over the accuracy and relevance of the motifs. Although there have been several proposals for the square, including the City of Gothenburg’s proposal to turn it into a park, the square has developed into a carpark since the demolition of the market hall.



South elevation, 1:400

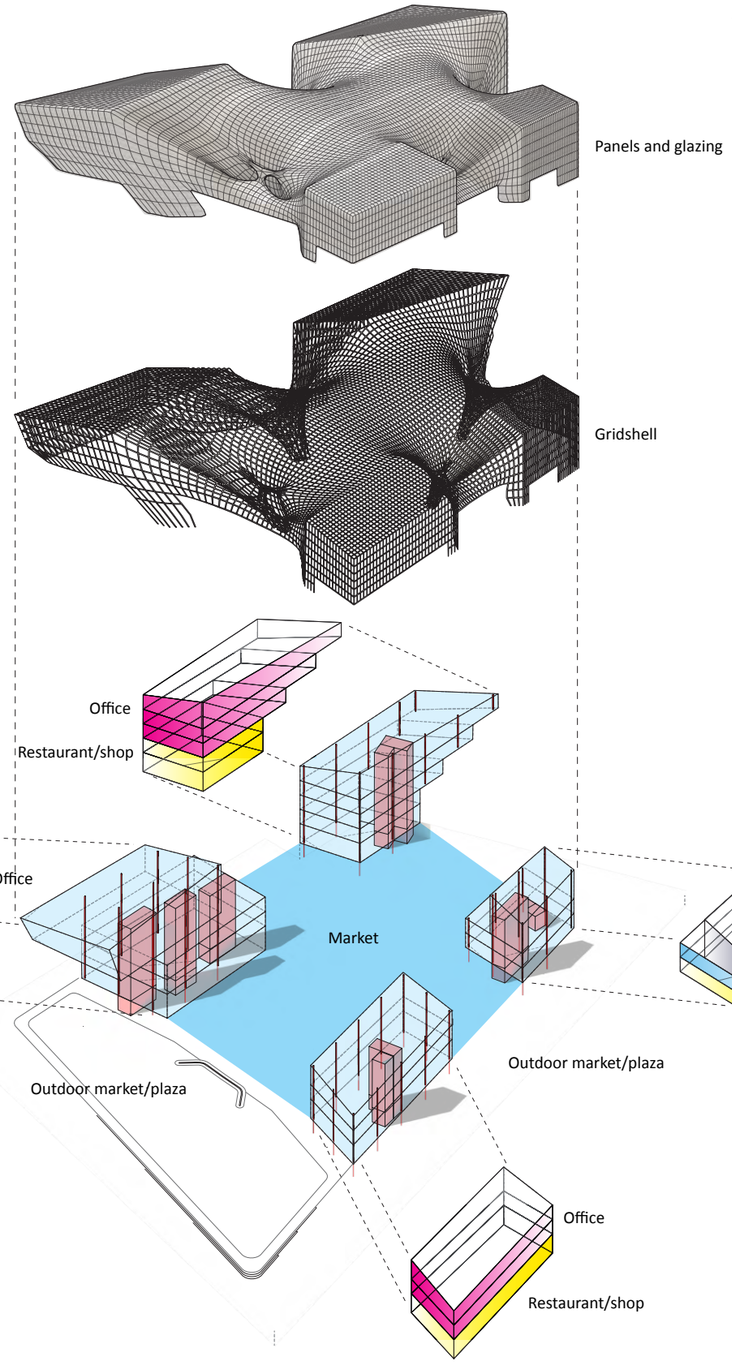


North elevation, 1:400

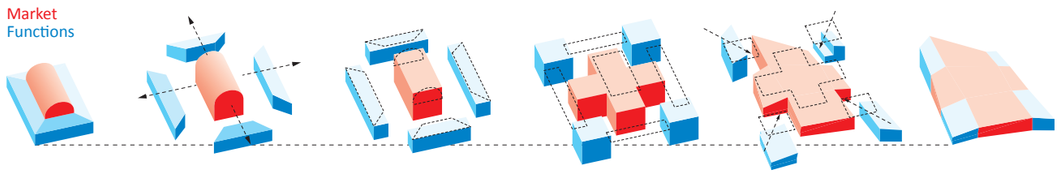


East elevation, 1:400

Spatial organisation



Derivation of programmatic concept



1. Common market hall, ex. Kungstorget market hall in Gothenburg

2. Split functions

3. Adaptation to program

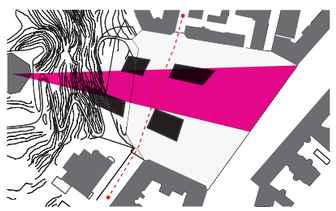
4. Location concept of functions

5. Programatic study

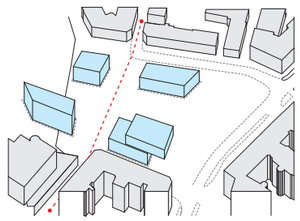
5. Basic geometry

Spatial organisation process

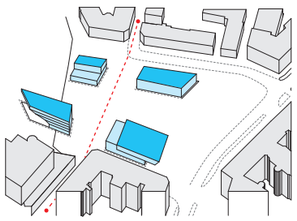
Contextual study of views, neighbouring building heights, and pedestrian traffic flows.



Maintaining a line of sight between the street level and Skansenkronan

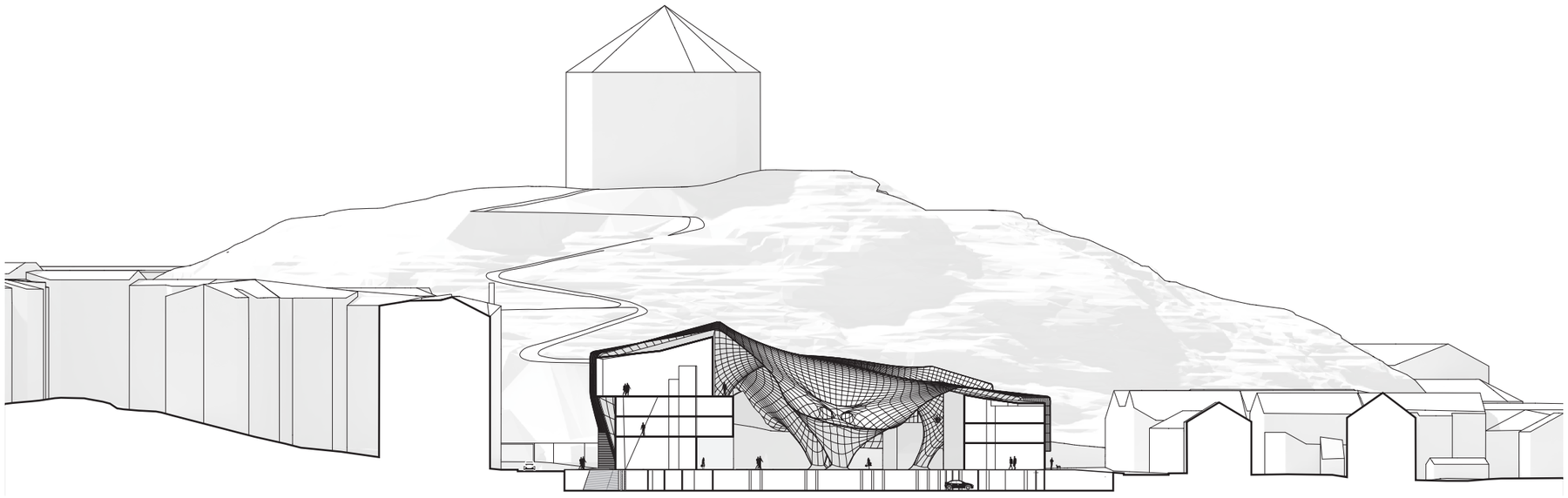


Keeping a relationship to the heights of the surrounding buildings



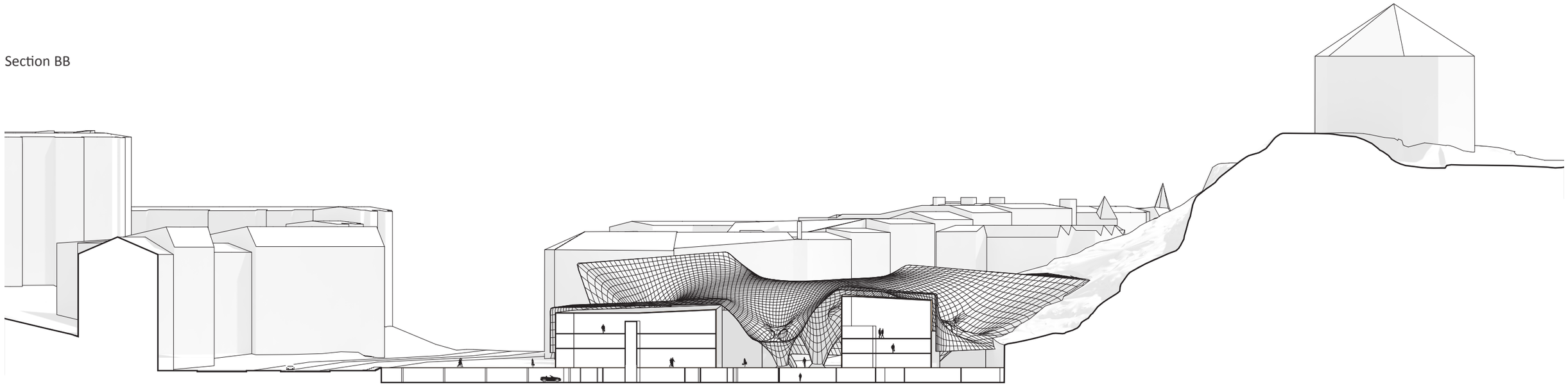
A further study of each individual volume to better incorporate the surrounding roof typology and enhance the qualities of the membrane

Section AA



1:800

Section BB



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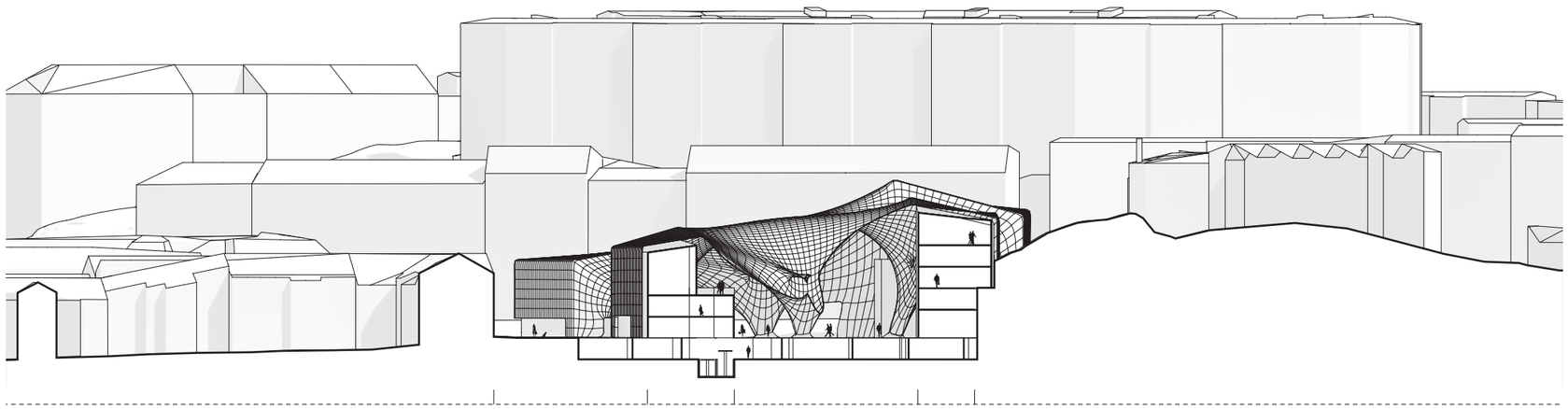
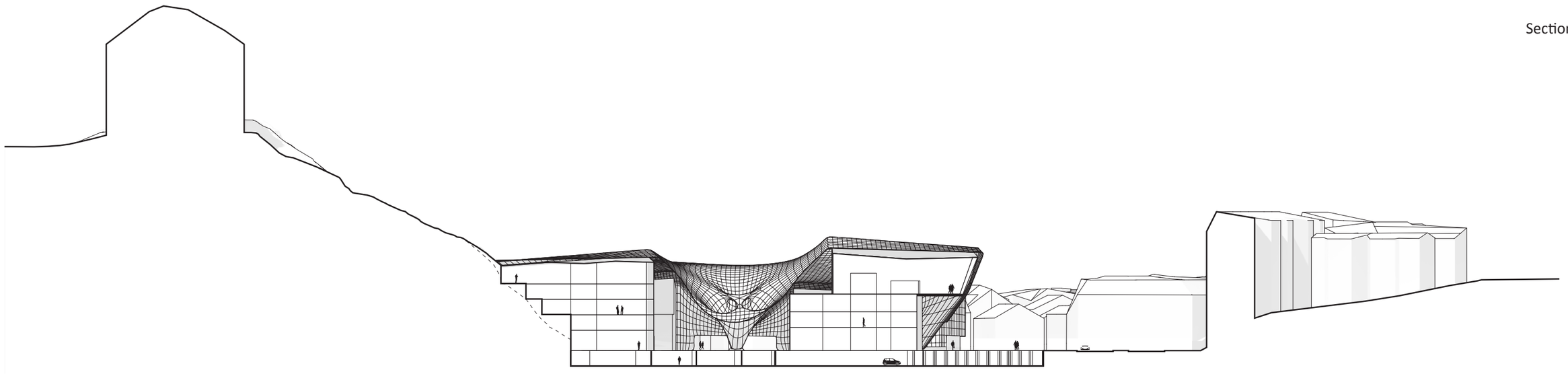
Section CC



1:800

Section DD



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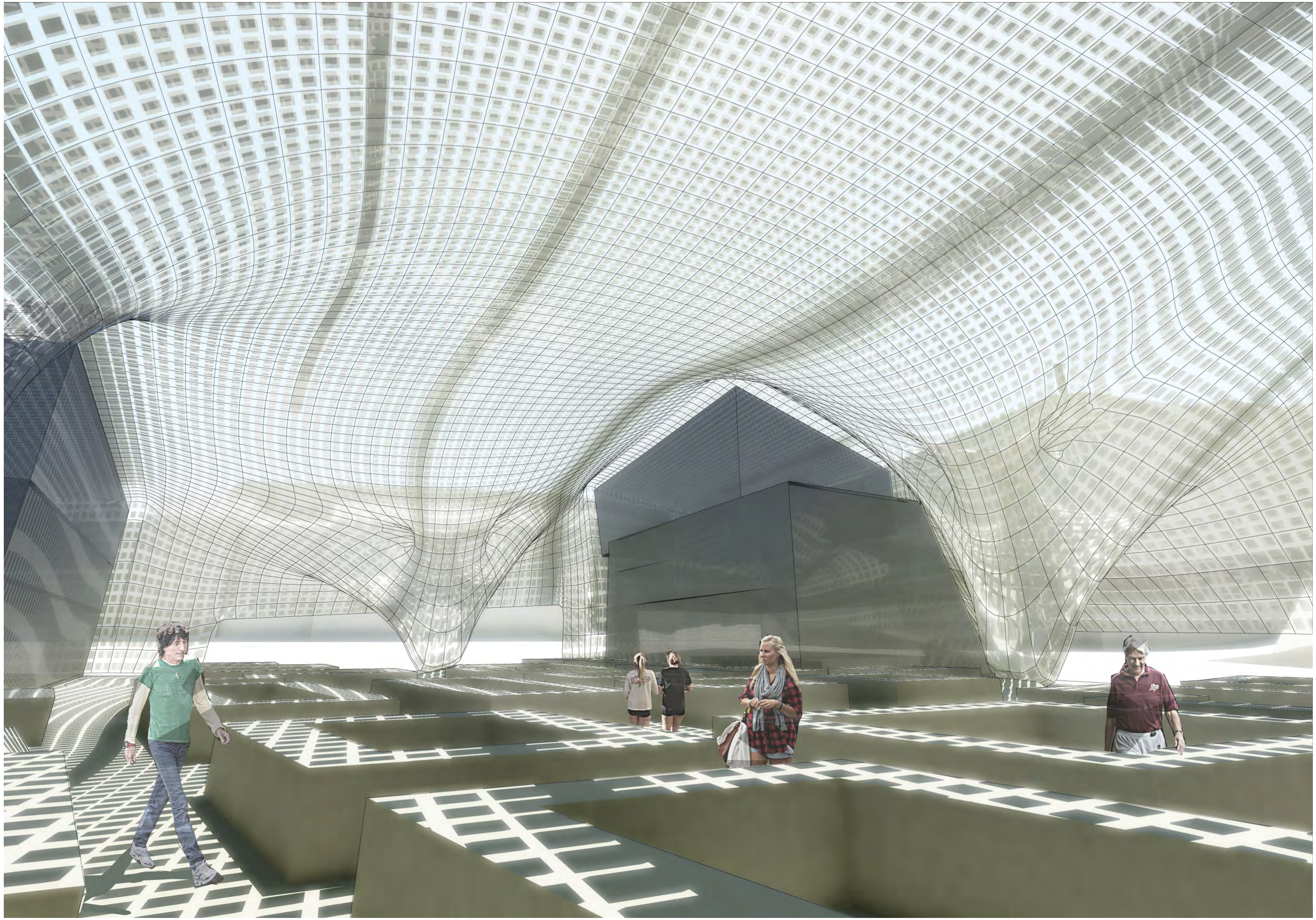

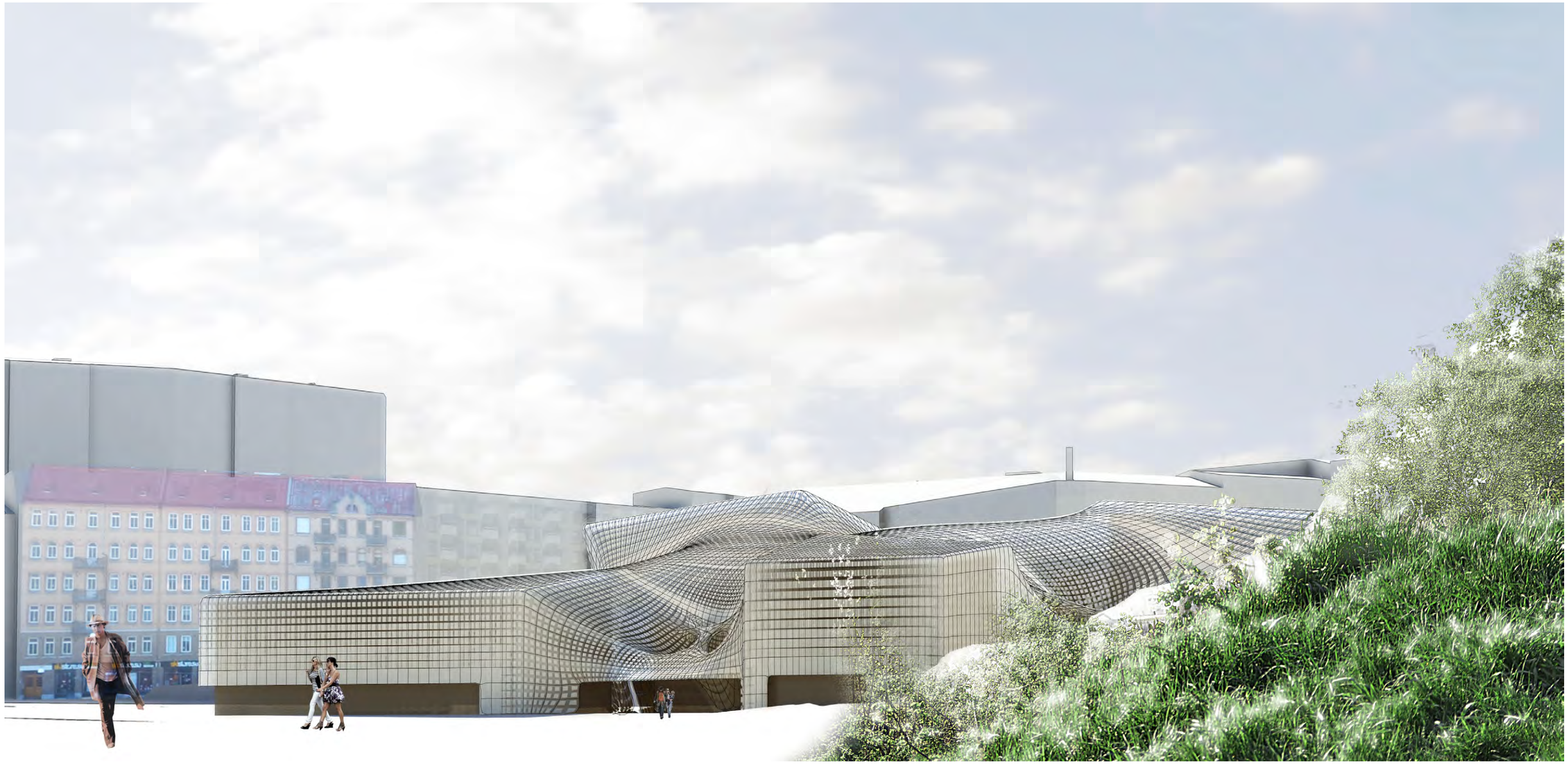

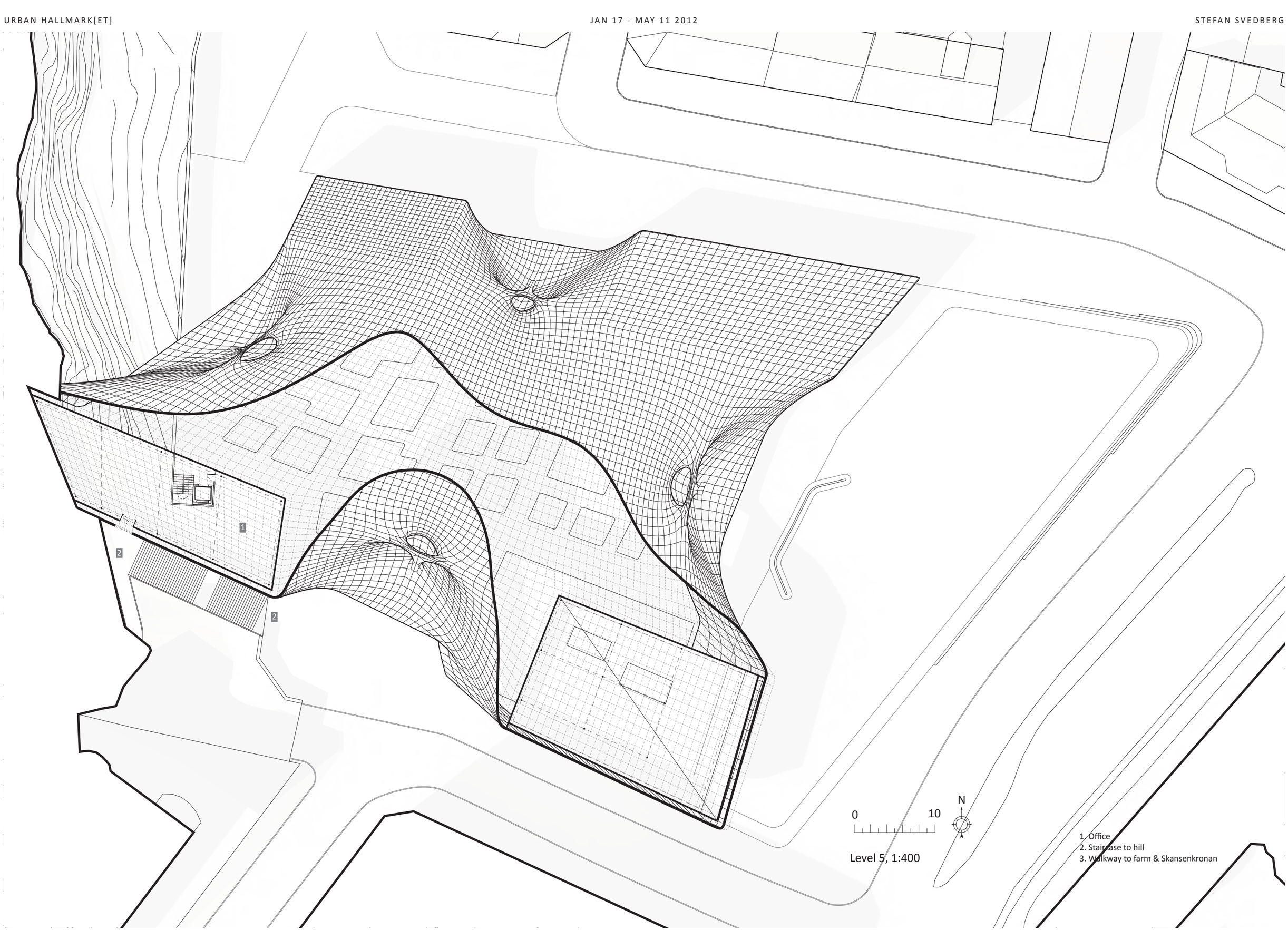
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2
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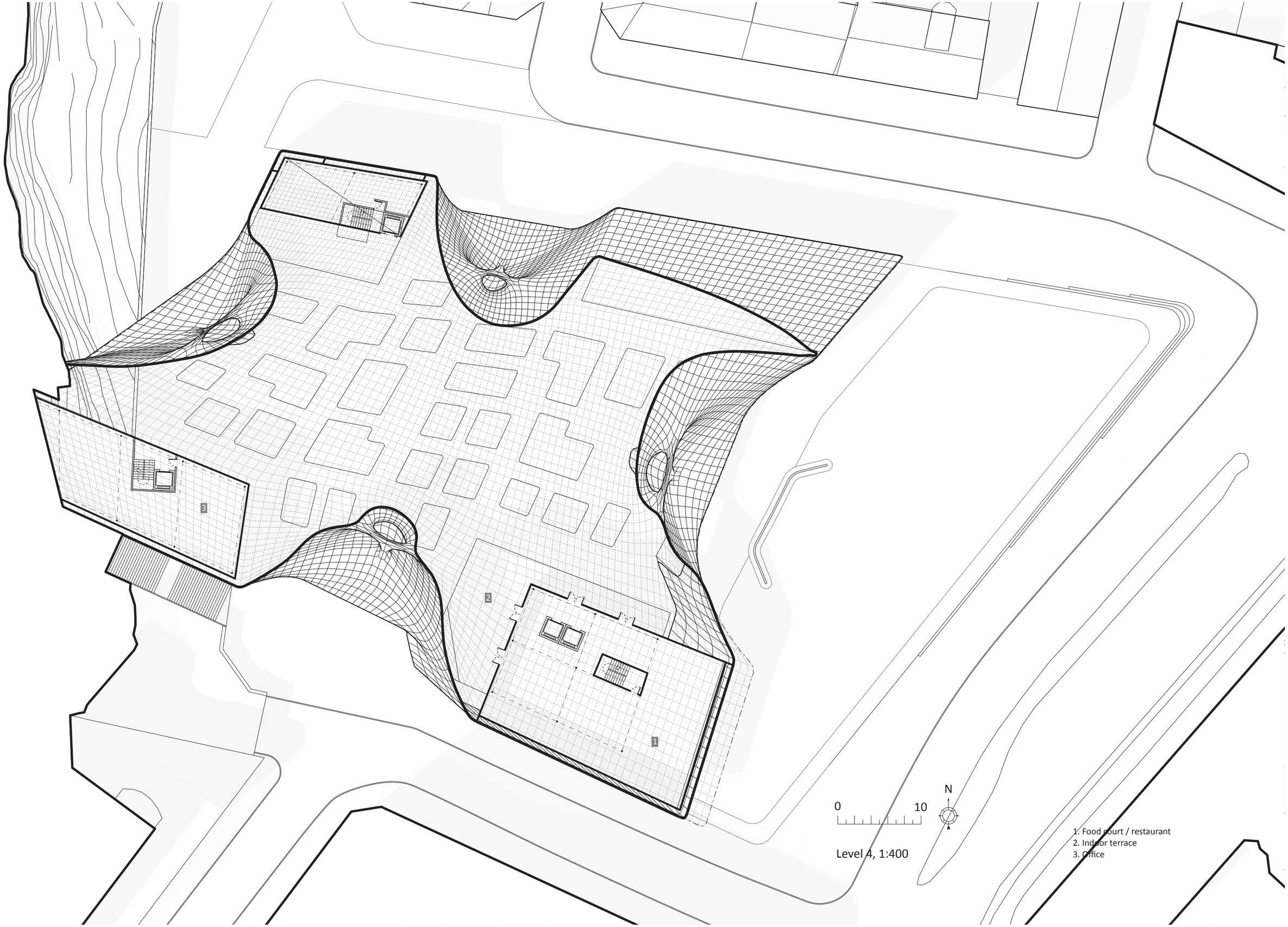
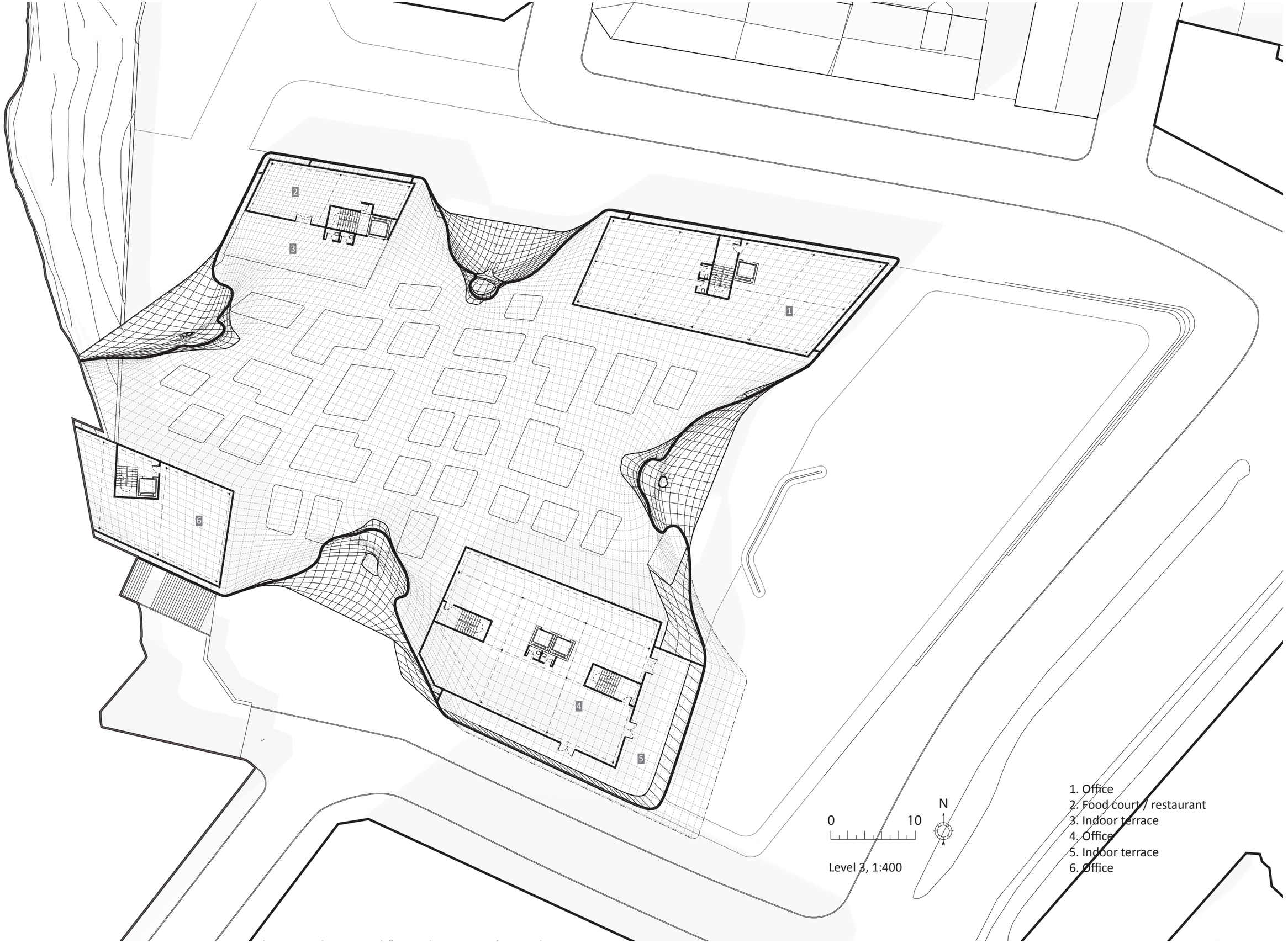
Level 5, 1:400
1. Office
2. Staircase to hill
3. Walkway to farm & Skansenkronan



Level 4, 1:400

1. Food court / restaurant
2. Indoor terrace
3. Office



Level 3, 1:400

1. Office
2. Food court / restaurant
3. Indoor terrace
4. Office
5. Indoor terrace
6. Office


1
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3
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0
10
N
Level 2, 1:400
1. Office
2. Staff recreation & office
3. Office
4. Shop / restaurant


1
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11
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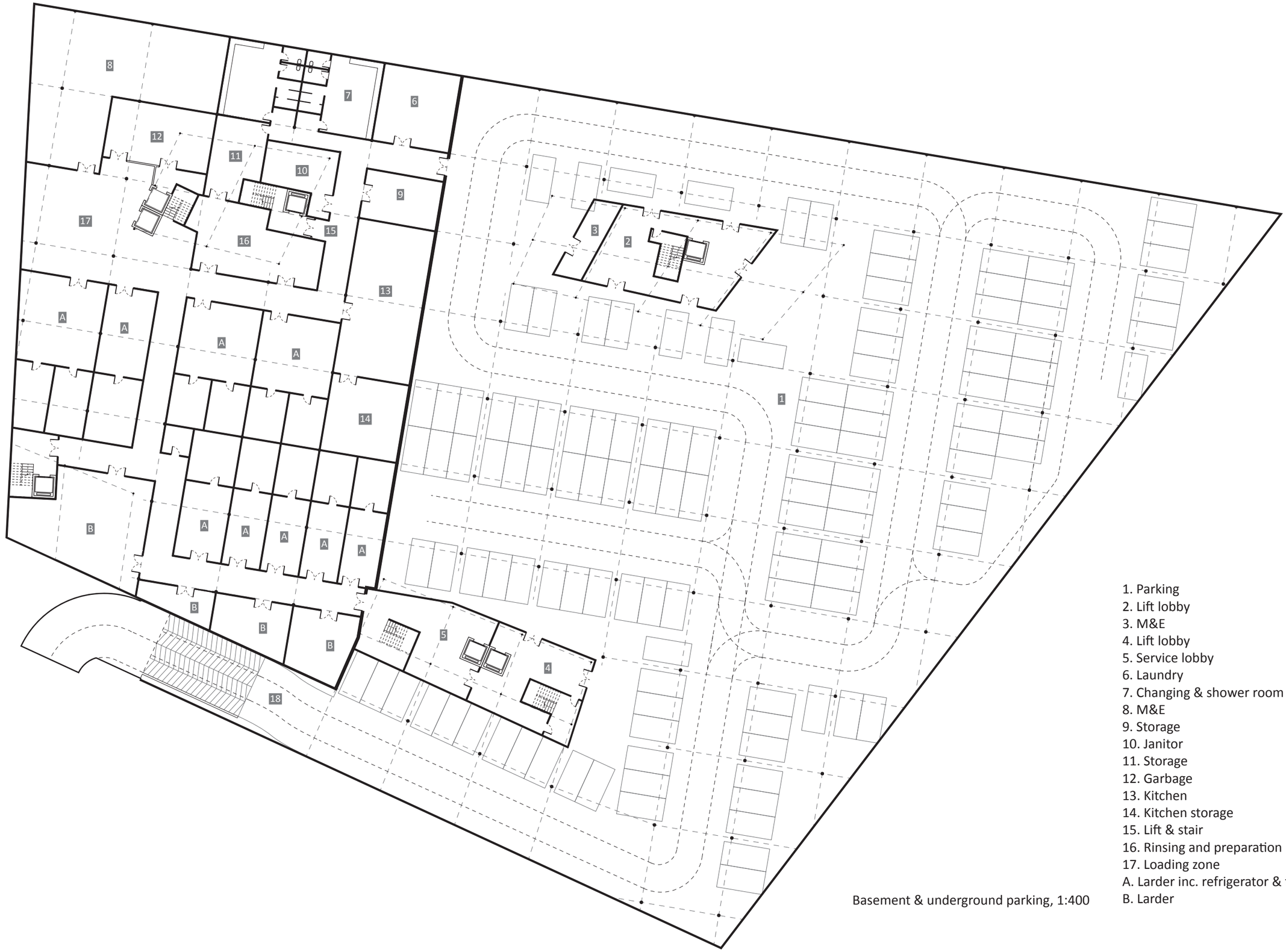
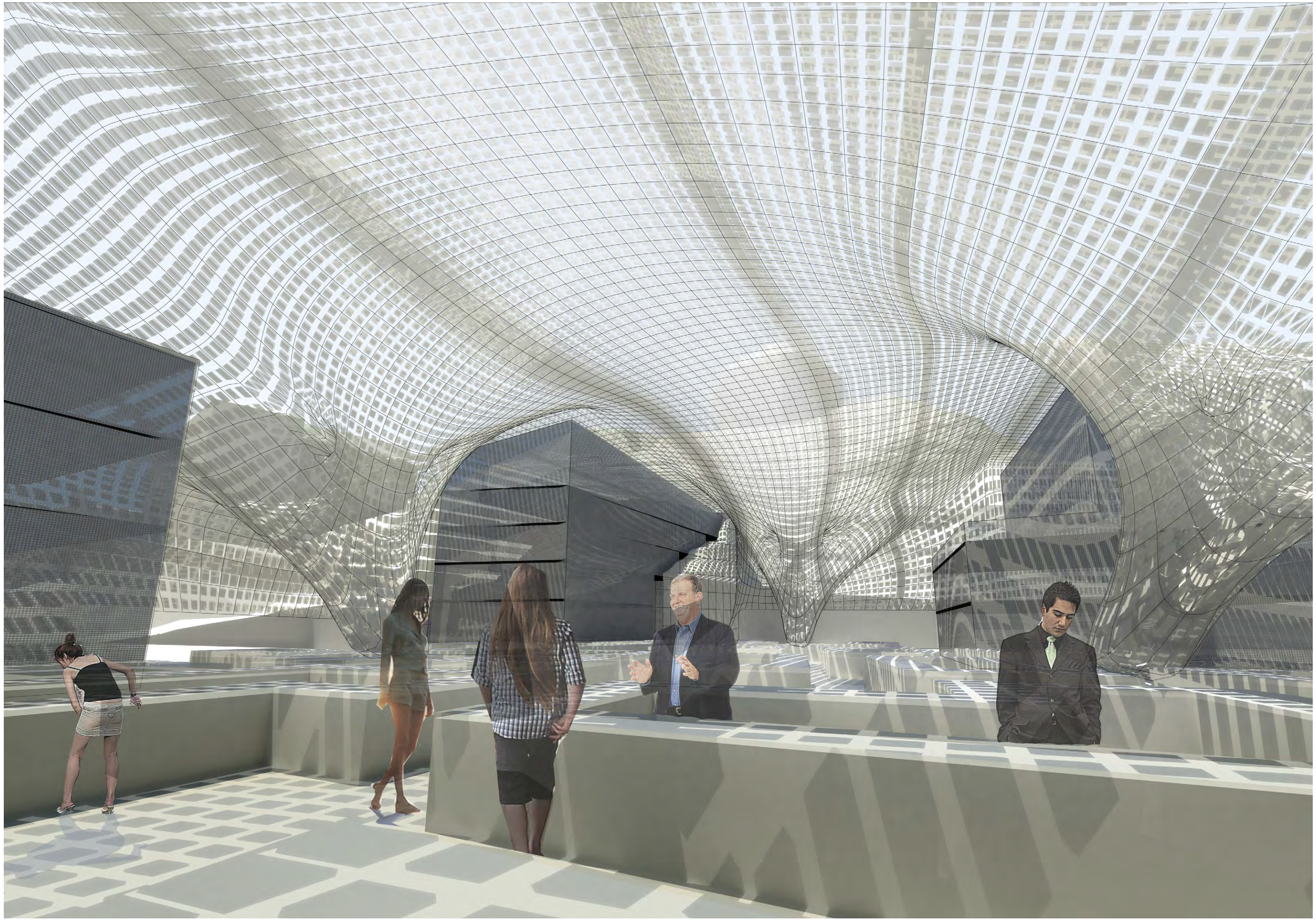
15
16
17
18
19
0
10
N
Level 1, 1:400
1. Shop / Restaurant
2. Lift & stairs
3. Shop / Restaurant
4. Shop / Restaurant
5. Lifts
6. Shop / Restaurant
7. Shop / Restaurant
8. Shop / Restaurant
9. Indoor market
10. Shop / Restaurant
11. Lift & stairs
12. Toilettes
13. Garbage
14. Loading zone
15. Shop / Restaurant
16. Lift & staircase
17. Outdoor market
18. Plaza & outdoor market
19. Underground parking ramp

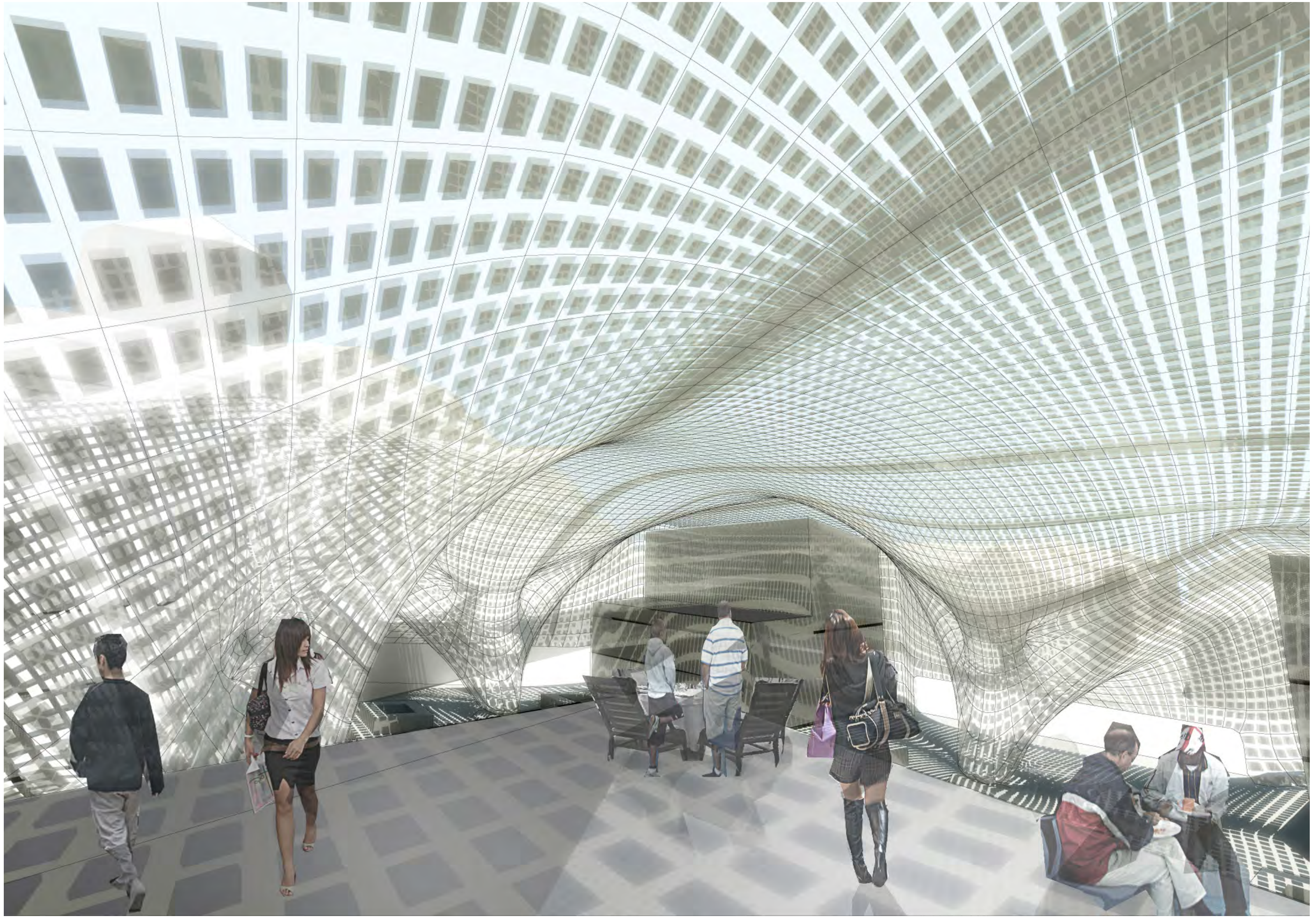


Basement & underground parking, 1:400

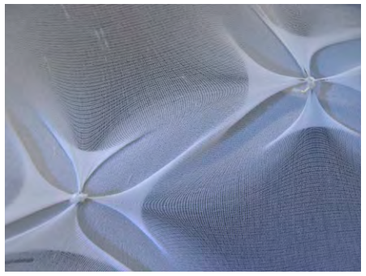
1. Parking
2. Lift lobby
3. M&E
4. Lift lobby
5. Service lobby
6. Laundry
7. Changing & shower room
8. M&E
9. Storage
10. Janitor
11. Storage
12. Garbage
13. Kitchen
14. Kitchen storage
15. Lift & stair
16. Rinsing and preparation
17. Loading zone

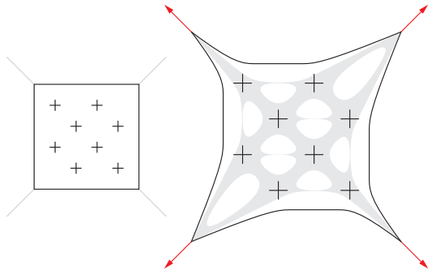
A. Larder inc. refrigerator & freezer
B. Larder

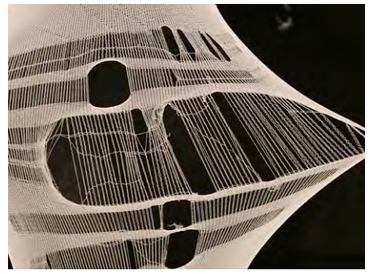


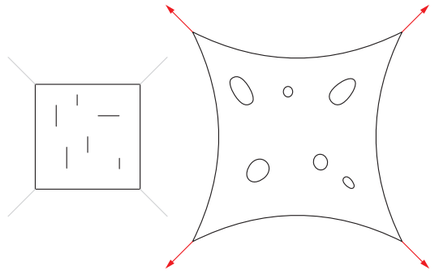


The two articulation systems used in the final design

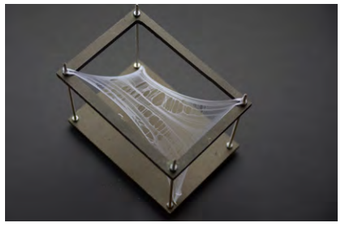


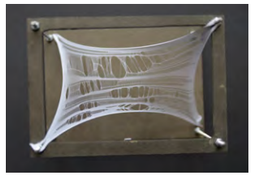




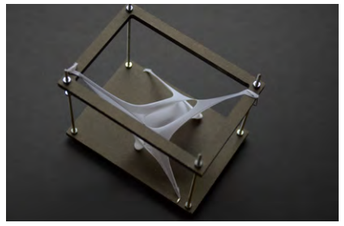


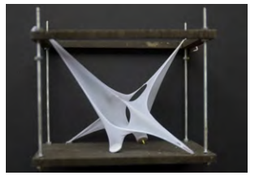
Generation of design articulations



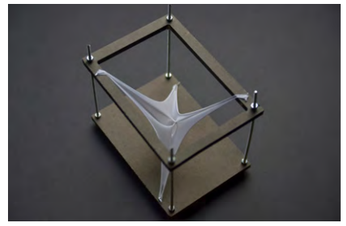


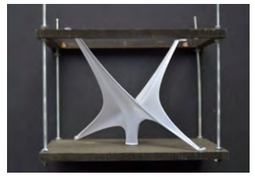
Hyperbolic paraboloid with controlled ripping



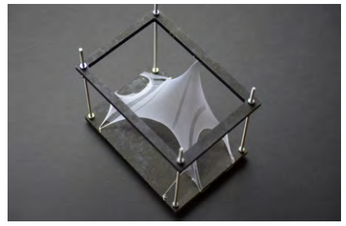


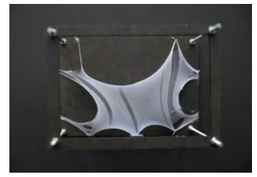
Hyperbolic paraboloid with 2 separate 2 point knots and 2 broad point constraints on the XY plane





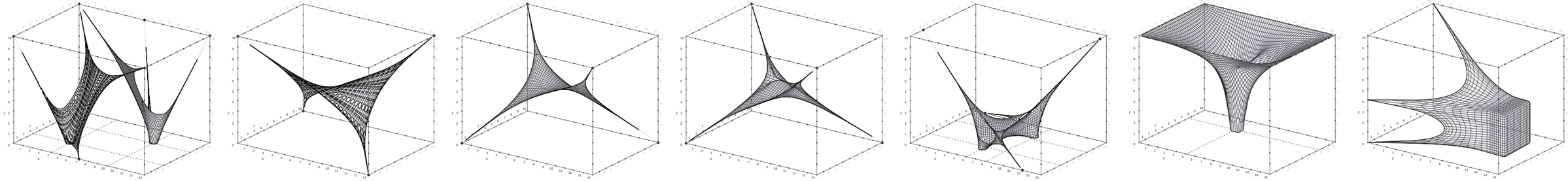
Hyperbolic paraboloid with a 4 point knot and a broad point constraint on the XY plane



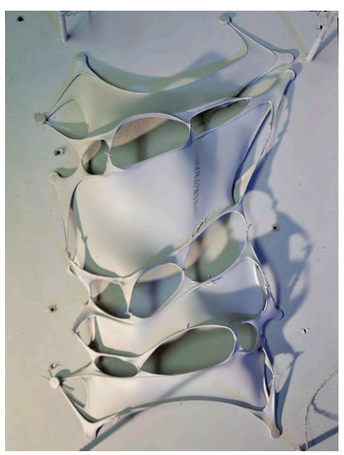


Various point constraints on the XY plane and 1 upper point constraint

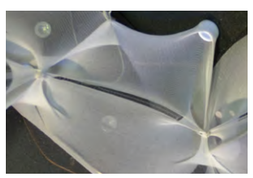
Digital reproduction through Maya NCloth



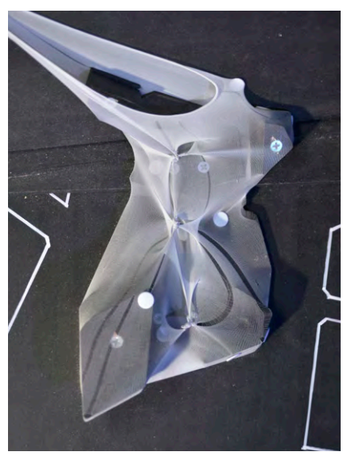
Spatial models incorporating the site and fabric articulation studies

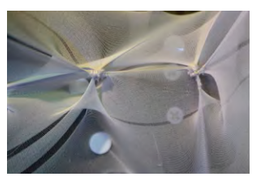


Multiple hardened surfaces with intersecting point constraints allowing possibilities for monocoque qualities



One surface with controlled ripping, broad point constraints, 3 and 4 point knots and internal predetermined geometric constraints

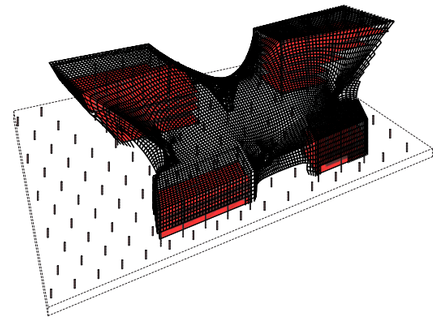




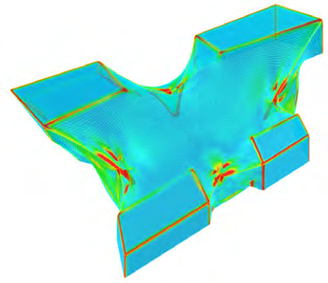
One surface with controlled ripping, broad point constraints, various point knots and internal predetermined geometric constraints

One surface with controlled ripping, broad point constraints, 1 3 point knot and internal predetermined geometric constraints

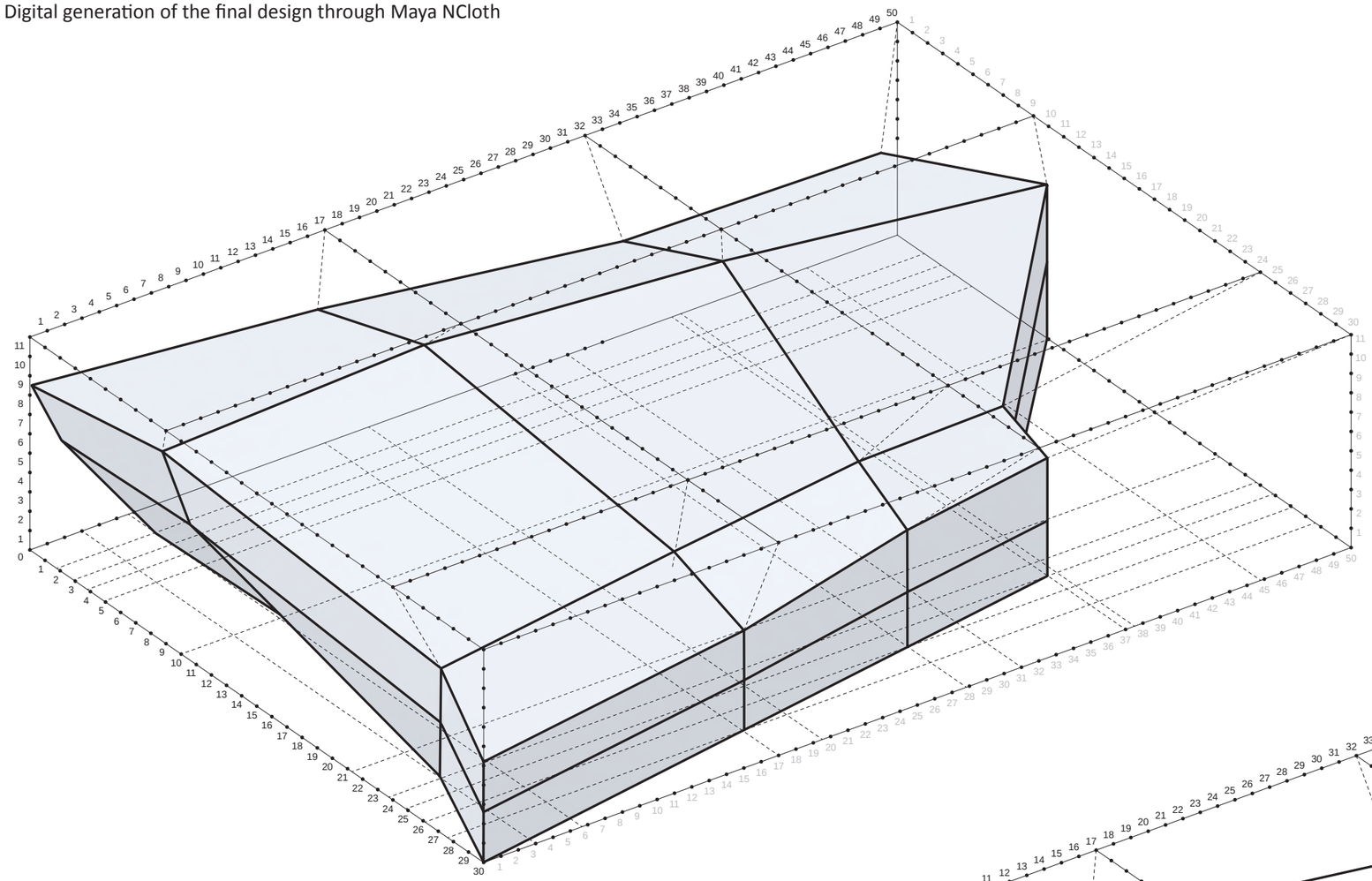
Digital generation of the final design through Maya NCloth

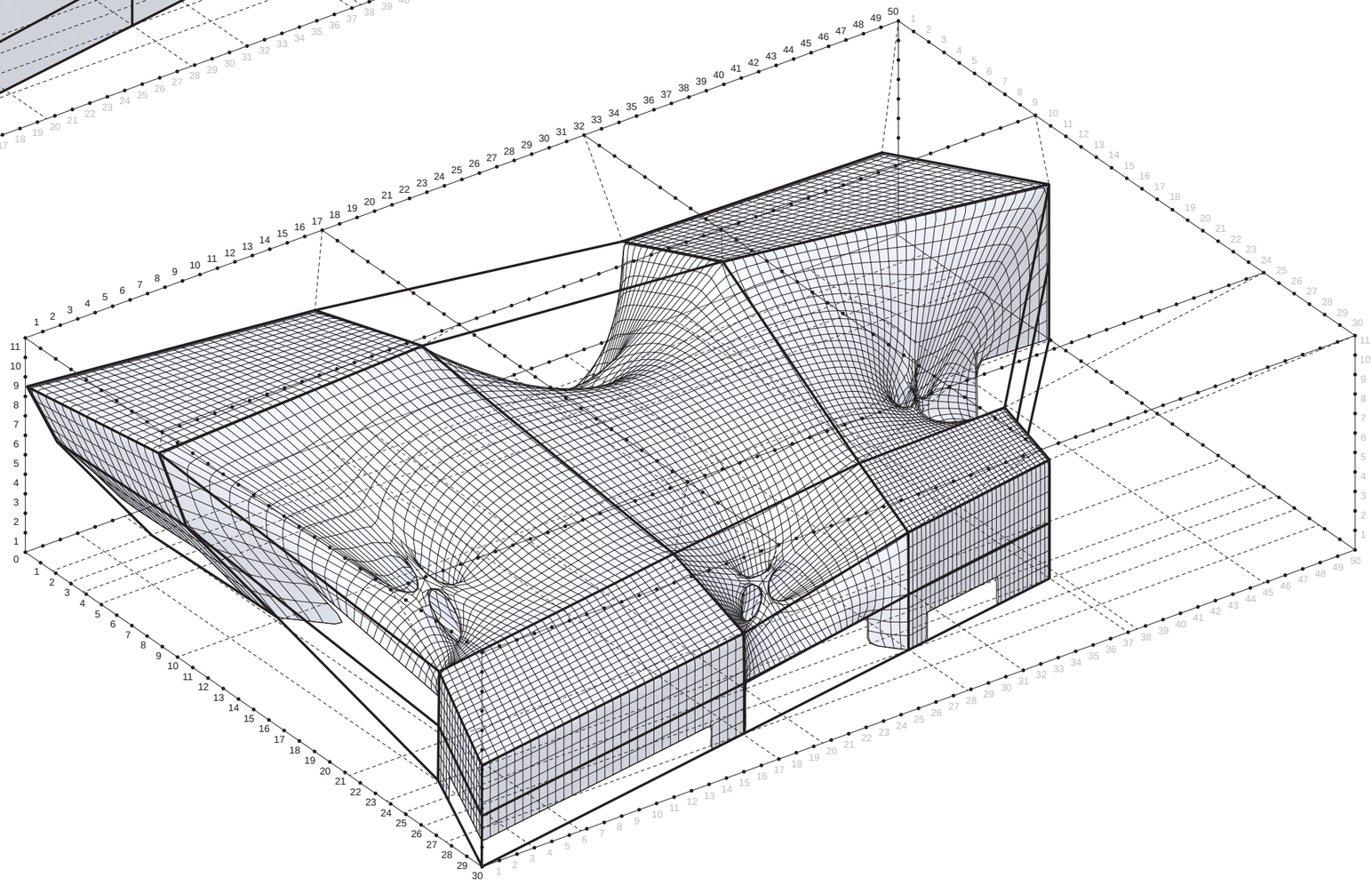


Internal structure & gridshell structure

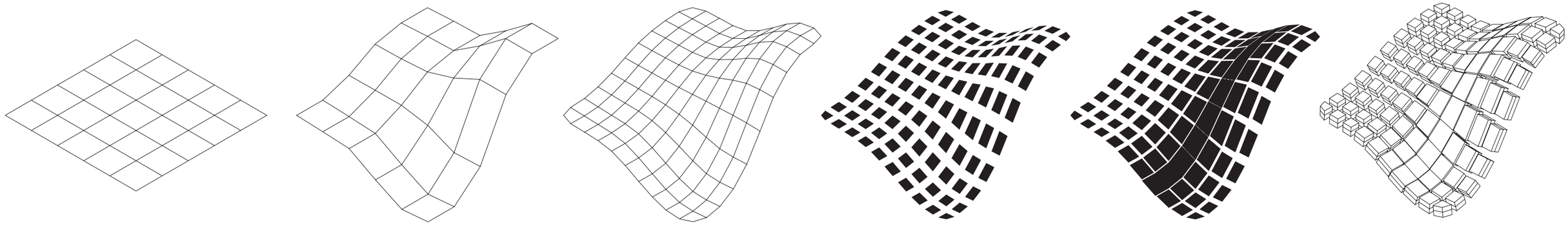


Surface curvature

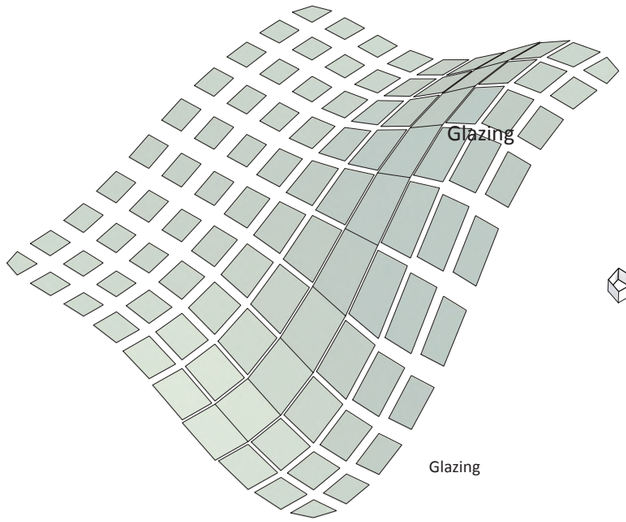




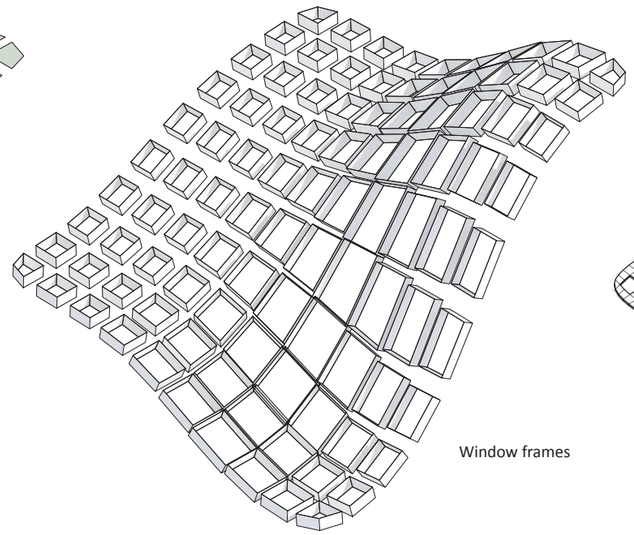
Generation of polygon surface texture through quadrilateral sub-divisions whose faces have been individually manipulated



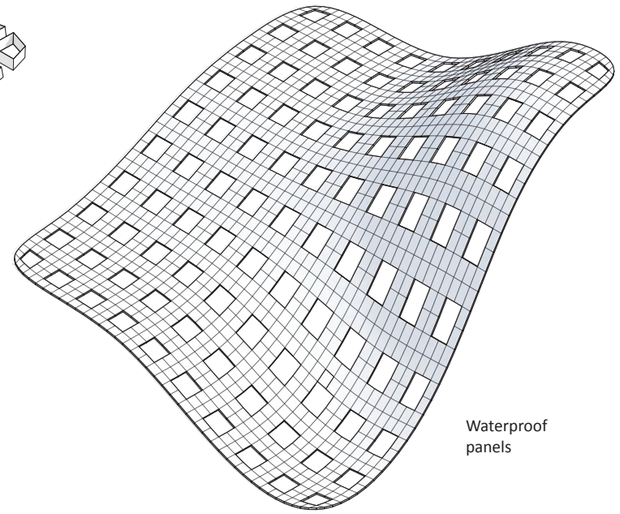
Materialization of membrane components



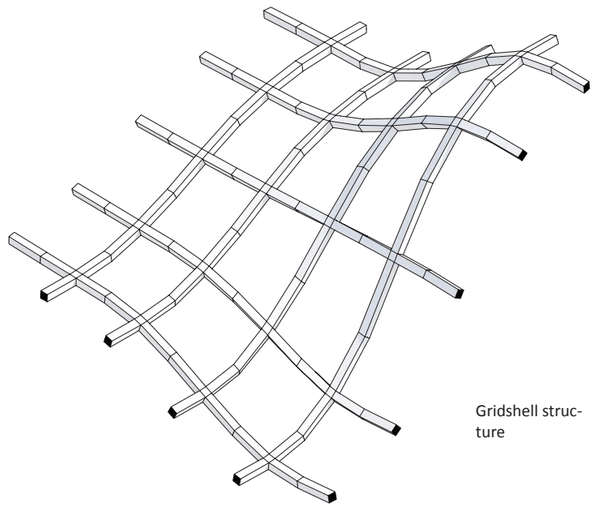
Glazing



Window frames



Waterproof panels



Gridshell structure

References

1

2

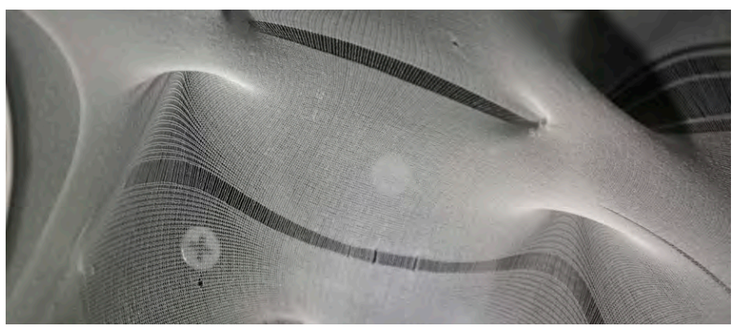
3

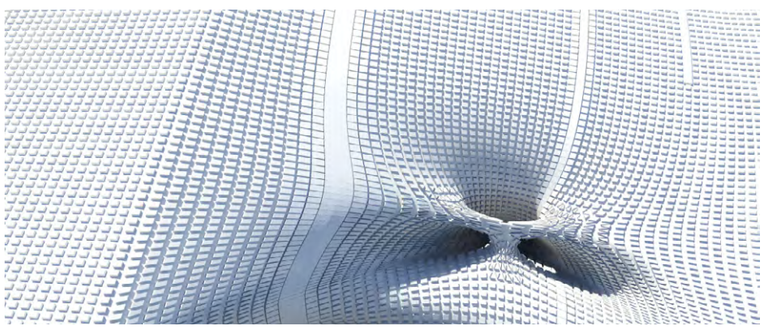
1. Le Corbusier, The Philips Pavilion, Expo 1958, Brussels

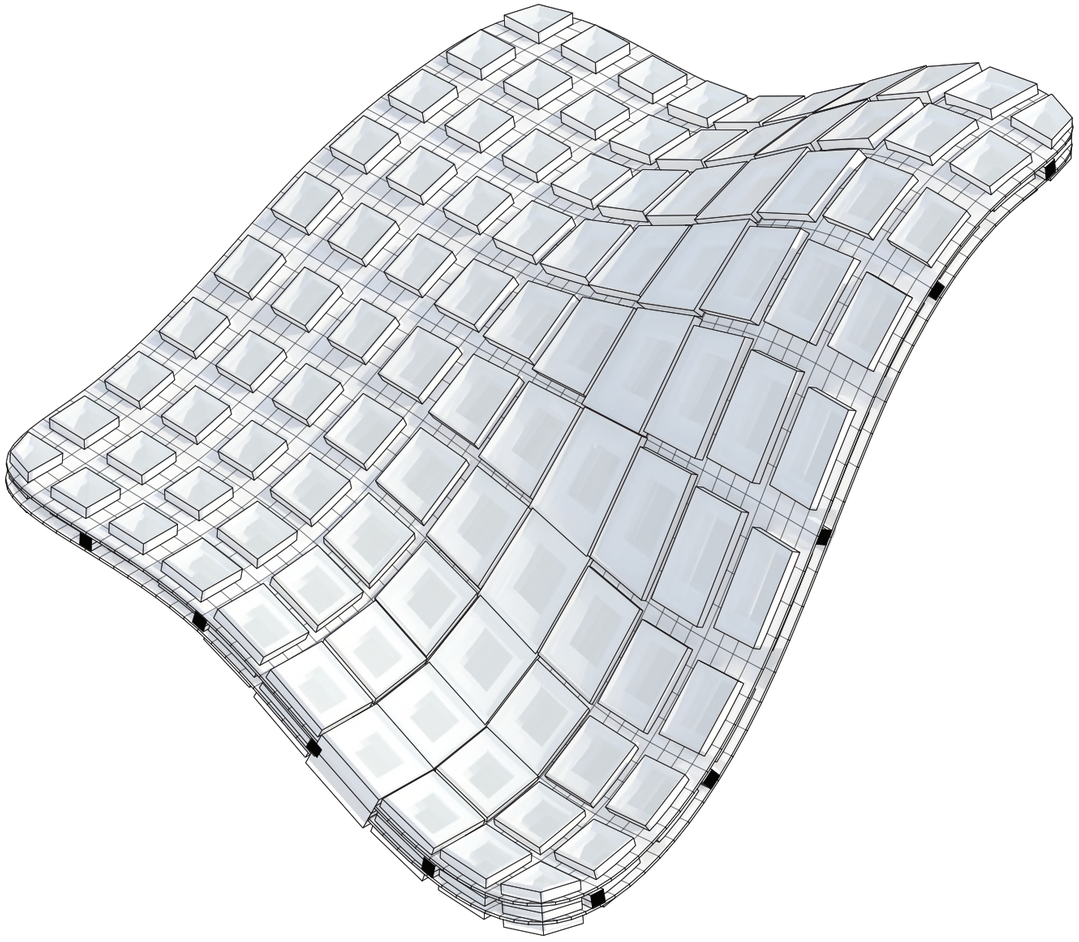
2. Frei Otto, Structural study, Stuttgart High-speed Railway Station, Germany

3. Frei Otto, German Pavilion, World Expo 1967, Canada

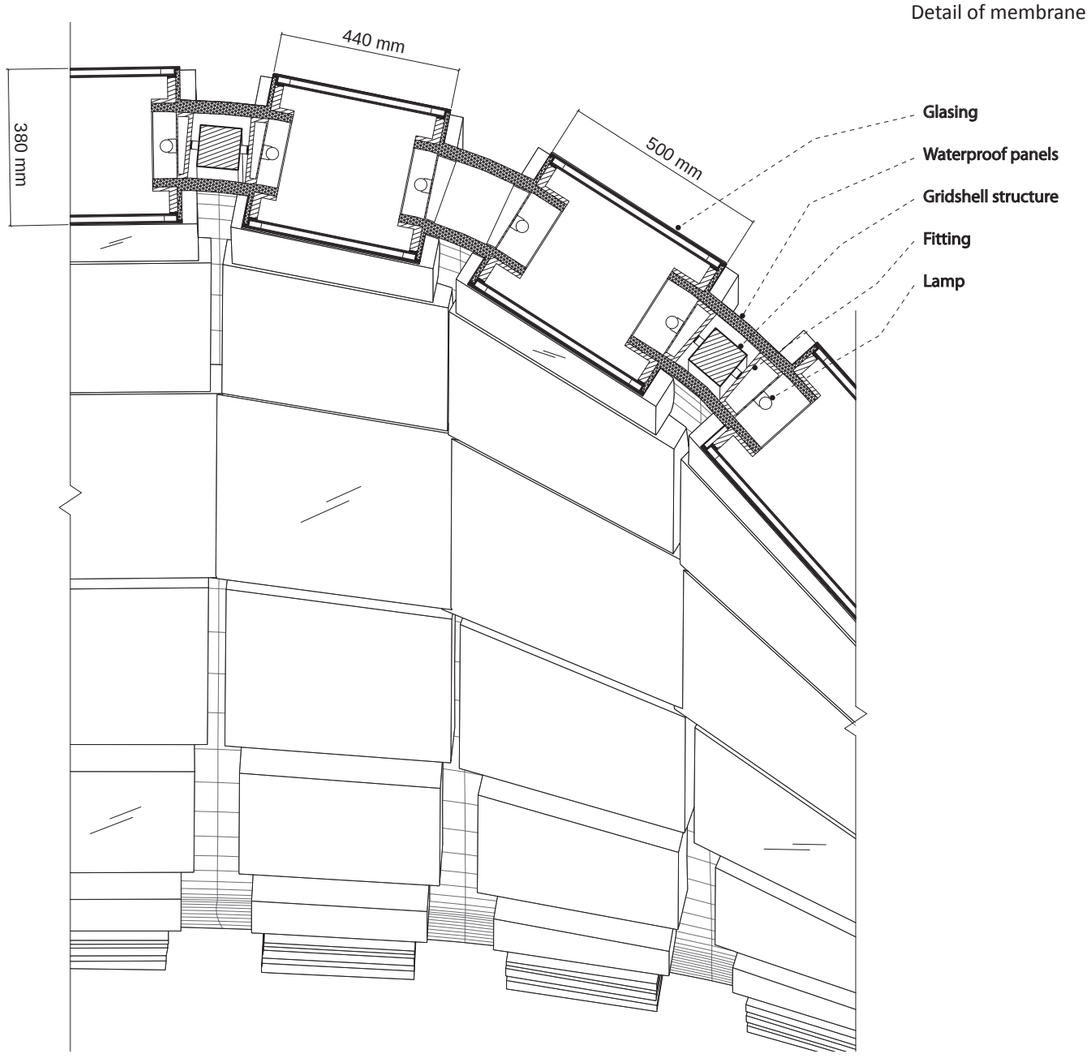
Comparison between analogue and digital outputs



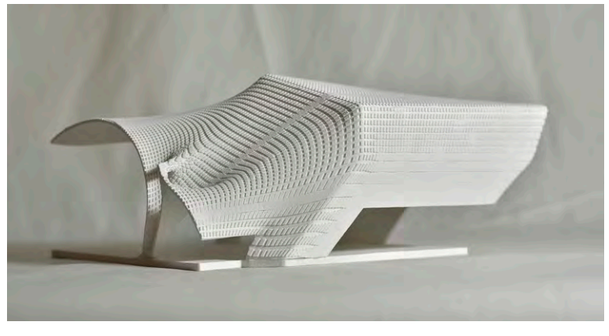




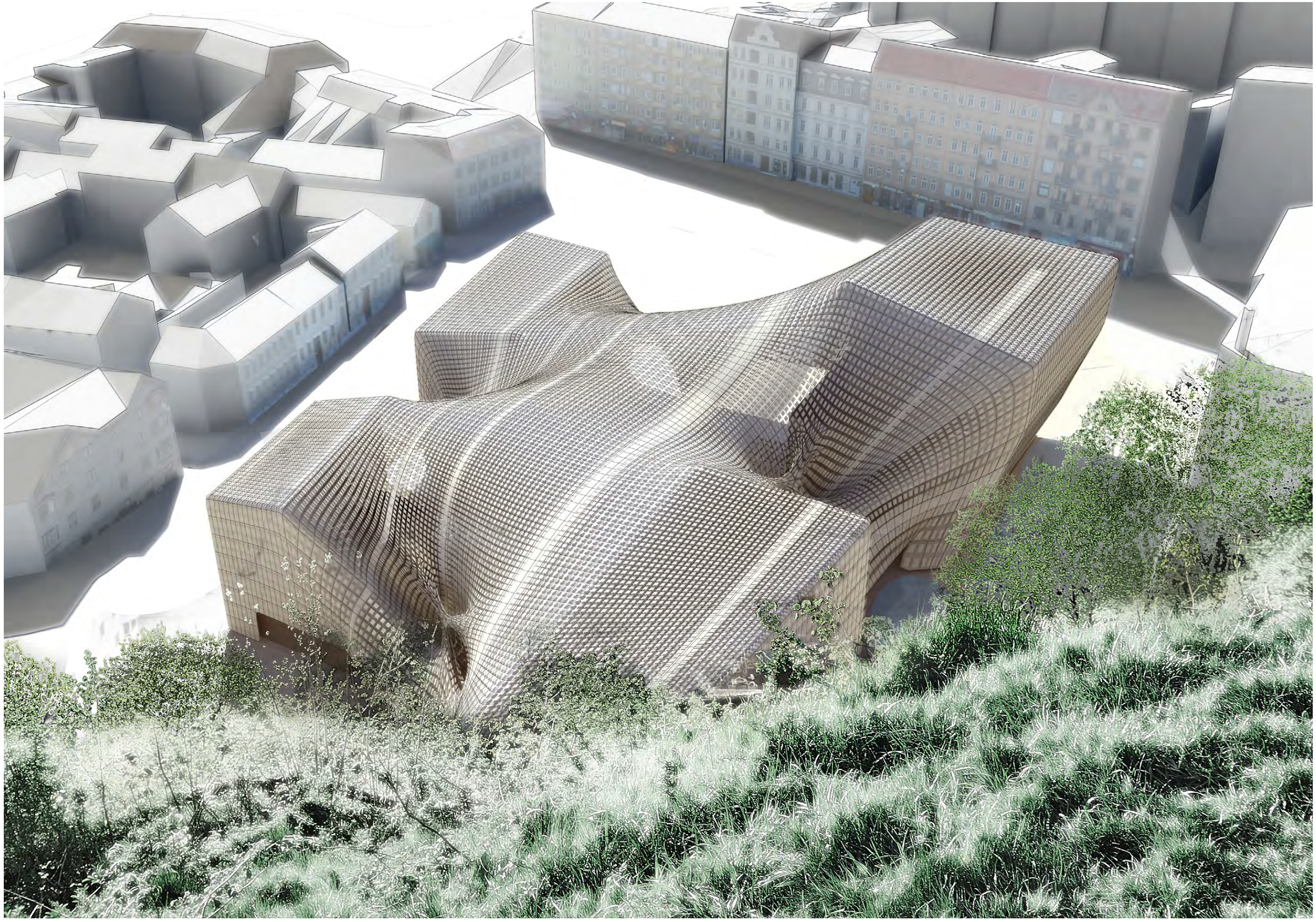
Detail of membrane

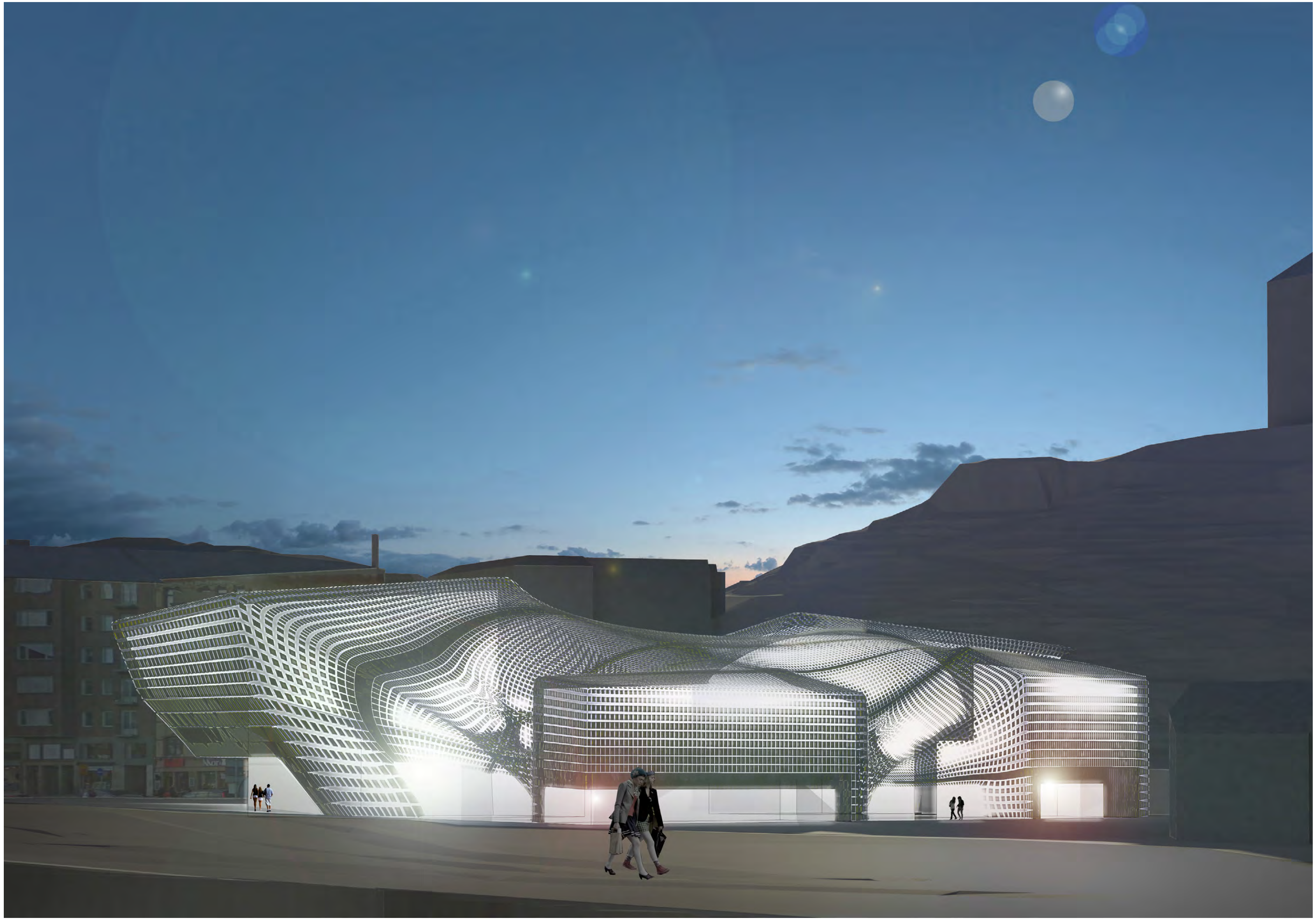


3D print of a section of the final membrane design



3D print close up of polygon modelled texture

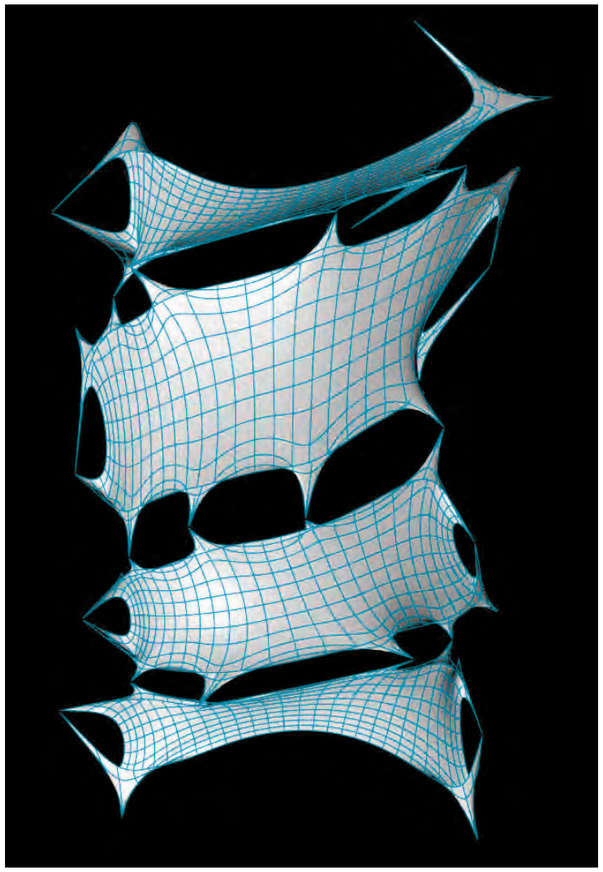




HALLMARK[ET] MODEL CATALOGUE

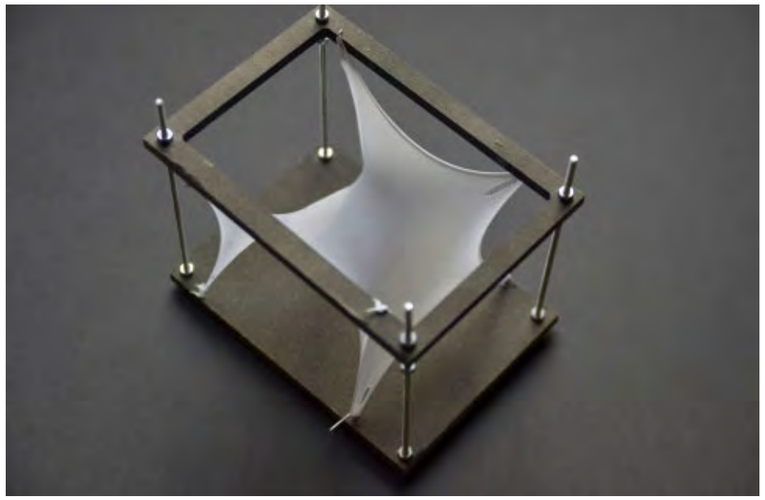
Fabric

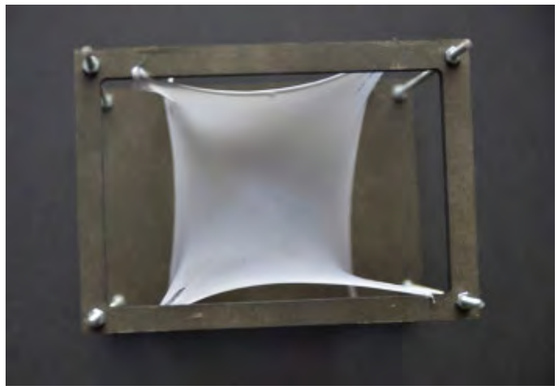
Hardened fabric

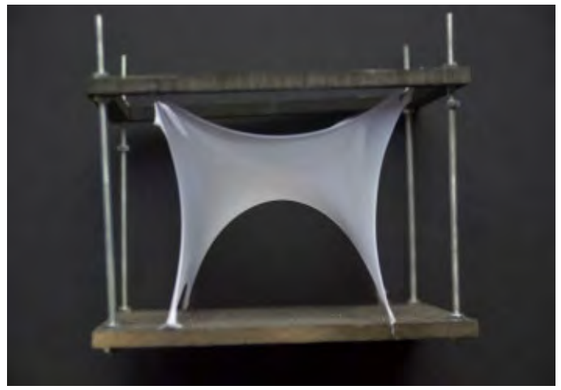


Software model, virtual fabric

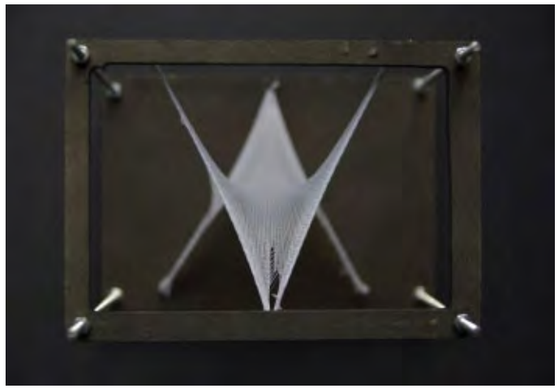
Scherk

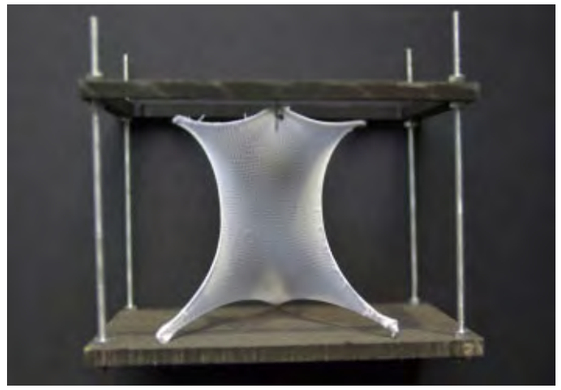




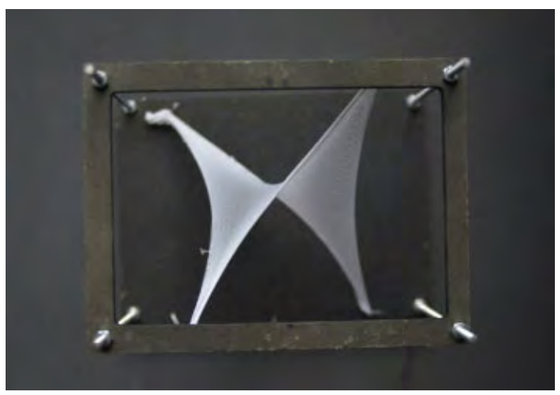


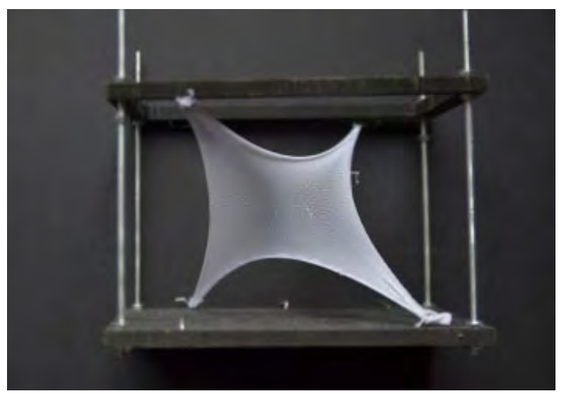
Monkey saddle



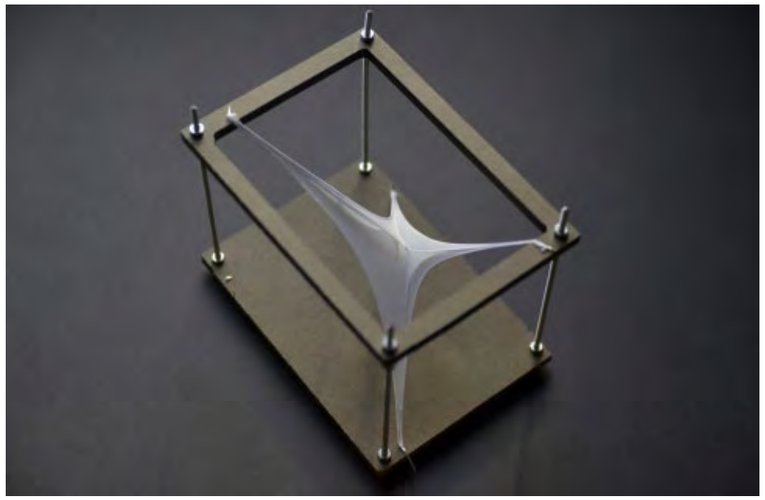


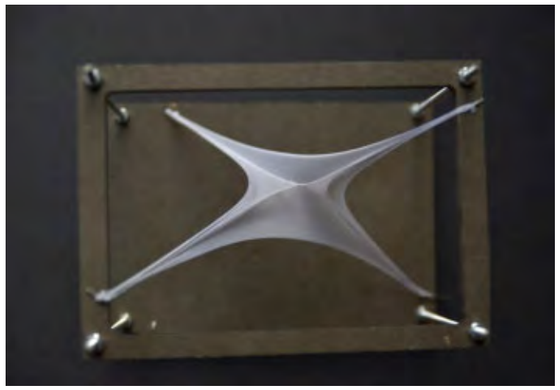
Hyperbolic paraboloid

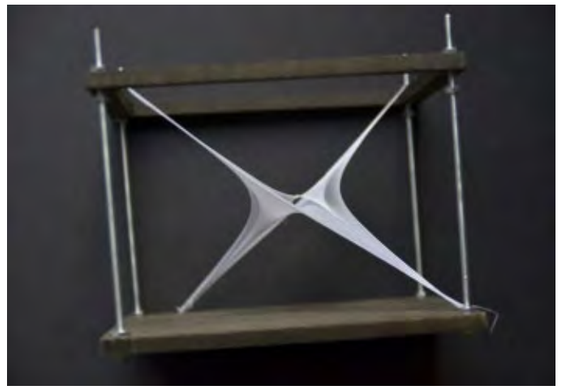




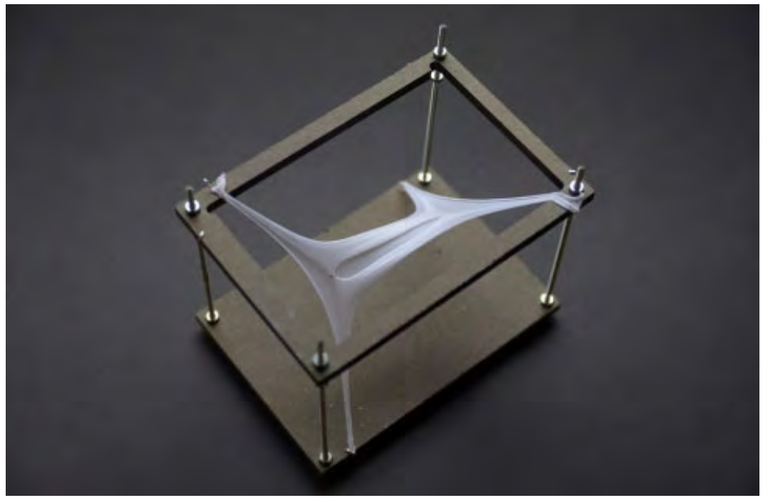
Hyperbolic paraboloid with a 2 point knot

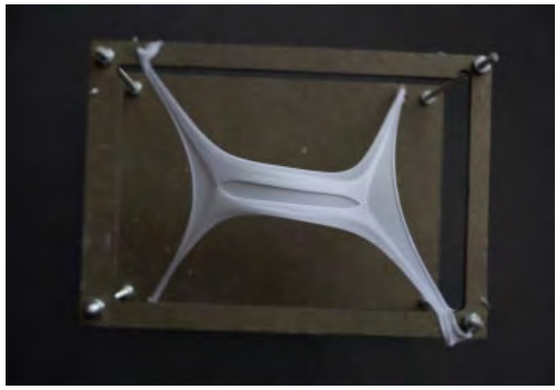


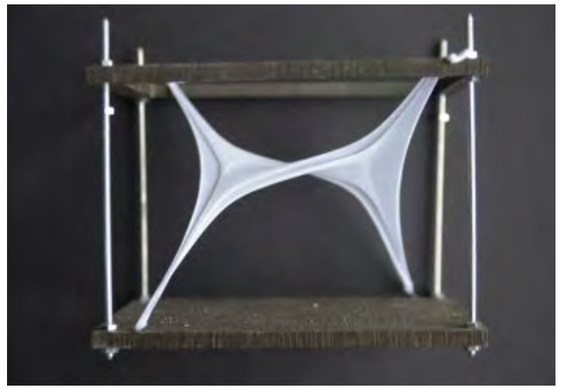




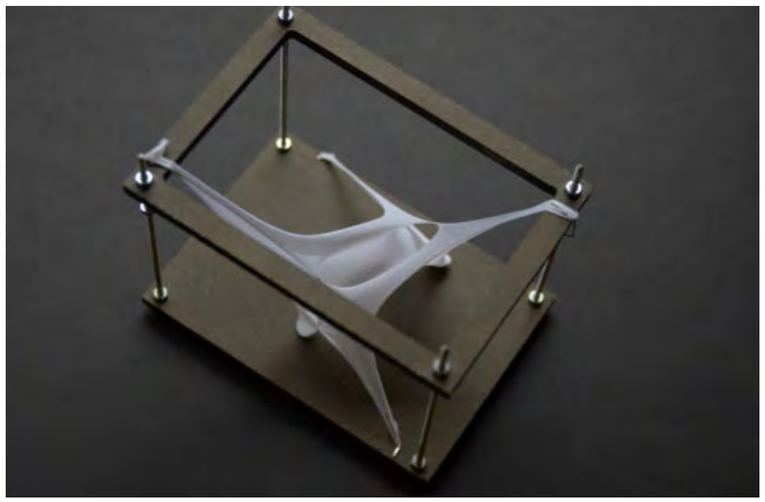
Hyperbolic paraboloid with 2 separate 2 point knots

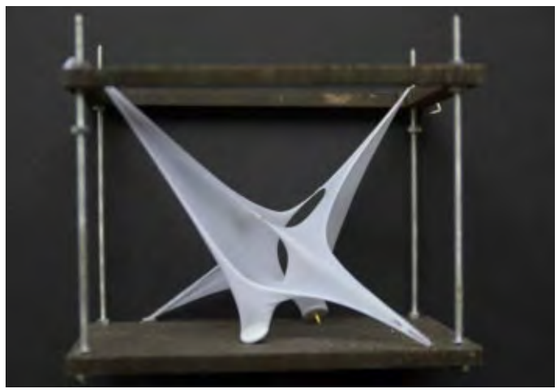


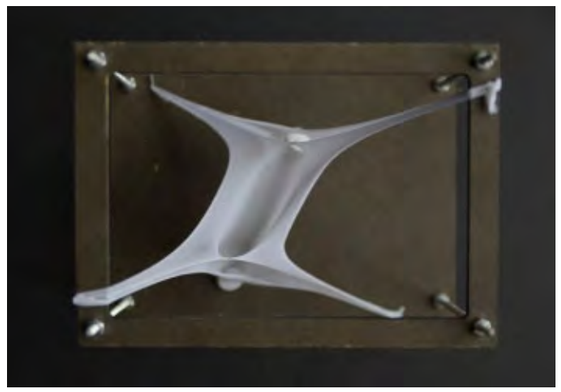




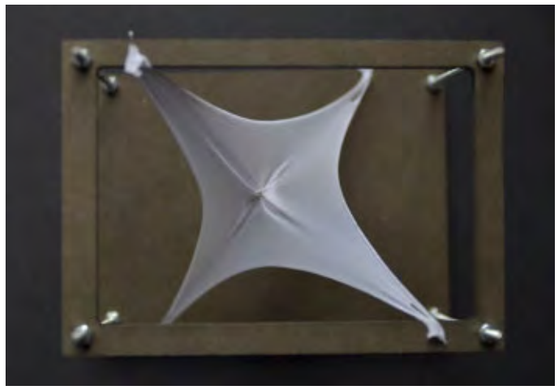
Hyperbolic paraboloid with 2 separate 2 point knots and 2 broad point constraints on the XY plane

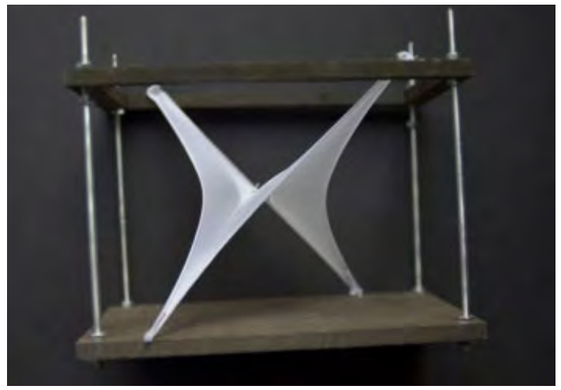




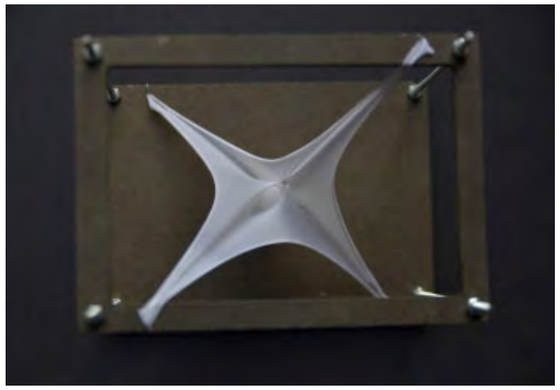


Hyperbolic paraboloid with a 4 point knot

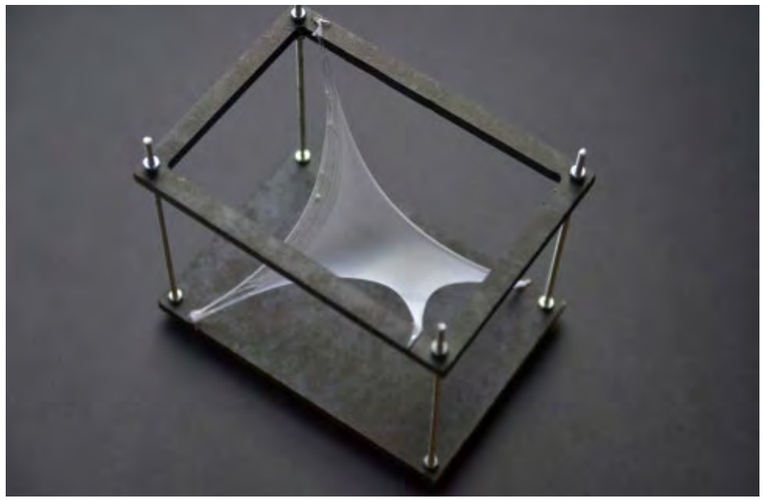


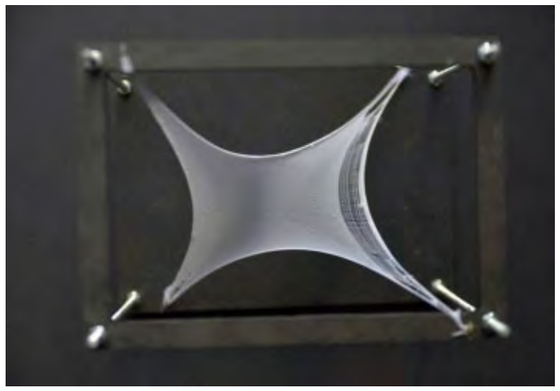


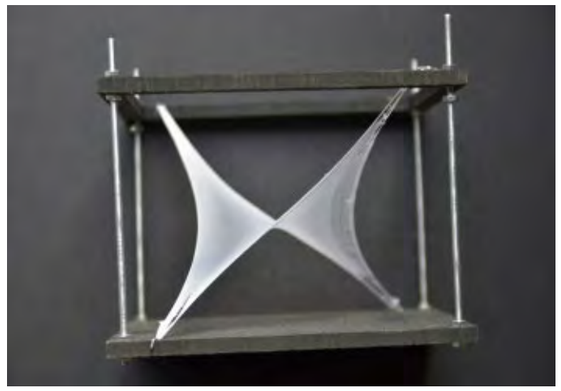
Hyperbolic paraboloid with a 4 point knot and a broad point constraint on the XY plane



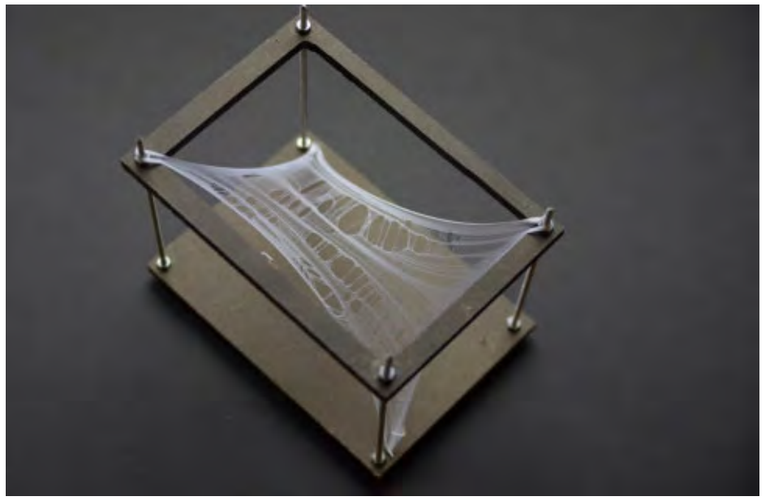
Hyperbolic paraboloid with controlled ripping 1

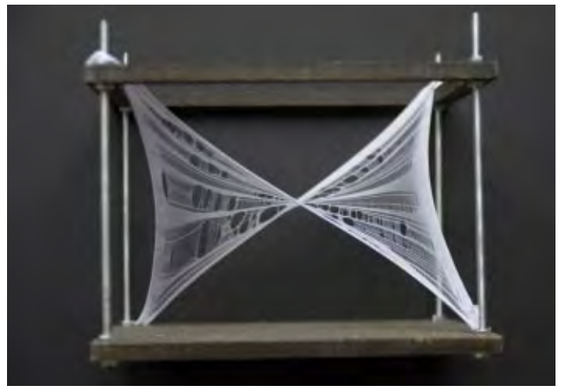




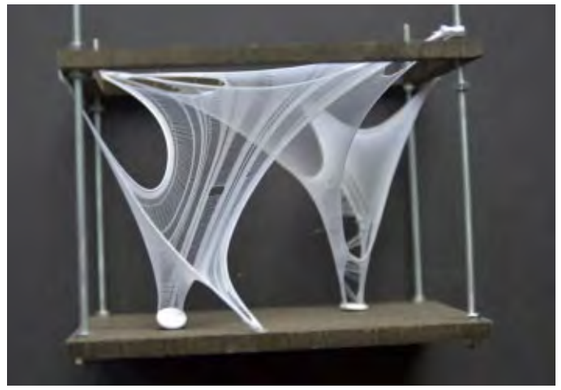


Hyperbolic paraboloid with controlled ripping 2

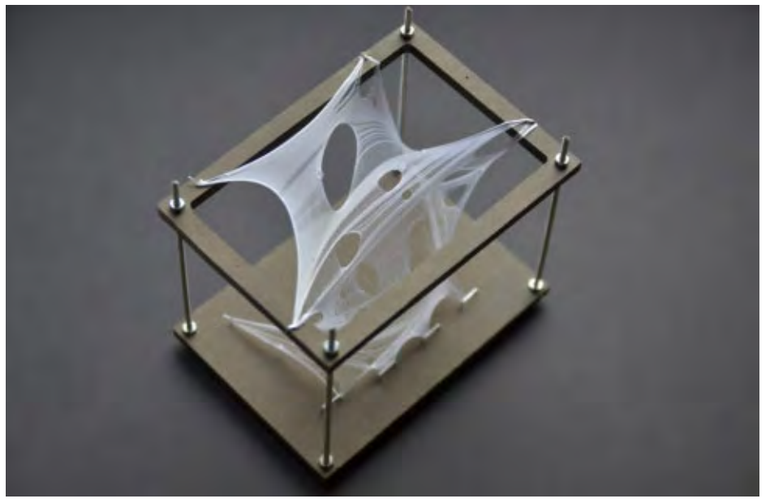


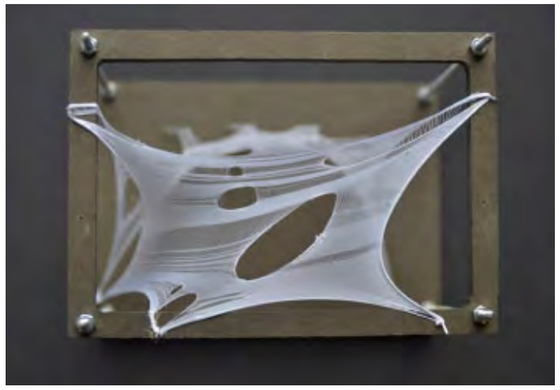


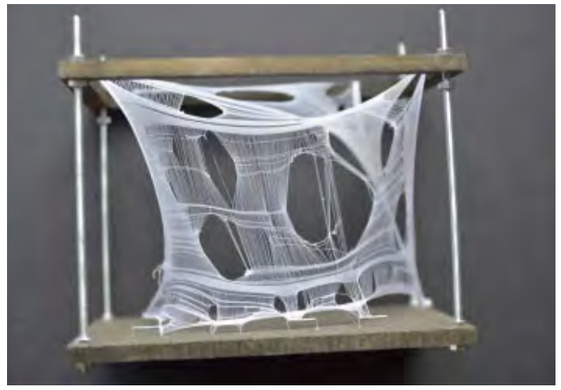
Various point constraints with controlled ripping 1



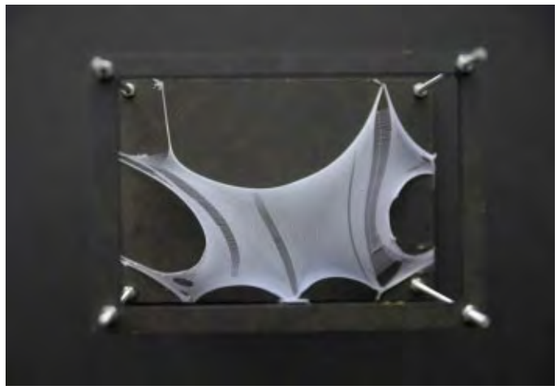
Various point constraints with controlled ripping 2

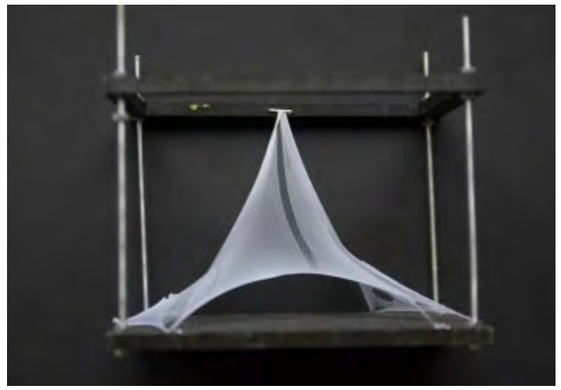




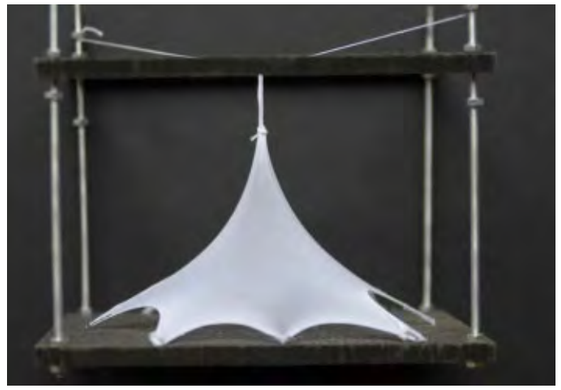


Various point constraints on the XY plane and 1 upper point constraint

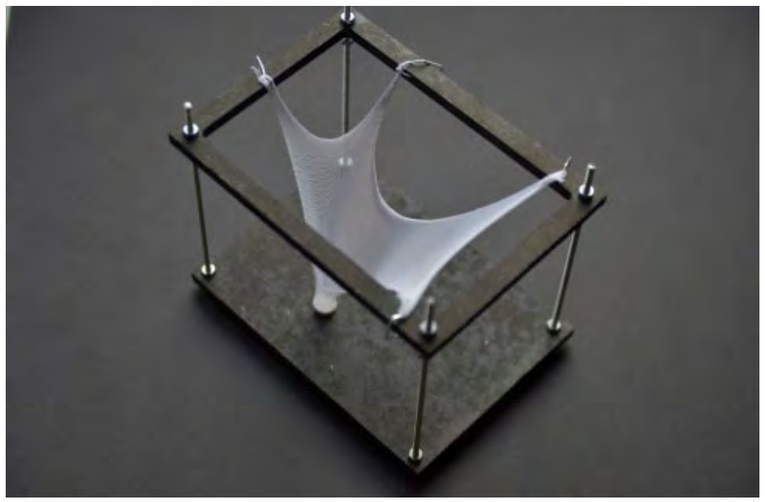


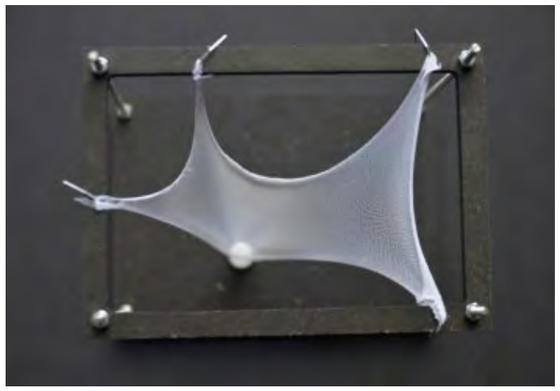


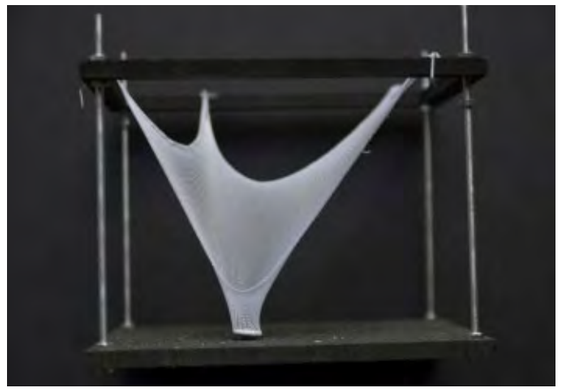
Canal surface with 8 point constraints on the XY plane and 1 upper point constraint



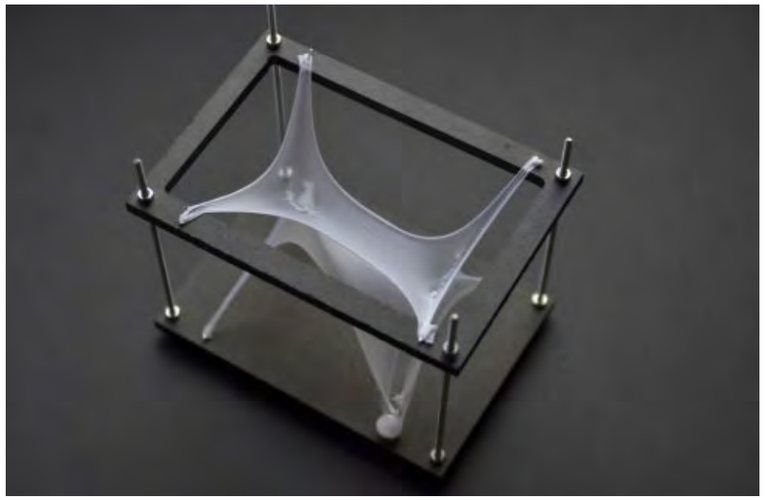
4 planar and 1 broad point constraint on 2 XY planes

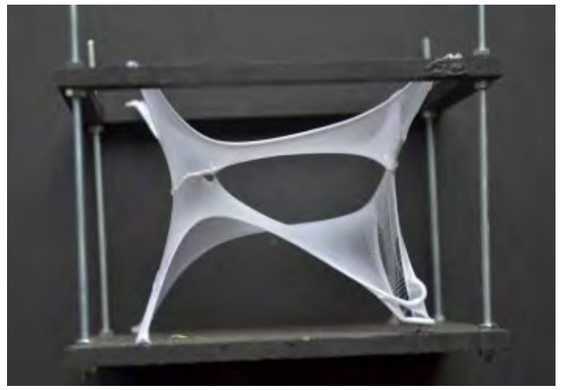






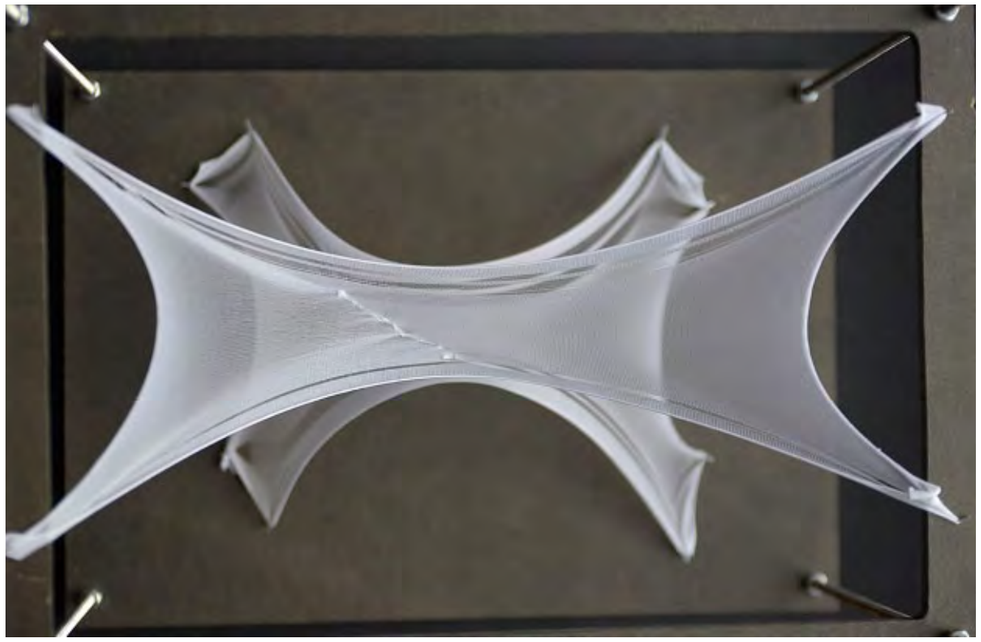
Mirrored scherk-like surfaces with intersecting constraints

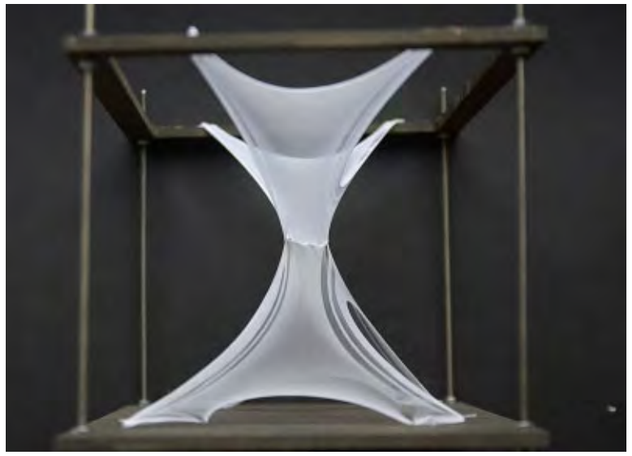


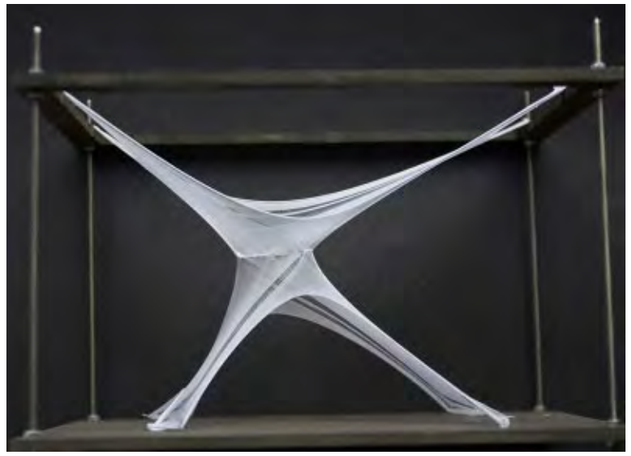


Mirrored surfaces with intersecting point constraints

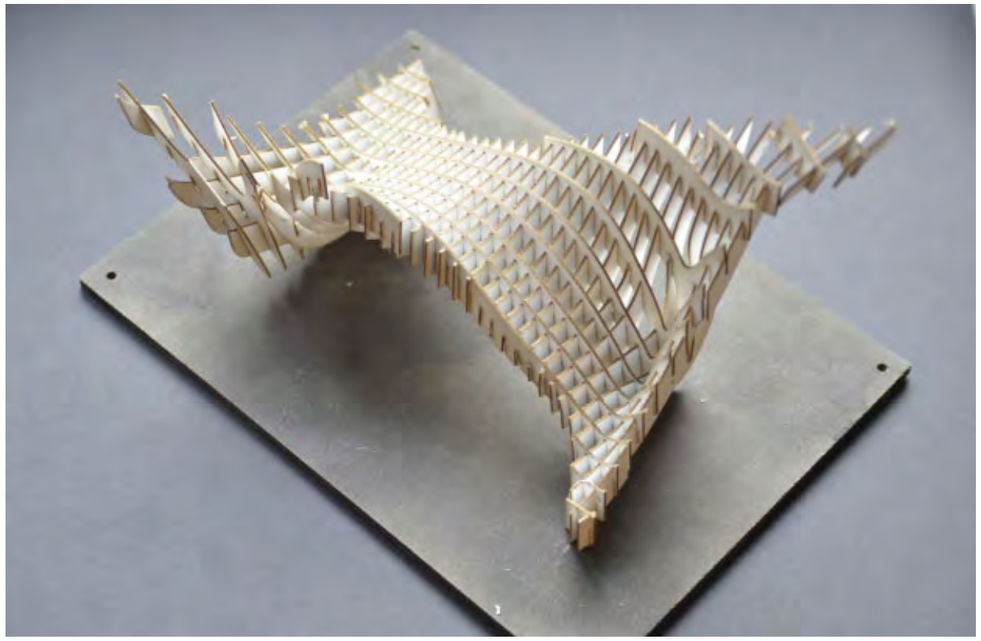
2 surfaces with intersecting constraints and controlled ripping

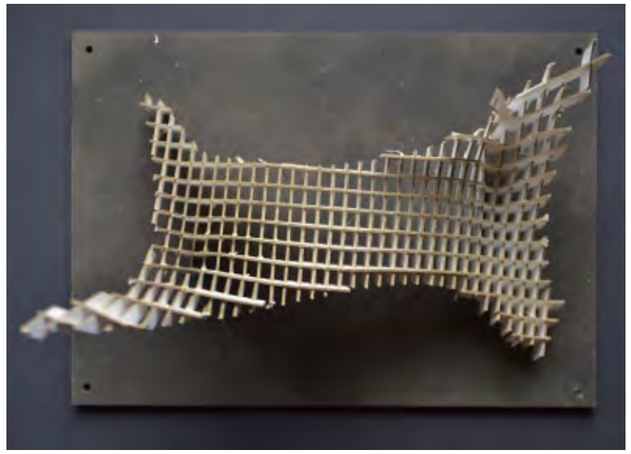






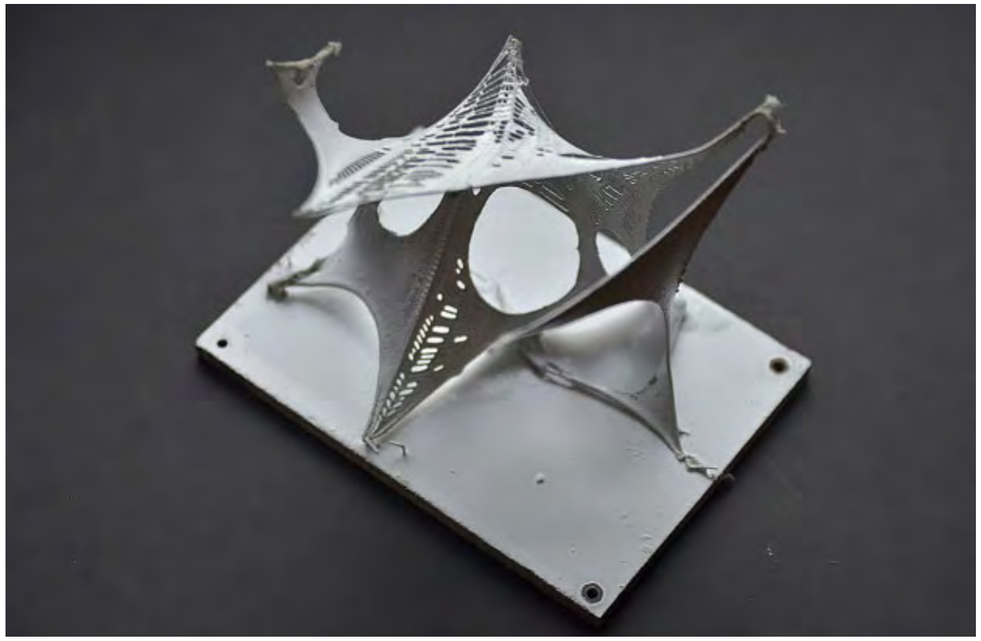
2 surfaces with 1 intersecting constraint and controlled ripping

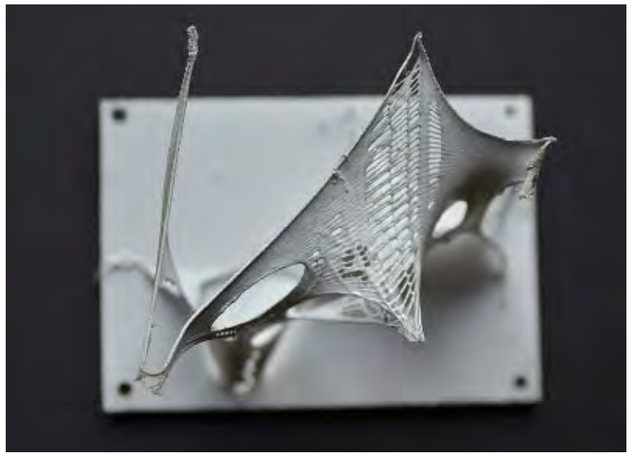


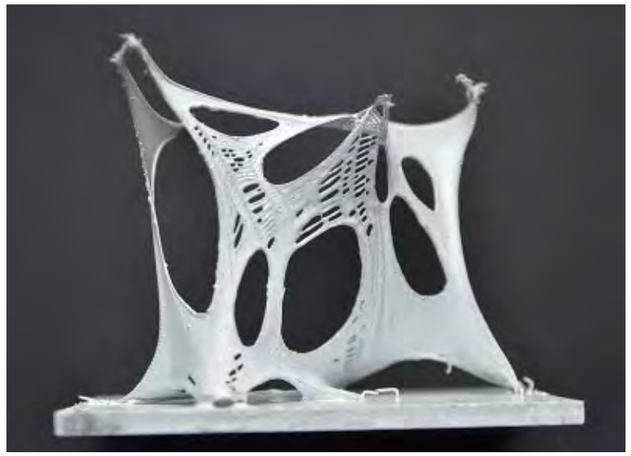


Grid construction on predetermined surface geometry

Hardened surface with various point constraints

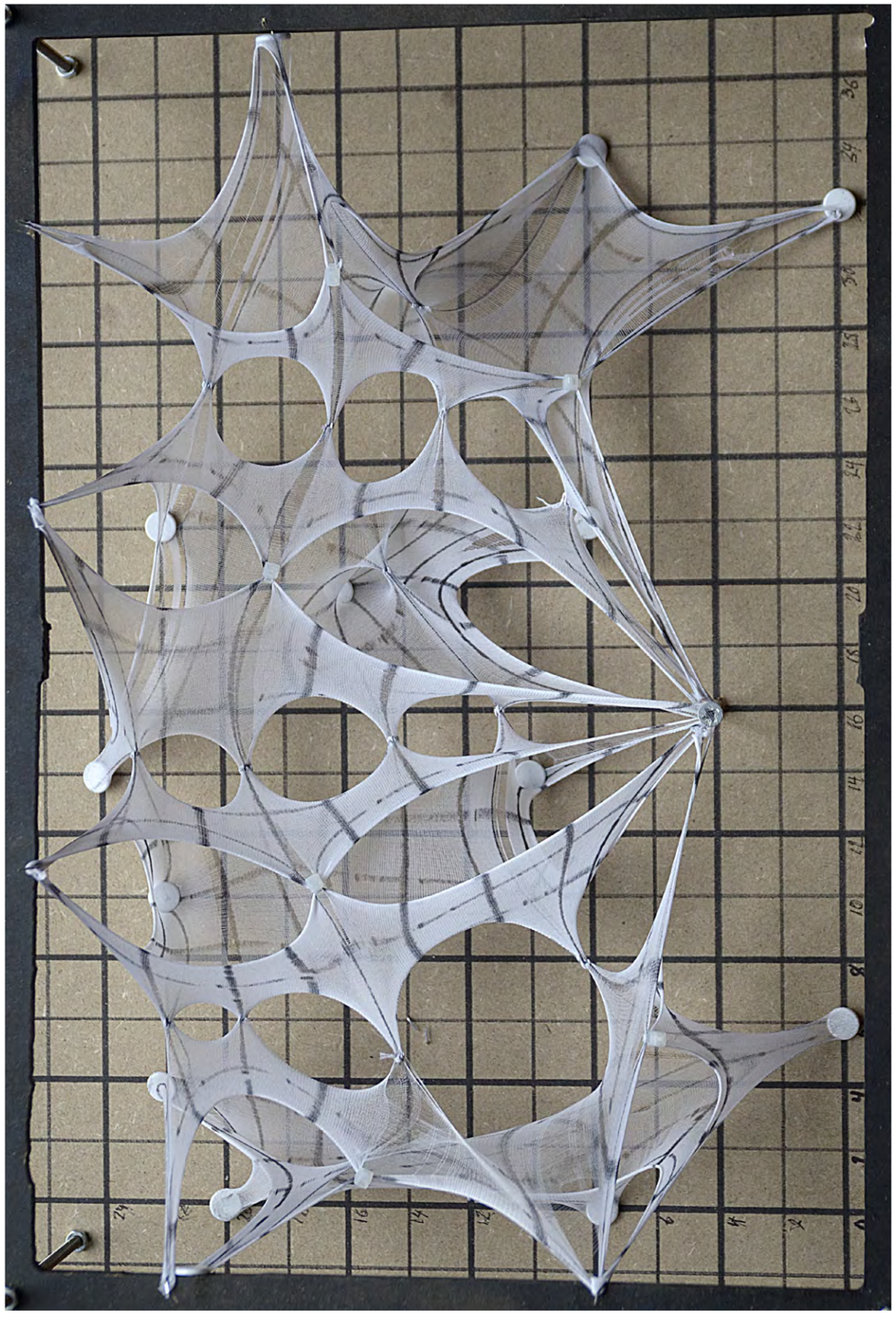


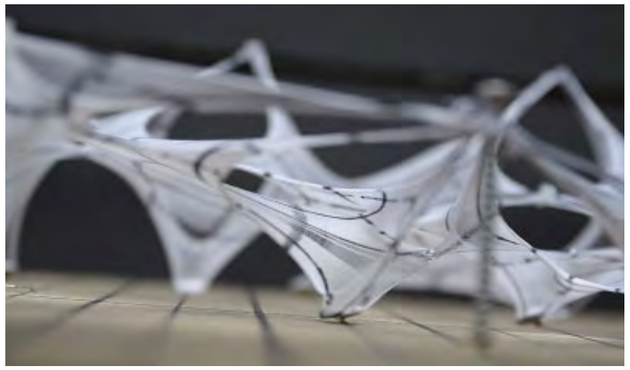




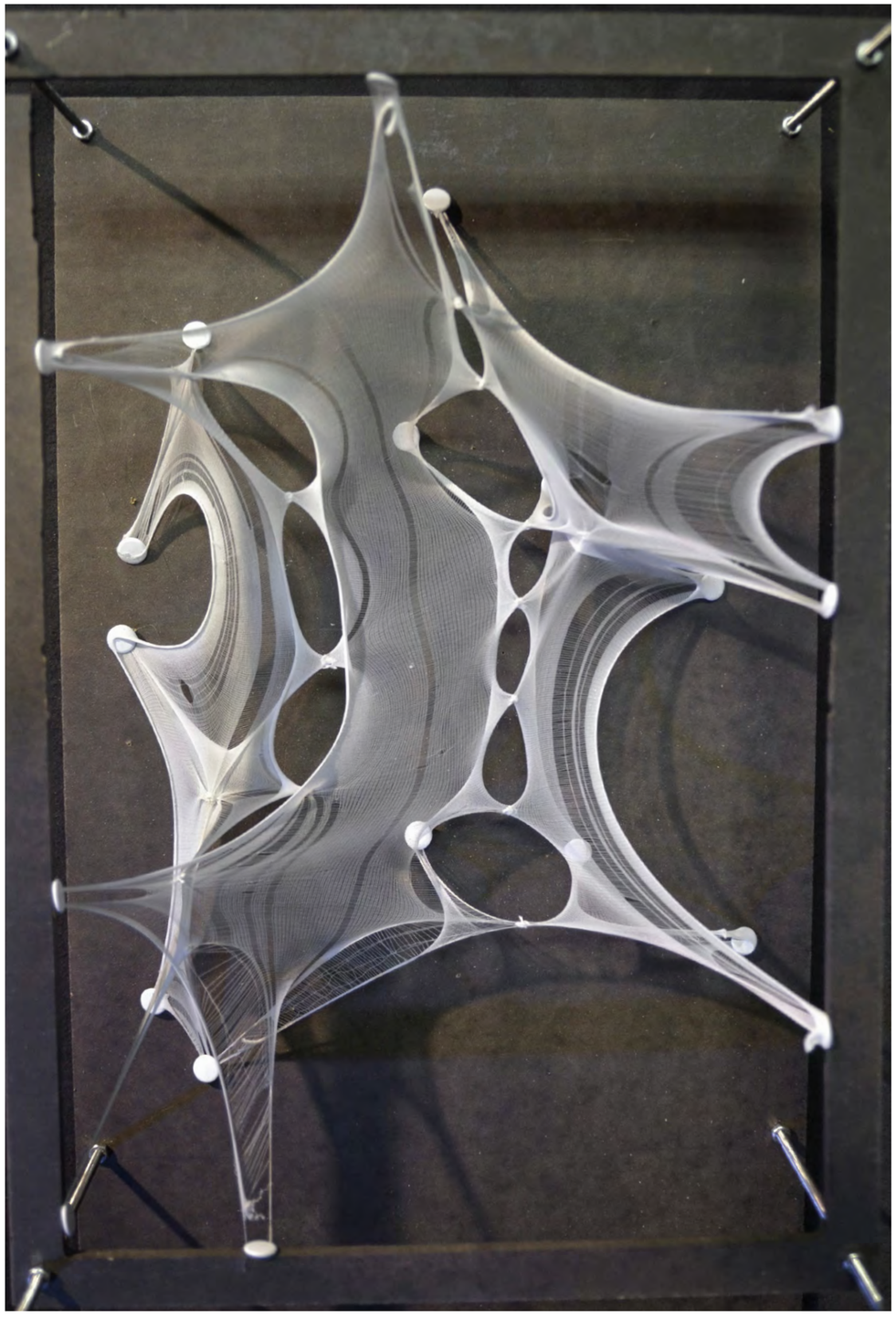
Hardened surface with various point constraints and controlled ripping

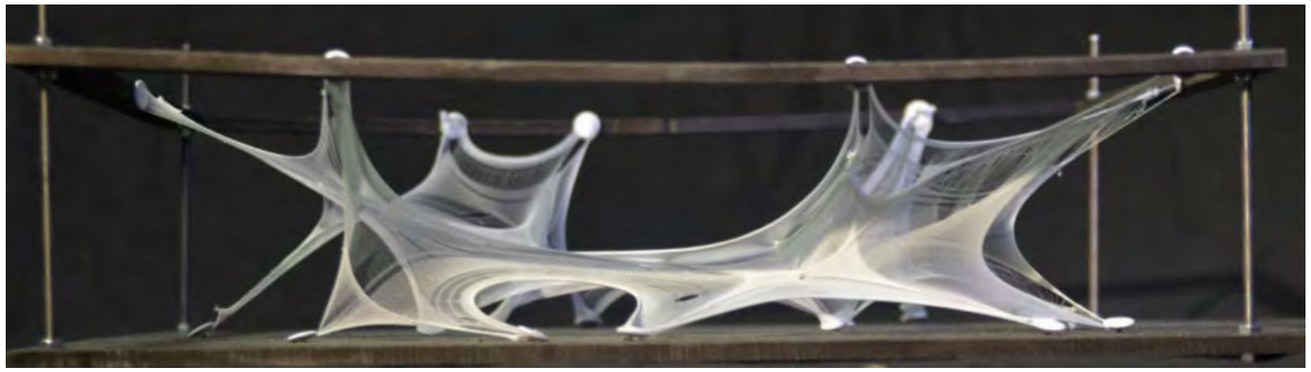
Multiple hardened surfaces with intersecting point constraints allowing possibilities for monocoque qualities

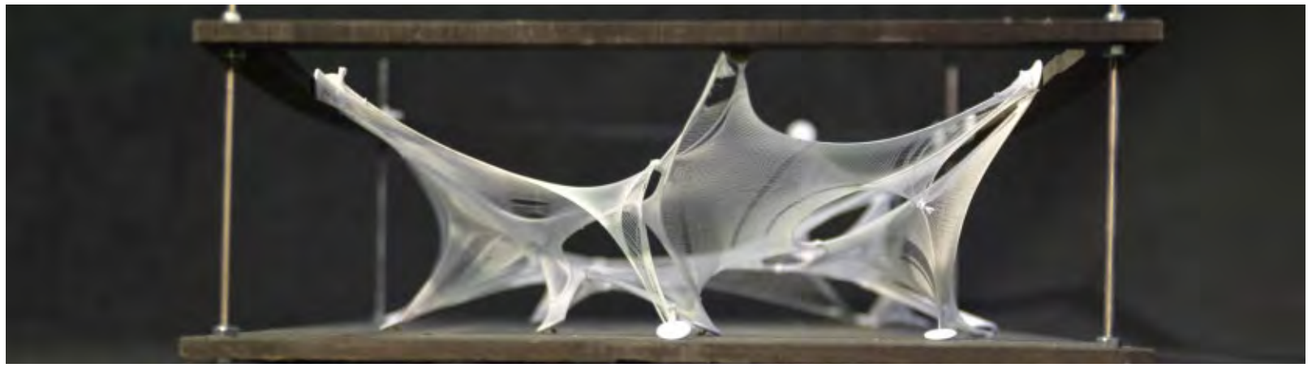




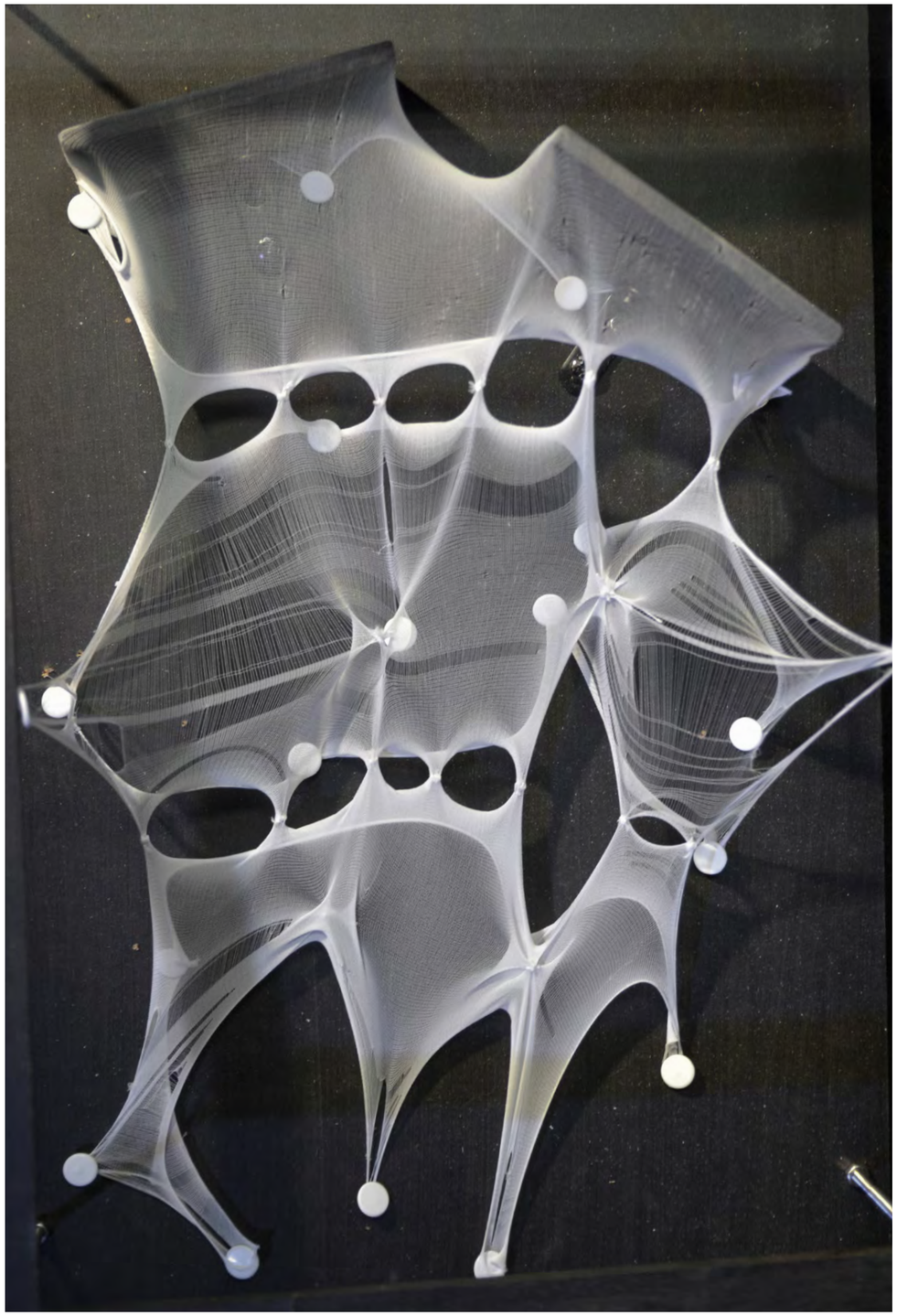
Multiple surfaces with intersecting point constraints. A grid was marked out onto the fabric prior to the model making in order to analyse directional behaviours in the fabric.

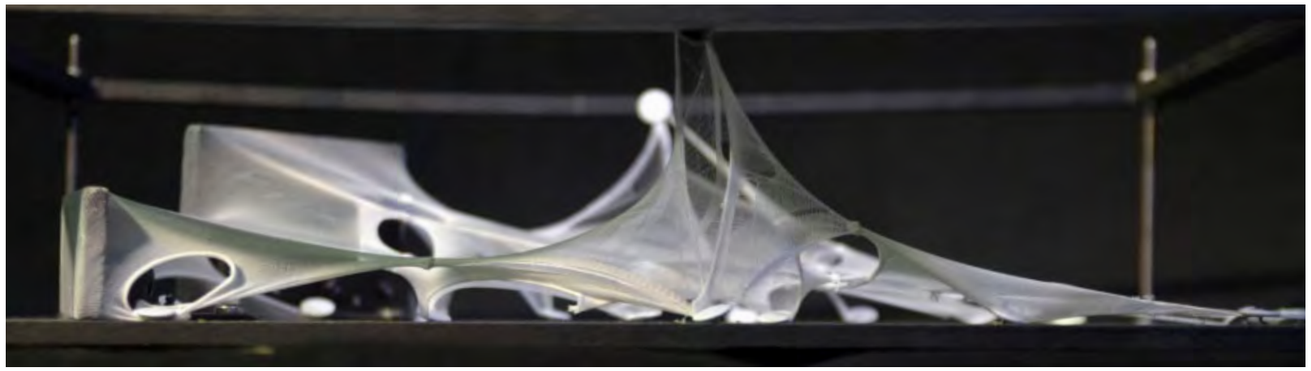


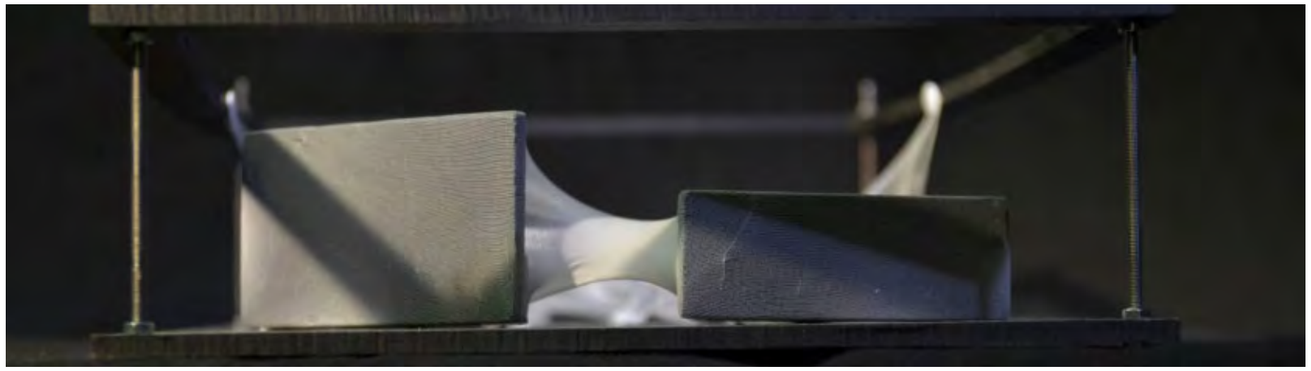


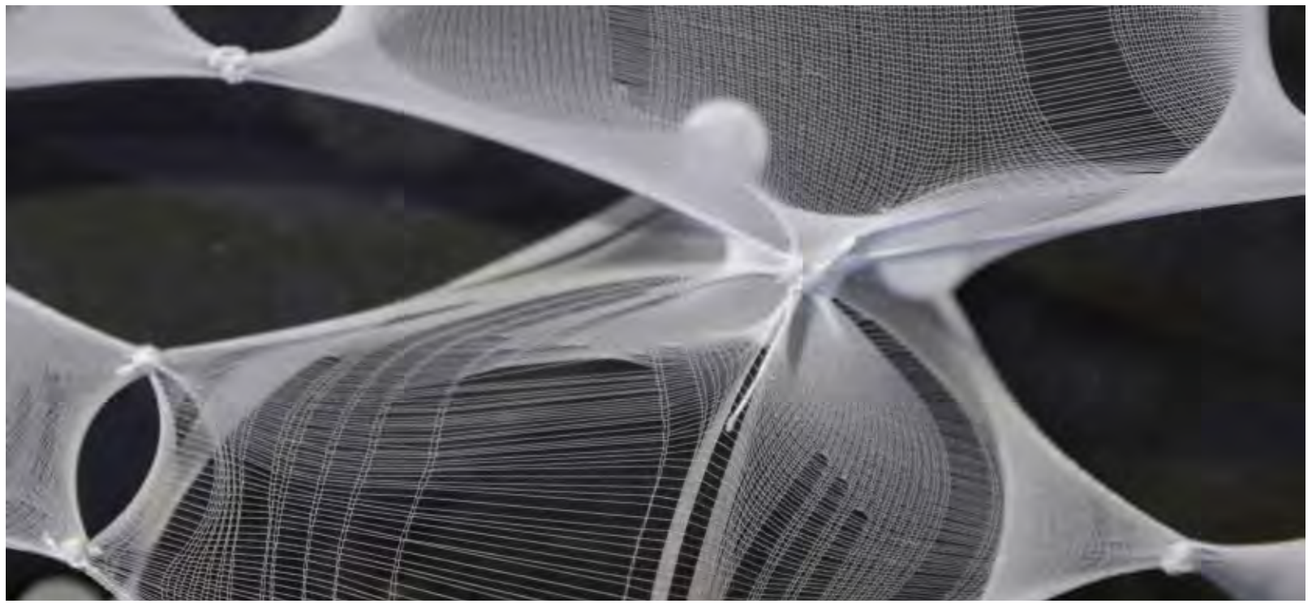


Multiple surfaces with intersecting point constraints and controlled ripping

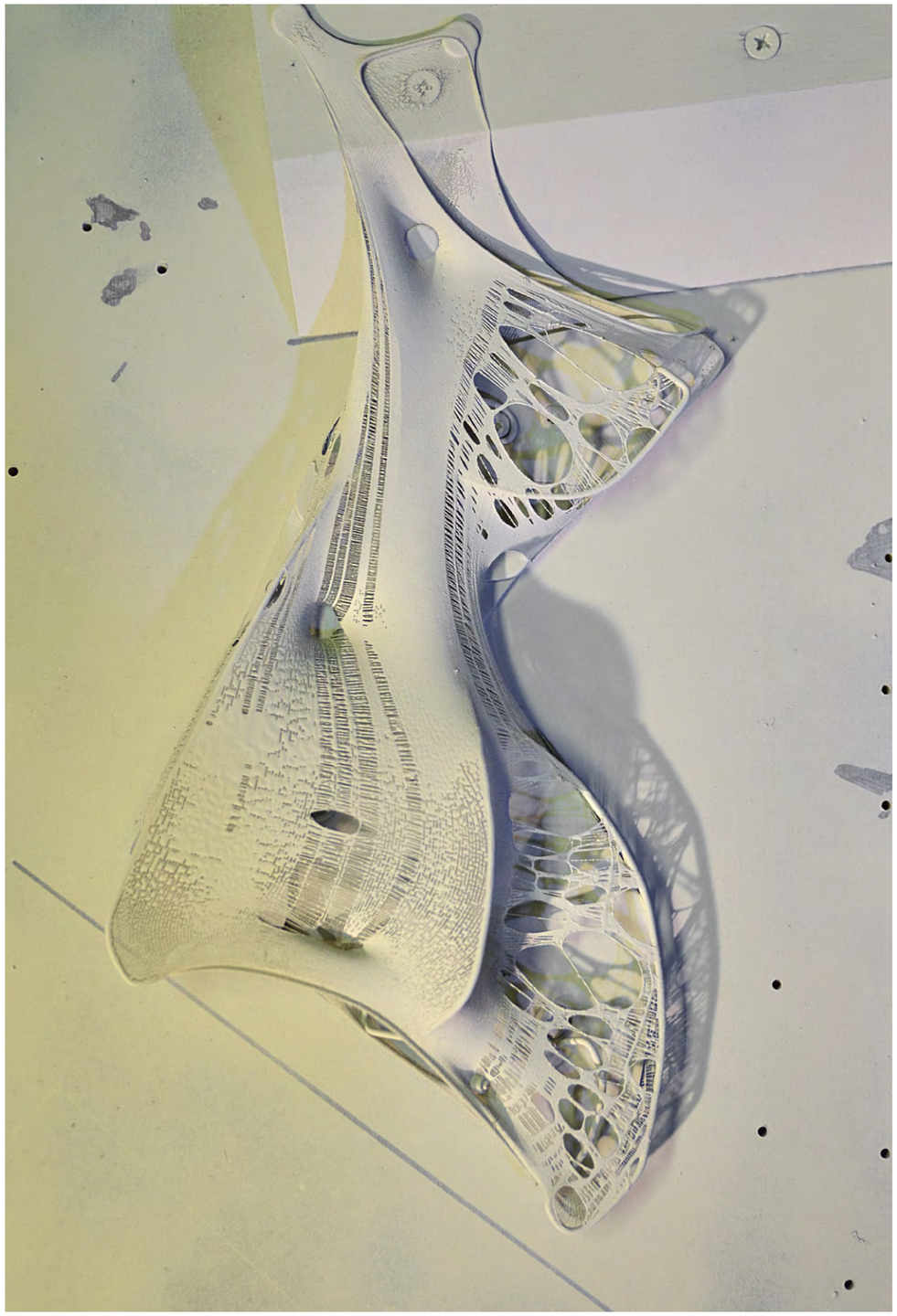


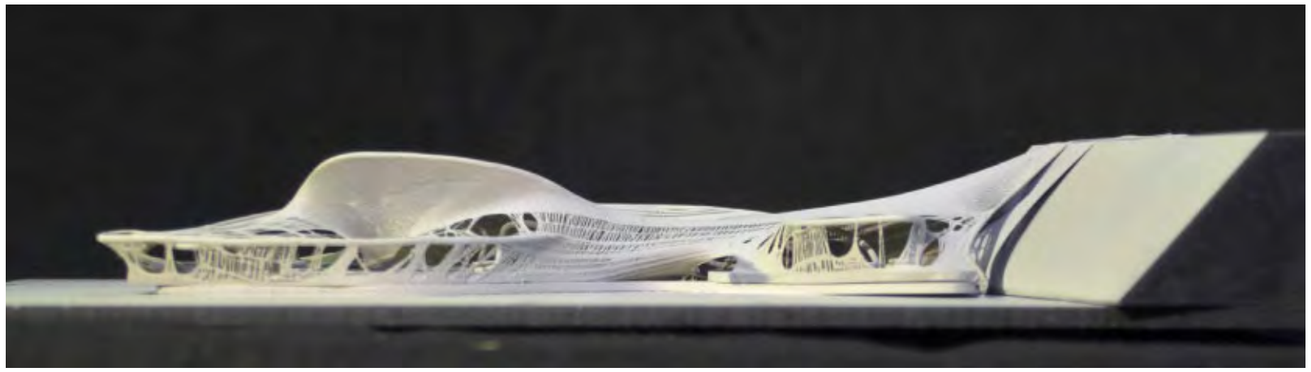


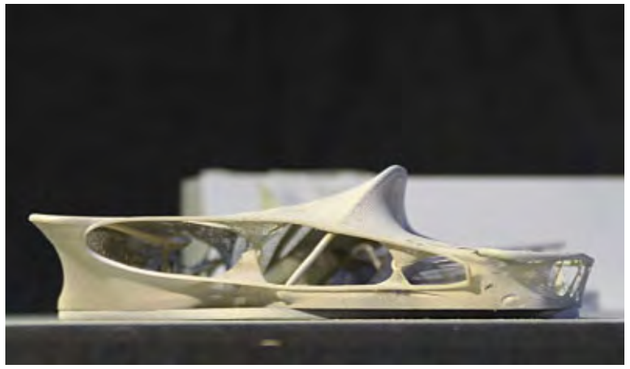


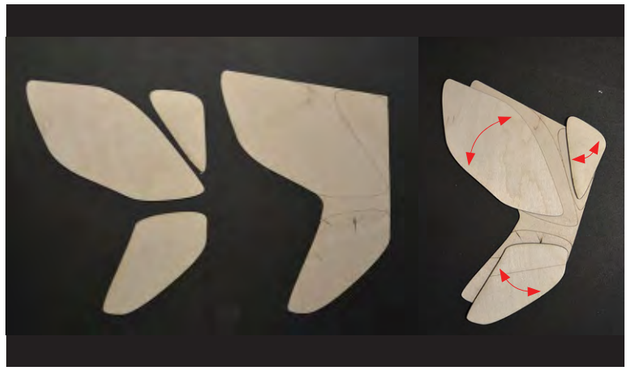


Multiple surfaces with intersecting point constraints, controlled ripping and internal predetermined geometric constraints

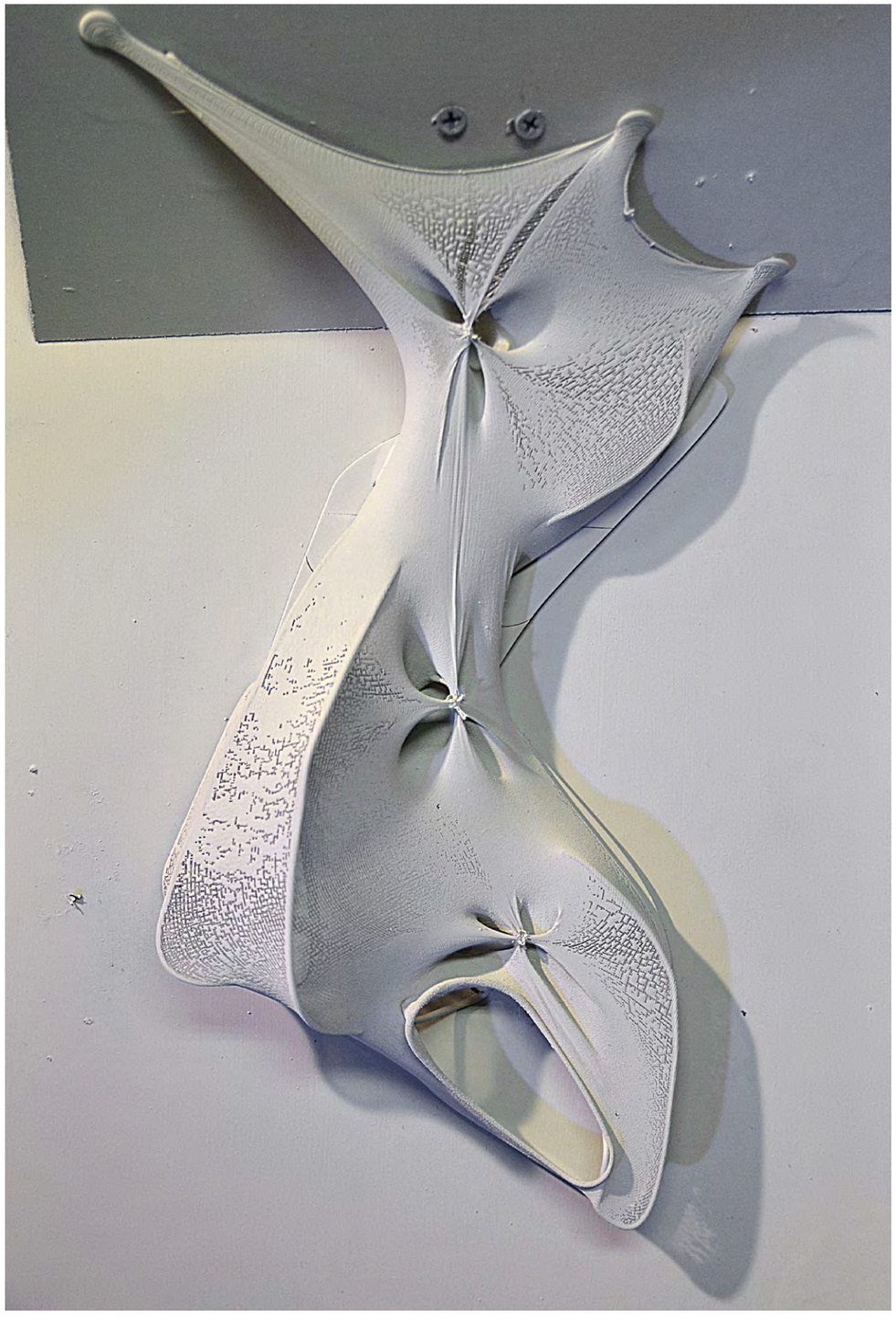


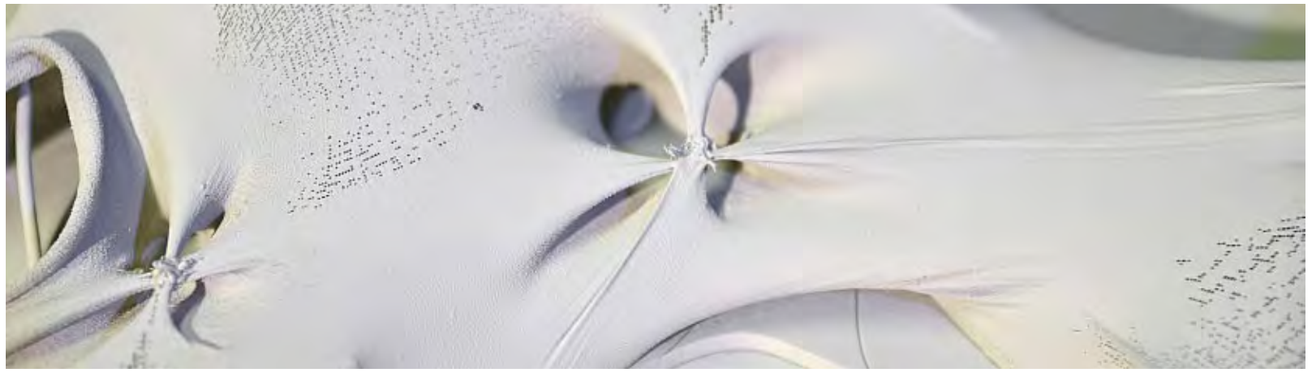


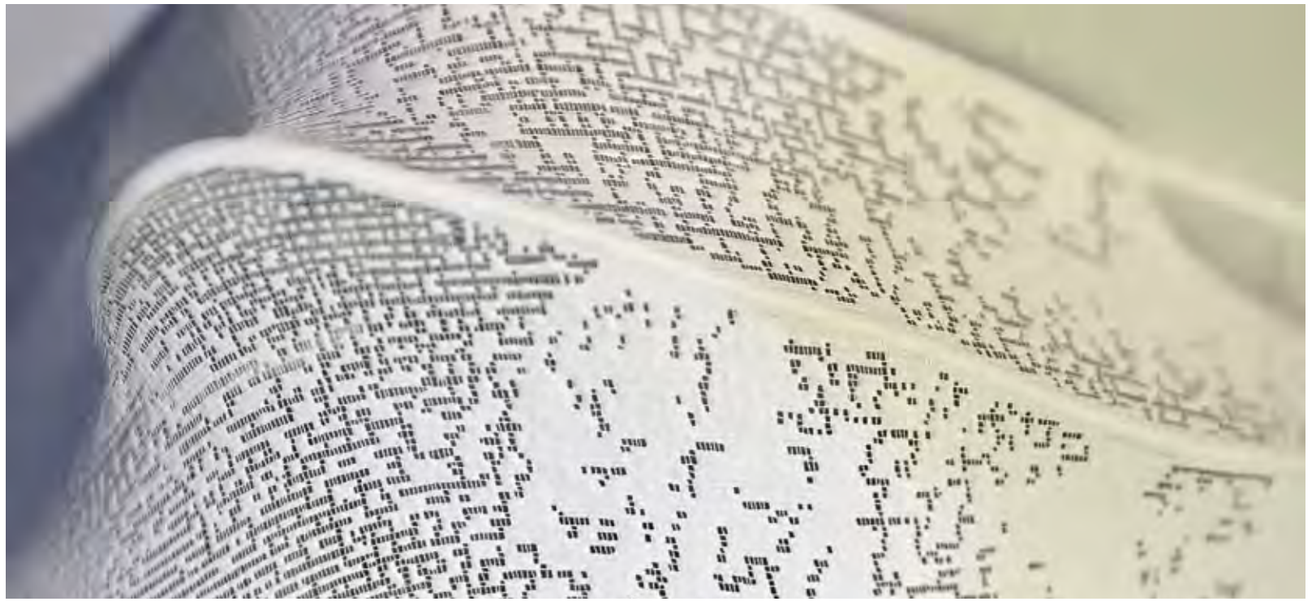




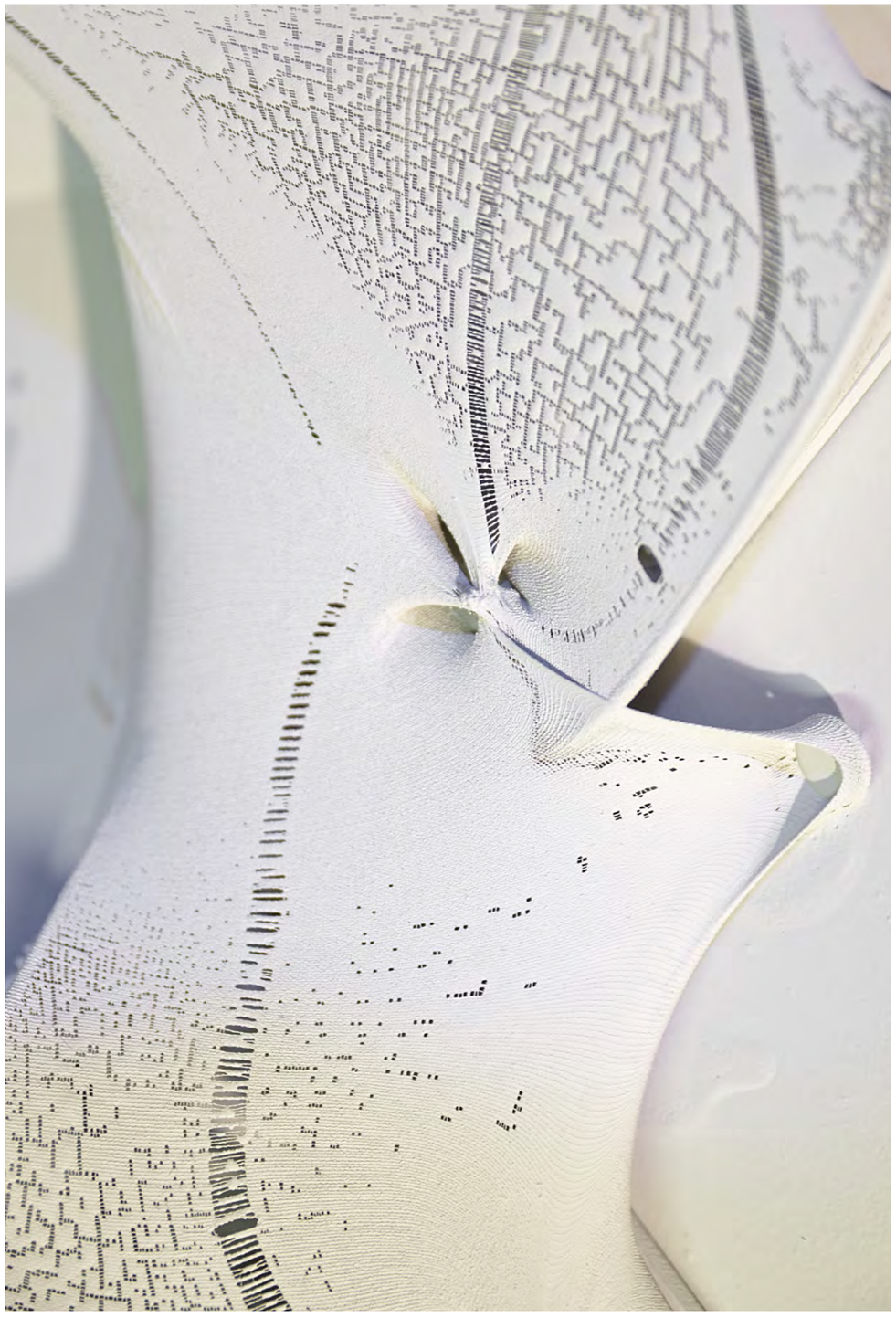
One hardened surface with controlled ripping, broad point constraints and internal predetermined geometric constraints.



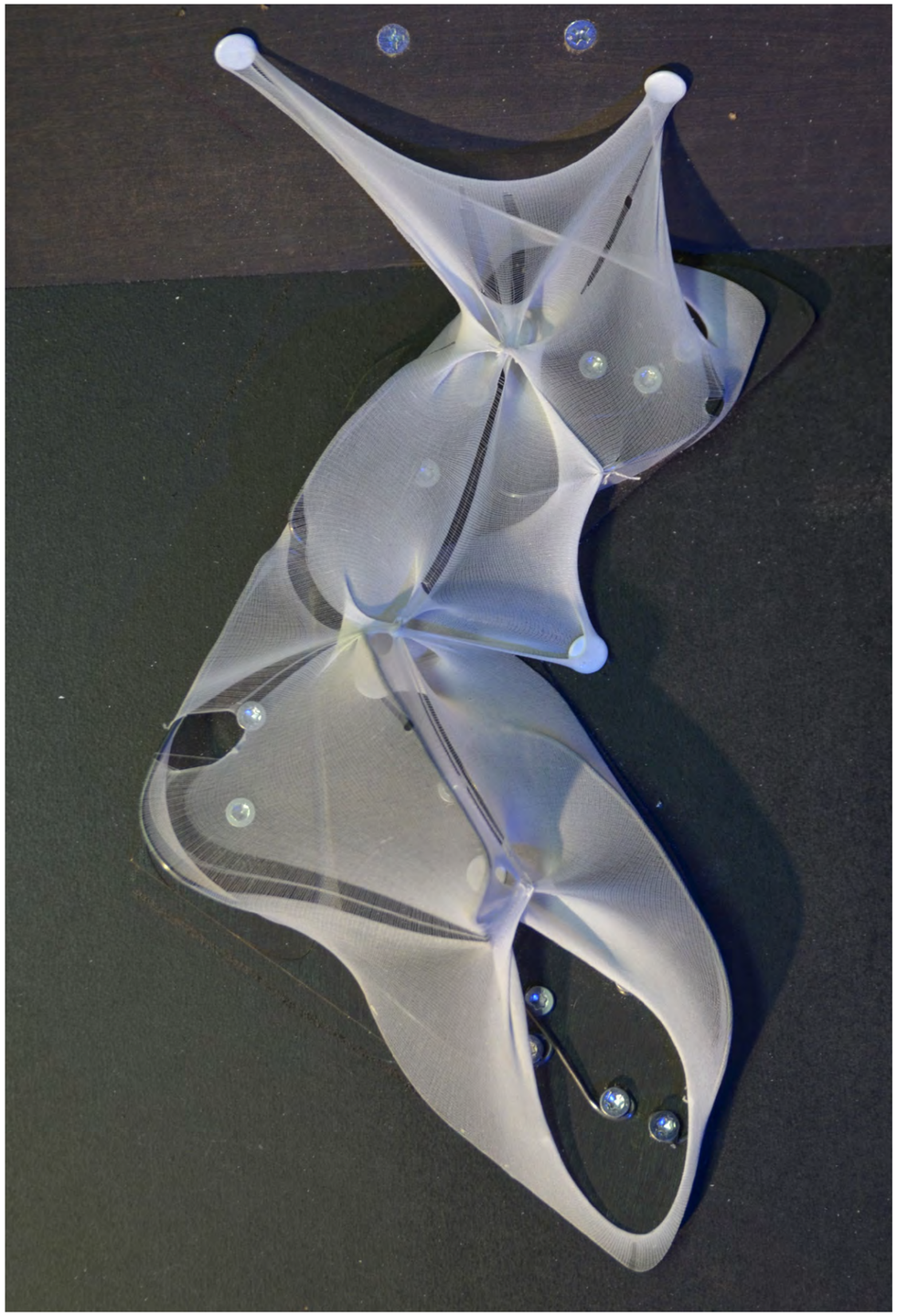


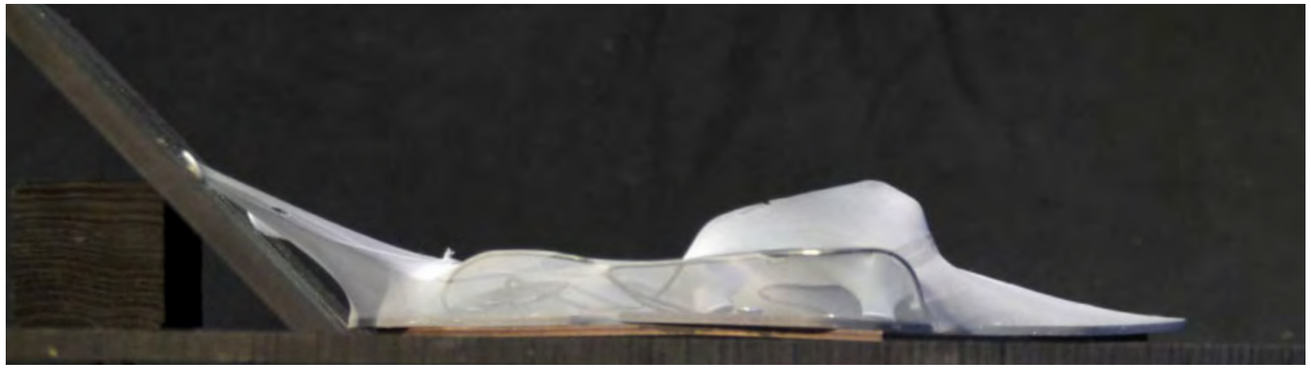


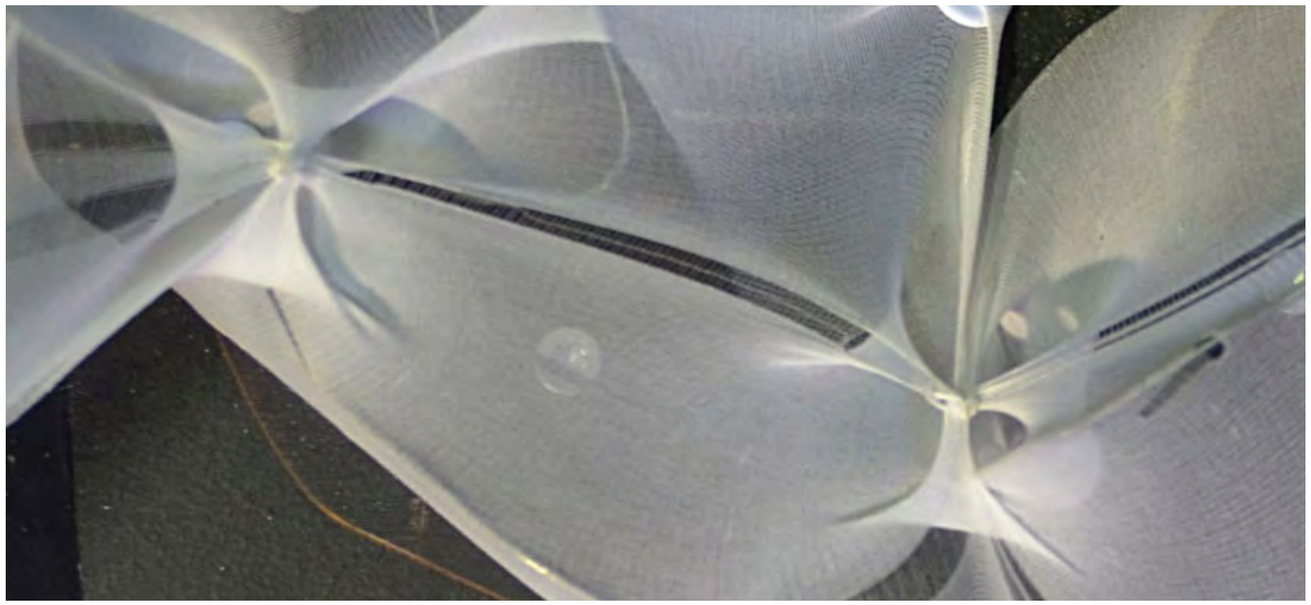
One hardened surface with controlled ripping, broad point constraints, 3 4 point knots and internal predetermined geometric constraints. The hardening process (achieved through a spray filler) creates a pixelated texture as a result of the fabric's weave.



One hardened surface with controlled ripping, broad point constraints, various 4 point knots and internal predetermined geometric constraints

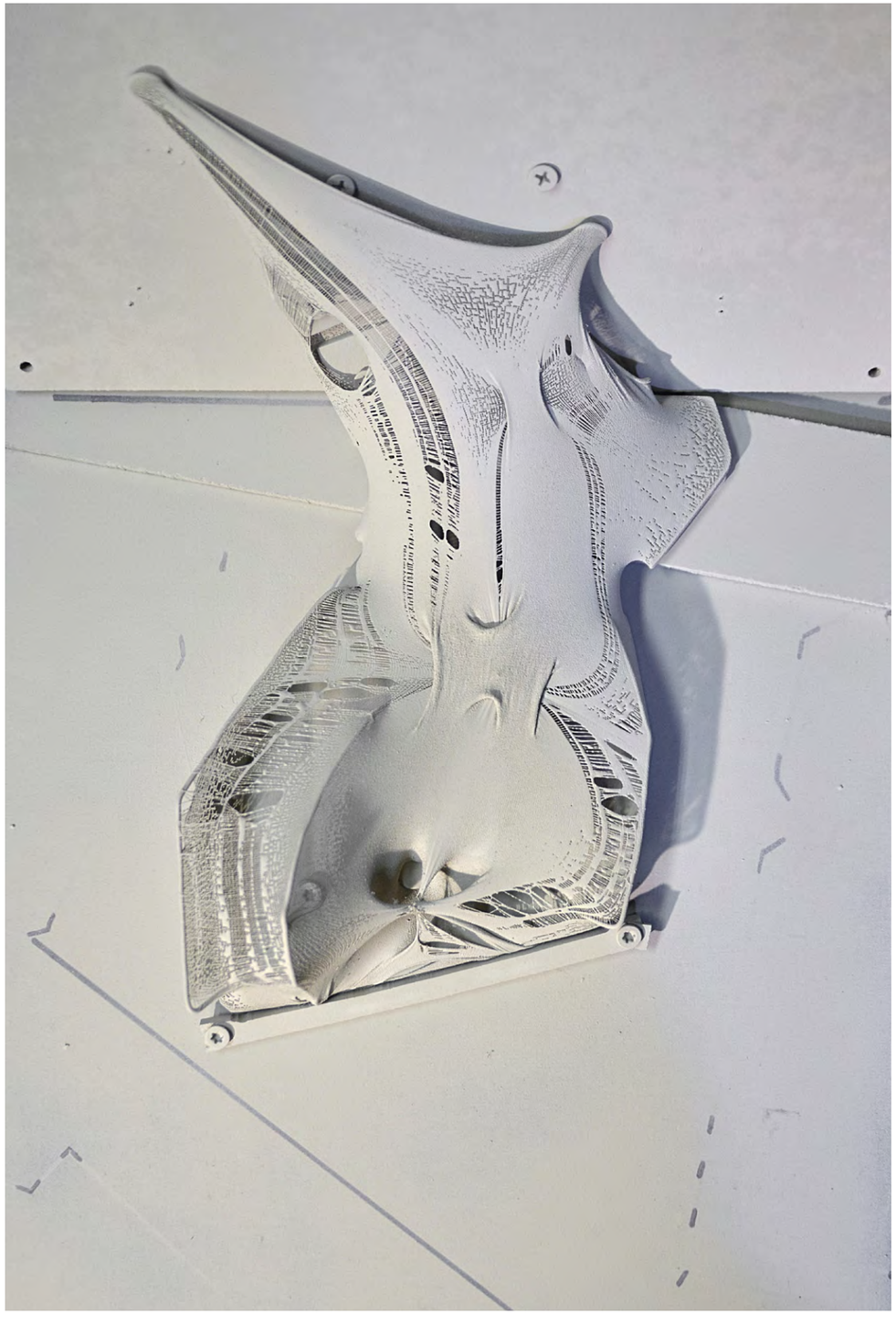


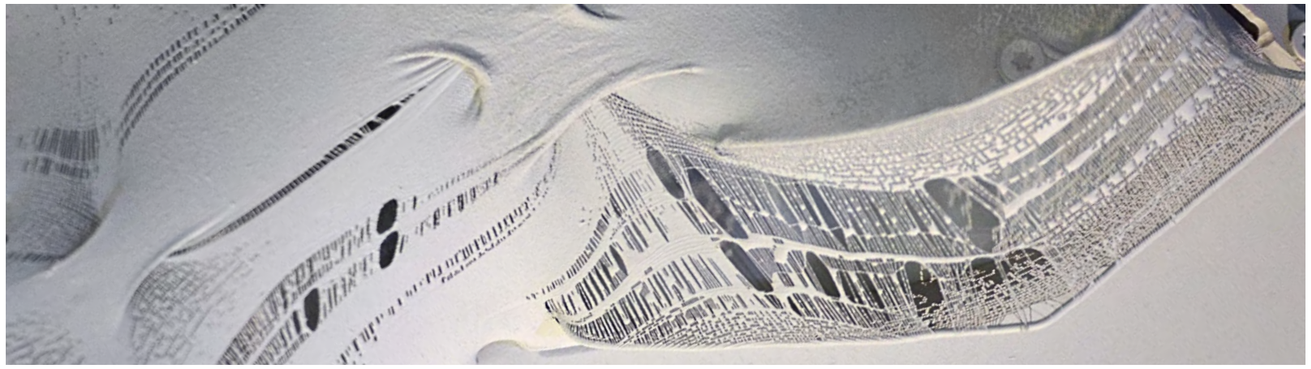




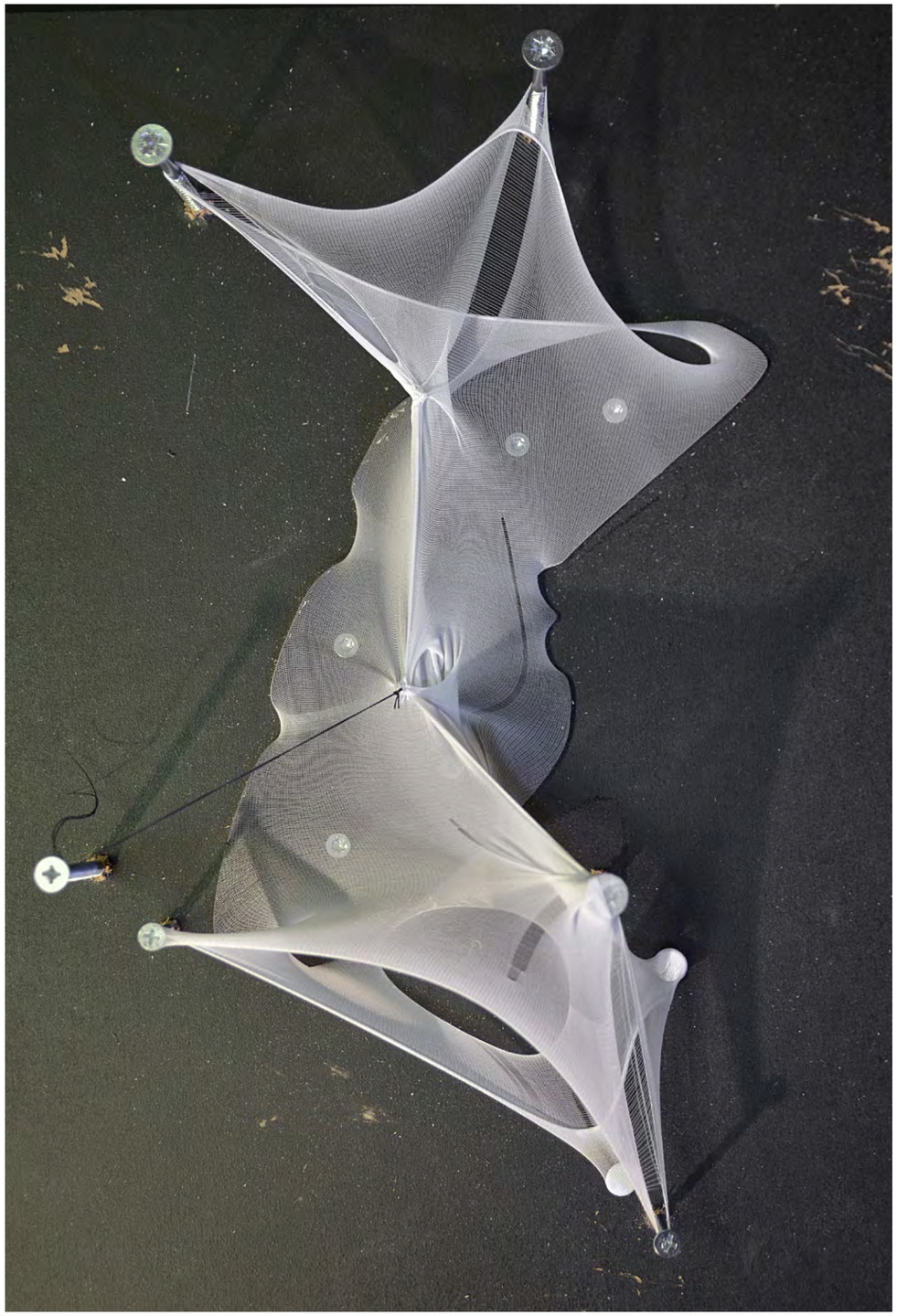
One surface with controlled ripping, broad point constraints, 3 and 4 point knots and internal predetermined geometric constraints

One surface with controlled ripping, broad point constraints, reverse point knots and internal predetermined geometric constraints



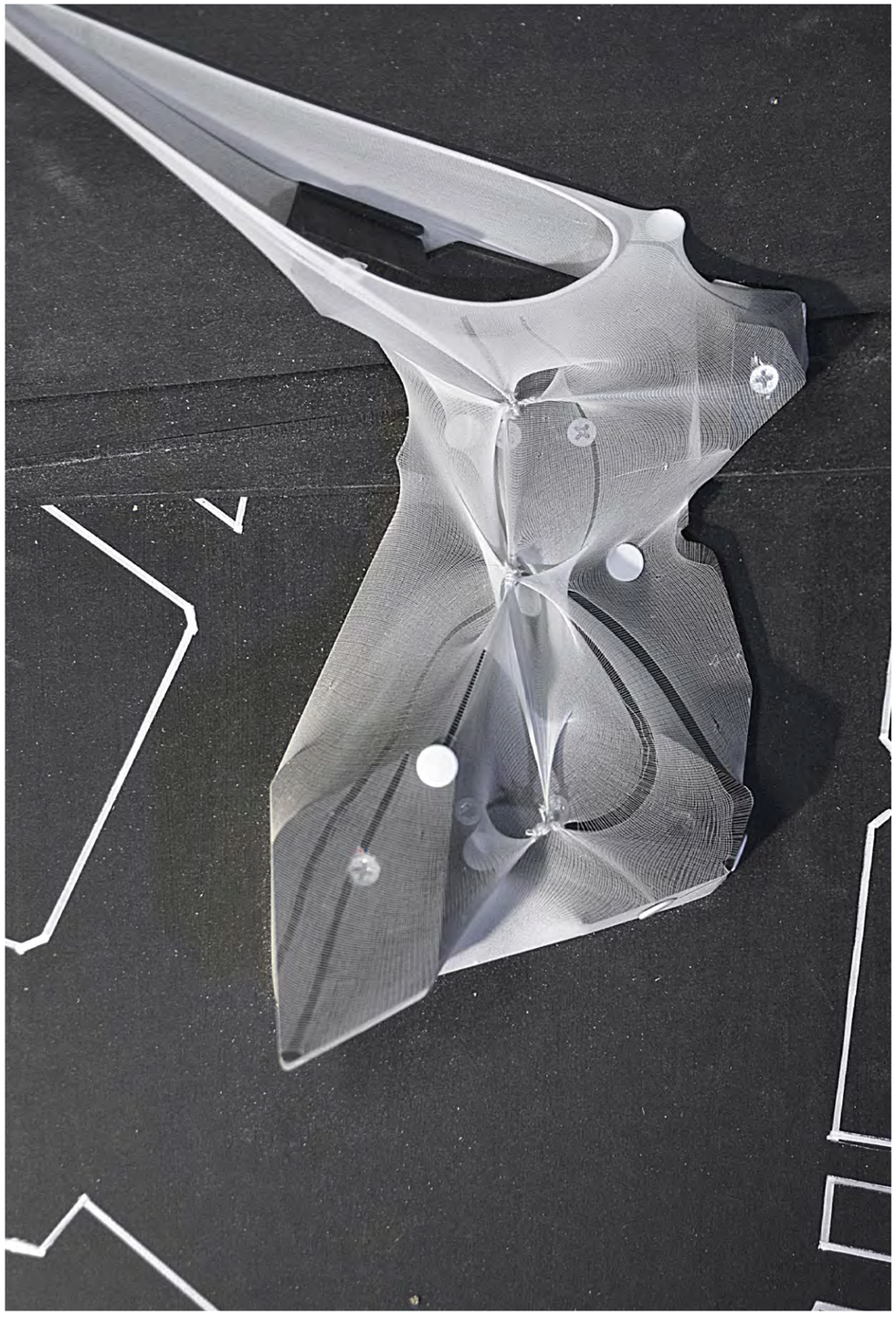


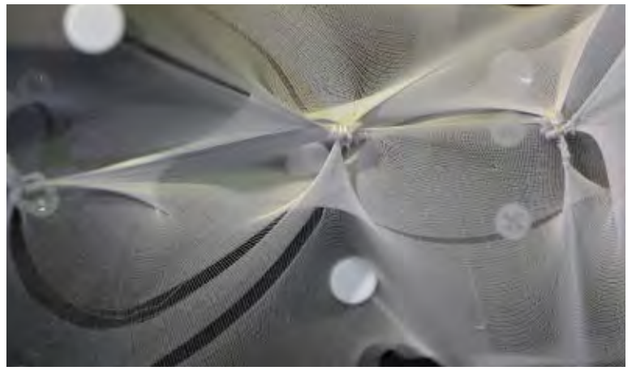
One surface with controlled ripping, broad point constraints, normal and reverse point knots and internal predetermined geometric constraints



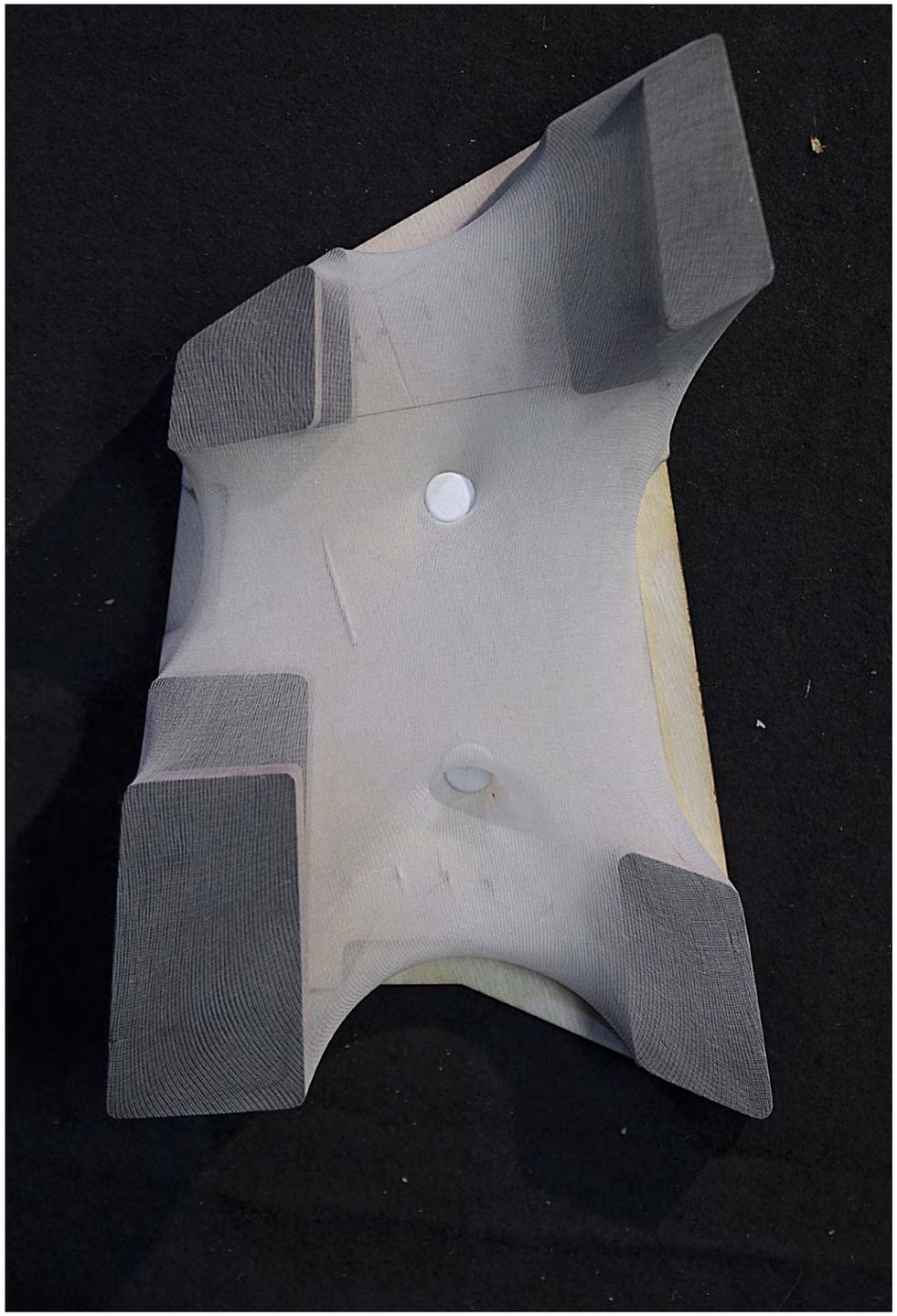
One surface with broad point constraints, various point knots and internal predetermined geometric constraints

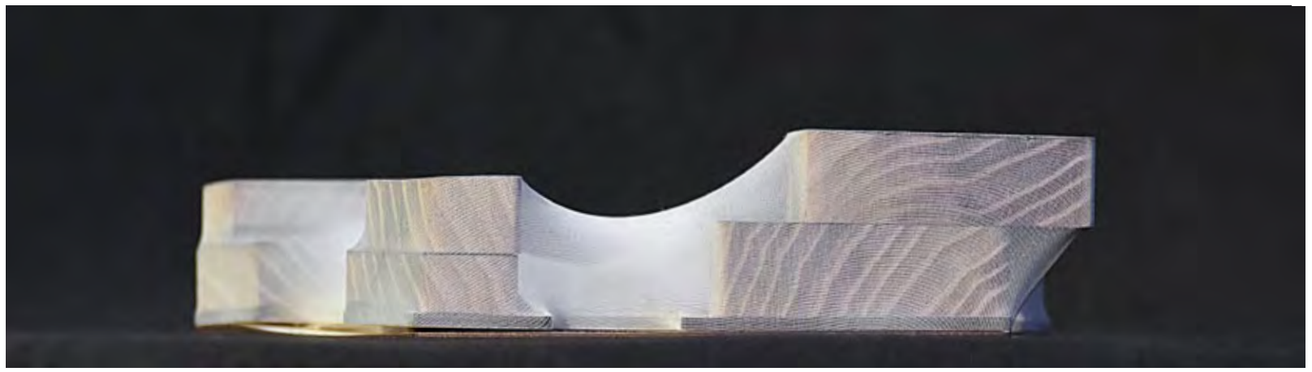
One surface with broad point constraints, various point knots and internal predetermined geometric constraints

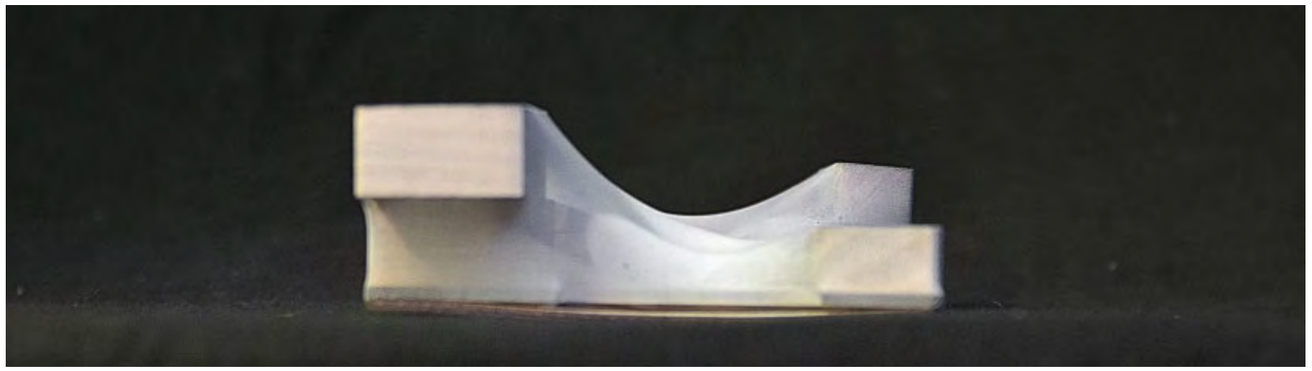




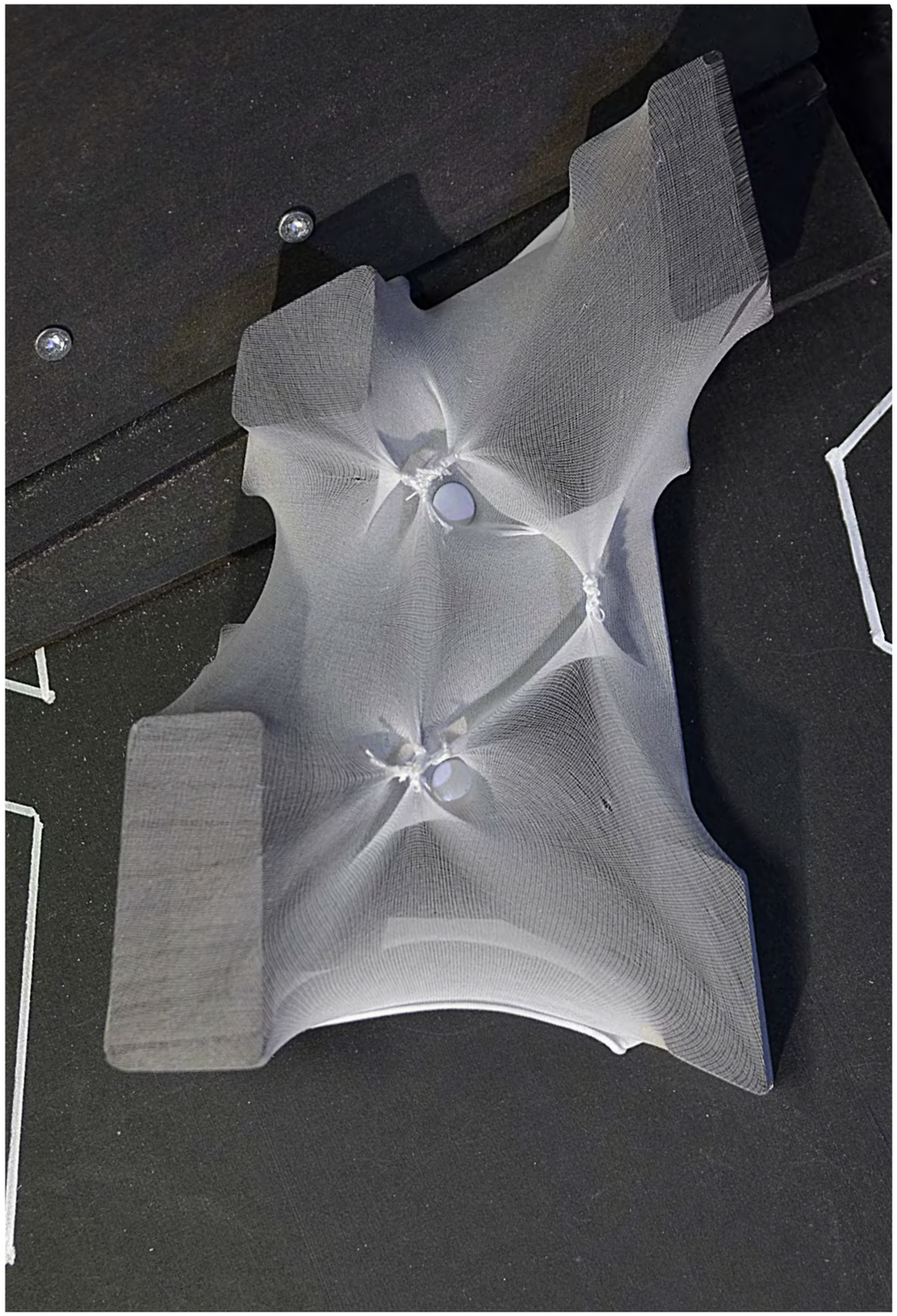
One surface with controlled ripping, broad point constraints, various point knots and internal predetermined geometric constraints

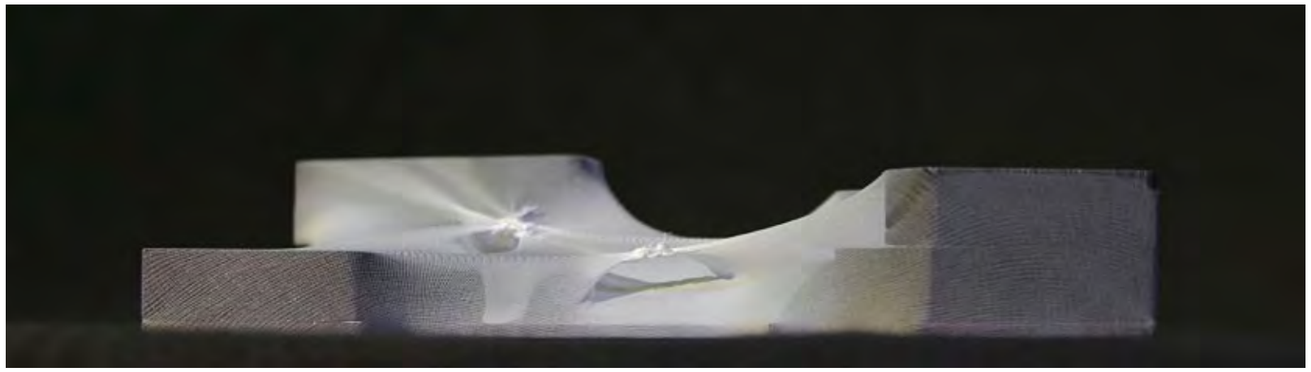


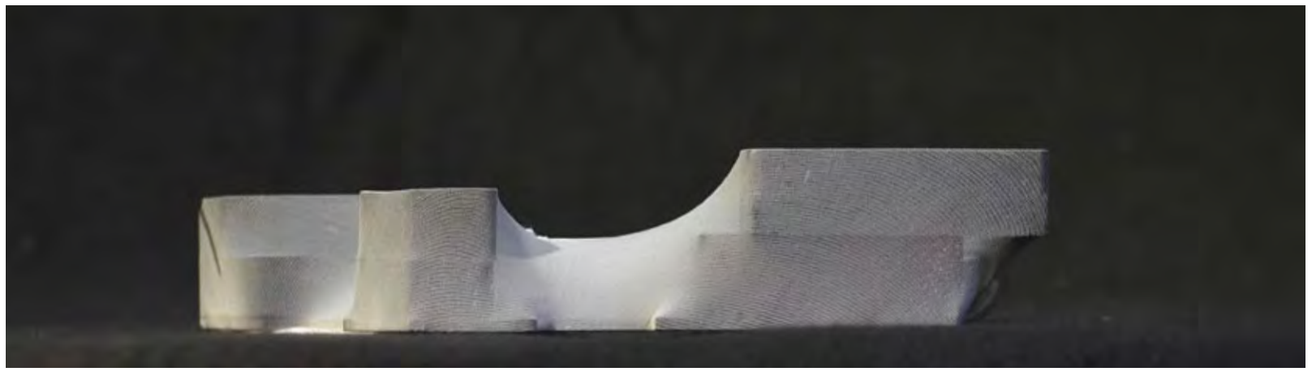


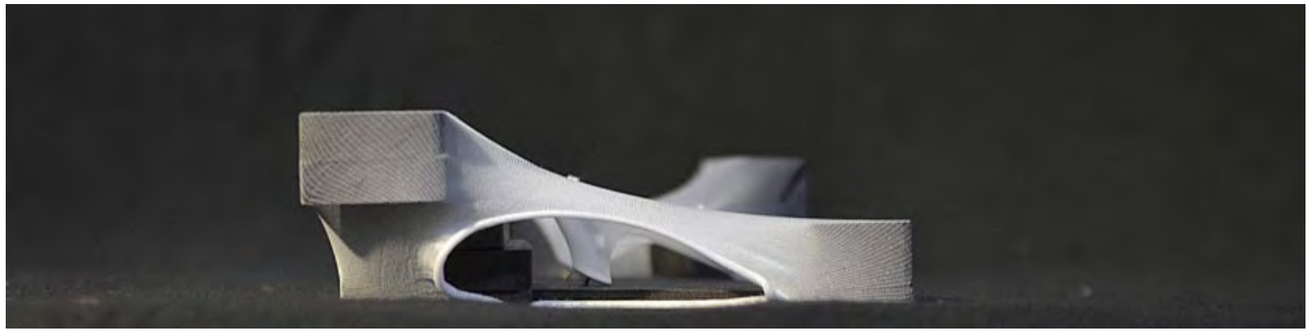


One surface with broad point constraints and internal predetermined geometric constraints

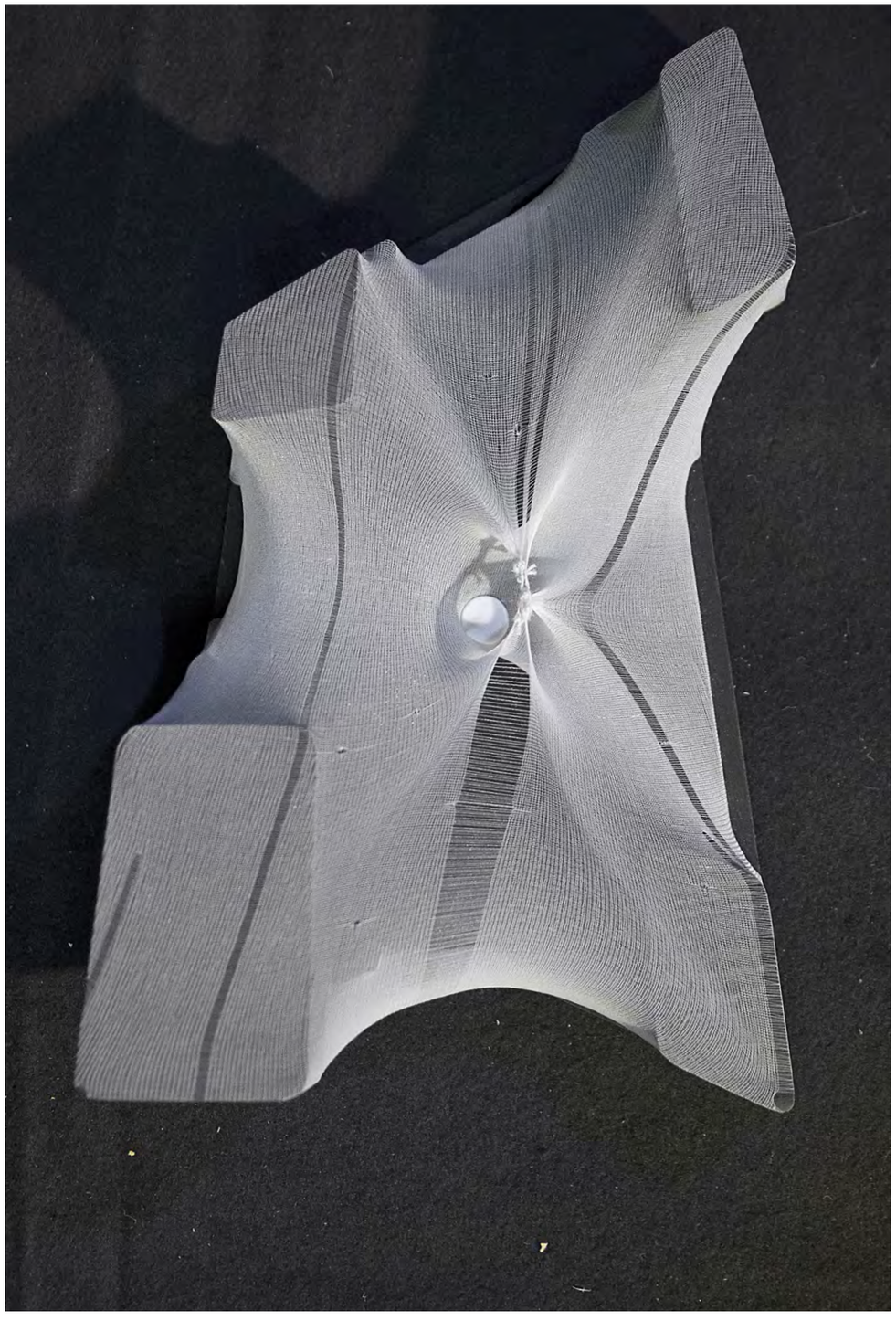


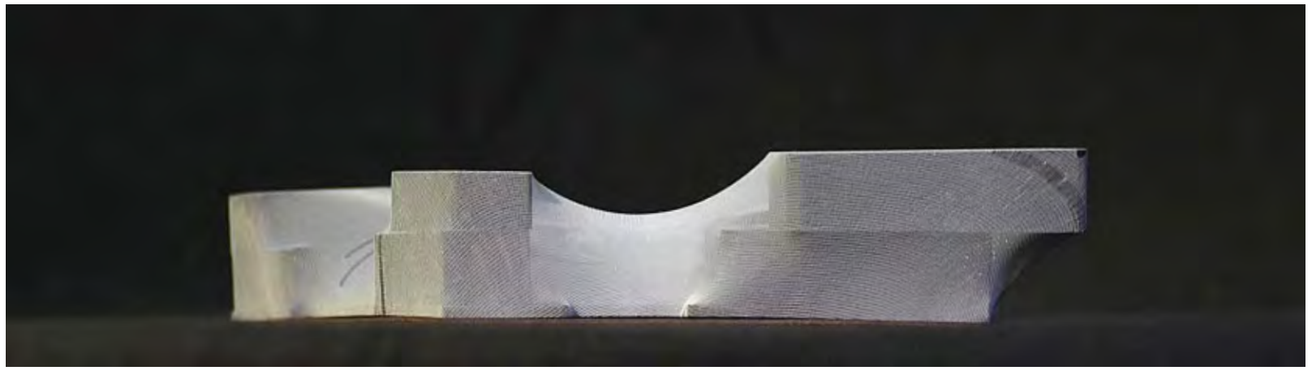


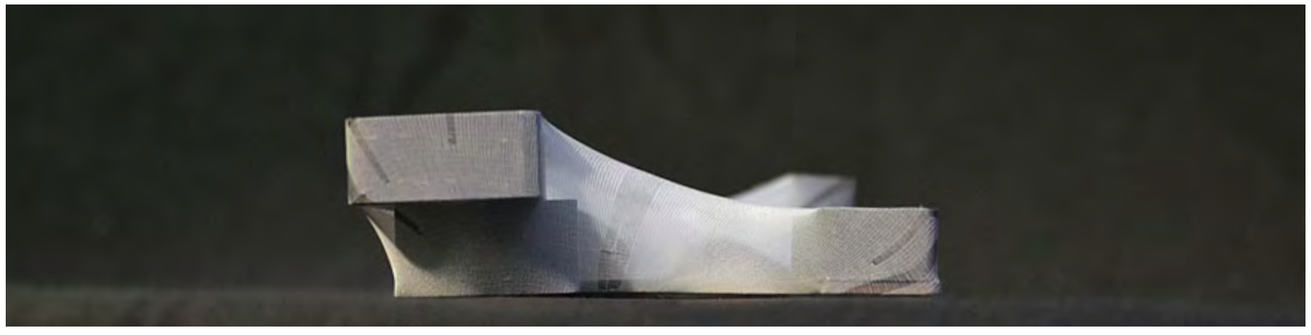




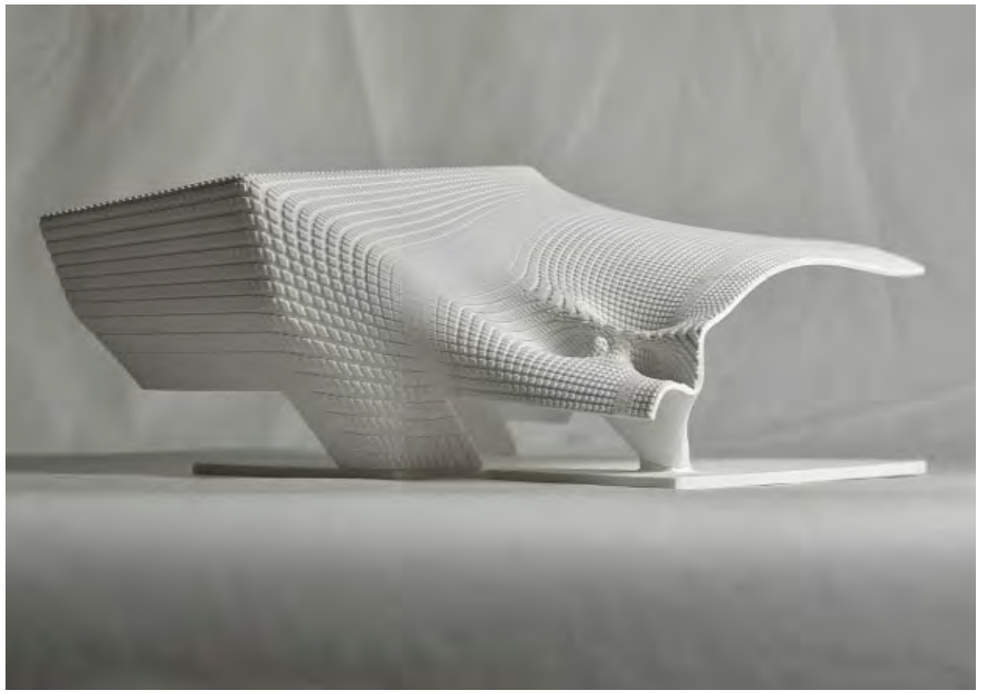
One surface with broad point constraints, various point knots and internal predetermined geometric constraints

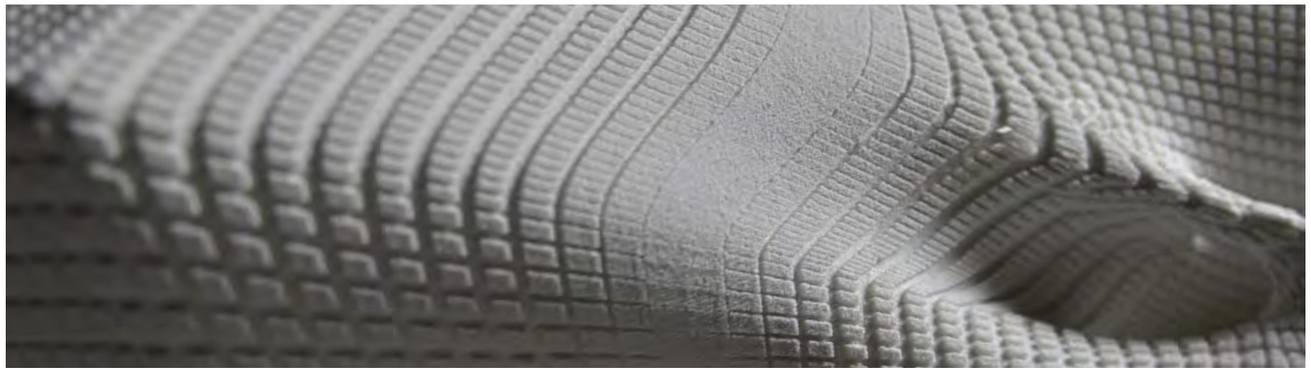


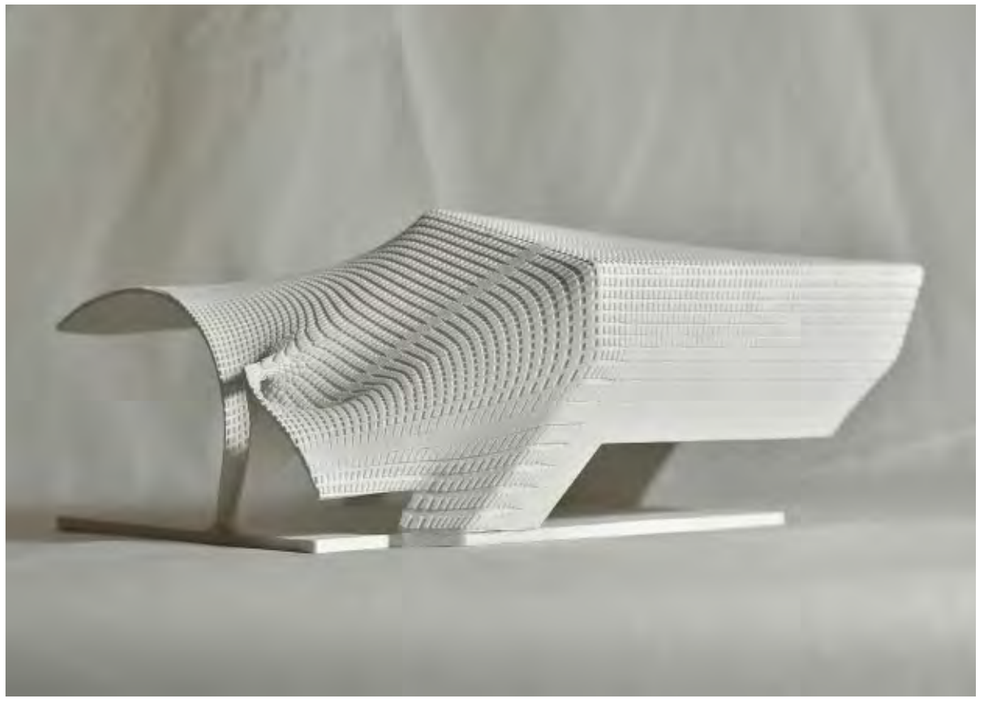




One surface with controlled ripping, broad point constraints, 1 3 point knot and internal predetermined geometric constraints







3D print of a section of the final design. Using a plug-in to Autodesk's Maya called Ncloth, which is a digital simulation of fabric, a polygon surface was produced. This surface was then further subdivided into smaller quadrilaterals whose faces have been individually manipulated to create the texture.

HALLMARK[ET] RESEARCH BOOKLET

STEFAN SVEDBERG 2012

CONTENTS

STATEMENT OF INTENT

PROPOSAL

To create a market hall on Skanstorget that will form a new hub for the activation of the surrounding area through the production, preparation and distribution of food. The market hall will also act as a gateway to the neighbouring 17th century redoubt located on Skansberget, Skansen Kronan.

PROJECT AIMS

Geometry
The project will primarily focus on the use of fabric to generate and organise structural geometries to create a long span roof. The connection to the ground and how spaces are created will be derived from studies of the behaviour of fabric and its weave. These studies will also give rise to the effectuation of creating articulation and detailing. The structure will then be reproduced using digital tools in order to compose a strategy for construction and materiality.

Accessibility
The aim is to create a diverse and stimulating environment with easy access to food and as well as offering a platform for social gathering. The market is a strategic actor for binding together Haga and Skanstorget with Skansen Kronan and Linné to engage and intensify the area and attract people from all sides of Gothenburg.

Food and Goods
Programmatically, the market hall will have a range of sections that will be used for the cooking and selling of related goods and products. These sections include market stalls as well as shops, cafés and restaurants. Some of the produce will be locally produced goods from a new proposed urban farm on the hillside of Skansberget.

Education
The market hall will be place of knowledge and education in the field of all the processes involved in the production and preparation of food. Not only can customers come for their daily food shopping, but they can also come out of interest for specific products and be in contact with staff who have knowledge in specific food related fields. The market will encourage the selling of local food produce as well as the application of international preparation methods to the local produce.

THESIS QUESTIONS

Geometry and material

- How can a long span hall be redefined through design techniques derived from the use of elastic fabric?
- How can shifts and subsequent interrelationships between analogue and digital medias inform design and construction processes and aesthetics?
- How can inherent material qualities be harnessed and extrapolated to inform design and construction processes and aesthetics?
- Fabric has traditionally been used to optimise structure and minimise depth and weight. How can the use of fabric in architectural design be updated in order to create hierarchies and surface articulation?

Market hall

- What differentiates a contemporary market hall from a regular shop or shopping centre and how can a design benefit from and improve the specific urban situation?
- How can a market space be unique and how should it function in our age and be adaptable to future changes?

Local food production

- How can we farm products locally to sell in the market hall and in what ways it can be done?

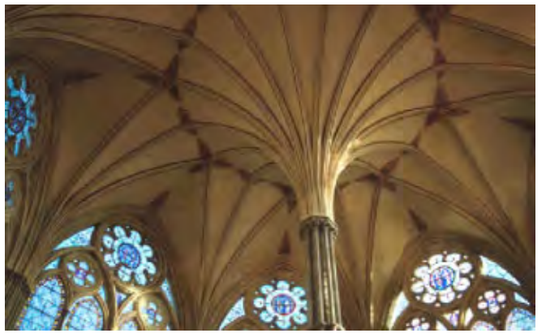


Fig. 1, Salisbury Cathedral, England

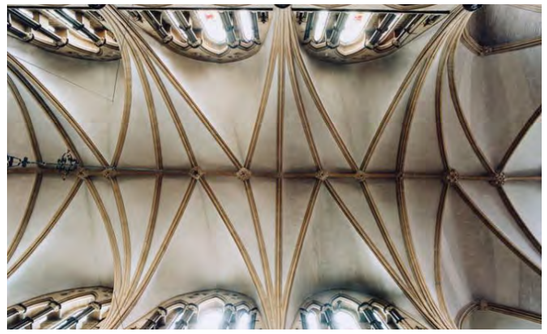


Fig. 2, Lincoln Cathedral, England

Fig. 3, Santa Maria de belem, Portugal

Fig. 4, Laon Cathedral - Laon, France

References

The following references delineate an investigation of different geometrical, structural and detail qualities that will be explored, tested and adapted to the project. For the purpose of clarity, these have been organised thematically and chronologically.

Formation: Church vaults

The church vaults (figures 1-4) depict rich spatial environments with heavy ornamentation. These examples have been gathered in order to explore the possibilities of the intricacies of structural aesthetics and materiality.

This includes the interplay between materiality and perceived experience, for example, despite being constructed out of stone, the vaults suggest a certain amount of weightlessness. These examples also distinctly address the varying scales in which a building is perceived, from the urban to the human, and contain the varying depths of the qualities of materiality and detailing.

In keeping these qualities in mind, it is hoped that a new level of complexity will be added to the digitization of the project and that the project will be a celebration of food in a similar way in which the church is a celebration of religion.

Formation: Early concrete and steel

Concrete and steel introduced new methods of construction which brought about new geometrical implications. The examples shown (figures 1-5) of the early application of these new methods exhibit a more literal association to textiles as a tool for either structural or aesthetic concepts. These references have been gathered in order to explore a whole new set of qualities.

Materially speaking, the buildings are less revealing in terms of constructional make-up and the intricacies rely more on cladding materials and patterns rather than ornamentation. In terms of lighting and configuration, the buildings do not depict any religious symmetry or holiness, they possess an altogether different hierarchy and transparency depending on their intended usage.

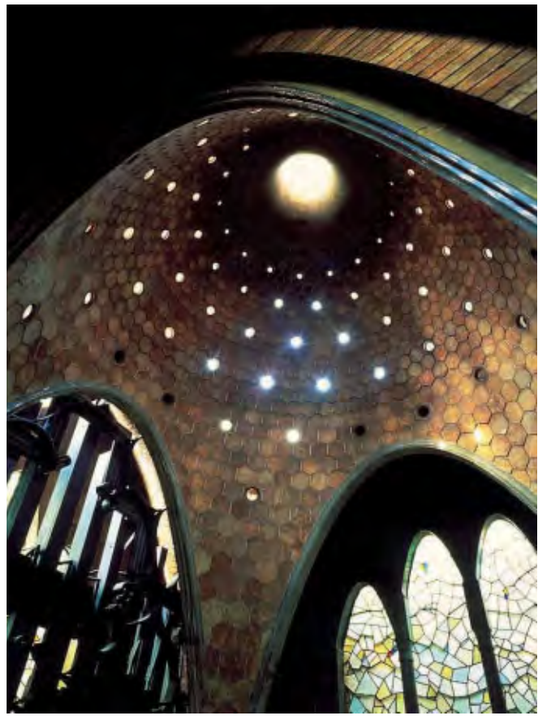


Fig. 5, Guell Palace, Spain

Fig. 6, Johnson Wax Headquarters, USA

Fig. 7, Bibliothèque Nationale, France

Fig. 8, The Pagoda, spain

Fig. 9, German Pavilion, World Expo 1967, Canada

Fig. 10, Sergie Musmeci bridge

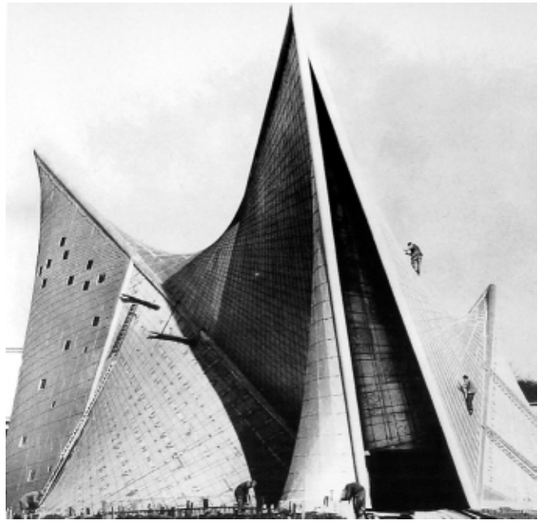


Fig. 11, The Philips Pavilion, at Expo 1958, Brussels, Belgium

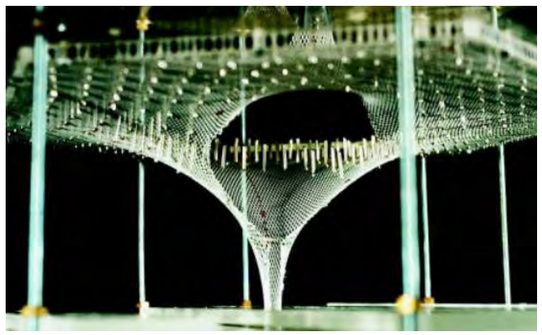


Fig. 12, Structural study,
Stuttgart High-speed Railway Station, Germany

From a structural point of view, there is a definite shift as is evident in Antoni Gaudí's pioneering use of gravitational models to determine the distribution of force in relationship to interior spatial quality and programme (figures 5 and 26).

As mentioned previously, the aim of using these buildings as references is to add a deeper level of aesthetic complexity to the project and these particular examples present configurational possibilities as well as a more contemporarily realistic approach to materiality.

Structural optimization

Fabric itself has for a long time been commonly used for spanning roofs, a typical example of this is the tent structure (figure 9). These types of structural optimizations tend to be lightweight and demand less material to construct. Figures 9-12 illustrate examples of different forms of structural optimization whereby the entire design process aims towards a pure and easily comprehensible structure. Here it is important to state that although there is a structural relevance in these examples, thematically, the strive for structural clarity and purity is not the aesthetic aim of this thesis project.

Figures 13-15 show a deviation from this structural optimization whilst still maintaining a sense of purity. While figure 15 focuses on clear structural expressionisms, figure 13 exemplifies a focus on spatial and environmental qualities.

These examples relate more to the aforementioned formation examples (figures 1-8) but incorporate a greater structural complexity and a different approach to creating events that occur in the geometry in order to bring aesthetic variation. These aspects will also be appended to the qualities to consider for the design of the market hall.

Fig. 13, Shenzhen International Airport, China

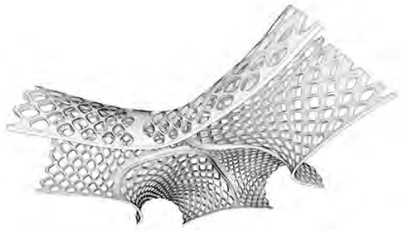


Fig. 14, Axonometric
Shenzhen International Airport, China

Fig. 15, Complex weight-bearing system, Gare TGV de Lyon, France

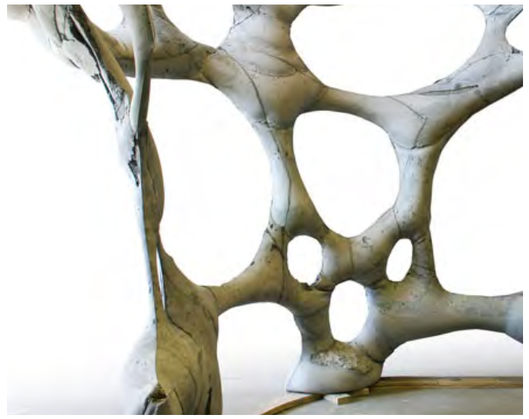
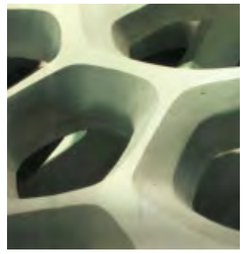


Fig. 16, Concrete experiment, University of Michigan, USA



Mold
Fabric casting systems allow the plasticity of concrete to shape an accurate curvature as well as to form ornamentation

Fig. 17, Cocoon Club
Concrete Wall, Frankfurt

Fig. 20, Transperent tensile roof, Munich Olympic Grounds, Germany

Textile/fabric
Fabric and stretchable sheets result in lightweight, low material usage structures that are possibly mobile

Fig. 21, PVC spanned across steel bars,
United bamboo Store, Tokyo

Tessellation
Tessellation gives a quality of arranged component succession through the application of smaller repeated construction parts to form the greater geometry

Fig. 18, System of vaults,
IwamotoScott Architecture & Buro Happold engeneering

Fig. 19, BMW Welt Museum, Germany

Polymers and composites
Prefabricated double curved panes incorporate bending or shaping materials into a number segments that are then assembled together

Fig. 22, Glass-fiber reinforced plastic,
Little Red Riding Hood, Germany

Fig. 23, Mineral foam, external insulation sawed and rasped in to shape in the construction of Casa Villa, Germany

Figures 16-23 are examples of various solutions and approaches to the realisation of materiality and construction. These examples will act as reference points for determining the most appropriate solutions for the material realisation of the project. Through further exploration of these solutions and approaches, it is expected that a sense of heterogeneity and differentiation in material processes will be achieved.

Gridshell
As its name suggests, gridshell structures are constructed from a lattice or a grid.

This type of construction obtains its strength from the double curvature of the structure's from.

Fig. 24, Frei Otto, Mannheim Multihall

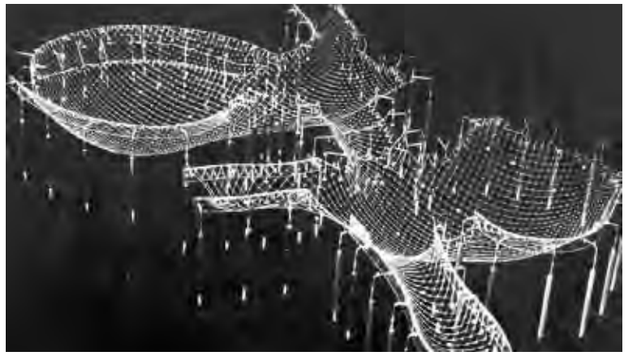


Fig. 25, Frei Otto, Mannheim Multihall, Gridshell model

Monocoque
French for "single shell," monocoque systems use construction techniques whereby an object's external skin bears the structural load.

These structural skins have various applications such as armoured vehicles and certain aircraft constructions, two wheeled vehicles and rockets.

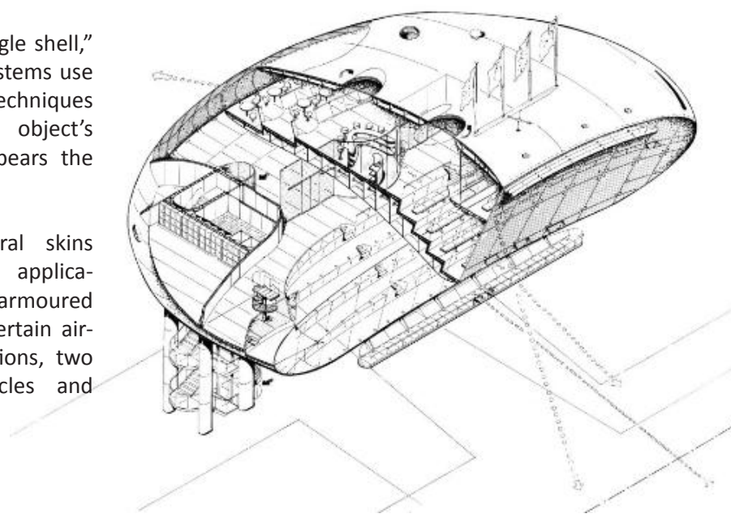


Fig. 26, Natwest Media Centre, Lord's Cricket Ground, by
Future Systems is a semi-monocoque construction

GEOMETRIC STRATEGIES

Fig. 27, Sergio Musmeci, bridge study

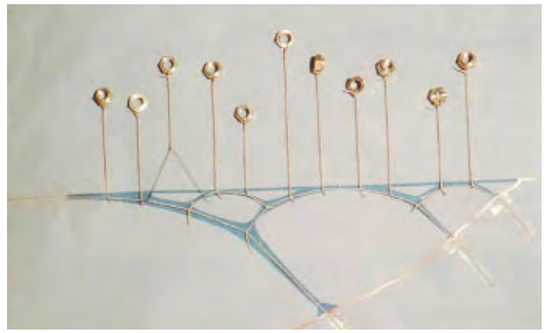


Fig. 28, Sergio Musmeci, bridge study

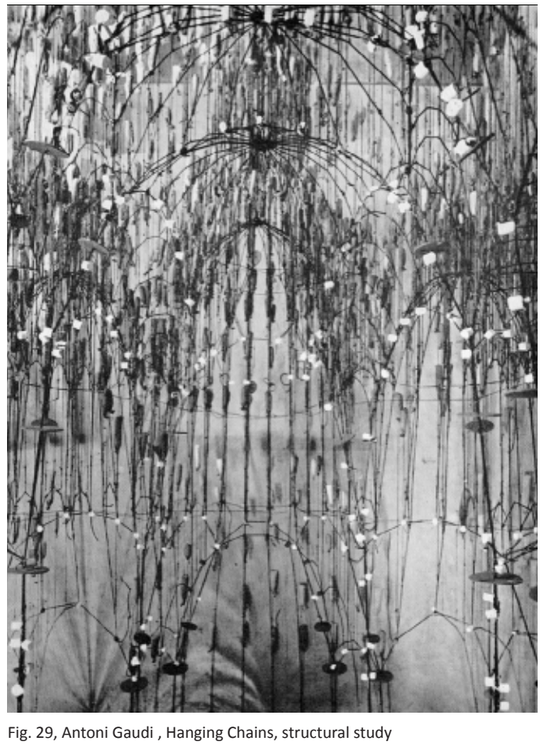


Fig. 29, Antoni Gaudi , Hanging Chains, structural study

Figures 27-29 (left) highlight the various methodologies of testing tensile and gravitational forces that will be utilised to demarcate structural integrities.

In addition to this, material manipulations, such as the application of knots, folds and punctures (figures 28-33 are some examples of this), will be used as a type of surface articulation that is a means of controlling the textile or structure.

Figures 30, 31 and 33 illustrate the use of stitching together points in the fabric to create surface articulations that effect tension forces at chosen intervals. Different levels of tension applied to the fabric through this method generate different tensile zones on the surface of the fabric. This is reflected in the varying levels of opacity of the weave (figures 30 and 33).

Alternatively, the fabric could be manipulated through partially controlled breaking or tearing (figures 32, 34 and 33). One way of creating surface articulations in this manner is to predetermine the location of punctures. Another way is to apply enough tension to bring the fabric to its breaking point.

The articulation of the resulting tearing is determined by a number of factors including the location of the tension points and amount of applied force as well as the fabric's, weave, rigidity, tensile strength and material makeup.

These two methods of manipulation (figures 30, 31, 33 and 32, 34, 35) represent somewhat opposite treatments. Whereas the first option involves the creation of pinch points (figure 30 and 33) to redistribute the surface tension, the latter option uses voids (figure 34 and 35) to do so.

A combination of both methods, amongst the others that have been mentioned will be tested and developed. It is hoped that this study will offer a platform for updating current architectural uses of fabric.

Fig. 30, four points stitched together

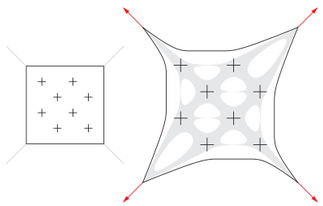


Fig. 31

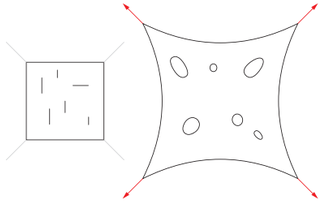


Fig. 32

Fig. 33, four points stitched together

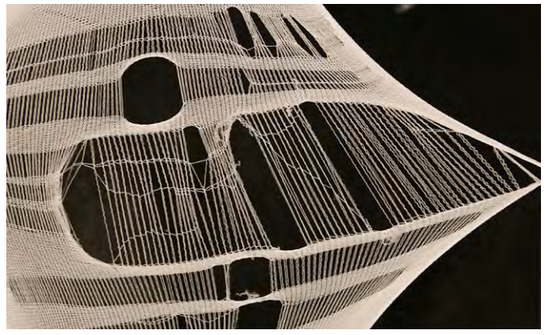


Fig. 34, Stretching and tearing

Fig. 35, Stretching and tearing

Fig. 36, Fabric density 15 denier

Fig. 37, Fabric density 50 denier

Fig. 38, The direction punctures spreads along the fabric. Density 15 denier

The fabric used in this study is a stocking product of two different thicknesses. You can see the difference in density and delicateness in figures 36-38 above. The product is available in a range of thicknesses from 15 Den up to a 100.

Denier is a unit of measurement for the linear mass density of fibres. It is defined as the mass in grams per 9,000 meters. The term denier is derived from a French coin.

With the use of software the behaviours of the fabric can be reproduced digitally and animated in 3D, shown in figures 39-40 below. The material properties, thicknesses, forces and gravity will be applied for an accurate behaviour.

This section (figures 36-47) demonstrates the nature of how all the references will be propagated in order to formulate an actual design.

Figures 42-47 are a re-appropriation of the physical model-making techniques that have been explored thus far. These studies will then be digitized (figures 39-40) and computer aided systems will be used in order to analyse, refine and extend the overall process and outcome. This outcome will be the source from which precise calculations and drawings will be generated.

The project aims to reproduce the rich environments portrayed in the references through the use of fabric and structure enhancing articulation. The varying scales in which a building is perceived will be a driving force for the study of spatial and material experiences. For example, spatial experiences could explore the monocoque qualities that textiles can create whereas material experiences could explore the weave of the fabric itself. One of the greatest challenges in this project, will be to achieve a sense of structural, and particularly material, complexity and realism.

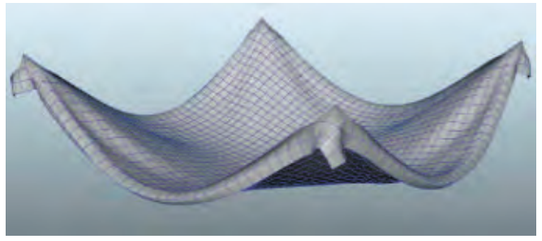


Fig. 39, software model, gravity pulling virtual fabric

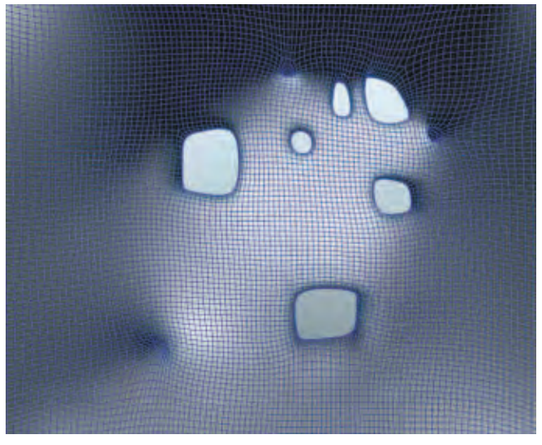


Fig. 40, software model, stretched virtual fabric with punctures

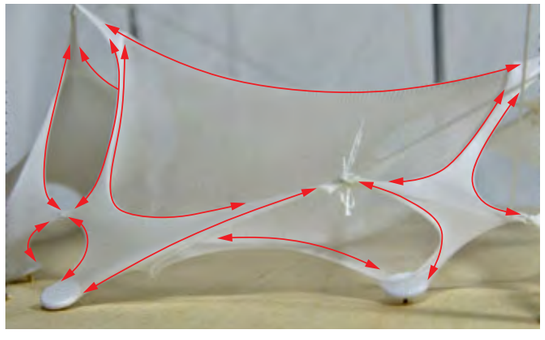


Fig. 41, force directions

Fig. 42, fabrick model made with 15 den stocking, stretched with strings

Fig. 43, stiffened fabric with a type of plaster spray. The strings are removed and the model supports itself

Fig. 44

Fig. 45, plaster sprayed on the fabric, resembles reinforcement and concrete

Fig. 46

Fig. 47, Plaster spray. The weave in the fabric leaves holes that lets light through

PROGRAMMATIC STUDIES

Refer to the project portfolio for more information

	Quantity	Average area		Cumulative area	
Stall units					
Individual units [1]	-	-	m^2	-	m^2
Utility					
Storage	-	-	m^2	-	m^2
Loading zones	-	-	m^2	-	m^2
Refrigerator room	-	-	m^2	-	m^2
Freezer room	-	-	m^2	-	m^2
Communal kitchen *	-	-	m^2	-	m^2
Preparation rooms *	-	-	m^2	-	m^2
Management office *	-	-	m^2	-	m^2
Dressing rooms *	-	-	m^2	-	m^2
Shower rooms *	-	-	m^2	-	m^2
Staff WC	-	-	m^2	-	m^2
Staff recreation	-	-	m^2	-	m^2
Maintenance					
Garbage	-	-	m^2	-	m^2
Elevator *	-	-	m^2	-	m^2
Mechanical/Electrical	-	-	m^2	-	m^2
Communal cleaning	-	-	m^2	-	m^2
Public service					
Atrium *	-	-	m^2	-	m^2
Food court *	-	-	m^2	-	m^2
Reception area *	-	-	m^2	-	m^2
Elevator *	-	-	m^2	-	m^2
Toilets	-	-	m^2	-	m^2
Circulation (30%)			m^2	-	m^2
Subtotal				ca 5000	m^2
Outdoor area					
Market space	-	-	m^2	-	m^2
Bicycle parking	-	-	m^2	-	m^2
Car park	-	-	m^2	-	m^2
Subtotal				ca 4000	m^2
TOTAL				ca 9000	m^2

[1] Each unit represents the minimum rental space. Several units can be grouped together to create larger stalls or spaces for restaurants, bars and cafés

* Facilities marked with an asterisk are optional

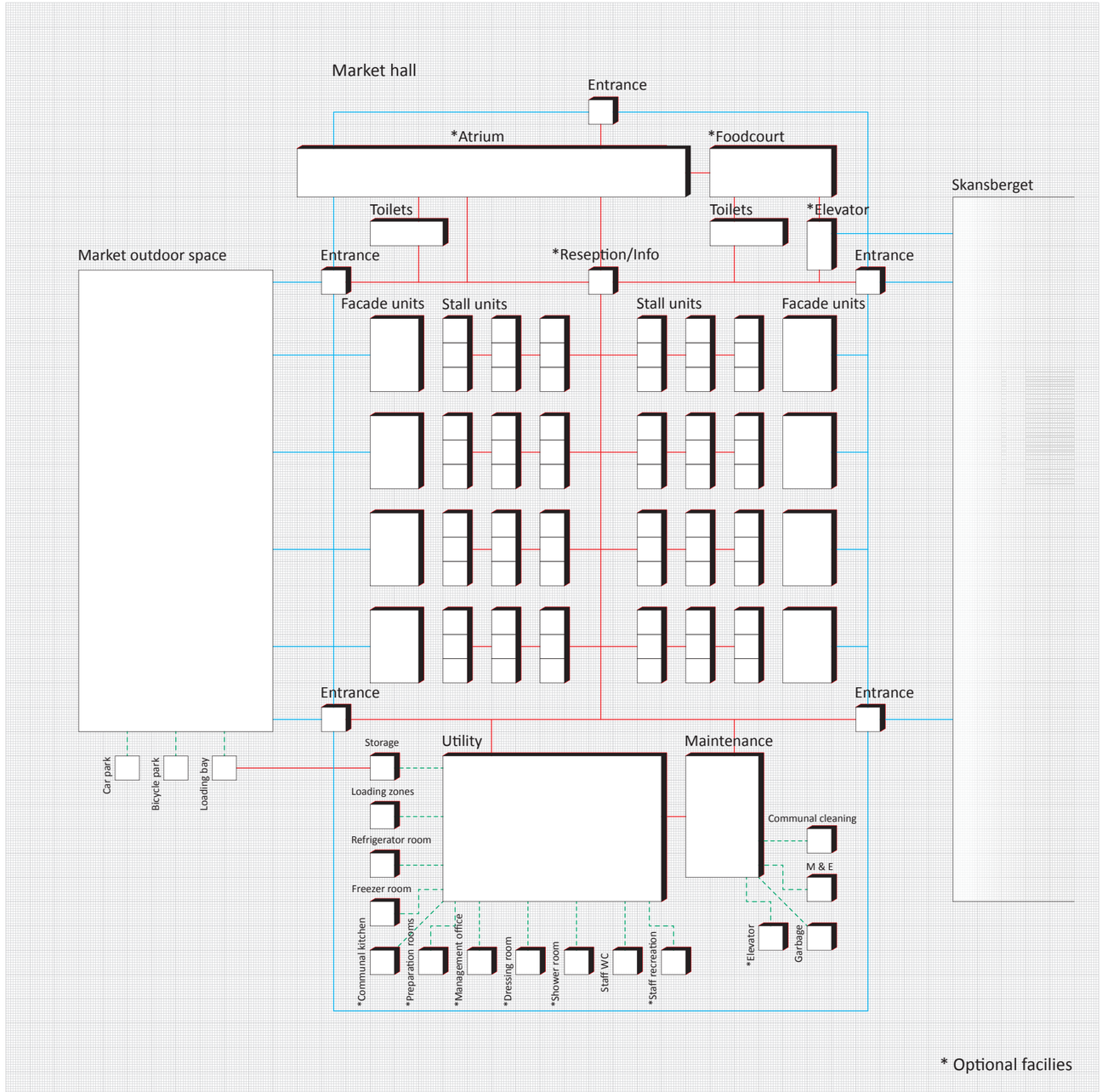


Fig. 48

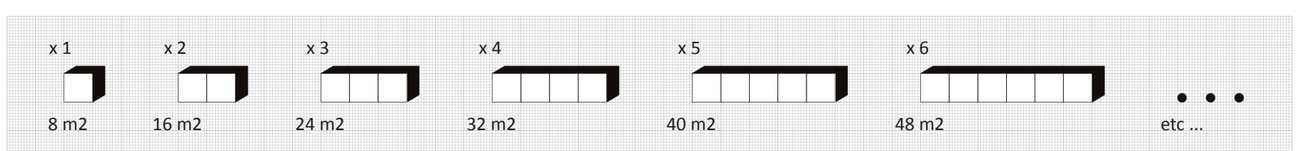


Fig. 49

Stall unit division concept

Higab runs the market hall at Kungstorget and the market hall Briggen on Nordhems street.

Interview with Jesper Lundel at Higab on the market hall at Kungstorget in Gothenburg.

- How has the market hall changed in history?

“When the market hall was first built, it had 94 stalls. Today it’s probably less than 50 since the stalls are larger and different”

- What are you allowed to sell and is there a planned diversity in what you allow?

“The focus is on a high level of knowledge and the handcraft depending on each business. There is a certain control of what we are allowed and not allowed to sell, for example, if there are too many olive stalls we will balance it up”

- How do you rent a stall and is there any difference in price according to location in the market hall?

“There are quite homogenous prices in the market and right now the price is at least 2100 kr per m^2 a year but the price will be higher in the future”

- What does it cost in comparison to shops around the centre of Gothenburg?

“A normal shop around the area would be a minimum of 6000 plus per m^2 a year”

- Who decides the division and size of the stalls?

“What can happen is that a stall manager wants to rent the neighbouring stall to expand and we will have a discussion about that. This kind of thing happens in all kinds of ways, though not that often”

- Are there different rules for the shops along the facade?

“It’s the same rules for them”

- Do you have roles for food and beverages?

“We wont allow the hall to become only restaurants and we wont allow certain kinds of restaurant concepts but it’s mainly the authorities who deal with regulations and heath and safety”

- What is the idea of the market hall?

“It is availability to Gothenburg’s citizens and visitors, knowledge, quality and representations from other continents”

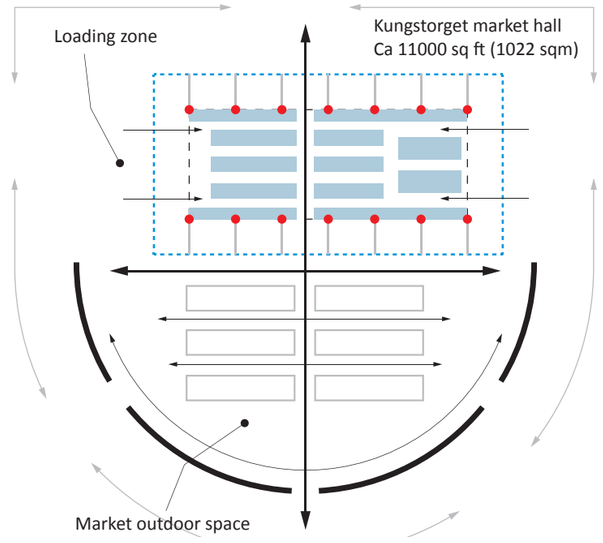


Fig. 50

The following references (page 09-10) delineate an investigation of different programmatic schemes that will be explored, tested and adapted to the project.

Fig. 51, Kungstorget market hall, gothenburg, Sweden

Fig. 52, Kungstorget market hall, gothenburg, Sweden

PROGRAMMATIC REFERENCES

Fig. 53

Fig. 54

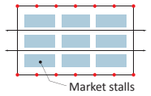


Fig. 63

Interior arrangement

Fig. 64

Derby market hall, England

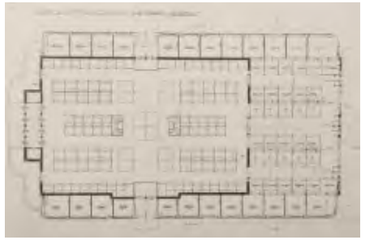


Fig. 55

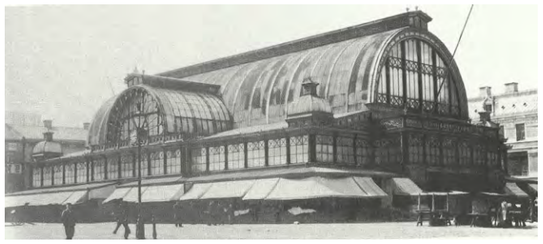


Fig. 56

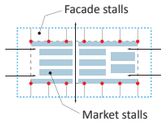


Fig. 65

Interior arrangement

Fig. 66

Kungstorget market hall, Gothenburg, Sweden

Fig. 57

Fig. 58

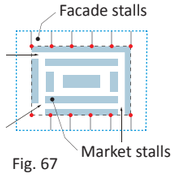


Fig. 67

Interior arrangement

Fig. 68

Östermalm market hall, Stockholm, Sweden

Fig. 59

Fig. 60

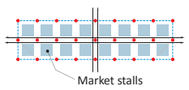


Fig. 69

Interior arrangement

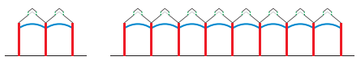


Fig. 70

Stockport market hall, England

Fig. 61

Fig. 62

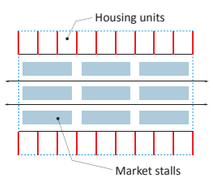


Fig. 71

Interior arrangement

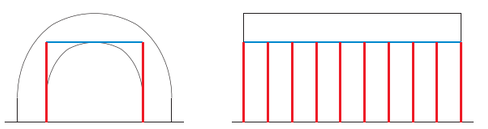


Fig. 72

Rotterdam Market Hall by MVRDV, Netherlands

SITE ANALYSIS

Site usage

- The neighbouring areas are mainly residential and small scale business areas with a lot of pedestrian access which can provide a basic visiter crowd to Skanstorget.
- The intensification of Skanstorget can lead to a busier area and more small business activities
- There are not many local offices, but the site has a close proximity to universities and other educational institutions that activate the spaces during the day
- Skansen kronan's proximity to Skanstorget provides access to a great historical monument and a green area for social activities
- One of Gothenburg's most popular promenades is next door and can branch off and lead pedestrians through Skanstorget towards Sveaplan, Linneplatsen and Linnegatan
- There are just a few food stores in the area which are very small and there is also an occasional open air market at Haga nygata
- Övre Husargatan is adjacent to Skanstorget and is an important and heavy trafficway connecting southwestern suburbs and the city centre. This provides access for delivering goods but it also brings pollution
- There is great access for bicycles but there is no direct access to the buss or tram network, the nearest station is about a 3 minute walk towards Vasastaden

Fig. 73

Fig. 74

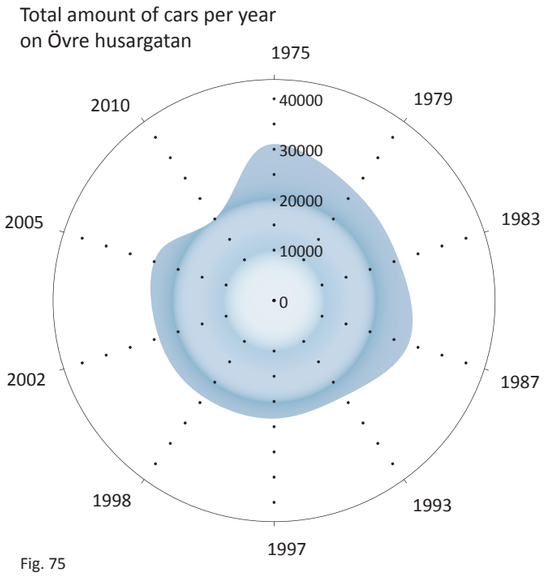


Fig. 75

Site location and area

Skanstorget

- The diagram (right) shows the areas of the different zones in square metres.
- The area marked in red marks the poroposed location of the market hall.
- The area marked in light red shows a possible connection to Skansberget and the farming research site

Skansberget

- The sites for the farming are chosen according to sunlight and the typography of the hill. These areas are marked in blue.
- The darker blue area is made up of plateaus that are ideal for farming typologies that require level ground.
- The lighter blue areas have less plateaus and steeper hillsides and could be used with the application of vertical farming techniques .

SITE ANALYSIS

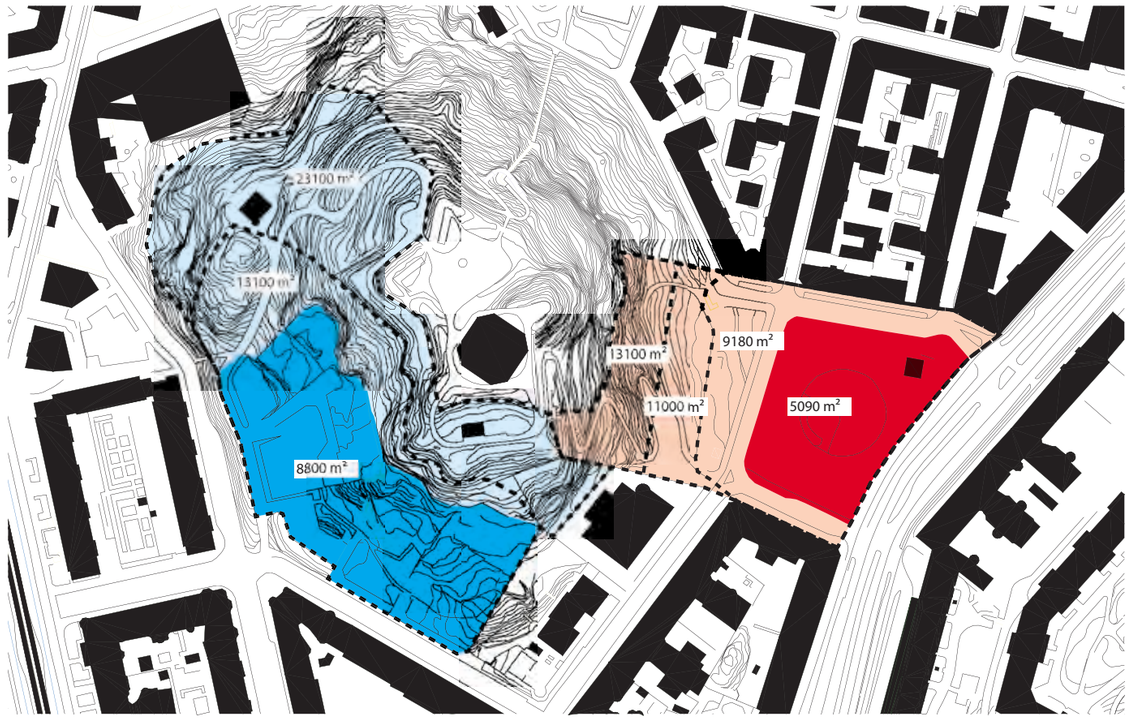


Fig. 79, project area

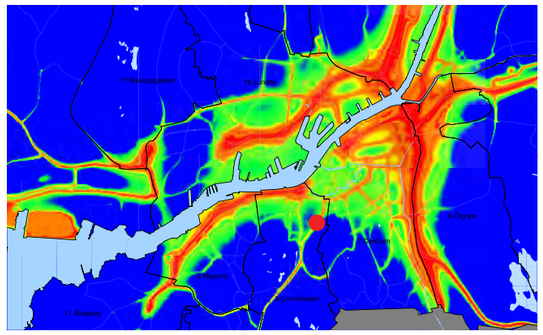


Fig. 76, greenhouse gasses emitted during 2009

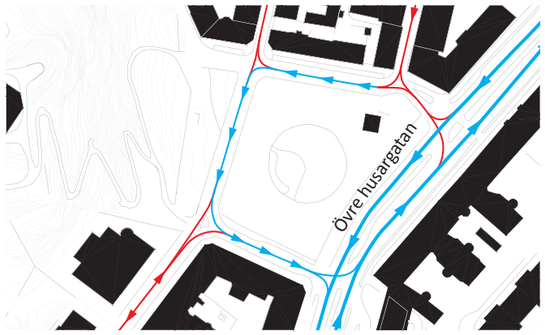


Fig. 77, traffic directions

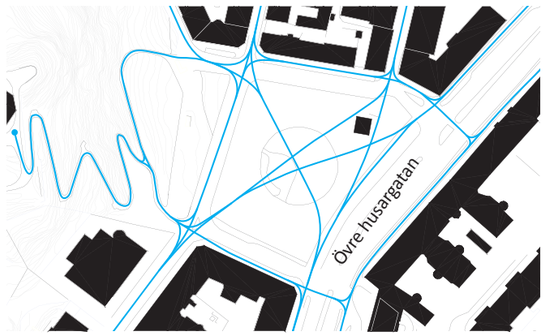


Fig. 78, pedestrian movement directions

Fig. 80, Site dimensions

SITE ANALYSIS

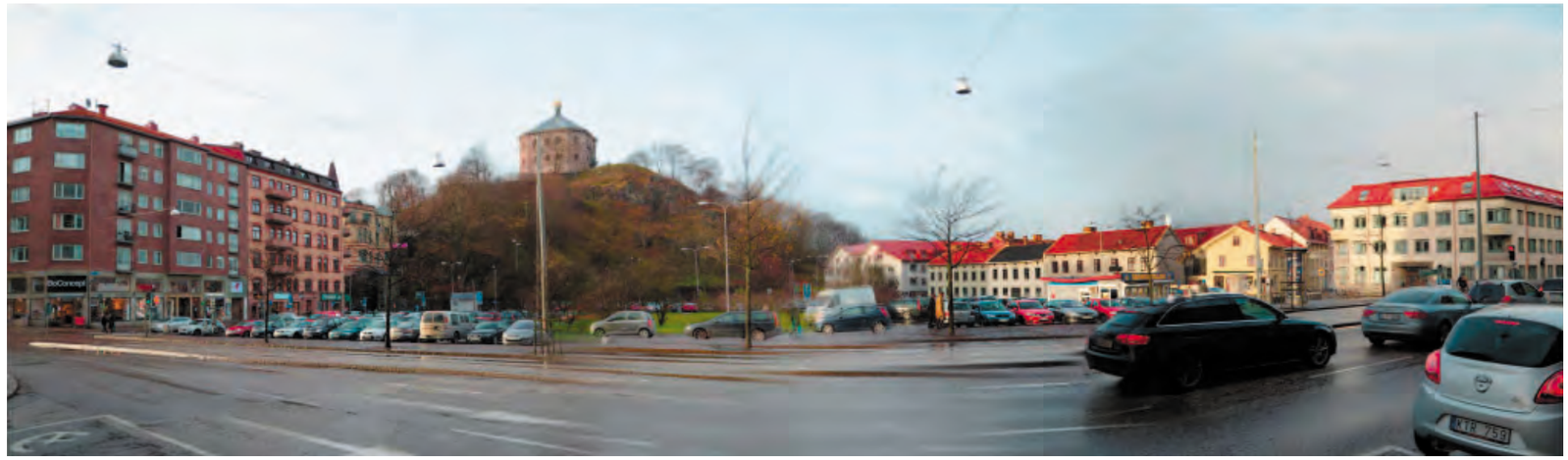


Fig. 81, Skanstorget in the foreground and Skansen Kronan in the background

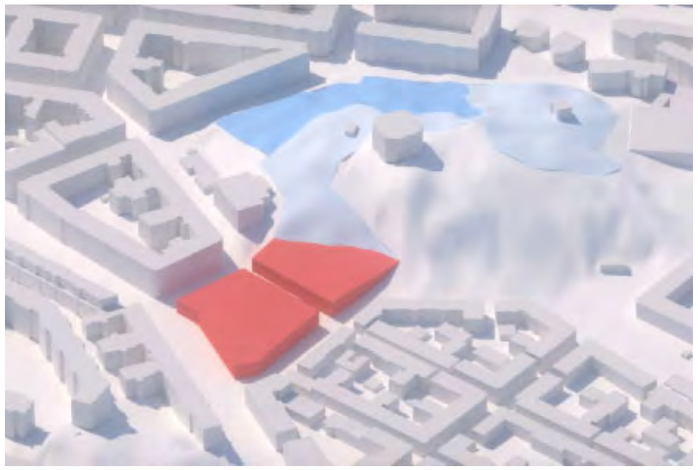


Fig. 82, site volume

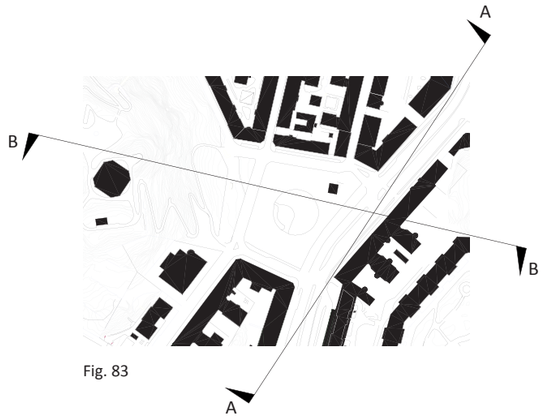


Fig. 83

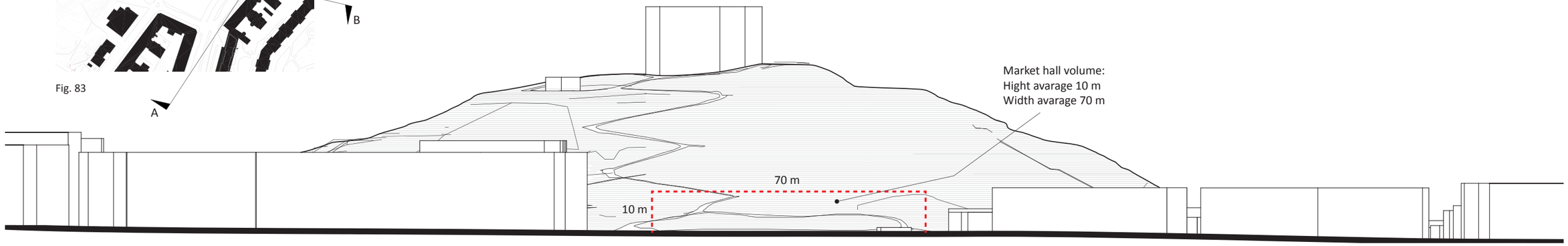


Fig. 84

AA Facing west

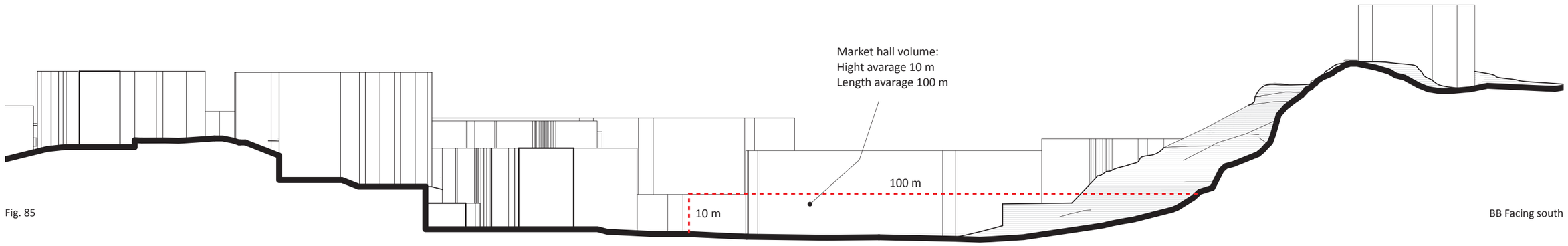


Fig. 85

BB Facing south

LOCAL FARMING

Farming on Skansberget

The southwestern face of Skansberget has a number of hillside plateaus (figure 98 to 105) which are remains of an old Landshövdingehus[1] neighbourhood built between 1899-1905. The last of these buildings was demolished in the 1970s and all that remains of these houses are the plateaus on which they stood.

When it comes to selecting a site for farming, not only do these plateaus offer an existing level ground, they are ideally located in terms of the reception of sunlight (refer to page 18) and proximity to the square.

There has been increasing interest in urban farming amongst citizens of Gothenburg, which is reflected in small scale initiatives that have sprung up in places such as Högsbo, Majorna, Kvillebäcken and Nya Varvet. The majority of these examples have been supported by an organisation known as Stadsjord (*City soil*).

[1] Roughly translated as *Govenor's houses*, a type of building unique to Gothenburg consisting of a ground floor made of brick and two upper floors made of wood

Fig. 86, Jun 08.00 - 20.00

Natural light on skanstorget (Skans square) and Skansberget (Skans hill)

Sunlight is an essential aspect to consider in the design of the market hall on Skanstorget and the location of farming on Skansberget.

* For more information refer to project portfolio

Fig. 87, Level ground on Skansberget

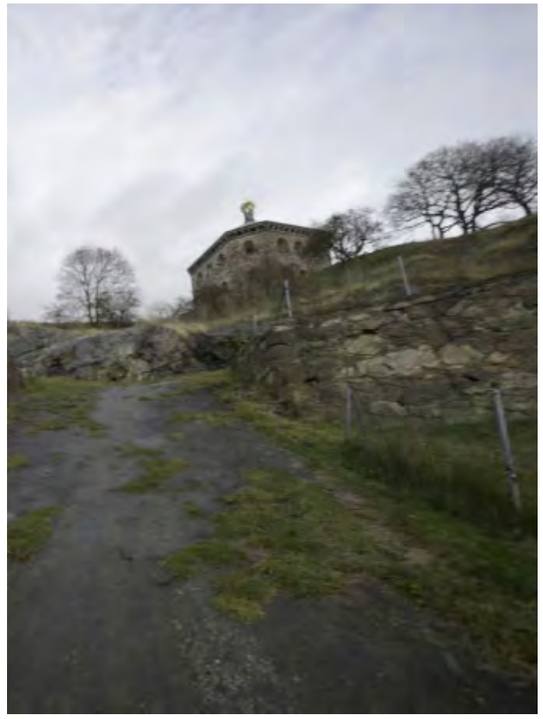


Fig. 88

Fig. 89 3

Fig. 90 6

Fig. 91 2

Fig. 93 1

Fig. 92 5

Fig. 94 4

Stadsjord interview and research

- Stadsjord is a constellation of groups and organisations who work with urban farming strategies. Participants: Public participants, Chalmers, Gothenburg universityn, KTH, Botaniska trädgården, Gunnebo slott, Familje-bostäder och räddnings missionen.
- The active participants are from all ages and social ranges. The concept of farming in the city is popular and shows great potential as an urban sustainable way of life
- Stadsjord's mission is to activate social interaction, public involvement in the area, healthy products, education, awareness, research and an understanding of how food is brought to our dinner table
- The project vision is local food produce, social engagement in the neighbourhoods and activation of areas permanently in the city or temporarily on wasteland waiting to be developed.
- The concept is to use old sustainable knowledge in new ways in the cities
- Stadsjord not only farms vegetables and herbs, but also uses Pigs and other animals in the production of food. The pigs are part of the ecological chain of working the soil, they are also a source of small rations of meat production, and they also function as social beings
- The project leader of Stadsjord is man called Niklas Wennberg, he is one of the most active and influential people in the field in Sweden

Excerpt from an interview/conversation with Niklas Wennberg
30th November 2011

- What is stadsjord?

"Stadsjord is not favouring any particulars like vegans or anything like that. It is local produce that sometimes involves animals as well as vegetables"

- How is it done?

"We apply for permission with a plan and have discussions with the council and it has gone through in places, such as in Högsbo where we had pigs. We have workshops and people participating from the area. It's very popular and we are planting and we use pigs to work the soil. In Högsbo the pigs have been a success and we are now working on having pigs in Majorna and there will be a workshop next week"

- Are there other kinds of animals?

"If you know how to work with pigs all smaller animals are easy, like hens and ducks"

- How many pigs do you have?

"We use to have several but now it only one left, Sötnos"

- What happened to the other pigs?

"They were slaughtered and eaten somewhere in Gothenburg"

- How much product do you get in relation to the price paid?

"It's local interest and local produce for and by the locals involved"

Thesis

To propose a sustainable function and activation for Skansberget as a part of a proposal for a market hall on Skanstorget. Stadjord is a good existing initiative that are spreading across Gothenburg and will be incorporated in the programming of the area.

Fig. 95, Stadsjord Hisingen

Fig. 96, Stadsjord Högsbo

Fig. 97, Stadsjord pig

Fig.98, Stadjord logo

Fig. 99 vertical farming concept

FIELD WORK

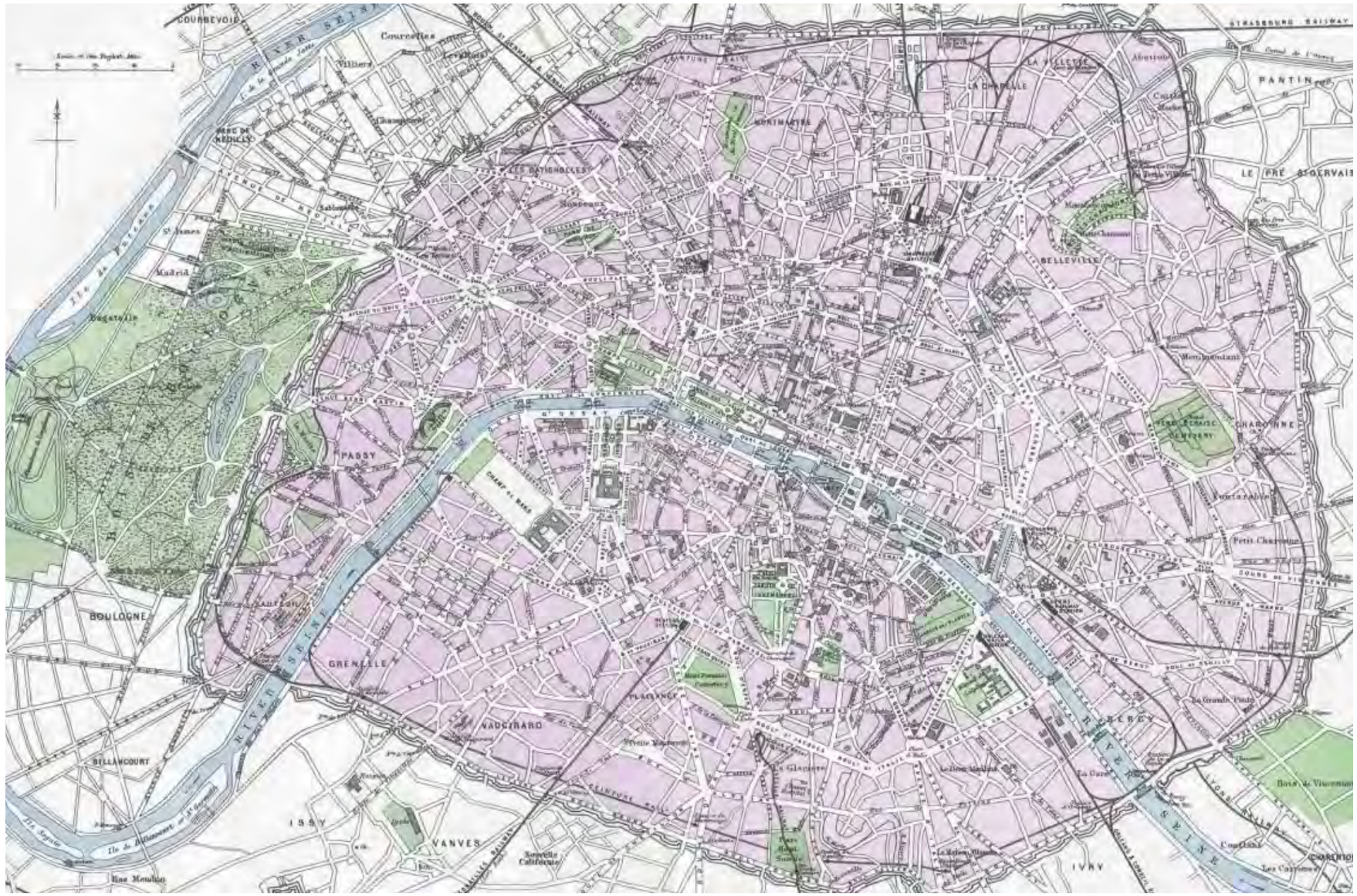


Fig. 106

Field trip to Paris 16 - 21 December 2011

Market halls
- Marché St-Quentin
- Marché des Enfants Rouges
- Marché Aligre
- Carreau du Temple (undergoing construction to change use)

Passage gallerias
- Passage du Caire
- Passage du Grand - Cerf

Other
- Bibliothèque Nationale. Henri Labrouste
- Opera Garnier, Phantom Restaurant. Odile Decq
- Communist Party HQ. Oscar Niemeyer
- Musée du quai Branly. Jean Nouvel, Patrick Blanc
- Pershing Hall courtyard. Patrick Blanc
- Citroën Show Room. Manuelle Gautrand
- Arab World Institute. Jean Nouvel
- Mobile Art Pavillion. Zaha Hadid
- Docks de Paris. Jakob+MacFarlane
- Simone de Beauvoir Bridge. Dietmar Feichtinger
- Bibliothèque Nationale Francois Mitterand. Dominique Perrault
- Centre Georges Pompidou. Richard Rogers & Renzo Piano
- Centre Georges Pompidou, Restaurant Georges. Jakob + MacFarlane
- Hotel Guimard. Hector Guimard
- Canal Saint Martin and Morland Bridges
- CNIT, Centre des Nouvelles Industries et Technologies. Robert Edouard Camelot, Jean de Mailly, Bernard Louis Zehrfuss
- Parc de la Villette. Bernard Tschumi

Fig. 100, Marché Aligre

Fig. 101, Marché des Enfants Rouges

Fig.102, Marché St-Quentin

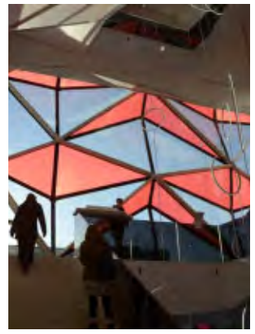


Fig. 103, Citroën Show Room

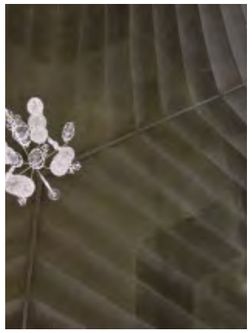


Fig. 104, CNIT, roof

Fig. 105, Hotel Guimard

Presentation

A0 panels
Project portfolio, Model catalogue, Research booklet

Programme

Market hall concept
Interior facilities
Exterior facilities

Models - Physcial

Sketch models
Articulatory investigations
Structural investigations
Site parameters model
Architectural intervention
Site model
Architectural intervention

Models – Digital

Articulatory investigations
Structural investigations
Spatial investigations
Animations

Drawings

Site location
Site parameters
Plans
Elevations
Sections
Exploded axonametric / isometric
Detail

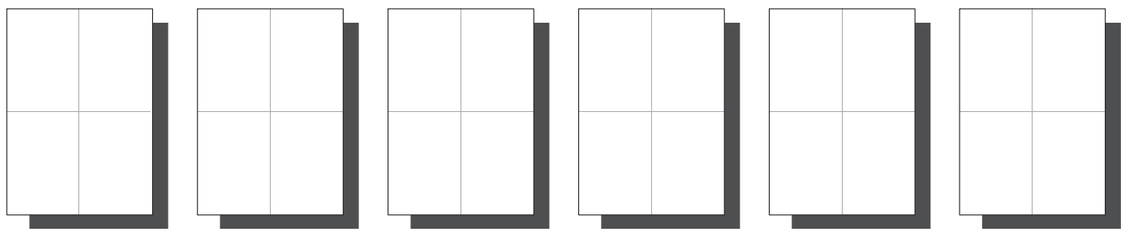
Construction

Exploded axonametric / isometric
Construction details

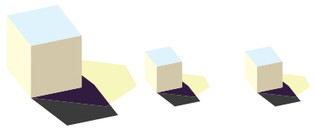
Visualisations

Areal view
Street views
Interior views
Material feeling

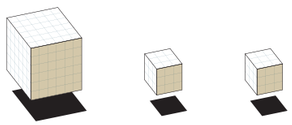
Project portfolio, Model catalogue, Research booklet



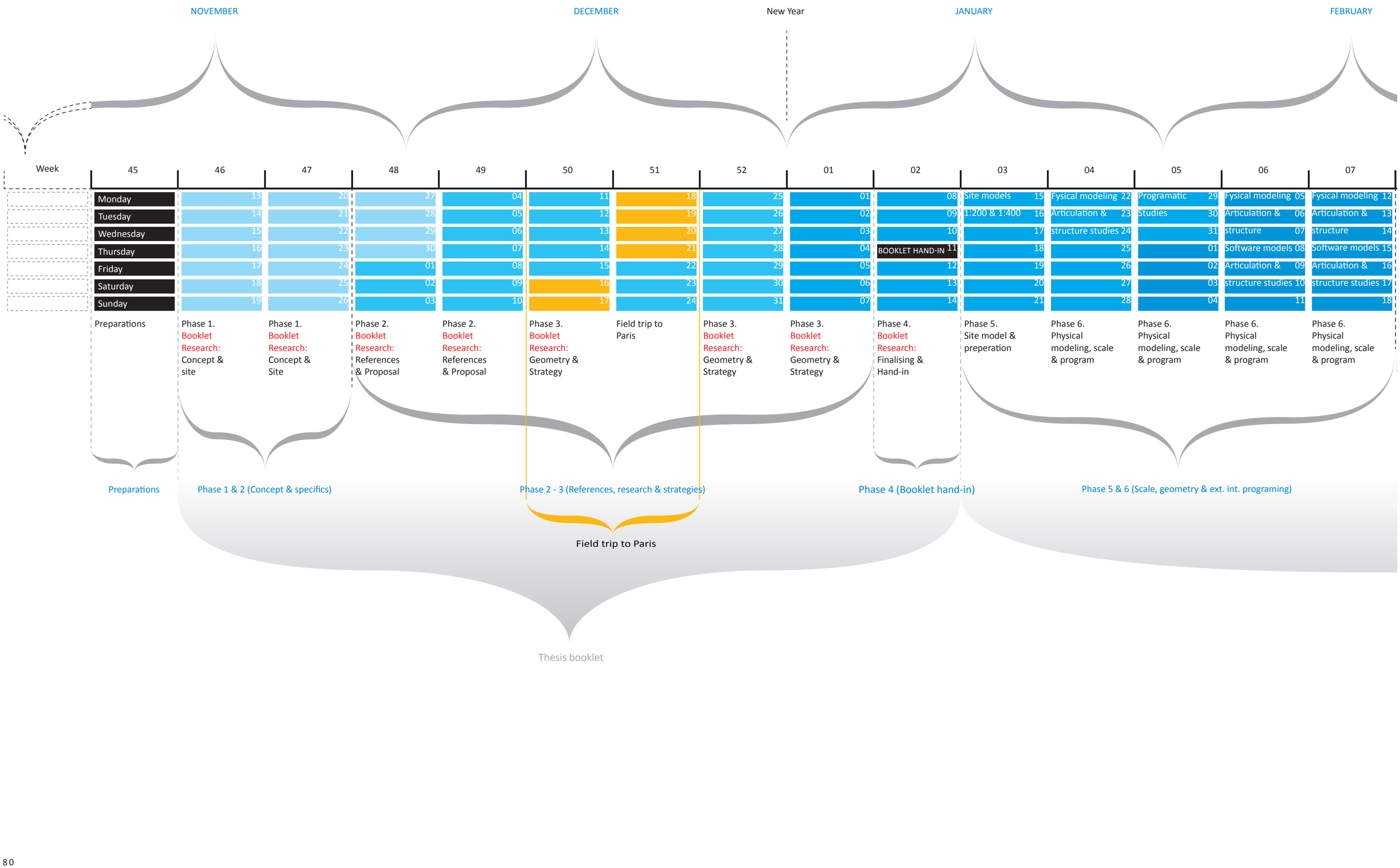
Presentation boards A0



Physical models



Software models & animations


NOVEMBER
DECEMBER
New Year
JANUARY
FEBRUARY
Week
45 46 47 48 49 50 51 52 01 02 03 04 05 06 07
Monday 13 20 27 04 11 18 25 01 08 15 22 29 05 12
Tuesday 14 21 28 05 12 19 26 02 09 16 23 30 06 13
Wednesday 15 22 29 06 13 20 27 03 10 17 24 31 07 14
Thursday 16 23 30 07 14 21 28 04 BOOKLET HAND-IN 11 18 25 01 08 15
Friday 17 24 01 08 15 22 29 05 12 19 26 02 09 16
Saturday 18 25 02 09 16 23 30 06 13 20 27 03 10 17
Sunday 19 26 03 10 17 24 31 07 14 21 28 04 11 18
Site models 1:200 & 1:400
Fysical modeling Articulation & structure studies
Programatic Studies
Fysical modeling Articulation & structure Software models Articulation & structure studies
Fysical modeling Articulation & structure Software models Articulation & structure studies
Preparations
Phase 1. Booklet Research: Concept & site
Phase 1. Booklet Research: Concept & Site
Phase 2. Booklet Research: References & Proposal
Phase 2. Booklet Research: References & Proposal
Phase 3. Booklet Research: Geometry & Strategy
Field trip to Paris
Phase 3. Booklet Research: Geometry & Strategy
Phase 3. Booklet Research: Geometry & Strategy
Phase 4. Booklet Research: Finalising & Hand-in
Phase 5. Site model & preperation
Phase 6. Physical modeling, scale & program
Phase 6. Physical modeling, scale & program
Phase 6. Physical modeling, scale & program
Phase 6. Physical modeling, scale & program
Preparations
Phase 1 & 2 (Concept & specifics)
Phase 2 - 3 (References, research & strategies)
Phase 4 (Booklet hand-in)
Phase 5 & 6 (Scale, geometry & ext. int. programing)
Field trip to Paris
Thesis booklet

TIME LINE

MARCH

APRIL

MAY

08	09	10	11	12	13	14	15	16	17	18	19	20	21	22
Fysical modeling 19	Fysical modeling 26	Drawings & 04	Drawings & 11	Finalising 18	Finalising 25	Finalising 01	Finalising 08	Drawings & 15	Drawings & 22	Drawings & 25	Drawings & 02	Drawings & 09	FINAL PRES. 11	18
Articulation & 20	Articulation & 27	diagrams 05	diagrams 12	Fysical models 19	Fysical models 26	Fysical models 02	Software models 09	explanatory 16	explanatory 23	explanatory 26	explanatory 03	explanatory 10	12	19
structure 21	structure 28	Preperation of 06	Preperation of 13	articulation & 20	articulation & 27	articulation & 03	Articulation & 10	MID CRIT 2 17	diagrams 24	diagrams 27	details & 04	details & 11	13	20
Software models 22	Software models 29	presentation 07	presentation 14	structure 21	structure 28	structure 04	structure 11	plans 18	plans 25	plans 28	presentation 05	presentation 12	14	21
Articulation & 23	Articulation & 01	08	15	MID CRIT 1 22	Software models 29	Software models 05	12	sections 19	sections 26	sections 29	06	13	15	22
structure studies 24	structure studies 02	09	16	Articulation & 23	Articulation & 30	Articulation & 06	13	axanometrics 20	axanometrics 27	axanometrics 30	07	14	16	23
25	03	10	17	structure 24	structure 31	structure 07	14	etc 21	etc 28	etc 01	08	10	17	PUBLIC PRES. 24
Phase 7. Physical modeling, digital modeling scale & program	Phase 7. Physical modeling, digital modeling scale & program	Phase 7. Preperations mid crit.	Phase 7. Preperations mid crit.	MID CRITIQUE 1	Phase 8. Finalising physical modeling, digital modeling scale & program	Phase 8. Finalising physical modeling, digital modeling scale & program	Phase 9. Detailing, systems & program	MID CITIQUE 2 Phase 9. Detailing, systems & program	Phase 9. Detailing, systems & program	Phase 10. Finalising project	Phase 10. Finalising project	Phase 10. Finalising project & presentation	Final presentation with examinator & jury: Morten Lund, Daniel Norell, John Ross & Anna Nilson. Preparation for public presentation	Public presentation & exhibition

Phase 7 (Digital modeling ext. int. programing)

MID CRITIQUE 1

MID CRITIQUE 2

Phase 8 - 10 (Detailing & finalising project)

Final presentation

Public presentation & exhibition

Thesis project

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