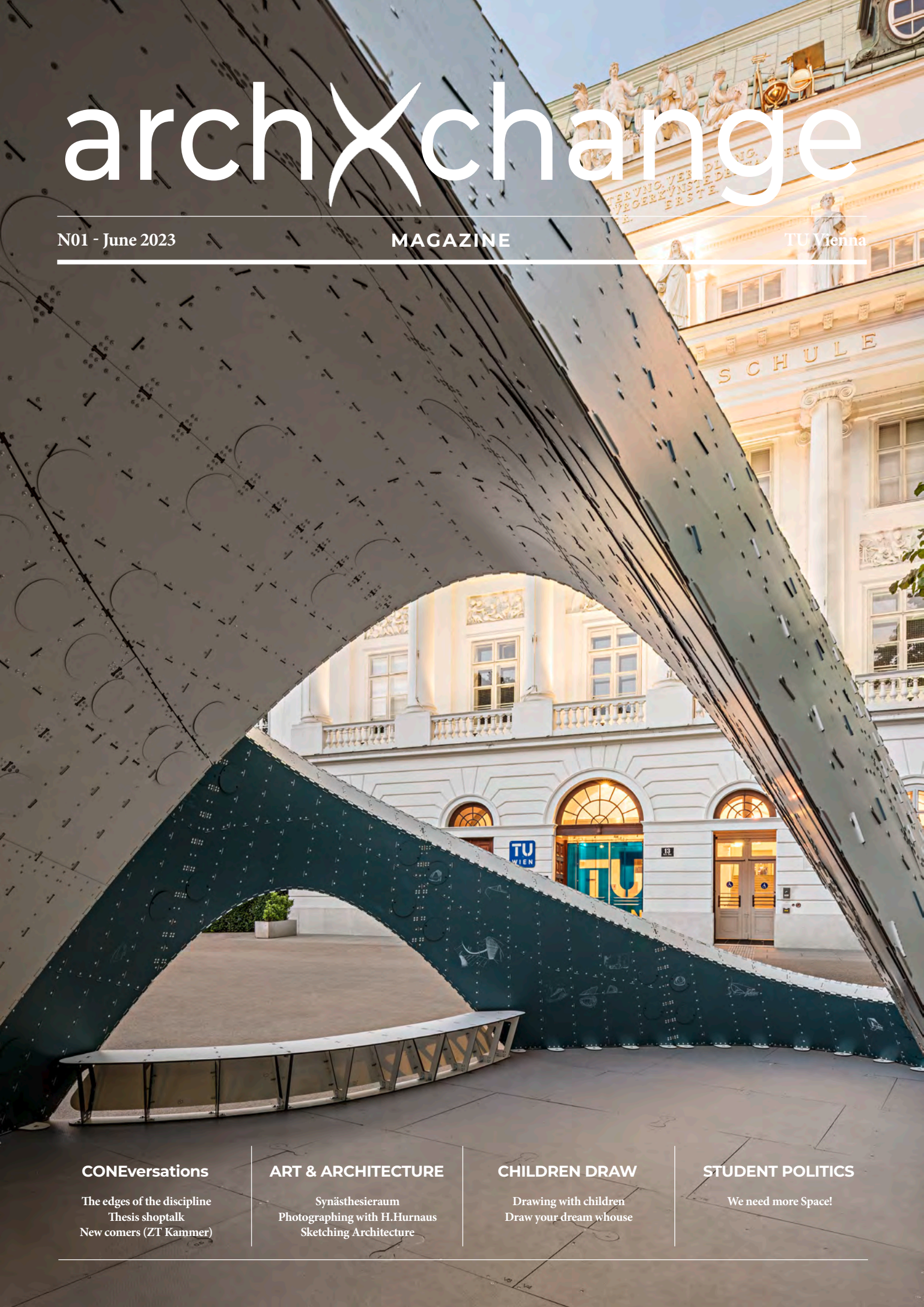
archXchange

N01 - June 2023 MAGAZINE TU Vienna



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We need more Space!

Impressum
archXchange

Published by
TU Wien
Institute of Architecture and Design
Department of Building Construction and Design 2 E 253/5

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Cover:
Photography by Herta Hurnaus
Design by Alena

Edition No. 1, Revision 2, Published June 2023

Sponsored by:
Fundermax

With the support of:
KOGLER Gerüstbau GmbH
WERK IMPULS
Architekturzentrum Wien
Hochschülerinnen- und Hochschülerschaft an der TU Wien
Institut für Tragwerksplanung und Ingenieurholzbau
Institut für Architektur und Entwerfen Forschungsbereich Hochbau

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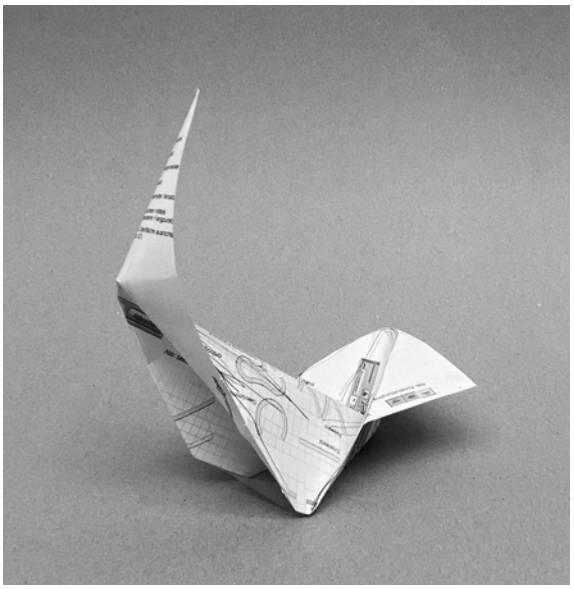
DESIGN CONCEPT

The archXchange project is a discussion platform in the public space by architecture students who want to discuss questions about architecture. The structure becomes a podium, a meeting point, an interface between TU students and the interested public on the Karlsplatz in front of the TU Vienna. The partial roof creates a place where discussions can be held in public that deal with design activism and general questions in architecture.

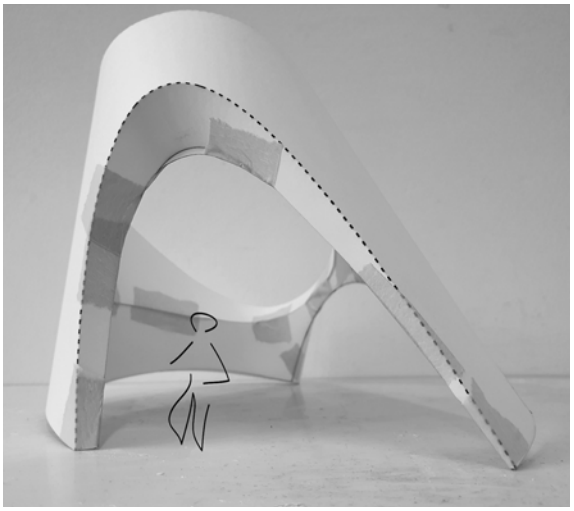
The project is the result of a cooperation between the Research Department Structural Engineering 2 of the TU Vienna and the company Fundermax. The pavilion is intended to express how architects can address issues of sustainability through new approaches to building systems. The 40m² project is a prototype that shows how geometry in combination with digital fabrication can lead to very light constructions. The construction was made with HPL panels from Fundermax, which were assembled into lightweight building elements that can be carried by small teams.

The project was based on this initial studio brief:
This course deals with the question of how to use methods to design a small architectural project. Beyond the design, we deal with sustainability conceptually by addressing embodied energy thematically and visualising it in the context of a small project. Students will make study models and prototypes during several workshops and address problems in digital fabrication. We will collectively agree on a design and then build it. The aim is to prepare a feasible design and construct it in spring together with Fundermax at Karlsplatz. Paper and cardboard models will be made with laser cutters. Knowledge in Rhino3d is recommended, in Grasshopper advantageous.



Conceptual sketch model

A printed piece of paper folded into a 3d structure operates as public screen that gets reset every day.



Spatial sketch model

The folding of the surface creates a series of cone patches that are used to create a double shell structure. The space is structured by a partial roof, a generous opening and an area with a bench.

An architectural surface as display

The project creates a public space for conversations and exchanges of ideas in architecture. The Programing organized by the students includes interested passersby, students and children who can comment on questions about architecture.

CONEversations

THESIS SHOPTALK WITH OLIVER SCHÜRER AND CHRISTOPH MÜLLER

Unser Thesis Shoptalk mit Oliver Schürer und Christoph Müller fing mit einer kleinen Vorstellungsrunde an. Dabei zeigte sich, dass O. Schürer ein Vertreter der theoretischen Architektur ist und C.Müller einer, der praktischen Architektur. Beide Professoren sagen allerdings es gibt keine Grenzen zwischen praktischer und theoretischer Architektur. Es gäbe eher einen fließenden Übergang der widerum auch subjektiv definiert wird.

Wir haben ein langes Gespräch über konzeptionelle Ideen und praktische Herangehensweisen geführt, ebenso haben wir viele Tipps bekommen, wie wir unser Studium auf gutem Wege beenden könnten.

Von dem Gespräch haben wir mitgenommen, dass es wichtig ist eine emotionale Ebene zu erreichen, mit der man sich immer wieder motivieren kann, dass Diplom abzuschließen. Ebenso sollten wir vielleicht eher die kommerziellen Aspekte in den Hintergrund stellen und unsere wahren Interessen in den Vordergrund stellen.

POST-WAR RECONSTRUCTION AND CONTESTED HERITAGE WITH WITH MMAG.A DR.IN TECH. BIRGIT KNAUER

SOFIYA LUKYANCHENKO, BLANCA DÍEZ CRUZ AND HAZAL SARIKAYA

Students of the University of Vienna had a short interview and discussion with Birgit Knauer, MMag. Dr.techn. Birgit Knauer studied art history and romance studies at the University of Vienna. Afterward, she was an assistant at the Chair of Heritage Conservation and Building in Existing Fabric at TU Wien and finished her Ph.D. in 2018. From 2020-2021, research assistant at Otto-Friedrich-Universität Bamberg. Since 2020 she has been researching and teaching at the Chair of Heritage Conservation and Building in Existing Fabric at TU Wien, focusing on the architecture of post-war modernism in Austria and the discourse and practice of urban planning and preservation in the 20th century. Ongoing project on reconstruction of historic city centres in Austria during and after the Second World War.

This conversation focused on postwar architecture, which is uncomfortable because of its political and historical background. How can we perceive communist architecture today? How can we evaluate this architecture and work with it? Should we protect this architecture as an example of history or demolish it and build new residential areas? These questions have long been facing the architectural community. Still, it can be challenging to find a solution that everyone would support because each architect evaluates such controversial architecture through their prism of values. That is why it isn't easy to find a compromise. After the Second World War, Germany, Austria, Spain, and Europe as a whole went through a process of recovery and reconstruction, and this is an experience that we could use to accelerate the recovery of countries such as Ukraine, Iraq, Syria, and Israel. We, as students, decided to discuss these issues with Birgit Knauer.

Blanca: There are certain monuments or certain styles of architecture, such as communist architecture, that adhere to a certain ideology. It is an artistic style that is tied to the times, but the difficult question is how do we deal with buildings that are specifically designed to honor a certain person who may be a problematic historical figure?

Birgit: This exciting question has been widely discussed for many years, even decades. Let's think of the buildings of the National Socialist era that survived the war. Understandably, these buildings represent a challenge, and one would like to remove them. On the other hand, these buildings are also a way of remembering these difficult parts of our history. When something disappears, it is more easily forgotten. The architecture of National Socialism, which has been discussed for many decades, is still preserved and shows what happened. It makes history more tangible, even if it is challenging to deal with it. One can discuss how to preserve these buildings and give them a new purpose that benefits society. The sites can be preserved as memorials and, at the same time, reinterpreted to give society space for different uses. It is important to show younger generations what happened so that it is not forgotten.

Sofiya: : I did a little bit of work on the Tempelhof in Berlin, and I can understand the problematic nature of such architecture. In Germany, there is now an understanding of how to restore and renovate buildings of such styles as Baroque, Renaissance, etc... Still, with such awkward architecture as the National Socialist one, there is no easy solution. And when we, as students, sit and study many theories about architectural preservation, and experts in this field come and say that there is no specific solution because each expert perceives the values of preservation differently, for me, as a student, it sounds like "I don't know" or "I can't find a solution." Today, many experts and architects have long argued about the awkward political architecture that delays decision-making and the search for answers to such questions: How can we use uncomfortable architecture because of its political and historical background today? How can we unite architects with different values?

Birgit: Yes, it is difficult. There is no recipe, no solution that works in every historic building. You always have to start from scratch and first understand the structure and history of the building. You have to weigh what is to be preserved and whether the new use or function is sensible and appropriate. You have to question the significance of the building and weigh up how far you can interfere with the historical substance in the respective area of the building. Discussing different solutions and determining what is more important is an exciting challenge. There is no clear answer to how far one can go. There are always different possibilities, but it is essential to consider which values and qualities of the existing building should be preserved. It requires constant discussion and different points of view to find an objective and reasonable solution.

Hazal: I wanted to ask how we can value historical buildings, whether we should keep them and preserve them or tear them down. Maybe I can give an example. There is the 23rd district on Kastenstrasse. There is an old industrial building with light wooden rafters. Is it worth keeping an re-using?

Birgit: In recent years, the issue of sustainability has become increasingly important. For this reason alone, preservation should be considered. But only some historic buildings are monuments with an exceptionally high value. One has to weigh up whether it is worth preserving or not. Various criteria make a building a monument, such as its historical, cultural, or artistic significance. It can also be the significance of a specific event in a building. Creative solutions can be found to highlight this history. It is important to discuss things and consider different solutions. It is a complex task, but there are ways to preserve historical structures and find new uses simultaneously.

Sofiya: We have a provocative question. What should be done about The Motherland Monument, Ukraine? Many want to forget about this huge complex and take it down, but others say, "No, it's better to keep it. " Maybe it could be seen as a past Soviet symbol that can change into a Ukrainian symbol. Maybe its adaptive reuse could provide a new program for the general public.

Birgit: One could say that as long as there are discussions, a building is of value, namely, of public interest. It is difficult to answer this question definitively. I think there should be an open discussion. Ultimately, once a building is gone, it is lost. Because of the emotions surrounding war and destruction, it is understandable that people want to remove such buildings and monuments quickly. But it would be good to discuss these decisions and consider different solutions. Buildings can certainly be toppled. They can be removed. But they can also be overwritten or highlighted and interpreted differently through interventions and artistic stagings. Or one can draw attention to other perspectives of history. It is always challenging to take something away because sometimes there are also different perspectives on history. We don't have to leave things as they are. You can commemorate historical events in different ways, subtly, or you can be more offensive and use creative solutions to draw attention. But when it's gone, it's gone. And then it can't be corrected. It is lost, even if it is a difficult building or a complex object in a public space.

Sofiya: Does it make sense to completely reconstruct buildings damaged in a war? Which examples can you think of that we can learn from?

Birgit: After the Second World War ended, it took many years to come close to reconstruction. In the beginning, practical measures were taken to restore infrastructure and provide habitable housing, which were the most urgent needs. And that is entirely understandable and logical. But there were also identity-forming buildings that were rebuilt and restored early on. It was important for the population to regain these places and have a sense of renewal and normality. And yes, it was a long process, and many buildings stood as ruins for a long time. Sometimes it can be good to wait. Many creative and sound solutions were only implemented in the late 1950s, such as Hans Döllgast's solution for the Alte Pinakothek in Munich, which was rebuilt creatively. Not everything can be rebuilt immediately. Much was also additionally demolished at the time that could have been rebuilt. In urban planning, the destruction was also seen as an opportunity to implement radical plans to find new paths and axes, for example, from a traffic point of view. But many cities suffer today at the expense of the historic and dense cityscape.

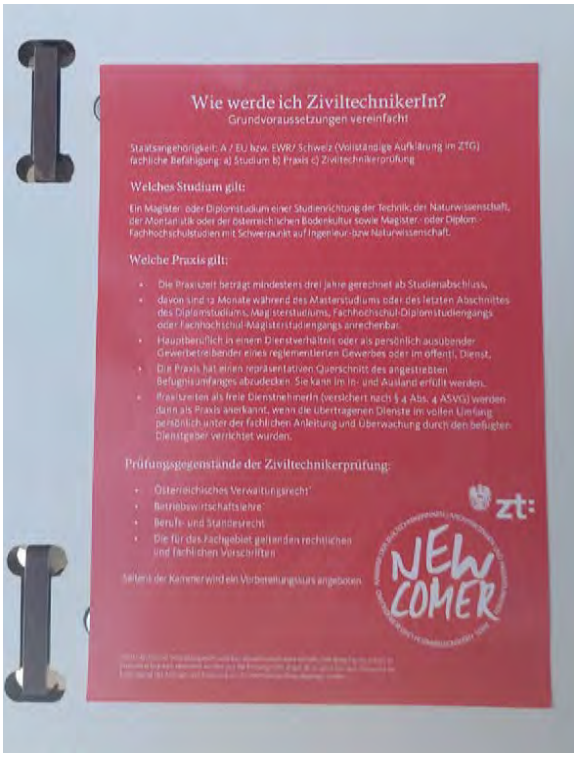
Sofiya: This is our last question. How do you think awareness of monument protection has changed over time?

Birgit: Yes, consciousness has changed. It has also evolved. The spectrum of values has not really changed, but they are weighted differently today. 100 years ago, when the Austrian Monument Protection Act was passed, it was mainly architecturally outstanding buildings that were worth protecting, today industrial architecture is also important and modest buildings, modest in their design, are also important, those that may not stand out as monuments at first glance. Many buildings are worth protecting because of their history, the events that took place, and not because of their architecture. The question of how to preserve it is becoming more and more important, as is the the question of public interest, for whom do we preserve what? There are also places of significance for minorities and migrants in Austria. So there is definitely a dynamic in the question of values. The arguments are not the same as they were 100 years ago.

TALKING SHOP WITH THE NEW COMERS OF THE ARCHITECTS CHAMBER [ZT KAMMER]

Die Newcomer waren bei uns zu Besuch und haben uns informiert über den Weg zur ZiviltechnikerIn. Laut Ziviltechnikergesetz (ZTG) ist die Befugnis eines Ziviltechnikers österreichischen Staatsbürgern oder Staatsangehörigen und deren Familienangehörigen eines Mitgliedsstaates der Europäischen Union oder eines Vertragsstaates des Europäischen Wirtschaftsraumes oder Staatsangehörigen der Schweizerischen Eidgenossenschaft oder den durch sonstige zwischenstaatliche Vereinbarungen den österreichischen Staatsbürger(inne)n gleichgestellten Personen zu verleihen, wenn die für die Ausübung erforderliche fachliche Befähigung nachgewiesen wurde und kein Ausschließungsgrund vorliegt.

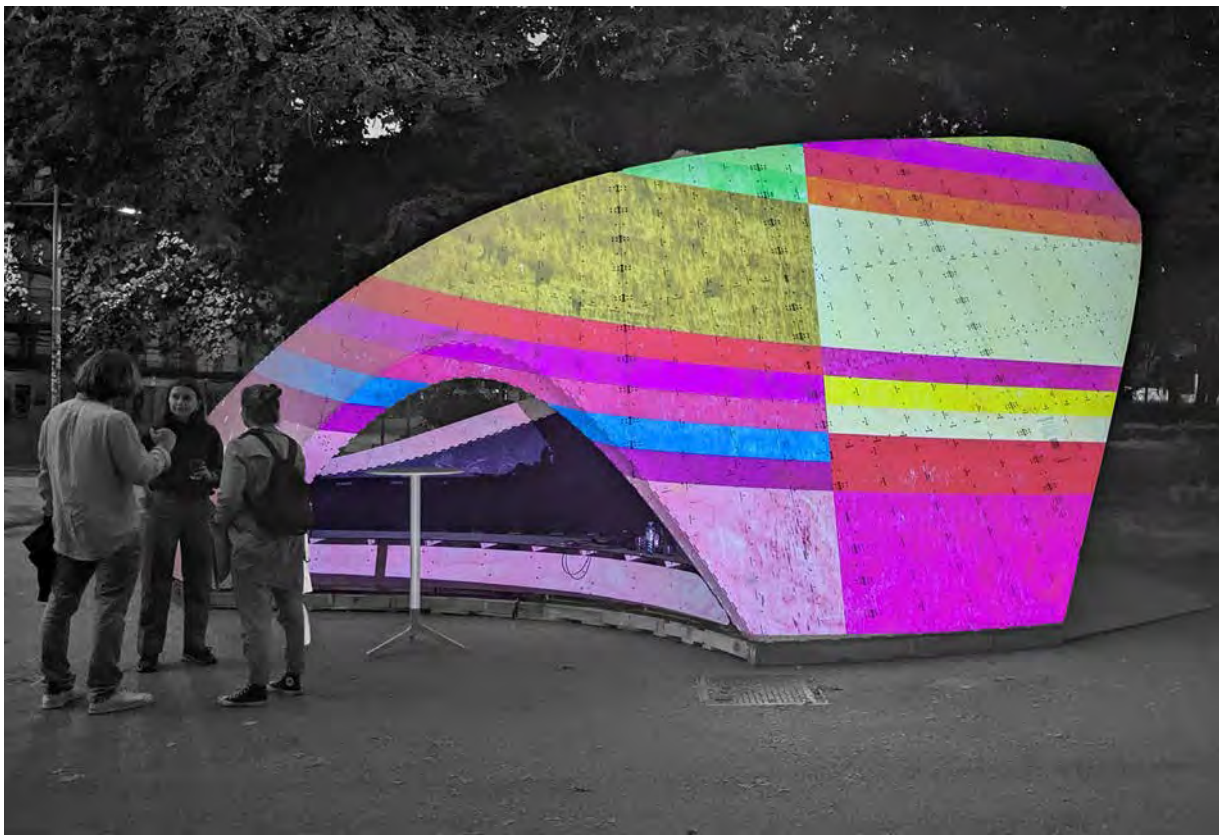
Die fachliche Befähigung ist laut ZTG nachzuweisen durch
- die Absolvierung des der angestrebten Befugnis entsprechenden Studiums,
- praktische Betätigung und
- die erfolgreiche Ablegung der Ziviltechnikerprüfung.



ART & ARCHITECTURE

SYNÄSTHESIERAUM

The Nitsch Foundation explores with another exhibition the ideas of synaesthesia in the Orgies Mysteries Theater and traces the meaning and significance of the interplay between the various sensory impressions in Hermann Nitsch's work.
The centerpiece is the installation "Synästhesieraum" created in 2016, a collaborative work by Hermann Nitsch and Frank Gassner, which invites visitors to a sensual audio-visual experience.
Frank Gassner is a freelance artist, from 1998-2010 personal assistant to Hermann Nitsch, working with video, photography and representational on the edge of the abstract. In 2005 he founded the self-managed workshop WERKIMPULS and is significantly involved in the implementation of the open bookcases in Vienna.



The extensive planning of Hermann Nitsch's artistic actions includes the creation of subterranean spatial sequences. These spaces are characterized in their ground plans by predominantly organic structures and often recall the colorful mesentery of an open body. Yet, like them, they are rarely arranged orthogonally. The happenings inside - the actions, the pulsating life - should also be readable from the outside. The "outside", however, remains hidden, as the spatial structures are conceived underground. Here, there is once again a descent into the depths of the human psyche and human history.
In the realizations and designs of his stage works in Zurich and Munich, Nitsch planned large-scale video projections whose organizing motif was always the rhythm of color scales and the staggering of color stripes. For an exhibition of his work at the Theatermuseum in Vienna in 2016, a room-sized video installation was designed by Frank Gassner that took synesthesia, a basic structure of the Orgien-Mysterien-Theater, as its theme. What is meant here is synesthesia of meaning, in which a perception in one sense creates a sense in another sense. The room has been presented and adapted several times in the context of Hermann Nitsch's work.On the 24th of June 2023 Frank Gassner transformed and made the ArchXchange Pavilion a part of his „Synesthesia Room" exhibition. The projection of an excerpt of the videos from the synesthesia room onto the organically shaped ArchXchange Pavilion picks up on themes from Hermann Nitsch's work, represents a formal extension of the possibilities of the temporary space, and also possesses a surprisingly captivating visual appeal.

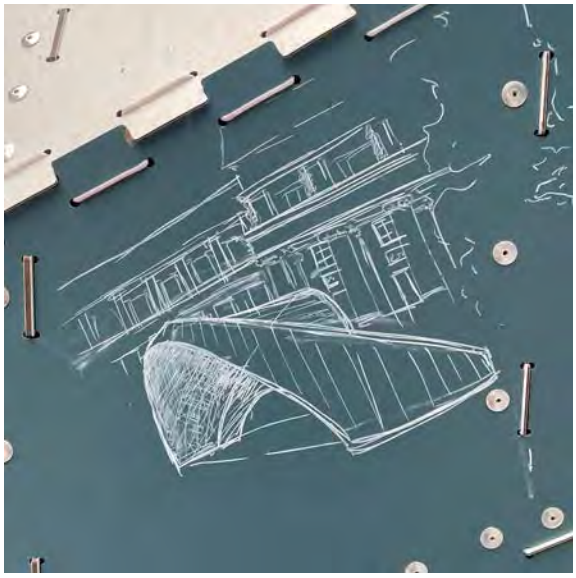
Text: Frank Gassner

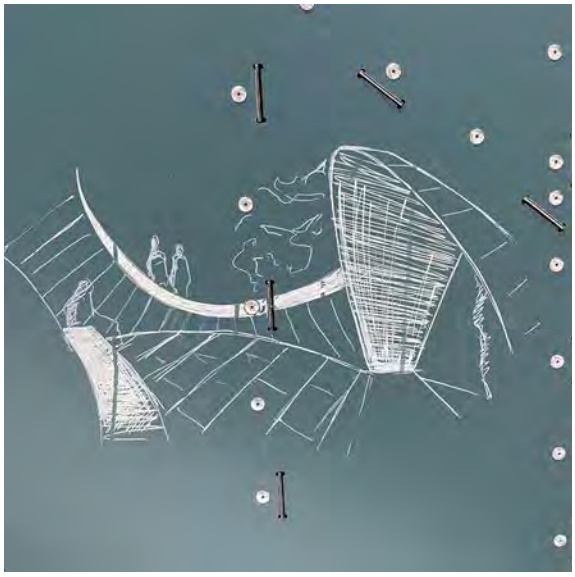
PHOTOGRAPHING WITH HERTA HURNAUS

Das Projekt wurde von Herta Hurnaus fotografisch festgehalten und in seiner Gesamtheit dokumentiert. Wir haben uns im Vorfeld überlegt zu welcher Tageszeit, man das Projekt am besten fotografieren kann und haben uns auf einen späten Nachmittag geeinigt. Herta Hurnaus hat sich zunächst auf den Gesamteindruck des Projekts konzentriert und uns dann, mit ein paar Details und Blickwinkeln überrascht. Wir danken ihr recht Herzlich für die tolle Zusammenarbeit.

SKETCHING WITH PROFESSOR VON-CHAMIER-GLISCZINSKI

Constructive Drawing is a weekly course offered at the University of Technology. In it, students are asked to approach a series of given locations through drawings, using perspectives and views. All drawings are then submitted in a collected form. Because of the shape of our pavilion, the collaboration was born. We and Daniel Chamier, who supervises the course, saw it as a challenge for the students to draw it. In the first step, the students had to draw the pavilion from the outside, and in the second step, they had to transfer this drawing to the inside of the pavilion in a sketchy manner using a white crayon. This resulted in about 30 drawings and 5 of them were selected.





CHILDREN DRAW

DRAW YOUR DREAM HOUSE

Die Klasse 1b der Volksschule am Karlsplatz in Wien kam zu uns auf Besuch und hat uns eine Sammlung von Traumhäusern hinterlassen. Frau Böck, die Lehrerin der Klasse, hat die Kinder auf die Aufgabe am Vortag vorbereitet und die Kinder haben dann in Gruppen ihre Entwürfe gezeichnet.

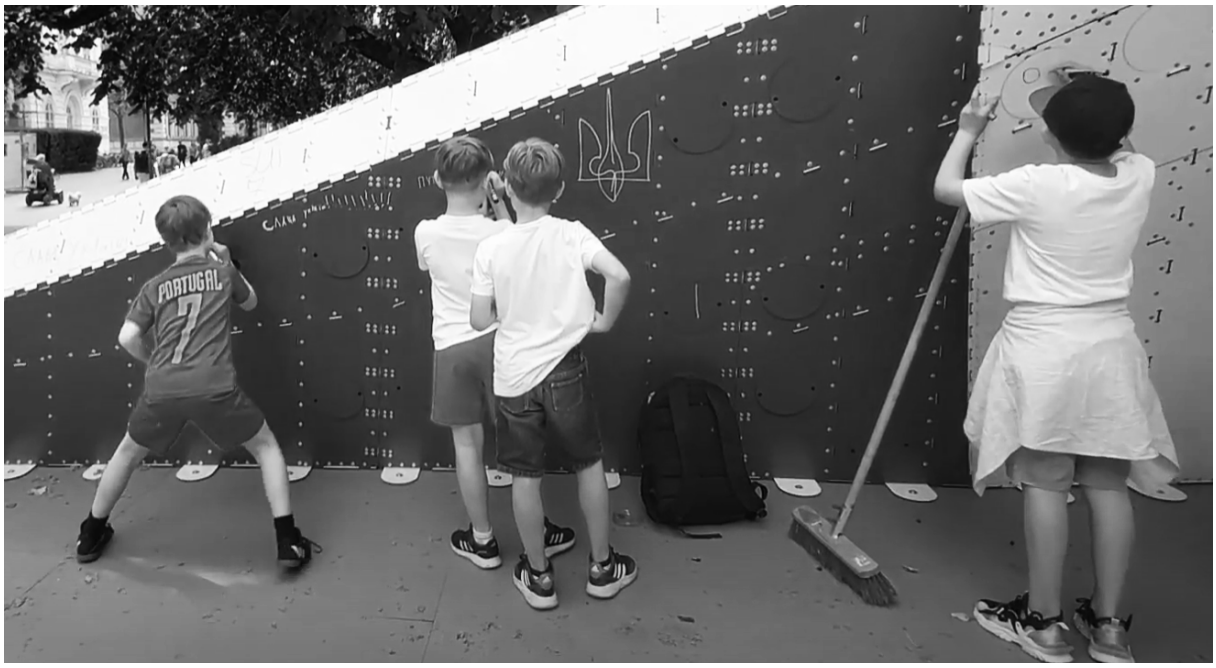
DRAWINGS FROM PLAST AUSTRIA

We held a small workshop for children who are scouts of the Ukrainian Plast organization.

"Plast" is a national scouting organization of Ukraine. The purpose of Plast is to promote comprehensive patriotic education and self-education of Ukrainian youth on the basis of Christian morality. As a non-political organization, Plast educates conscious and responsible citizens of the local, national and world communities, and leaders of Ukrainian society.

It was an interesting experience that showed that the pavilion can be used for active games among children and for small lectures about architecture. Children are usually very active and therefore they tried to climb on the structure of the pavilion and manipulate the small building parts of the pavilion. Also, they were initially not very interested in the idea of painting on the walls and showing their ideas about the difference between a home in Austria and Ukraine until they tried. After that, they became fascinated with the idea and painting, and they painted nothing related to the subject, but what bothered them. There were many inscriptions in Ukrainian that related to war and politics, or simple drawings of fish, symbols and people. They argued among themselves who could draw better, so it looked like a competition among children. Also, the teacher who followed the children gave a small informative lecture about famous buildings in Vienna and architecture. The children wanted to play and draw more, so this lecture did not last.

After the workshop, the children's parents came and started asking questions about the pavilion and the technical university. In this way, the technical university was recognized among the Ukrainian community thanks to our workshops and programming at the pavilion.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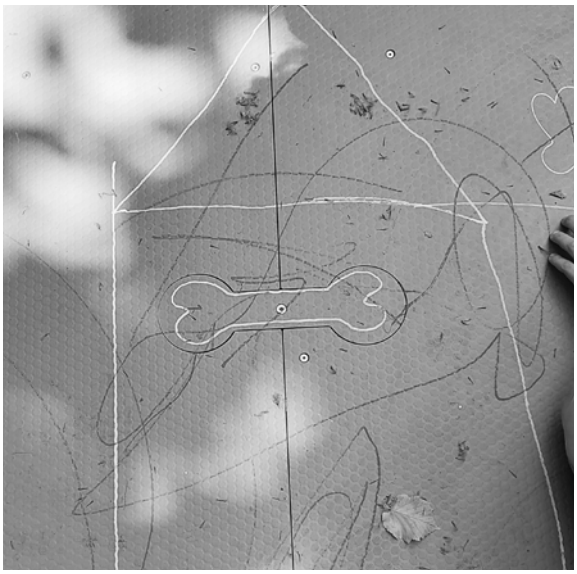
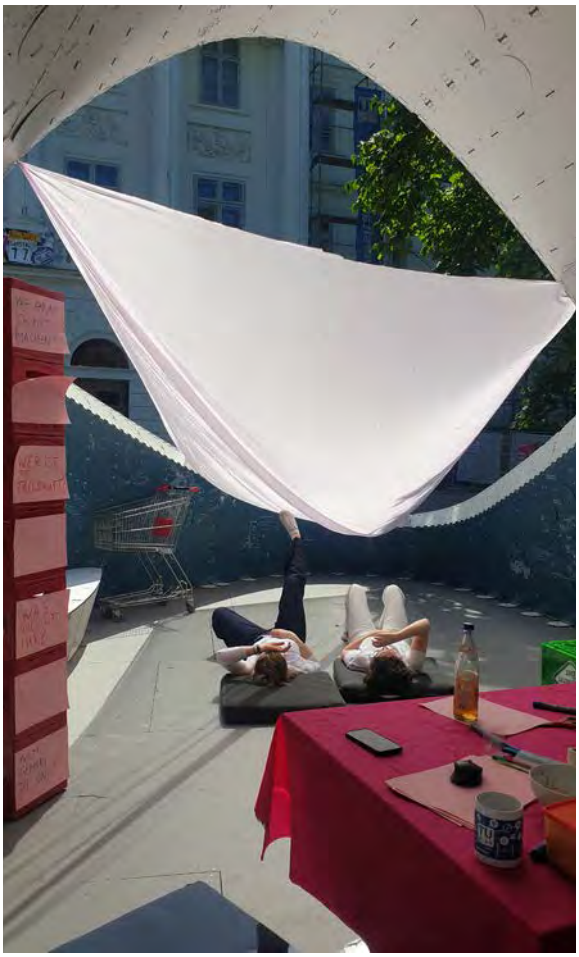


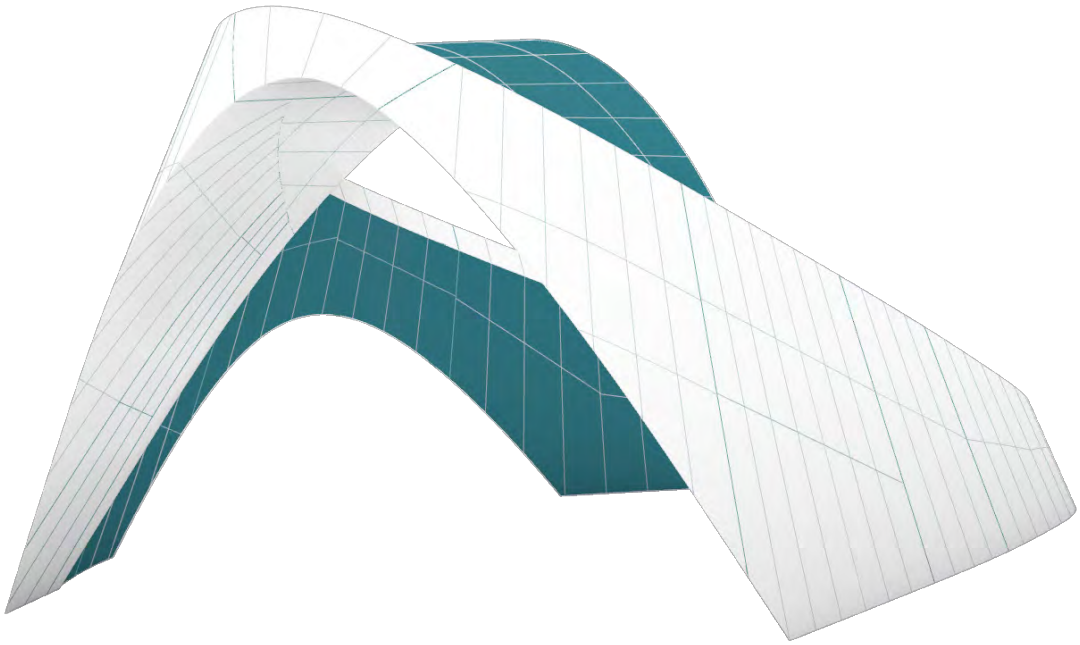
STUDENTS POLITICS

WE NEED MORE STUDIO SPACE!

For many years there has been a shortage of work and drawing space for architecture stuents, especially at TU Wien. Especially during the presentation phase at the end of the semester, it comes to overcrowded study rooms.
With our action 'Zeichensaal 0.1' we want to draw attention to this issue. WLAN, electricity, tables and good weather provided a pleasant working atmosphere. With our action we realized that it does not need much more to support students in their studies a little bit.

FACHSCHAFT ARCHITEKTUR @ ARCH**X**CHANGE



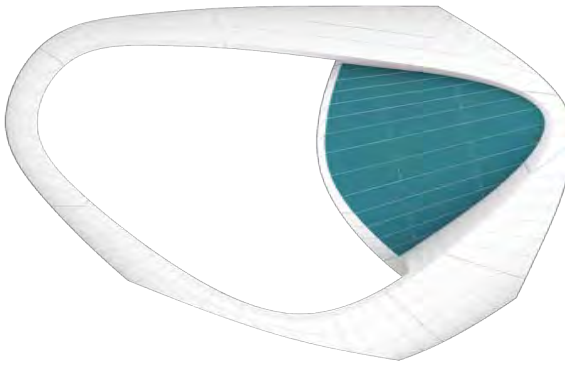


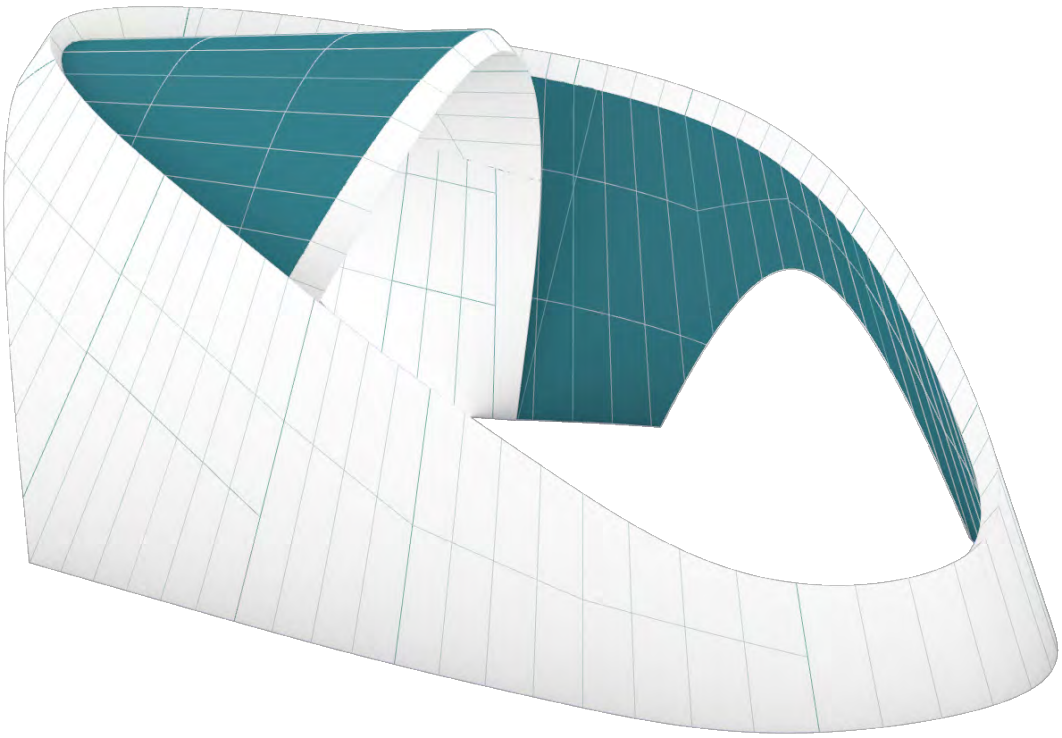
DESIGN

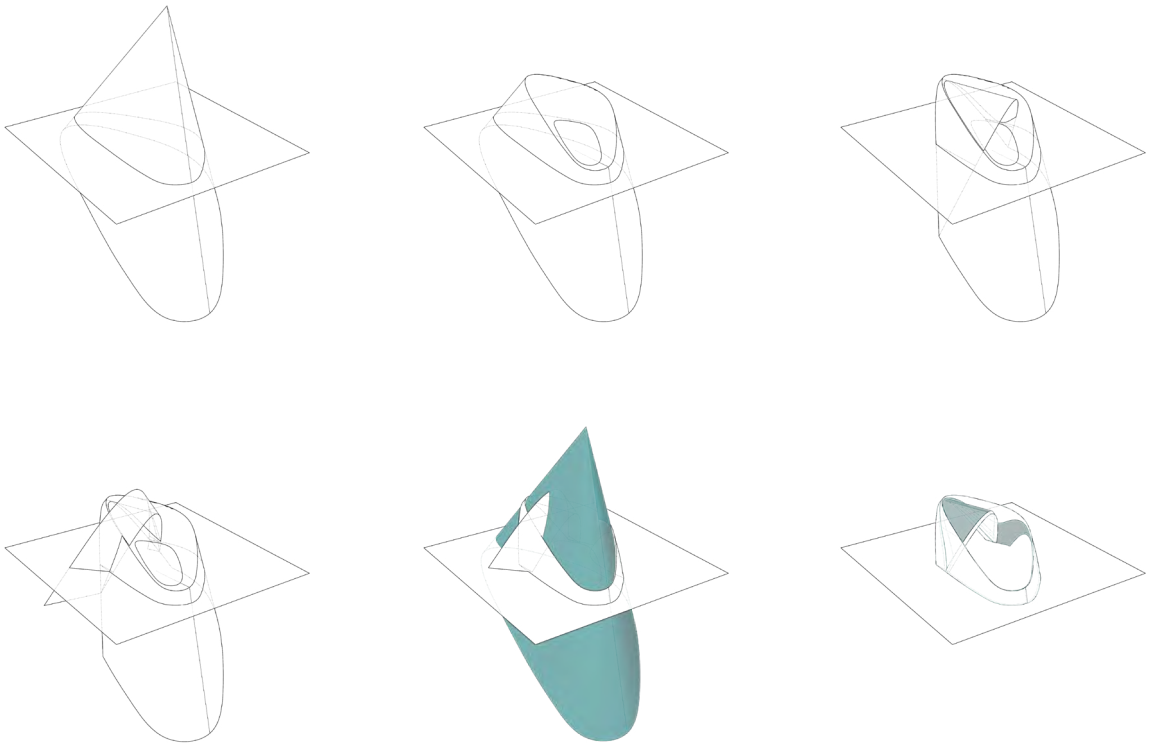
FOLDING GEOMETRY

The basic premise of this project - geometrically speaking - is based on developable surfaces. These consist of the plane, cylinders, cones and tangent surfaces. In our case we focused on conical patches and used curved creasing as a method to design the project. Given a general cone one can create a folded edge by intersecting the patch with a plane and subsequently mirror-reflecting the cut off part along the intersecting plane.

The necessary individual steps to create the form of the project are illustrated in the diagrams on the next page. Each step consists of a cut and mirror action.



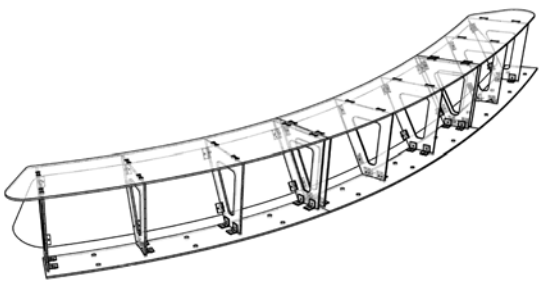


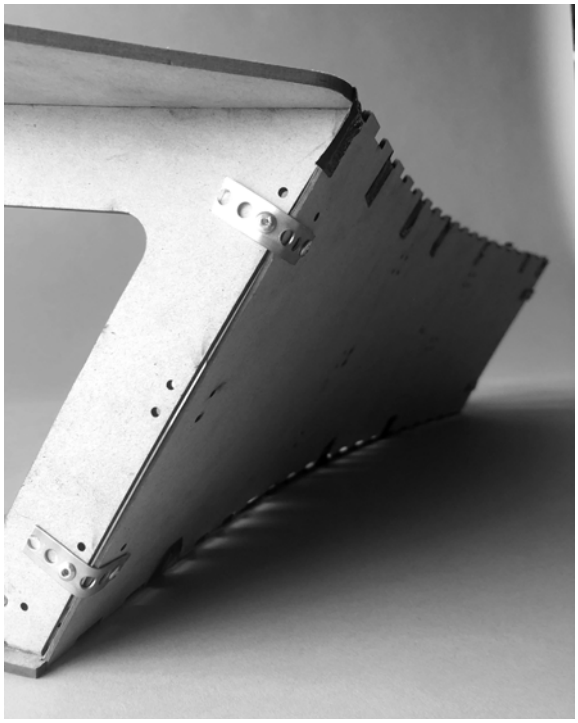


BENCH DESIGN

PROTOTYPES

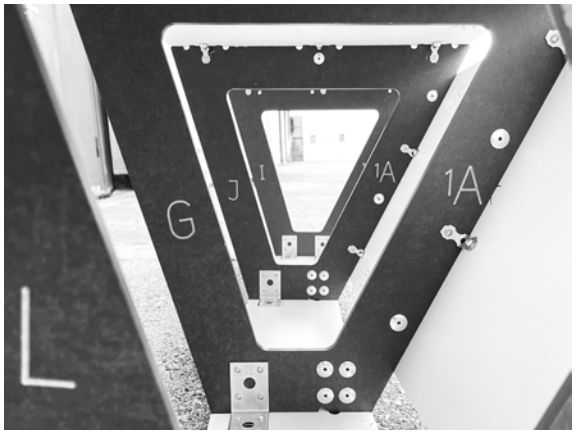
Instead of adopting standard details, several mock-ups with different connection details were built. These mock-up models were made out of gray board, on which many connection alternatives such as interlocking, stitching, riveting, etc. were tested. For the final version, the connection involving riveting/bolting with the help of L-brackets and flat washers.

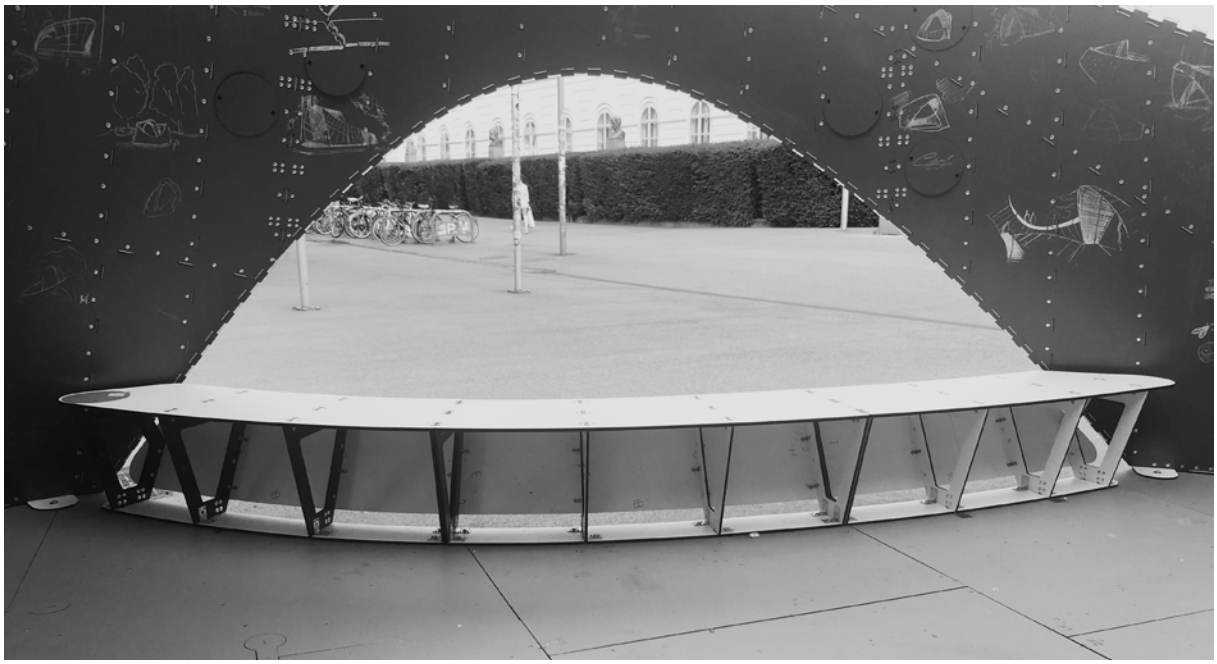




For the wall-opening, a bench was designed for the guests as a resting spot. In comparison to the usual chairs that were used during the events it provides a resting corner, that is accesible from inside and outside of the structure. It creates a visual barrier between in and out.

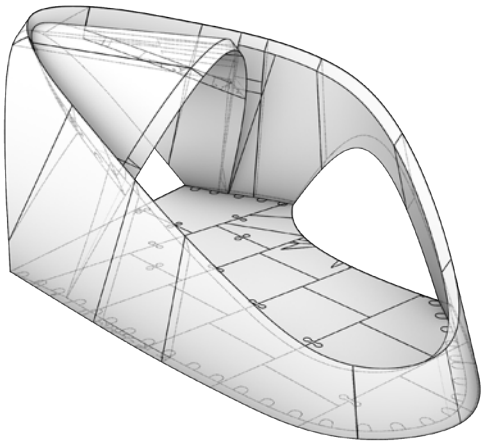
The bench is designed with the same creative principles of the main structure in mind. The “carved out” concave form is the reflection of the geometric operations that were used to achieve the final form of the pavilion. Just like the main structure, the bench is made out modules, which are connected to each other with threaded bolts. For each module, a board is riveted on the structural ribs to protect them and to reinforce the bench against shear force and torsion. The plates for the seat are both glued and bolted on the structural ribs to give it extra protection. All of the modules have one base plate each, which are bolted on the platform. This gives the bench enough stability to withstand weight of 7 people.



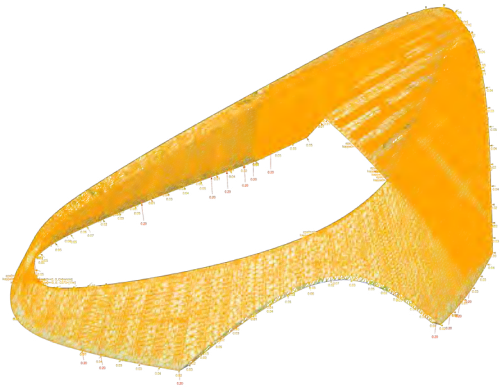


STRUCTURAL ANALYSIS

WITH UNIV.PROF. DIPL.-ING. PETER BAUER
AND MARTIN POSPICHAL , SOFIYA LUKYANCHENKO



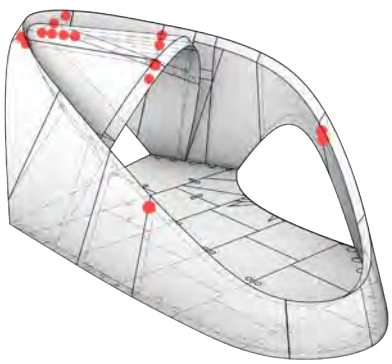
Early in the design process we analysed monocoque structures. According to these findings, we decided to build a sandwich double shell connected via frames. The frames allowed us to reinforce and segment the design, almost like rods in a tipi. Nevertheless the inner and outer shell is loadbearing. This allows us to use a 2 mm thin material on the surface and a thicker (4 mm) on the frame.
The connection and transfer of loads is made via teeth and brackets.

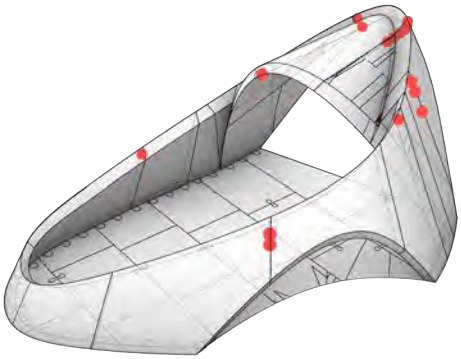


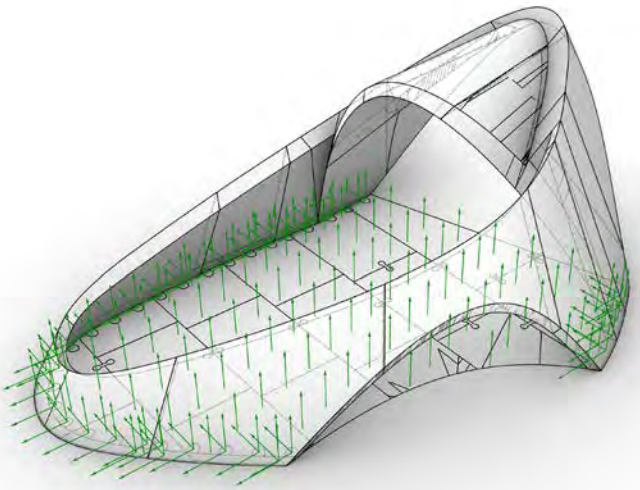
After careful consideration and consultation with Univ.Prof DI Peter Bauer we decided to calculate the ultimate limit state (ULS) to withstand wind loads up to 75 km/h. This allows us to monitor the weather forecast and apply a safety strategy (eg. adding supports, closing the pavilion).

In the first rough calculation we calculated a rivet spacing of 10 cm. During the detailed calculation we found that certain areas needed to be reinforced. Thus we integrated thicker frames at the stress points and reduced the distance between the module/module brackets.

We also calculated the initial stress according to bending in respect to the minimum tolerable bending radius of 40 cm, as discussed with Univ.Prof. DI Peter Bauer.

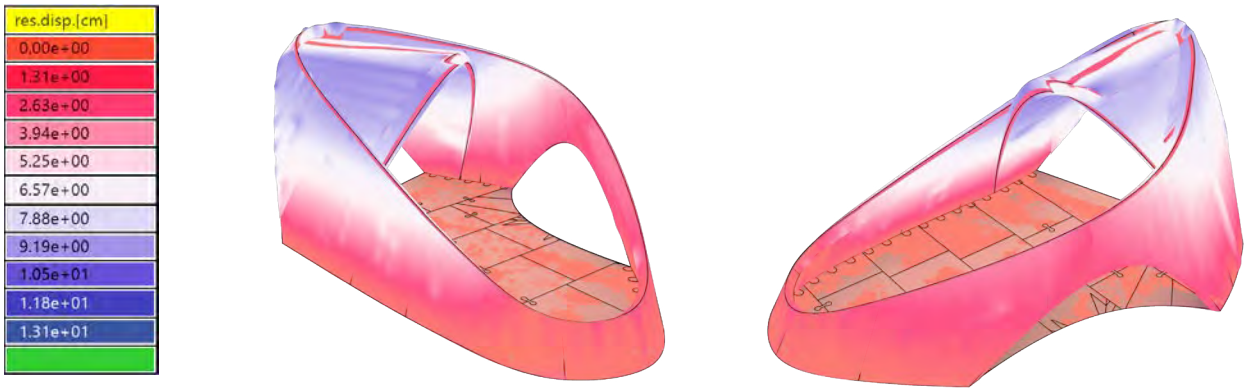




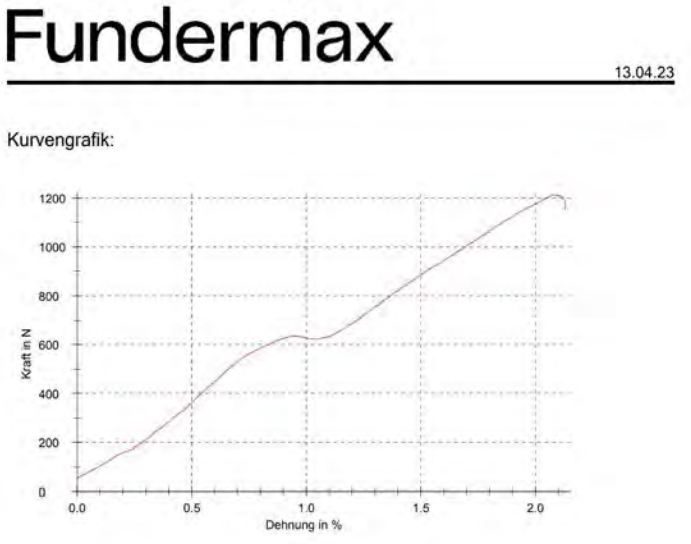


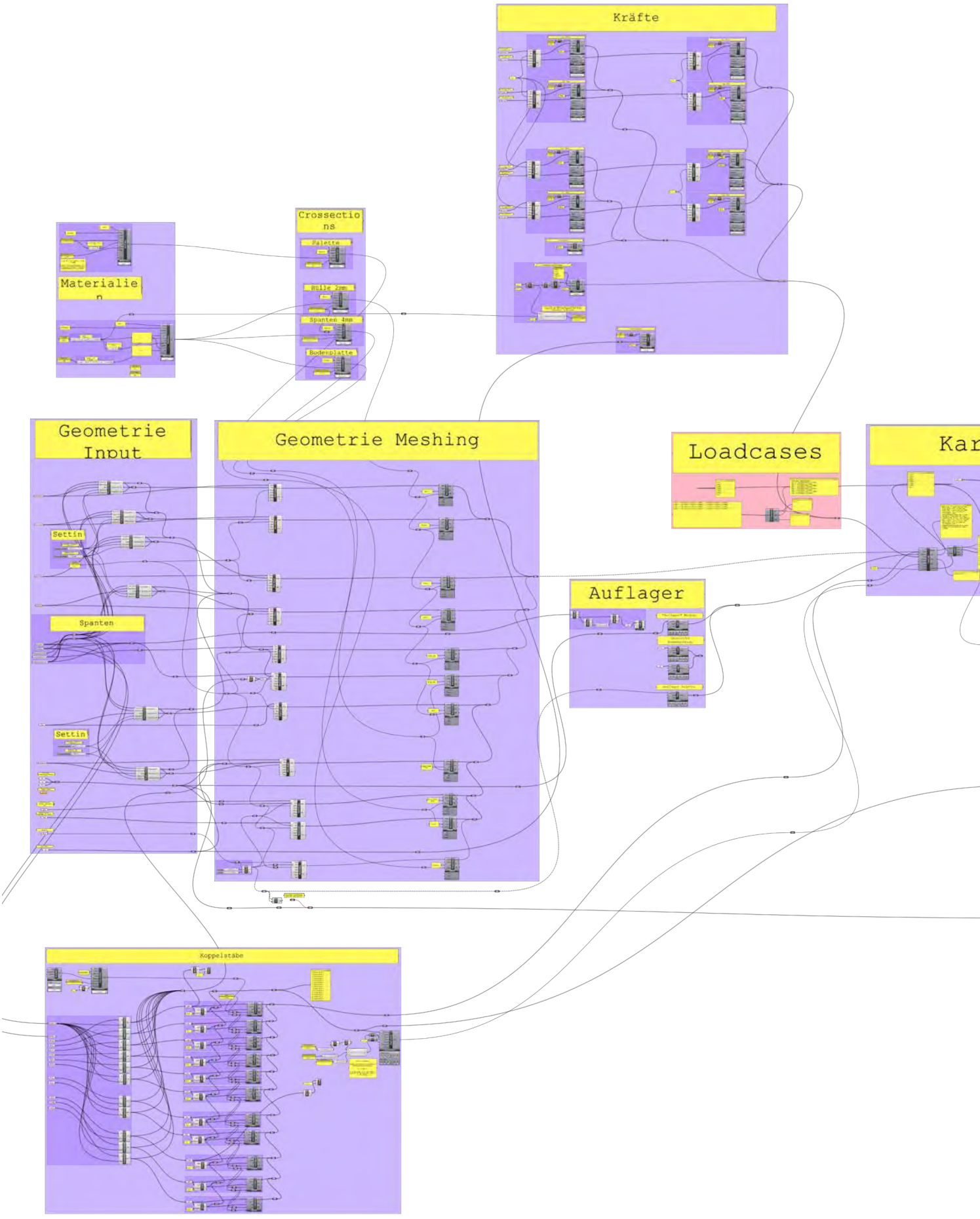
We also calculated the initial stress according to bending in respect to the minimum tolerable bending radius of 40 cm, as discussed with Univ.Prof. DI Peter Bauer.

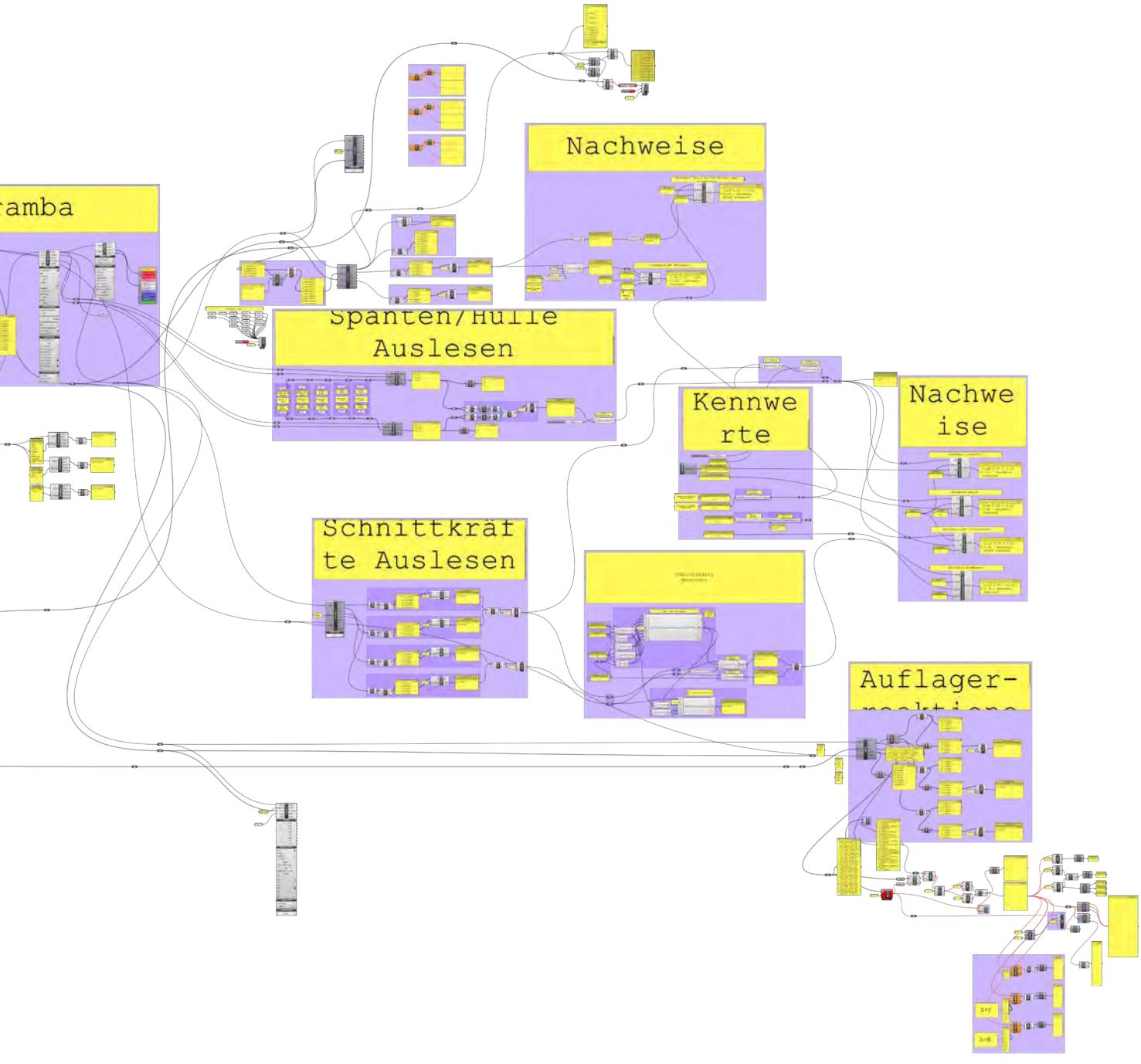
Then we analysed the model according to its deformation induced by wind and gravity.
At first we had only the modules in the FEM-Analysis and according to their weight of appr. 400 kg the would have "flown away". Thus we thought to add weights. After we prepared the foundation (palettes and flooring) we realised that these were so heavy (palettes appr. 300 kg and flooring appr. 700 kg) that we needed to integrate these into our FEM-Simulation. Thus we designed additional rounded joints to fasten the modules to the foundation and flooring. With these measurements we sucessfully avoided additional weights, and could prove that the pavilion will not be displaced by wind load.



At Fundermax we tested our joints in their Material testing machine. According to these results it was clear that each fixation bracket will support 0,5 kN. As a result of the setup of the experiment it was shown that the steel brackets between the modules can support much more.

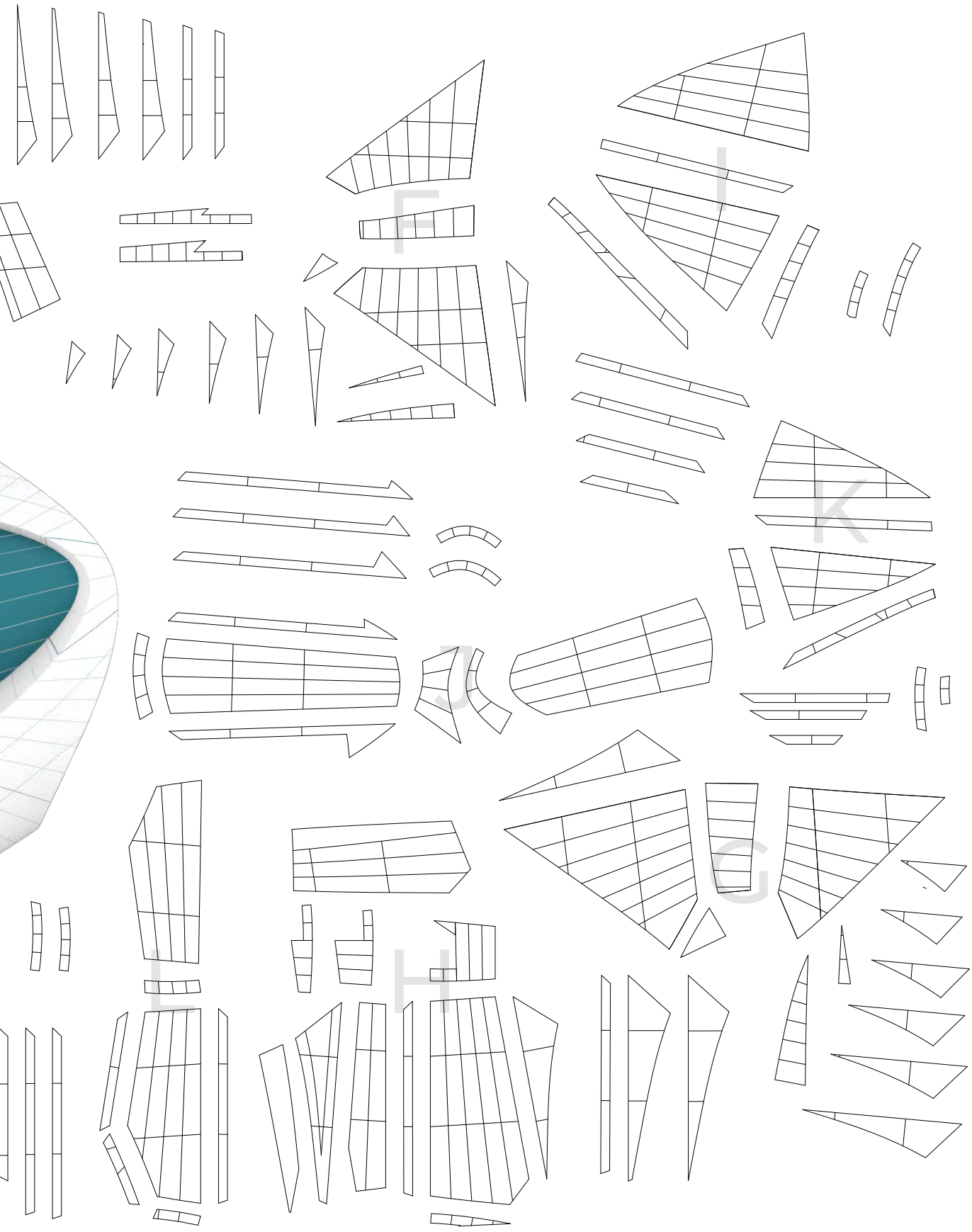



Kräfte
Crossectio
ns
Palette
Rülle 2mm
Spanten 4mm
Bodenplatte
Materialie
n
Geometrie
Input
Settin
Spanten
Settin
Geometrie Meshing
Loadcases
Auflager
Kar
Koppelstäbe

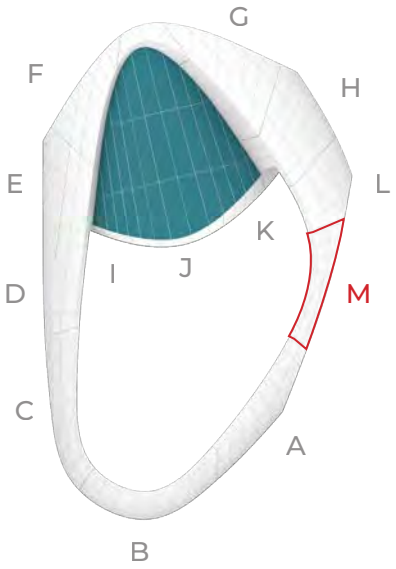

Nachweise
Spanten/Hülle Auslesen
Kennwe rte
Nachwe ise
Schnittkräf te Auslesen
Auflager-

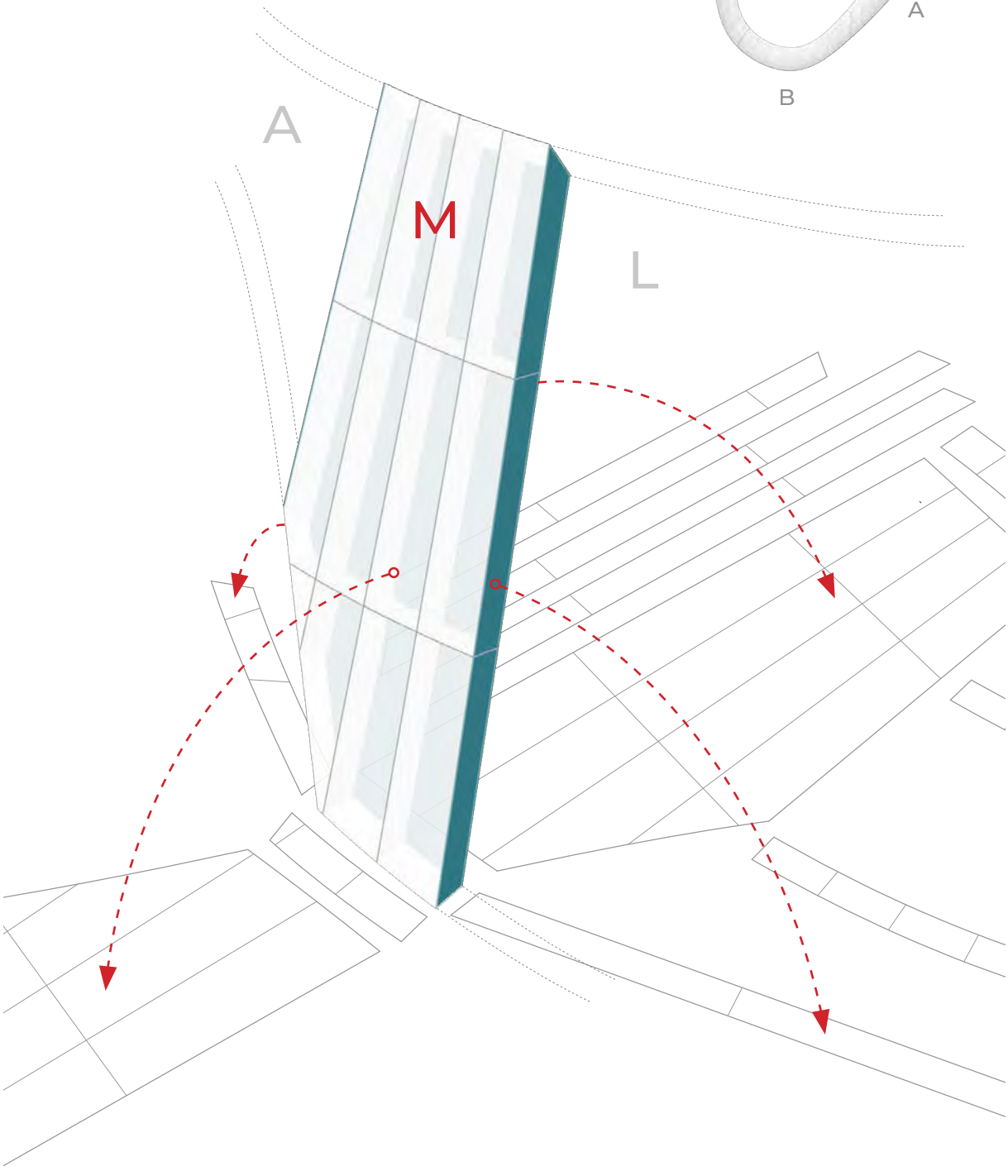
UNFOLDING 3D TO 2D

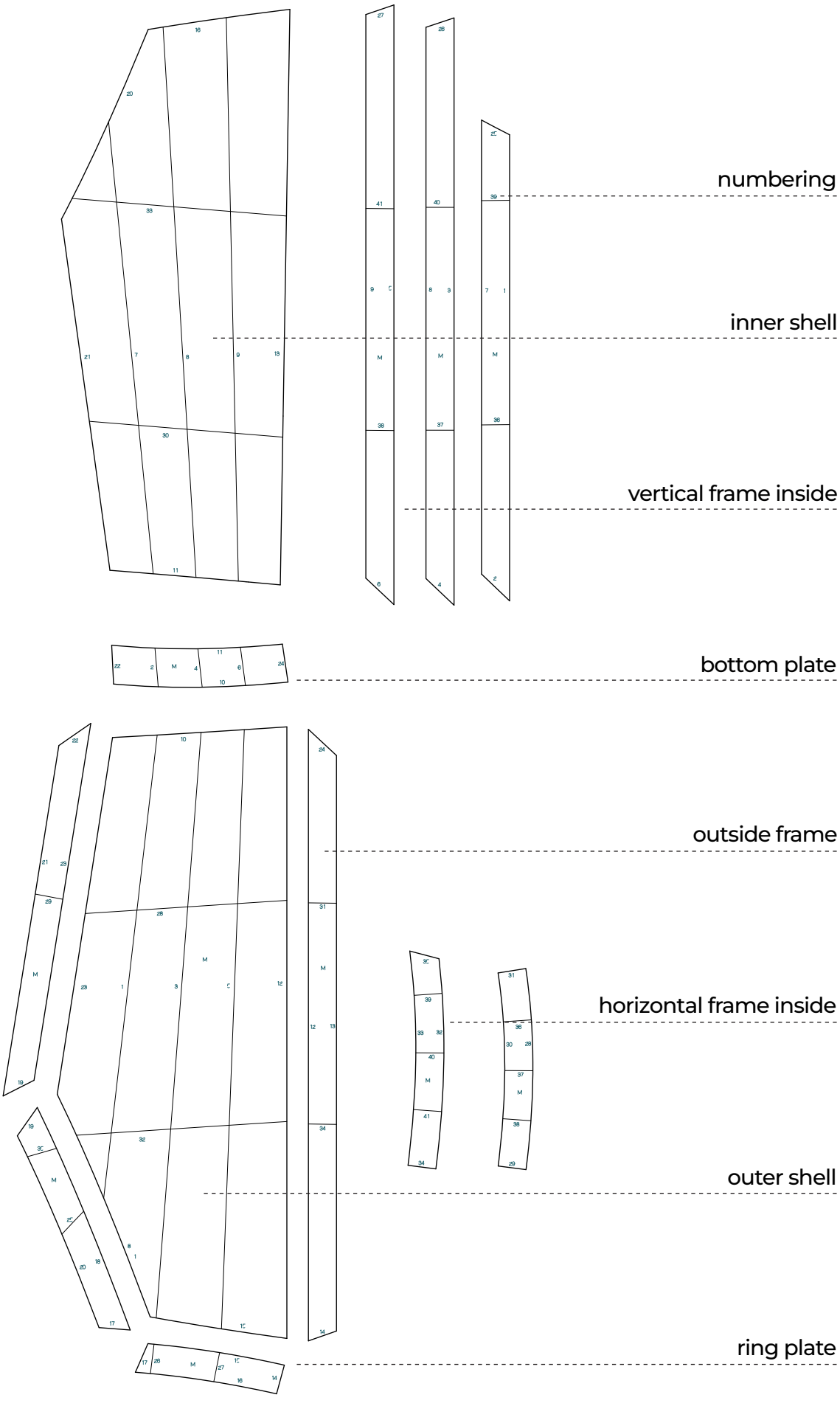
Since the project will change location several times, the whole had to be divided into separate parts. The size of the parts were limited to the dimensions of a regular box truck. This ensured transportation. After much consideration and taking care that the division did not negatively affect the statics, the pavilion was divided into 13 (A, ..., M) differently sized modules. Each module consists of several individual parts. In total, 169 parts were created by unwinding from the 3D. Not included are module to module spacers, floor to module spacer plates and the floor plates.


F
I
K
J
G
H

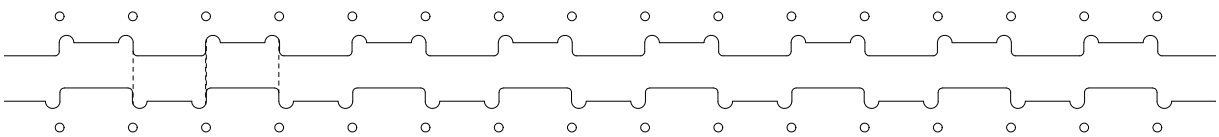
In order to mill the 169 parts of the 13 modules (A, ..., M) as well as the floor, etc., the first step was to create the 3D model. The individual modules were first exported and unrolled one by one. The process of unwinding, is the decomposition of a 3D (using Rhino) into individual surfaces in 2D, which were then labeled, numbered and ordered in sequence. For each module a separate file was created. Each file contains 2D plans of outer shells, inner shells, outer frames, horizontal frames and vertical frames. These will be edited in more detail in the next steps and then milled by FUNDERMAX.

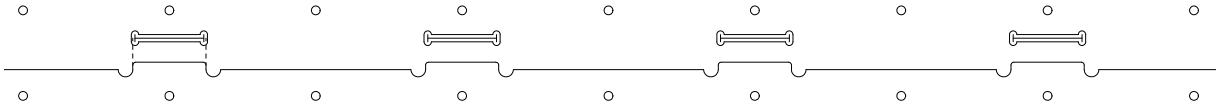


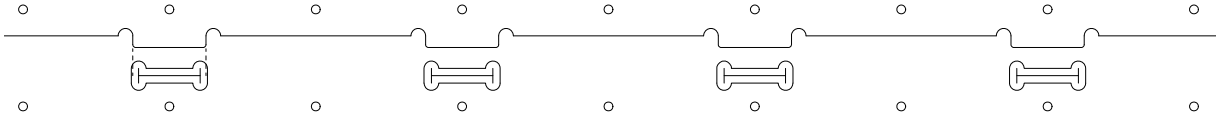


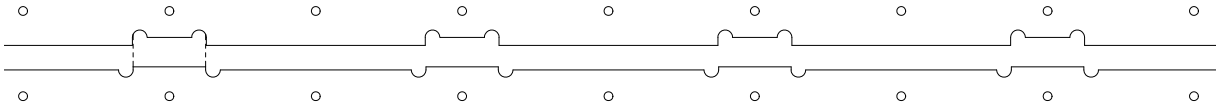

numbering
inner shell
vertical frame inside
bottom plate
outside frame
horizontal frame inside
outer shell
ring plate

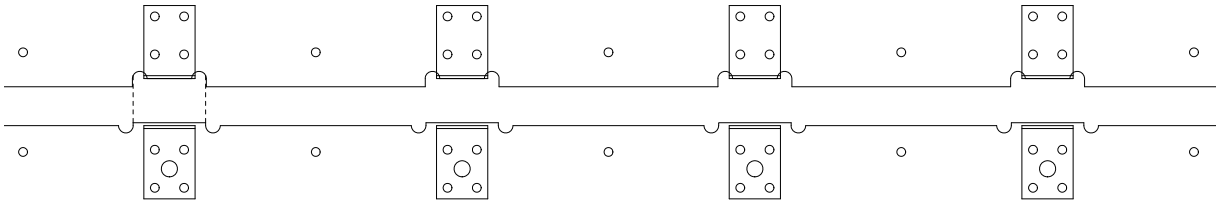
COMPONENT EDGES

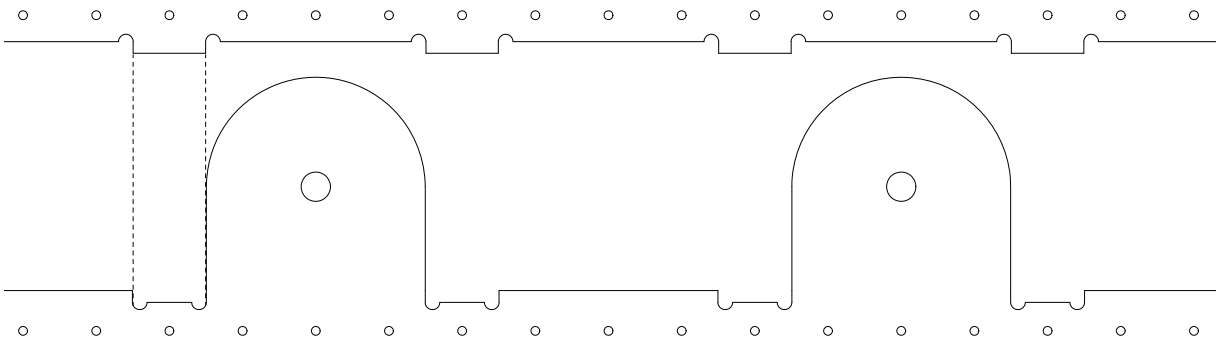


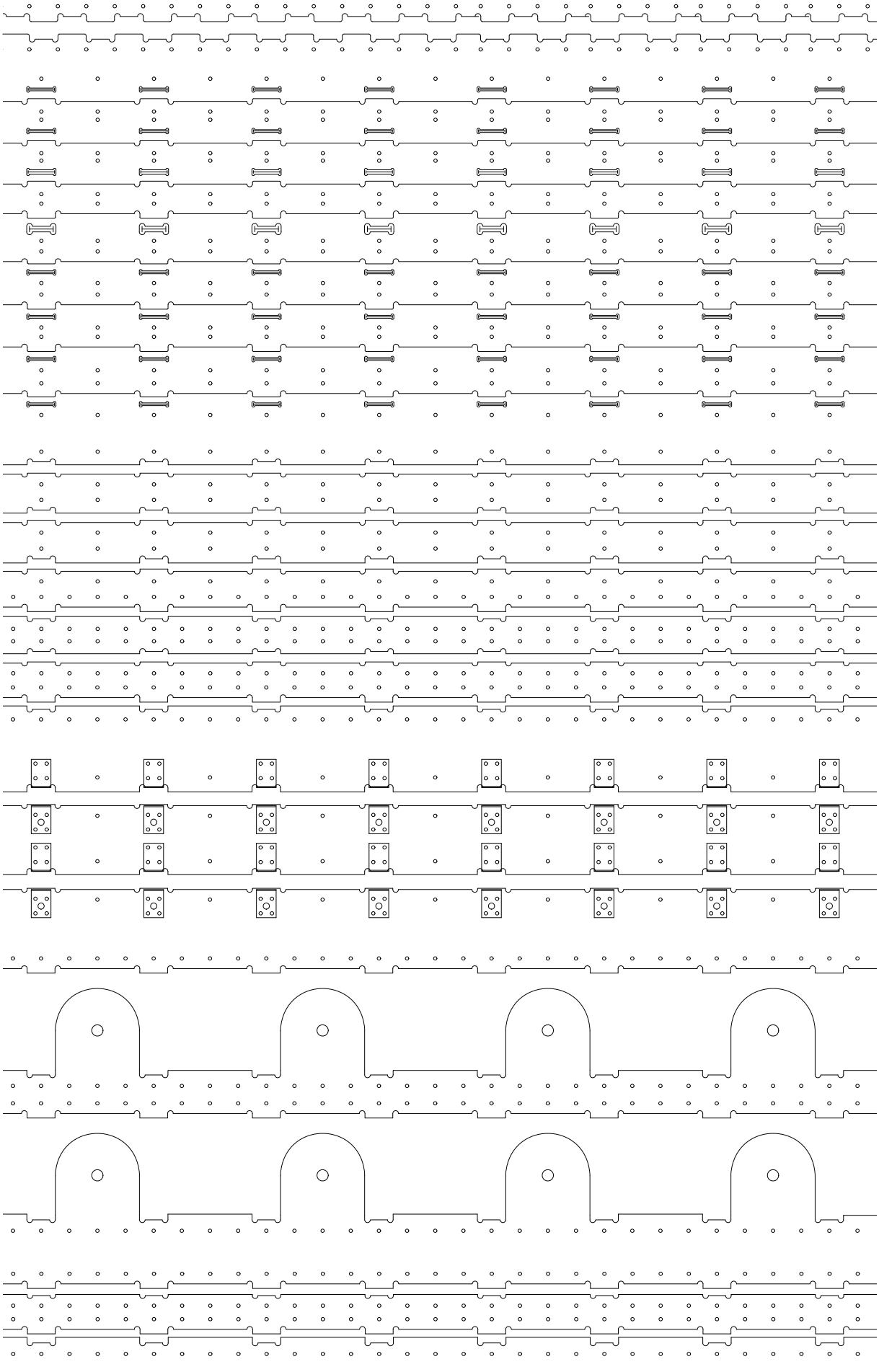




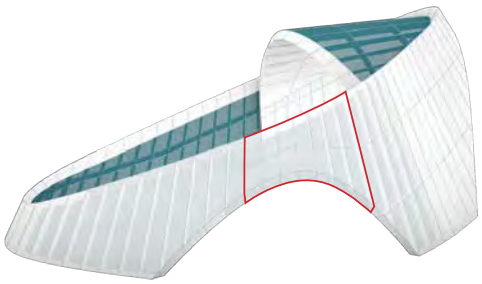


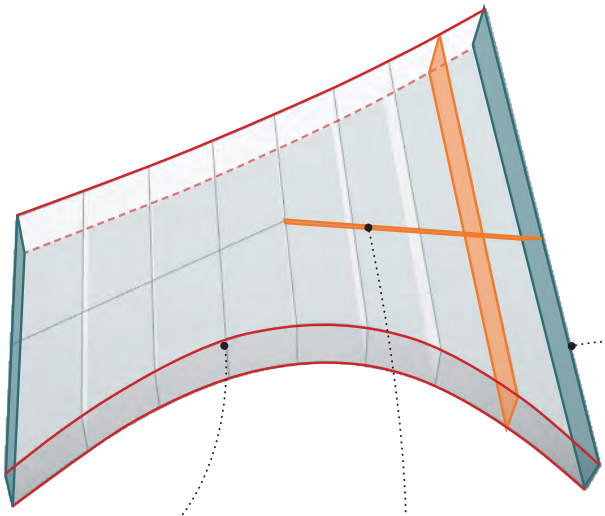


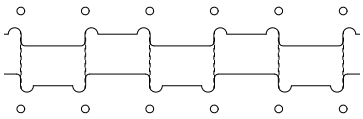


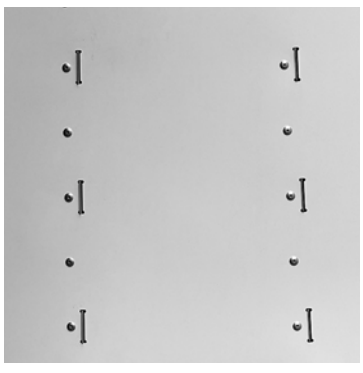


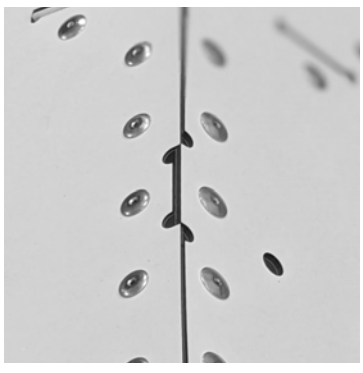
COMPONENT ASSEMBLY







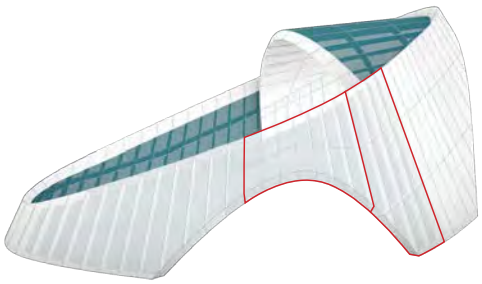


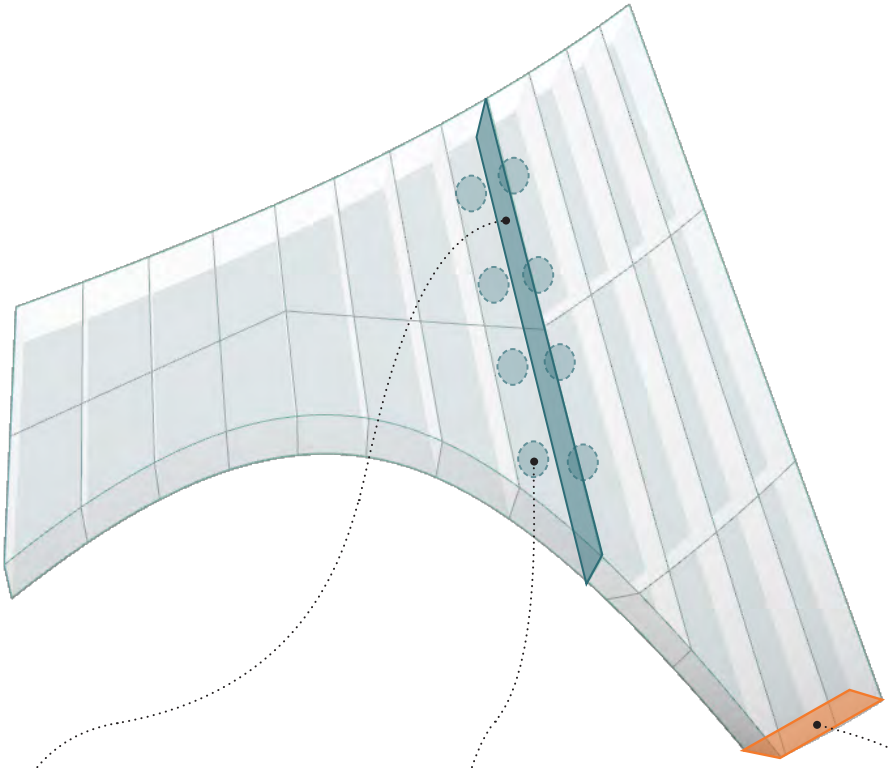


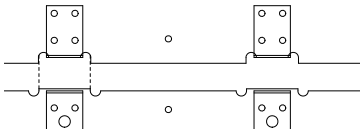
Genähten Kante

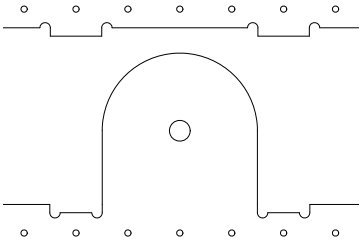
Durchstoßkante
von vertikalen und horizontalen Spanten

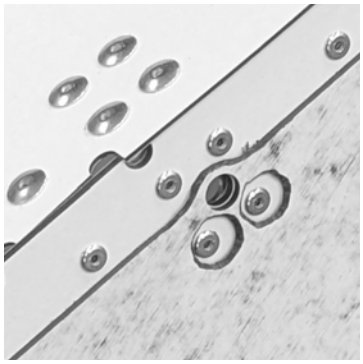
Passfuge
von den Randspanten



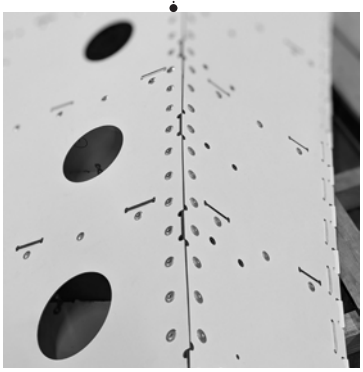




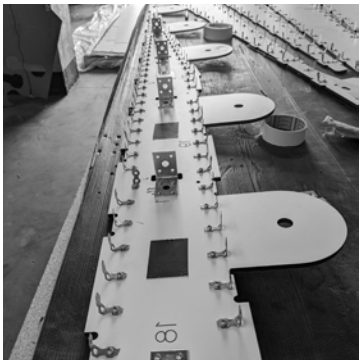




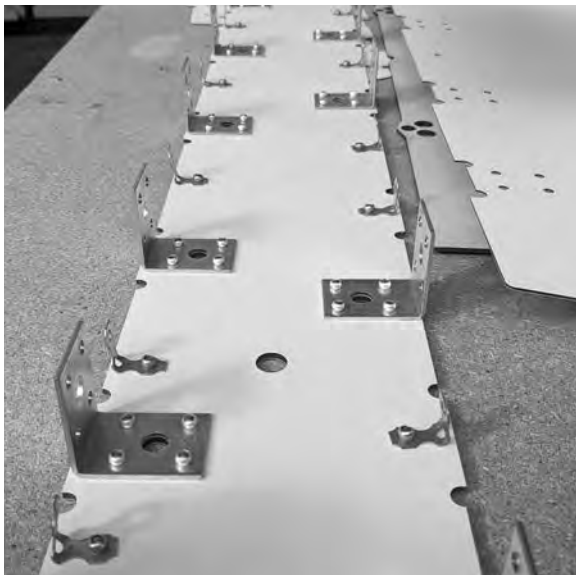
Verbindung Modul zu Modul



Handlöcher

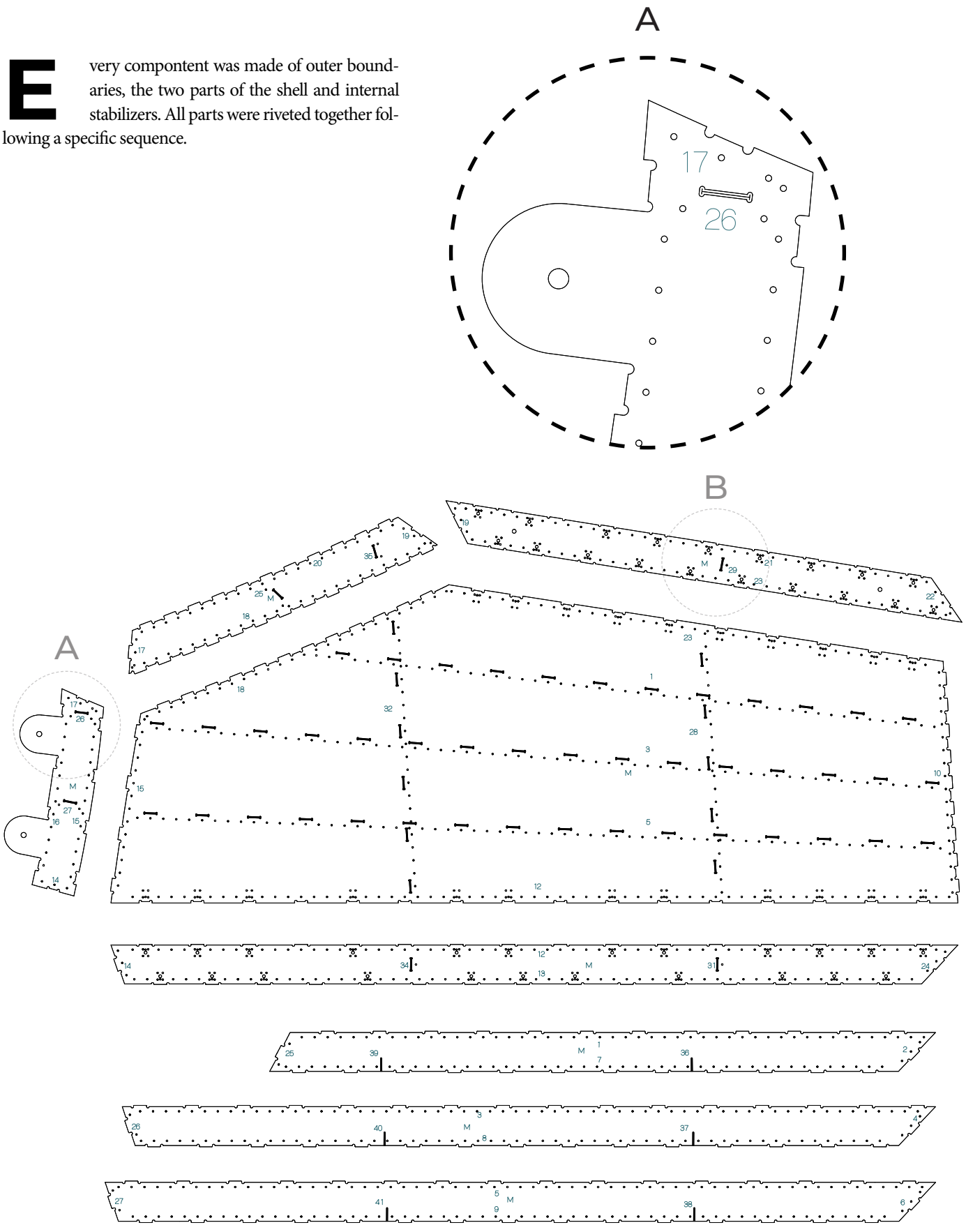


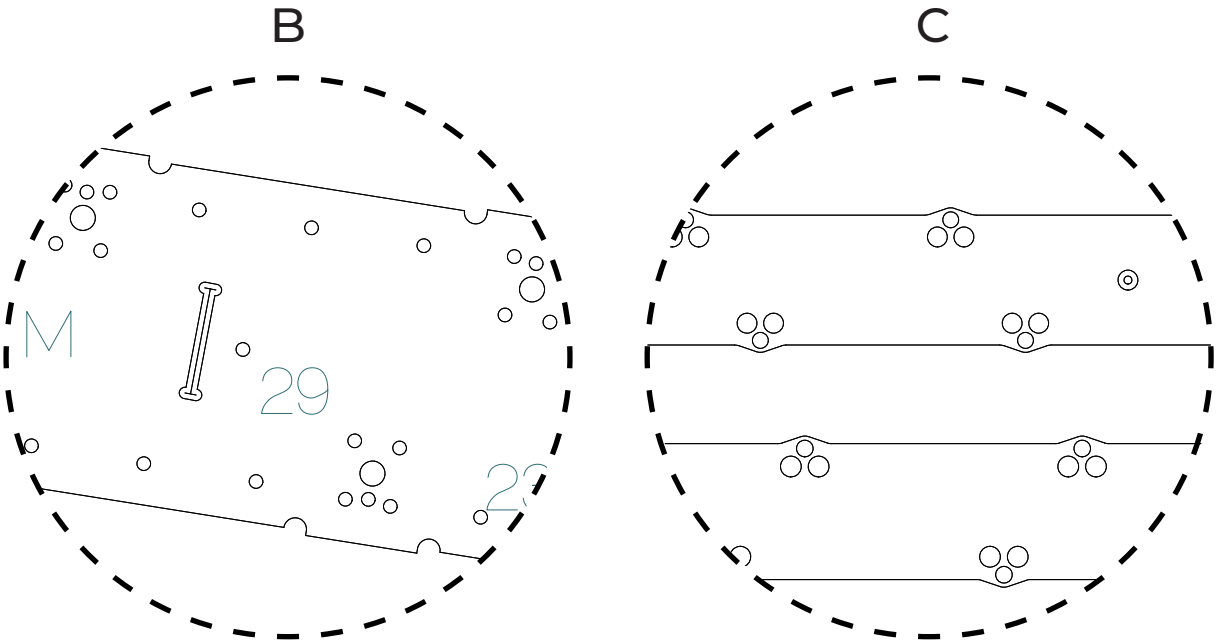
Bodenanschluss

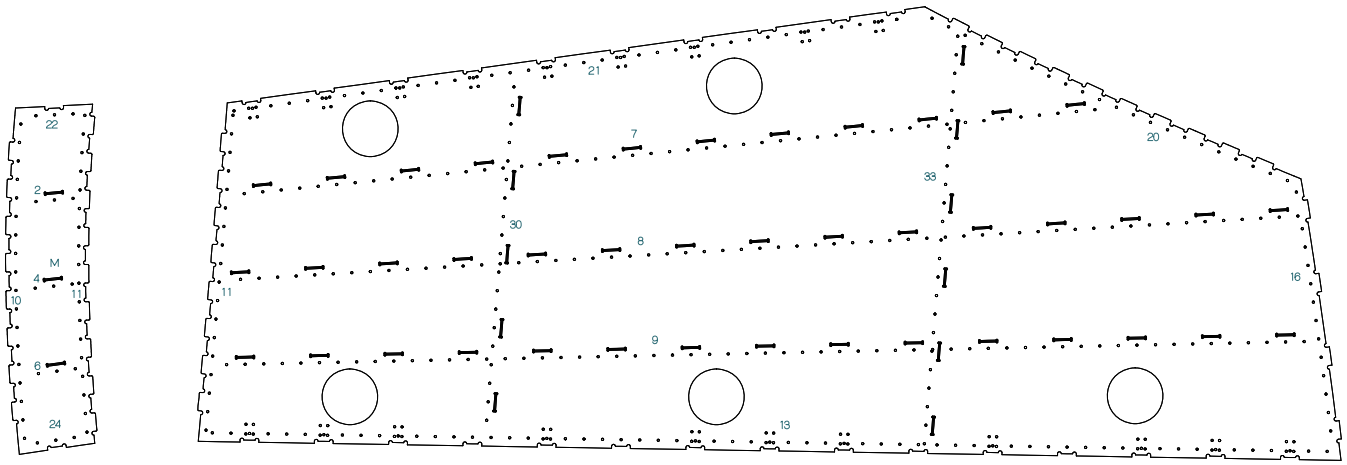


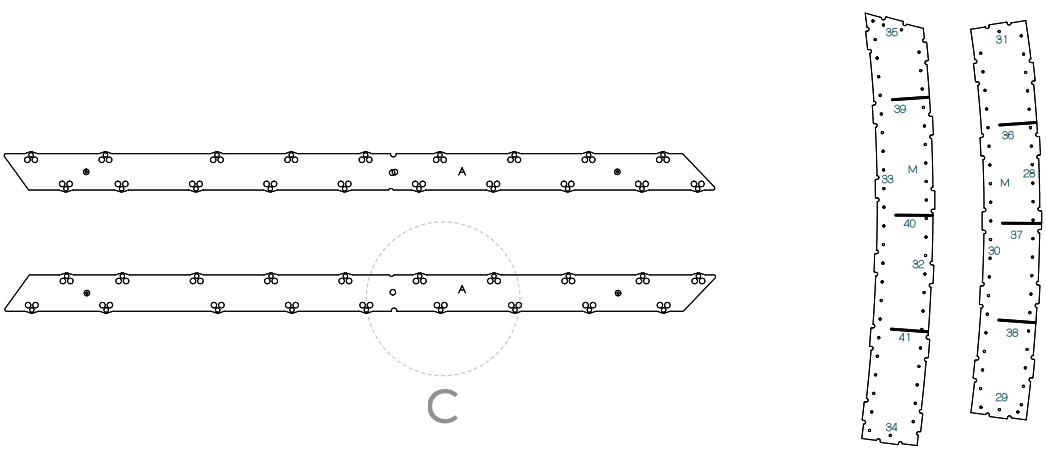
CNC FILE / COMPONENT M

Every compontent was made of outer boundaries, the two parts of the shell and internal stabilizers. All parts were riveted together following a specific sequence.



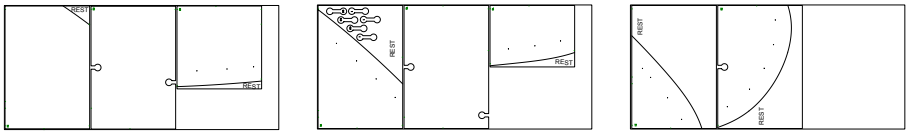

B
C
M
29


22
2
M
4
10
11
6
24
21
7
20
33
30
8
16
11
9
13

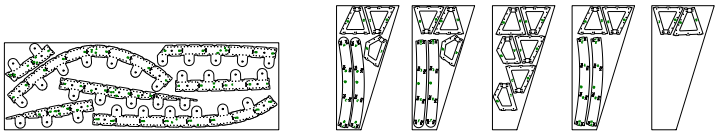

A
A
C
35
39
M
33
40
32
41
34
31
36
M
28
37
30
38
29

CNC FILE / OVERVIEW

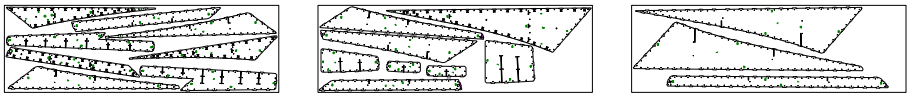
7
16mm
gray



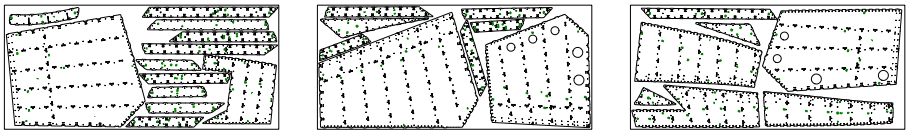
6
8mm / remnant
gray



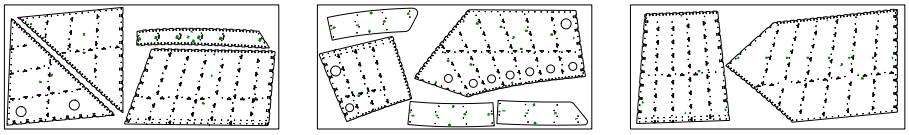
4
6mm / remnant
white

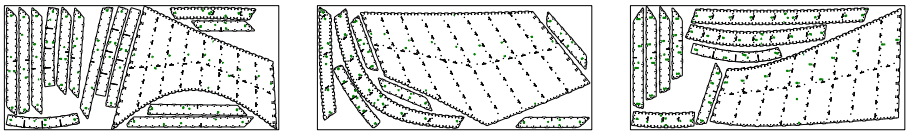


3
4mm
white

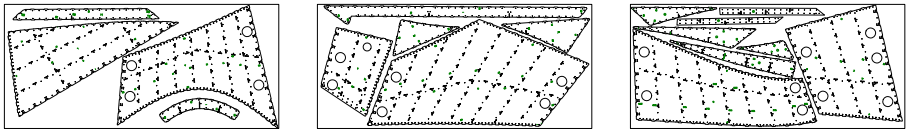


12
2mm
white



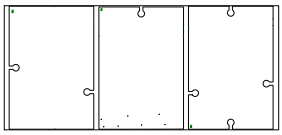
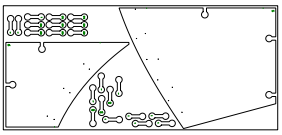
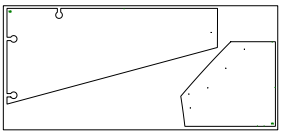
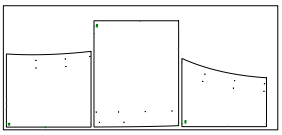


7
2mm
blue

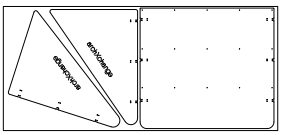


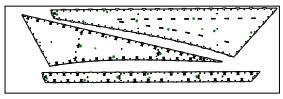
1950lfm
CNC fräsen

30
288m²
Fundermax-Platten
Max Compact Exterior Platten

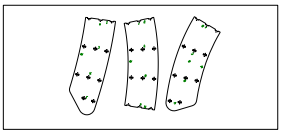





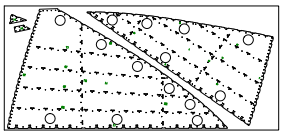
1
16mm
gray



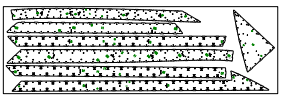
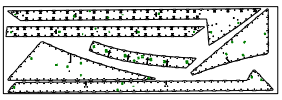


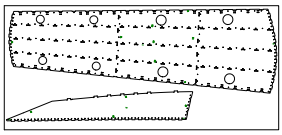
1
12mm
white



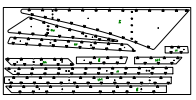
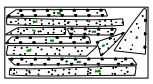


2
4mm / remnant
white

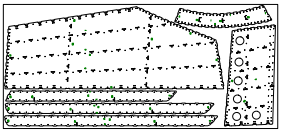
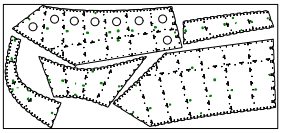



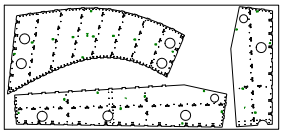
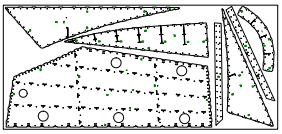
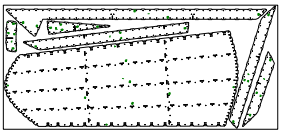
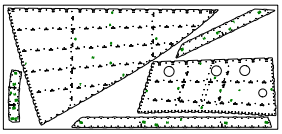


1
3mm / remnant
white



13
componentes

180
pieces

19000
gefräste Löcher

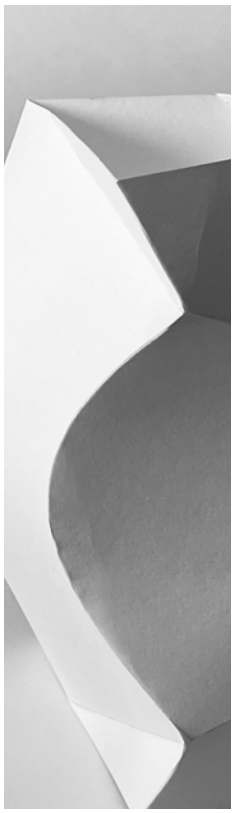
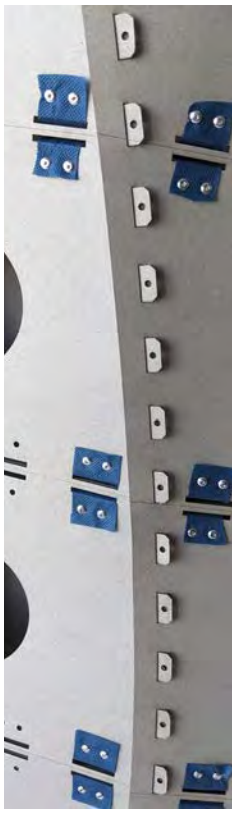
1800
Passfugen

14 000
Nieten

300
Verbindungsschrauben

450
Stahlwinkel

5 000
Lochbandwinkel

MAKING

SKETCH MODELS IN PAPER

Der Entwurfsprozess für den Pavillon begann bereits im vorigen Semster. Die beste Alternative neben digitalen Rhino-Modellen waren 3-dimensionale Modelle aus Aquarellpapier. Seit der Anfangsphase des Projektes wurden wöchentlich Prototypen aus Papier gefaltet um mit der Geometrie und Form vertraut zu werden. Dabei wurde sich meistens auf einem bestimten Schwerpunkt konzentriert. Nachdem das Thema der gekurvten Faltung intensiv mit Modellen erarbeitet wurde, ging es bei diesen Modellen schon um konkretere Annäherungen eines Pavillons. Bestimte geometrische Regeln, die sich während des Prozesses herauskristallisierten, wurden beibehalten und vertiefet. Unter anderem waren das eine auf einer Ellipse basierende Grundform, eine durch Faltung entstehedne Auskragung als Dach und die Doppelschale. Für alle Modelle war der Kegel als geometrische Figur die Ausgangsform.

Auf den nächsten Seiten gibt es eine Auswahl von Papiermodellen, die in der analogen Entwurfsphase entstanden sind. Einige davon stellen reine Versuche mit Form und Geometrie dar, andere weisen schon konkretere Züge eines späteren Pavillons auf. Bei wiederum anderen hat man sich mit der elliptischen Grundrissform auseinandergesetzt.
Die Herausforderungen bei den soeben genannten Themen war es, allesamt in einer baubar, funktionierenden Doppelschale zu falten.

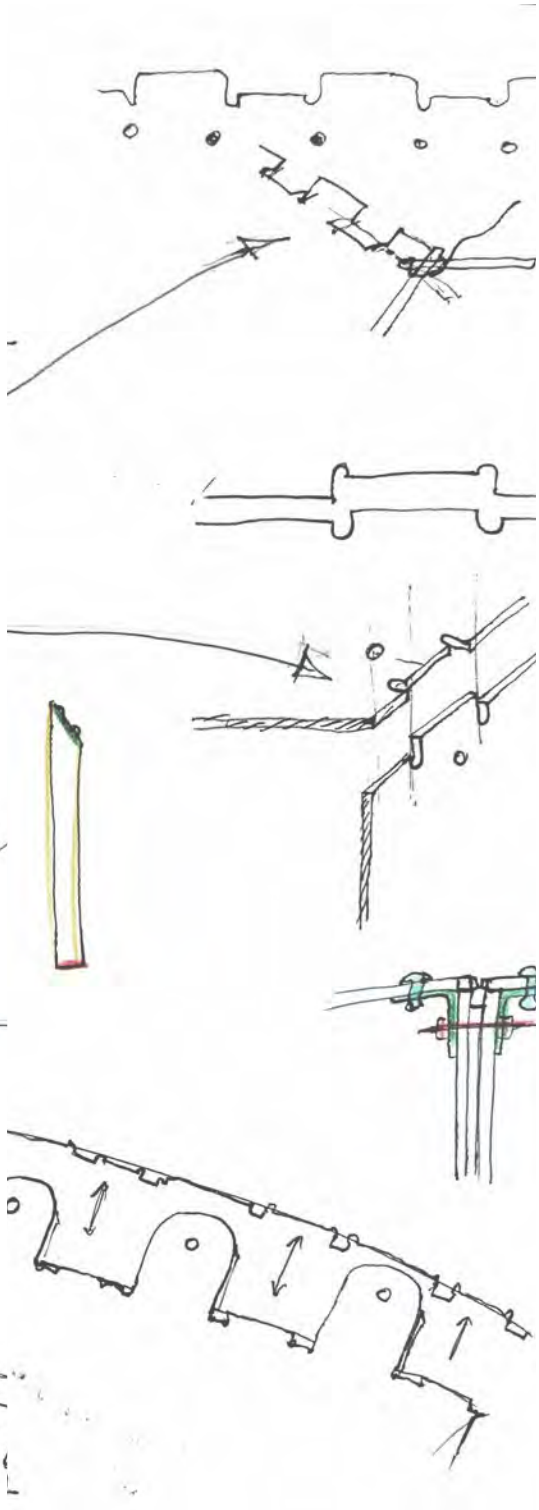
Thema: Baukörperstudie, Ellipse, Doppelschale

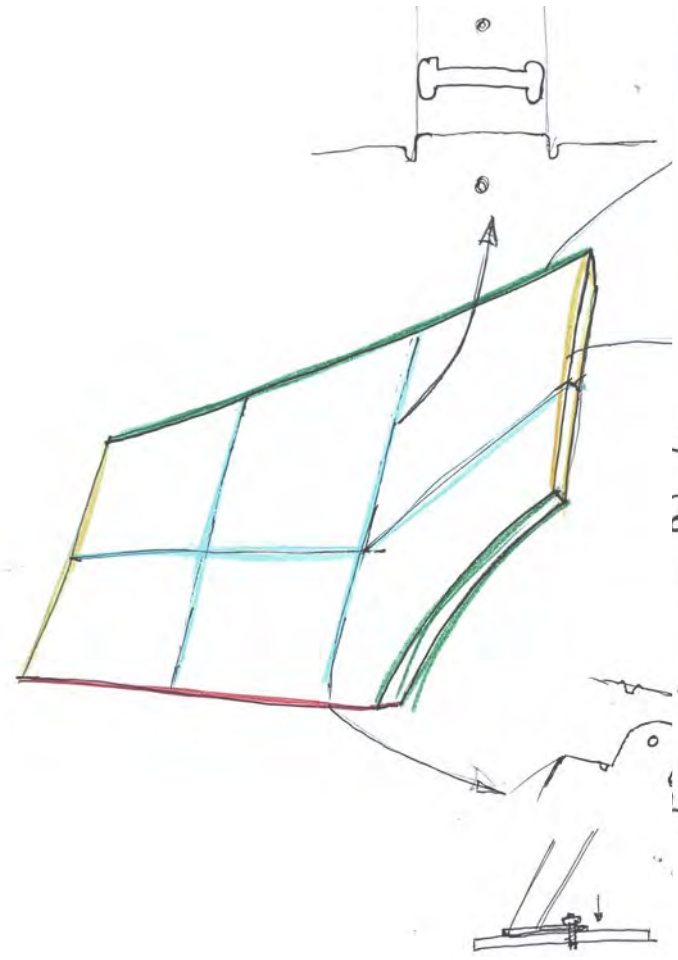
Thema: Formstudie, gekurvte Faltung

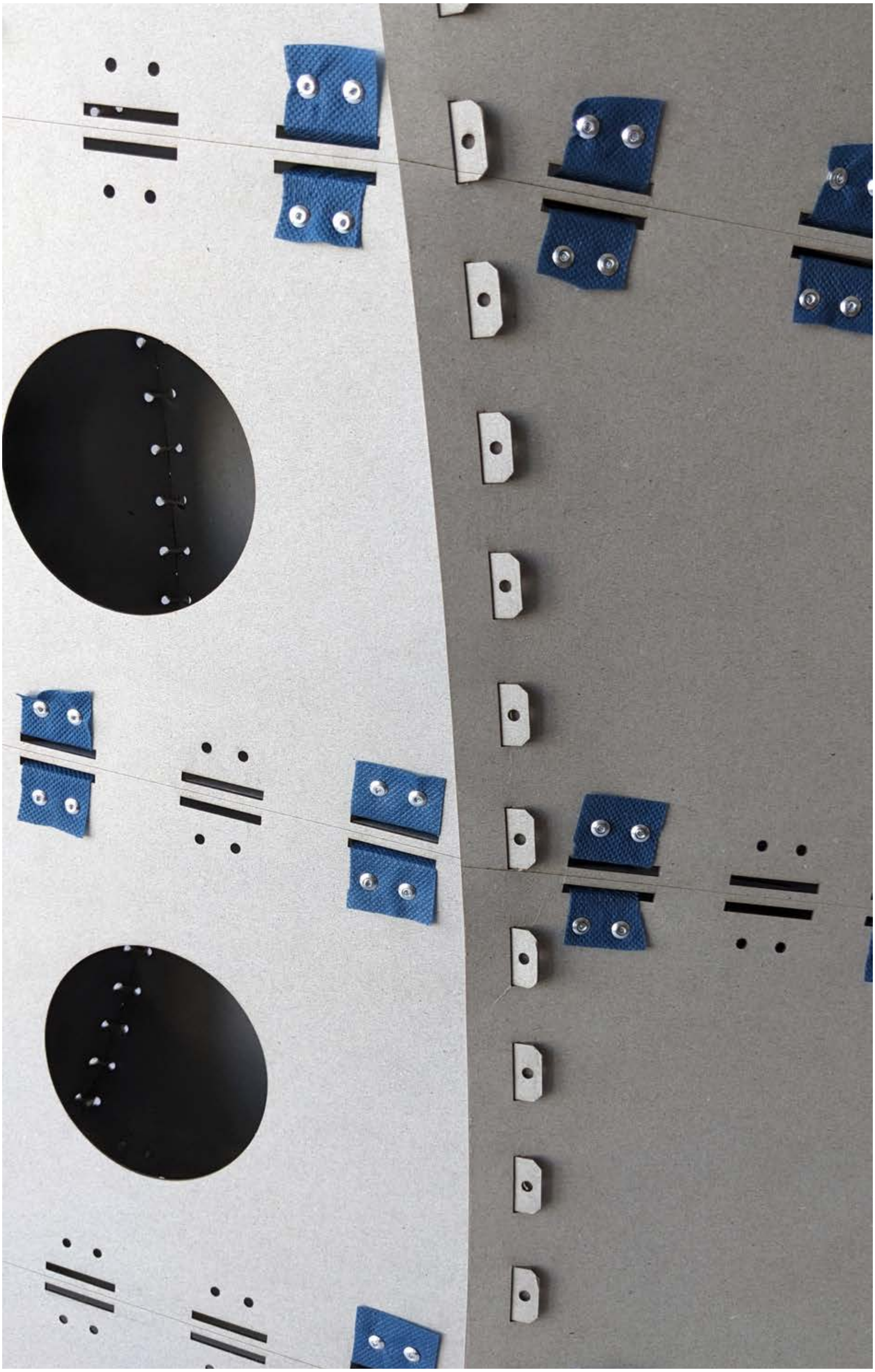
CARDBOARD PROTOTYPES OF CONNECTIONS

Nach einer intensiven Auseinandersetzung mit gekurvten Faltungen in Papiermodellen, kam der wichtigste Schritt zur Überleitung in die Ausführungsphase des Projektes: Die Entwicklung der Verbindungsdetails. Nachdem das Fundermax-Material nicht wie Papier einfach mit einer perforierten Linie faltbar ist, mussten neue Details entwickwelt werden. Dabei ging es um zwei zentrale Themen: Zum einen musste eine Lösung gefunden werden, wie man zwei getrennte, flächige Materialien, über eine gekurvte Kante miteinander verbinden kann, sodass eine gekurvte Falte simuliert wird. Dazu gehört auch eine "sheet to sheet" Verbindung von zwei Teilen in der gleichen Ebene. Zum anderen spielten T-förmige Verbindungen ("rib to sheet") eine wichtige Rolle.

Auf den folgenden Seiten sieht man einen Katalog an Verbindungsdetails, die in Graukarton getestet wurden und von denen einige auch im realen Pavillon angewendet wurden.





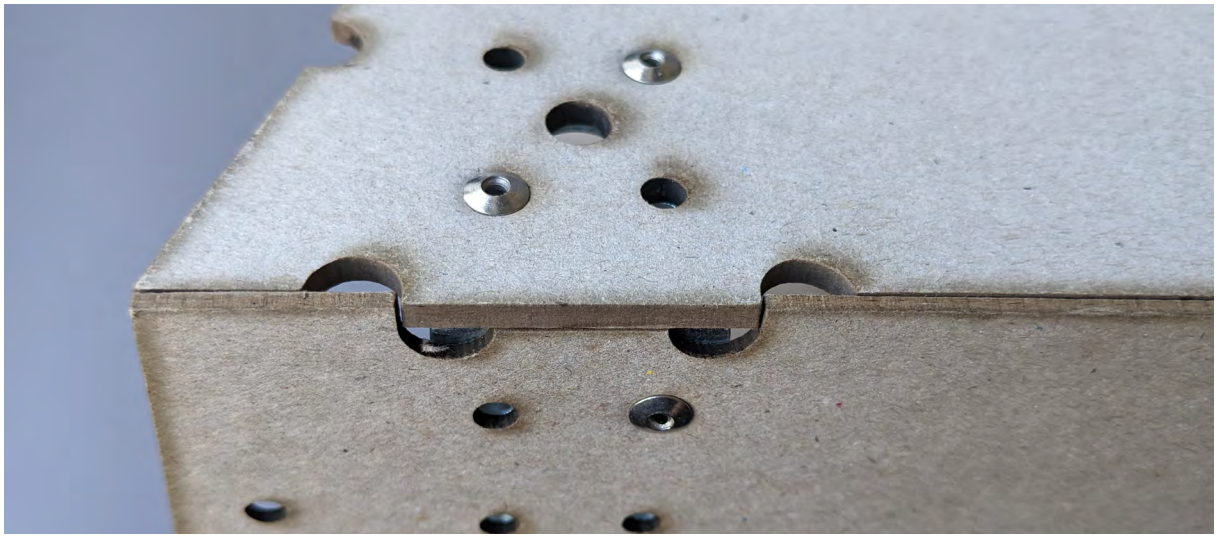


Nähkante

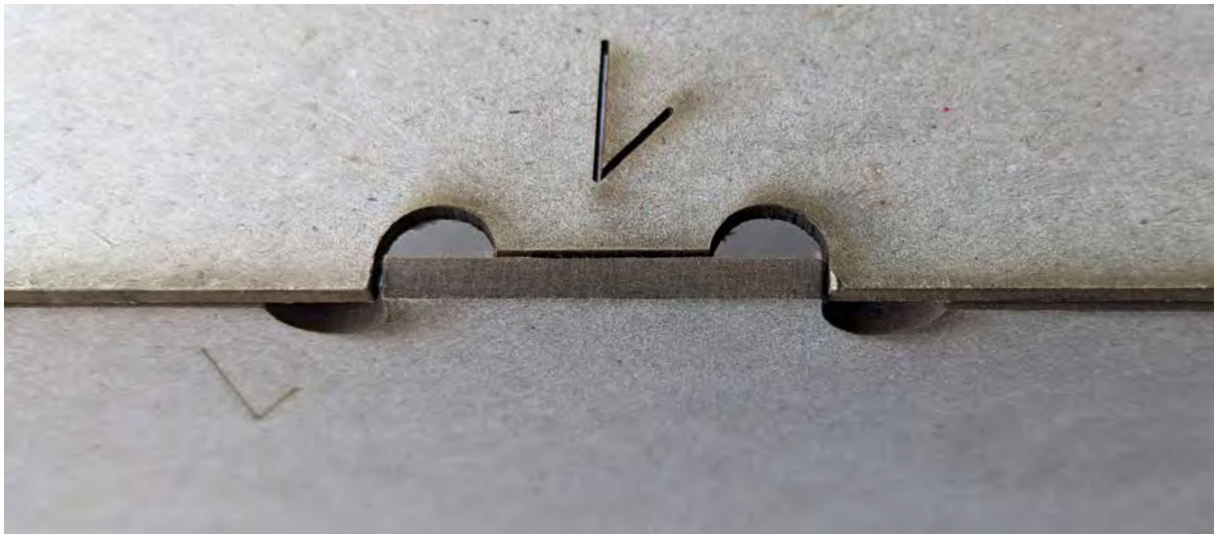
Nähkante mit Zähnen, Löcher jeweils außen

Nähkante mit Zähnen, Löcher mittig

Verzahnte Kante mit umgestülpten Zähnen, angenietet

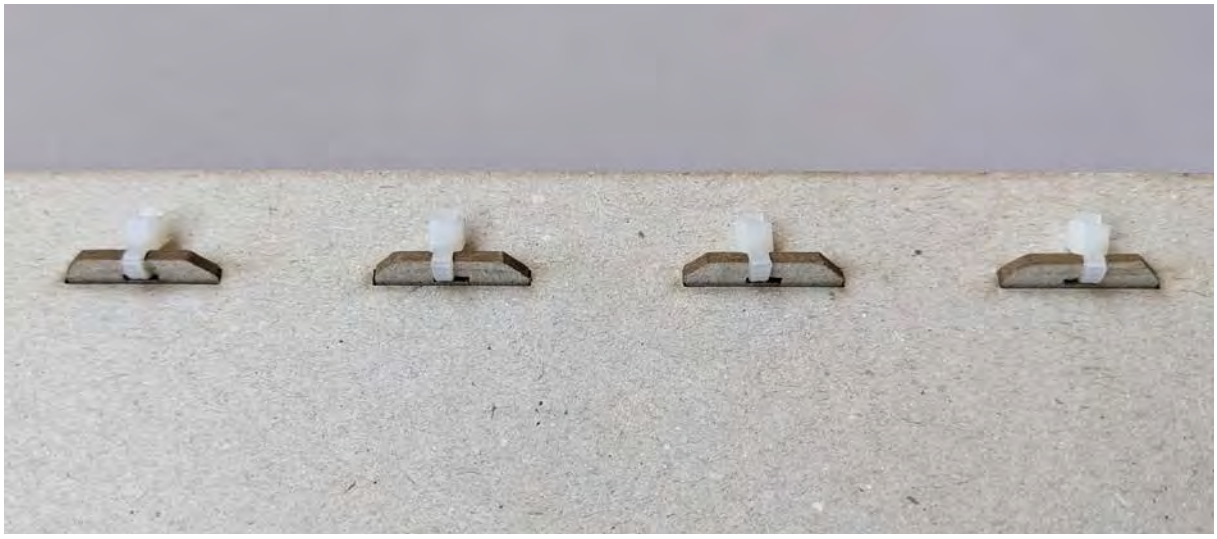


90°-Verbindung mit Zahn und Gegenstück und angenietetem Stahlwinkel, ohne Überstand.

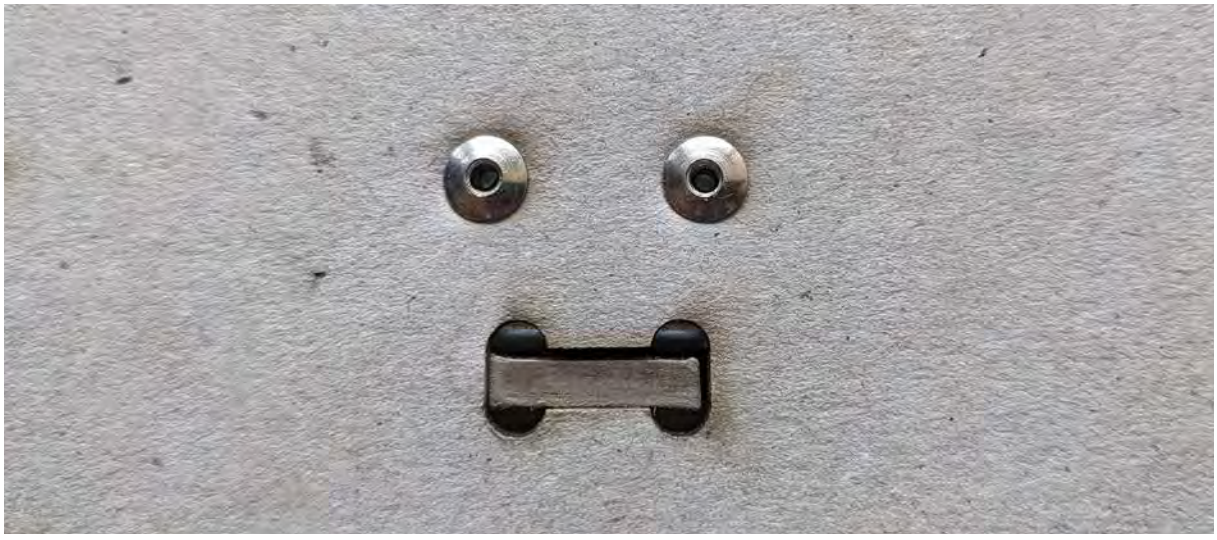


90°-Verbindung mit Zahn und Gegenstück, ohne Überstand

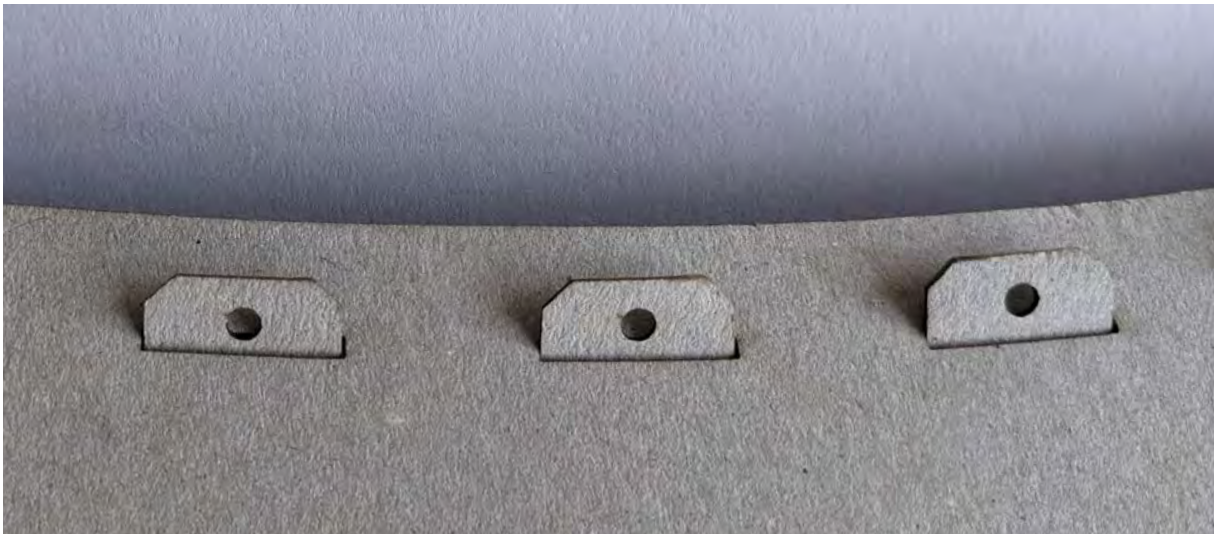
T-Stoß durchgesteckt, Faden als Lagesicherung



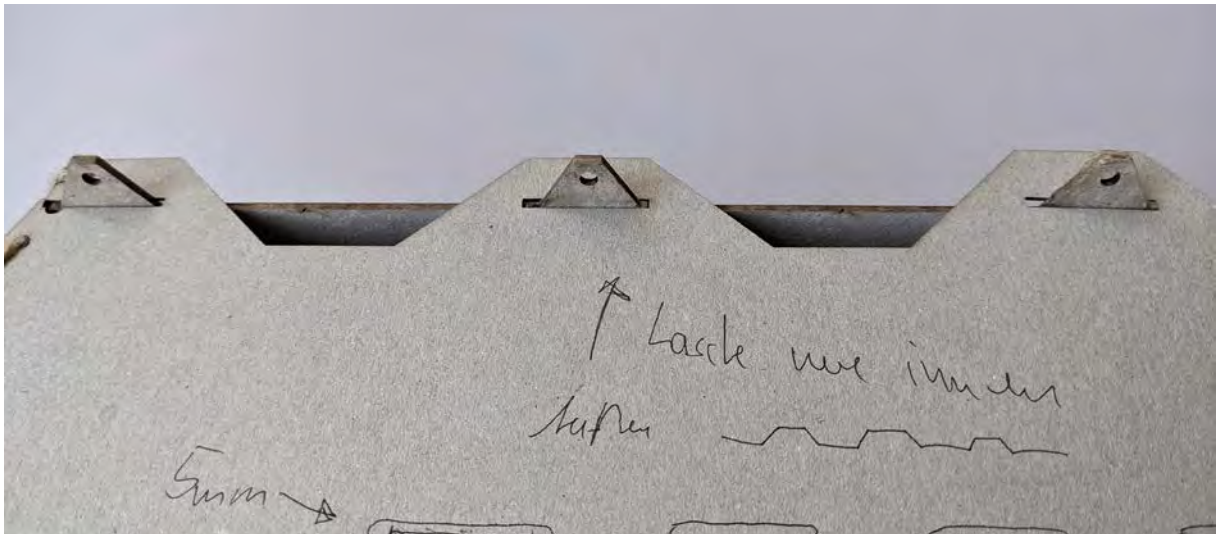
T-Stoß durchgesteckt, Kabelbinder als Lagesicherung



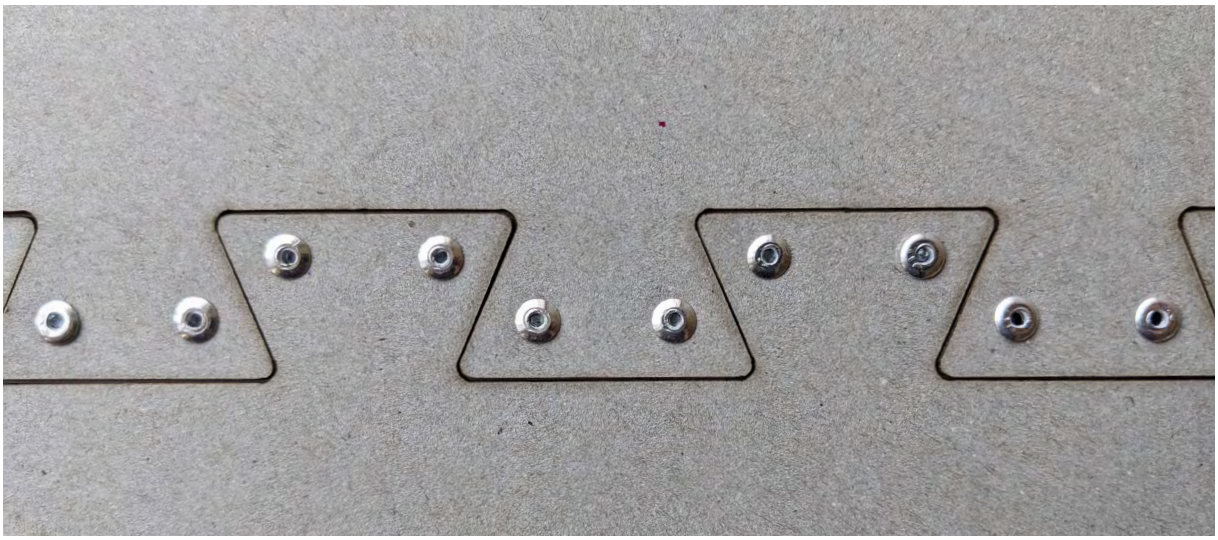
T-Stoß mit Stahlwinkel und “dog bone”



Durchgesteckte, gekurvte Kante



Bauteil zu Bauteil-Verbindung, durchgesteckte Zähne und Lasche zur Lagesicherung



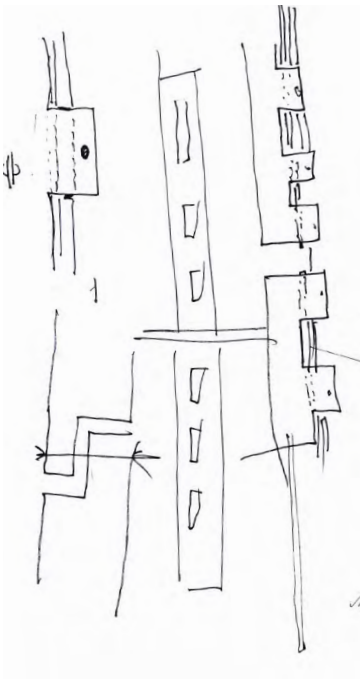
Sheet to sheet - Verbindung mit Schwalbenschwanz und angenieteter Lasche

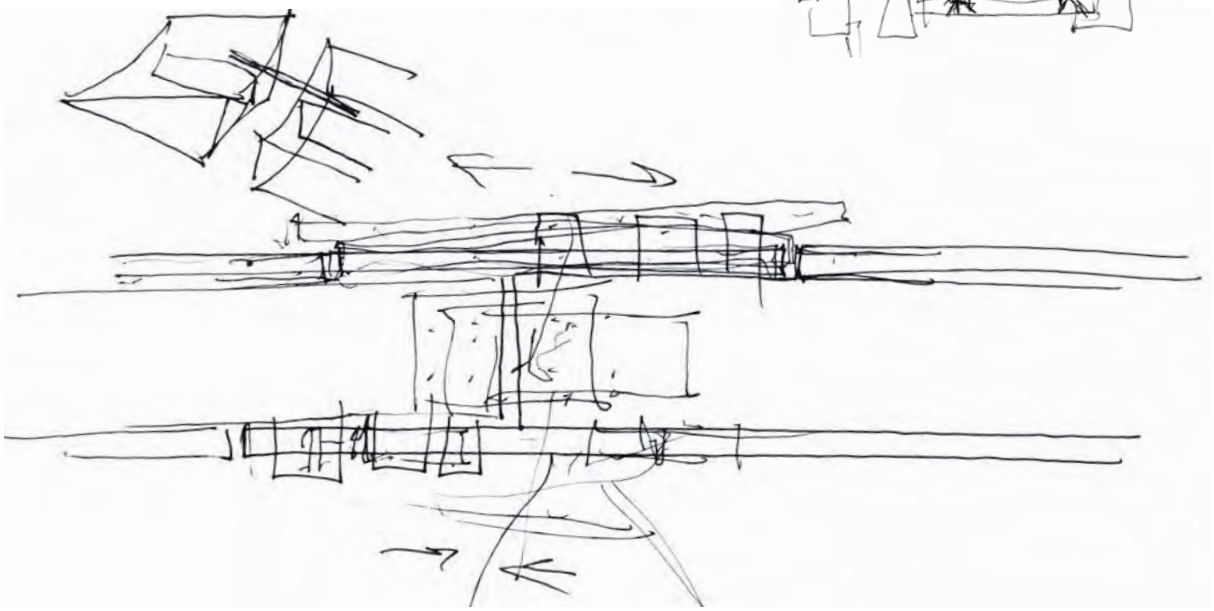
CARDBOARD PROTOTYPES OF COMPONENTS

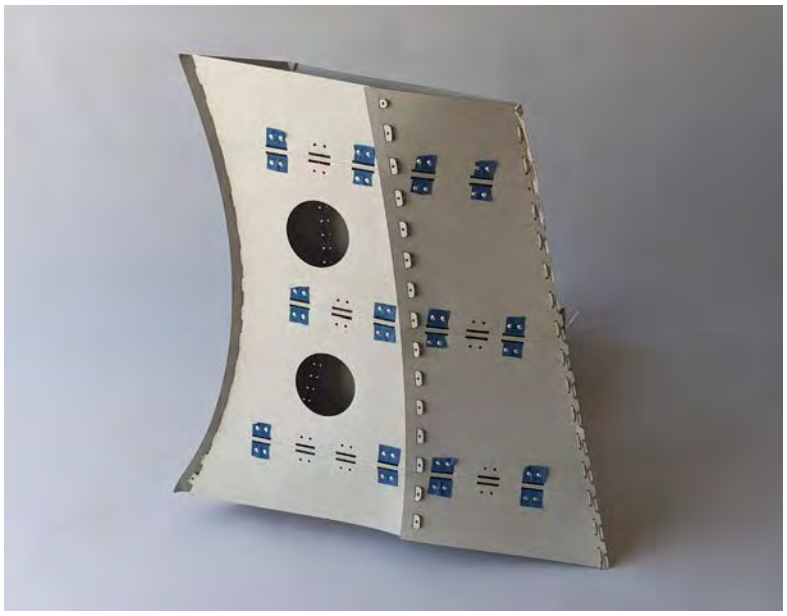
Um die Verbindungsdetails zwischen zwei Einzelteilen im volumetrischen Kontext zu testen, wurden eine Reihe von 3-dimensionalen Modellen aus Graukarton gebaut. Dabei wurden immer verschiedene Verbindungsdetails in einem Modell verwendet, um eine gute Vergleichbarkeit zu erreichen. Unterschiedliche Winkel, Krümmungen oder Ecken schränkten die Auswahl der Details stetig ein und so konnte ein relativ genaues Regelwerk gefunden werden, welches Detail, wann und wo auf welche Kante angewendet werden kann.
Auch in der Reihenfolge des Zusammenbaus eines Modells konnten Methoden gefunden werden, die funktionieren und falsche ausgeschlossen werden.

Nachdem für die Verbindung von Einzelteilen die richtigen Details gefunden wurden, wurde die Verbindung von volumetrischen Bauteilen überdacht. Die obligatorische Voraussetzung für diese Verbindung war, dass sie, im Gegensatz zu den Verbindungen innerhalb eines Bauteils, wieder lösbar sein musste.

Auf den folgenden Seiten ist eine Auswahl aus Graukarton-Modellen zu sehen, die sich mit den eben beschriebenen Themen auseinandersetzen







BAUTEIL 1

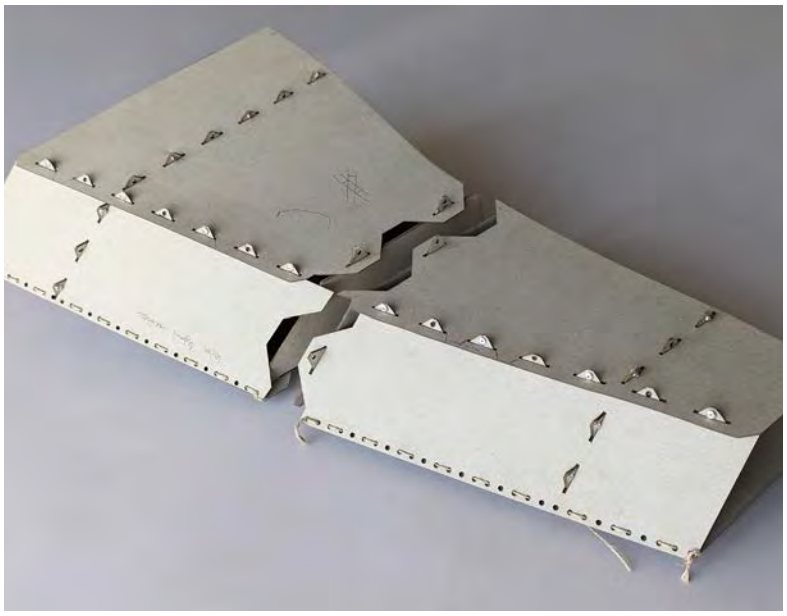
Details: genäht, gesteckt, genietet

In diesem Modell wurden gekurvte Kanten mit verschiedenen Details verbunden. Einmal ineinander gesteckt, einmal mit Verzahnung und Nähen. Die Innenspanten wurde mit Glasfaserbändern durch Schlitze in der Außenschale angenietet.
Die runden Öffnungen in der Außenschale dienten als Handlöcher zum befestigen von innenseitigen Details.

BAUTEIL 2

Details: verzahnt, gesteckt, genietet

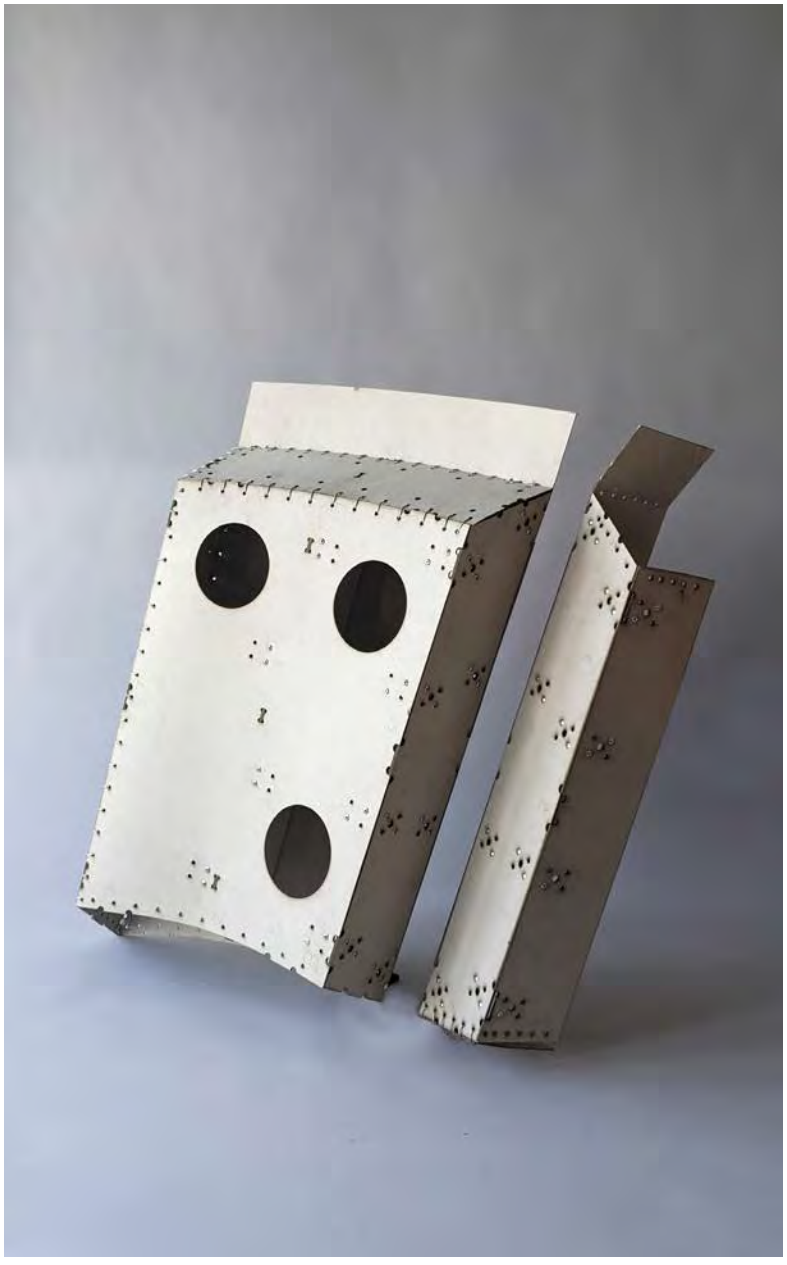
Bei diesem Modell wurde eine besonders komplexe Situation gebaut, wo mehr als zwei Flächen aufeinander treffen. Besonders wichtig hierbei war die richtige Reihenfolge beim Zusammenbau der Einzelteile, weil man später an bestimmten Stellen nicht mehr mit den Händen hinkommt, um eine Niete oder einen Faden zu befestigen. In diesem Fall wurde ein Handloch aus der Außenschale ausgeschnitten, um schlussendlich noch hinein greifen zu können.
Die länglichen Schlitze dienen der Positionierung der Innenspanten, welche entweder mit einem Glasfaserband und einer Niete oder nur in gesteckter Form miteinander verbunden wurden.
Im realen Pavillon wurde später bewusst darauf geachtet, dass bei der Einteilung der einzelnen Bauteile solche schwierigen Situationen weitgehenst vermieden werden.



BAUTEIL ZU BAUTEIL

Details: genäht, gesteckt, verzahnt

Ein volumetrisches Modell wurde in zwei Teile unterteilt und über eine wieder lösbare Verbindung miteinander verbunden. Die großen Zähne, welche in der Ebene der Außenschalen liegen, dienen der richtigen Positionierung beider Bauteile beim zusammenführen. Eine Lasche, die zum Schluss auf die kleinen, hervorstehenden Zähne der Randspanten gesteckt wird, sichert beide Bauteile miteinander.



BAUTEIL ZU BAUTEIL

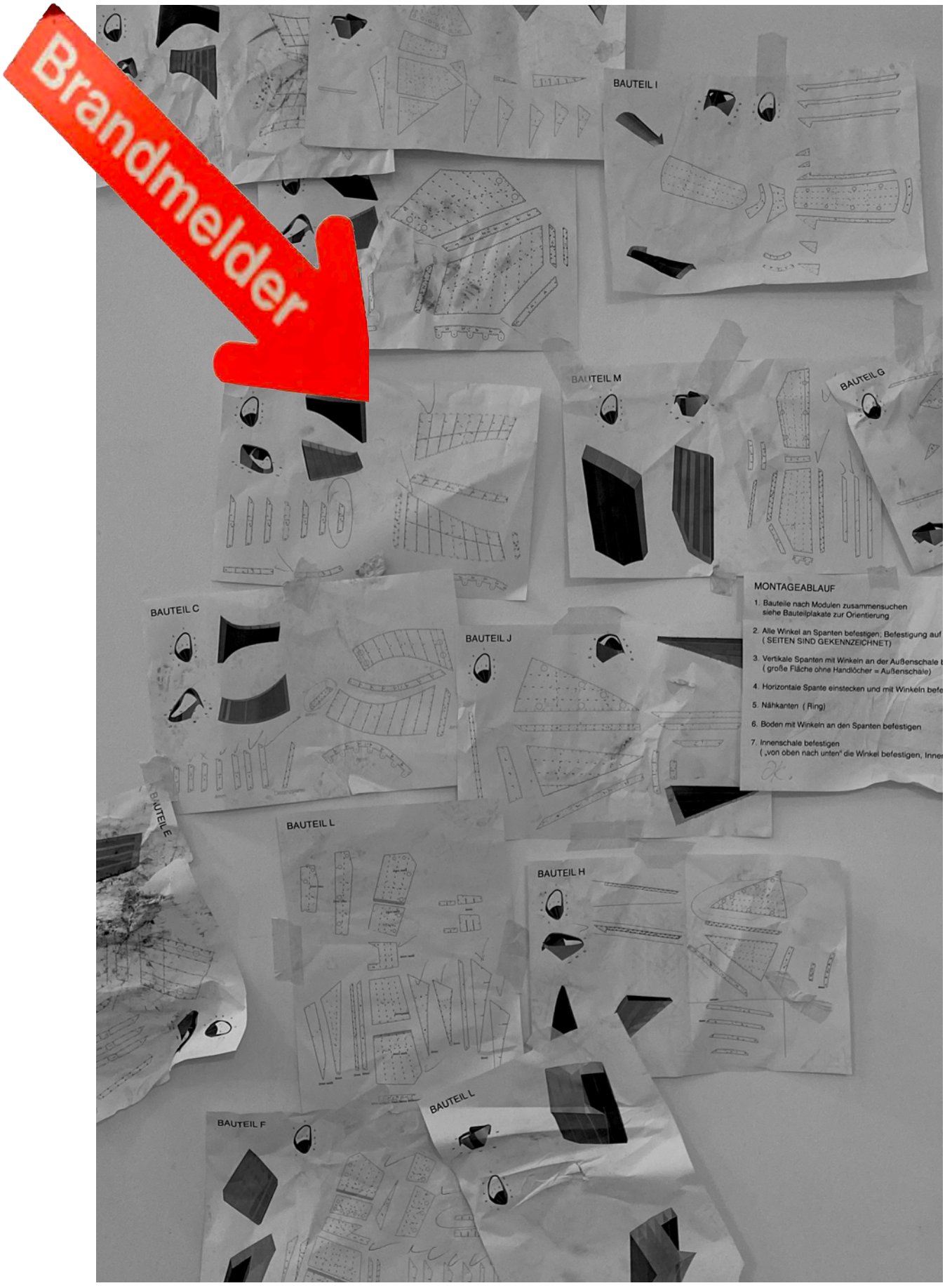
Details: genäht, verzahnt, Stahlwinkel

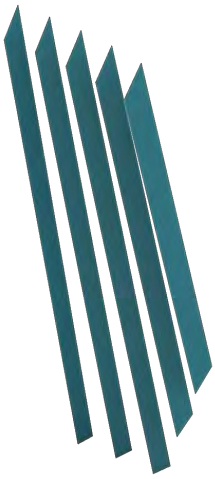
In diesem Modell wurde eine geschraubte Verbindung zwischen zwei Bauteilen getestet. Die beiden Randspanden, die in der Schnitteben liegen sind kongruent. Sie sind jeweils mit Stahlwinkeln mit den Außenschalen vernietet. Die Stahlwinkel haben mittig ein Loch, durch welches beim Zusammenführen eine Gewindeschraube gesteckt wird und dadurch beide Bauteile fest miteinander verbunden werden können.

Dieses Detail hat sich durch die Kräfteübertragung über die Stahlwinkel als äußerst stabil erwiesen und wurde auch später im realen Pavillon angewendet.

Die genähten Kanten wurden in diesem Modell mit einem Draht ausgeführt, was sich jedoch als ungeeignet herausstellte und deshalb ausgeschlossen werden konnte.

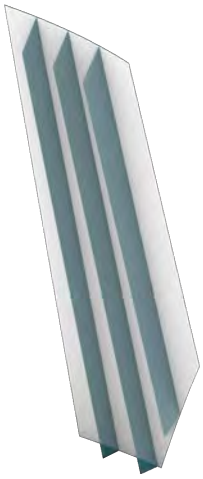
COMPONENT MAP





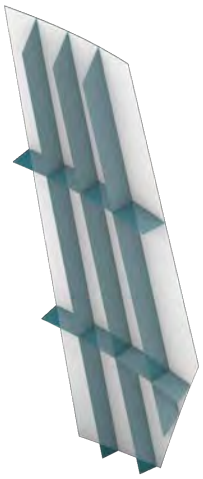
Schritt 1

Spanten vorbereiten -
Lochband- und Stahlwinkel werden
an alle Spanten genieten



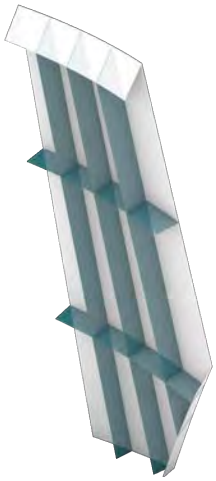
Schritt 2

Vertikale Innenspanten werden
an der Außensschale befestigt



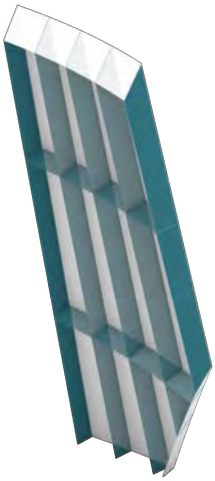
Schritt 3

Horizontale Innenspanten werden
an der Außensschale befestigen



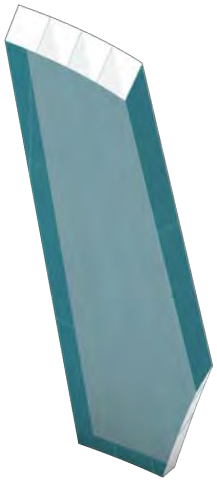
Schritt 4

Nähkanten werden angebracht



Schritt 5

Randspanten werden angenieten

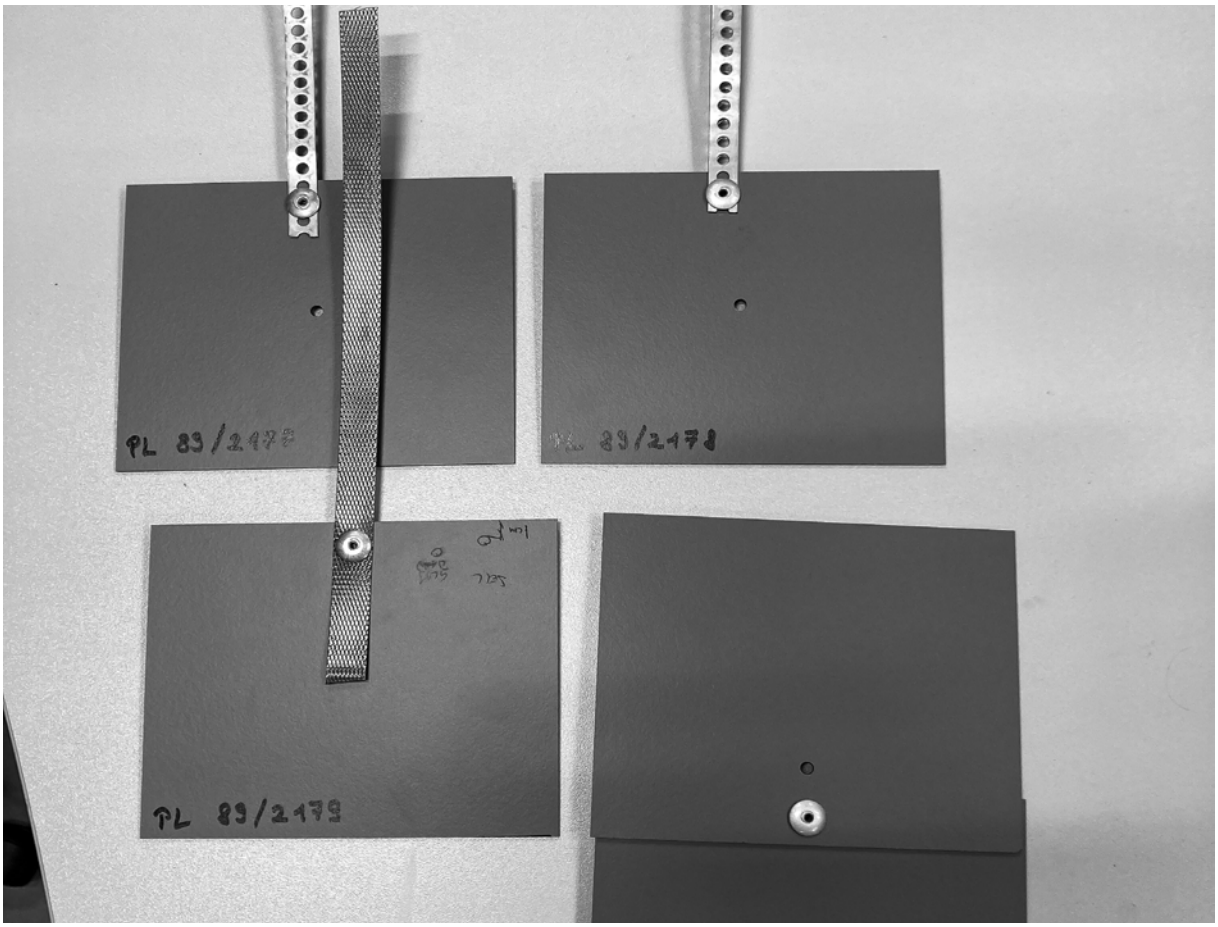


Schritt 6

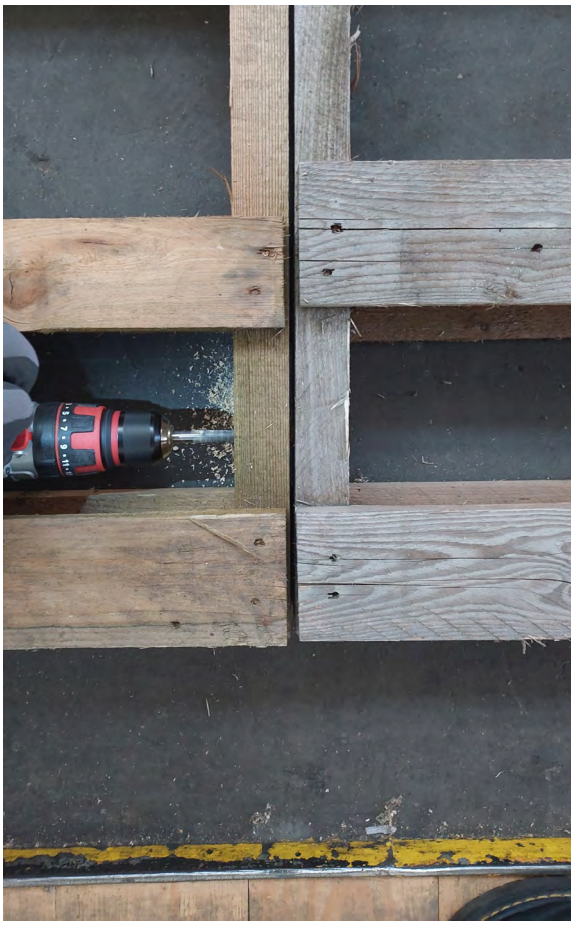
Innenschale wird angenietet

Um vor Ort die Bauteile zusammenbauen zu können, haben wir für jedes Element eine component map gebraucht, die uns gezeigt hat wie die Spanten und Schalenteile zusammenkommen.

TESTING PARTS AT FUNDERMAX

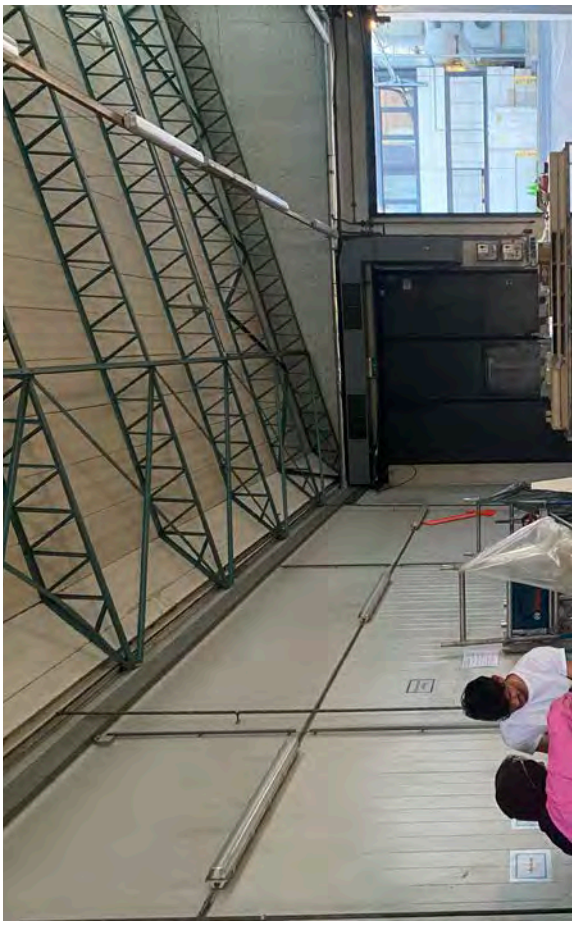


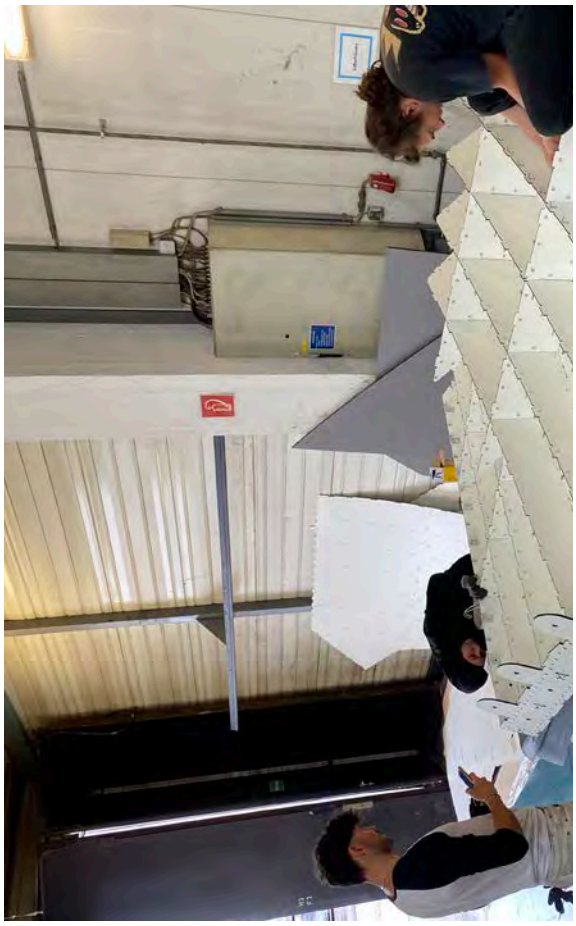
PREFABRICATION AT FUNDERMAX




MaxiFlex
YOU ARE MY SUNSHINE


Brandmelder

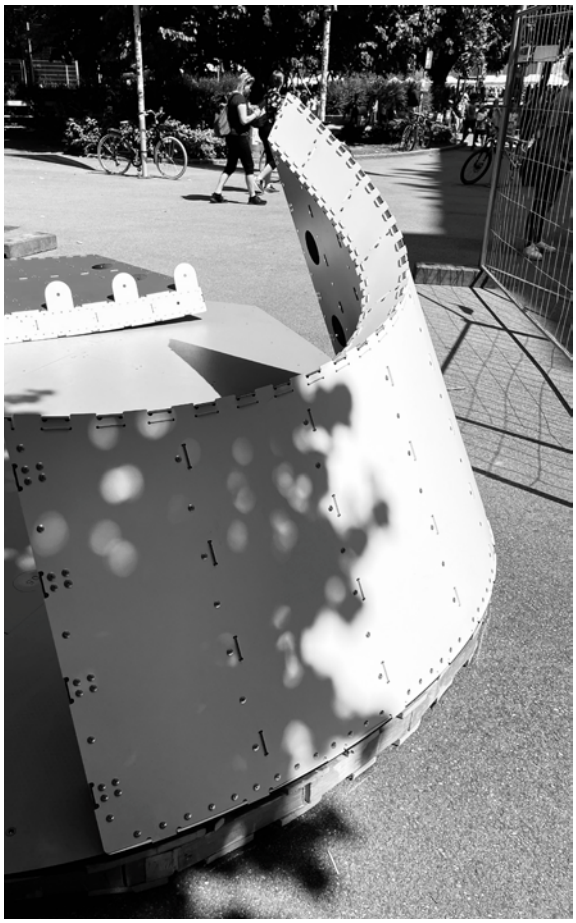


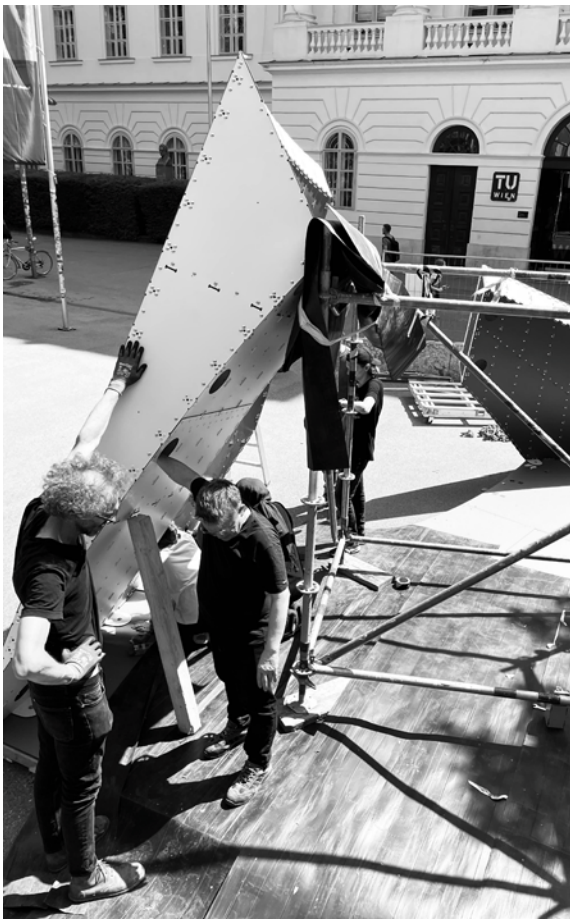



W 76577 I
A

BUILDING AT KARLSPLATZ


TU
WIEN

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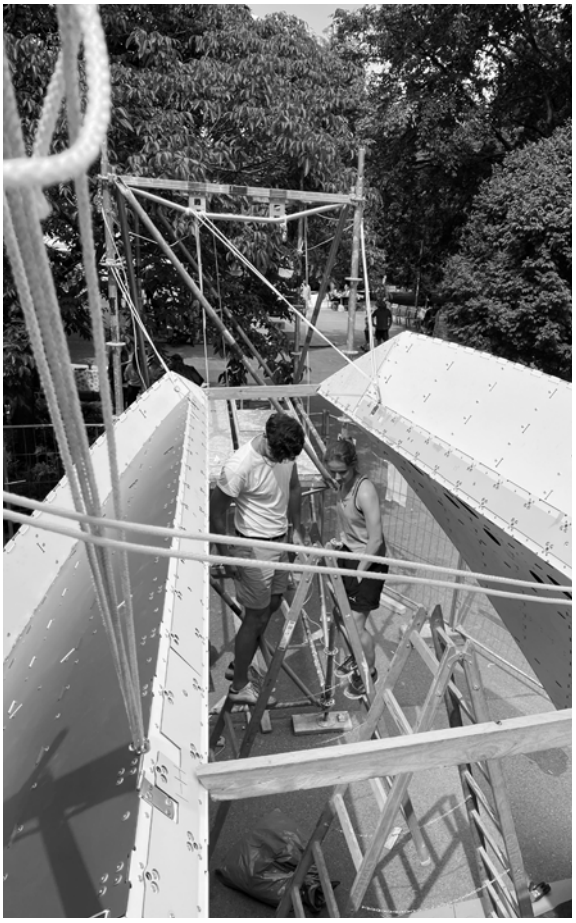
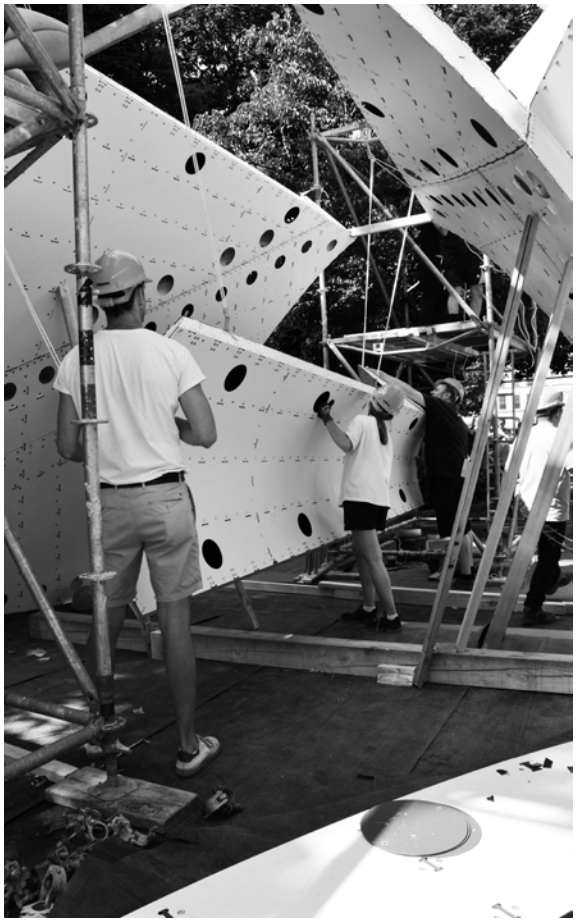
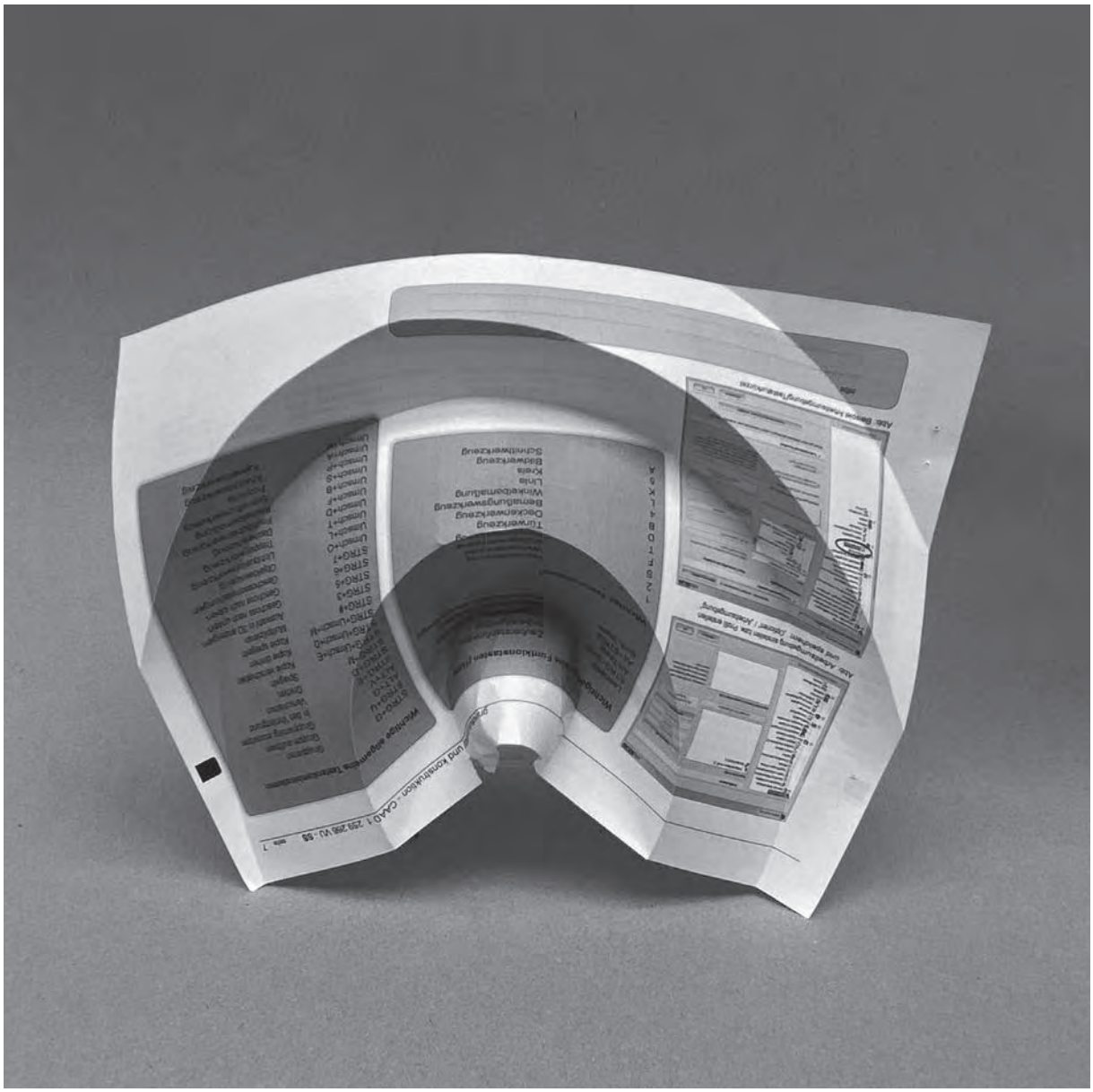






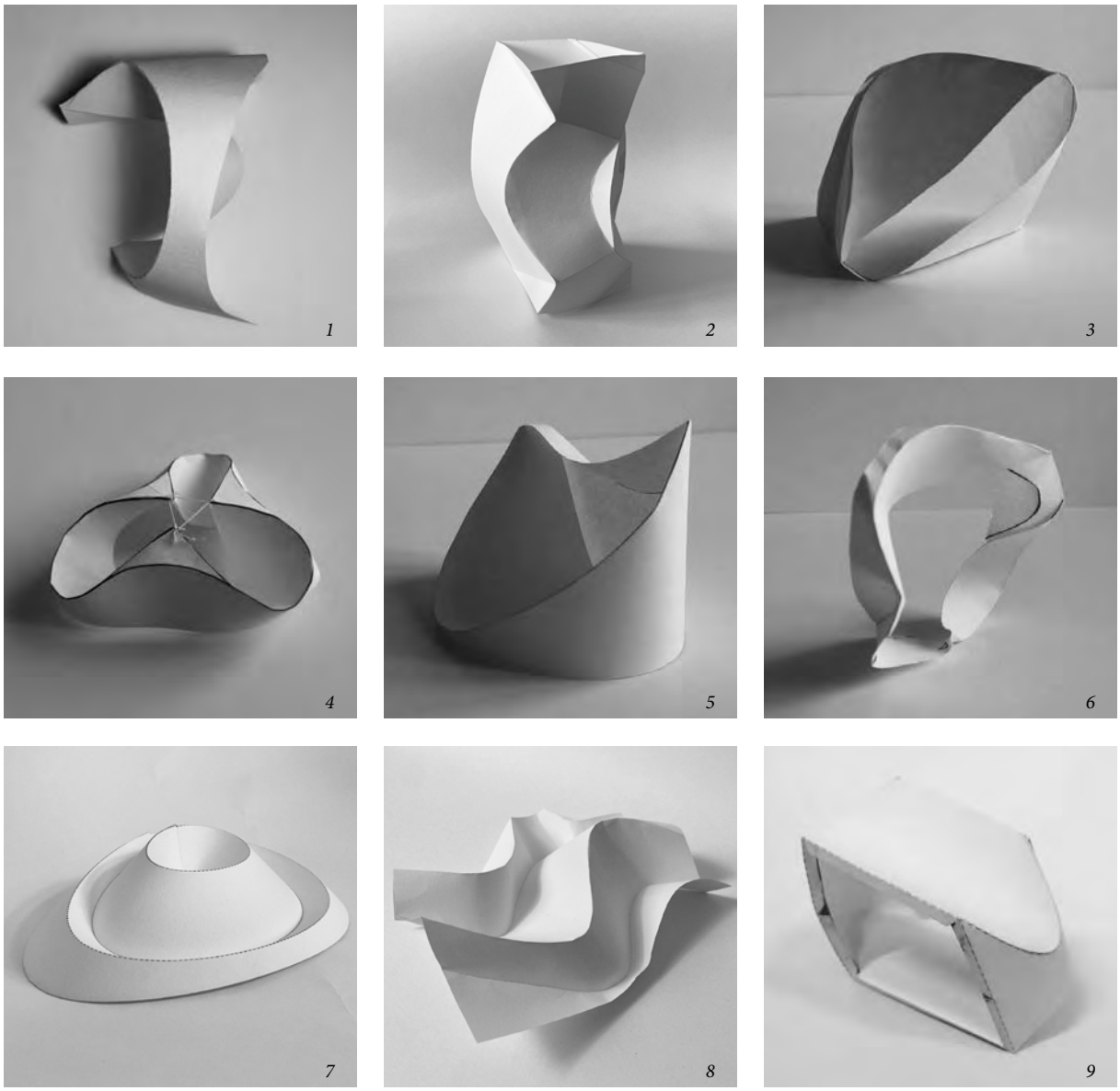
EARLY WORK

In our group of adventurous students, we embarked on countless experiments, trials, and explorations of different curves and folding techniques, which led to the creation of various fascinating folded monocoque shapes and objects.

Throughout the process, we developed an intuitive understanding of the construction method and formed a unique bond with the materials we used. The materials used in these experiments included cardboard, watercolor paper, newspaper, and gray cardboard, among others. These diverse materials provided us with a range of textures, strengths, and possibilities to explore. Each material brought its own unique characteristics, allowing us to experiment with different folding techniques and observe how the folds interacted with the specific properties of each material.

We discovered how the choice of material influenced the outcome of our folded creations. This exploration of materials added an extra layer of excitement, discovery, and sometimes frustration to our creative process, further enhancing our appreciation for the art of folding.

The challenges we encountered on our path to creative success were often accompanied by in depth conversations about geometric rules, folding principals and a lot more discussions about so called “valleys” and “mountains” which allowed us to push the limits of both the materials and our own imaginations, expanding them week after week.
Immersing ourselves in this thrilling world of experimenting with unfolded surfaces, we not only honed our technical skills but also gained a deep appreciation for the creative process and the infinite possibilities that folding presented.



First paper models

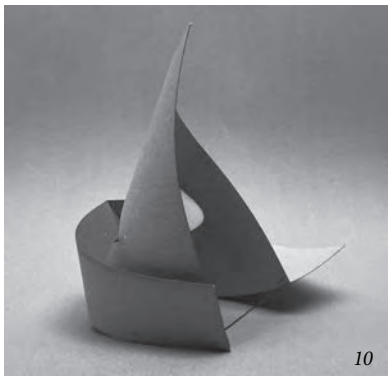
[1, 9] Alena Dizdarevic & Alena Marold

[2] Elena Meister & Daniel Ornetzeder

[3, 4, 5, 6] Ralitsa Danailova & Blanca Díez Cruz

[7] Nina Doringer & Nele Herrmann

[8] Johanna Grabher & Veronika Amann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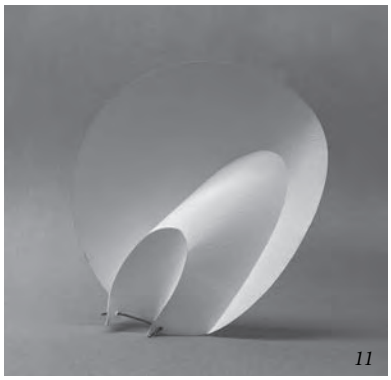
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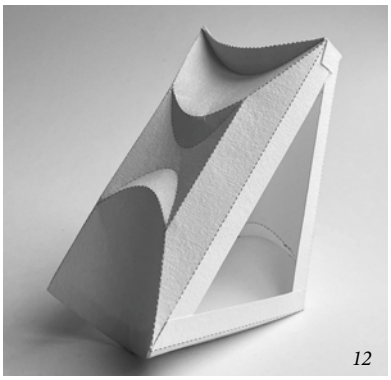
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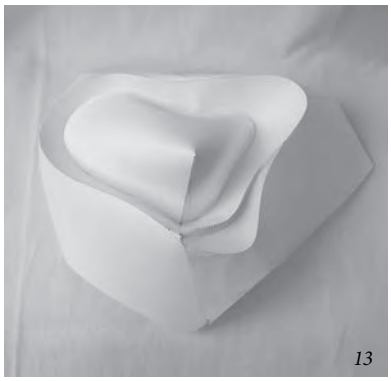
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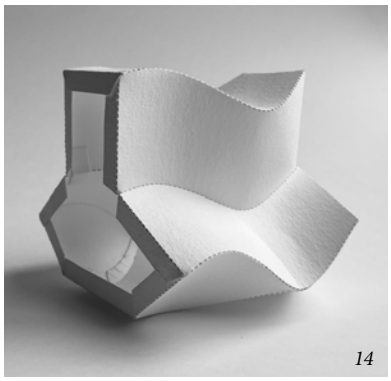
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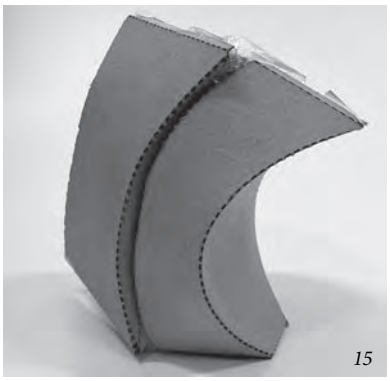
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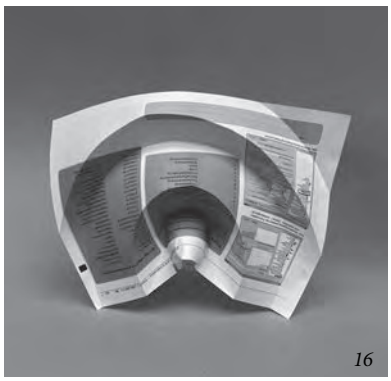
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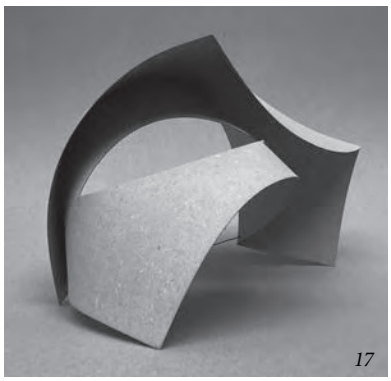
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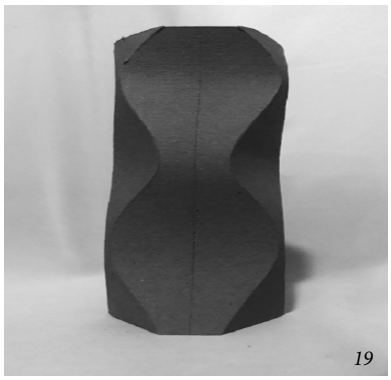
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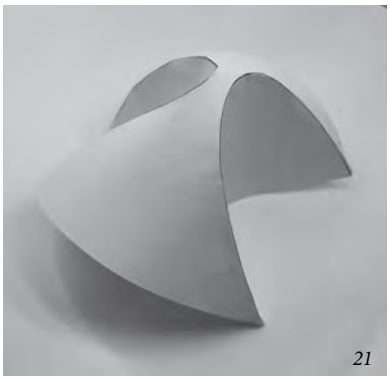
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[10, 11, 16, 17] Anton Marx & Florin Dissegna

[12, 14] Elena Meister & Daniel Ornetzeder

[13] Martin Pospichal & Nadja Kreiner

[15] Alena Dizdarevic & Alena Marold

[18, 20, 21] Ralitsa Danailova & Blanca Díez Cruz

[19] Carlos Juli Gil & Sofiya Lukyanchenko & Eda Karabel


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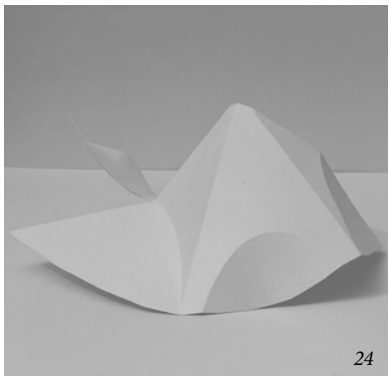
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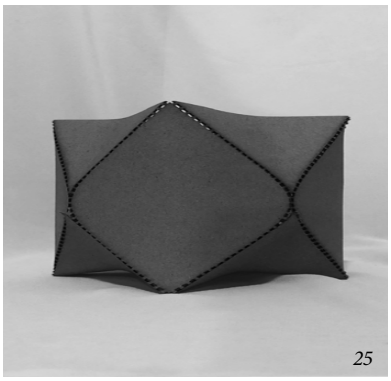
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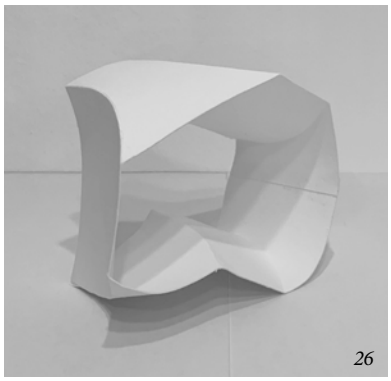
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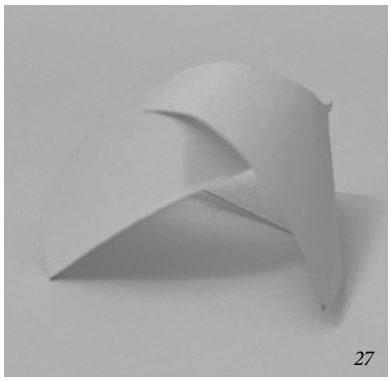
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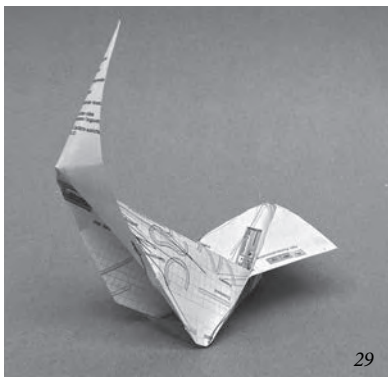
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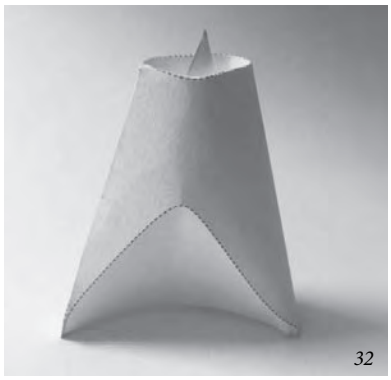
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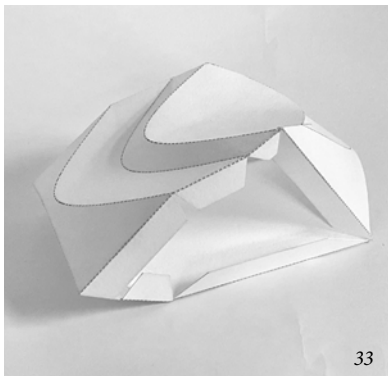
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[22, 23] Ralitsa Danailova & Blanca Díez Cruz

[24, 27] Alena Dizdarevic & Alena Marold

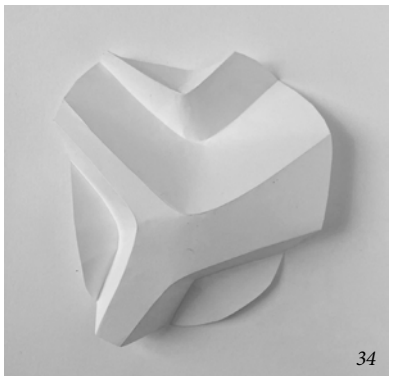
[25, 30, 31, 32] Carlos Juli Gil & Sofiya Lukyanchenko & Eda Karabel

[26] Christian Mitschdörfer & Milomir Milenkovic & Jonathan Kerth

[28] Martin Pospichal & Nadja Kreiner

[29] Anton Marx & Florin Dissegna

[33] Nina Doringer & Nele Herrmann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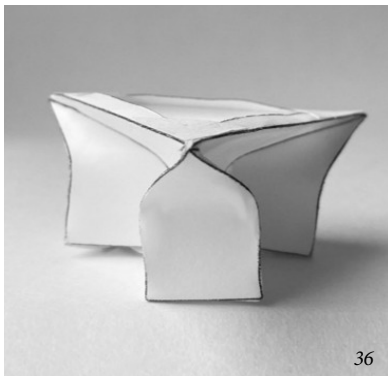
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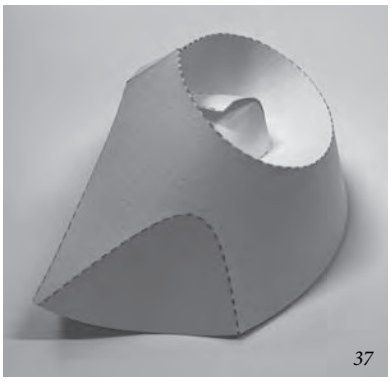
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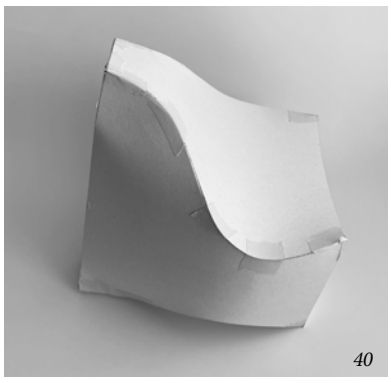
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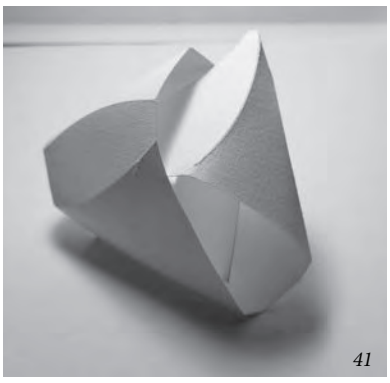
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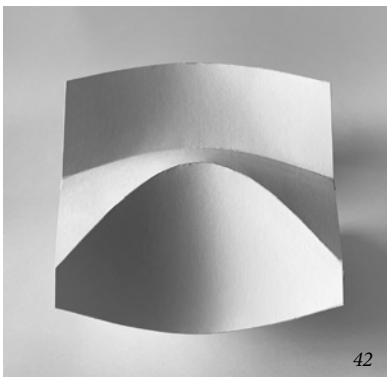
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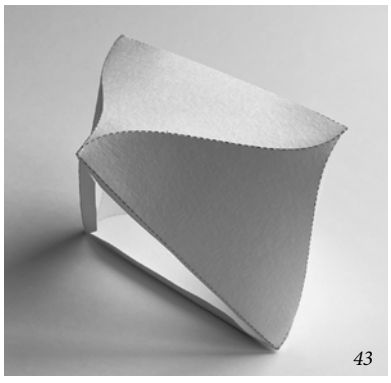
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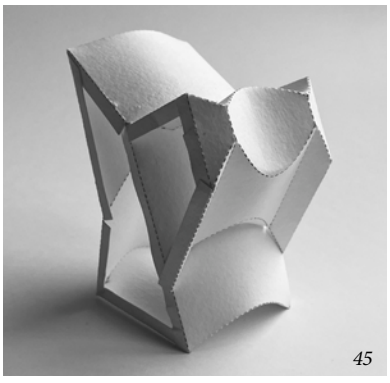
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[34, 36] Johanna Grabher & Veronika Amann

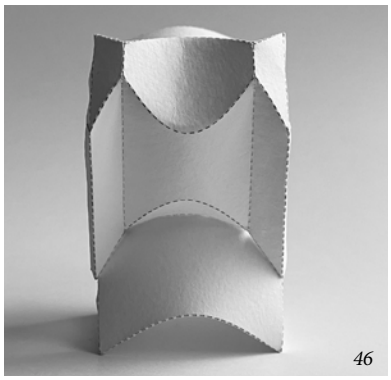
[35] Nina Doringer & Nele Herrmann

[37, 41] Alena Dizdarevic & Alena Marold

[38] Carlos Juli Gil & Sofiya Lukyanchenko & Eda Karabel

[39, 44] Anton Marx & Florin Dissegna

[40, 42, 43, 45] Elena Meister & Daniel Ornetzeder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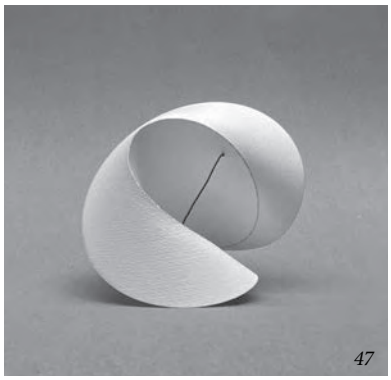
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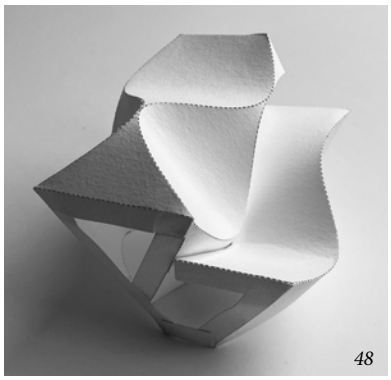
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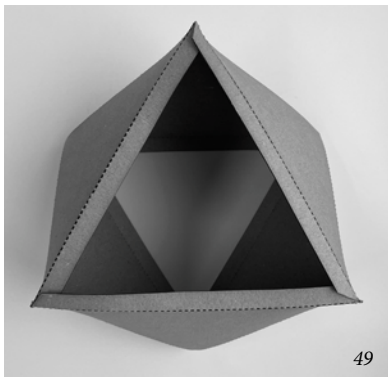
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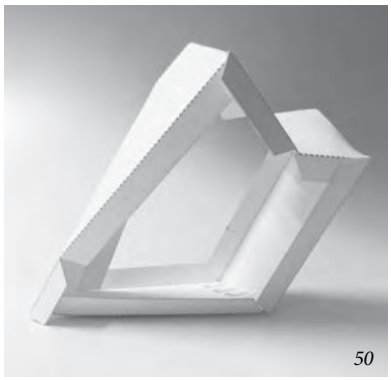
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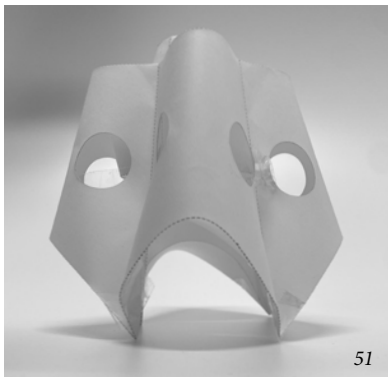
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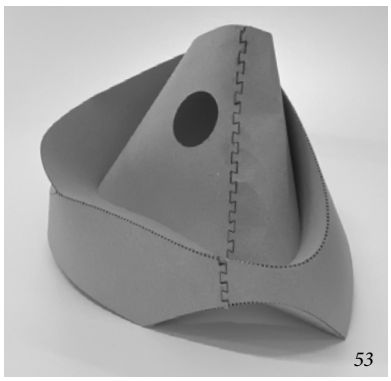
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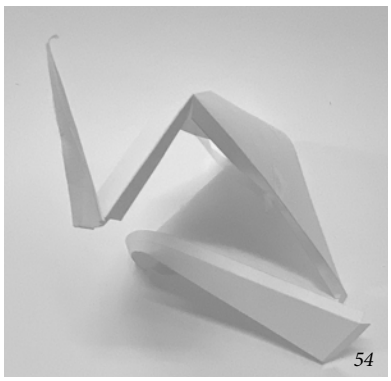
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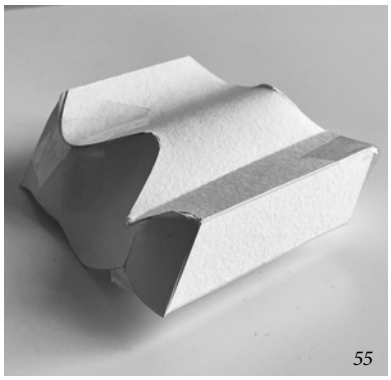
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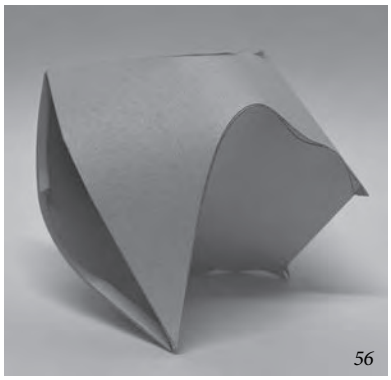
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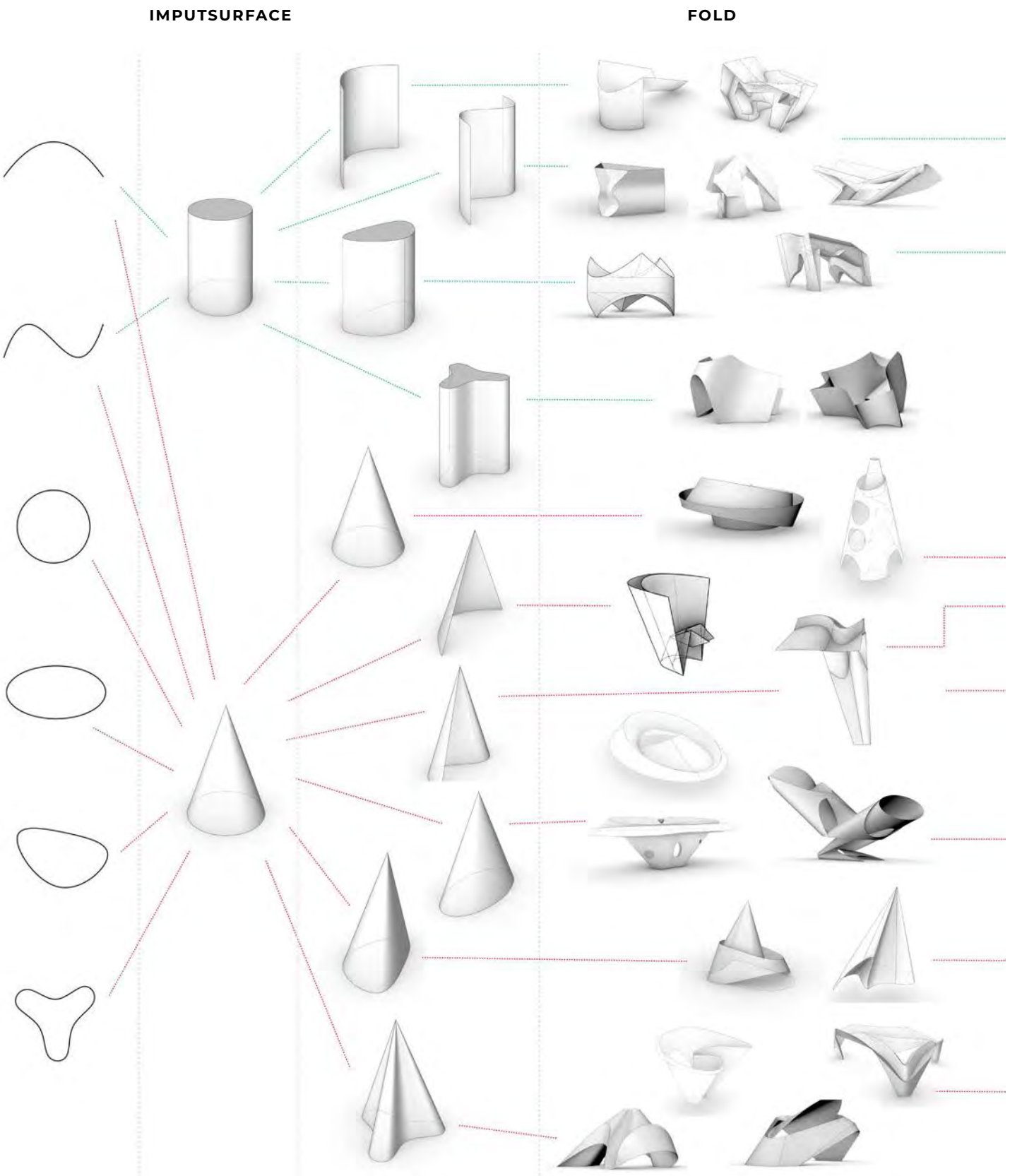
[46, 48, 49] Elena Meister & Daniel Ornetzeder

[47, 51, 52, 53, 54] Anton Marx & Florin Dissegna

[50] Carlos Juli Gil & Sofiya Lukyanchenko & Eda Karabel

[55, 56] Nina Doringer & Nele Herrmann

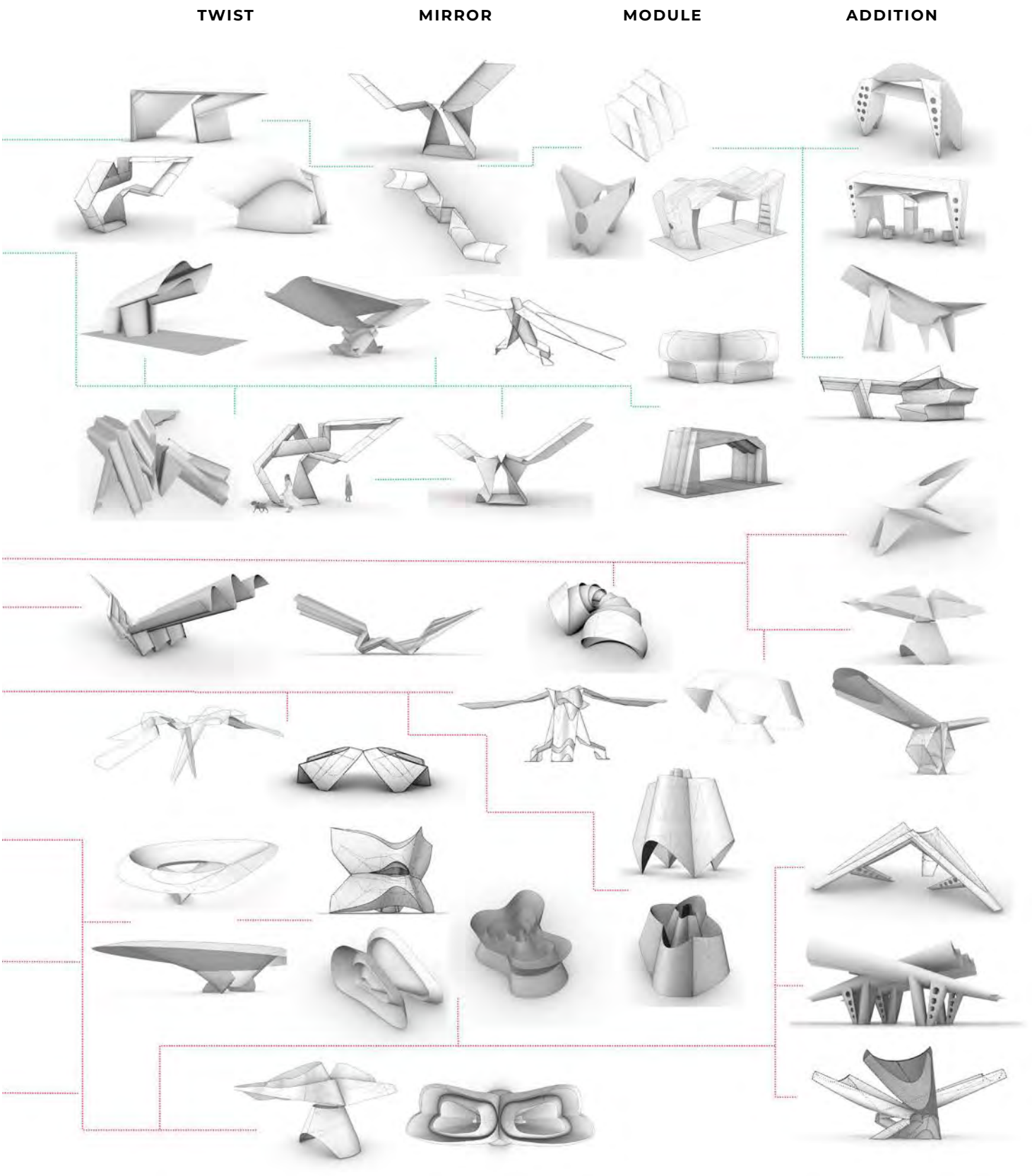
[57] Alena Dizdarevic & Alena Marold



Design Strategies

Over time, through mutual exchange within our group, we have become capable of increasingly complex folding and design techniques. It all started with small experiments and collaborative exploration of different approaches. Initially, our focus was on two fundamental geometric shapes: the cylinder and the cone.

Building upon these simple base forms, we began to explore more specialized techniques. One such technique was rotating the folding plane. Another breakthrough was the concept of mirroring. By reversing certain parts of the folding, we



could generate symmetrical and asymmetrical patterns.
Playing with these variables opened entirely new possibilities. Additionally, some groups worked with merging modules or components. By combining multiple folds, we could create complex and versatile objects. This allowed us to think in different directions and execute our designs in increasingly diverse forms. Through continuous exchange and collaborative experimentation within our group, we were able to continually refine our folding and design techniques. Each member contributed their individual ideas and approaches, inspiring and motivating one another to reach new heights.

TEAM

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FunderMax

Ein Projekt an der
Technischen Universität Wien
Institut für Architektur und Entwerfen
Forschungsbereich Hochbau – Konstruktion und Entwerfen (HB2)
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Franca Bierich
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Instagram management
Pavillon building

Ralitsa Danailova
Pavillon building
Bench design

Blanca Díez Cruz
Pavillon design
Magazine design
Programm Coordination

Florin Dissegna
3D to 2D conversion
Construction details design
Pavillon building

Alena Dizdarevic
Pavillon design
Magazine design
Programm Coordination

Emilio Duchscher
3D to 2D conversion
Graphic and Video Art
Pavillon building

Johanna Grabher
Construction details design
CNC-Files
Pavillon building

Eda Karabel
Bench design
Pavillon building

Nadja Kreiner
Construction details design
CNC-Files
Pavillon building

Sofiya Lukyanchenko
Structural analysis
Bench design
Pavillon building

Alena Marold
3D to 2D conversion
Pavillon building

Anton Marx
Construction details design
CNC-Files
Pavillon building

Süleyman Öztürk
Chipboard final modell
Pavillon building

Martin Pospichal
Pavillon design
Grasshoper parametrization
Structural analysis
Website management
Pavillon building

Hazal Sarikaya
Drawing for Permit
Bench design
Pavillon building

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