

A concise selection of the works by

Nick Krouwel

Nick Jan Krouwel
515 Beacon Street, 02215
Boston, MA, United States

nkrouwel@mit.edu
+1 (857) 277 3890

This is the portfolio of an architecture student who presents it with the same passion with which the projects he works on.



Preface

Nick Krouwel is currently joining MIT as an architectural exchange student from the Technical University of Delft. Very much driven to continue my academic education at MIT, I am caught by a vision where our knowledge and technology does not limit us but rather enables us to turn surreal dreams into inhabitable sustainable space, to turn fiction into fact. With technology accelerating our future and architecture being the canvas of the world we are living in, the discipline has the greatest potential to be evolved more than ever to make this happen. The combination of advanced digital prefabrication techniques and traditional crafts, should allow us to solve our rising demands and a sustainable future.

For my work I experience the benefits of combining digital and rapid prototyping techniques during the design process, as inspiring interchange between the virtual and real. To achieve this, I make use of high-end visualization software like Photoshop and Illustrator, as well as complex 3D modeling software like Rhinoceros, Grasshopper and Maya. I find digital and physical modeling a profound way, for presenting and prototyping my designs. Therefore, I use many different techniques ranging from the machining of metal and the moulding of concrete and plastics, to the understanding and practice of laser cutting 3D printing.

All these versatile skills are applied in my work so if you are interested, please have a look.

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Minor AP

Bachelor // Architecture & Industrial Design

The minor Advanced Prototyping was a six-month curricular program provided by the faculties of Architecture and Industrial Design at the Technical University in Delft. During this program, I gained experience in the use of digital modeling and rapid prototyping techniques which I find an inspiring interchange between the virtual and real. During lectures, workshops and several small design projects, I excelled myself on different fabrication techniques ranging from crafts like the machining of metal and moulding of concrete and plastics, to more innovative techniques such as laser cutting, CNC-milling and 3D-printing.

To convince you of my skills, I would like to present a selection of two smaller individual design projects. For Script, I practiced a sequence of production techniques to finally cast complex detailed double curved surface in epoxy resin. In the Lightstyle project I made multiple prototypes to determine its perfect proportions. I experimented with different materials in search of the most striking lighting effect.

I have worked on both projects with great passion and interest for the practice of these traditional crafts and innovative techniques. Since I have experienced these techniques, I am pleased to apply these techniques for my work.

Script

Due to my passion for handwriting and designing, it was my goal to produce a set of handwriting tools meeting my personal demands on size, grip and appearance.

After using rather primitive prototyping techniques in search of the right shape and grip for my hands, this shape was eventually simulated in a set of 3D models. These models are printed in cast using a sintered based 3D printer. They function as the basis for further production for any molding technique. The aluminum parts are made with a precision on the tenth of a millimeter on the lathe.



Lightstyle



The LZ129 Hindenburg was the world first ever made zeppelin of a light wooden structure and tensioned fabric. Because of the hydrogen that was used to lift its mass, it had a massive explosive ability that after a journey of 337000 kilometres lead to the fatal accident on the 6th of may 1937.

The story of the Hindenburg has been the inspiration for this lighting object. Digital fabrication is used as a tool to represent the correlation between the form and it's contrary. By interlocking these surfaces perpendicularly, the strongest visual effect and firm structure are achieved.



The process results into a final product existing out of just two main components. The actual surfaces are cut by a laser out of 3mm perspex. The aluminium component serves as fitting for the lamp and fixates these interlocked surfaces with a bayonet catch.

The explosive properties of het Hindenburg are translated into the heavy mass of the perspex. This gives the intention that the same fatal consequences might happen when hanged above your kitchen table.



Graduation Project

Bachelor // Architecture

For the graduation project of my bachelor I made a redesign for the Kunsthal Rotterdam, a true icon designed by the Dutch pioneer of architecture, R. Koolhaas. Despite its popularity among visitors, there have been complaints about the building because of its poor detailing and the complex routing in and around the museum.

After the analysis the following can be concluded: The environmental qualities around the Kunsthal, are insufficiently benefitted by the introverted design. When refurbishing the complex design, it will lose character since its different elements are heavily related to each other. Therefore, the new concept of composing the building to form a unity with its surroundings requires a complete new design.

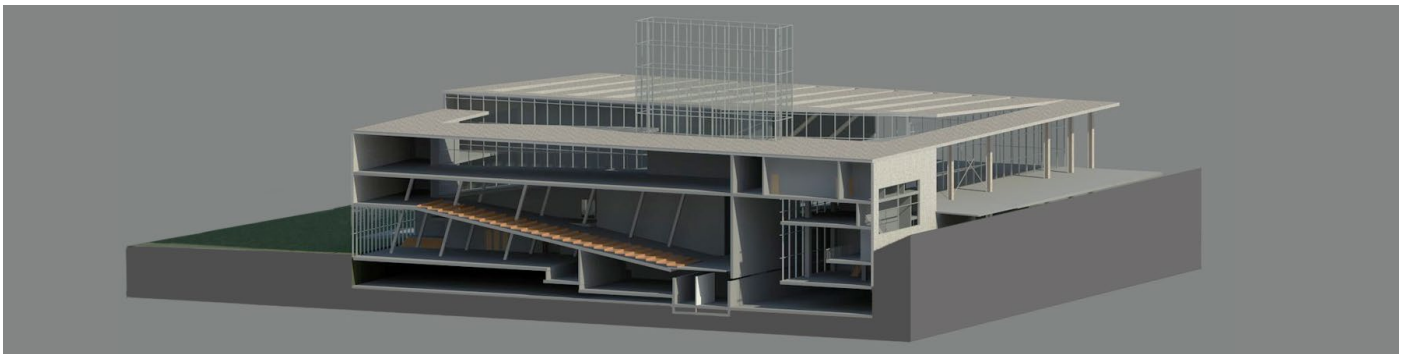
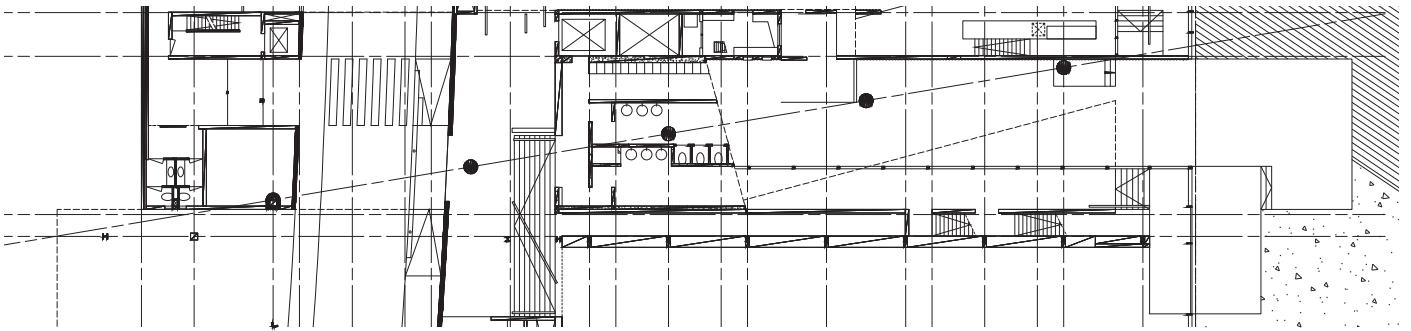
In this redesign there is a full integration of multiple disciplines present. Architecturally, the concept of R. Koolhaas is reinterpreted to use the building as a connection between the park and dike. By lifting the exhibition spaces a covered public space underneath is created, enabling a visual relation between the interior and exterior. Although its bearing structure is concealed from the exterior, it is present and aesthetically used in the exhibition spaces. In terms of installations there has been made a distinction between the closed volumes and the main hall. Those that have specific demands for ventilation, lighting and heating are positioned in the closed volumes, where as the public spaces surrounding these volumes have a more passive climate.

During my graduation project I was able to use all of my experience and skills obtained during my bachelor resulting in a detailed design comprising multiple architectural disciplines.

Kunsthall

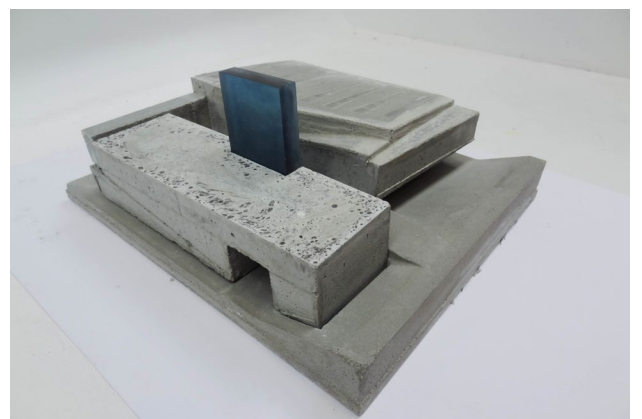
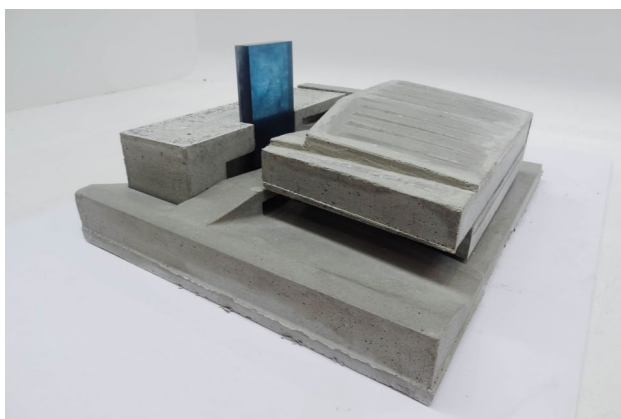
Analysis

To form assumptions and create a certain vision on the design, a thorough analysis needs to be made. Redrawing plans, cross-sections and elevations using two and three digital models helps to create a full understanding of the current situation.

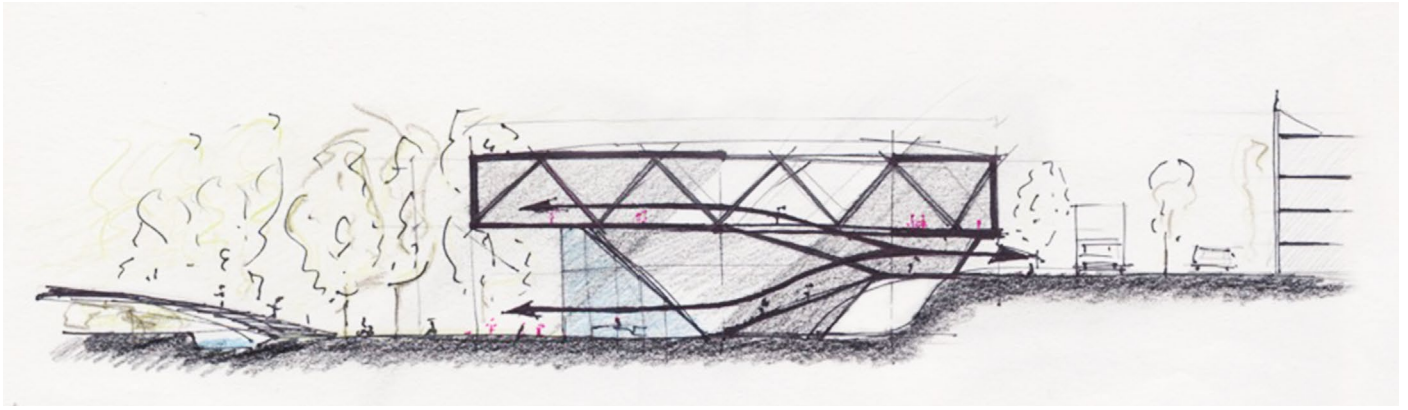


Concrete Model 1:100

A full understanding of its composition is vital. This knowledge is derived from this concrete model. A mould of the inverted building enabled me to cast this sculpture. This requires full understanding of the buildings mass, dimension, proportions and exterior details.

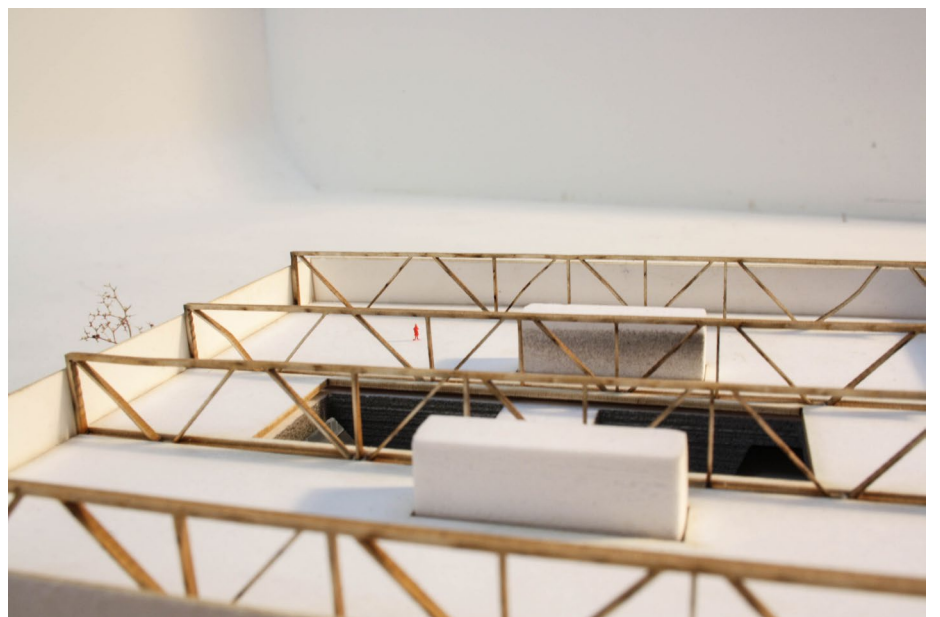


Conceptual Sketch



Final Model 1:100

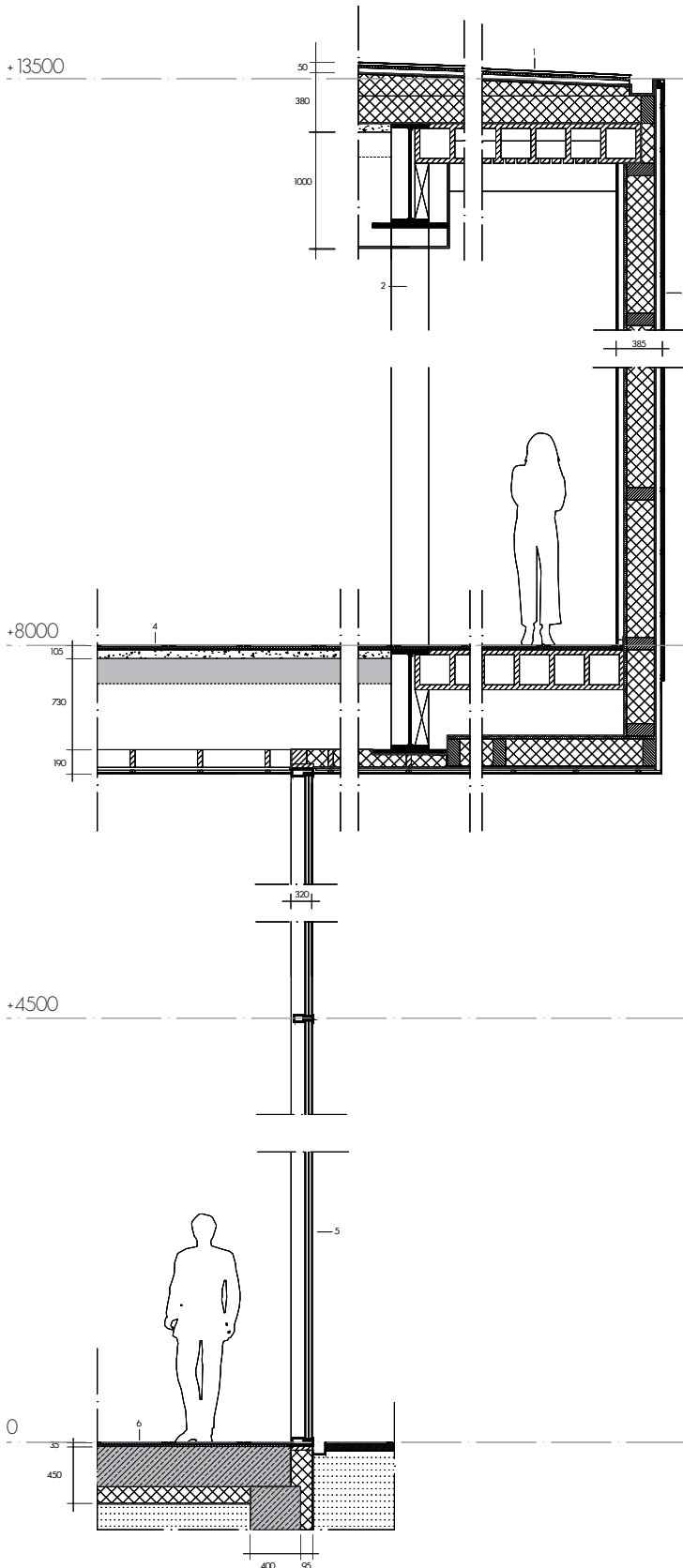
The qualities of the surrounding park are transferred into the interior space of the central hall by the use of a transparent façade. Because the hall is aligned with the route through the park, a strong visual relation arises between the park and the interior. The abstract volume that is lifted by two dynamical shaped masses domes the hall. This volume serving as exhibition spaces, frames the entering of daylight from above that alights the central hall. The spectacular image visualized by this lightened hallway and the cantilevering effect of the main volume mass, creates a unity between the interior space and its surroundings.



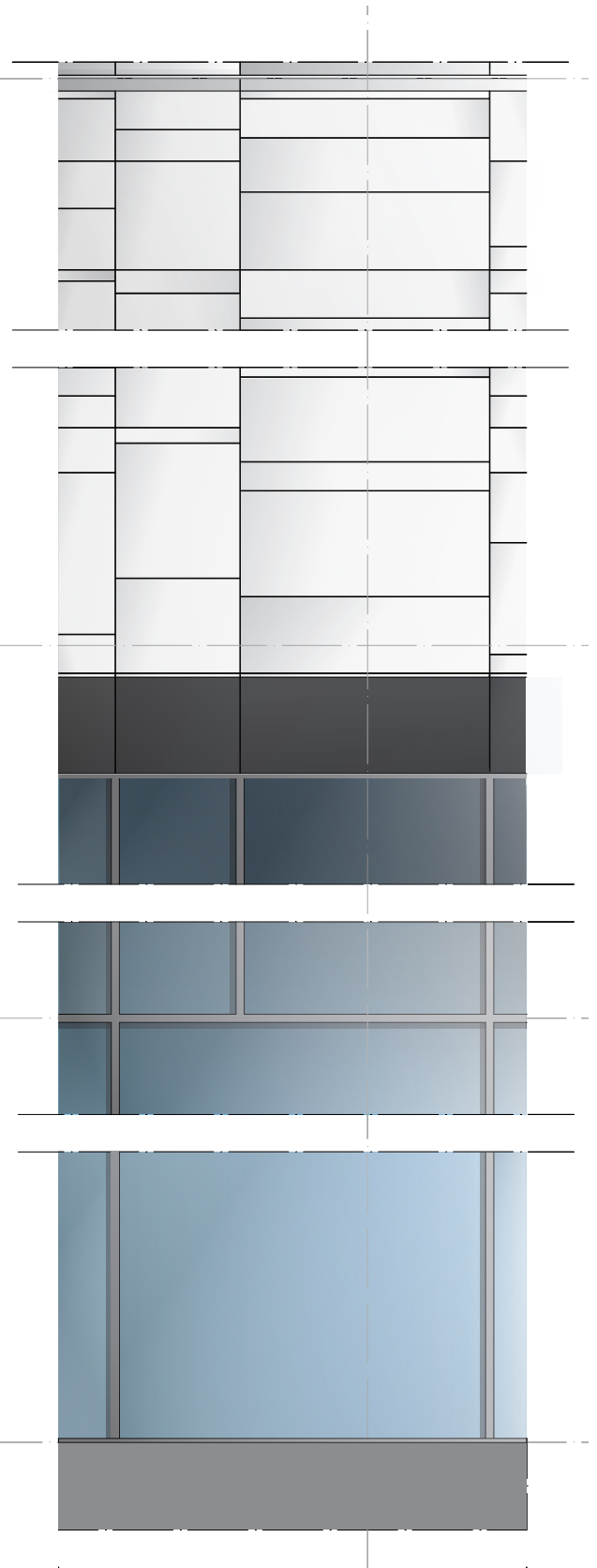
Technical Drawings 1:50

Considering sustainable matters, its structure will be constructed out of a relative lightweight steel-structure with wooden floors and façade panels; all materials that can efficiently be recycled. The two lower volumes are finished with matte black composite panels. This is in great contrast with the finishing of the giant volume that is finished with white-coated steel plates. The panels are positioned in a certain rythm, so the voids between create a subtle pattern along the façade.

Vertical Section



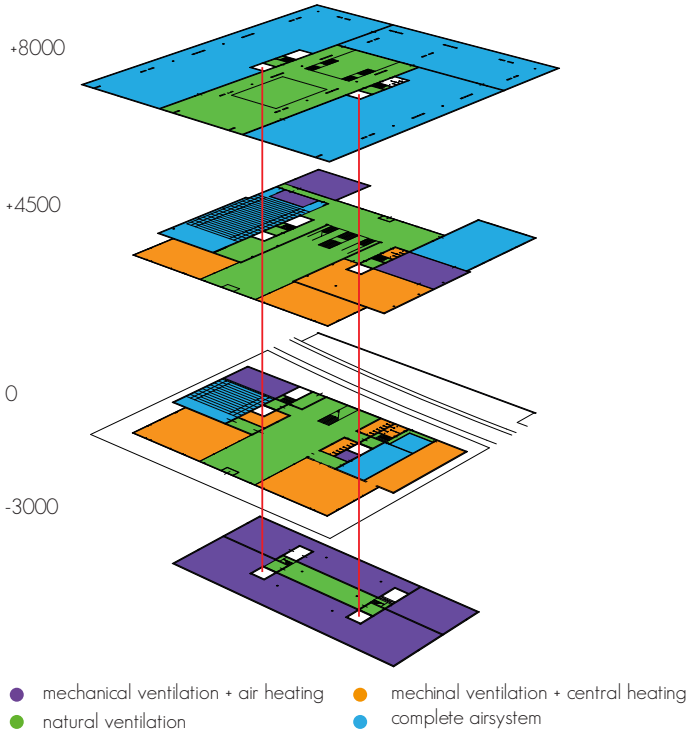
Elevation Exterior



Technical Schemes and Plans 1:500

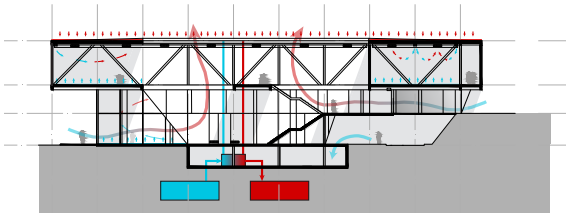
In terms of installations there has been made a distinction between the enclosed functions that have specific demands for ventilation, lighting and heating positioned and the space in need of a more general climate. The central hall is used for natural ventilation. In summer it allows hot air to rise and escape through shafts in the roof while in winter the hot air is captured and stored for heating.

Ventilation Systems

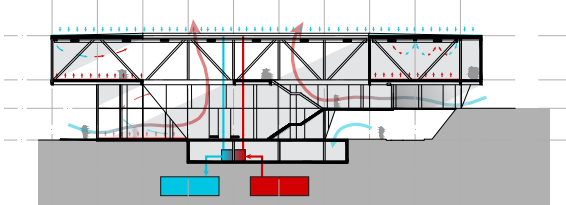


Ventilation & Heating

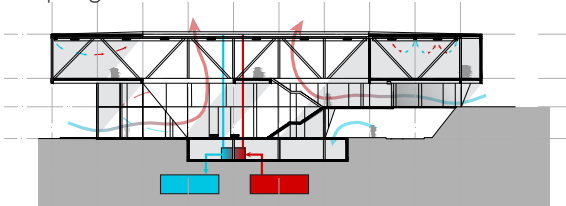
Summer



Winter

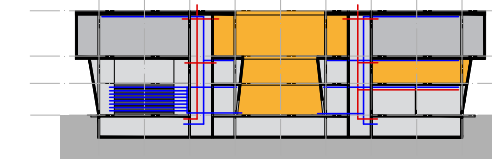
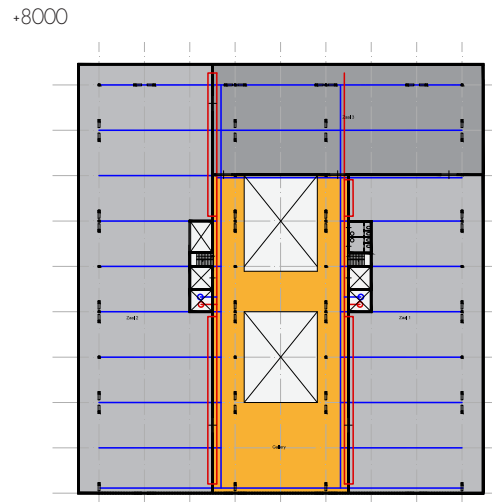
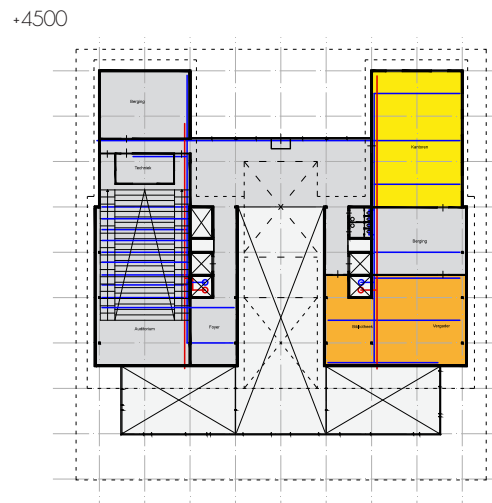
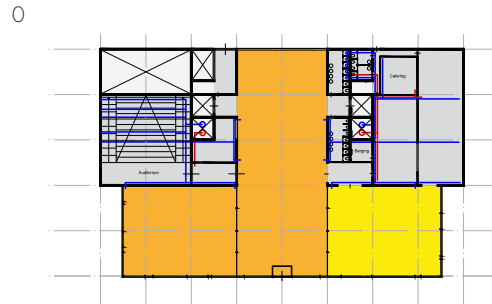


Autumn & Spring



- red circle: heat storage
- blue circle: cold storage
- red arrow: hot air
- blue arrow: fresh air

Installation Plans



- grey circle: dark room
- orange circle: daylight
- grey circle: artificial light
- yellow circle: daylight + view

Bucky Lab

Master of Science // Architecture, Urbanism and Building Technology

As a part of the Bucky Lab Studio, I designed the COS-e: a Cardboard Origami Shelter in case of emergency for refugees. It is based on an origami paper folding principle. The principle exists out of rectangular pieces of cardboard, which are folded in such a way it is possible to create a 3D double curved surface from a 2D flat surface. By folding the surface stiffness and strength are added. The entire structure of the cone can be folded into a relatively thin and lightweight package that makes the transportation to and the actual assembling on site easy and quick.

The folding structure is based on an repetitive origami pattern. This results into a fourteen angled cross-section that can be folded and unfolded around its central pivot point. The eventual shape is achieved by the fixed diameters at the top and bottom; the top joints are fixed allowing the structure to rotate, the bottom diameter is fixed by using cardboard tubes as spacers.

While origami folding is commonly practiced with paper material of which the thickness is negligible, the thicker cardboard is much complex to fold. In the final design fabric is sandwiched between two layers of cardboard allowing only the textile to fold on the folding lines. With this method the sheets cardboard will not be damaged when (un)folded the structure.

COS-e

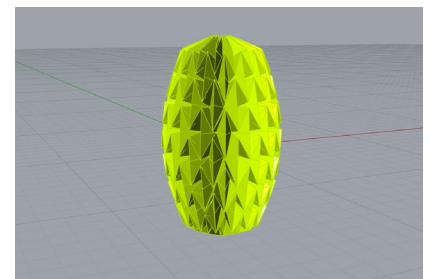
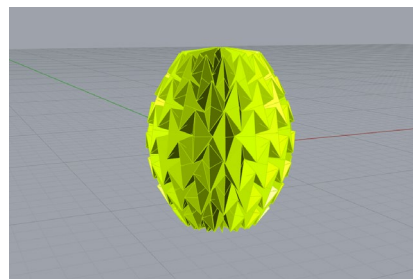
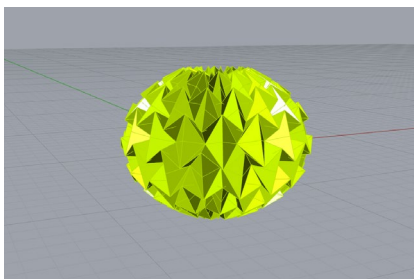
Concept 1:20

The foldable shelter is based on the *waterbomb* origami folding principle. Since this was such complex principle to be further developed, the use of physical models was a great but time-consuming method to develop the concept into a successful design.



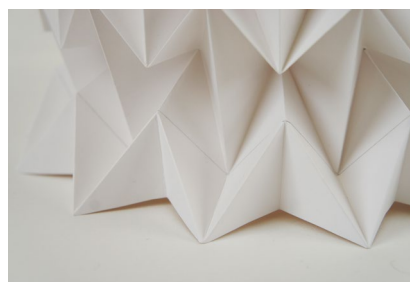
Parametric Design

By using complex digital modelling software like Grasshopper the folding pattern was optimized. An important fact is that the adding folds results in more 'shape-ability' and strength. However, this causes the total structure to enhance in weight since this principle is very material inefficient. A perfect equity between shape-ability and weight results in an exact number of folds.



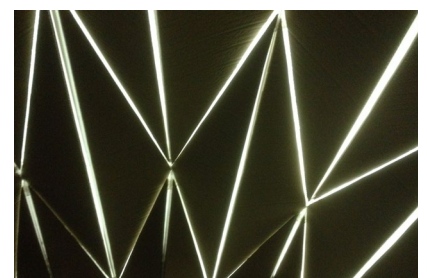
Final Design 1:20

The final design uses a combination of different folding patterns to serve all different sections of the structure. The specific sections for bottom, wall and roof result in a very efficient interior space, but also into a firm self-supporting structure.



Production Process 1:1

In the final design, cotton is sandwiched between two layers of cardboard allowing only the textile to fold. This prevents the cardboard to get damaged. To fold the structure, all folds need different sizes since several surfaces are overlapping each other. These are calculated using the parametric design tools. During production a mould positions all pieces with the exact distances from each other. After the total surface of 120m² is created, it is folded into the small package that can be transported and deployed where needed.



COS-e

Cardboard Origami Shelter in case of Emergency



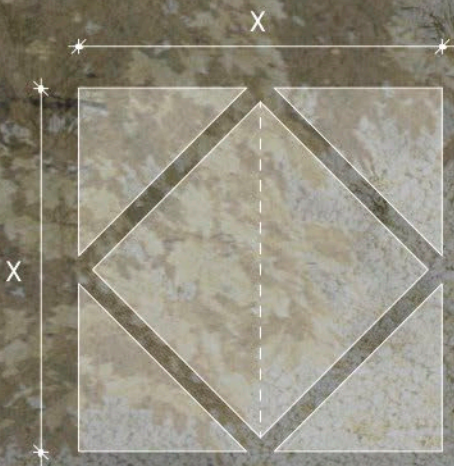
Leightweight



Renewable & natural resources

phase 1
CARDBOARD

phase 2
STRUCTURIZE





Easy transport



Adaptive

phase 3
UNFOLD

phase 4
MOUNT

phase 5
CLAD

