

HOUSE OF A HUNDRED COLUMNS

- Gothenburg's House of Making -

- Master's Thesis in Architecture -

PEDRAM SEDDIGHZADEH

HOUSE OF A HUNDRED COLUMNS

Master's Thesis in Architecture
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Matter, Space, Structure Studio

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Examiner: Morten Lund

Fall 2013

ABOUT

House of a hundred columns is a proposal for a new House of Making situated at Backaplan, in Gothenburg, Sweden. A house of making is a public building, a mixture of a culture house and a fabrication space, where the program is focused on creating physical objects as an act of culture.

The project is also an investigation of what a group of columns can be. Taking departure in historical and modern examples, the thesis project examines the architectural relationship between columns. Based on this research, one hundred unique columns are proposed for the House of Making. Their design is directional, enabling them to define space and gives each its own unique personality, very much like the people visiting the building. The wooden columns' identities are further developed through a play with the cross lamination of the timber.

Gothenburg's new House of Making is a dense forest. Like trees the columns provide shelter, define space, carry load, let light through and trigger activity.

The project consists of two main parts. The first part is an investigation trying to answer the question what a group of columns can be. And the second part is a proposal for Gothenburg's house of making, which is a proof of concept for the initial investigation where the learnings from the first part is implemented in the building proposal. In this report the two parts are presented as two chapters; *1. Proposal* and *2. Process*.

PROPOSAL

-House of a Hundred Columns -

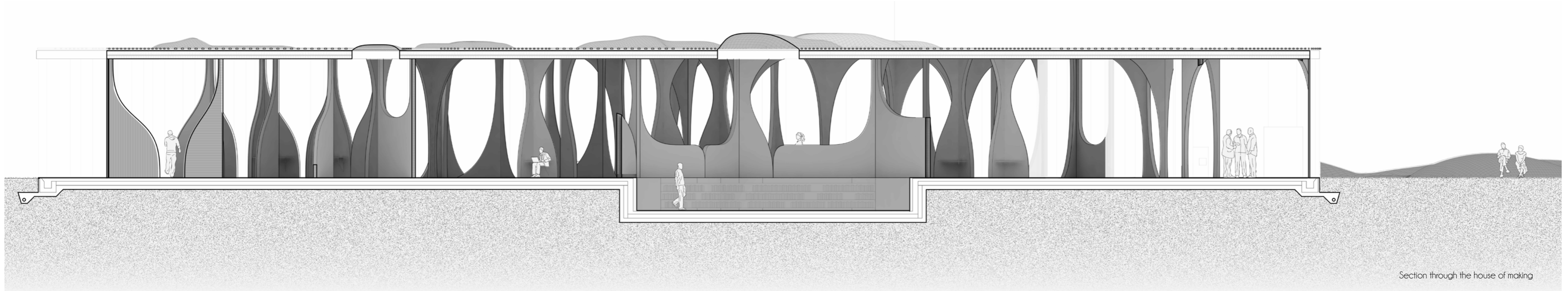
House of a Hundred Columns is created using three architectural elements: the columns (the tree trunks), the roof (the leaves) and the ground (the soil). Together they create the forest which is Gothenburg's House of Making.

The columns define space without creating barriers. They carry load and trigger activity.

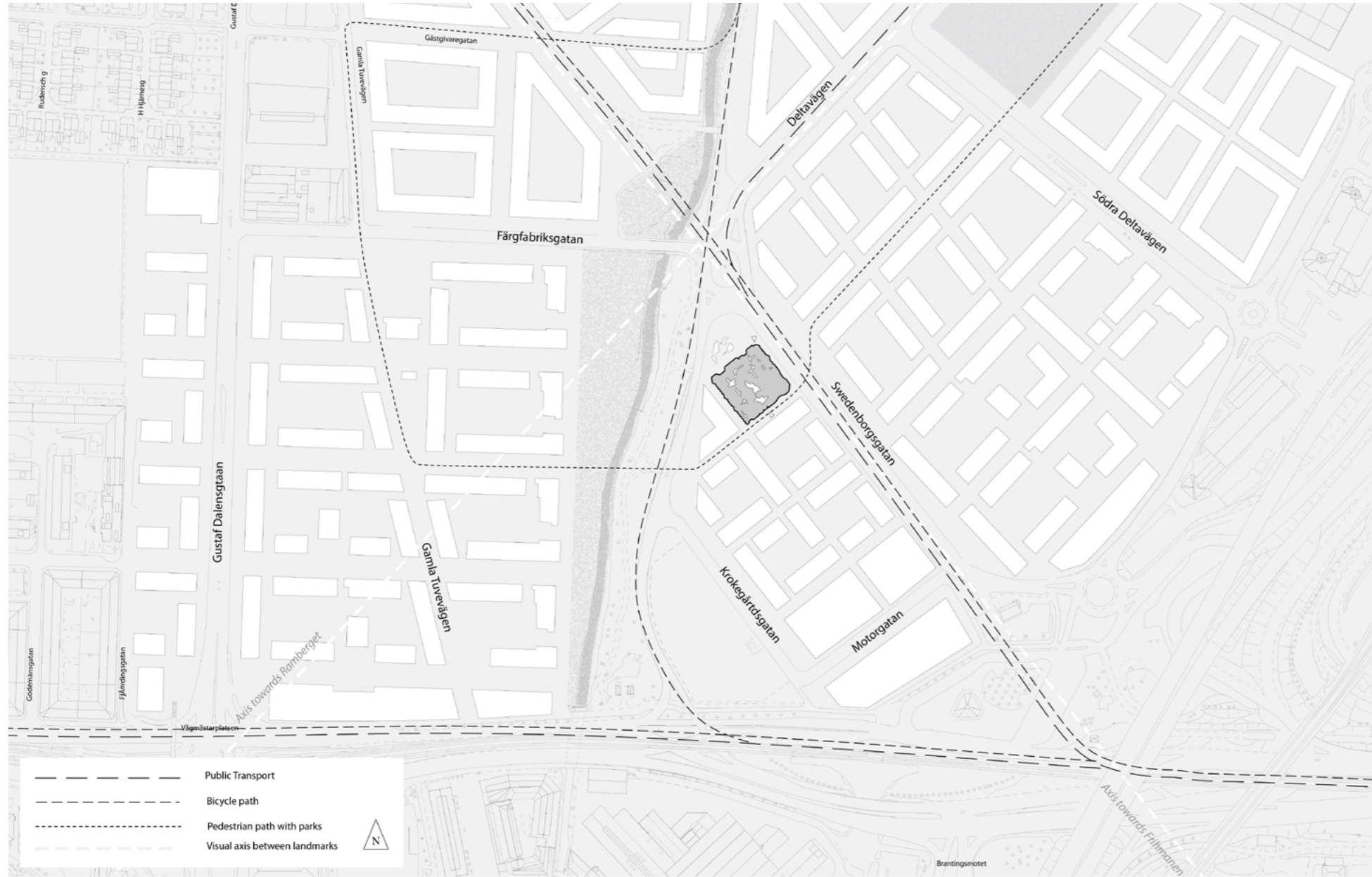
The building is proposed in cross laminated timber columns that carry a roof of massive wood. The facades are angulating glass that frames the activities on the inside for the people passing by on the street.

In designing the proposal for Gothenburg's house of making the program is divided into three main parts: a library, a maker space and a public stage with exhibition areas. Each of the three zones are then divided into regions which are defined by the hundred columns of the building, each having its own unique personality.

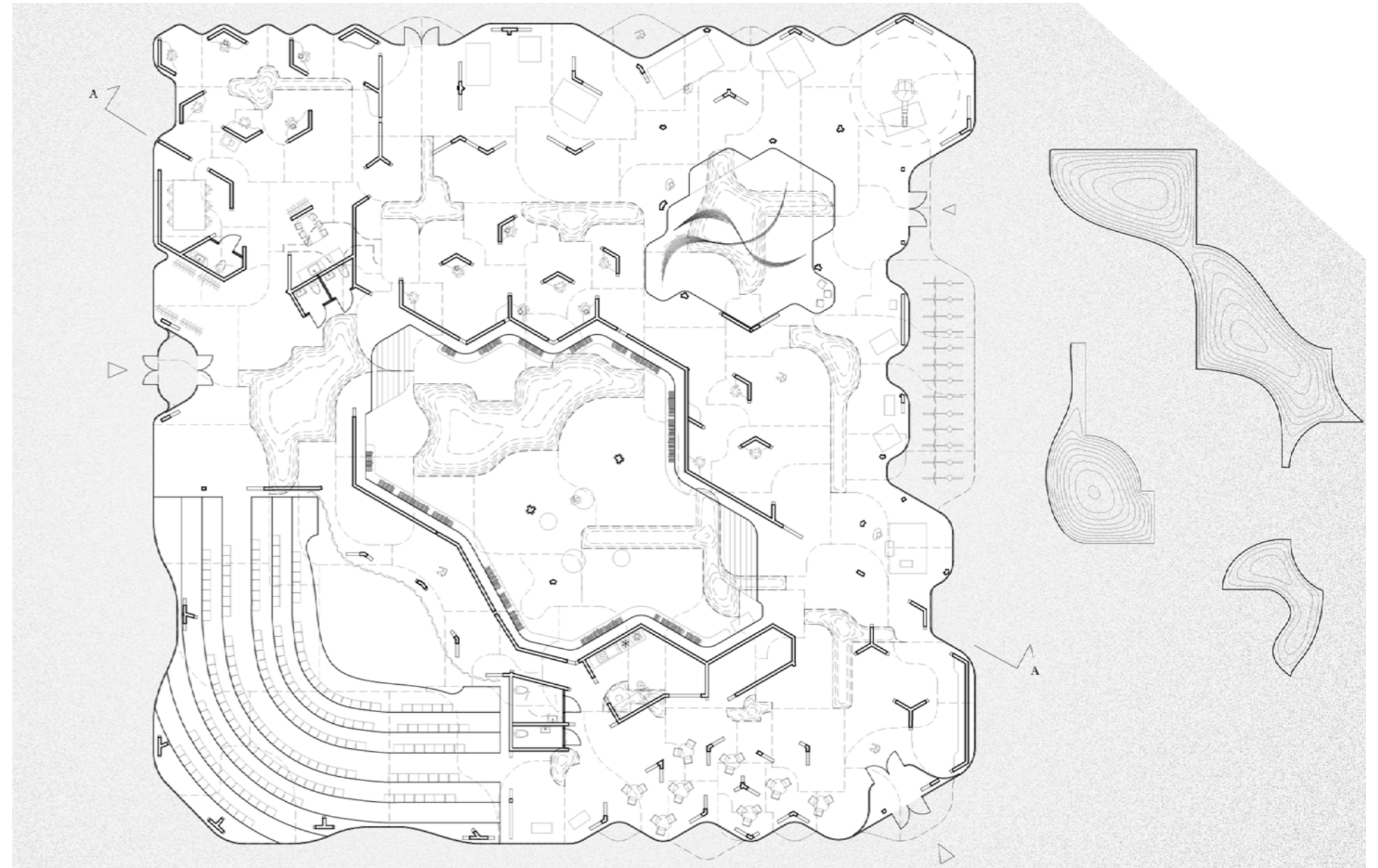
The roof is designed as an ornament using thin wooden battens in different direction; the aim is to give the neighbours a beautiful roof to look at the same time as the pattern on the roof gives hints of the program underneath it.



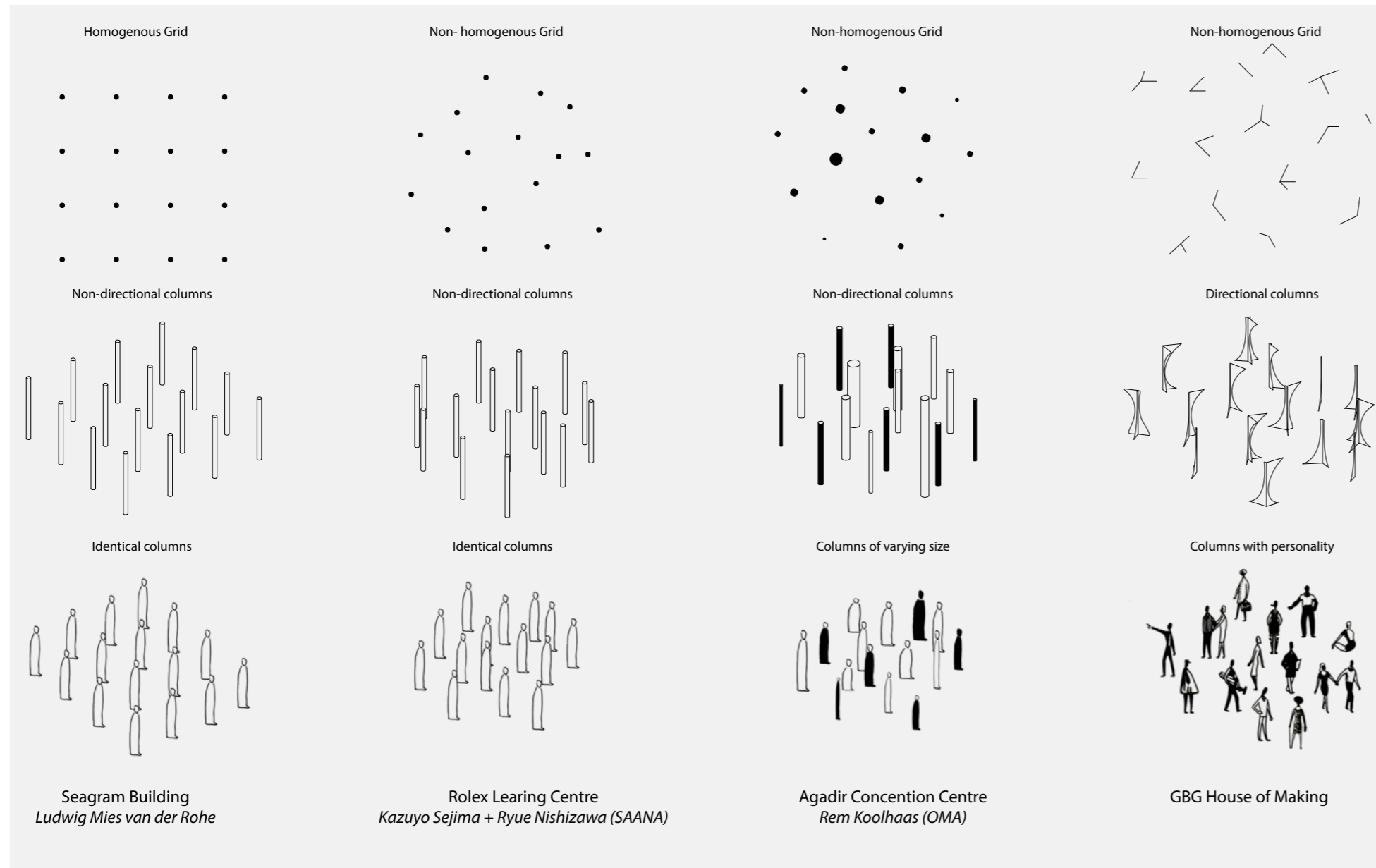
Section through the house of making



SITE
 - Backaplan, Hisingen -

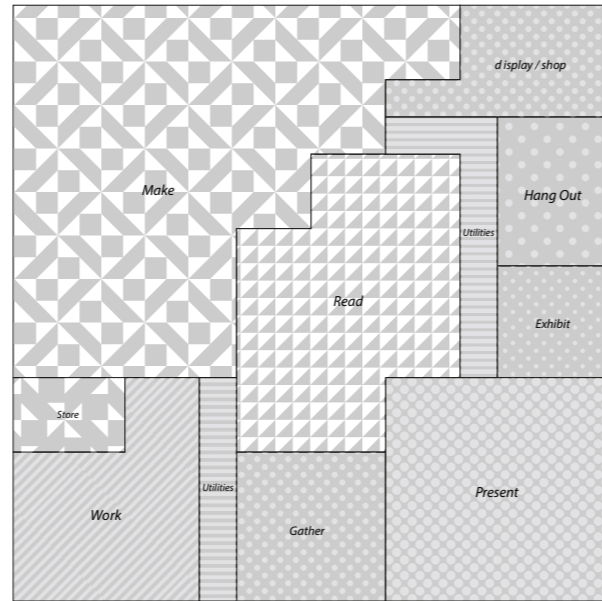
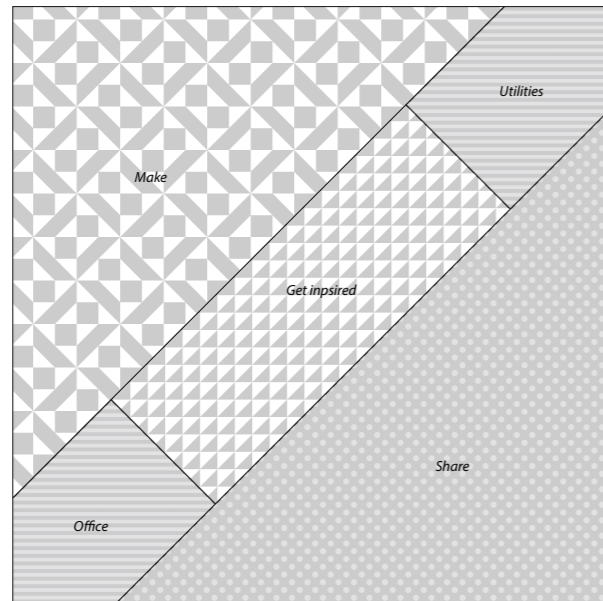
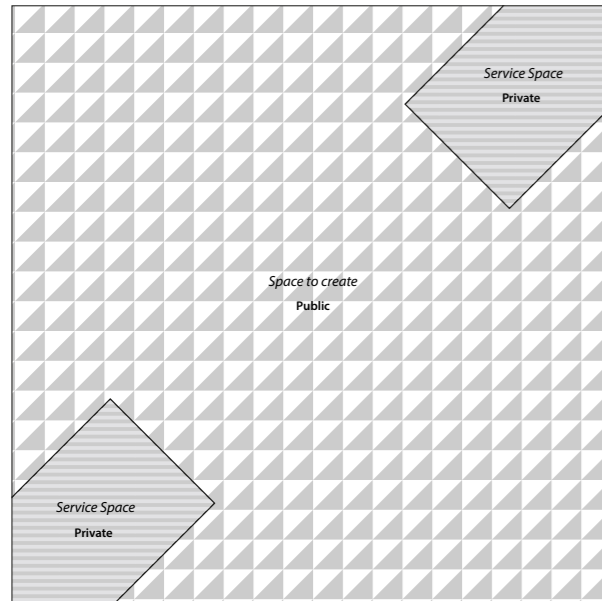


PLAN
 - A field of columns -



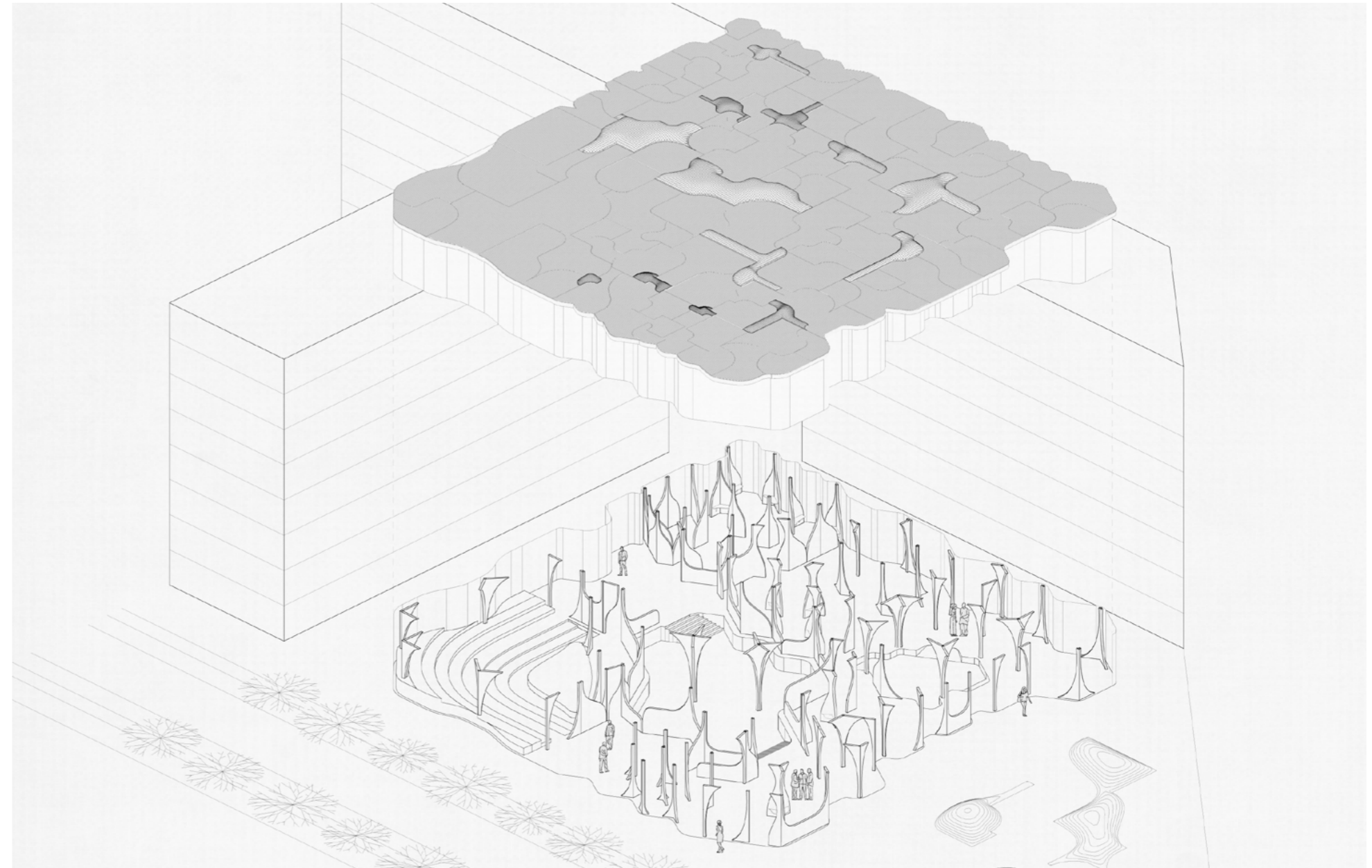
CONCEPT
- Directional columns -





PROGRAM

- The columns define the program -



AXONOMETRIC VIEW

- In between the columns -

[mm]

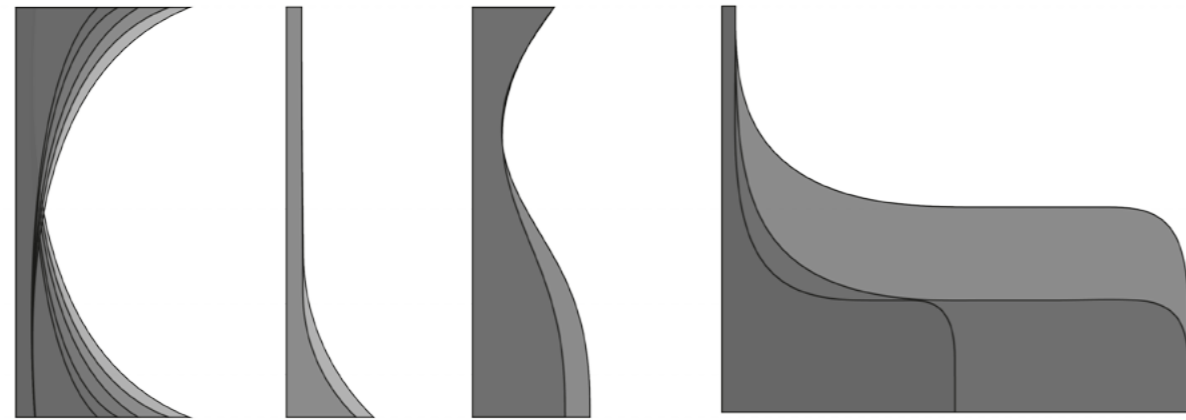
+ 4350

+ 2200

+ 1200

+ 450

0



The workshop column

The café column

The works space column

The library column

[mm]

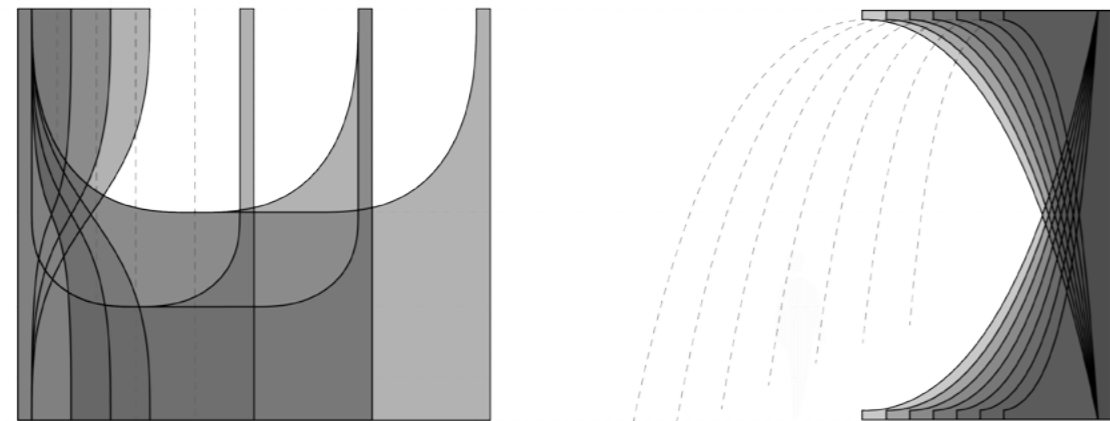
+ 4350

+ 2200

+ 1200

+ 450

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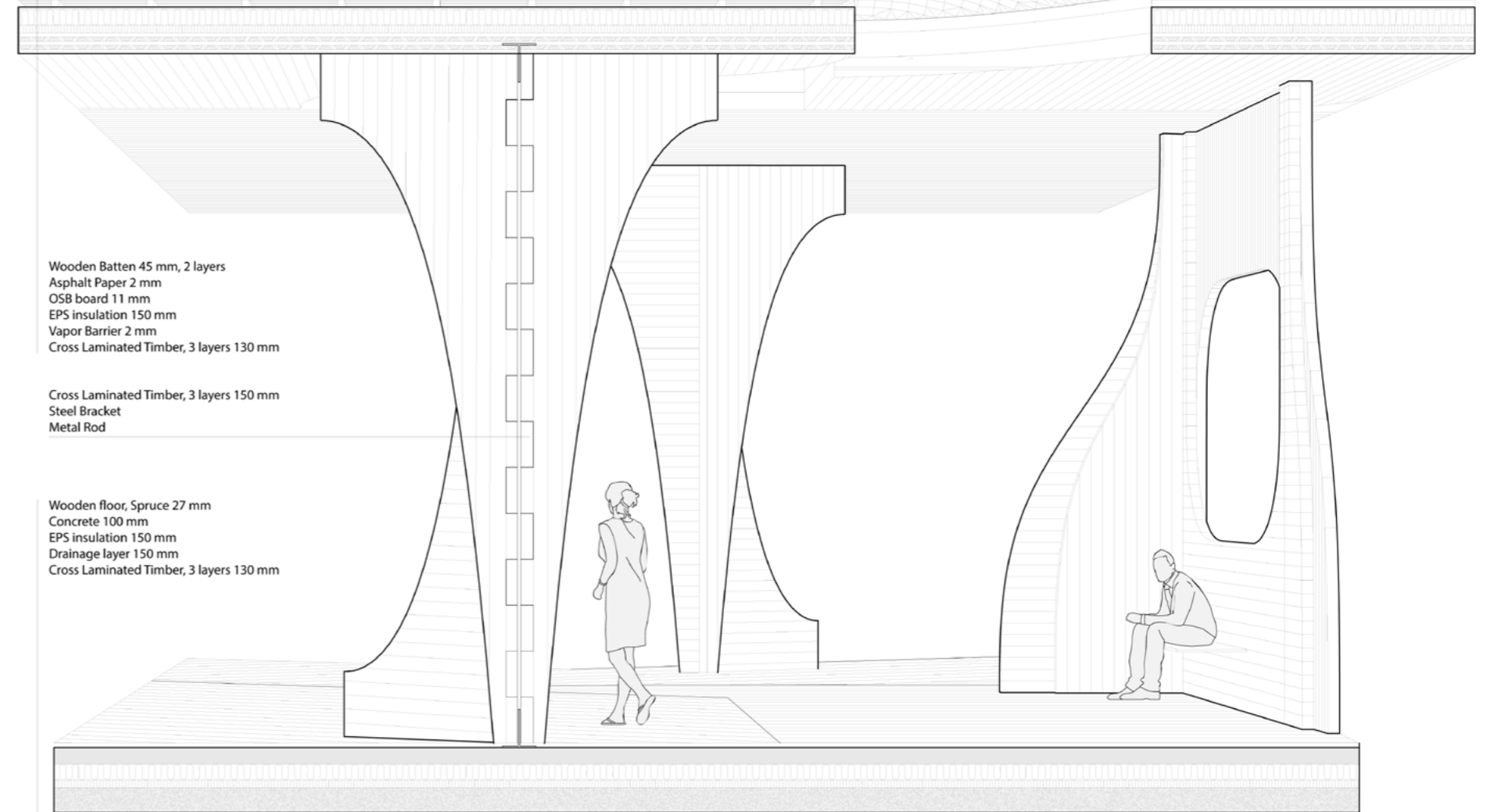
The office column

The auditorium column

COLUMNS GRAMMAR

- Family of columns, each with a specific geometry -

Polycarbonate Roof Light



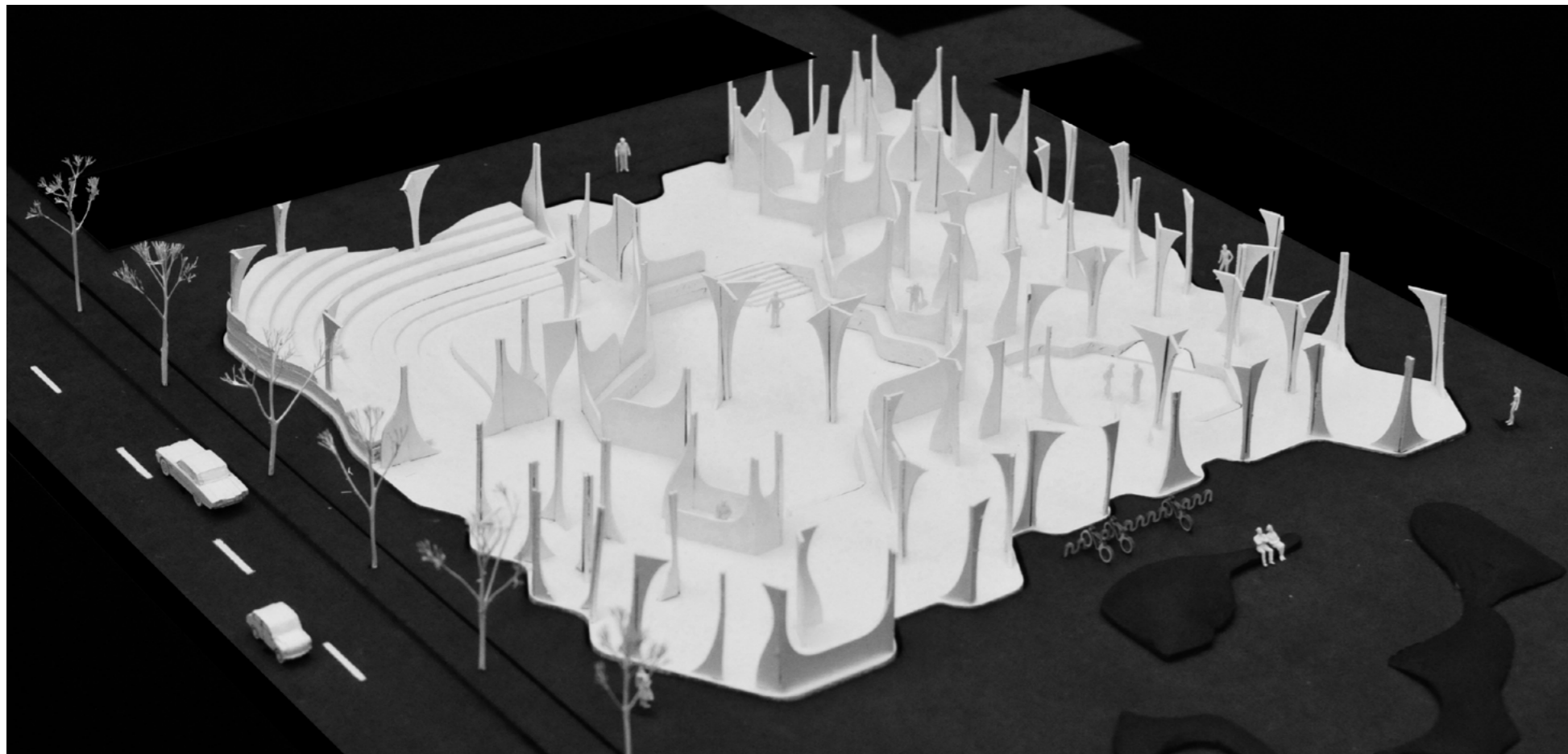
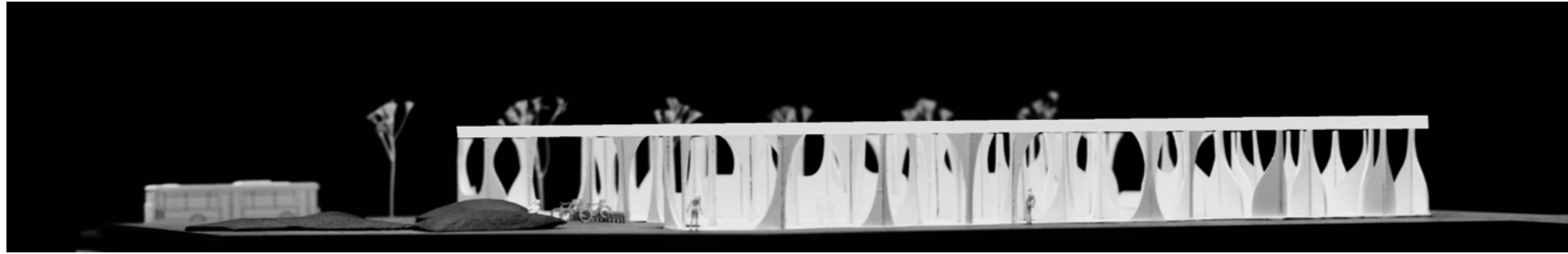
Wooden Batten 45 mm, 2 layers
 Asphalt Paper 2 mm
 OSB board 11 mm
 EPS insulation 150 mm
 Vapor Barrier 2 mm
 Cross Laminated Timber, 3 layers 130 mm

Cross Laminated Timber, 3 layers 150 mm
 Steel Bracket
 Metal Rod

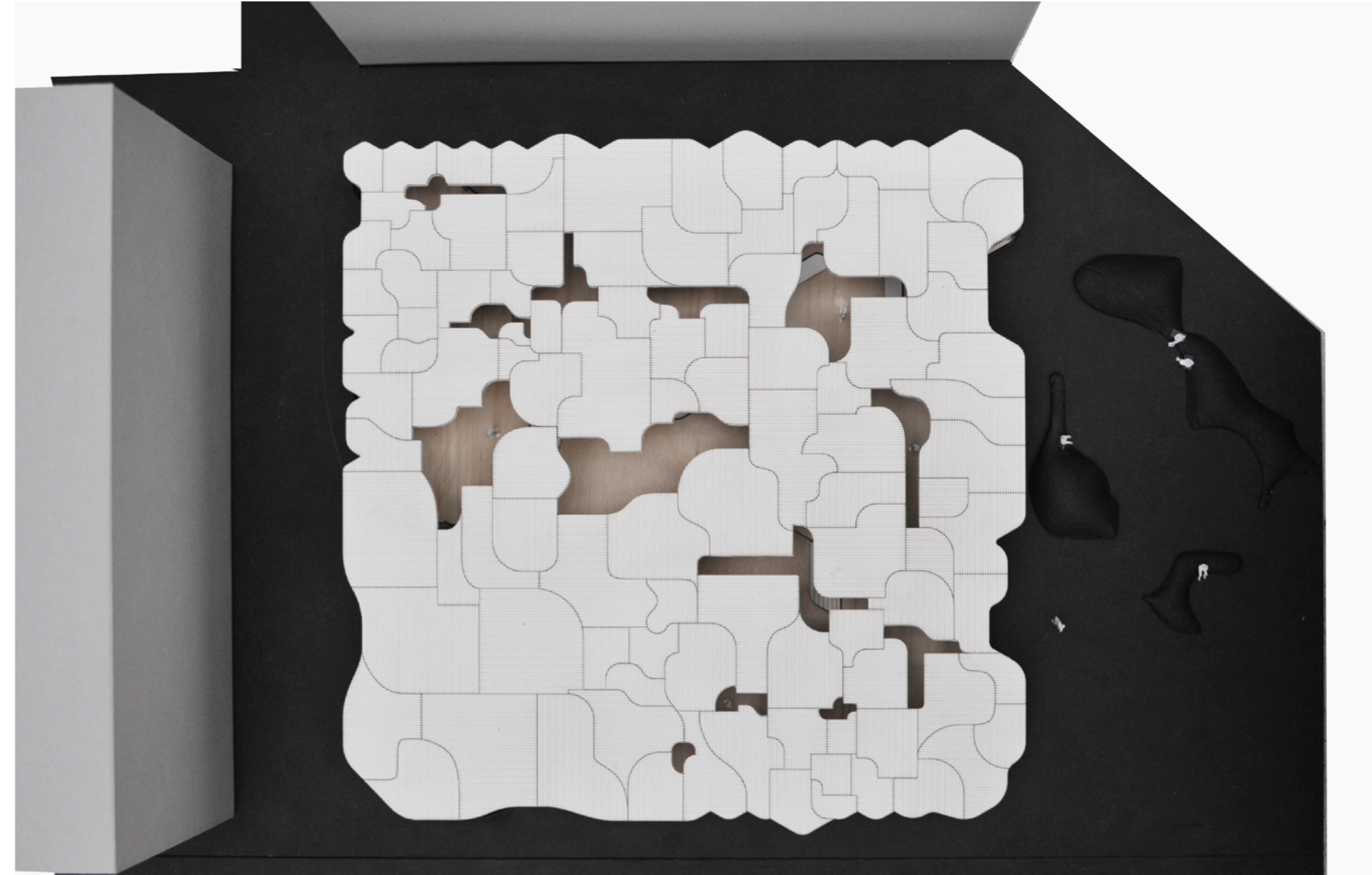
Wooden floor, Spruce 27 mm
 Concrete 100 mm
 EPS insulation 150 mm
 Drainage layer 150 mm
 Cross Laminated Timber, 3 layers 130 mm

DETAIL

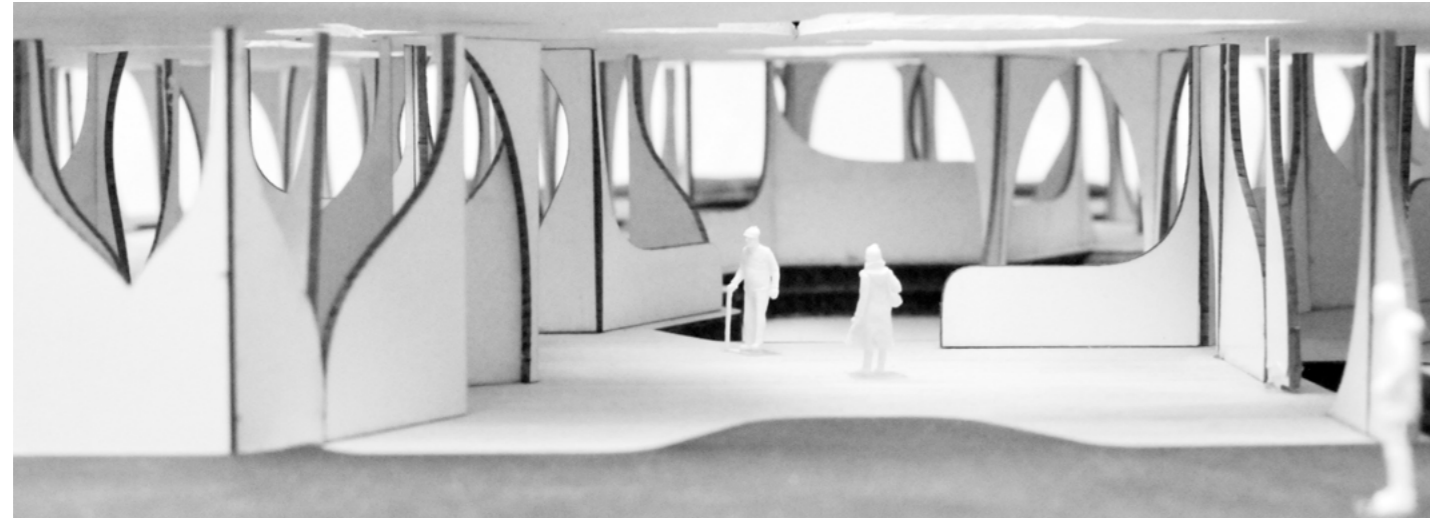
- Play with timber cross lamination -



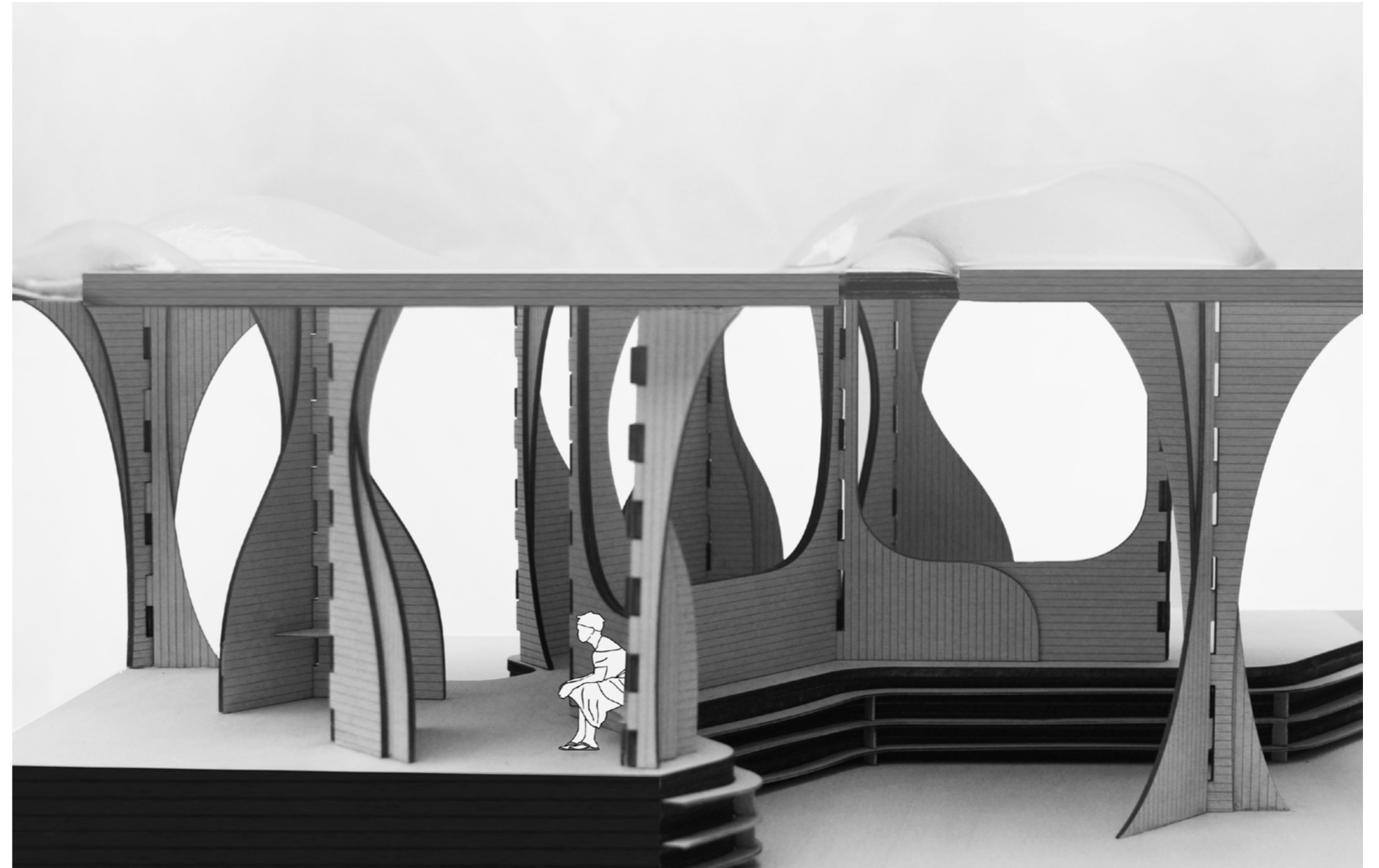
FOREST OF COLUMNS
- Varying density -



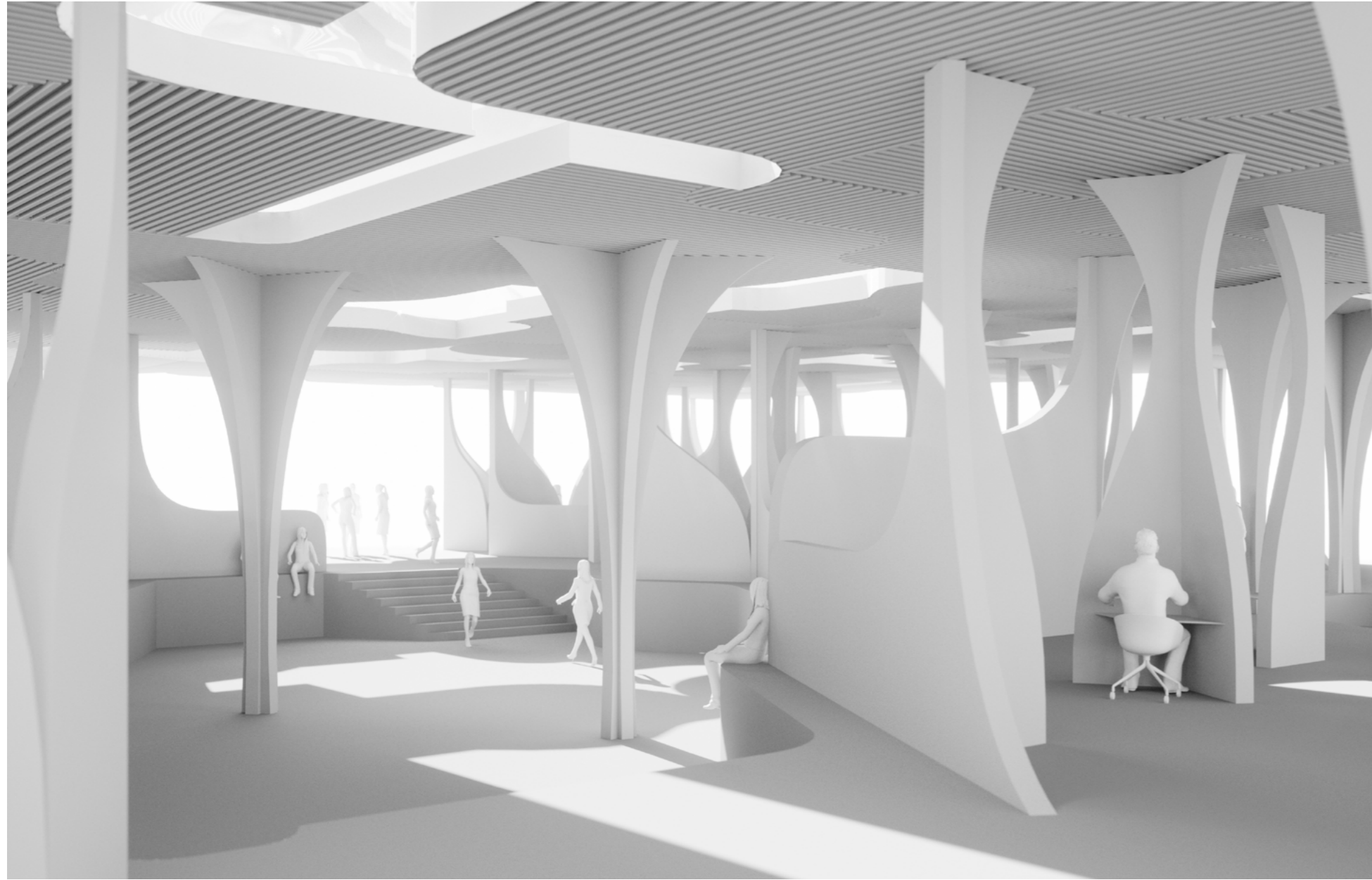
ROOF ORNAMNET
- The pattern of the roof reflects the program underneath -



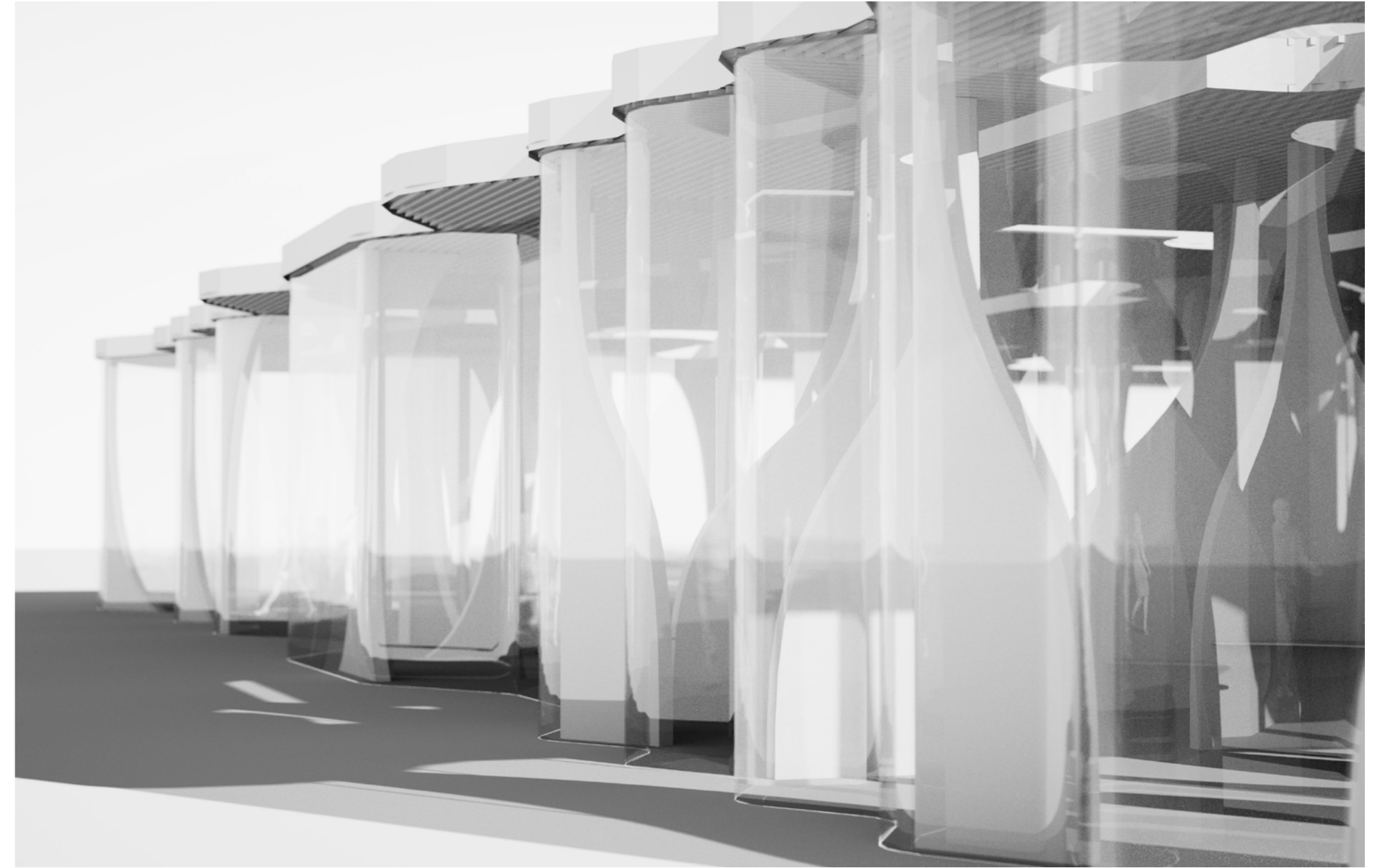
INTERIOR
- In between the columns -



INTERIOR
- In between the columns -



INTERIOR
- In between the columns -



EXTERIOR
- Along the facade -



PROCESS

-House of a Hundred Columns -



The point of departure of the investigation part of the project was to study columns as architectural elements by looking at examples both historical and modern. The focus was on three contemporary examples, 2 built buildings and one competition proposal: Johnson Wax building by Frank Lloyd Wright, Rolex Learning Centre in Lausanne by Sanaa and finally the competition proposal for Agadir Convention Centre by OMA .



Tama Art University Library
Hachio Tokyo, Japan
Toyo Ito

Material: Concrete
Spaciality: Arch-shaped



Bus Stop Prototype
Denmark
Unika Beton

Material: Concrete
Topology optimized structure



Stuttgart Railway Station
Stuttgart, Germany
Frei Otto, Werner Sobek



Rolex Learning Centre
Lausannae
Sanaa

Material: Steel
Spaciality: Thin



Rolex Learning Centre
Lausannae
Sanaa

Material: Steel
Spaciality: Thin



Palazzo del lavoro
Pier Luigi Nervi

Material: Concrete
Spaciality: Massive



Sendai Mediatheque
Sendai, Japan
Toyo Ito

Material: Steel Tubes
Function: Flow of air, water, electricity, light and people



Chehel Soton
Isfahan, Iran

Material: Timber

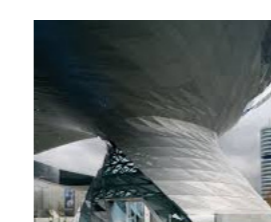


Michael Hansmeyer
ETH, Zurich

Material: 3D printed PLA



White Forest Kait Kobo
Kanawaga Institute of Technology
Junga ishigami

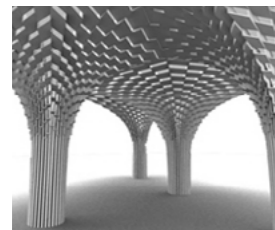


BMW Welt
Munich, Germany
Coop Himmelblau



Johnson-Wax Administration Building
Racine, Wisconsin, USA
Frank Loyd Wright

Dimension: 23 cm diameter at the bottom, and 550 in diameter at the top.



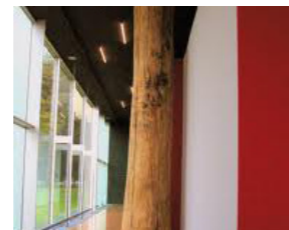
Phoenix Pixel Trees
Competition Proposal
Iwamoto Scott

Function: Shading, bus stop



The Pigeon House
Meybod, Iran

Function: Shading, bus stop



Kunsthall
Rotterdam, Netherlands
OMA

Material: Timber



Storhamarlåven Museum
Storhamarlåven, Norway
Sverre Fehn

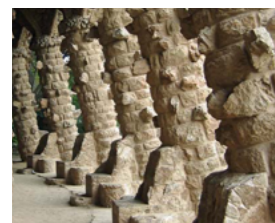
Material: Concrete



Barcelona Pavilion
Barcelona, Spain
Ludwig Mies van der Rohe

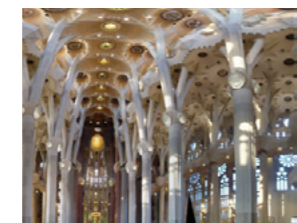


Final Wooden House
Sou Fujimoto
Kumamoto, Japan



Parc Guell
Barcelona, Spain
Antonio Gaudi

Material: Stone
Function: Seating



Sagrada Familia
Barcelona, Spain
Antonio Gaudi

Material: Plaster



Kunsthall
Rotterdam, Netherlands
OMA

Material: Steel, Concrete



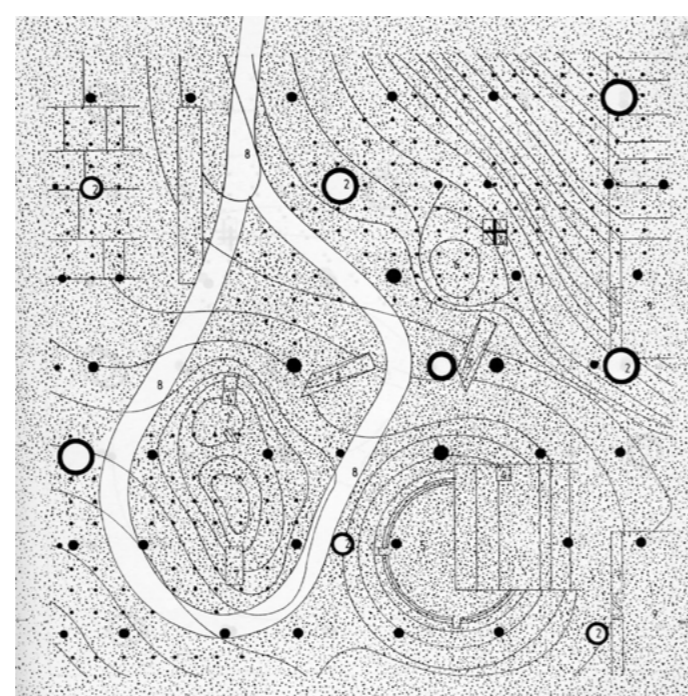
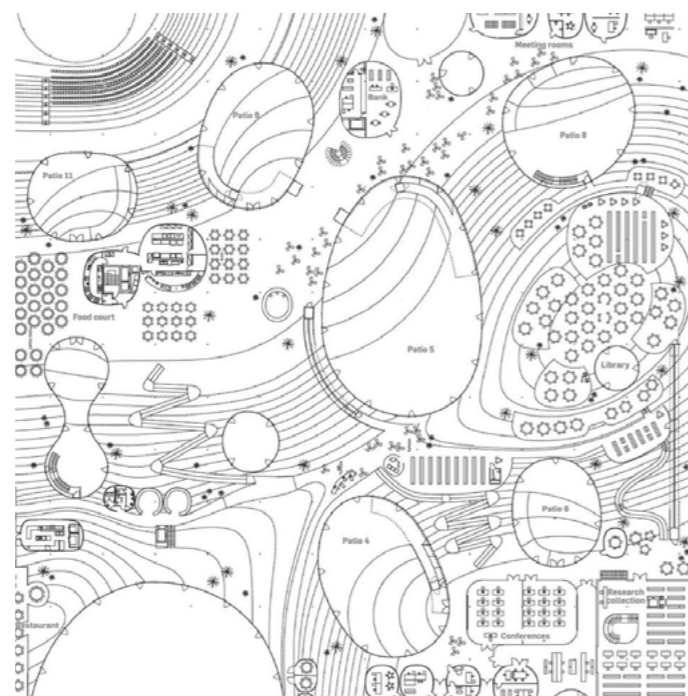
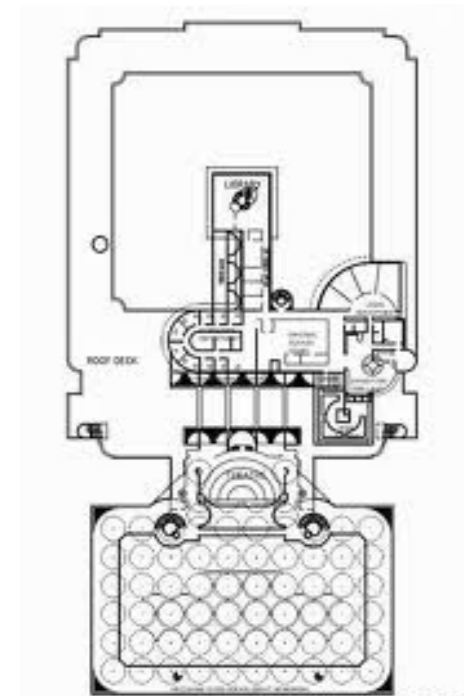
Tugendhat House
Brno, Czech Republic
Ludwig Mies van der Rohe



Phaeno Science Center
Wolfsburg, Germany
Zaha Hadid



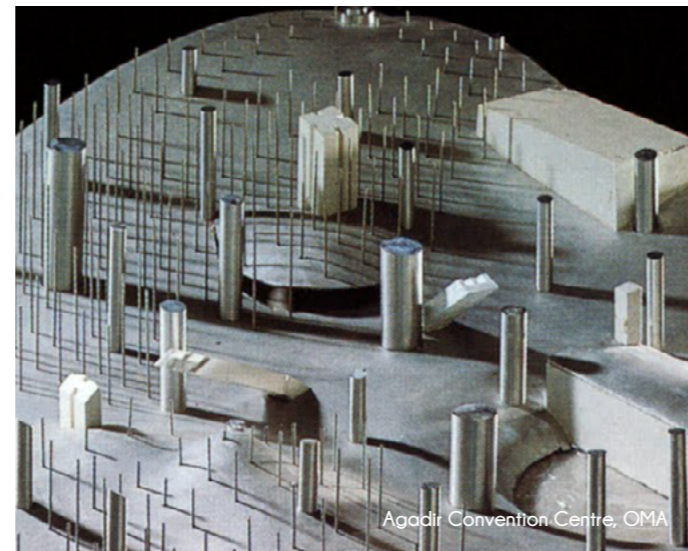
Musashino Art University Museum & Library
Sou Fujimoto
Musashino, Japan



Johnson Wax Building, Frank Lloyd Wright



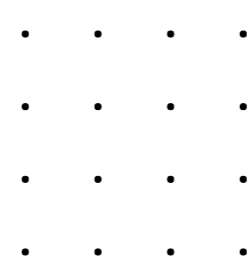
Rolex Learning Centre, Sanaa



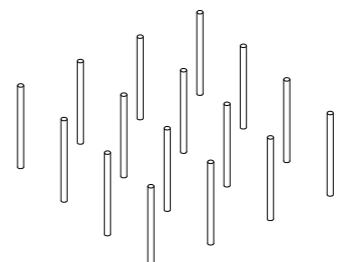
Agadir Convention Centre, OMA

REFERENCE PROJECTS
- Wright, Sanaa, OMA -

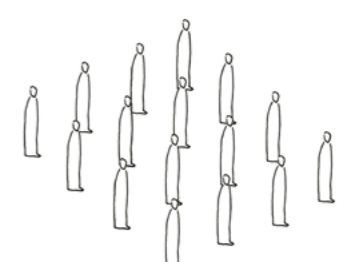
Johnson Wax Building
Frank Lloyd Wright



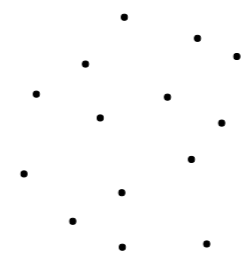
Homogenous grid



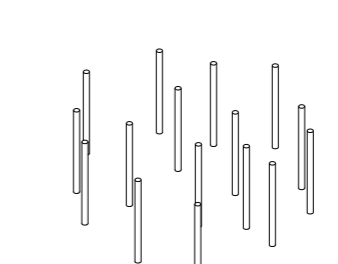
Non-directional columns



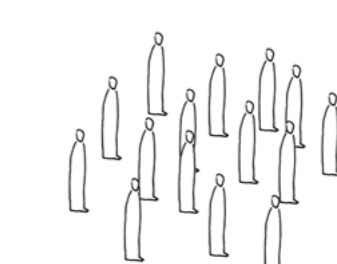
Identical columns



Non-homogenous Grid



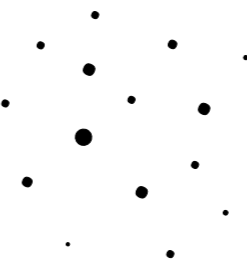
Non-directional columns



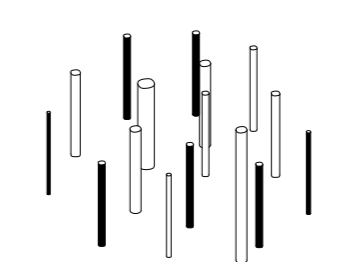
Identical columns

Rolex Learning Centre
Sanaa

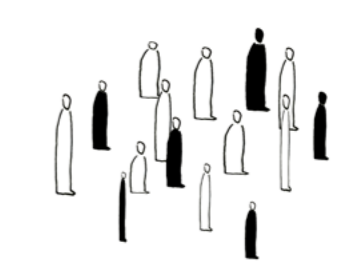
Agadir Convention Centre
OMA



Non-homogenous Grid

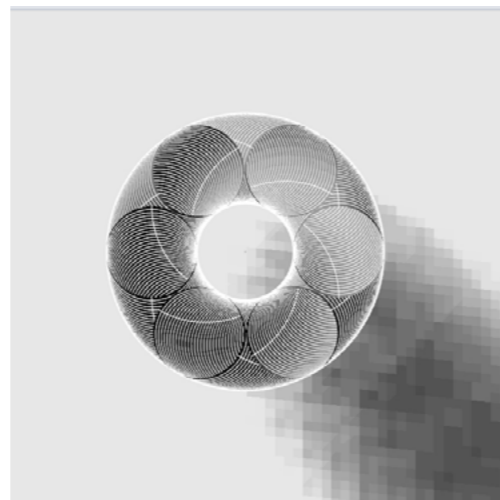
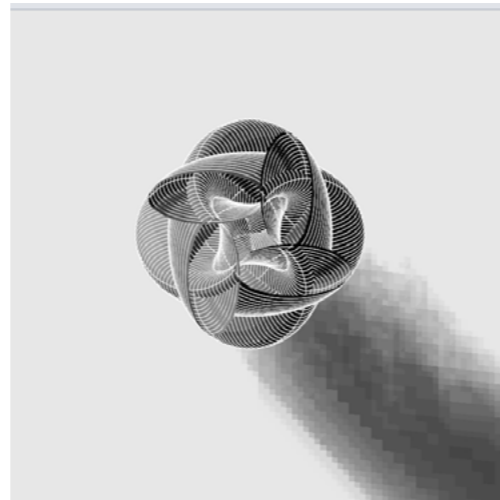
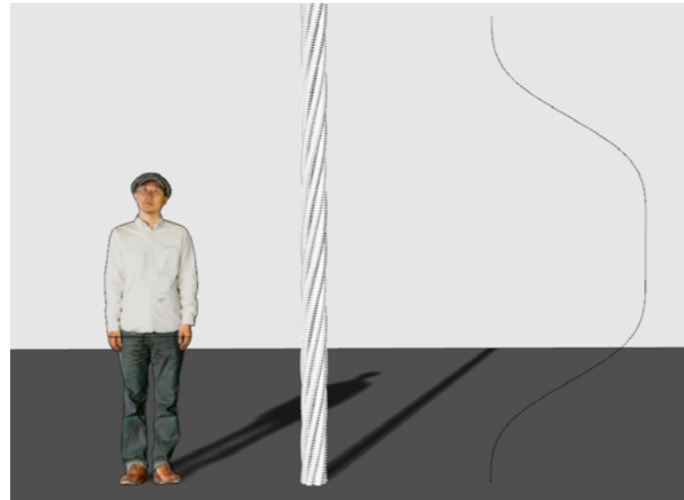
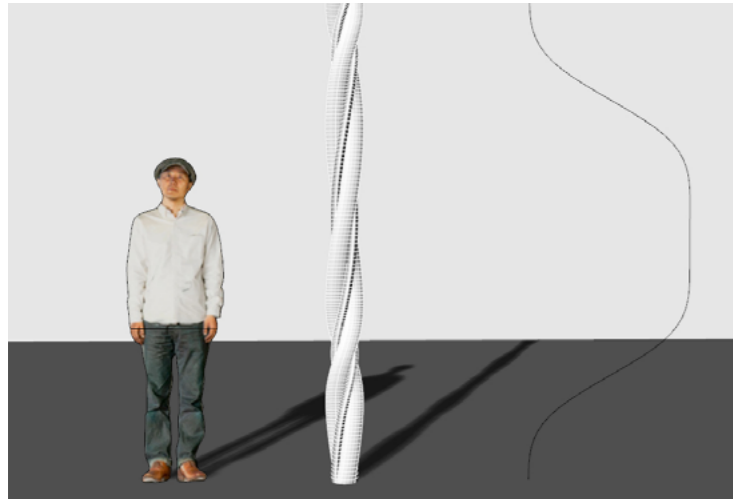


Non-directional columns



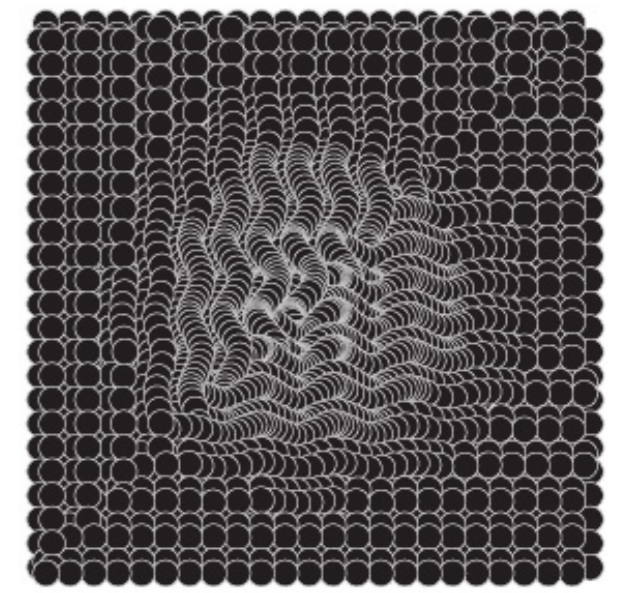
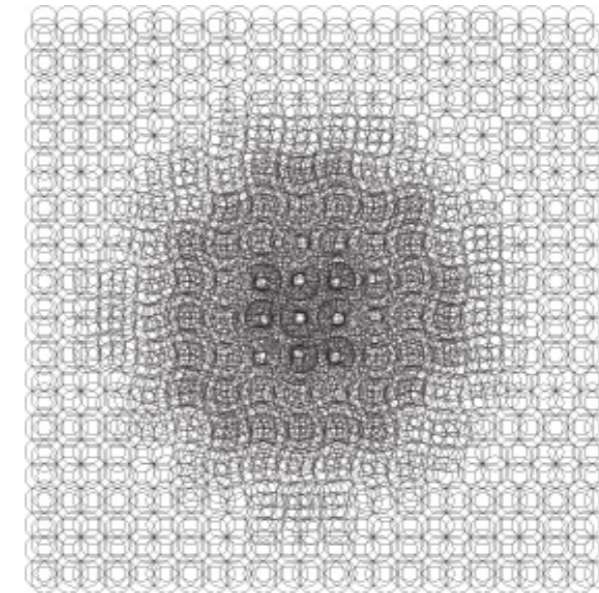
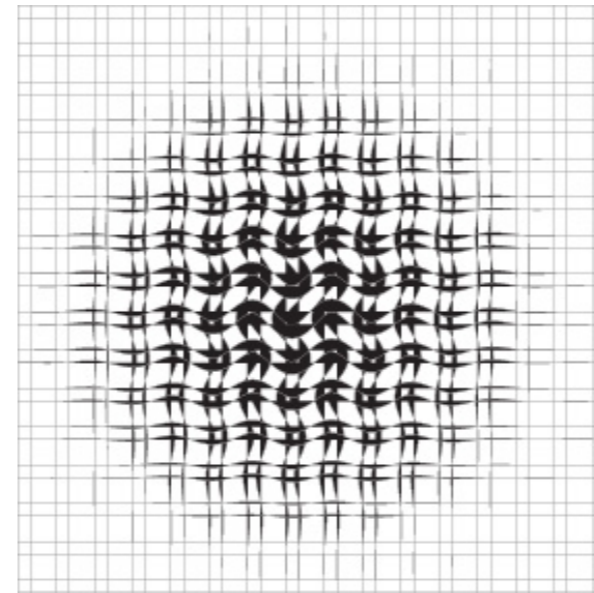
Columns of varying size

REFERENCE PROJECTS
- Analysis -



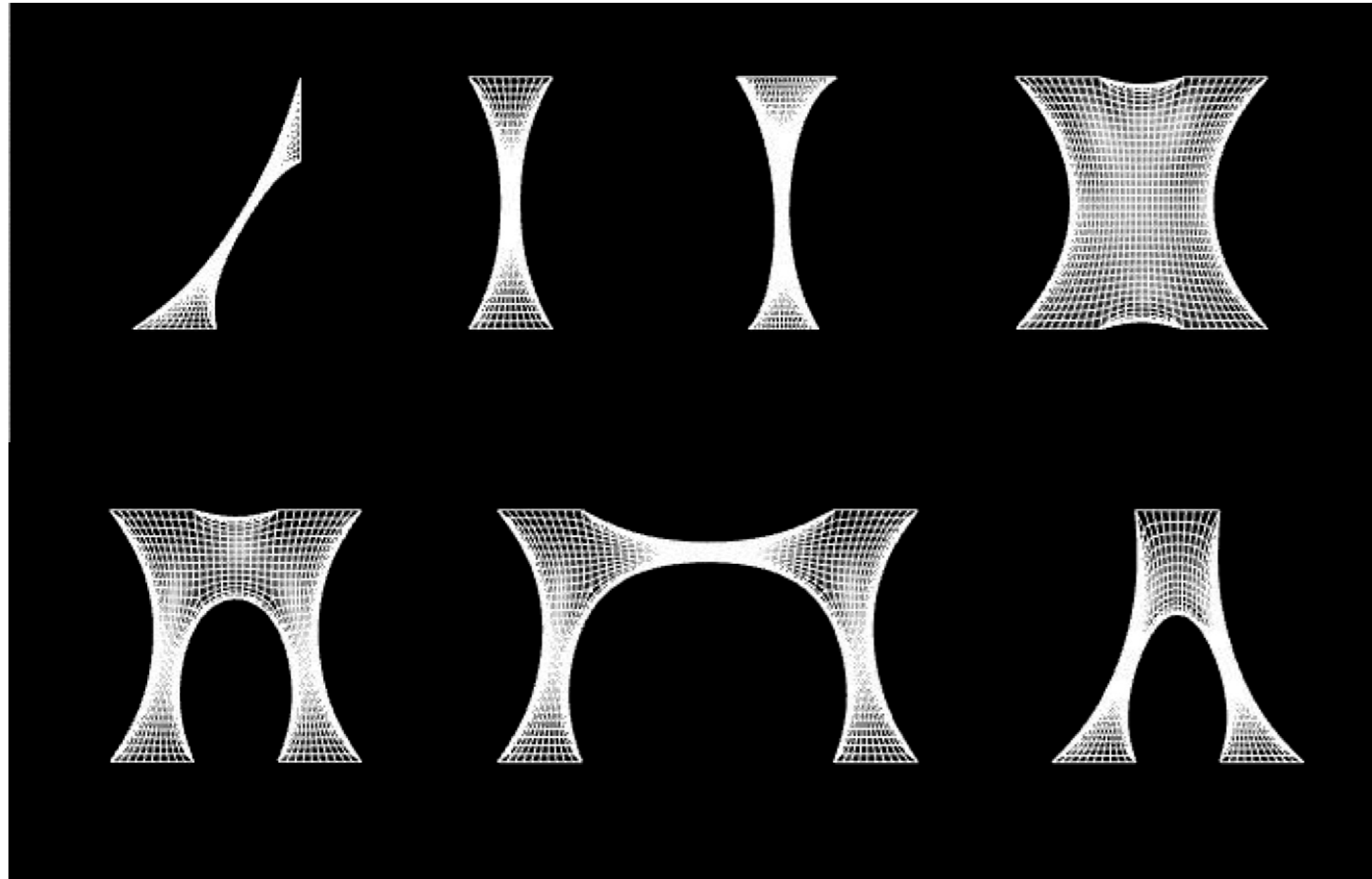
SKETCHES

- Variation along the length of the column -

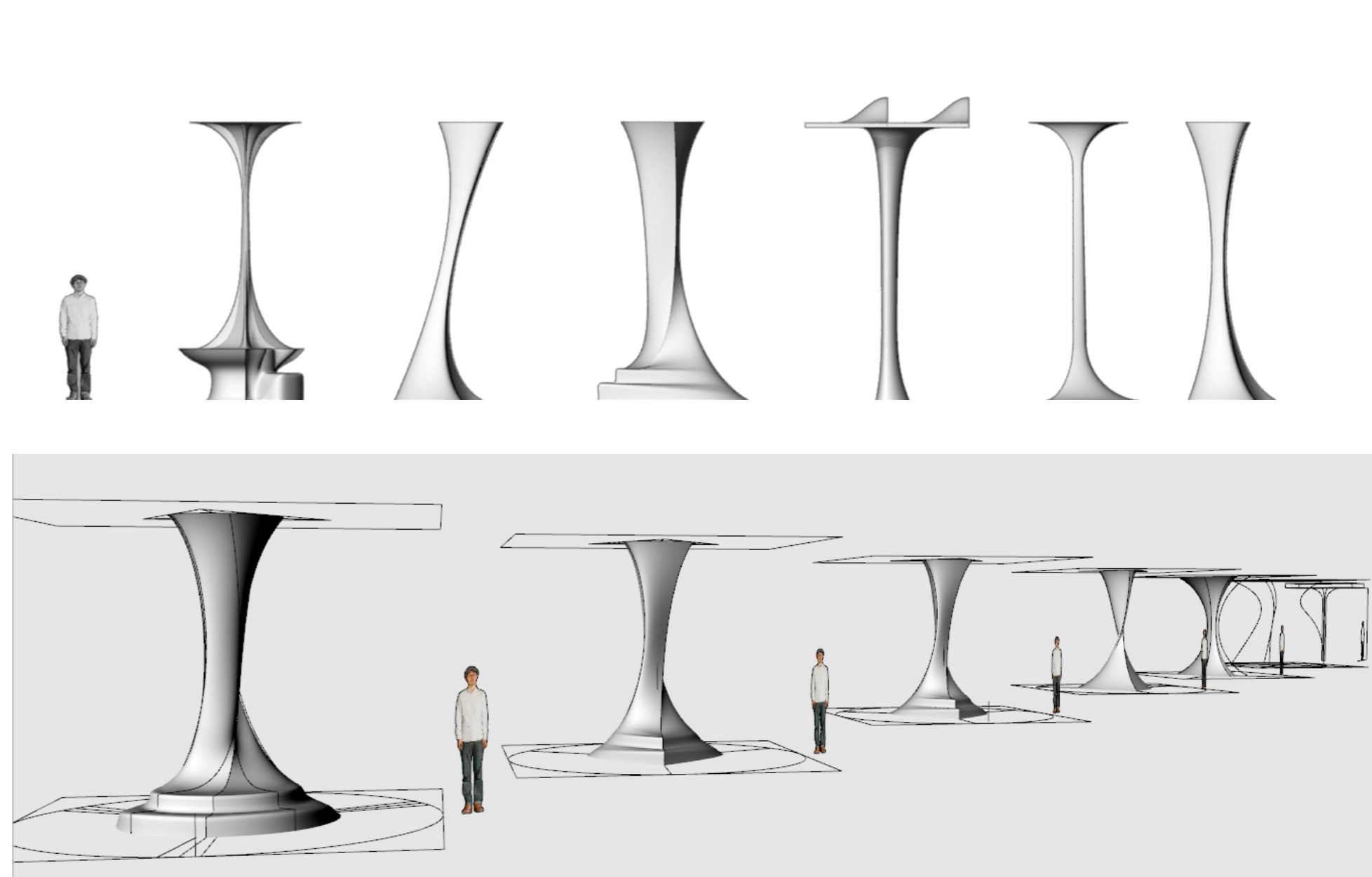


SKETCHES

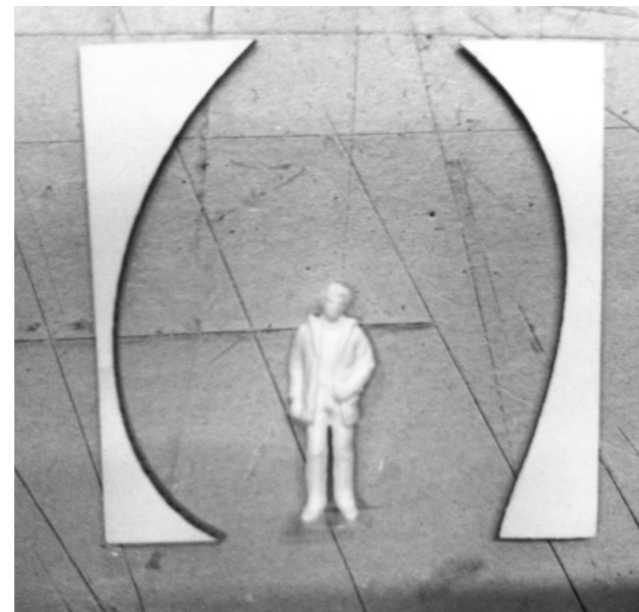
- Directionality and density of a field -



SKETCHES
- Column Form Finding -



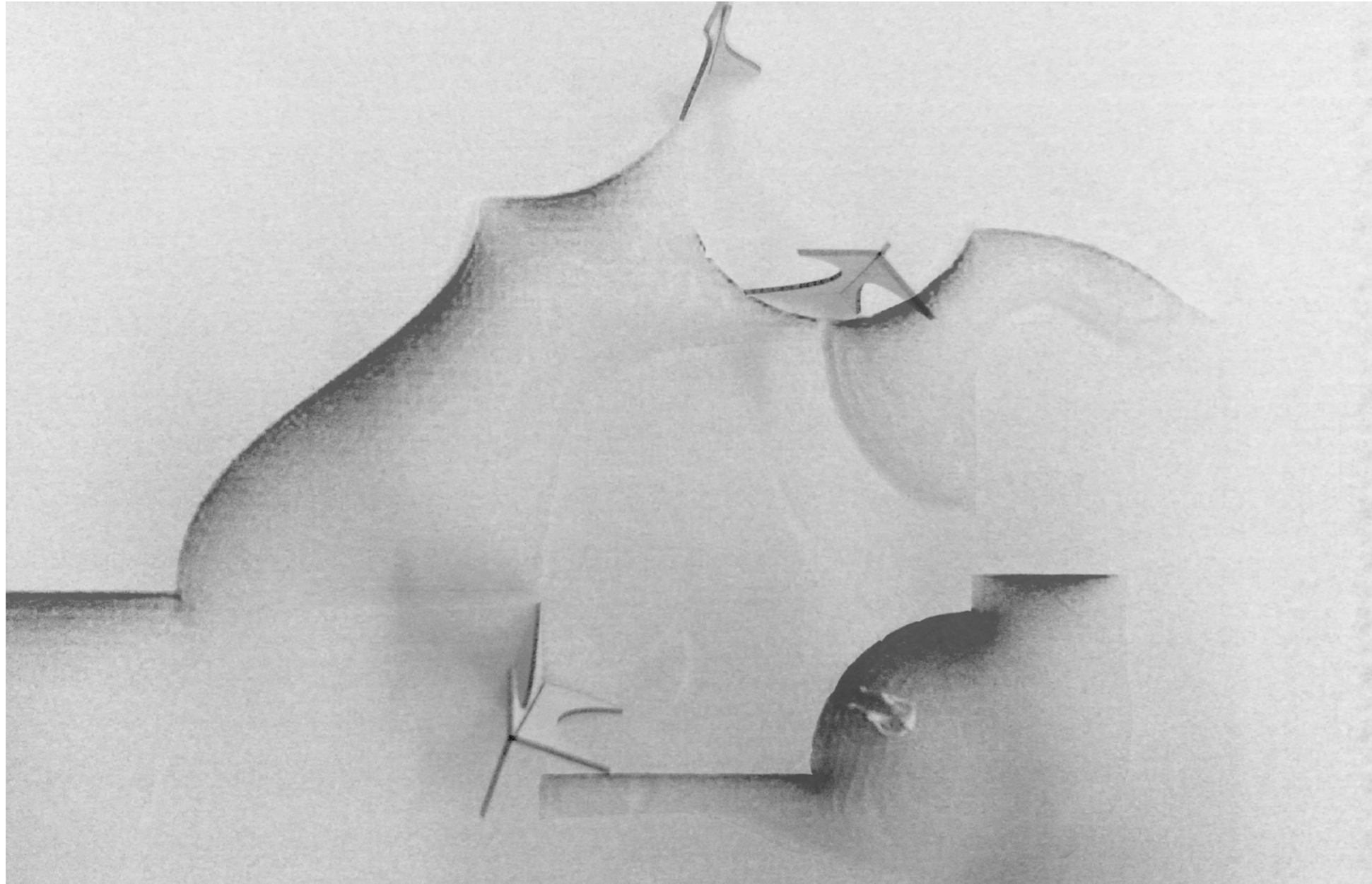
SKETCHES
- Column Variations -



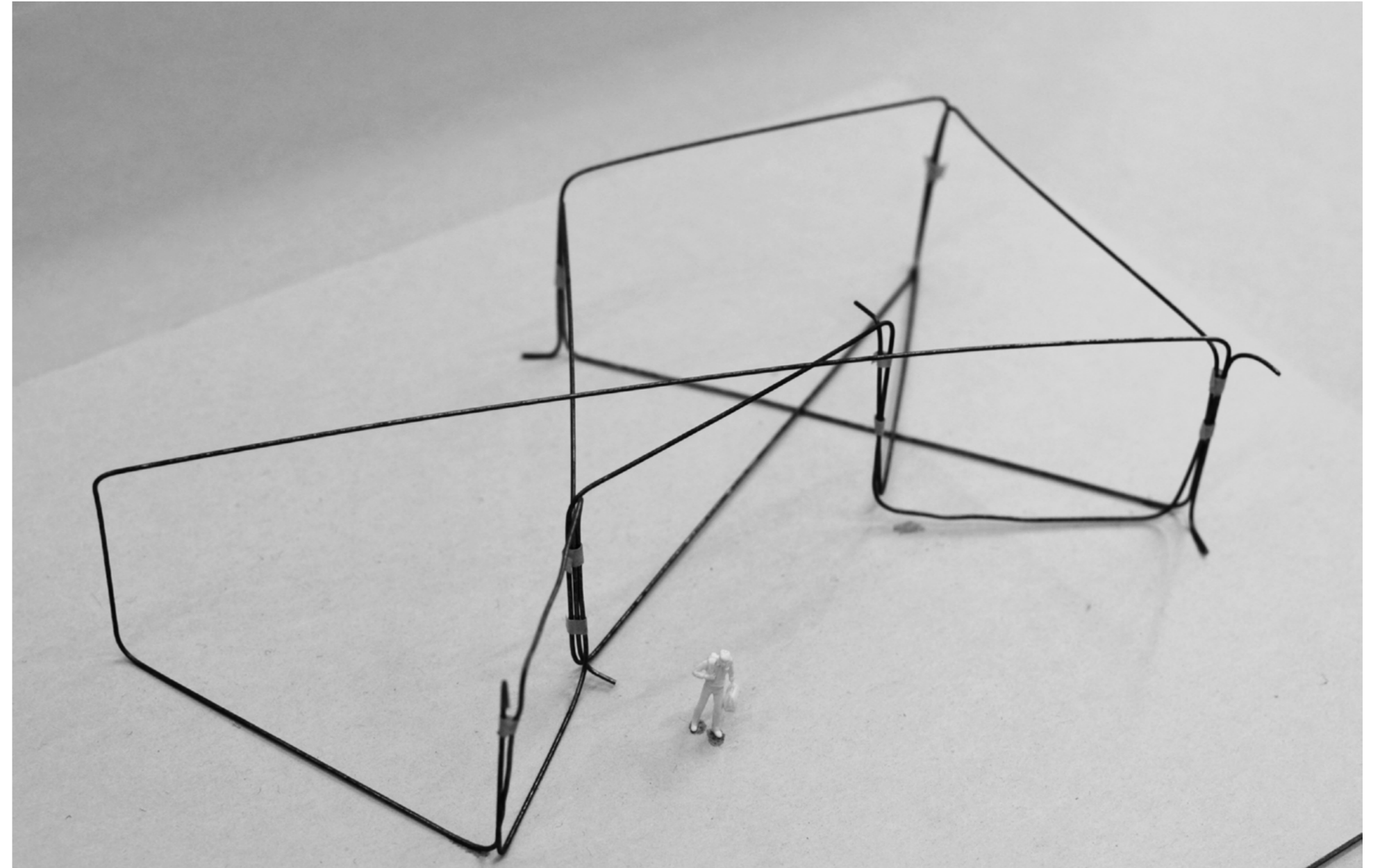
PROTOTYPING
- Material & Fabrication -



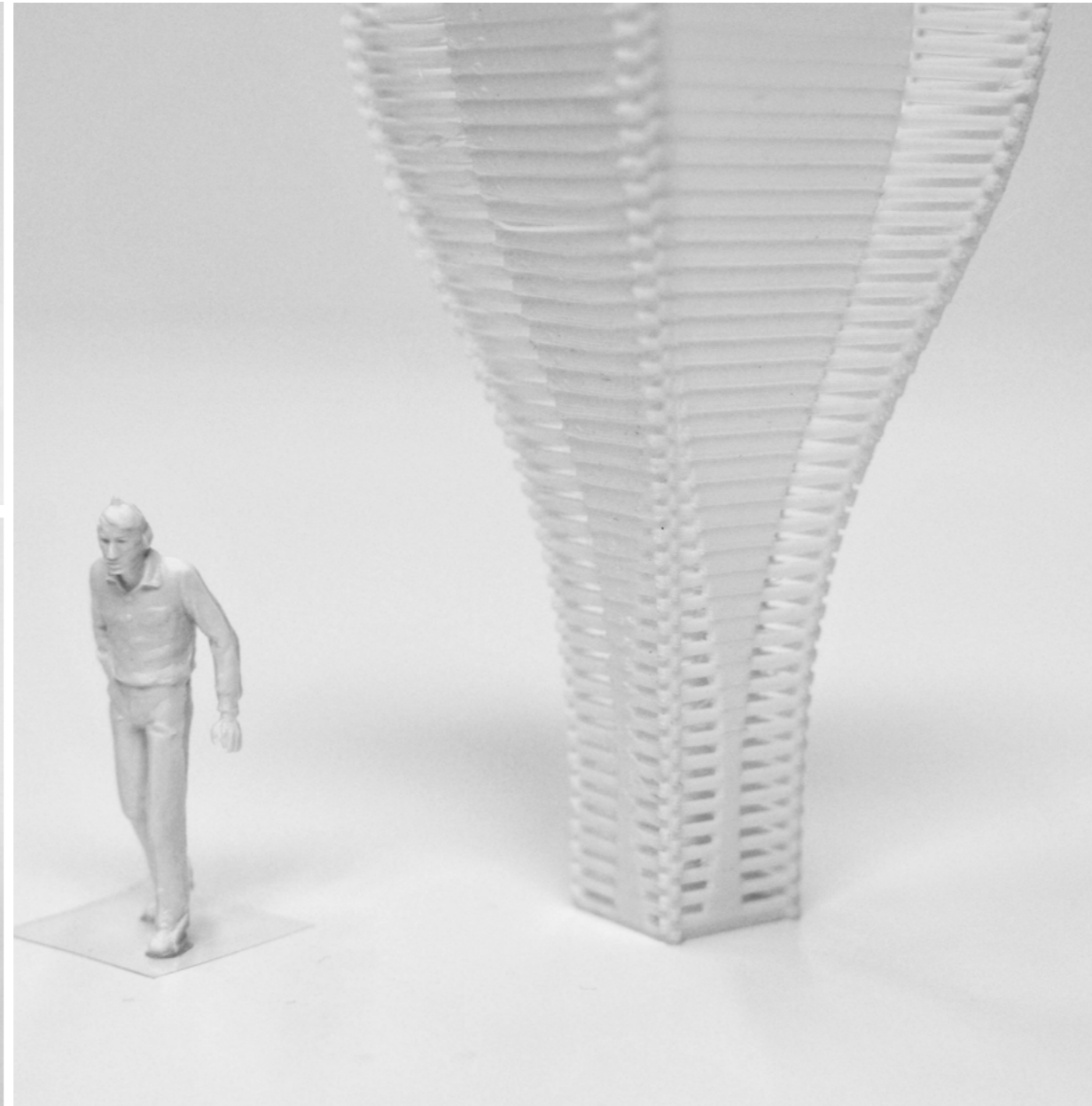
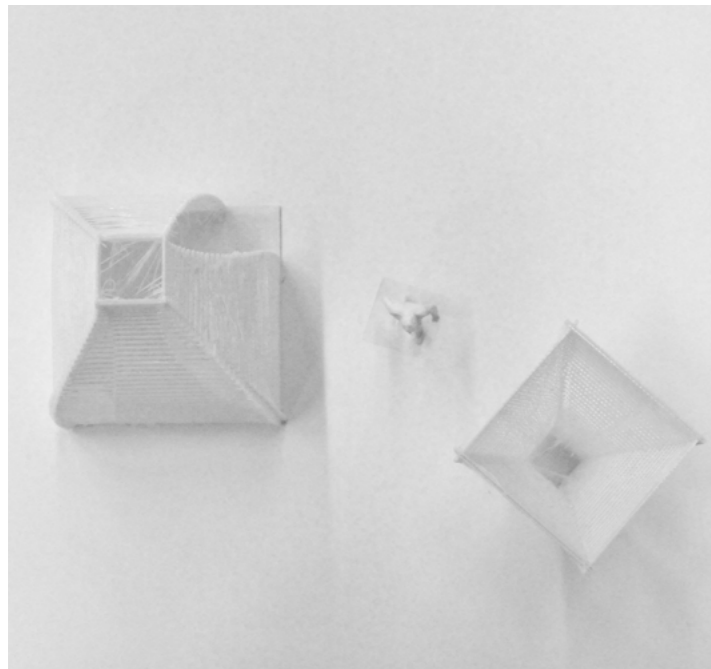
PROTOTYPING
- Column Variations -



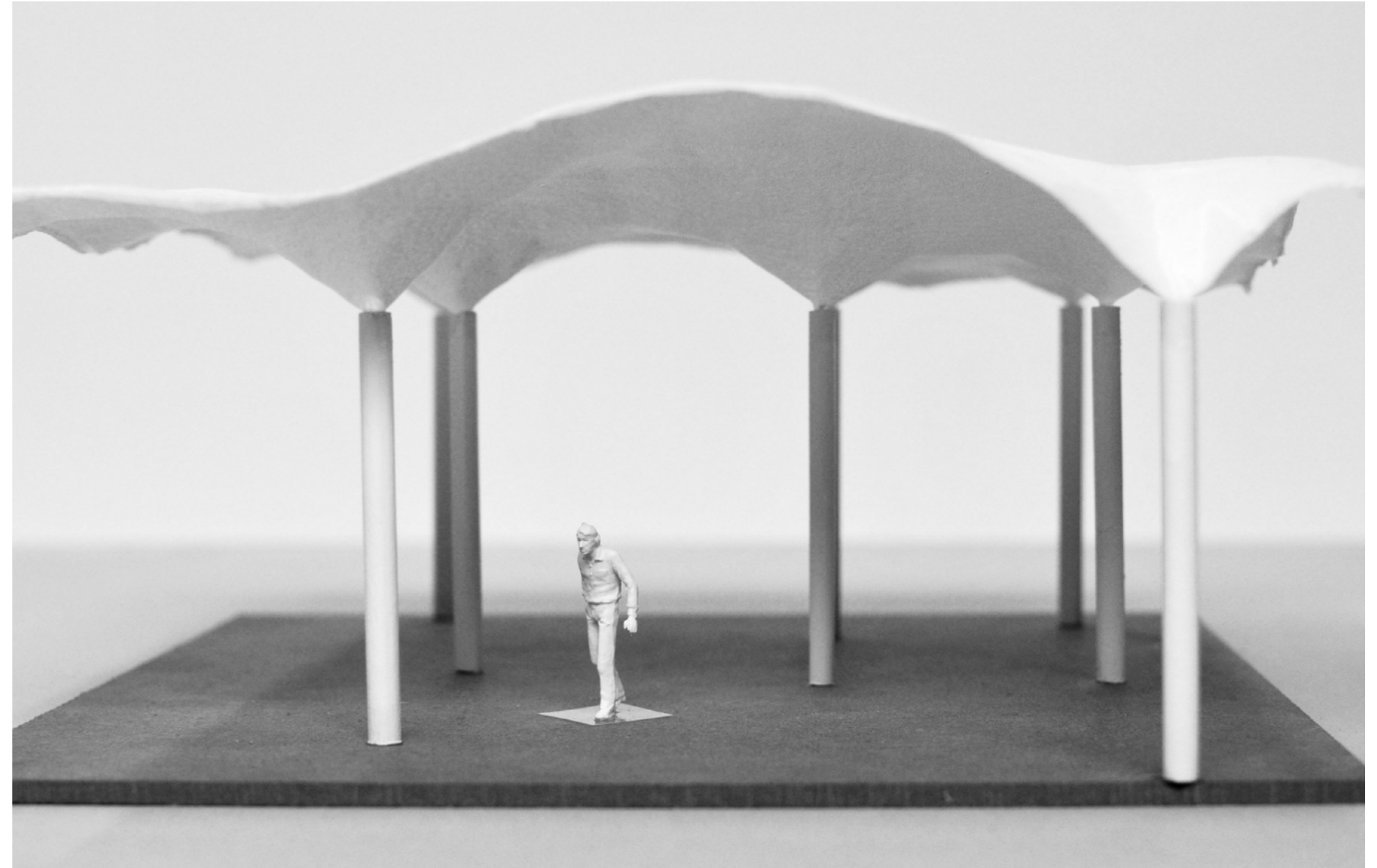
- PROTORYPING -
- Columns & landscape -



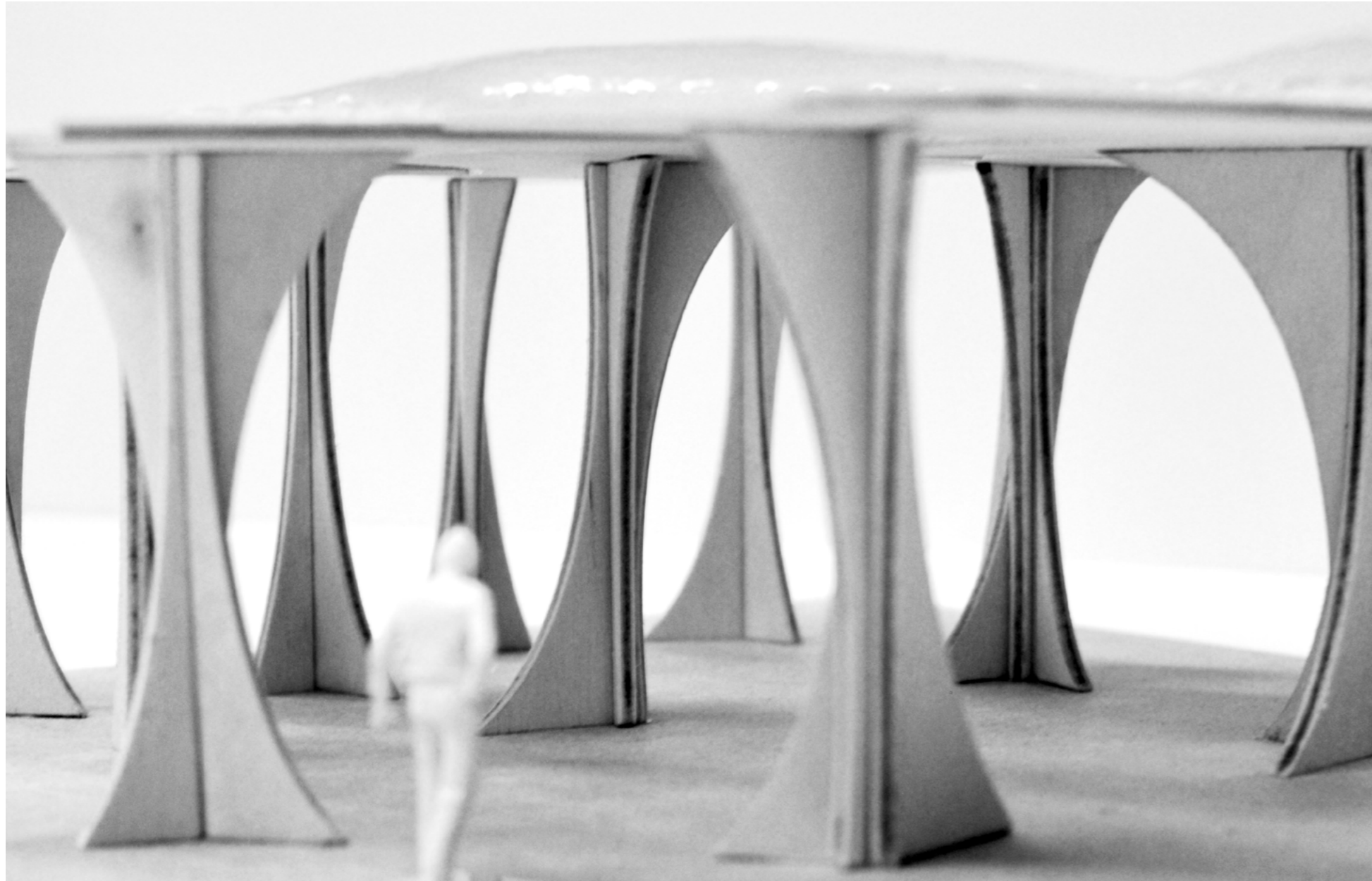
PROTOTYPING
- Relationship between a group of columns -



- PROTORYPING -
- Stacked ribs columns -

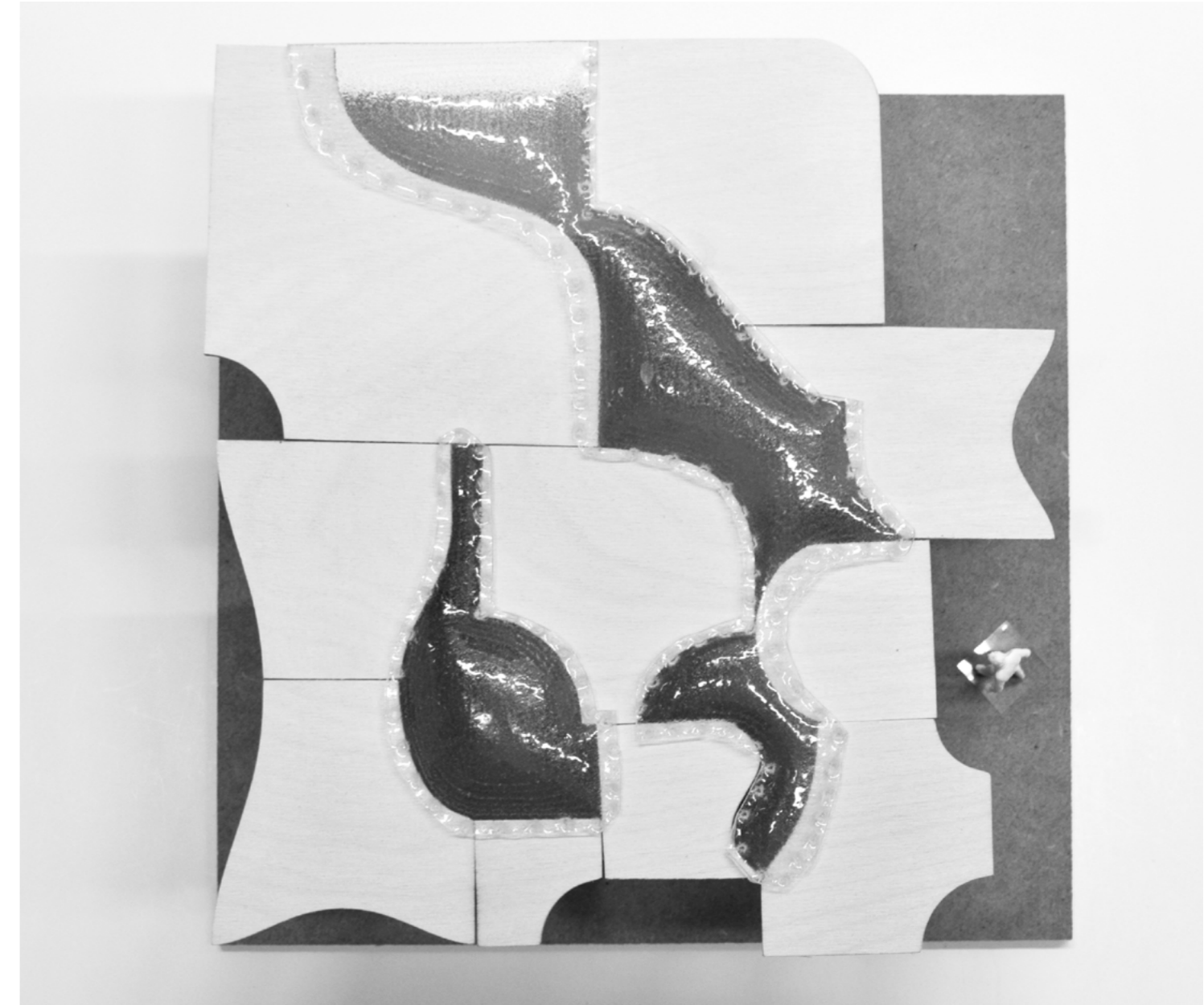


PROTOTYPING
- Thin columns & vaulted roof -



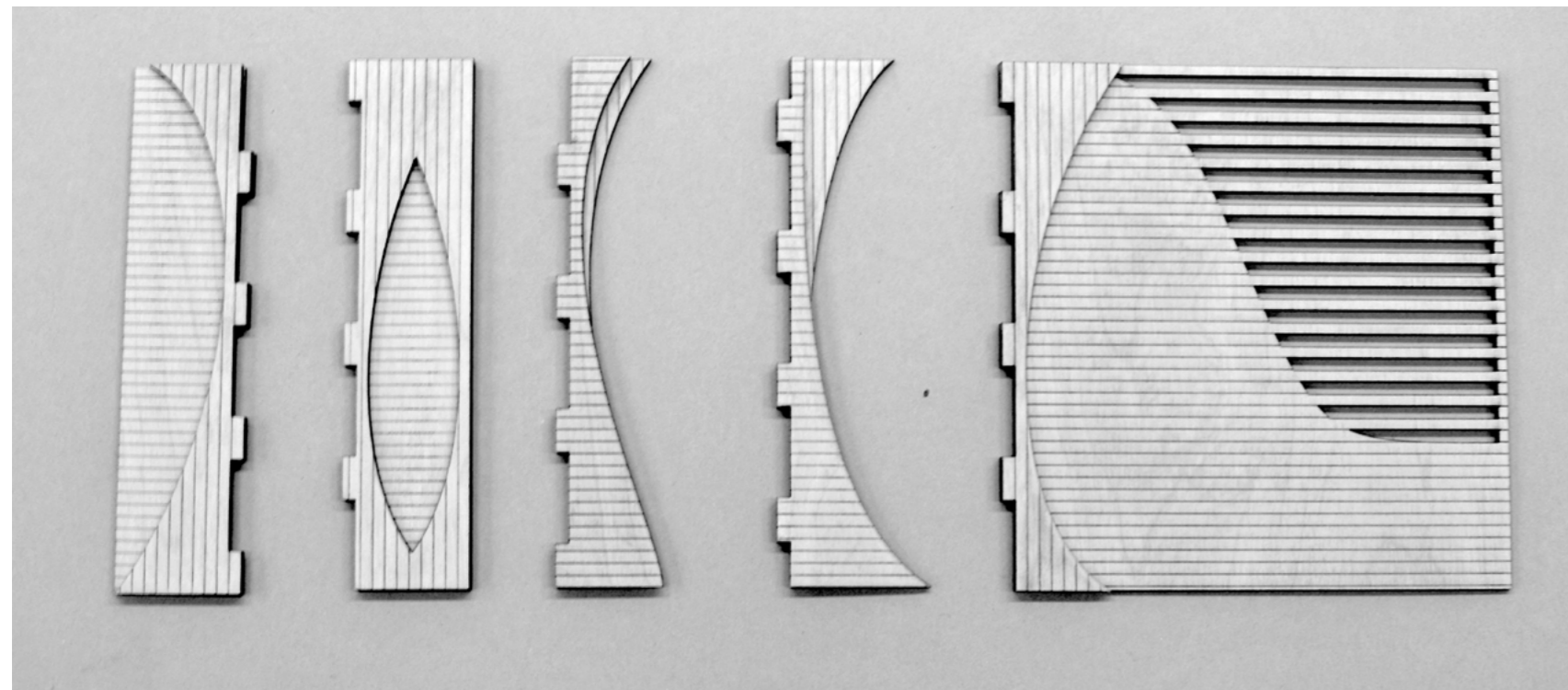
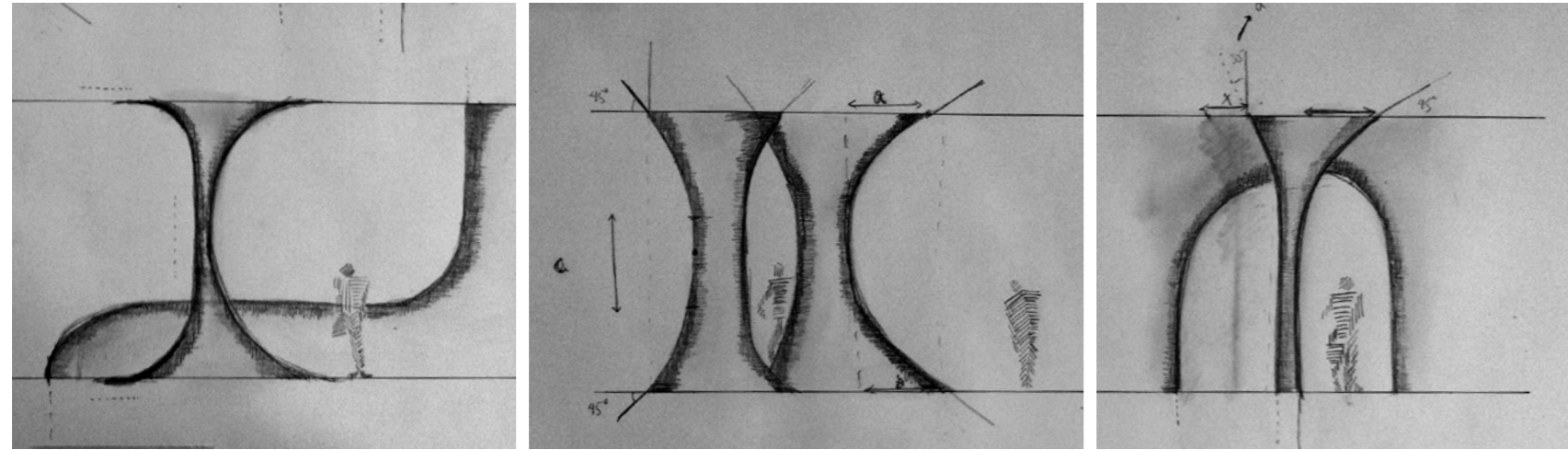
- PROTOTYPING -

- Directional columns with fins of cross laminated timber (CLT) -

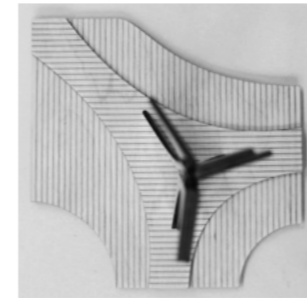
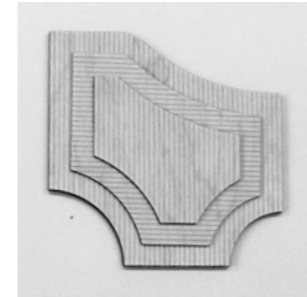
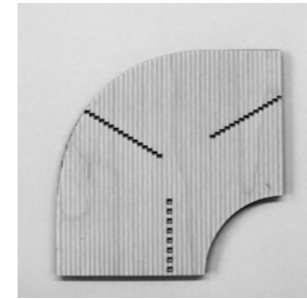


PROTOTYPING

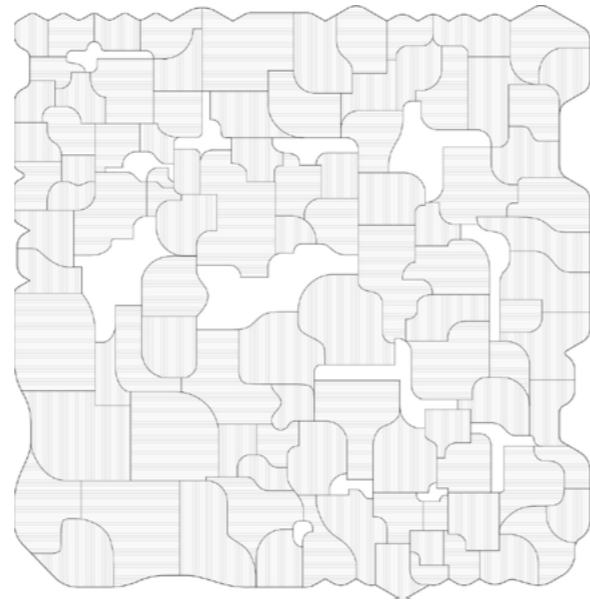
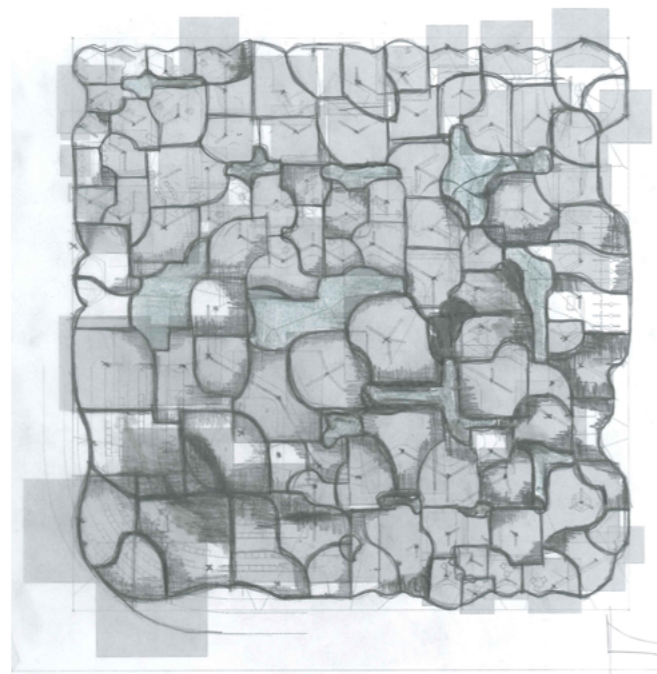
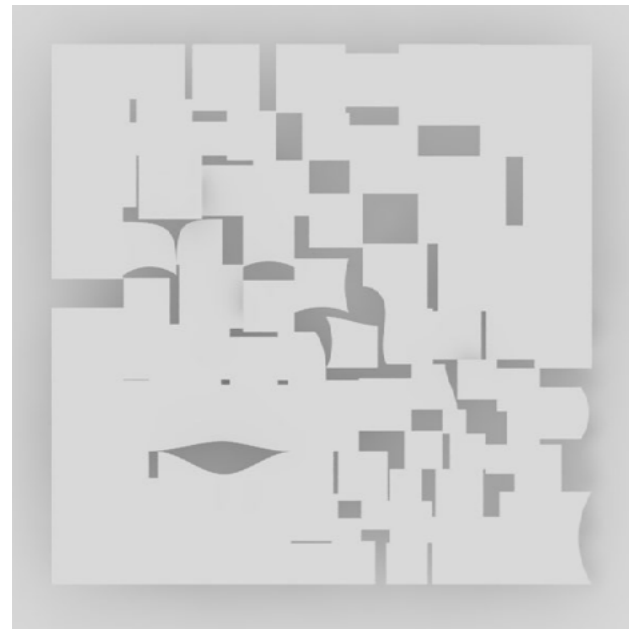
- Roof patterns and openings -



- PROTORYPING -
- Layering of the CLT Columns -

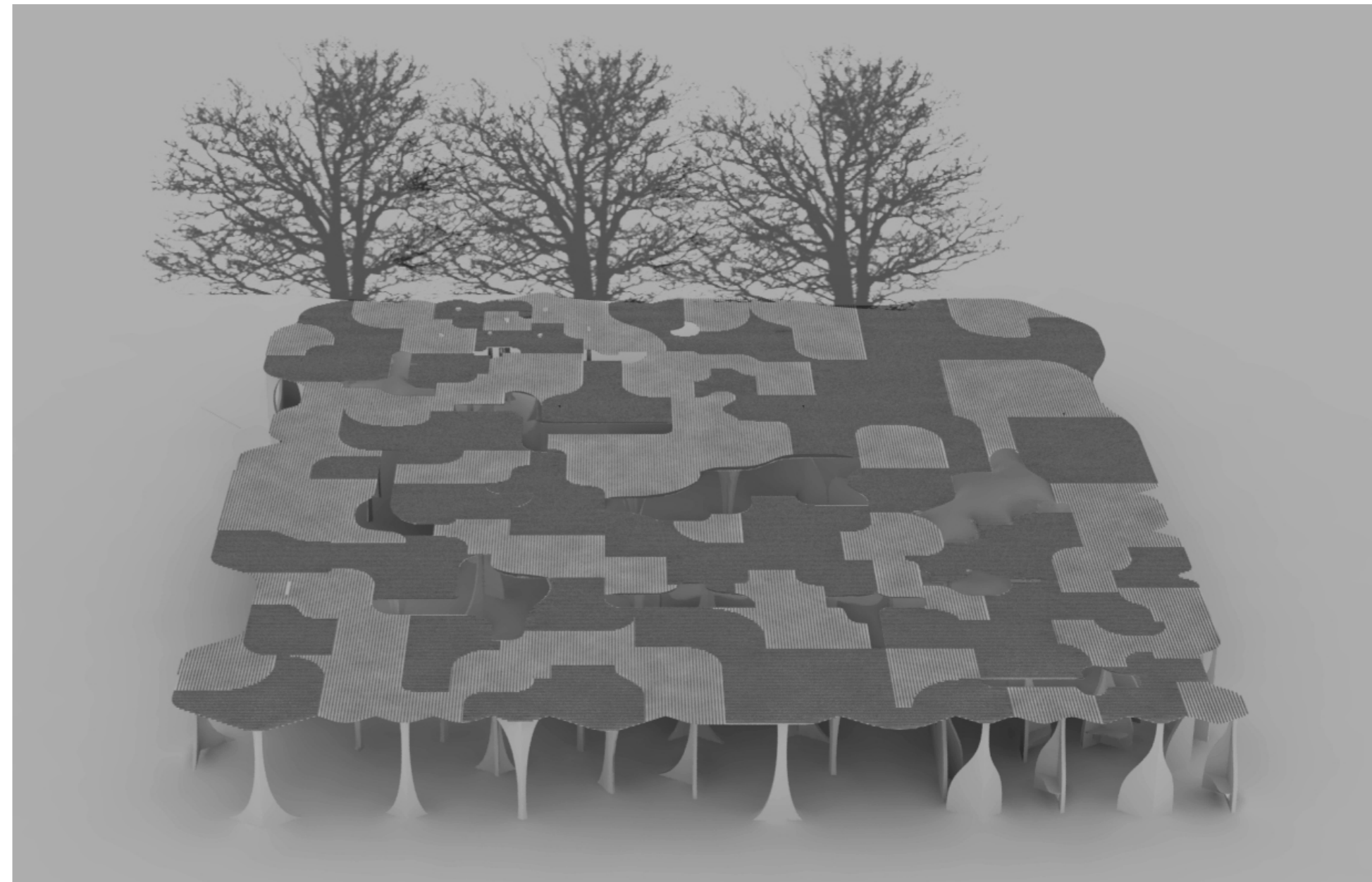


PROTOTYPING
- Layering of the CLT roof -



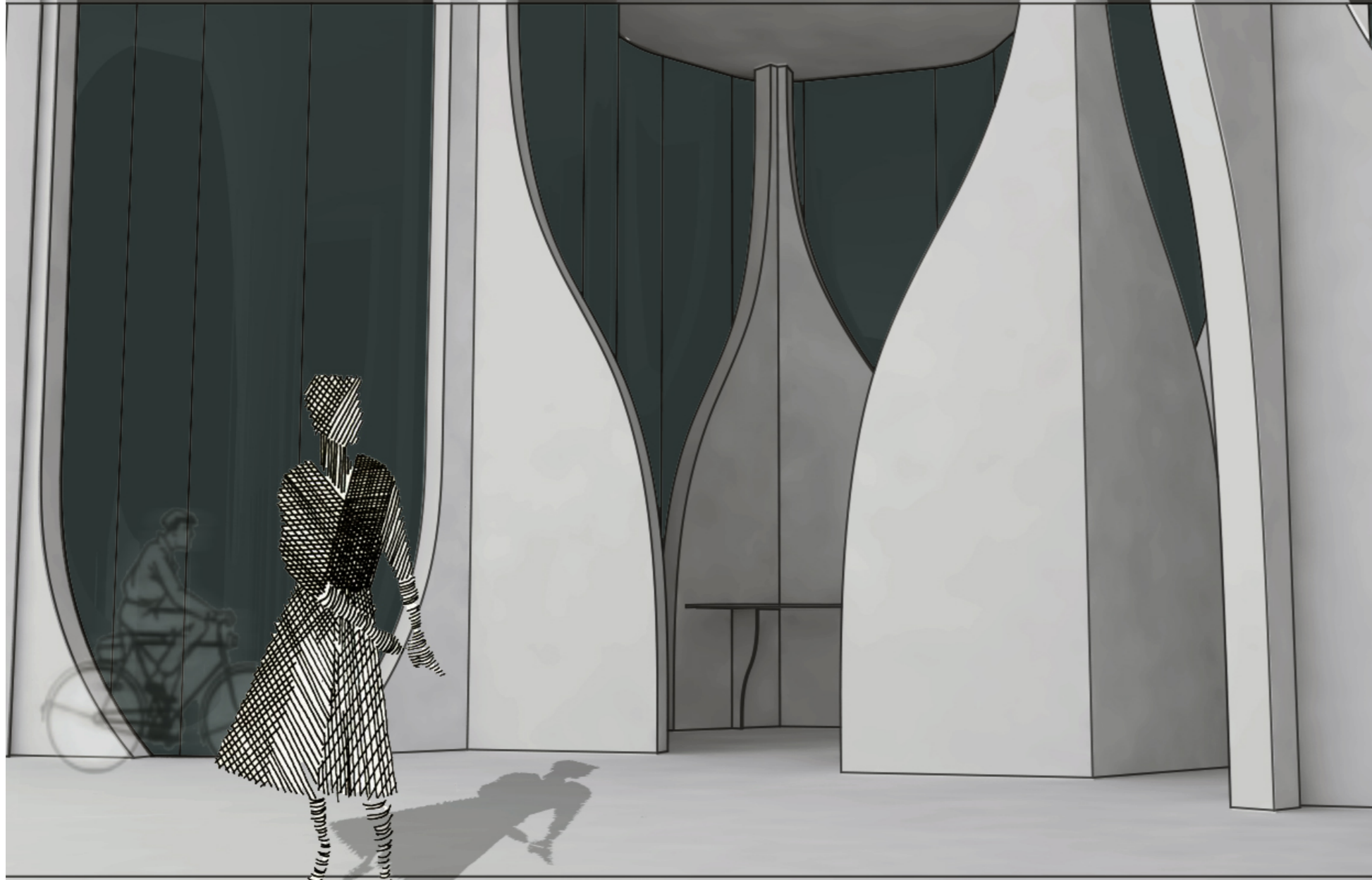
SKETCHES

- Roof pattern reflects the program underneath -



SKETCHES

- Shifting directionality of the wooden battens add variation -



SKETCHES

- Division of space using CLT columns -



SKETCHES

- Division of space using CLT columns -

REFLECTION

-House of a Hundred Columns -

Here follows a short reflection on *House of a hundred columns*. A few thoughts on both what worked well and what still needs improvement. These thoughts are very much a result of the discussion at the final presentation of the project fueled by insightful comments of the jury.

Looking back at the design process I am quite pleased with the balance I found combining computational tools with physical prototypes in my investigations. The learning from a physical model was constantly taken back into the digital model, reworked and prototyped in a new iteration of the physical model. Another successful aspect of the project is the study of precedents that helps relate the project to a larger architectural discourse namely the one on the column as an architectural element.

The pattern on the roof, although graphically intriguing, could be further developed to be a more meaningful part of the design. Integrating a gutter system in the roof pattern is an example of how this could be achieved. The variation of the slab height in the building could either be removed altogether to emphasize the columns even further, or developed much more together with directional logic of the columns to become a more natural part of the design.

Finally introducing customization into layering of the cross-laminated timber is an idea worth further developing. The idea tested in a few sketch models has the potential to be elevated to an interior ornament that tells the story of the fabrication process of the CLT and also reflects the structural system of the building.



MANY THANKS TO:

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Pedram Seddighzadeh
Chalmers University of Technology
Fall 2013