Smell of Wood

An exploration of how the sense of smell can be implemented into a wooden tram stop and how experiences of smell can be expressed in represenттion material

Emil Trabjerg Jensen

Chalmers School of Architecture and Civil Engineering

Examiner: Morten Lund
Supervisor: Jonas Carlson

Smell of Wood

An exploration of how the sense of smell can be implemented into a wooden tram stop and how experiences of smell can be expressed in drawing

Contact: sigur@live.dk

Chalmers University of Technology

Gothenburg, Sweden 2019

Master Thesis in Architecture and Urban Design

School of Architecture and Civil Engineering

Matter, Space, Structure Studio

January, 2019

Examiner: Morten Lund

Supervisor: Jonas Carlson

CHALMERS
UNIVERSITY OF TECHNOLOGY

Abstract

An exploration of how the sense of smell can be implemented into a wooden tram stop and how experiences of smell can be expressed in representation material

The sense of smell has long been overlooked in contemporary architecture and reduced to a question of air quality. This results in an unexploited quality instead of enriching the atmosphere of a place. One could start using the full ‘pallet’ of all the senses when designing, instead of just restricting oneself to work with the sense of sight.

Throughout history, the smell of wood has been used in religious buildings, monuments and tombs all over the world. In the Ling’en Hall, Chanling tomb, China, nanmu wood has been used as the bearing structure, and it is today, 600 years after construction, still possible to smell it. In a more recent project, Peter Zumthor used smell actively in his design for the Swiss pavilion at the Expo 2000 at Hannover to create an atmos-phere of the swiss pine forests.

This thesis aims to conceive a wooden tram stop at Vasaplatsen, Gothenburg, whose design is driven by the sense of smell and by developing a representation method that can communicate the smell experience.
Through an iterative process of hand-drawing, modelling and 3D modelling, this tram stop can take form. Based on a start-up workshop, intuition and preconceived knowledge, a first design proposal was created. This design was then the starting point for the iterative process as well as the development of the represen-tation method.

Strategies and parameters for how one can work with the sense of smell in a wooden building were devel-oped and then applied to the tram stop. This led to 5 different smell-stories that explore the smell of wood.

This thesis should be seen as a test of how one can implement and use the potential of the sense of smell when designing architecture.

Is it possible to use the sense of smell as a design driver for a wooden tram stop? And how can the experi-ence of smell be expressed in traditional representation materials?

Table of content

STUDENT BACKGROUND

Bachelor of Science in Engineering (Architecture and Design, specialised in architecture and urban design)

Aalborg University

September 2013 - June 2016

Master of Science in Architecture and Urban Design

Chalmers University of Technology

September 2016 - January 2019

Ode to the smell of wood

by Pablo Neruda, translation by Jodey Bateman

Late, with the stars
open in the cold
I open the door.
The sea
galloped
in the night.

Like a hand
from the dark house
came the intense
aroma
of firewood in the pile.

The aroma was visible
as
if the tree
were alive.
As if it still breathed.

Visible
like a garment.

Visible
like a broken branch.

I walked
into
the house
surrounded
by that balsam-flavored
darkenss.
Outside
the points
in the sky sparkled
like magnetic stones
and the smell of the wood

touched
my heart
like some fingers,
like jasmine,
like certain memories.

It wasn't the sharp smell
of the pines,
no,
it wasn't
the break in the skin
of the eucalyptus,
neither was it

the green perfumes
of the grapevine stalk,
but
something more secret,
because that fragrance
only one
only one
time existed,
and there, of all I have seen
in the world
in my own house at night,
next to the winter sea,
was waiting for me
the smell
of the deepest rose,
the heart cut from the earth,
something that invaded me
like a wave
breaking loose
from time
and it lost itself in me
when I opened the door
of the night.

(Pablo Neruda, 2019)

Introduction

In the poem on the previous page, Pablo Neruda has tried to put words to what smell can do to us. It can evoke deep emotions and flash forgotten memories before our eyes in split seconds. And also how wood can be the trigger for these experiences.

This phenomenon was what I found fascinating and it was what sparked my interest to do a thesis about the sense of smell. I wanted to investigate it and try to use it as the design driver of my design process, and at the same time develop a representation method that could convey my findings.

We can't turn off smell. We breathe in and out more than 20000 times a day. But our mind is filtering the input and we only notice anything if it stands out for both good or bad reasons. And the emotional response to any smell that stands out varies widely from person to person based on their personal experience, memories and culture. (Erwine, 2017)

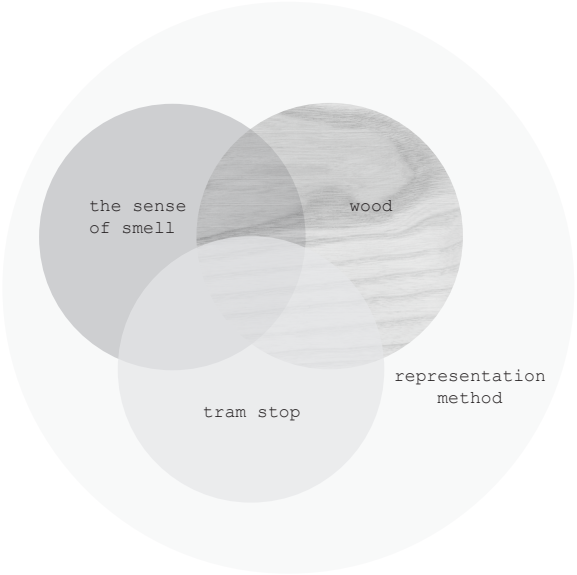
'The mute sense without words'

This is how Diane Ackerman has described the sense of smell, and to this Mahmoud Darwish added *'We lack a dedicated olfactory vocabulary'*. This is perhaps what has caused the sense of smell to be seen as the least important of all the senses, and in contemporary architecture it has mostly been reduced to a question of air quality (ventilation, getting rid of all smell). Studies have shown that losing the sense of smell is a bigger cause of depression than losing any of the other senses. So, the sense of smell in an architectural context has a big potential that we are not taking advantage of today. (Erwine, 2017) (Henshaw, 2014)

By introducing an uncommon smell at a tram stop and by activating the sense of smell I can then take the travellers' minds off the wait they are experiencing. The function of the tram stop can also be to introduce you to this experience of the smell of wood. It could potentially make one come back for the experience and not just to use the tram stop as a tram stop.

The goal is not to create a tram stop that always has a strong smell but to create a structure where there is a possibility for the experience of the smell of the wood to happen, a gentle lingering smell that can trigger interest and evoke memories. This is heavily dependent on weather conditions and the season (climate and geographical parameters). (Erwine, 2017)

The experiences of the smell will become less noticeable over time, so the experience of the smell becomes something special that happens under certain climate conditions. Or perhaps the smell could be reinvigorated.



Discourse diagram

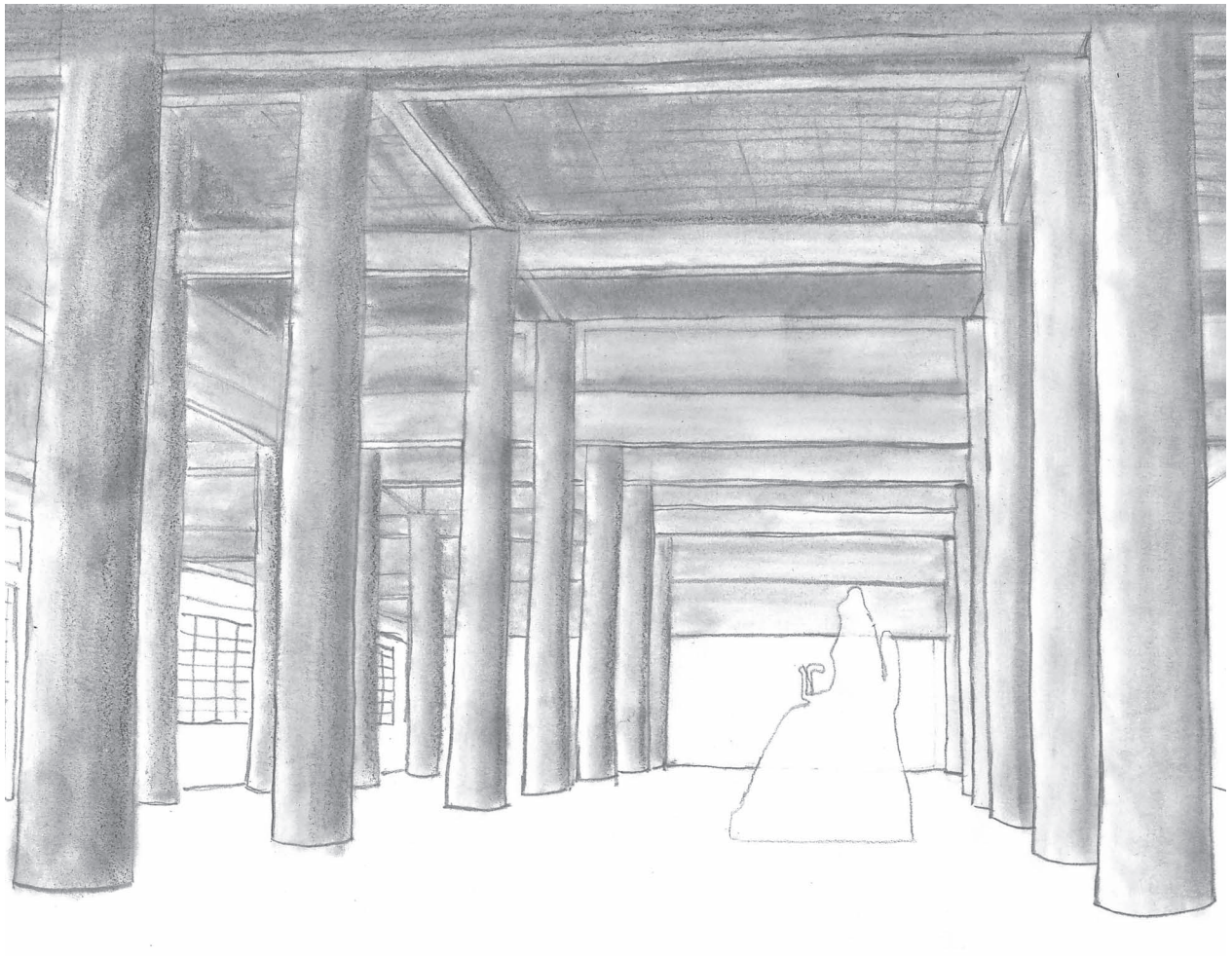
Method

The preparatory work and references were a starting point for the project. The generated knowledge was then the basis for a start-up workshop that worked with implementing this knowledge into architectural models and at the same time kickstart the design process. The outcome of the workshop was not one single of the 37 models that could be the main inspiration for the further design, but elements of many of the individual models were carried on to the next step of the process. The workshop also sparked questions that led to further research and digital and physical model investigation. The design was continuously iterated following the findings of the research and investigations always trying to keep the sense of smell as the centre of the investigations. Site analysis was also done in order to make the design site-specific.

Parallel to the design process the development of the representation method took place. It started as digitally generated material and quickly moved into the realm of the pencil. Especially a drawing workshop helped to this evolution.

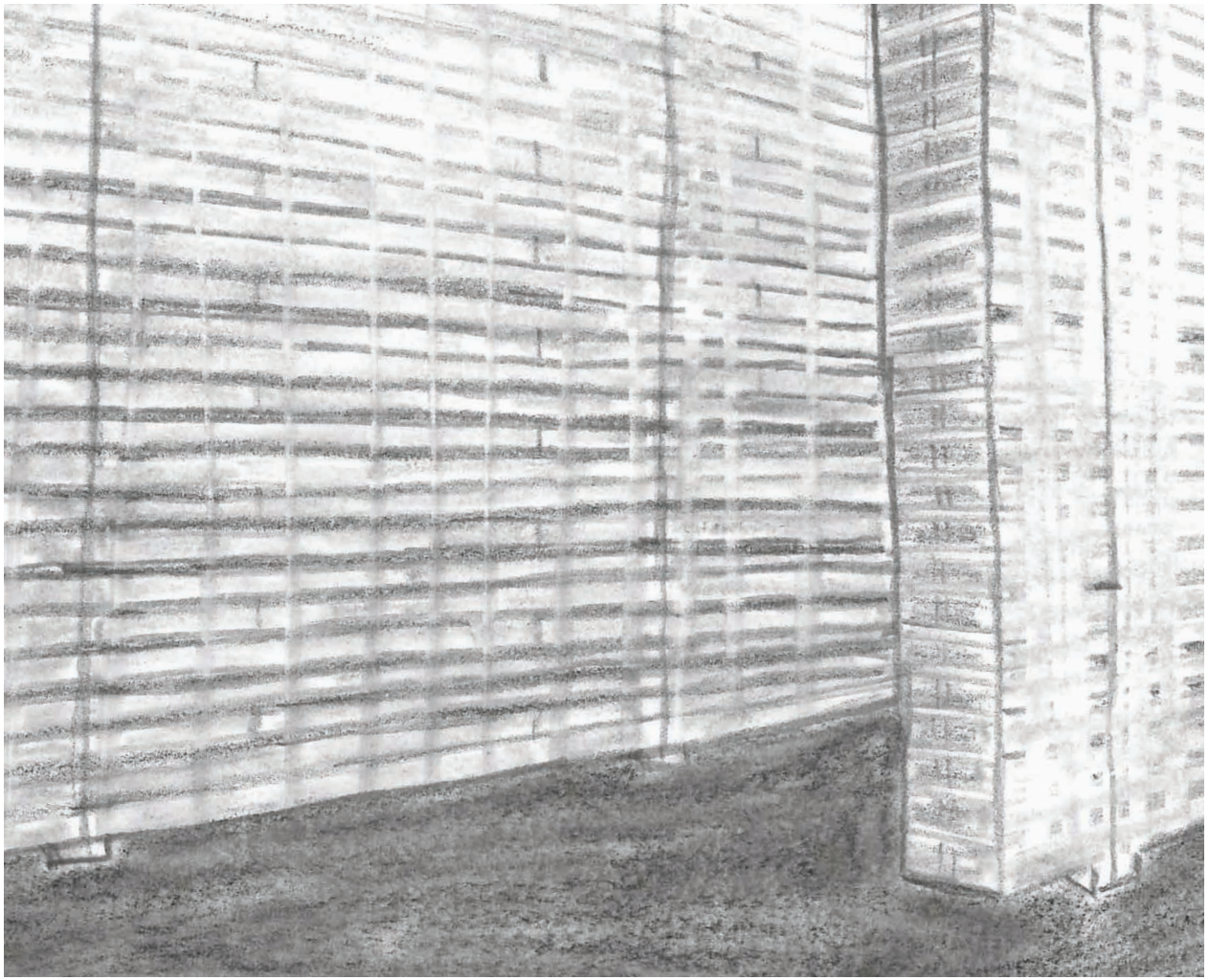
Historical context

In ancient Chinese temples, they used nanmu wood. This wood was priced and valued very highly by the emperors and nobles of China both because of its characteristics of not contracting or expanding with changes of humidity and temperature, act as an insect repellent and for its distinct smell, that instantly creates an atmosphere anywhere it is used. Even today many hundred years after being constructed the wood still gives of smell and atmosphere in temples and tombs it was used in. Another example the use of fragrant wood it the 2000 years door at the temple of Somnath in India, which was made crafted of sandalwood which still today emanates its natural scent. (Hultengren, 2019) (China-travelkey, 2019) (Evarts, 2019)



Ling'en Hall - the Hall of Eminent Favor, Changling tomb, 1413, Beijing

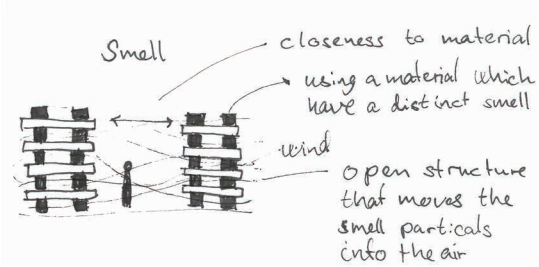
Built reference



Swiss Sound Box, 2000, Hanover Expo, Peter Zumthor

Peter Zumthor has with the Swiss Sound Box for the 2000 Expo in Hanover created a series of atmospheric spaces, what is connected with multiple 'hallways' making it up to the visitor to explore the space on their own terms being guided by their curiosity.

The pavilion is inspired by the way wood is stored, when it is dried, this allows air to move freely through the structure and carry the wooden particles from the source to the noses of the visitors. (WikiArquitectura contributors, 2019)



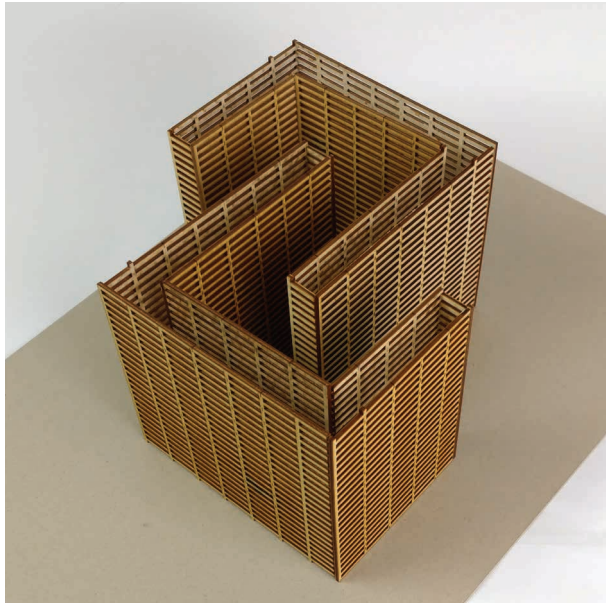
Preparatory work

Prototype II

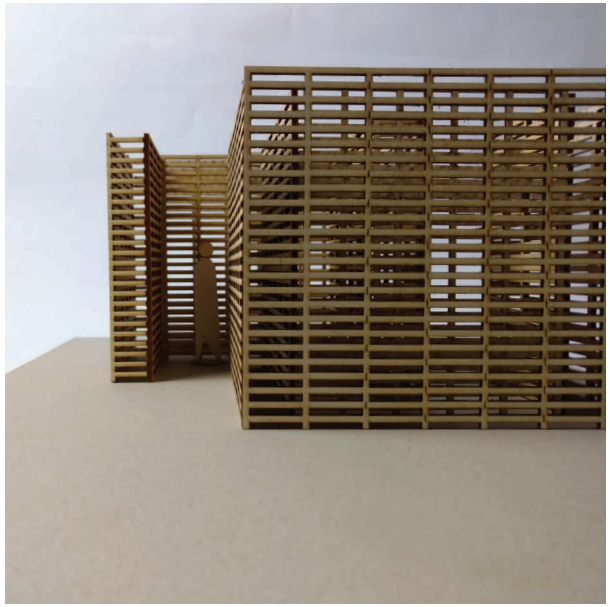
The smell of atmosphere

Identified parameters for strengthening experiencing the smell of wood:

- Obscuring other senses (visual, auditive)
- Physical closeness to wood
- Surface area of wood
- Movement of people to mix fragrant compounds from the wood into the air
- Open structure to allow wind to flow through, mixing air
- Freshness of the wood
- Wood with distinct smell



Prototype II - overveiw of spartial sequence



Prototype II - obscuration of the sense of sight

Current state

Tram stop C, Vasaplatsen, Gothenburg, October 2018

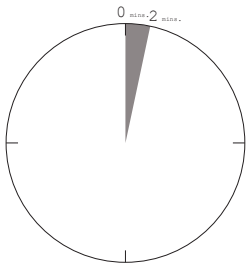
Advertisements are taking up more and more space in the public realm, and every time one uses public one gets bombarded with the newest dish-washing soap brand that does not add any value to one's life. On the other had these commercials help keeping the tram stops clean and maintained, now then the bombardment of ads, could be said to add value to one's life.

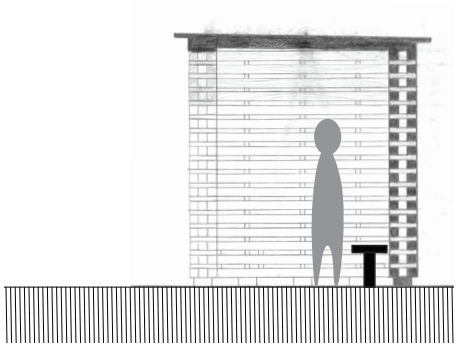
- Capitalism is taking over the visual image of the city
- visually disturbing
+ by having commercials at the tram stop, the city gets them maintained and kept clean

In this project, it has been chosen not to work with advertisement because of their visual nature and their lack of having an olfactory dimension in their current state.

Time and waiting

Ultra short wait >> standing



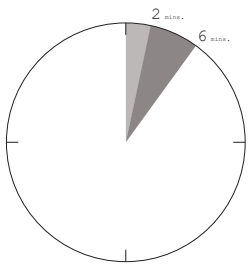


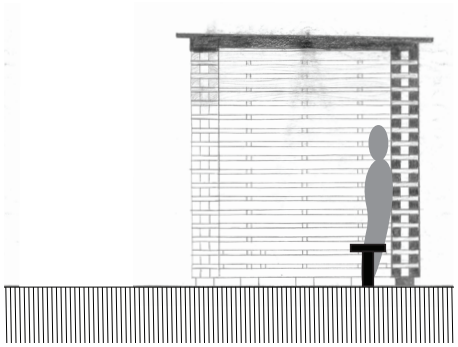
Demand for shelter: ■ □ □ □ □

Sequece of actions:

Arrival > Check for next departure > Find a place to stay > Ultra-short exposure to multisensory experience > Leave

short wait >> leaning



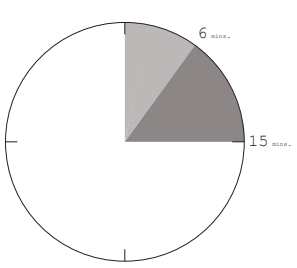


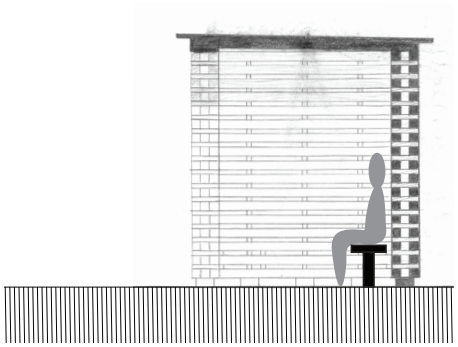
Demand for shelter: ■ ■ □ □ □

Sequece of actions:

Arrival > Check for next departure > Find a place to stay > Short exposure to multisensory experience > Leave

long wait >> sitting



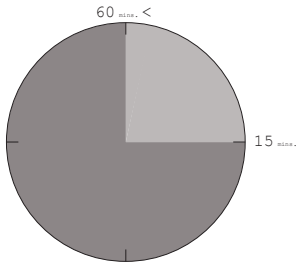


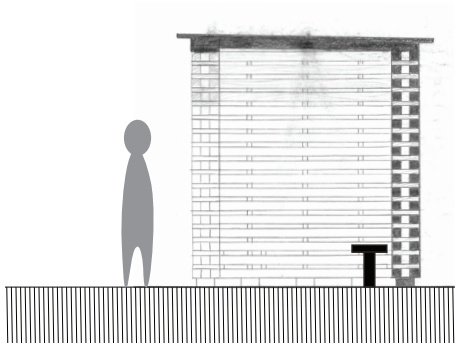
Demand for shelter: ■ ■ ■ ■ ■

Sequece of actions:

Arrival > Check for next departure > Find the nearest place to sit > Long exposure to multisensory experience > Leave

no wait >> in movement



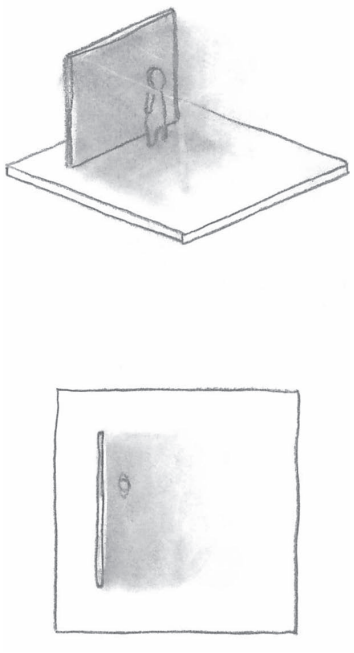


Demand for shelter: □ □ □ □ □

Sequece of actions:

Arrival > Check for next departure > Ultra shot exposure to multisensory experience > Walk to next tramstop

Enhancing olfactory experience by enclosure

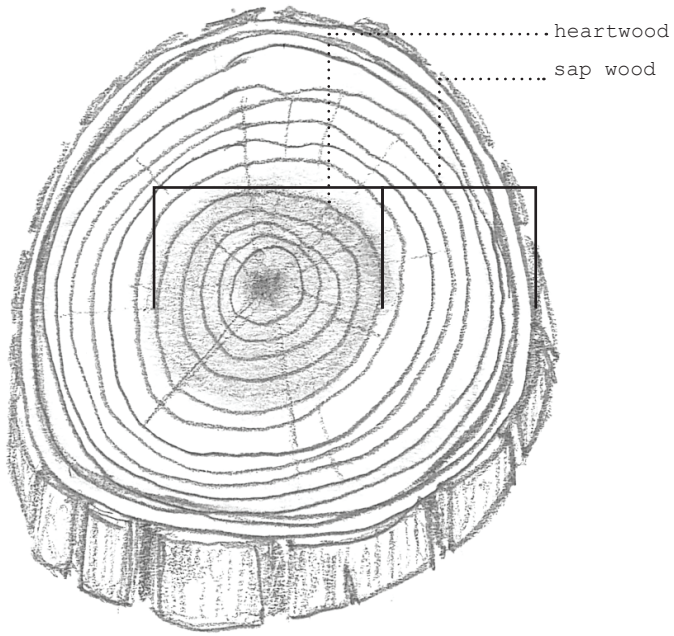


The more enclosed you are by a material with a smell the more intense the experience of the smell will be.

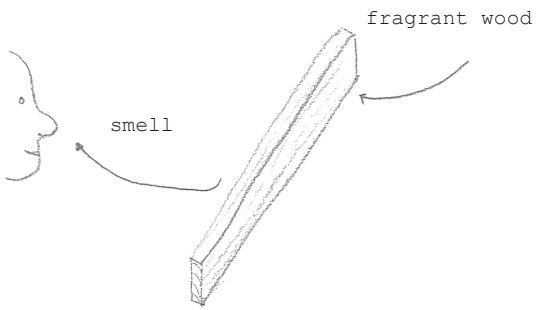
Wood and smell

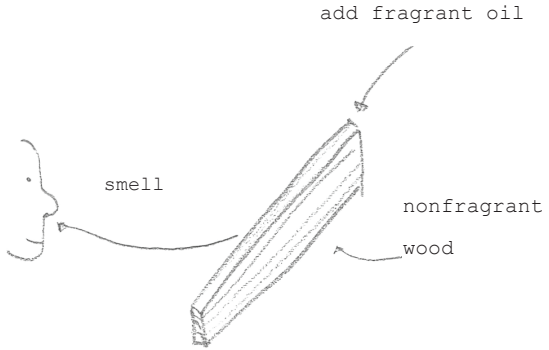
An aroma compound in the extractives that over time builds up in the heartwood of the tree, when a tree does not need the whole stem to transport sap the cells at the pith (core) die and this leads to the build-up of extractives which in some species of wood contains aroma compounds.
The extractives with the aroma compound are tightly bound in the cellular cellulose structure of the wood.
This makes the heartwood more stable and prevents decay and rot.

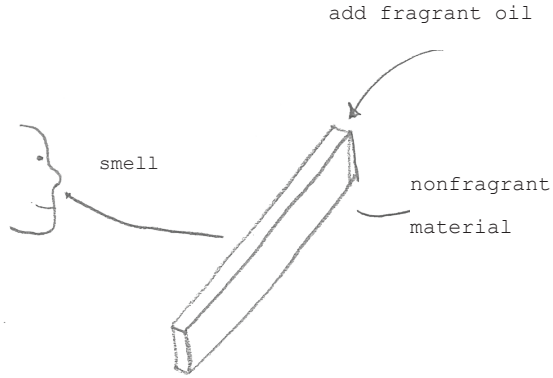
Any odour one can smell of a substance is because it has aroma compounds and the substances have a volatility that allows the aroma compound to be released into the air to then be carried to our noses in high enough concentrations to be registered in our olfactory bulb. (Meier, 2019) (Wikipedia contributors, 2019)



Source of smell







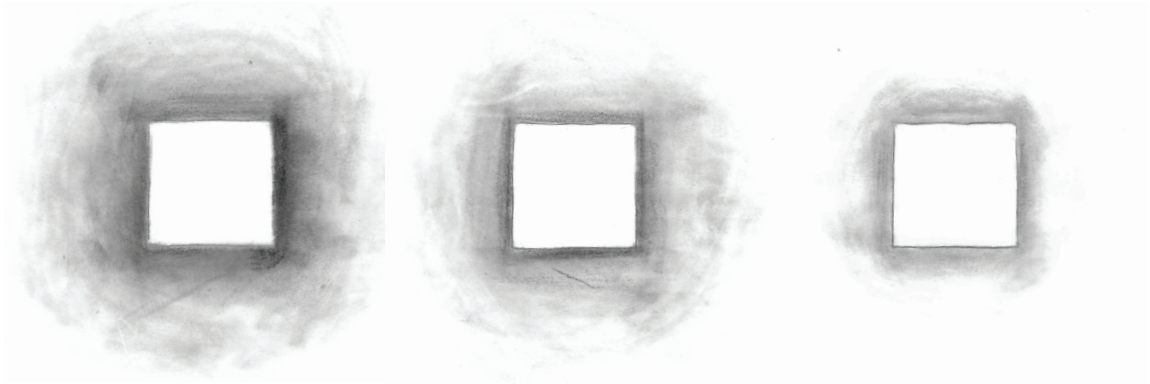
It has been chosen to work with wood as the origin of smell through out this project base on the fact that the intention in the project is to work with the smell as an integrated part of architecture and not as a part that must be added. This way the project doesn't get caught up in categorising and evaluate individual smells, and how these smells effects the architecture and its atmosphere.

Wood species

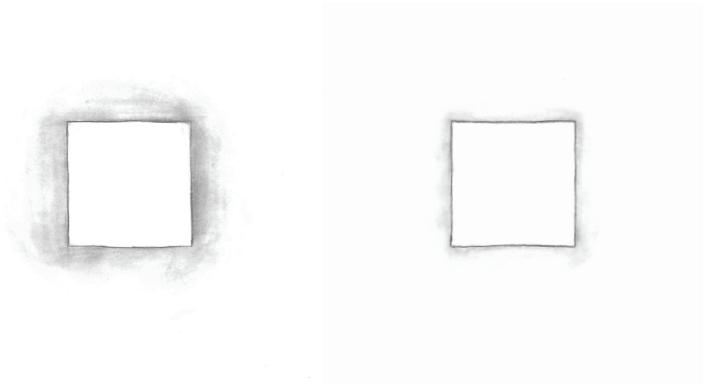
Many different wooden species have been researched in order to find species were the wood also would have a smell after the drying period. This has been done through the Wood Database (Meier, 2019), and researching essential oils that have been extracted from wood. Endangered species was taken out of the consideration. Sizes of tree trunks were also taken into consideration, thinking about possible constructions.

species	aromatic red cedar	camphor	incense cedar
sceintific name	Juniperus virginiana	cinnamomum camphora	calocedrus decurrens
smell	strong lingering scent	camphorous	spicy scent (pencils)
rot resistance	■■■■■	■■□□	■■■□

Woods smell over time



Freshly dried



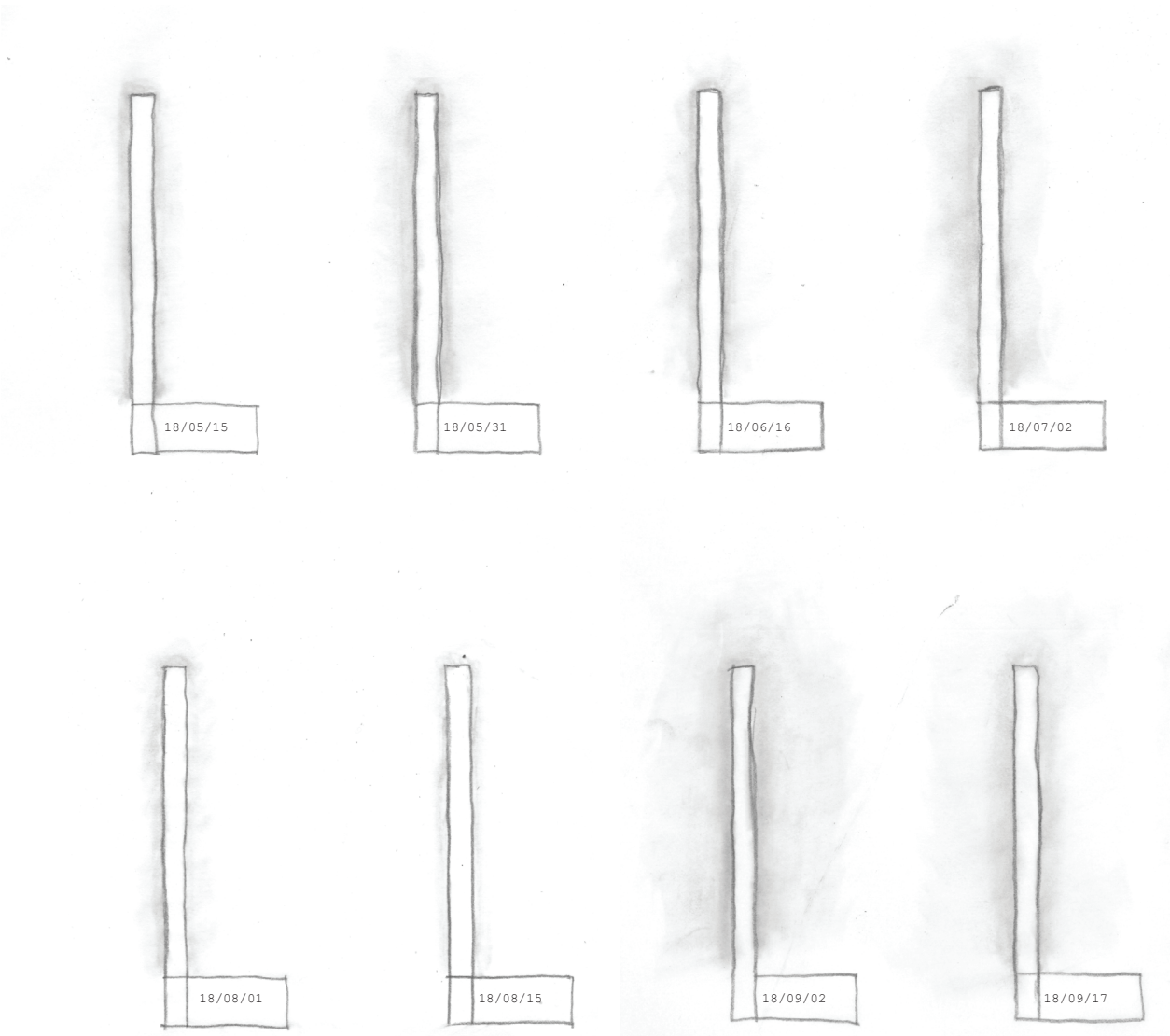
Completely weathered

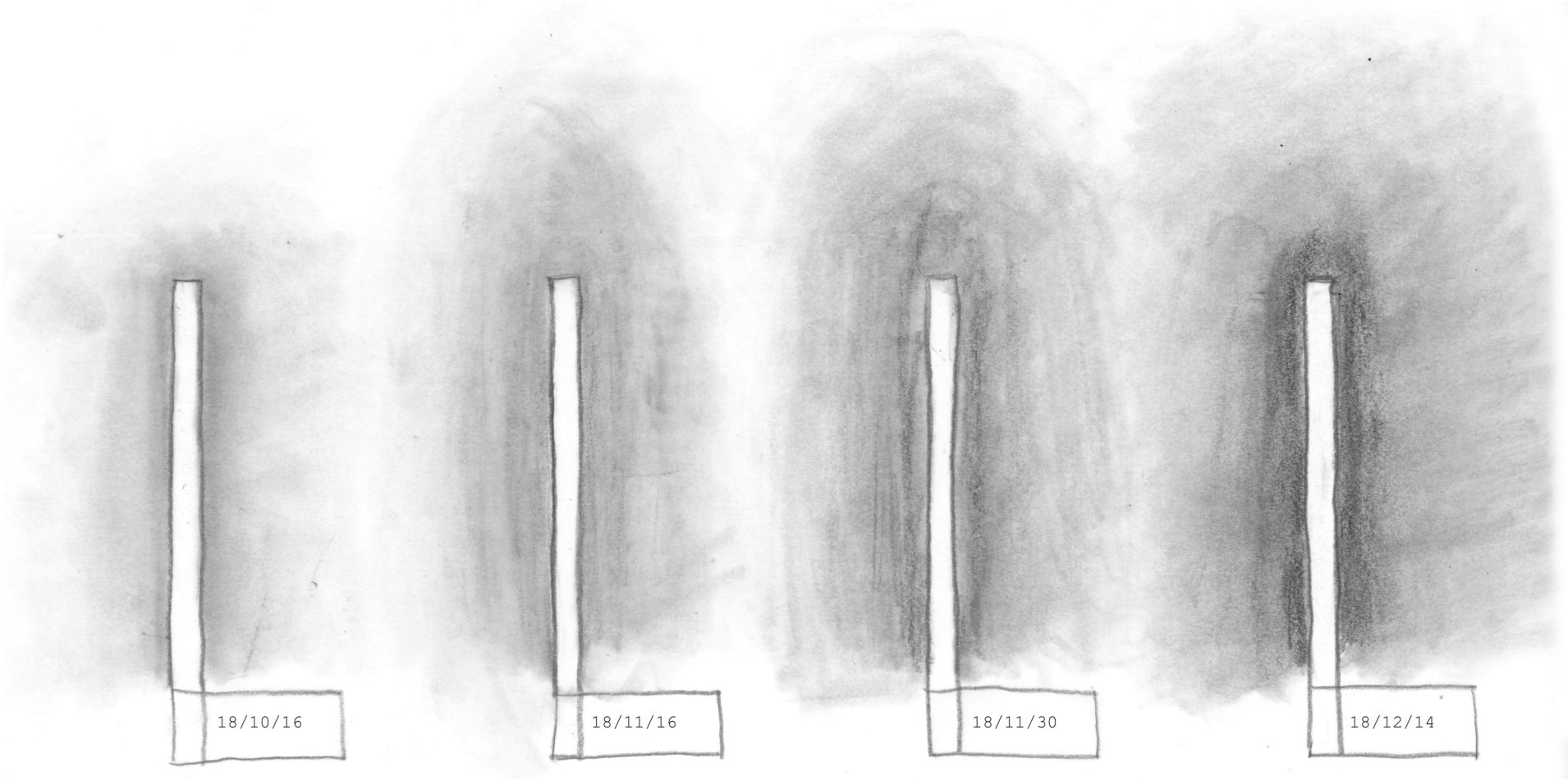
Wood will have the strongest smell when it is freshly harvested and the smell will fade over time. Events that can reactivate the smell can be heat, rain or somebody carving out their initials in the wood.

Aromatic red cedar's smell development

The test was conducted by applying a coat of essential oil (extracted from aromatic red cedar) to a wooden stick. Then this was repeated with an interval of about two weeks since May 2018. The sticks were then placed and kept separate in a draw to try to minimise transfer of essential oils. The same test was done with essential oil from camphor, and whereas the volatility of camphor oil was very high in the beginning when applied to the sticks, the smell quickly faded and was nearly unnoticeable after 2 weeks. While translating the smell emanating from the sticks into drawings one's nose can get acclimates to the smell because it becomes so used to it. This might explain the dip in the strength of the smell on the sticks from 18/08/01 and 18/08/15. Another reason could be that the amount of oil applied to each stick was not the same.

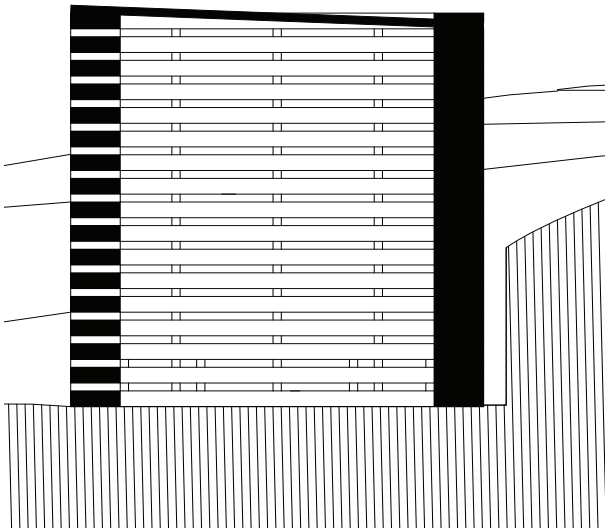
This experiment supported the choice to work with red aromatic cedar because of the longevity of the smell over time. It should also be noted that the smell develops over time and does not stay the same. This can be seen in the smell sticks from 18/11/30 and 18/12/14 materialised by the use of heavily applied pencil close to the sticks.



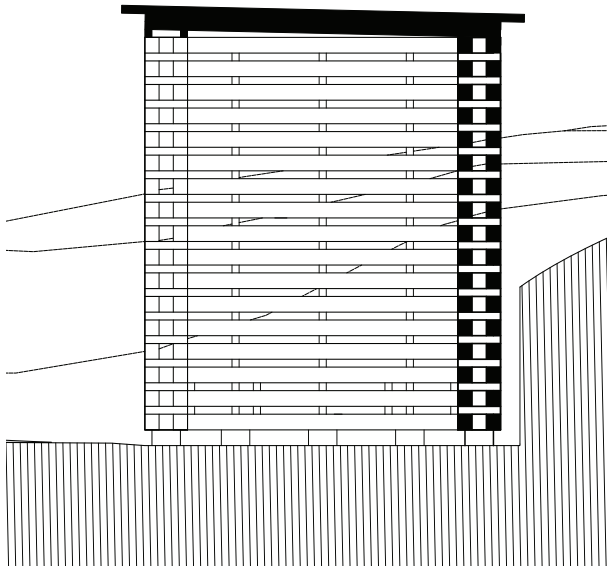

18/10/16
18/11/16
18/11/30
18/12/14

Development of representation method

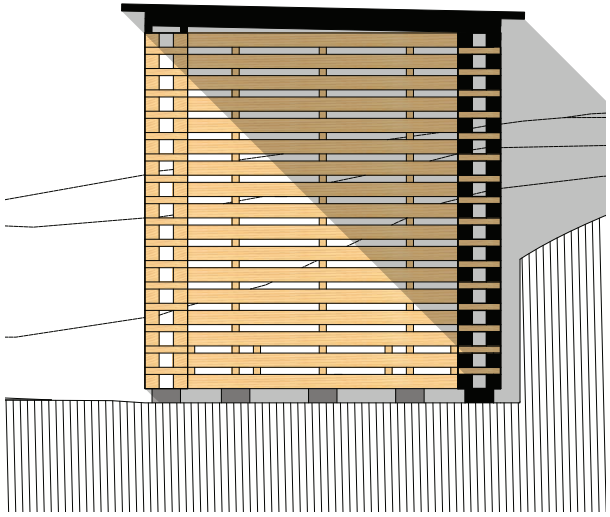
Drawing the atmosphere of smell 1



First drawing made based on preparatory work and intuition and the architectural drawing style was based on Mario Botta.

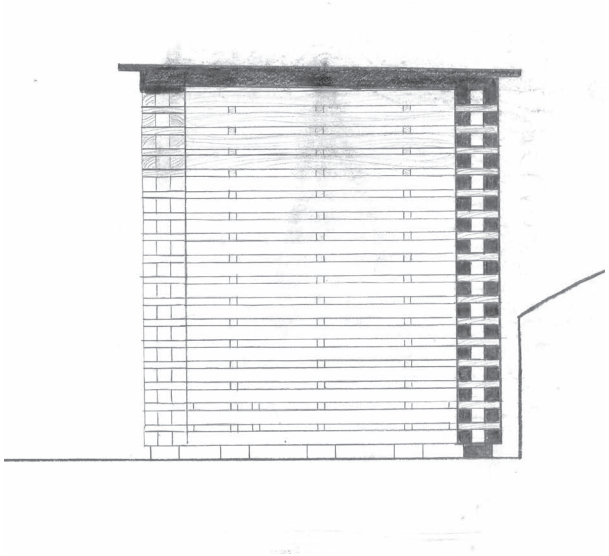


Different line weights were introduced to create a feeling of depth.



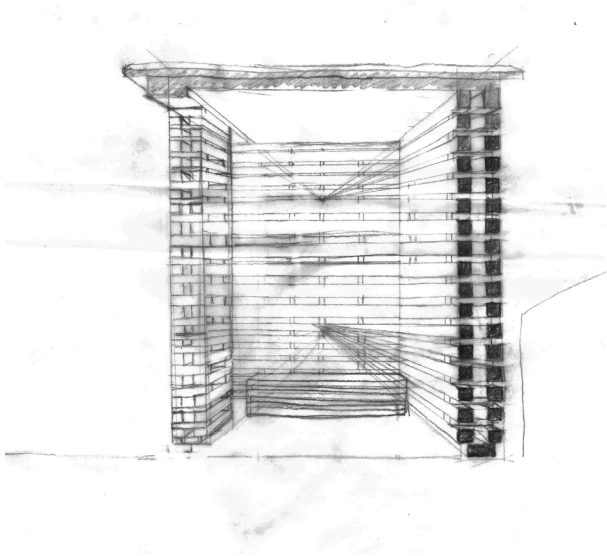
Shadow and materiality were added in order to better communicate the atmosphere with a focus on how to draw smell and temperature in the drawing.

Drawing the atmosphere of smell 2

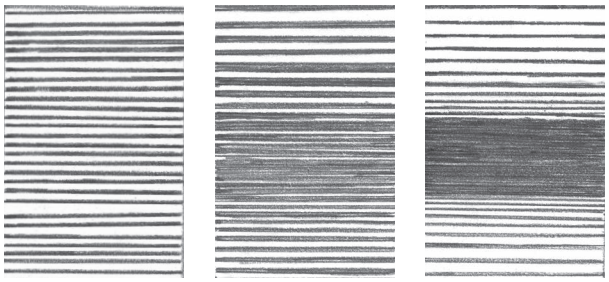


Change to hand drawing in order to see if it is easier to express atmosphere in this medium. It was concluded that it was.

Trying out if it was easier to express atmosphere when using a purple pen instead of pencil.

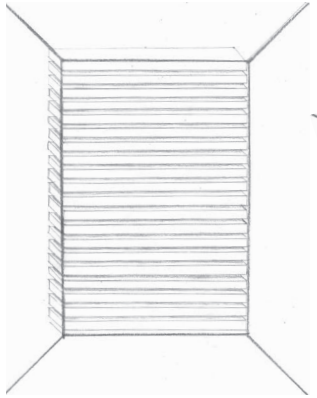


A trial of combining a perspective section with a regular section.

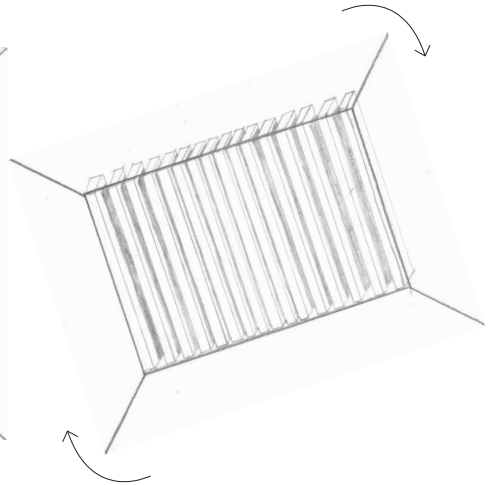


1 *2.* *3.*

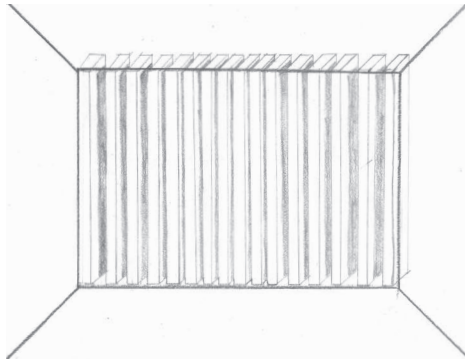
1, the regular interval of element > no difference in temperature. 2, wider elements that provide that more lee in the middle that in the top and the bottom > there will be a difference in temperature from the top and bottom part and the middle part. 3, has the biggest contrast between closeness and openness of the structure this also creates the biggest difference in temperature.



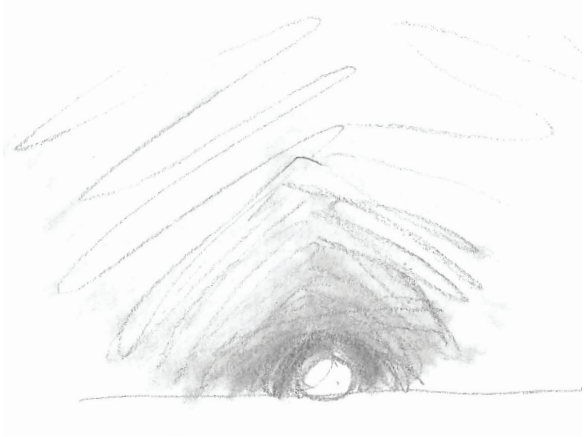
The depth of the elements and more controlled spacing was now explored. The atmosphere of the previous drawing was not transferred into the more controlled drawings.



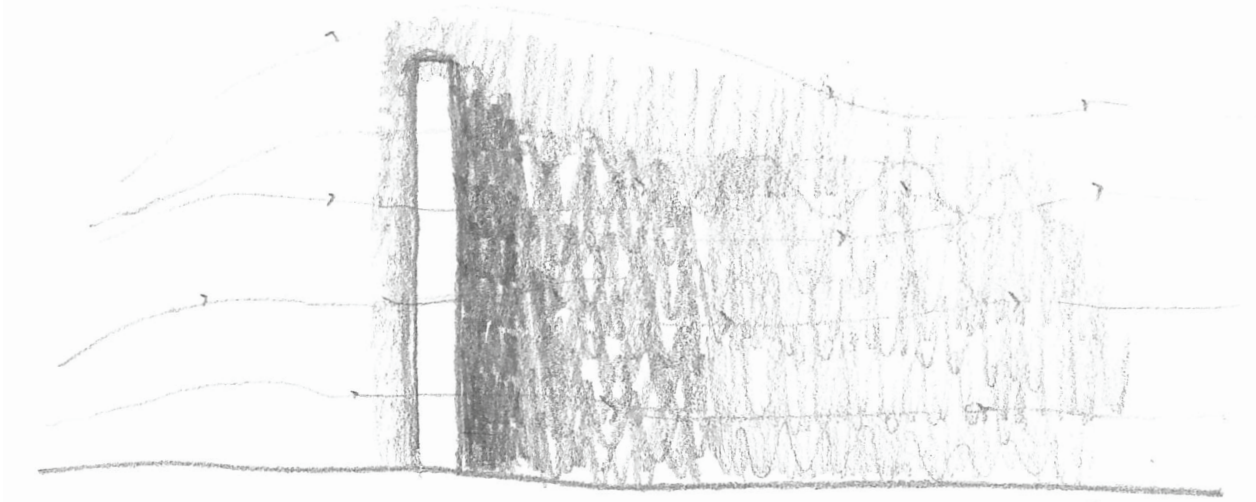
Then structure was rotated to move away for creating boxes.



Drawing the atmosphere of smell 4

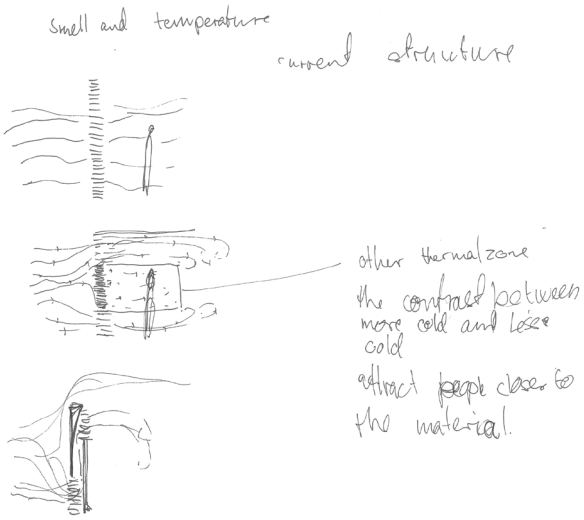


Visualising smell by creating a gradient of pencil smudge.



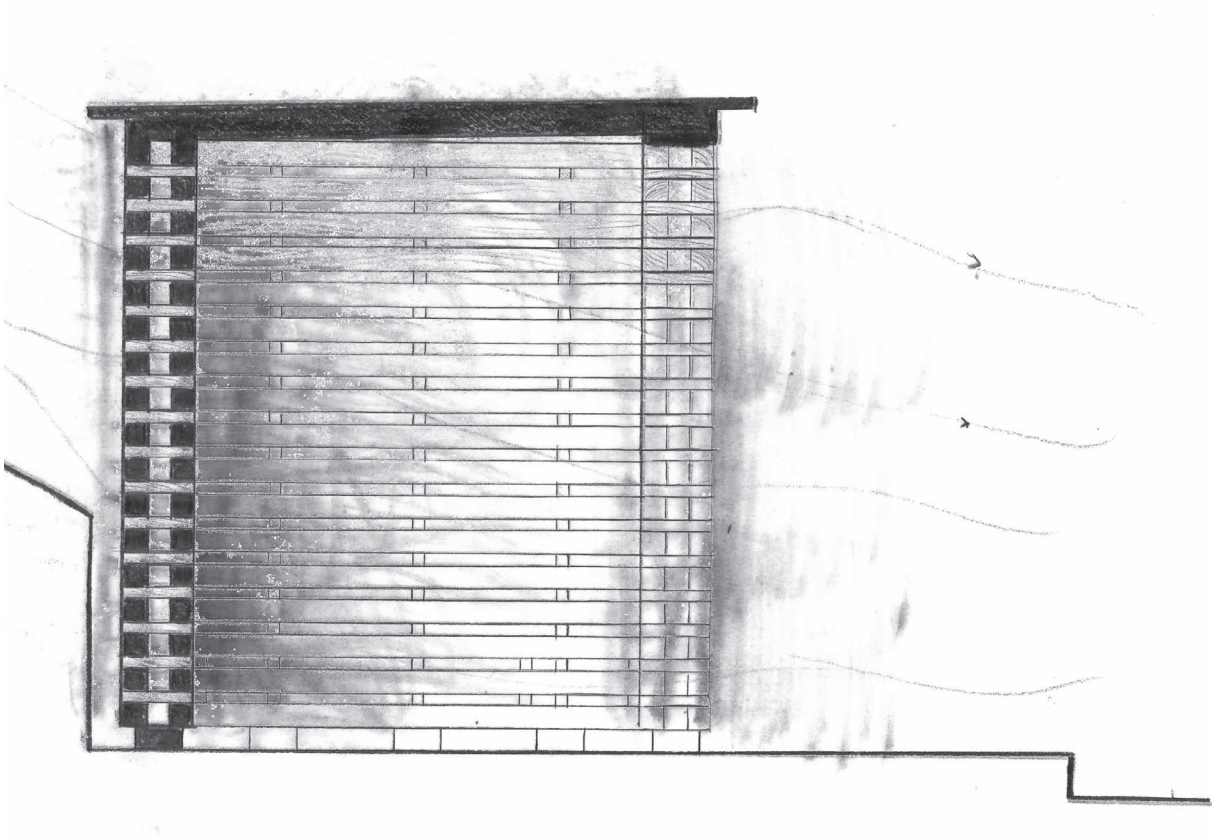
Adding a visualisation of wind as wind arrows.

> Visualising how the wind affects the smell of the structure.



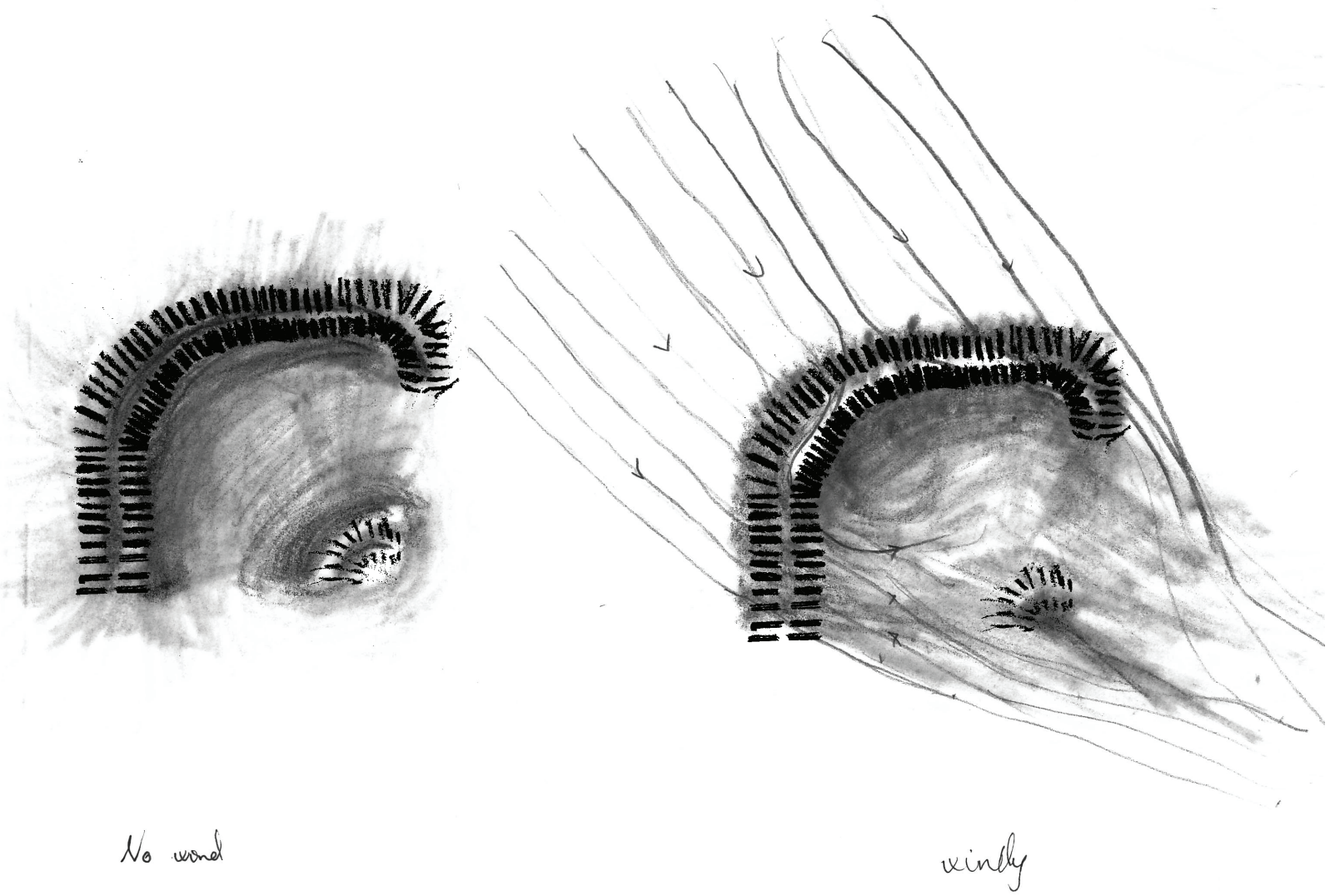
Strategies for how the experience of smell is expereinced when it is windy.

Drawing the atmosphere of smell 5

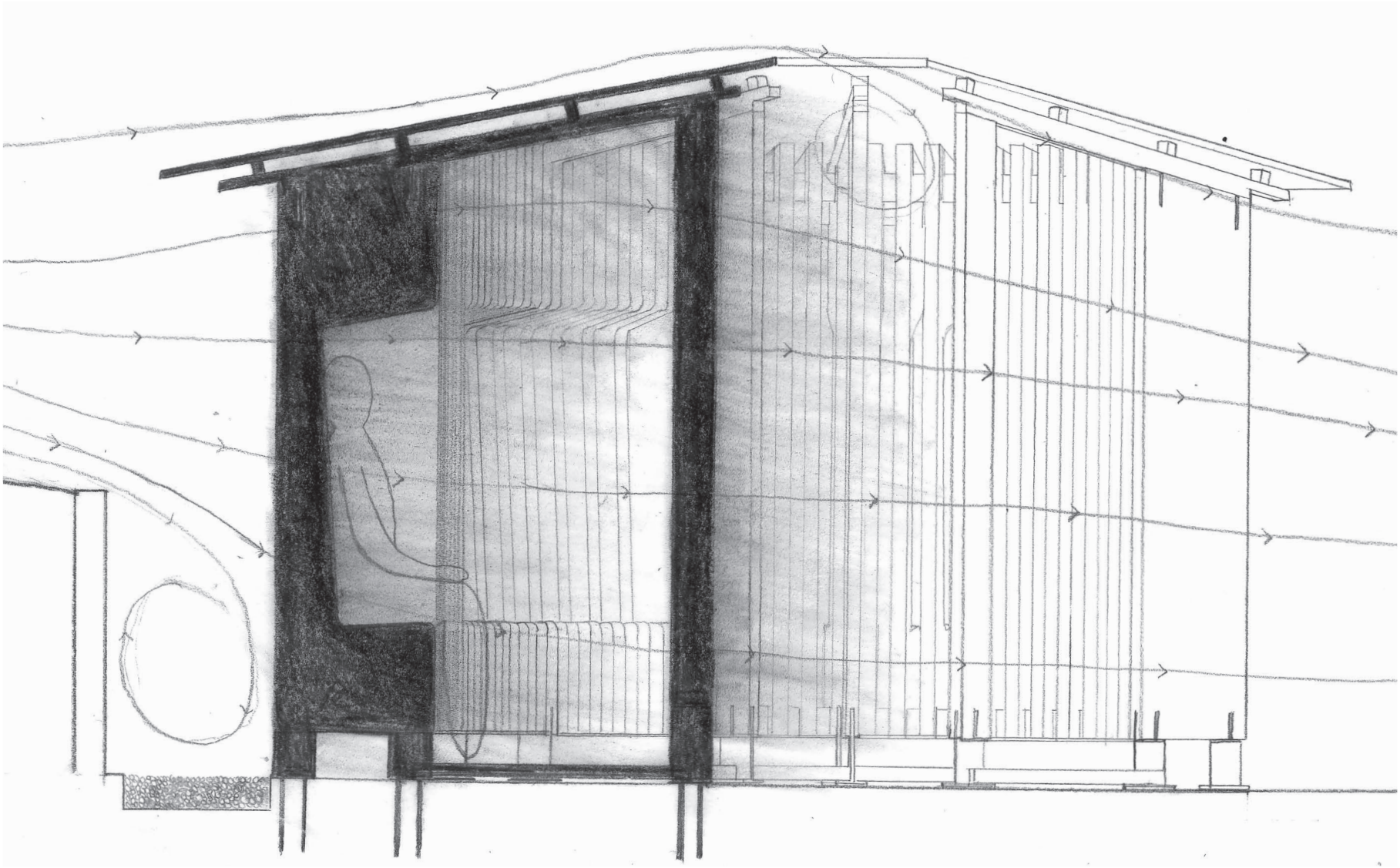


The technic of showing the atmosphere of smell is applied to an early section.

Drawing the atmosphere of smell 6

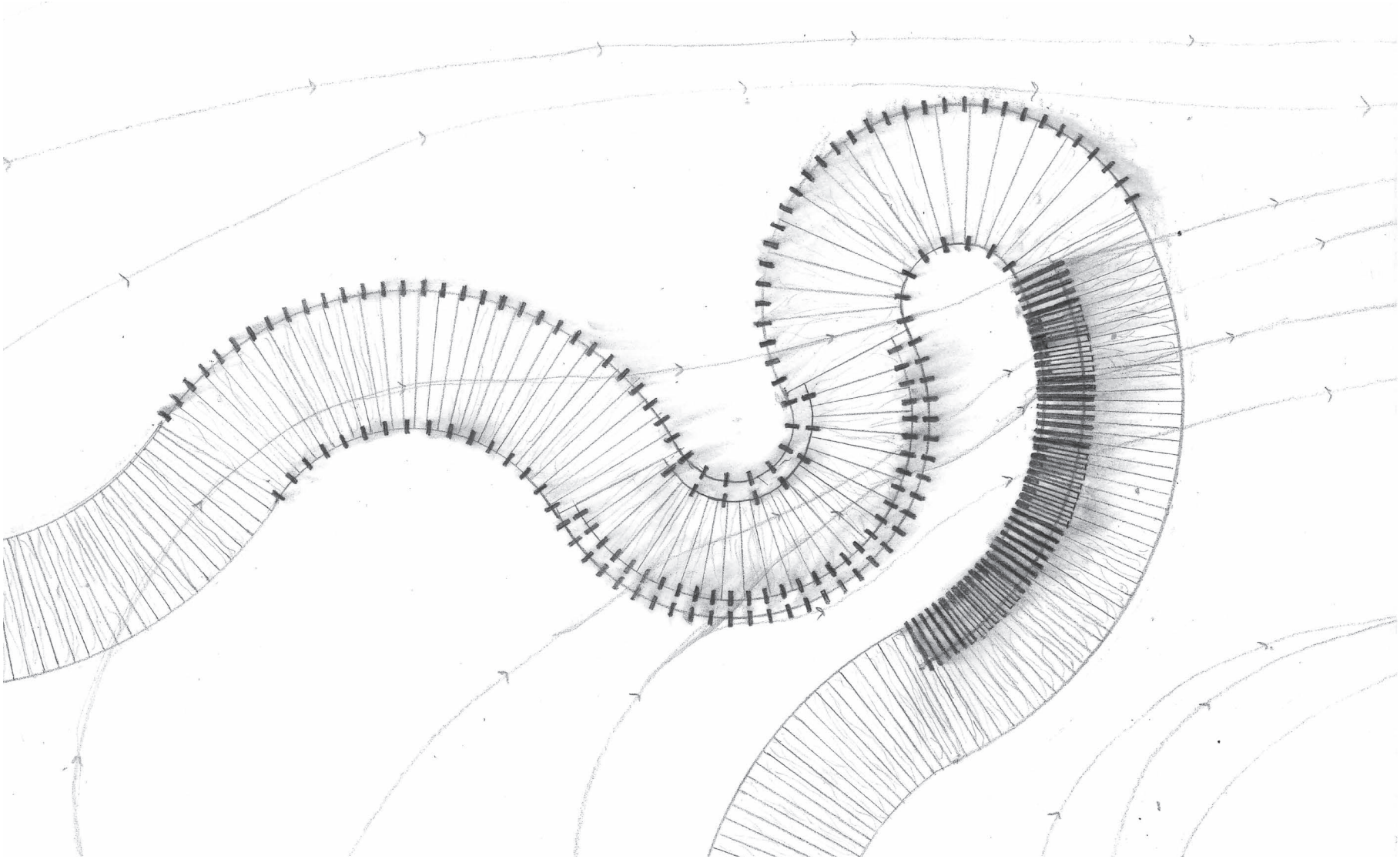


Plan showing the experience of the smell in the tram stop with and without wind.



A section that shows the application of drawing principles. Varying lead types are used to create a feeling of depth.

Drawing the atmosphere of smell 8



Plan where drawing principles are used. Here it is seen how the wind will interact with the structure.

Drawing tools

The plan and section A-A was done on tracing paper with digitally produced underlay. They were crafted in a very controlled manner, with the use of rulers, compass and if any mistakes were made, it would be erased and corrected. Section B-B was however crafted only by free-hand on tracing paper with digitally constructed underlay.


Design

Site

Vasaplatsen C

Zone

- Urban
- Placed just outside the city centre

Transport

- Busses number: 16, 19, 158, 753
- Trams number: 2

People flow

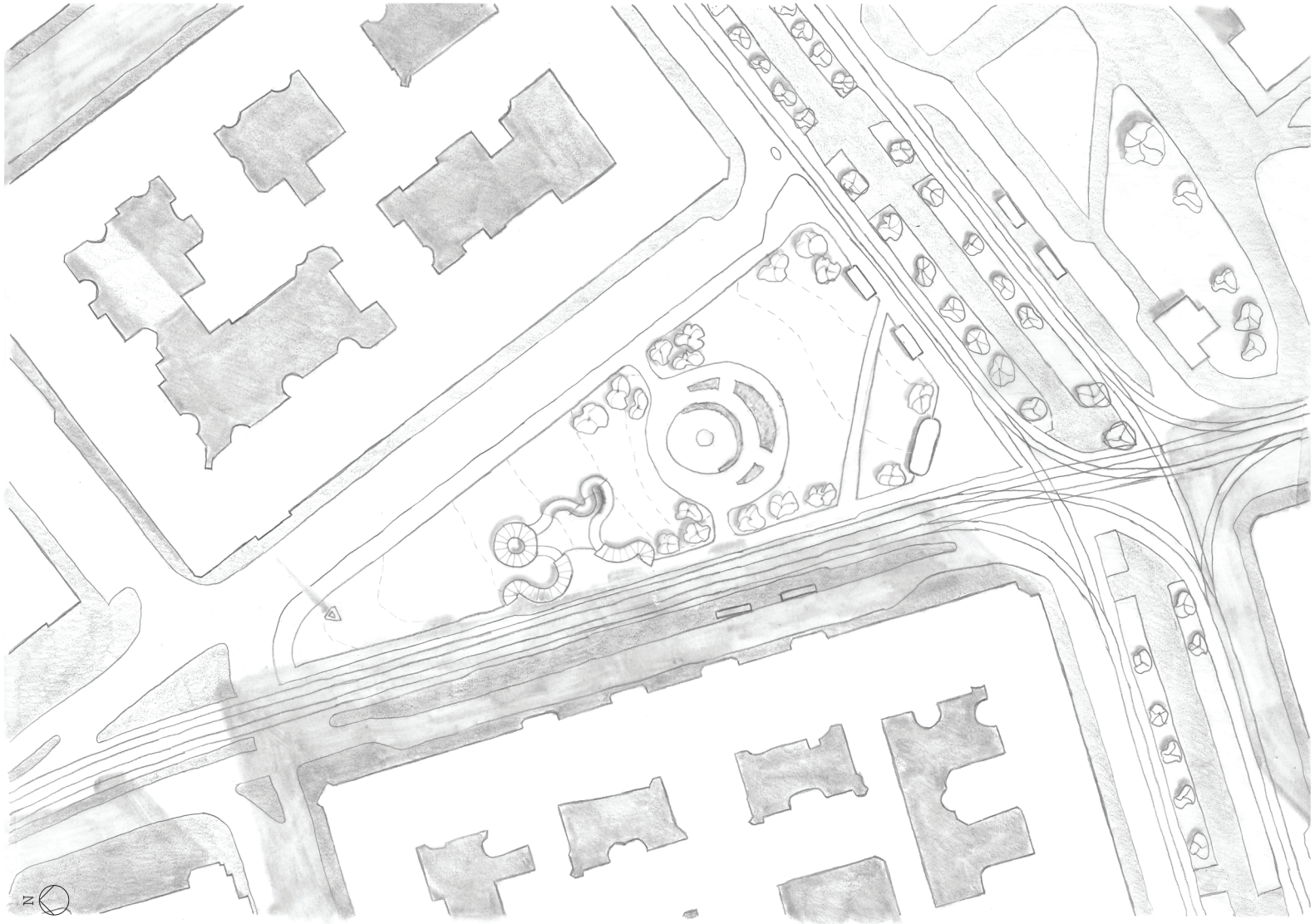
- Medium
- Because of the higher frequency of trams, there’s a possibility to have longer waits at the tram stop, when going to the tram stop without having checked departure time of one’s bus

Characteristics

- Busses and trams stop at the same stop
- Right behind the stop, there is Vasaplatsen park which is just a lawn

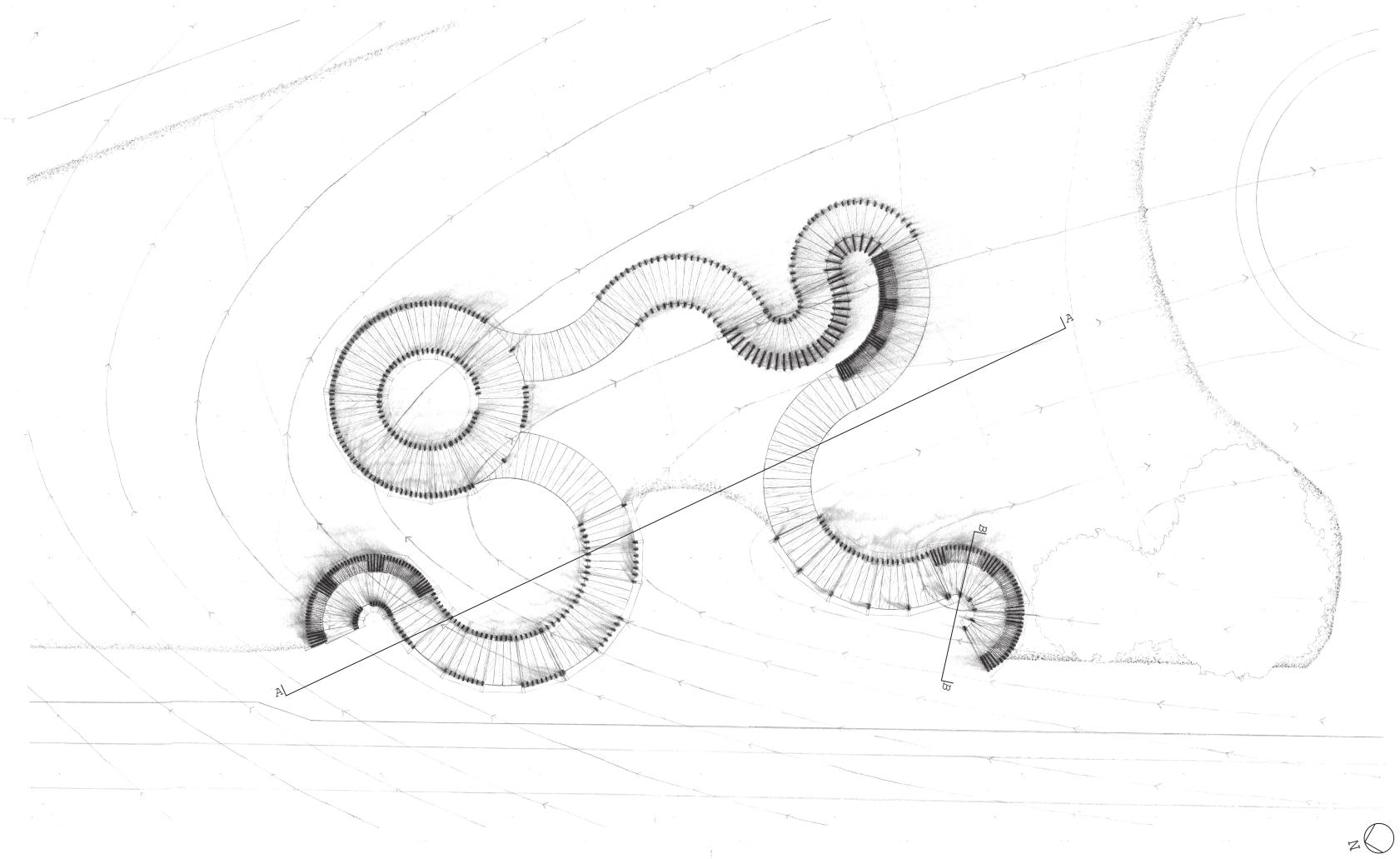
Site map

1:900



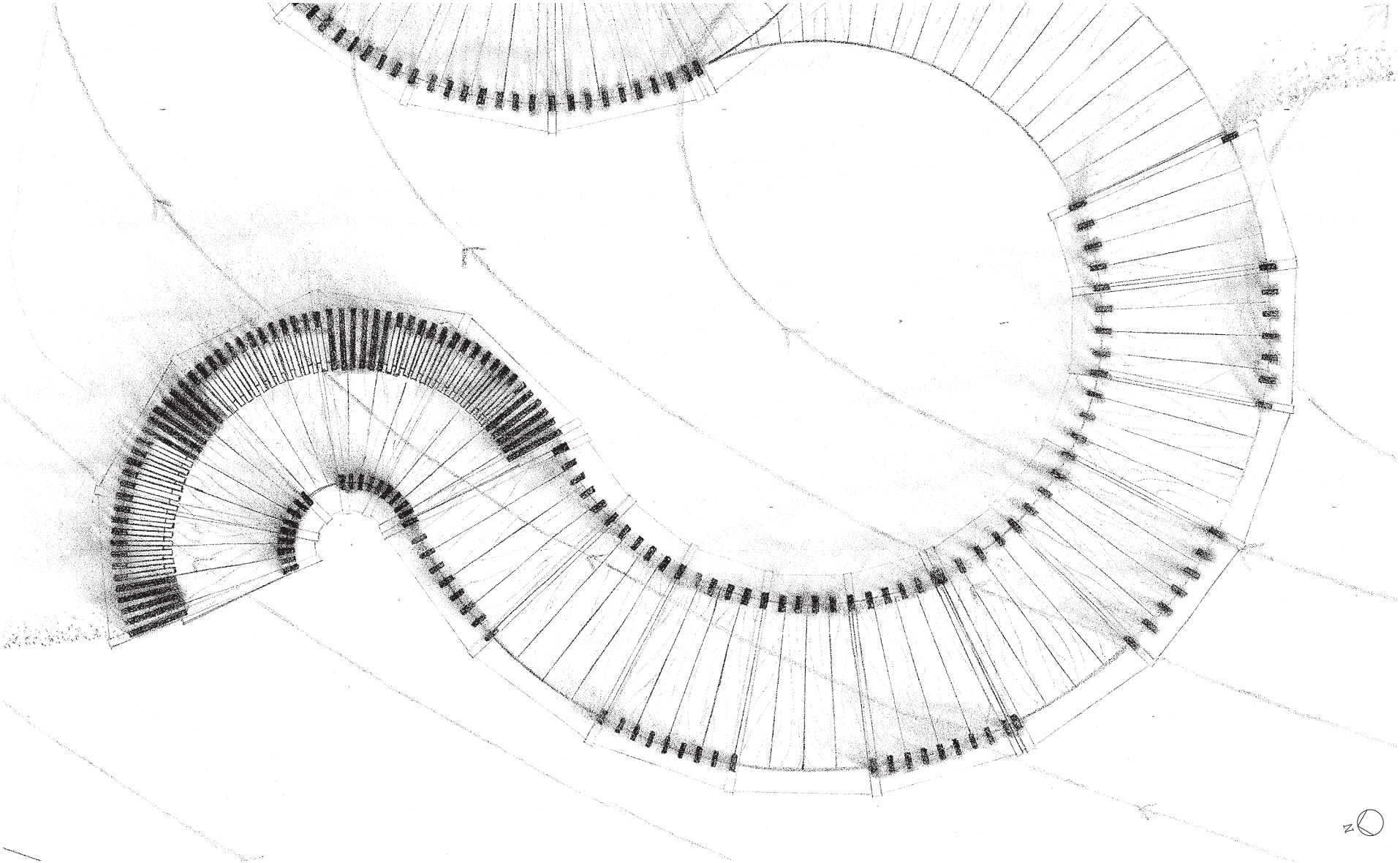
Plan

1:200



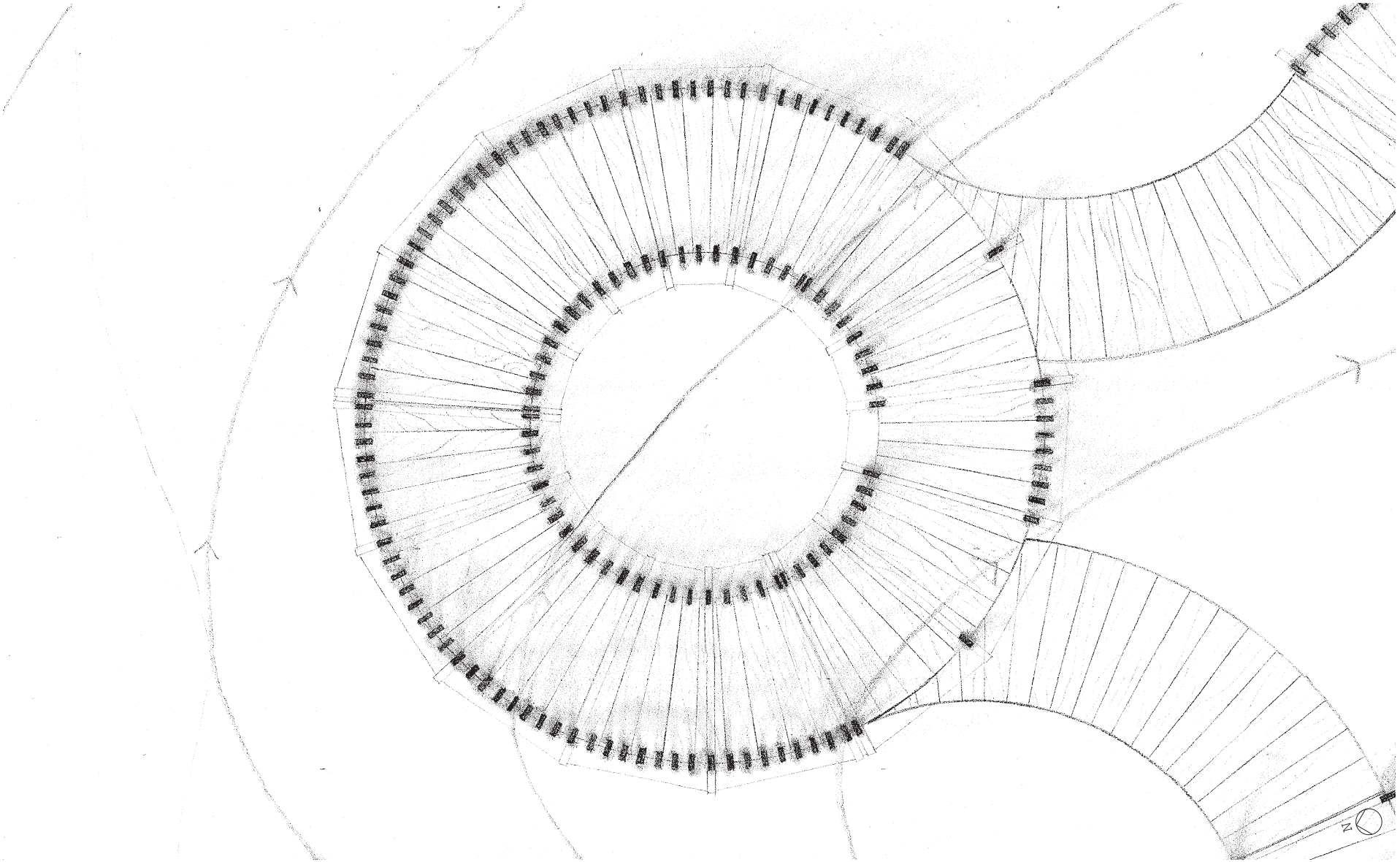
Progression in intensity

plan, 1:50



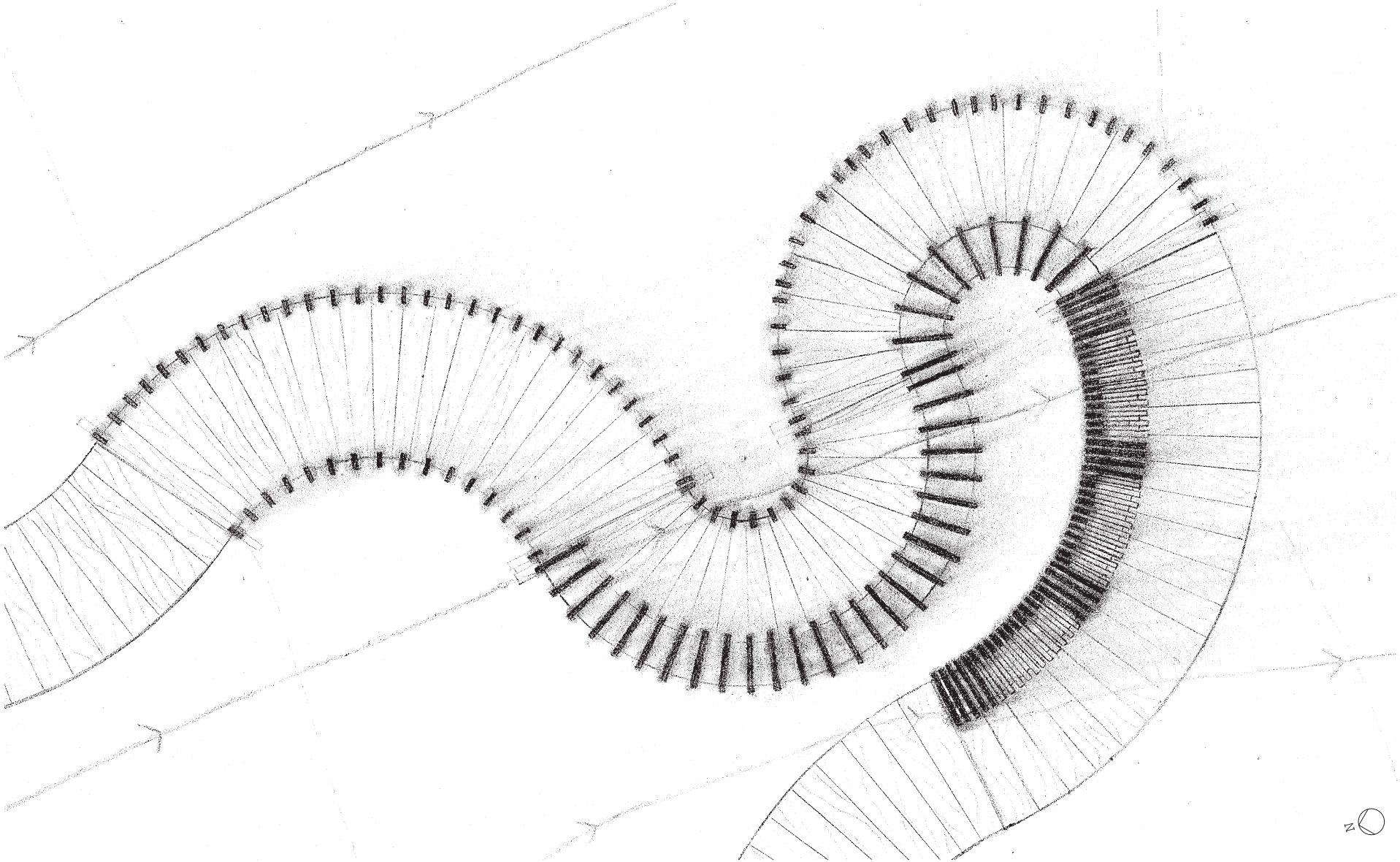
Smell no matter direction

plan, 1:50



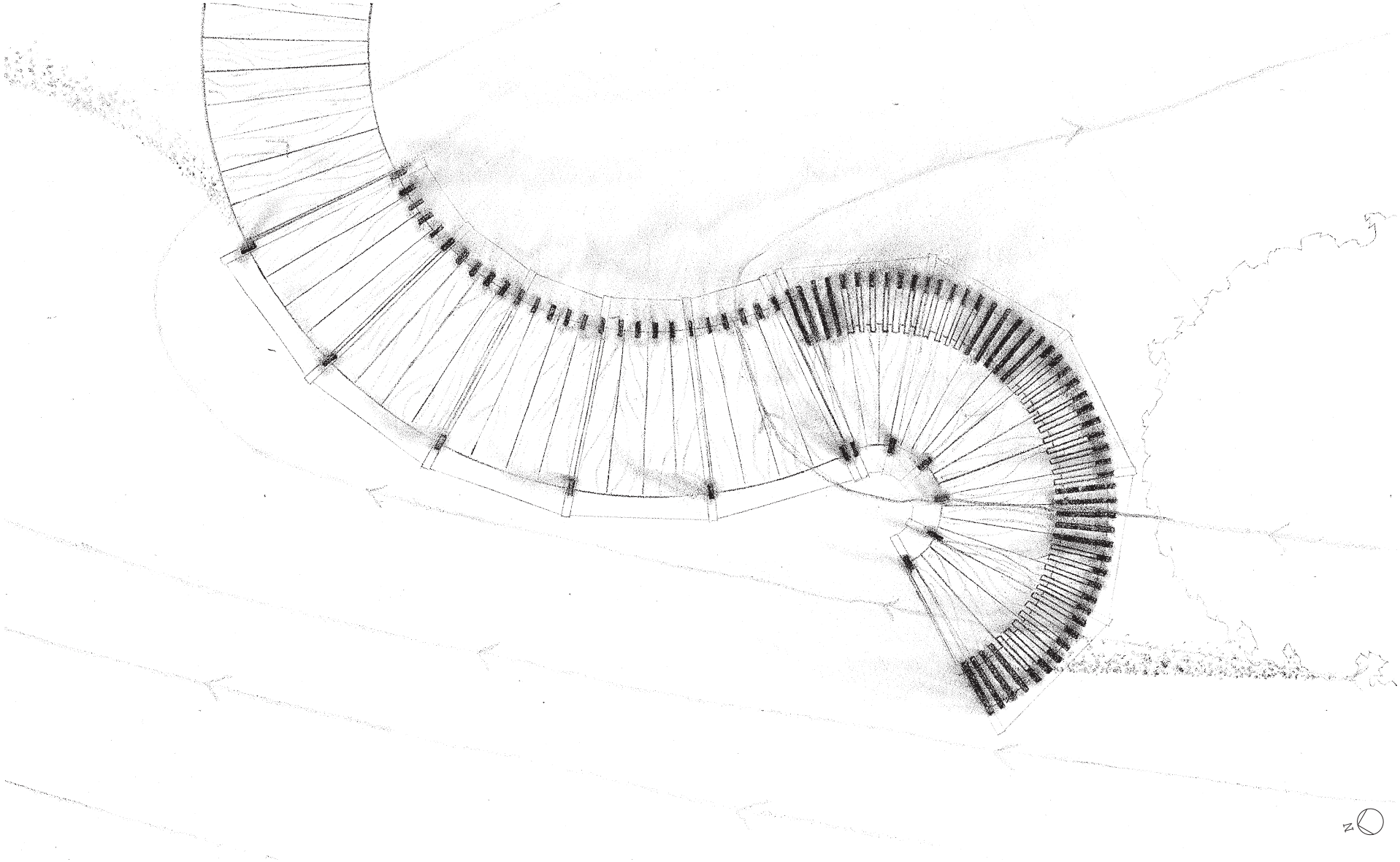
Closeness to wood & Seat in the sun

Plan, 1:50



One-sided

1:50



Five smell-stories

At Vasaplatsen, five individual smell-stories have been created, bound together by one wooden path. These stories should accommodate the different stages of waiting: the ultra-short wait (standing), the short wait (leaning), the long wait (sitting) and the no wait (a wait so long one would simply walk to the next stop); instead of leaving for the next tram stop when the wait is too long, the tram stop should give you the opportunity to go on exploring and spend your time there instead of leaving.

Progression in intensity

This smell story tries to give the visitor an experience of the rise or the fall, depending on which direction the story is entered, of the intensity of smell of the red aromatic cedar. This is done by increasing the amount of wood surrounding the visitor using 3 different gaps distances between the wooden elements, varying between roof and semi-open roof, and changing the amount of wood on both sides of the path. The first module (left) serves the long wait with a roof, 30 mm gap between the elements and seating carved into them. The second modules (centre) serves the short wait, with a roof, 100 mm gap between the elements and multiple opportunities to lean against the structure. The third module (right) serves the ultra-short wait where one just wants a place to stand and show interest in getting on the tram. It has a 150 mm gap between the elements and the semi-open roof.

Smell no matter direction

The principle for this smell story is that the smell of the wood can be smelled at some point when moving around the circular path, no matter where the wind comes from.

Closeness to wood

The closer physically one is to wood, the easier it will be to smell it. This is achieved by using a wider wooden element to narrow in the path, creating a closer connection between body and wood.

A seat in the sun

This smell story takes advantage of the fact that the aroma compounds in the wood will have higher volatility the warmer the temperature to which the wood is exposed, making the experience of smell stronger. Through layered sun studies, the sunniest place of the site is found, and seating is carved into the wooden elements to give one the possibility to have an immersive experience of the smell on warmer days.

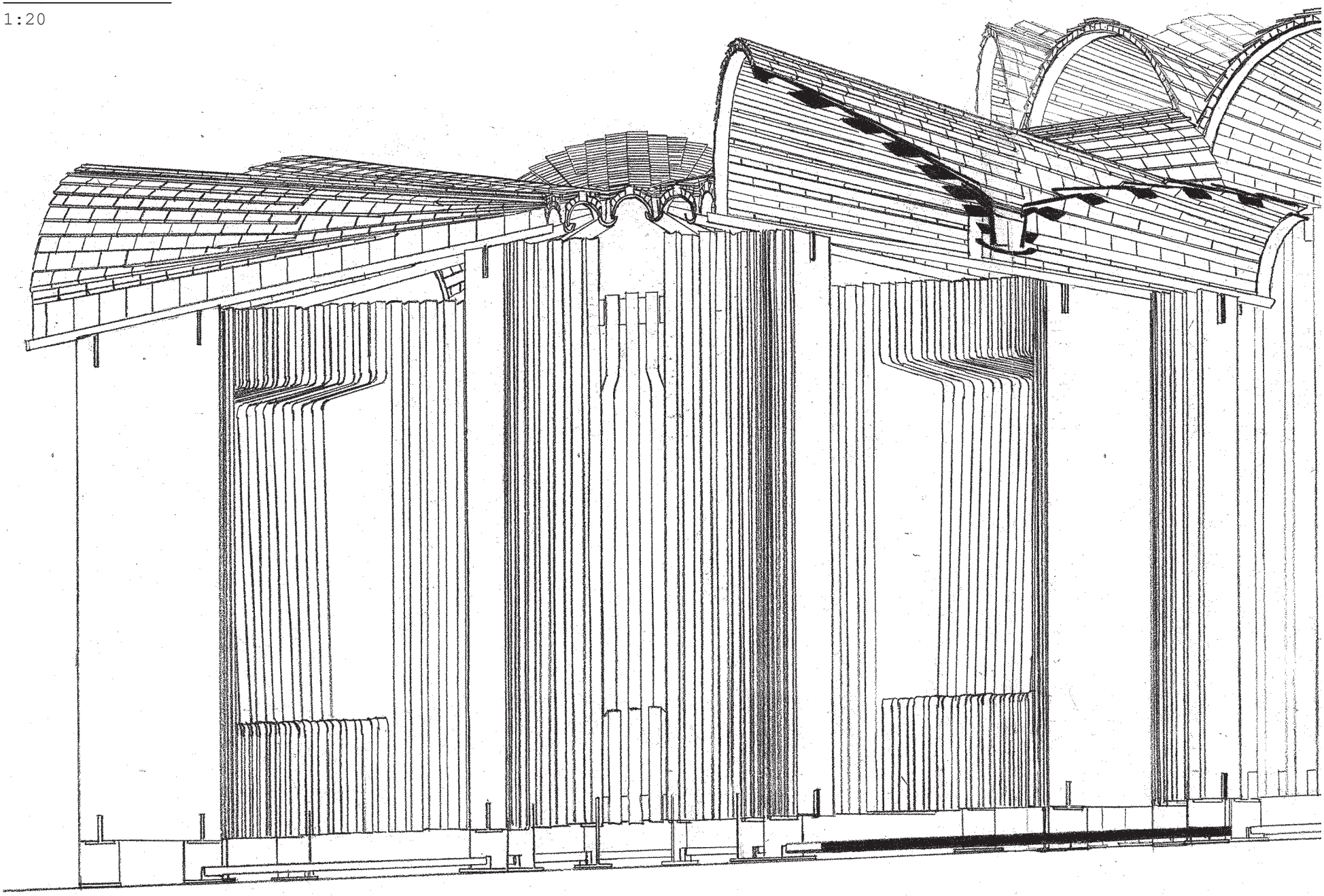
One-sided

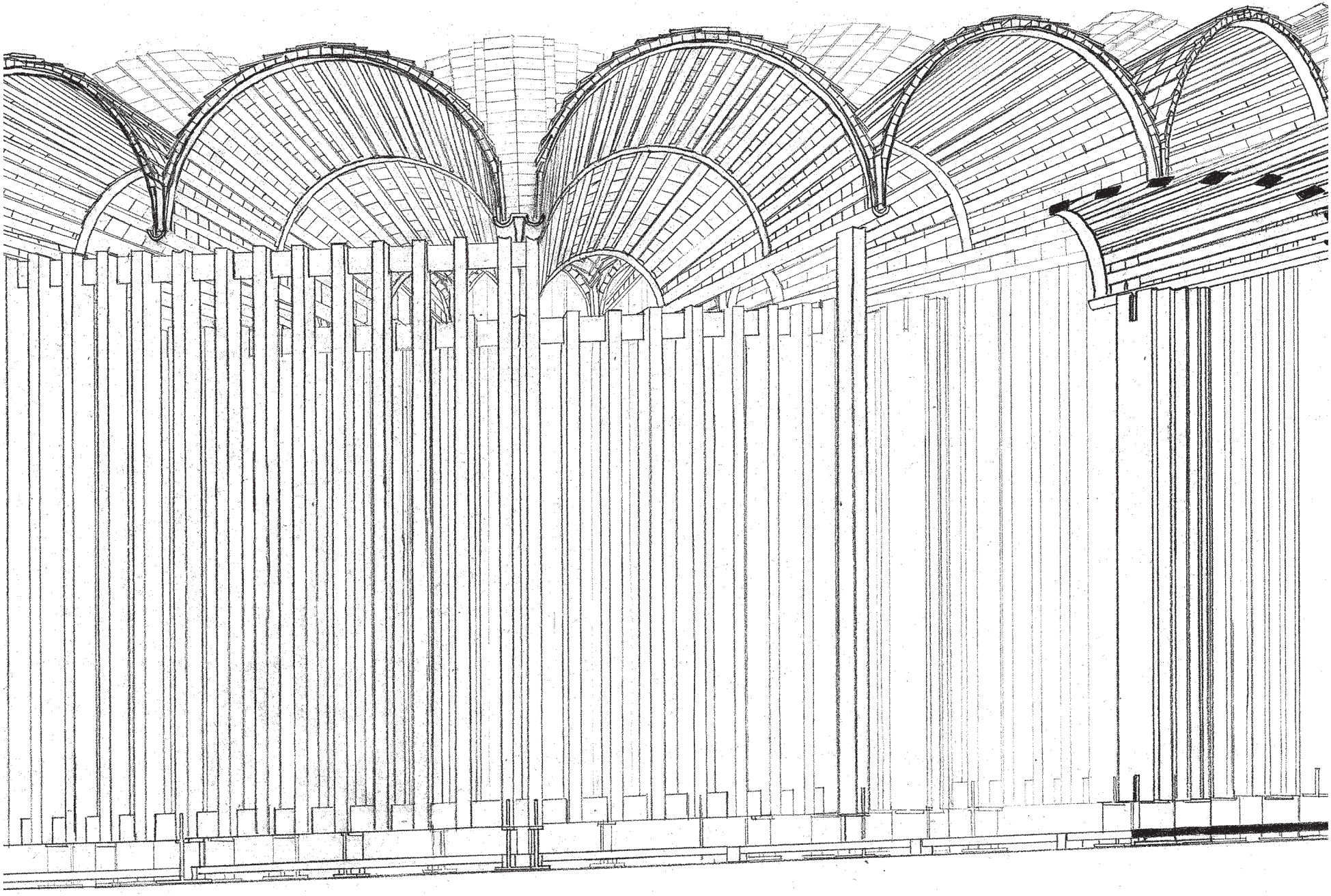
The last smell story focuses on the direction of the wind, since the experience of the smell only happens when the wind blows from the south. Simulations predict that this is in fact the prevalent wind movement on the site.

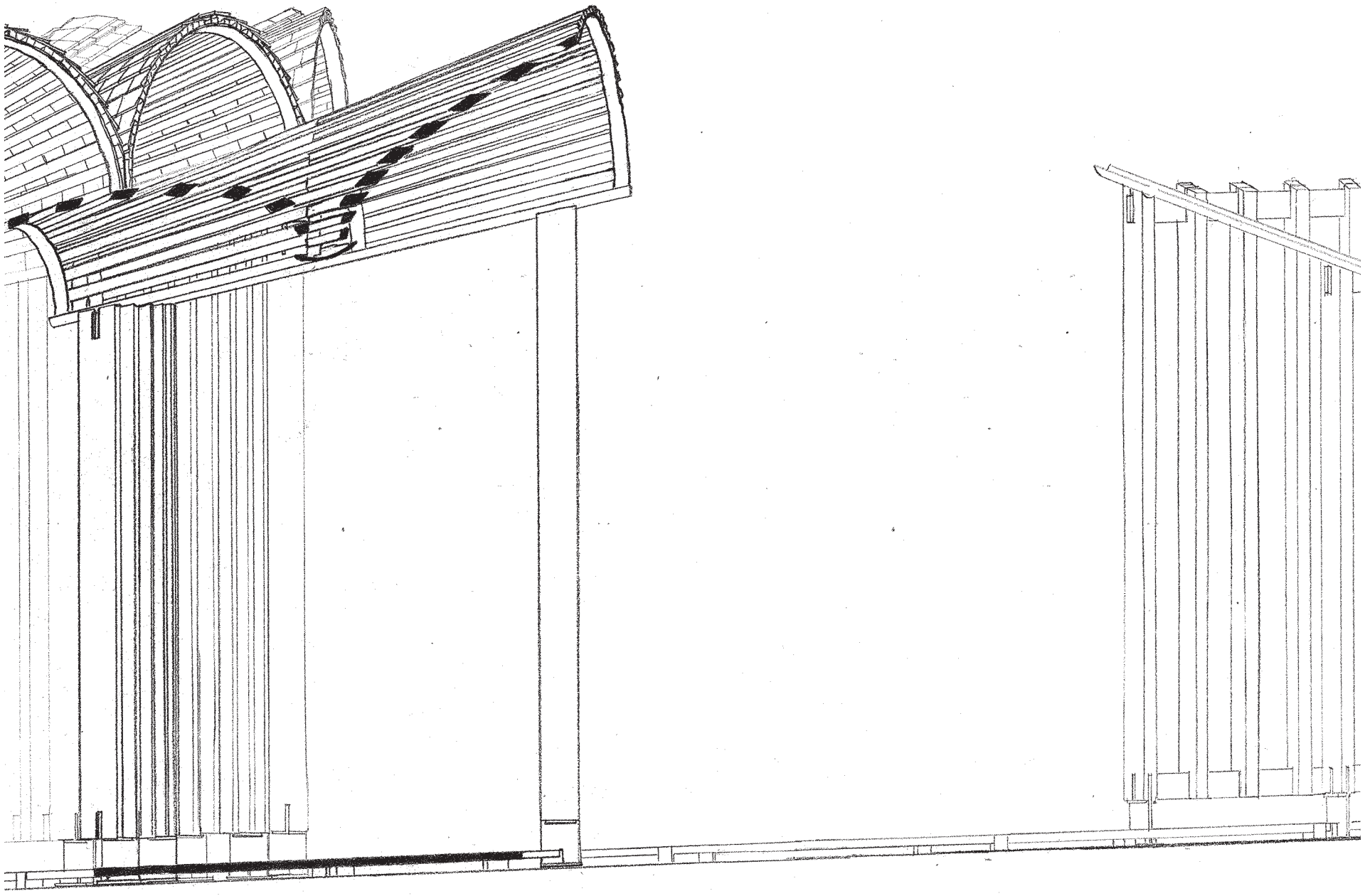
These five smell stories were something explicitely designed; but it is worth noticing that several other unintentional smell stories have been created as a result, laying outside the path, and on the other side of the wooden elements.

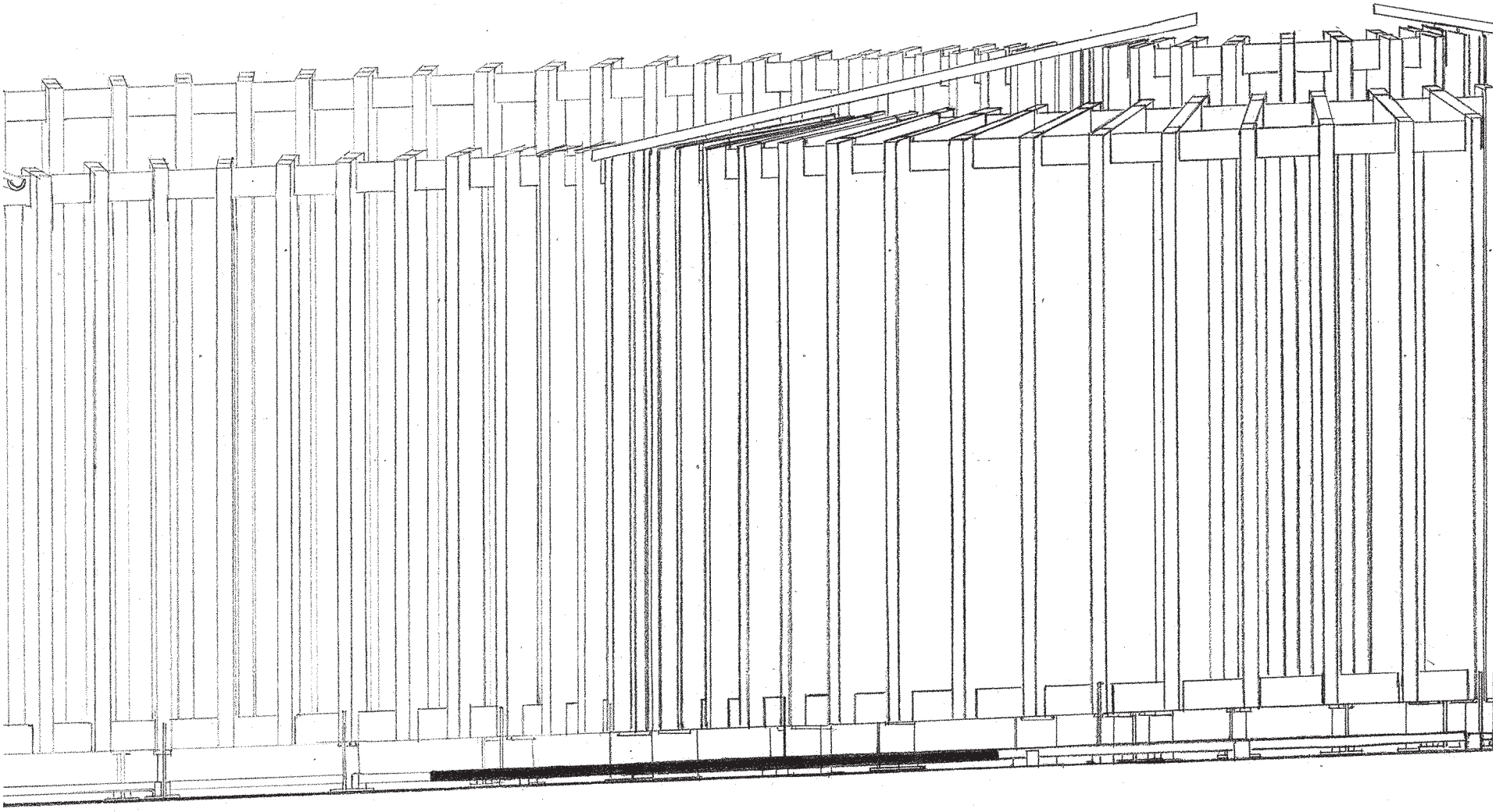
Section a–a

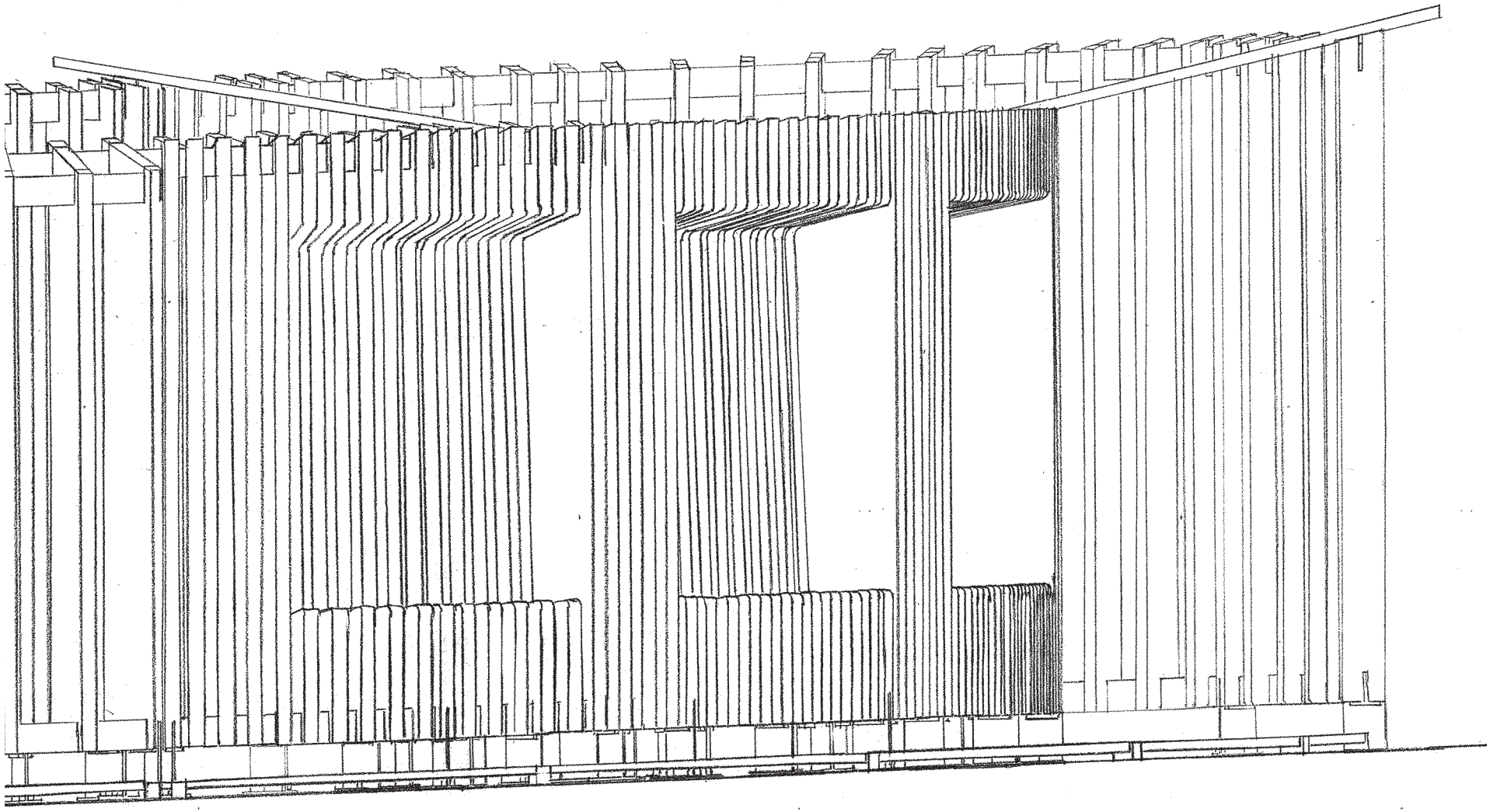
1:20





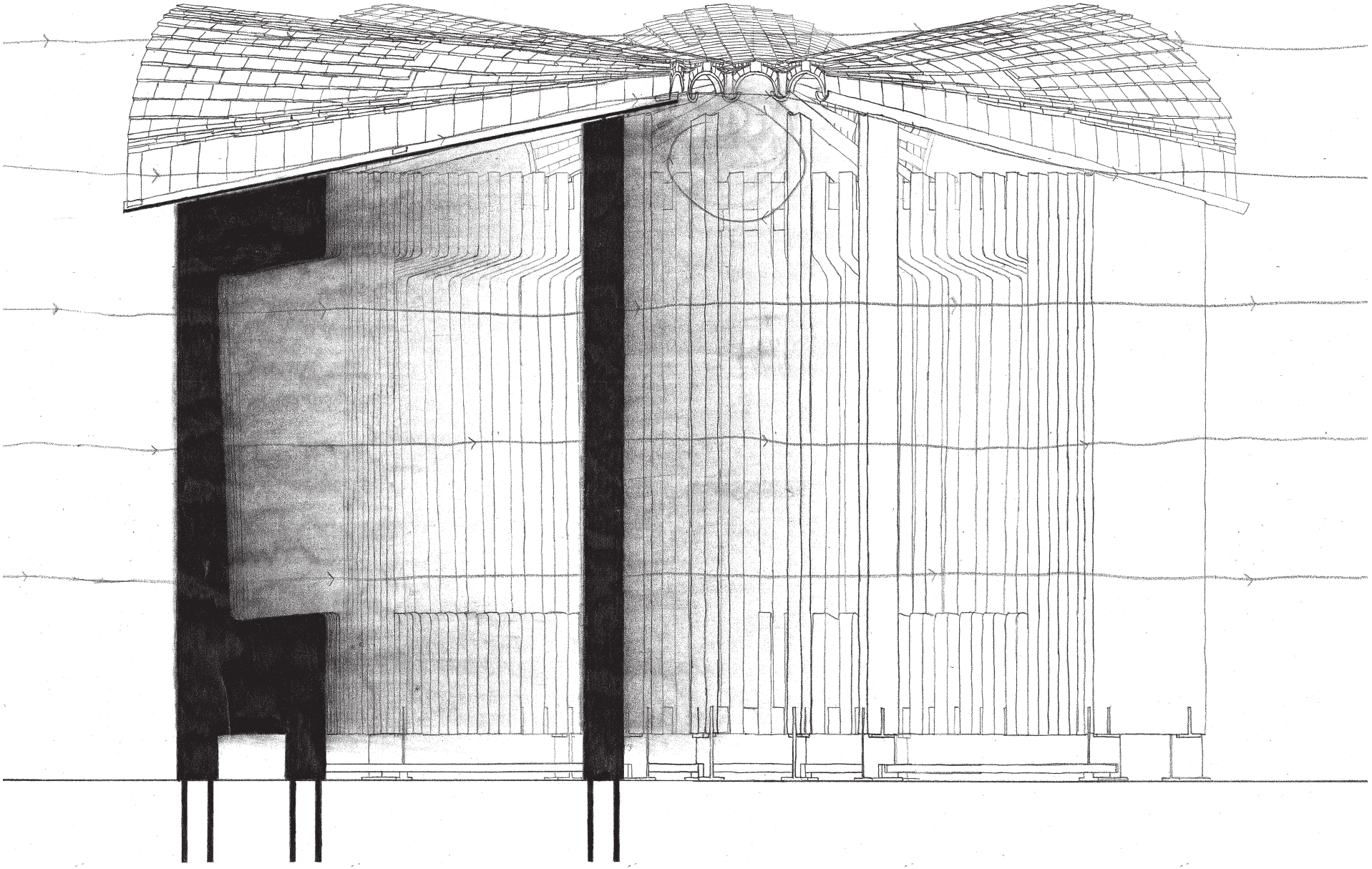






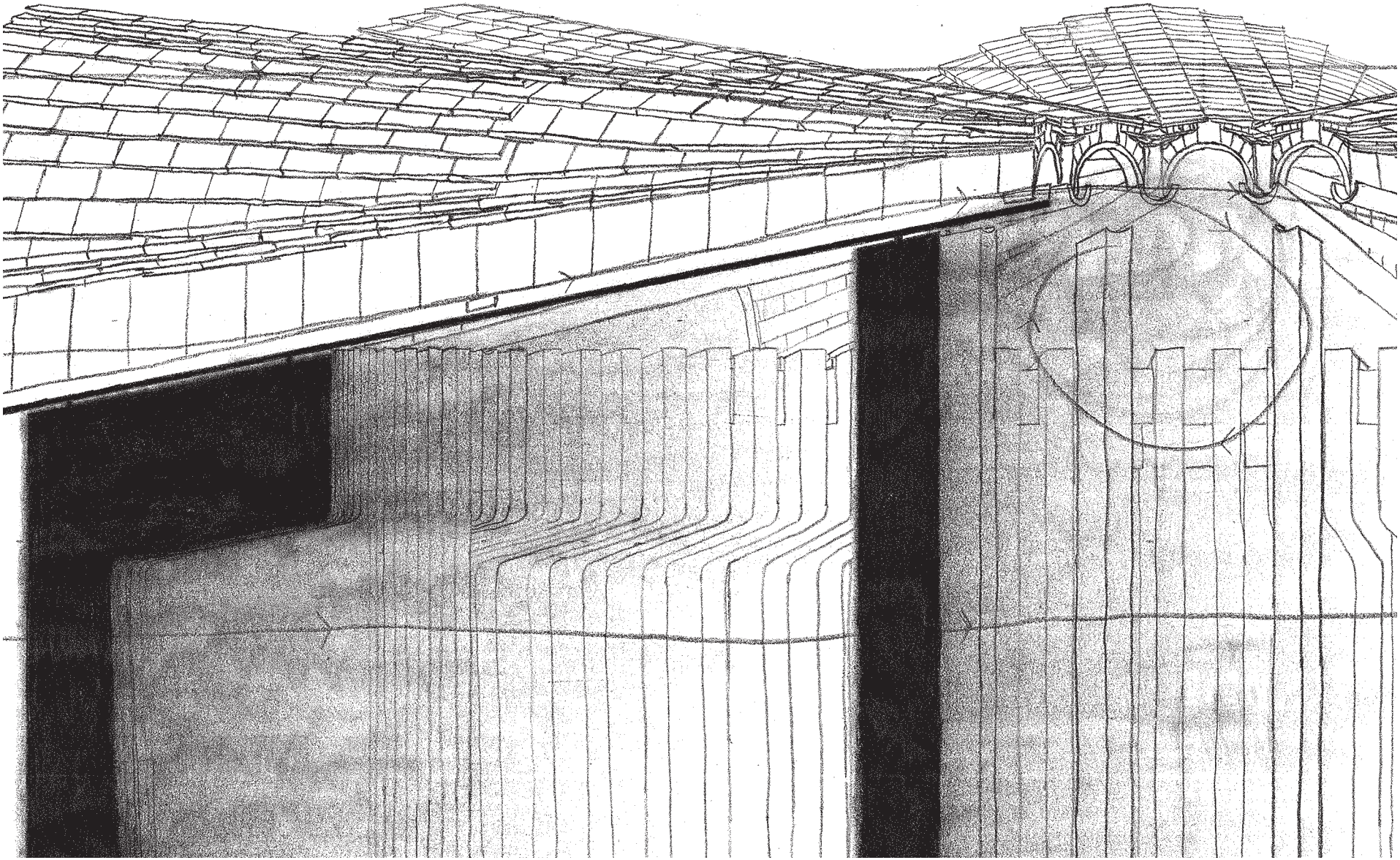
Section B–B

1:20



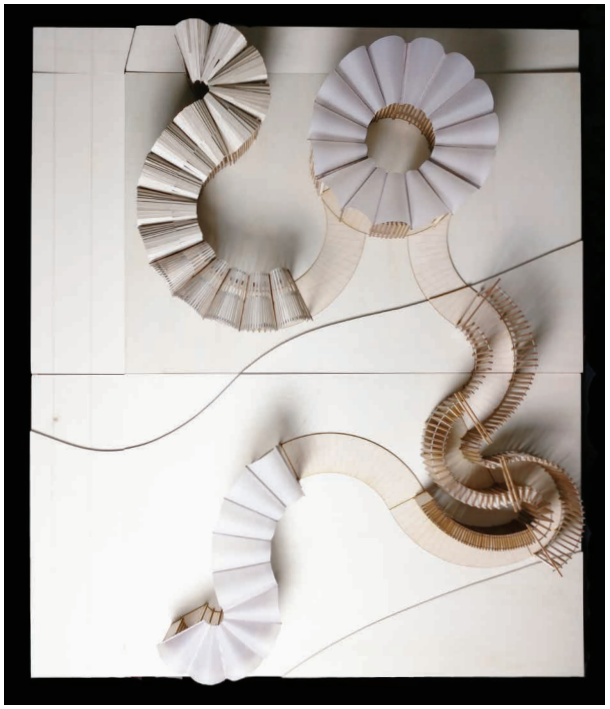
Section B–B detail

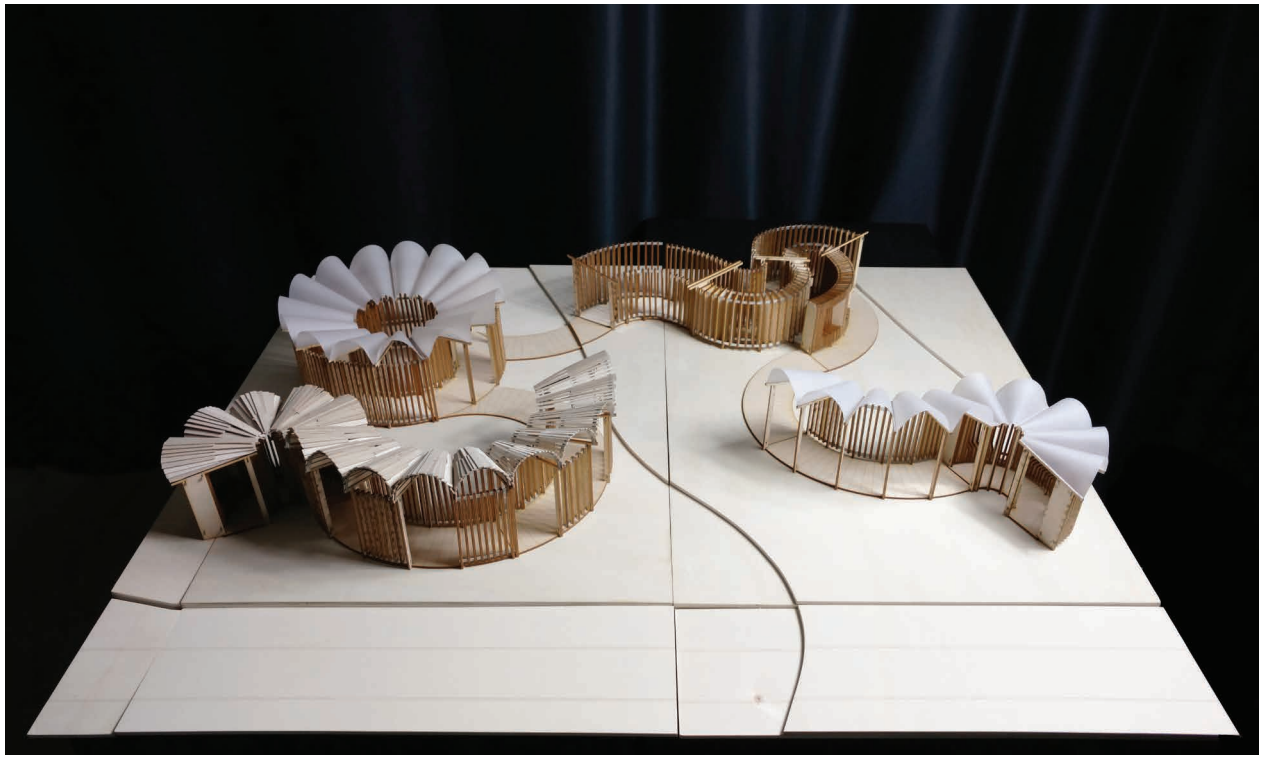
1:10

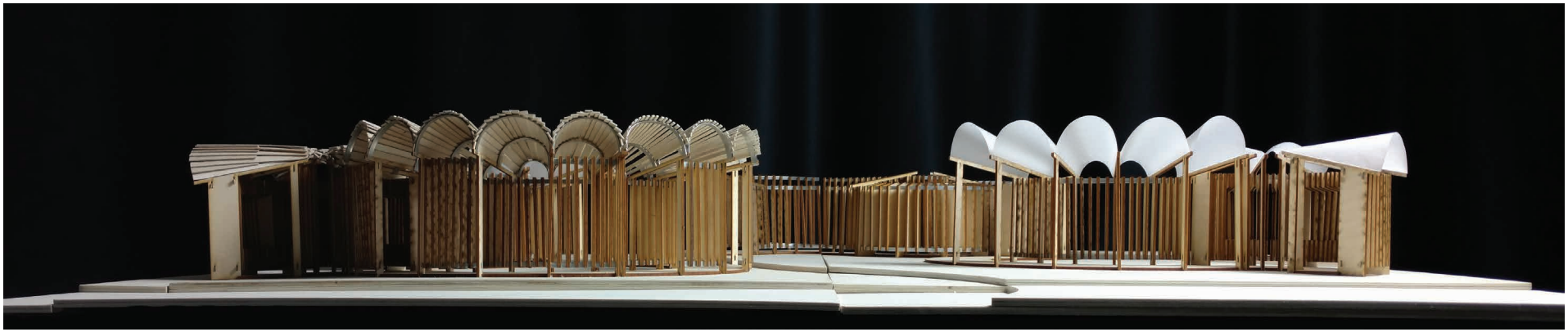


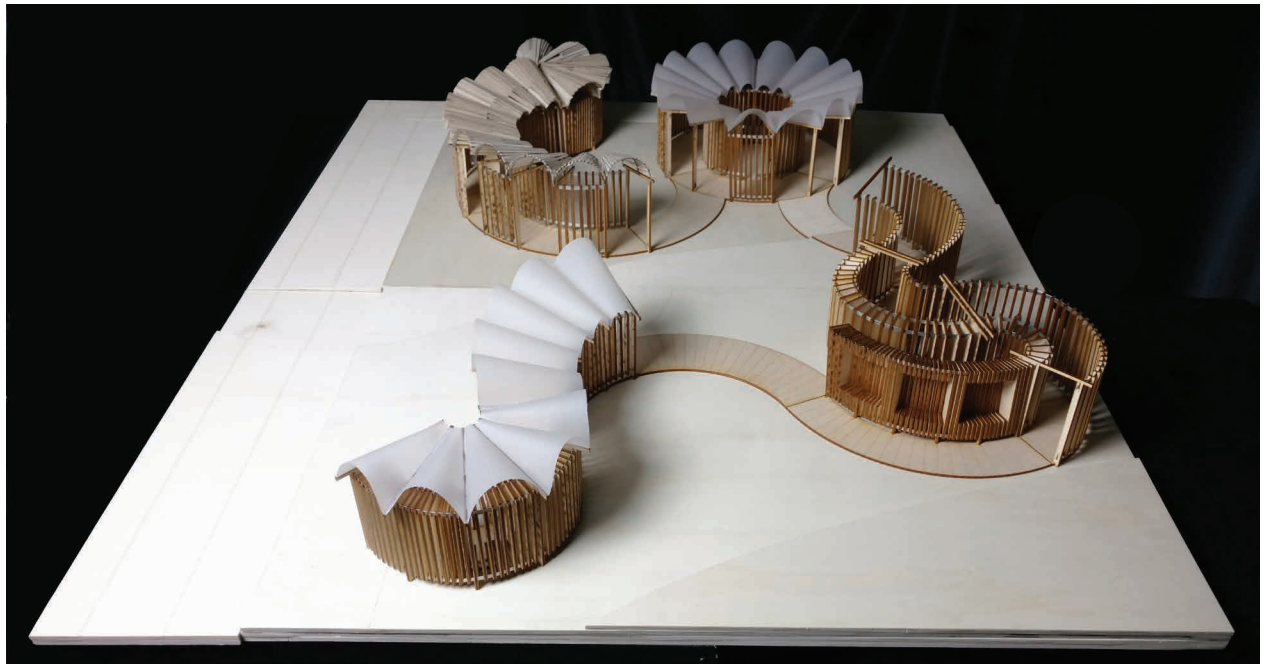
Overview

Model photos



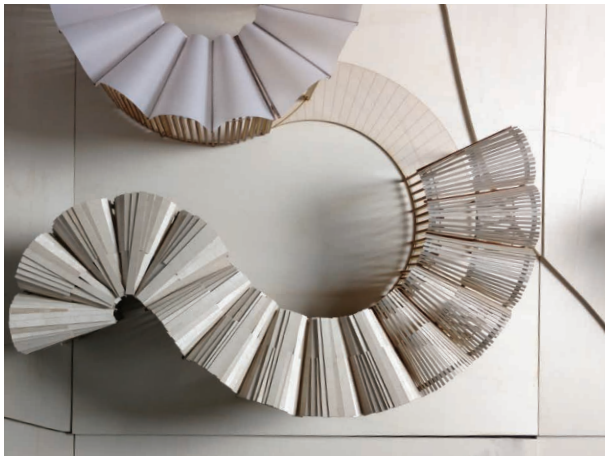


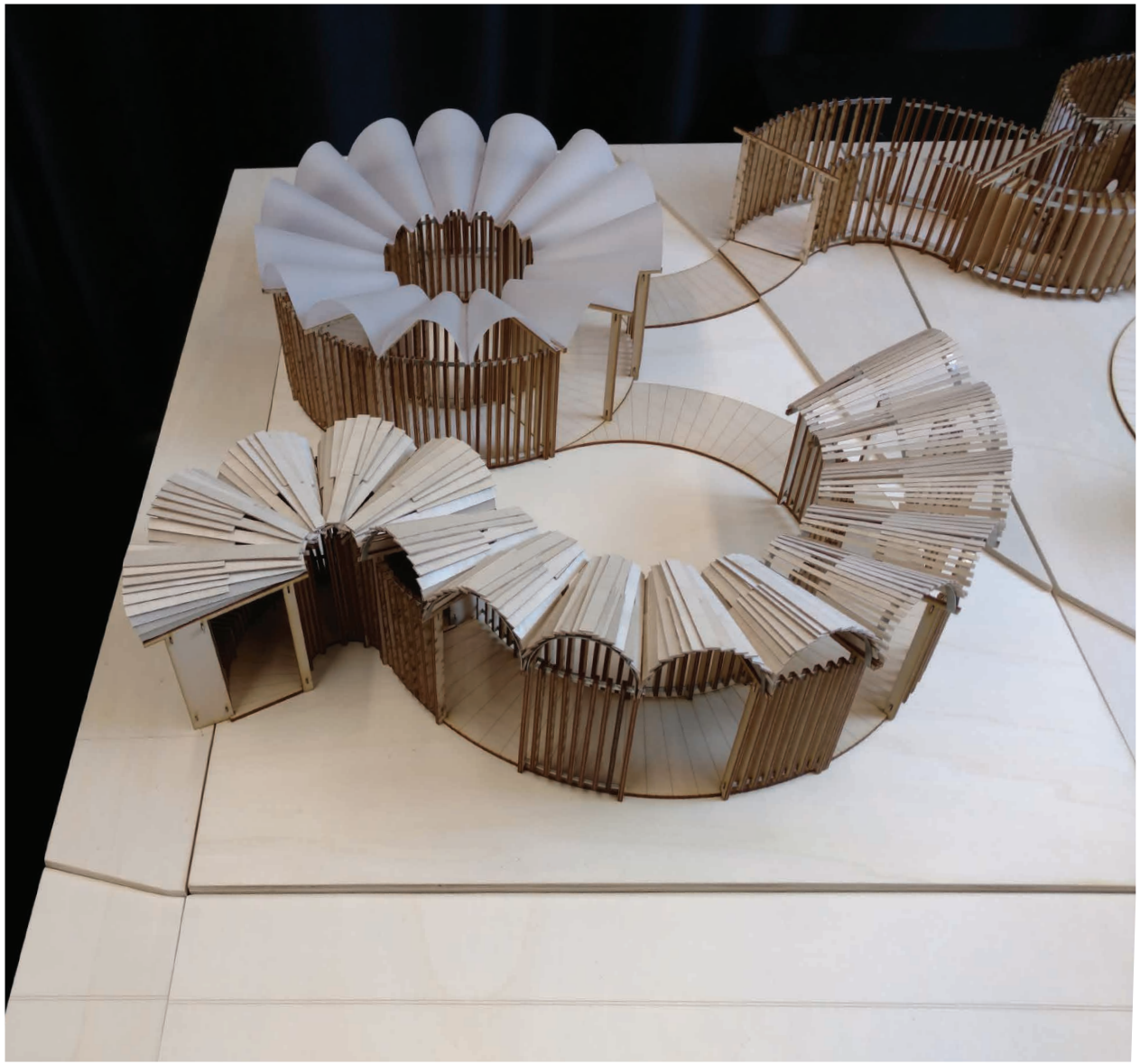


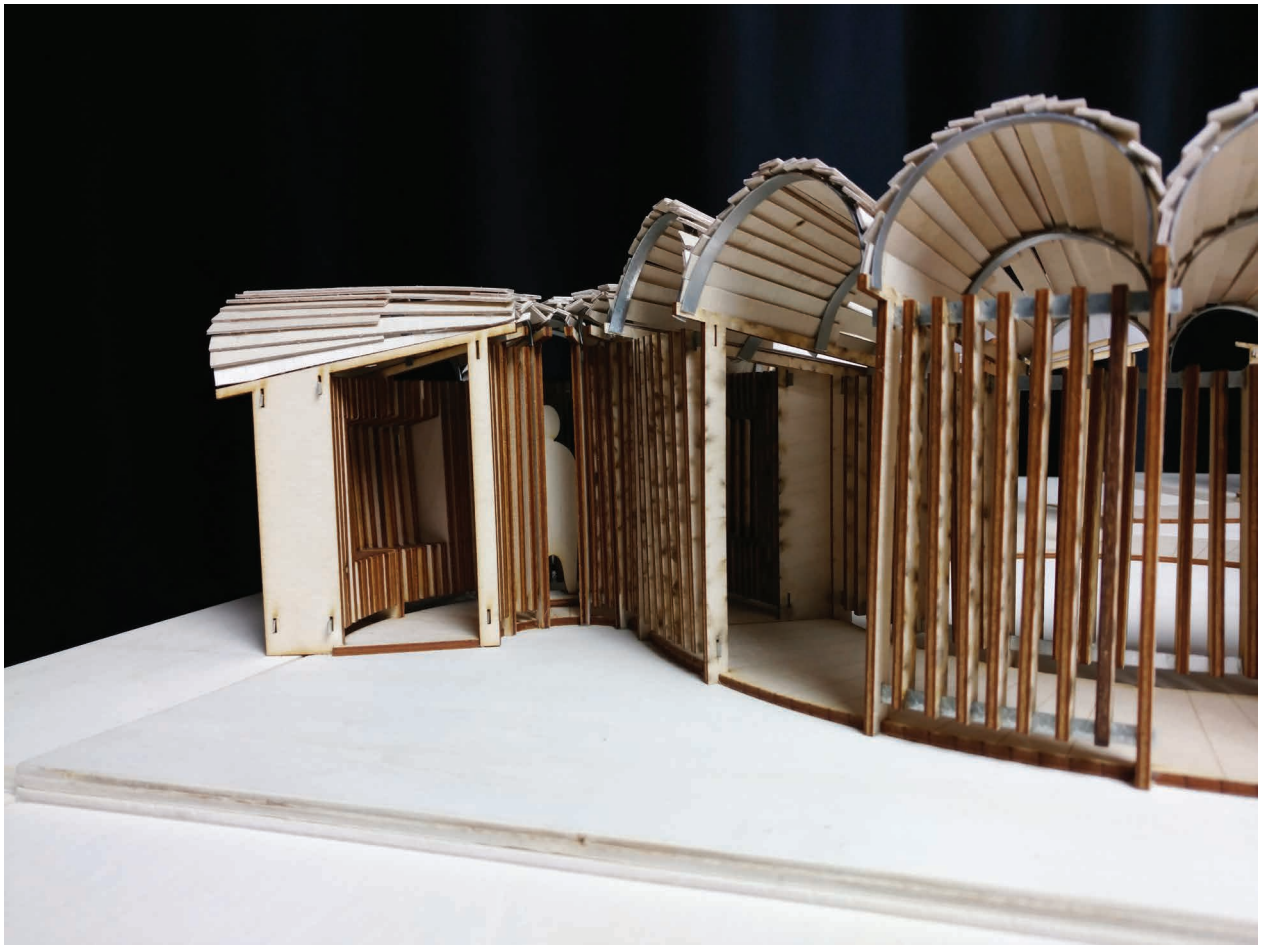


Progression in intensity

Model photos



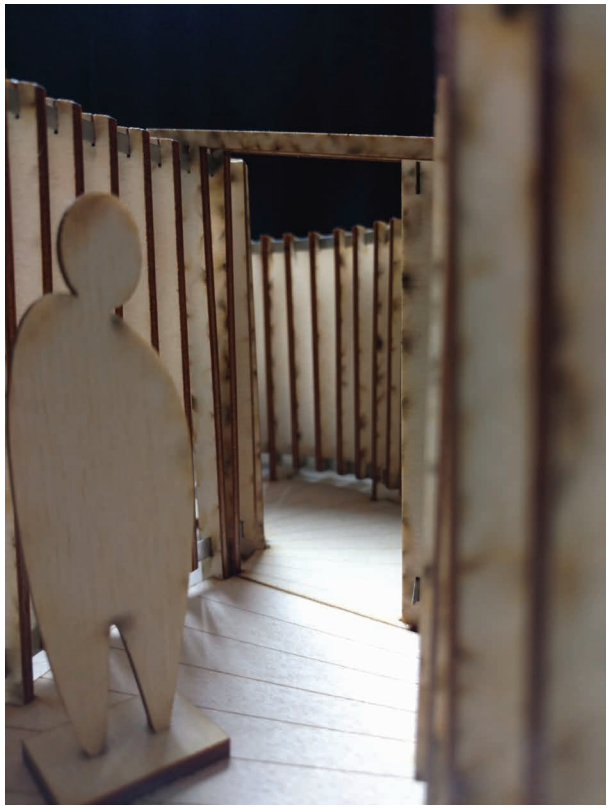




Smell no matter direction

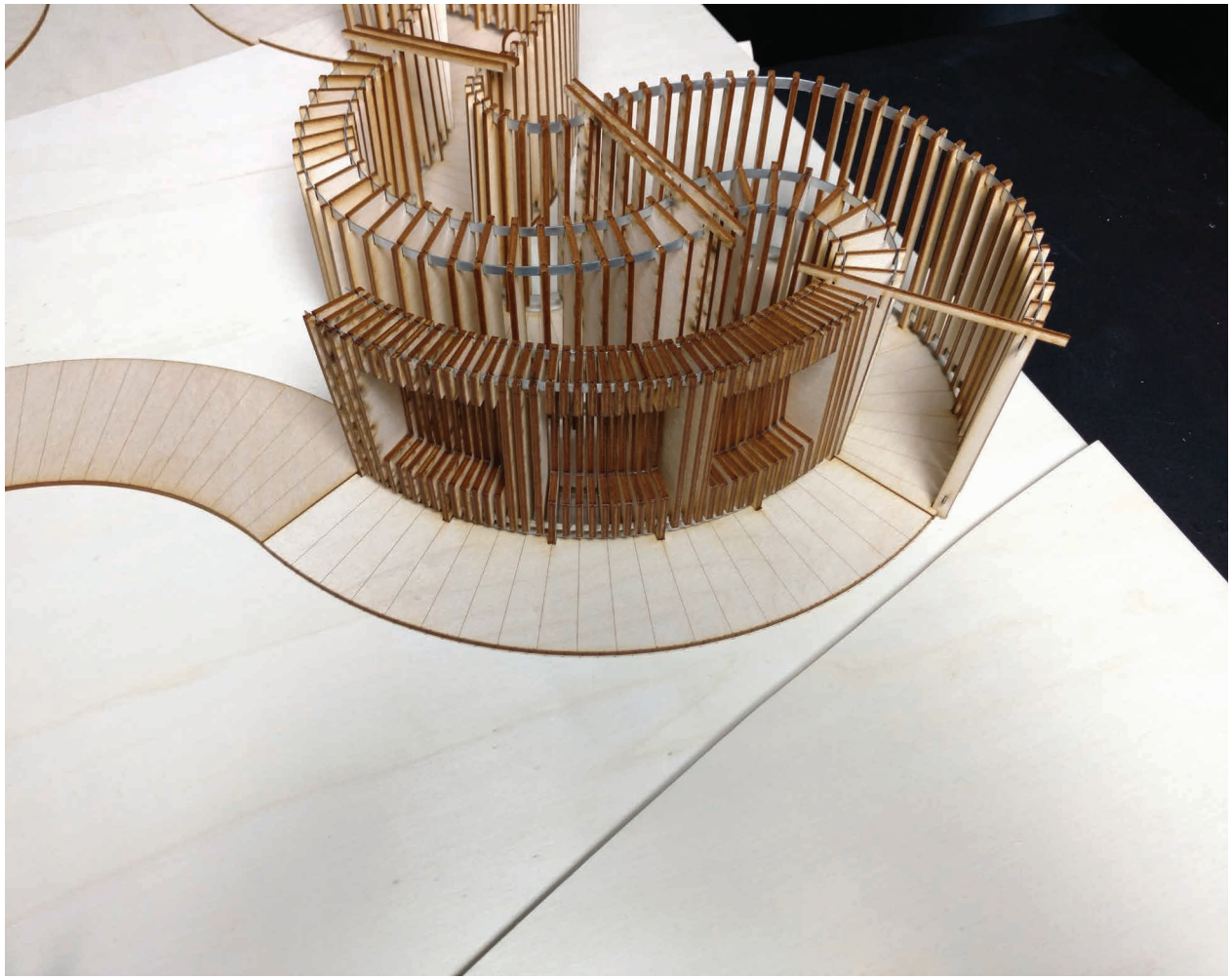
Closeness to wood

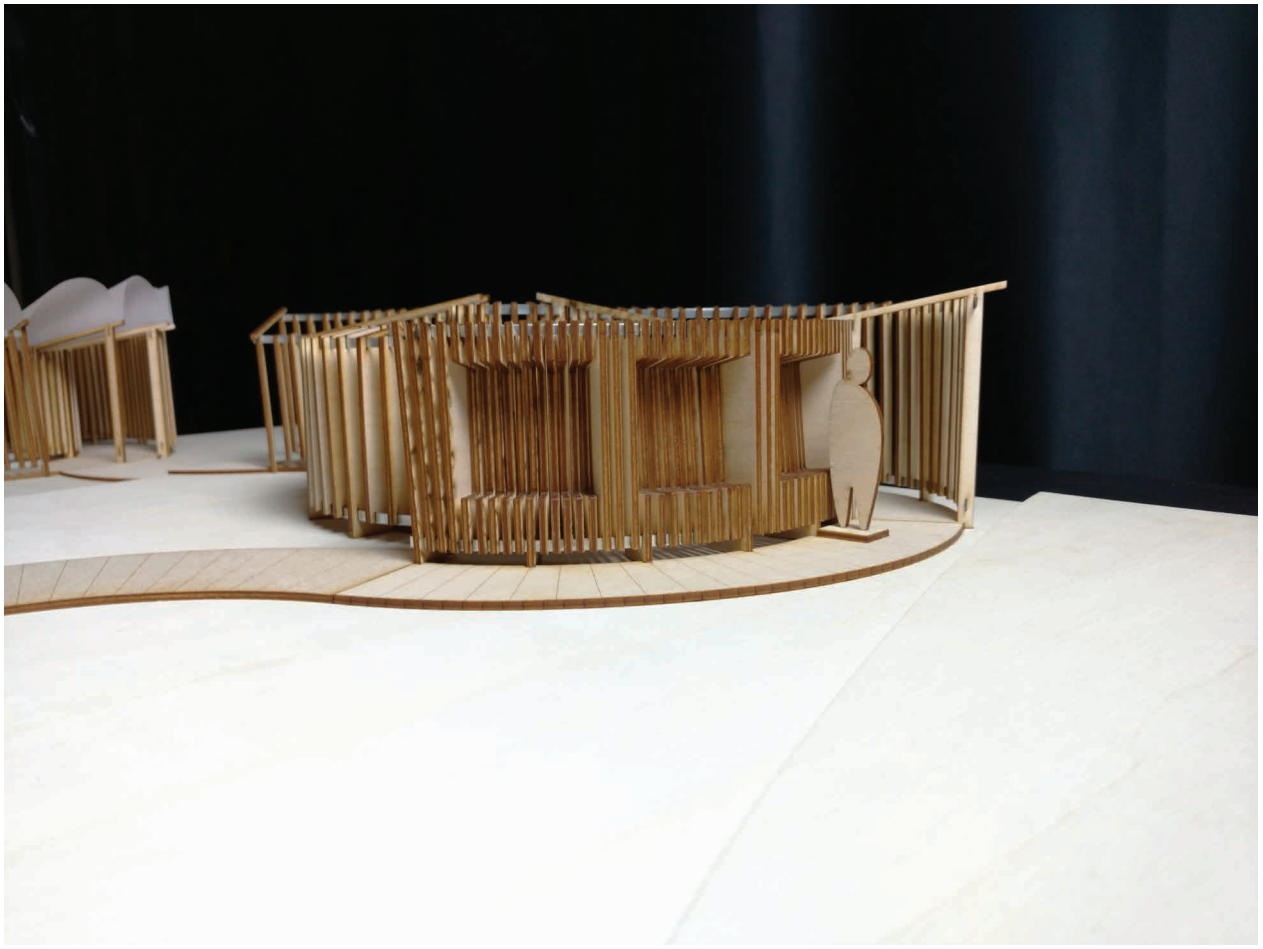
Model photos

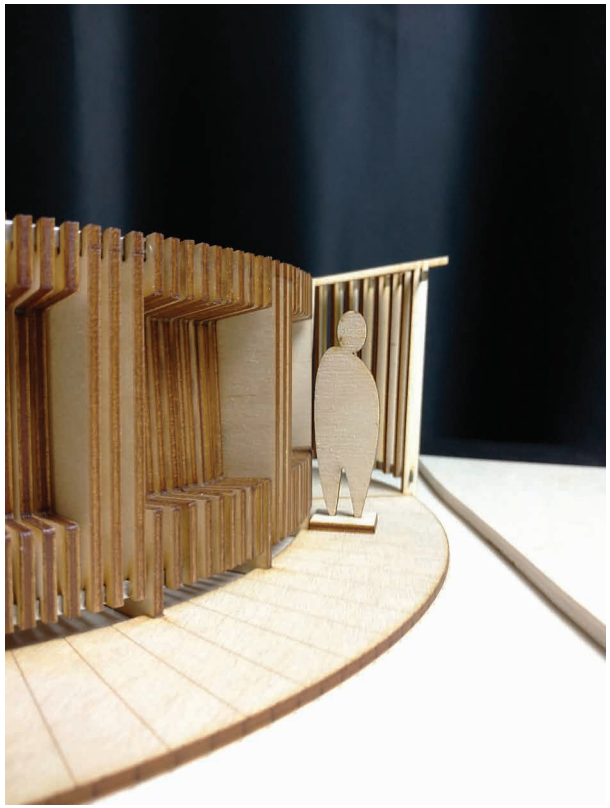


Seat in the sun

Model photos

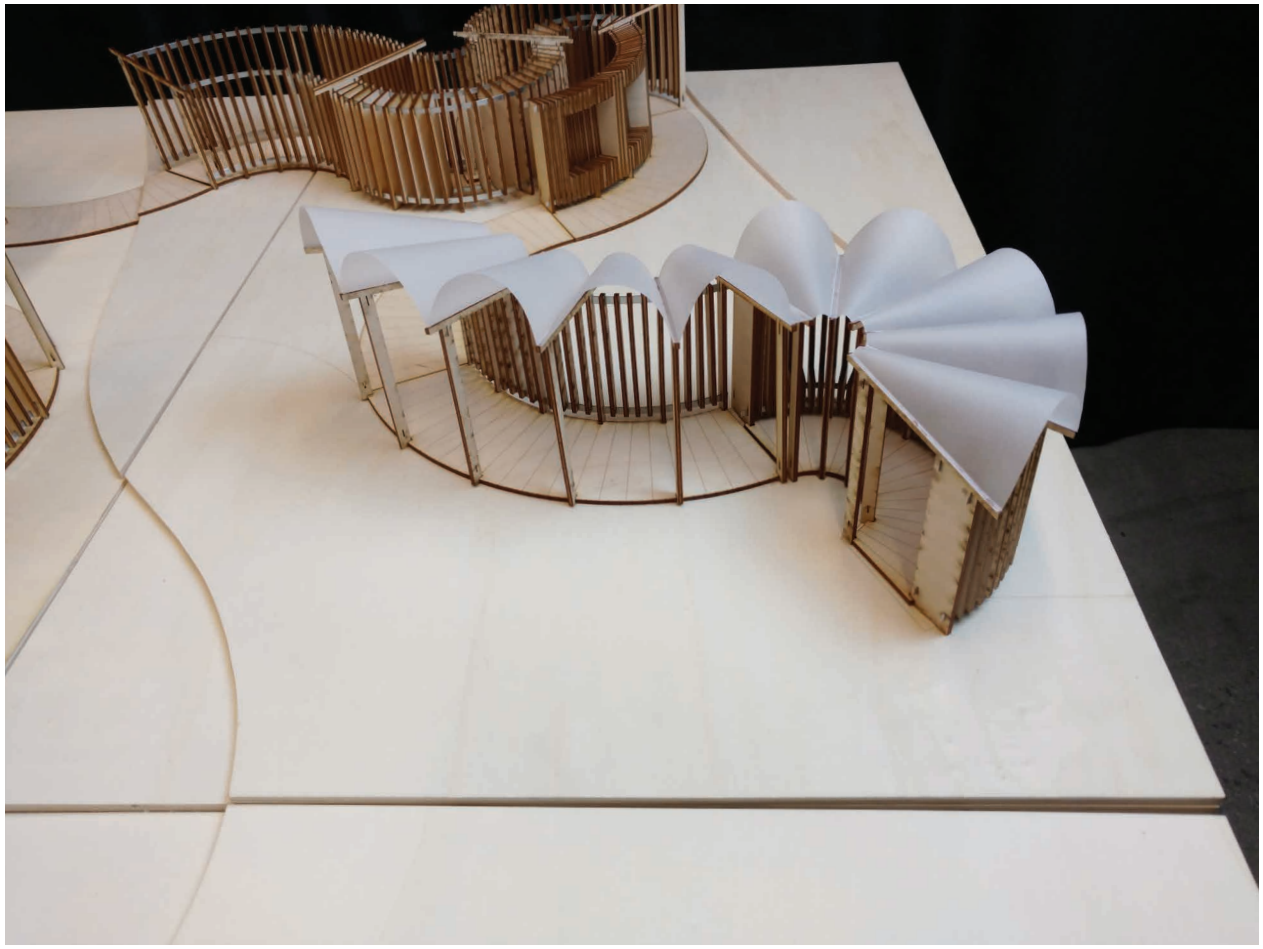


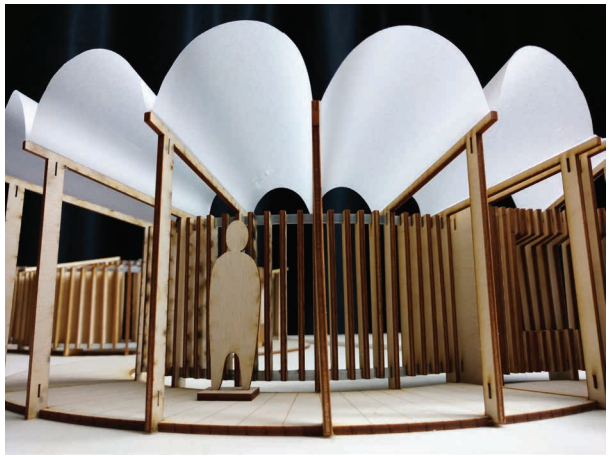




One-sided

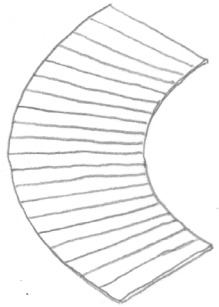
Model photos





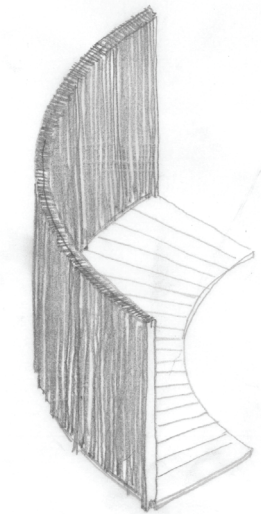
Configuration of module I

base

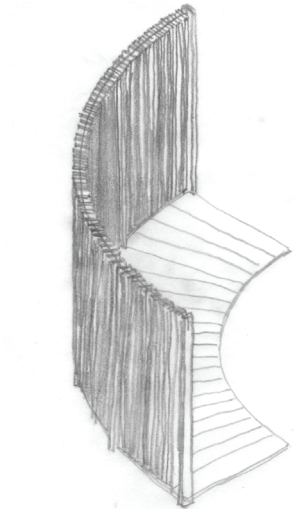


path

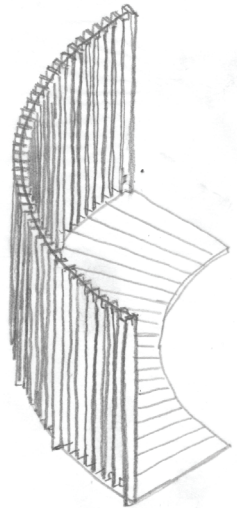
intensity of element



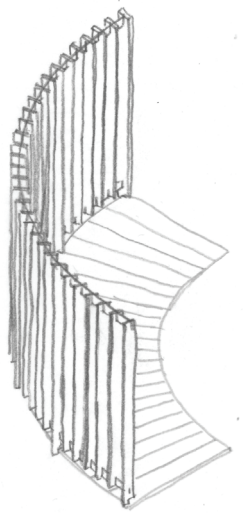
30mm



50mm

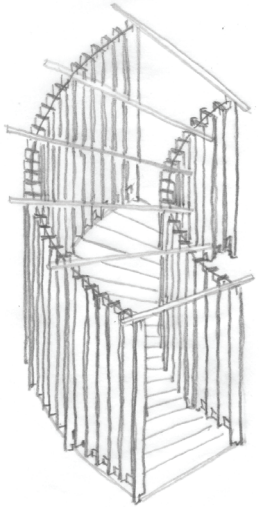


100mm

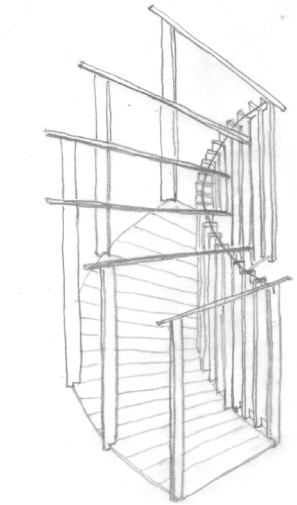


150mm

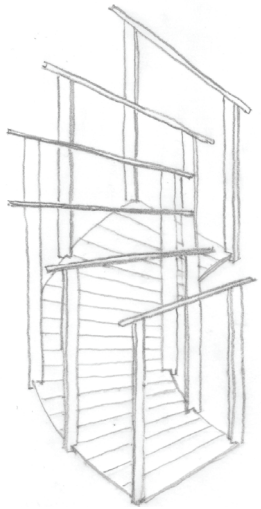
Configuration of module II



double-sided

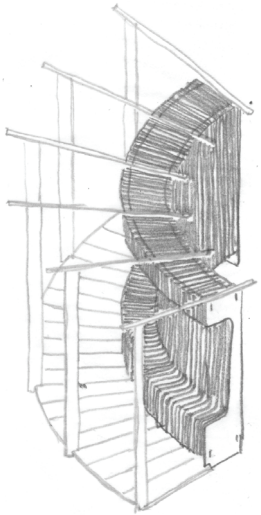


one-sided

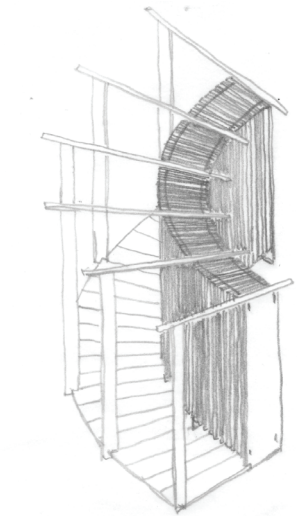


none

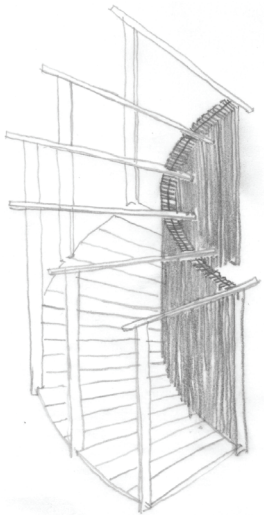
application of element



550mm, seating



550mm



150mm

depth of element

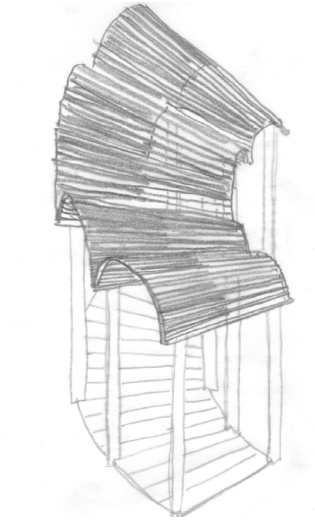
Configuration of module III

orientation of space

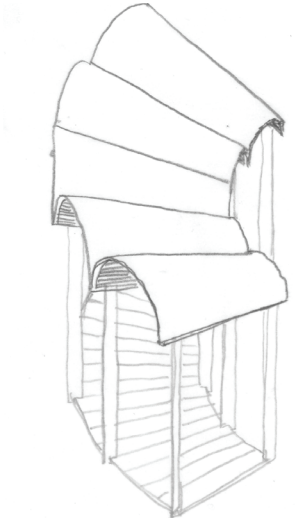
inward

outward

roof

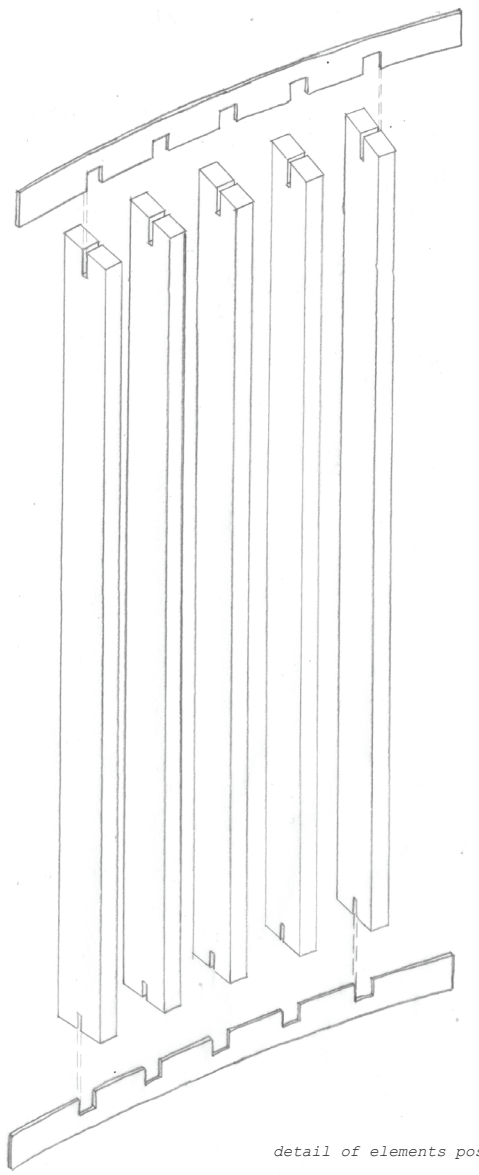


semi-covered

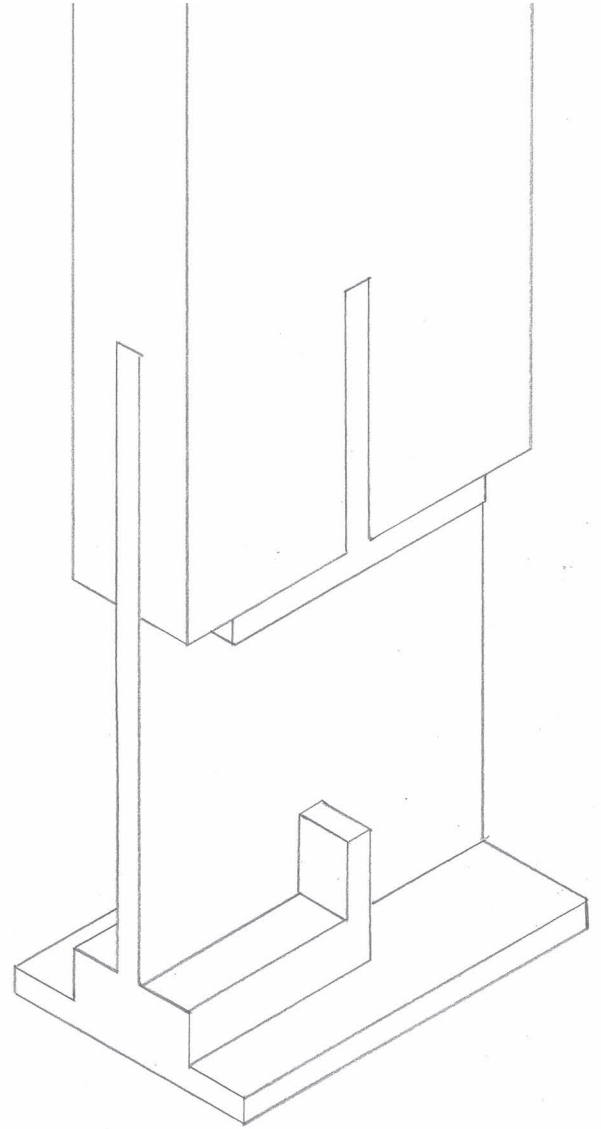


covered

Details



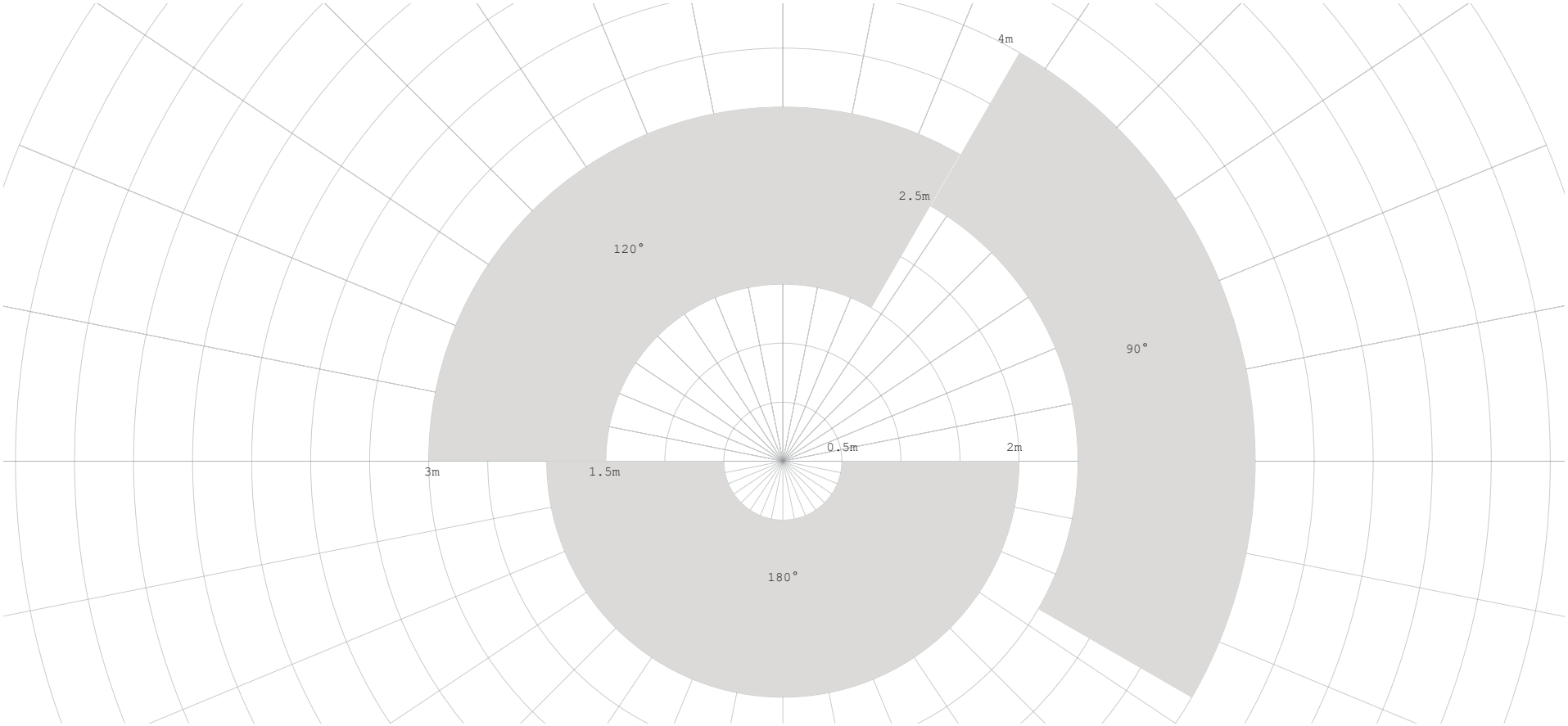
detail of elements position



base detail 1:2

MODULE DEVELOPMENT & SITE ANALYSIS

Defining building modules

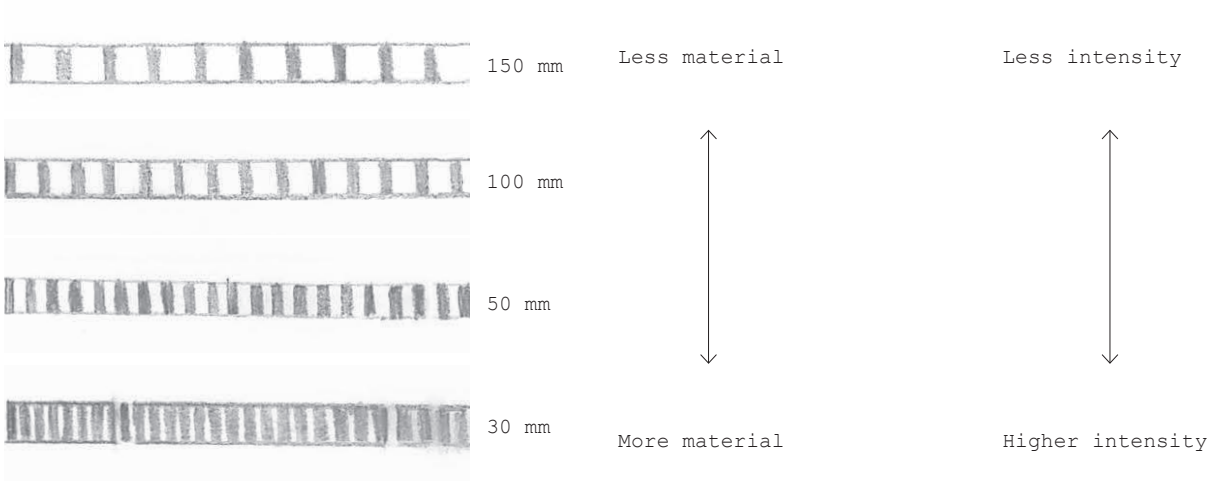


Curve modules were based on their ability to look open from some angles and closed from others. Also, a curved walls ability to create shelter from multiple wind directions compared to a completely straight wall.

The 3 different building modules are found based on the following abilities:
provide shelter, enclosure, fit on sites, configuration with each other.

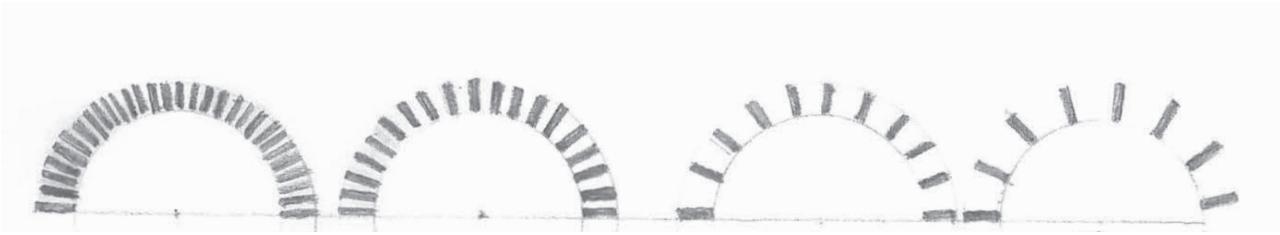
The wooden element

Repetetion of the wooden element

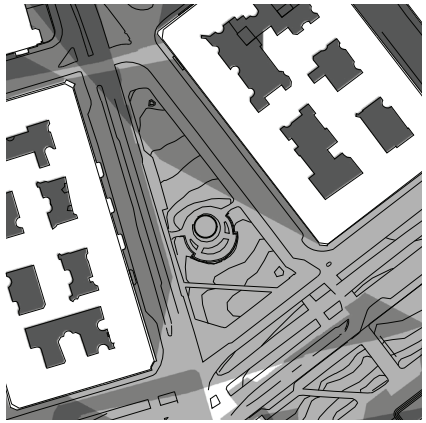


The distance between the elements is measured on the inside of the curve.

Dealing with curvature

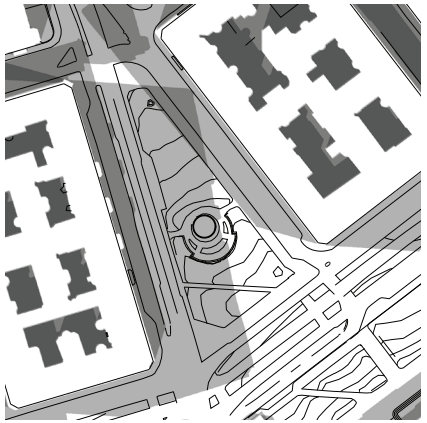


Layered sun studies



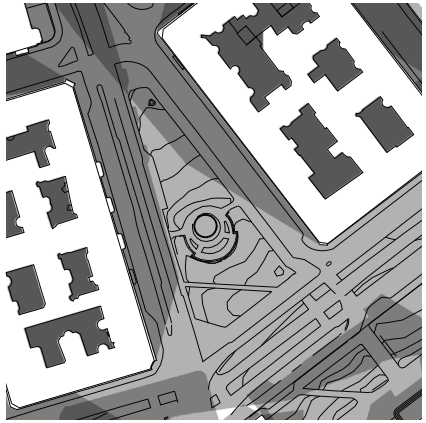
Spring
equinox

07:30
12:00
16:30



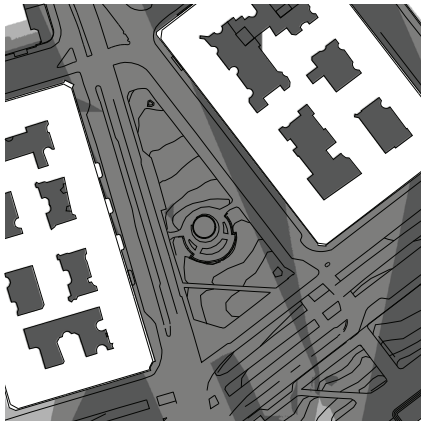
Summer
soltice

07:30
12:00
16:30



Fall
equinox

07:30
12:00
16:30

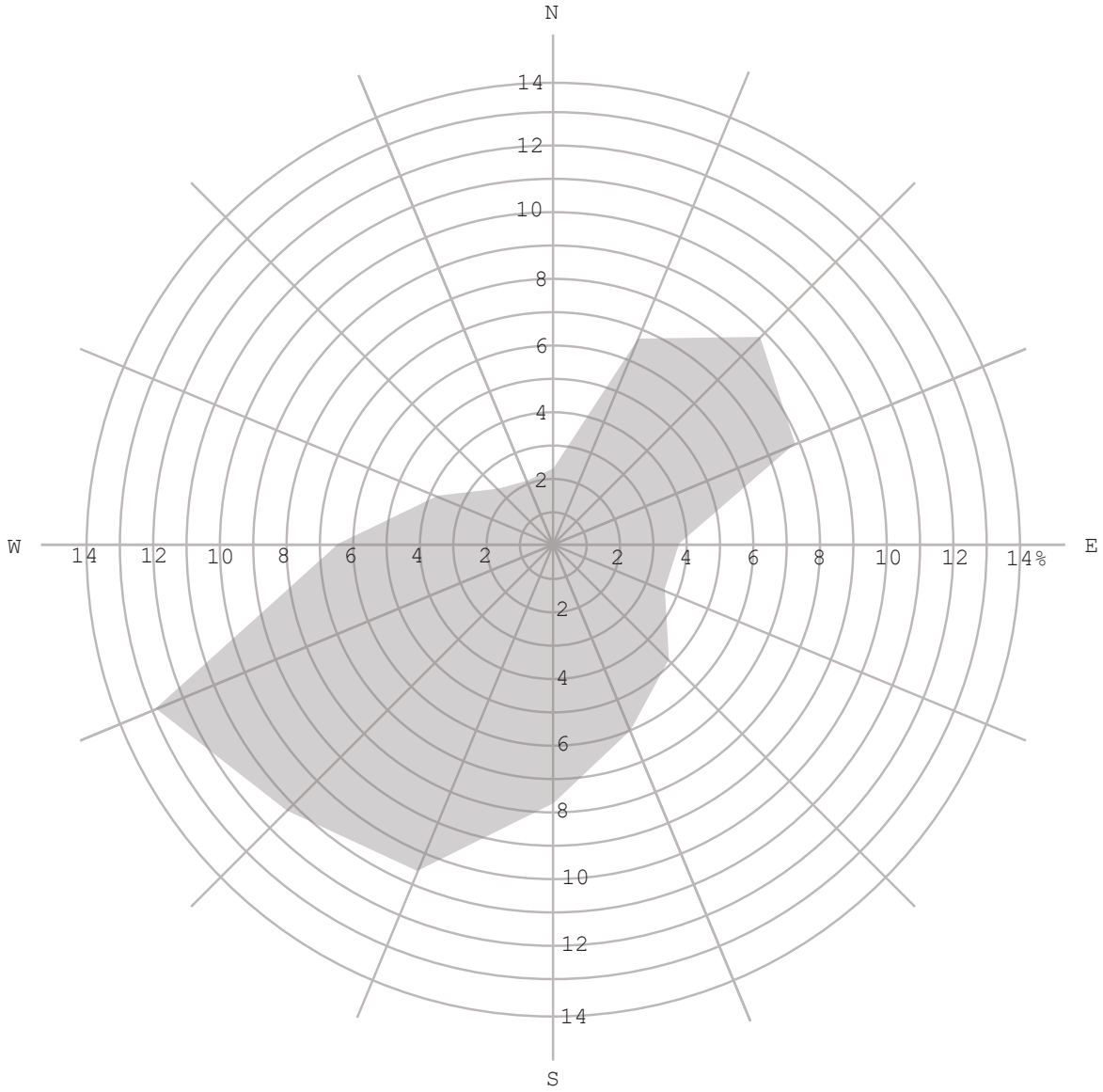


Winter
soltice

10:00
12:00
14:00

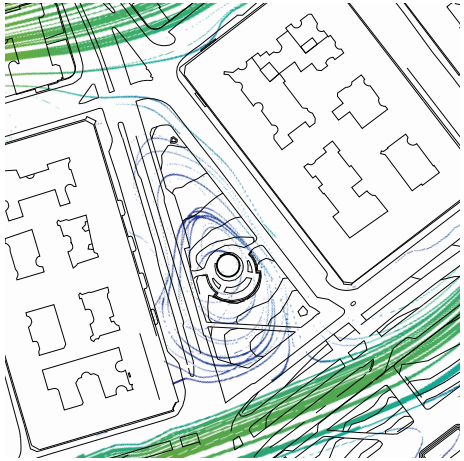
Wind study, Central Gothenburg

The year average windrose for central Gothenburg in %.
WSW to SWS are the most dominant wind directions nearly year-round. October to November and January to March NE is the most dominate wind direction. Therefore wind studies were done for WSW and NE. (Windfinder, 2019)



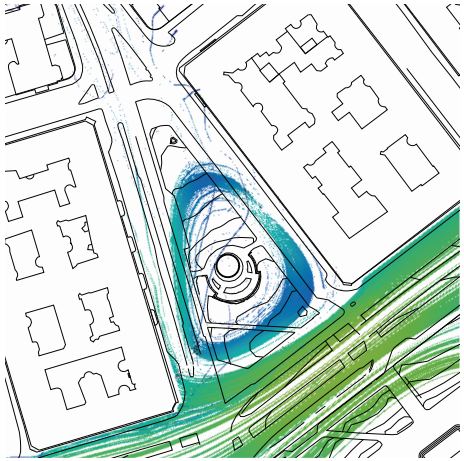
WINDSTUDY SITE

WSW

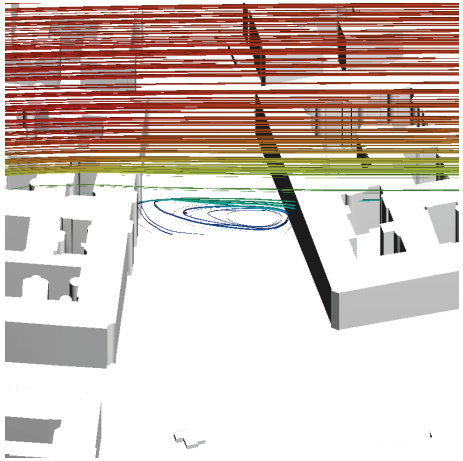


primary wind direction plan

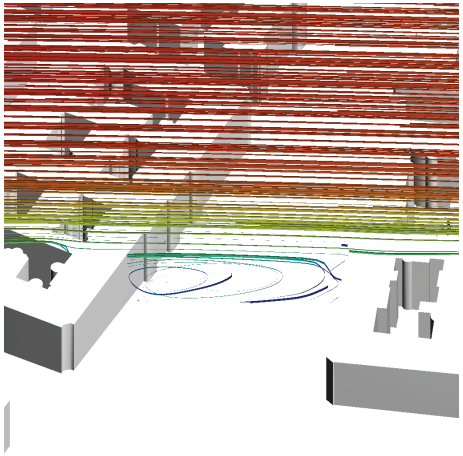
NE



secondary wind direction plan



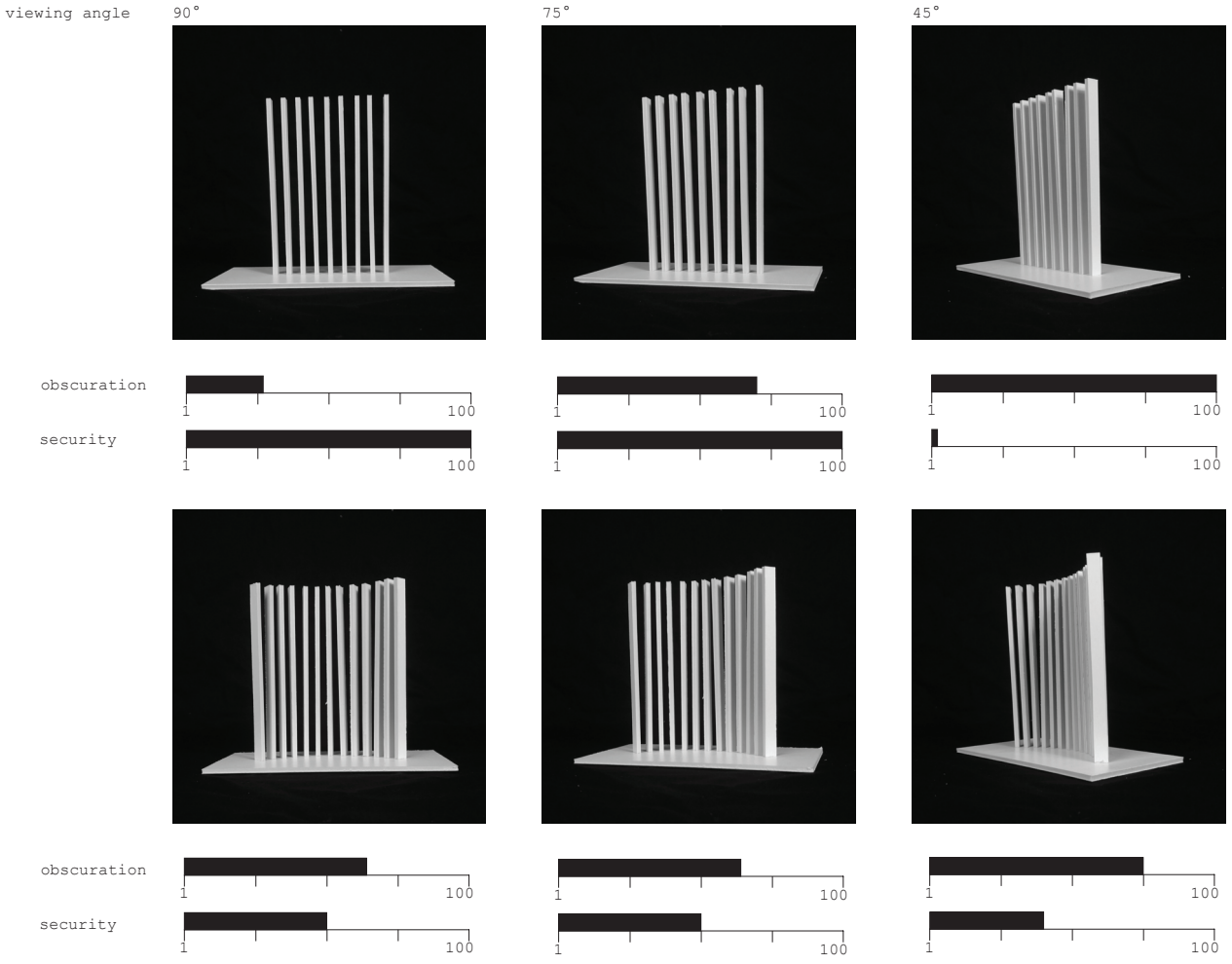
primary wind direction section



secondary wind direction section

Obscuration vs security

It was chosen to work with a curved structure because of its ability to from most angles to allows one to see through the structure but the same time obscuring some of one's vision whereas a straight structure either allows one to completely look through the structure or completely obscures one's vision.

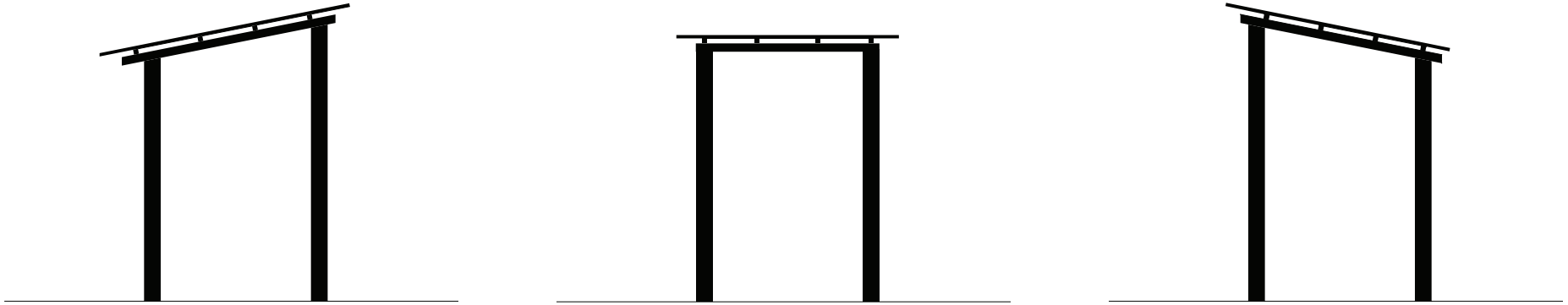


Directing space

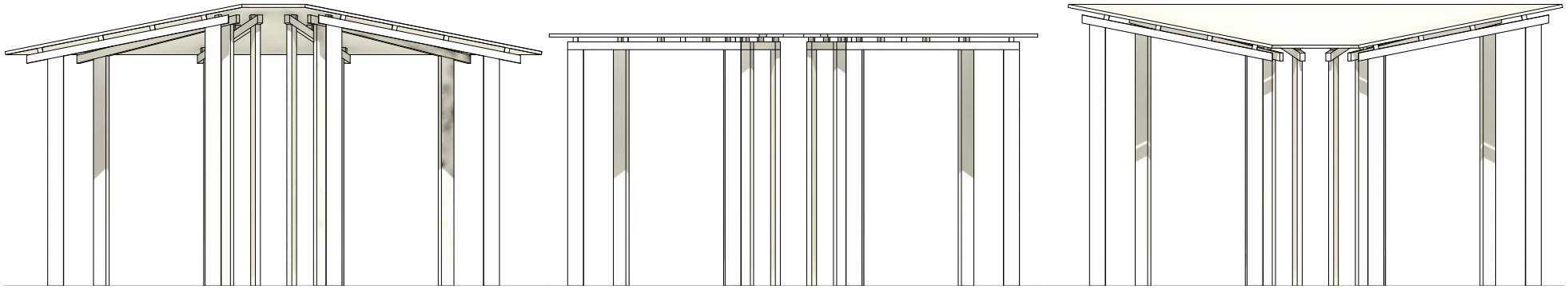
extrovert

neutral

introvert



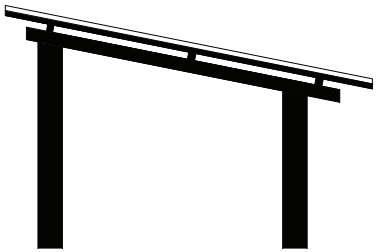
section



facade

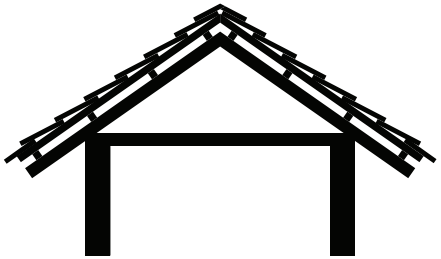
Exploration of roof construction

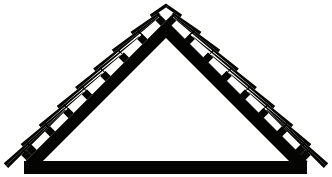
no.1



over under plank construction

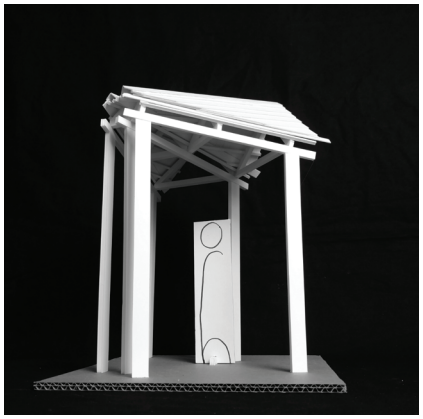
no.2

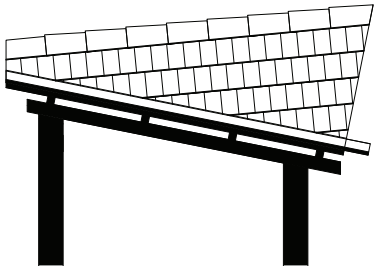




over over plank construction

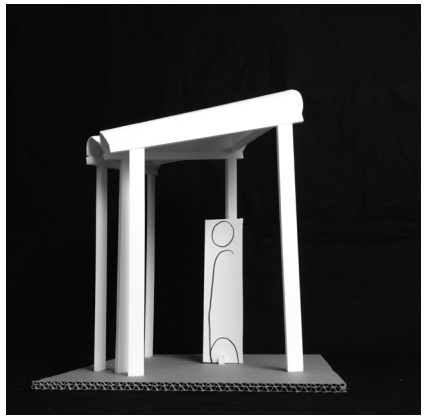
no.3

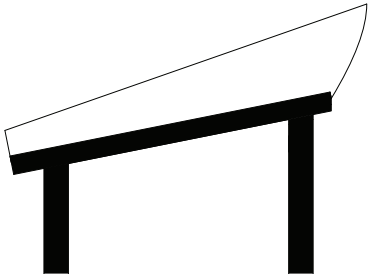


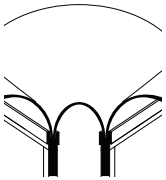


shingle

no.4

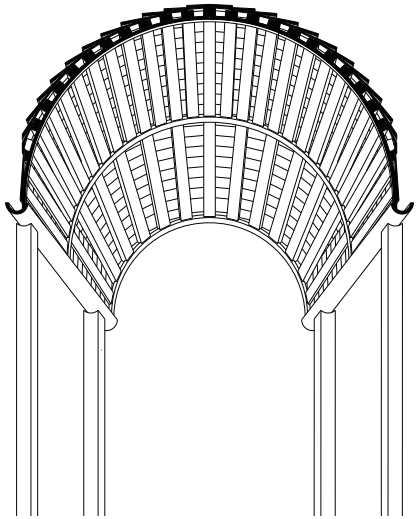


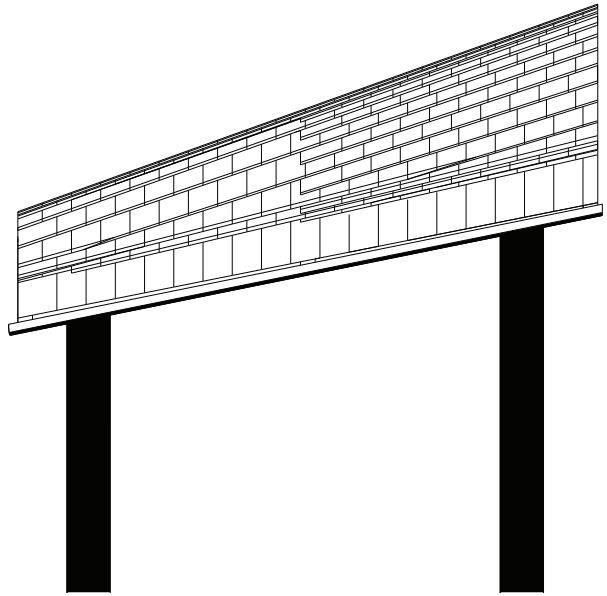




steambend plywood

Roof construction



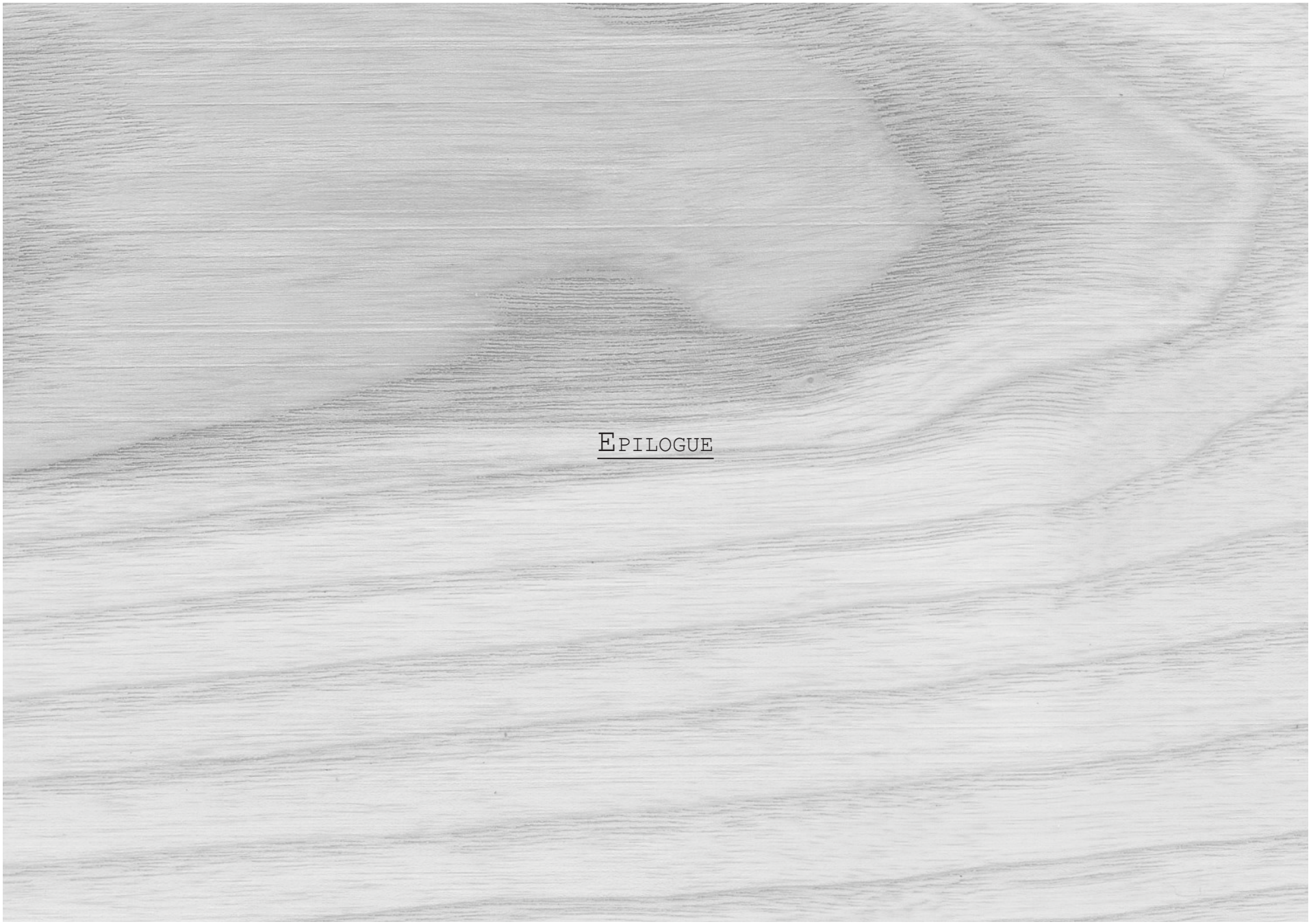


The roof construction chosen to use in the tram stop is a combination of construction method no.3 and no.4. Using the shape no. 4 and the shingles from no.3 to increase the amount of wooden surface area one is exposed to.

Start up workshop overview

The project was started with a model workshop where 36 models were produced in cardboard over a short period of time in order to establish a starting point for the design investigations. The models were based on prior knowledge uptrained in the preparatory work, intuition and the properties of the material.

There was not one single model that can be seen at direct precursor for the final design, but elements of multiple of the models have been carried into the final design.



Epilogue

Conclusion

In this Master's thesis, it has been demonstrated that it is possible to use the sense of smell as the primary design driver of an architectural design process. A wooden tram stop has been designed for Vasaplatsen, both achieving its function as a tram stop by providing a place of shelter and rest, and offering one the chance to experience five different smell-stories. Several parameters that affect the sense of smell have been identified and turned into design strategies that could be implemented into an architectural design. Parallel to the design process, the representation method was developed. This concluded in a method relying on drawings crafted with pencil on tracing paper, layering information of wind flows and the strenght of smell on top of conventional architectural drawings. The smell materialised as smudged pencil being activated by the wind flows which then allow one to read the experience of the smell of the wood in drawn format.

Discussion

One of the biggest takeaways for this Master's thesis has been that by focusing solely on the sense of smell in the design process, one could be afraid that the final design would be one dimensional, but what was created were multisensory spaces that cater for more than just the sense of smell.

It was a conscious choice to only focus on the spaces and the experienced smell-stories on the pathway to not let more parameters affect the design, but it could be very interesting to see how the design would have developed if this existing dichotomy had been part of the design process.

More research of how the wood smell is affected over time could be the next step in further informing this project. It could be very interesting to explore how weathering influences the smell. This could be done by placing several planks of red aromatic cedar outdoor exposed to the elements in an interval of 2 weeks and then observing and registering the evolution of the smell over a year.

Following along the same line of thought, it could have been beneficial for the project to make drawings that show the development of the experience of smell over time.

Another question that has surfaced after the completion of the project was how one could reinvigorate the smell if it completely disperses. One could either sand the surface of the wood, add a coating of essential oil from the wood; or maybe the smell experience could appear again when somebody carves the classic heart with the initials of themselves and their loved one into the wood.

The surrounding urban fabric and the tram stop connection to this were not given much thought during this thesis. Moreover, through the ability of smell to create space reaching far away from the source, one could potentially enter a smell space created by the smell of the wood around the corner from the tram stop. Both topics could be great subjects for further investigations. The smell will surely become a part of the identity of Vasaplatsen, but what more will it give the city? And which experiences would, for example, be created when the smell of the mowed grass or the blooming lilacs mixes with the smell of the red aromatic cedar?

The smell-stories in this Master's thesis are described as individual experiences, but it could be interesting to look at how the experiences of smell-stories after one another. Will some kind of synergy effect be created at the tram stop, not only taking the singular stimulus into consideration but the full multisensory experience?

Bibliography

Articles

Henshaw, V. (2019). Scents of Place: The Power of the Olfactory. Retrieved from https://www.architectural-review.com/rethink/scents-of-place-the-power-of-the-olfactory/8666675.article

Pallasmaa, J. (2016). The Sixth Sense: The Meaning of Atmosphere and Mood. Architectural Design, 86(6), 126-133. doi: 10.1002/ad.2121

Books

Erwine, B. (2017). Creating sensory spaces. The architecture of the invisible. Basingstoke: Taylor & Francis Ltd.

Pallasmaa, J. (2013). The eyes of the skin - Architecture and the Senses. Chichester: Wiley.

Zumthor, P. (2006). Atmospheres. Basel: Birkhäuser.

Online

Chinatravelkey. (2019). Lingen Hall (the Hall of Eminent Favor). Retrieved from http://www.chinatravelkey.com/beijing/attractions/mingtombs/changling/ling%27endian.htm

Evarts, C. (2019). Nanmu. Retrieved from http://www.chinese-furniture.com/c_furniture/m_nanmu.html

Hultengren, I. (2019). Ming tombs - Zhu Di - the Yongle Emperor. Retrieved from http://www.ming-tombs.eu/emp/03yongle/yongle.html

Meier, E. (2019). Aromatic Red Cedar | The Wood Database - Lumber Identification (Softwood). Retrieved from https://www.wood-database.com/aromatic-red-cedar/

Meier, E. (2019). Camphor | The Wood Database - Lumber Identification (Hardwood). Retrieved from https://www.wood-database.com/camphor/

Meier, E. (2019). Incense Cedar | The Wood Database - Lumber Identification (Softwood). Retrieved from https://www.wood-database.com/incense-cedar/

Meier, E. (2019). What is Wood? | The Wood Database. Retrieved from https://www.wood-database.com/wood-articles/what-is-wood/

Meier, E. (2019). Wood Odor | The Wood Database. Retrieved from https://www.wood-database.com/wood-articles/wood-odor/

Pablo Neruda, t. (2019). Ode to the Smell of Wood | Poem by Pablo Neruda. Retrieved from https://motherbird.com/smell_wood.html

Windfinder. (2019). Windfinder.com - Wind and weather statistic Göteborg. Retrieved from https://www.windfinder.com/windstatistics/goeteborg

WikiArquitectura contributors. (2019). Swiss Sound Pavilion - Data, Photos & Plans - WikiArquitectura. Retrieved from https://en.wikiarquitectura.com/building/swiss-sound-pavilion/

Wikipedia contributors. (2019, January 22). Aroma compound. In Wikipedia, The Free Encyclopedia. Retrieved January 23, 2019, from https://en.wikipedia.org/w/index.php?title=Aroma_compound&oldid=879617944

Wikipedia contributors. (2018, November 30). Wood. In Wikipedia, The Free Encyclopedia. Retrieved January 23, 2019, from https://en.wikipedia.org/w/index.php?title=Wood&oldid=871304218

Pictures

Fraxinus excelsior wood tangent section 2 beentree.jpg. (2014, December 15). Wikimedia Commons, the free media repository. Retrieved 15:57, January 23, 2019 from https://commons.wikimedia.org/w/index.php?title=File:Fraxinus_excelsior_wood_tangent_section_2_beentree.jpg&oldid=142879493.

Other pictures and graphics, own production, Emil Trabjerg