LE TEMPS

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Enhancing the Experience of Architectural Qualities* of Clouds by Cultivating Time

Mimmi Amini & Julia Dandebo

Chalmers School of Architecture
Department of Architecture and Civil Engineering
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Examiner : Daniel Norell
Supervisors: Jonas Lundberg & Kengo Skorick

*

The architectural qualities of clouds are; dissolving, formless, massless, depthless, scaleless, featureless, dimensionless and purposeless. The cloud has the power to dematerialize the architectural boundaries, as well as blurring them to create new dimensions and experiences. Inside of a cloud, there is nothing to see and nothing to do, except for being in the present.

What role can artificial weather play in the changing of awareness of presence, and why is this change of awareness important?

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THANK YOU

Jonas Lundberg
Daniel Norell
Jonas Runberger
Karin Hedlund
Kengo Skorick
Torbjörn Lindholm
Håkan Larsson
Peter Christensson
Morten Lund
Peter Lindblom
Tabita Nilsson

01: INTRODUCTION

Clouds are a natural weather phenomena that fascinates us. A cloud is formless, depthless, massless and scaleless. They are in constant change of patterns, density and in movement. In February 2017, the sky in Gothenburg was covered with a thick layer of clouds 80 % of the time, which is just a little bit above average (SMHI, 2017). Unfortunately this is not appreciated, which led to the idea in this thesis, of using the qualities of clouds into a designed space and turn the negative experience into something positive and fascinating instead.

We spend 90 percent of our lives in static buildings that lacks of physical change. Temperature, light and air in our indoor spaces are constant and regulated both day and night through all seasons (Architectural Design, 2016). Outside of our buildings we experience the ever-present elements of weather as an immediate change. In the book *-Arium* by Bhatia and Mayer from 2010, we read that weather is considered as the last uncontrollable force in our cities. Most buildings exclude weather, something that is important in order to remain present.

ABSTRACT

The research of this master's thesis is implemented as a design proposal for Gothenburg's 400th anniversary on Heden in 2021 as a temporary interactive observatory, for visitors to experience a dynamic formless architecture through the weather phenomena cloud and time.

The purpose for this master's thesis is to explore the possibilities of designing a dynamic space informed by artificial weather, in specific clouds, that stimulates the experience of presence. The result is to bring a renewed valuing of people's use of designed spaces and understanding of themselves in relation to a place. By using weather as architecture the project achieves to provide an immersive self-directed experience that allows the user to explore different spaces based on the interplay of the physical boundaries between space and natural phenomena both poetically and spatially. The project opens up to an invisible architecture that evaporates the physical architectural boundaries. It restores the diversity of changes in temperature, humidity, light, colour and air movement in indoor spaces through designed microclimates within the cloud where the architecture appears as a meteorology mapping.

The design is meant to insight enlightenment, awakening our body and mind asking us to pay attention that takes us out of our everyday lives. The project is operating in a field of climatic design, which builds upon the notion that brick or concrete in most cases can be replaced by light, temperature, and humidity, since we face the reality from the inside which is based on atmospheres rather than objects. Precursor within this area is Philippe Rahm Architects, who claim that form and function follow climate (Archithese no 2, 2010). Le Temps contributes to this field of interest, by designing microclimates within a larger climate, developing techniques to combine them and looking into the field of artificial clouds. The designed microclimates are spread in eight different levels within the cloud through a narrative approach used in film that alter or intensifies stories which in this case is specific atmospheric or climatic experiences.

The design approach is research by design, working with references and research based investigations through physical experiments with temperature, light, condense, air and dry ice to create different climate conditions in indoor spaces. The findings are iterated and refined into design proposals. Some experiments has taken part in Chalmers Laboratory in collaboration with engineers. These findings, along with intuitive understanding, Mollier Diagram, assumptions and theoretical research has set the basis of this thesis. How can one create a pocket of air inside a cloud? How can air pressure affect the formation, size and position of a cloud? These are questions that are answered on a theoretical level, however, the investigations and questions raised enter a broader field for discovering new grounds of architecture as climate.

THIS THESIS SEEKS TO:

Provide an immersive self-directed experience

Allowing the user to explore different spaces based on the interplay of the physical boundaries between space and natural phenomena.

Open up to an invisible architecture that evaporates the physical architectural boundaries

Restore the diversity of changes in temperature, humidity, light, color and air movement in indoor spaces and to allow changes, where the architecture appears as a meteorology mapping.

Provide an understanding of the conditions explored in the project

Investigate alternatives for how to achieve meteorologic design though experimentation and design

Mimmi Amini

Bachelor: Chalmers
Internship: White Stockholm and London
Master: Chalmers - *Matter, Space & Structure*

Previous Master projects:

Orchestrated Atmosphere

Interdependent Relationship Between Human Body and Space

Ambience of Sound

Interplay of Sounds in an Orchestrated Atmosphere

What Time is this Place?

Raising Awareness in Presence

Julia Dandebo

Bachelor: Chalmers
Internship: Liljewall Gothenburg
Master: Chalmers - *Matter, Space & Structure*

Previous Master projects:

Microencounters

Unexpected Encounters Generated by an Expected Catalyst

Micro Sound Encounters

Using Unexpected Encounters as a Narrative landscape to Bring Silence to an Urban Environment

Weather as Architecture

Researching the Architectural Qualities within a Specific Weather Condition

It is fascinating working with cloud and time as medium in discover new grounds for architecture. The references The Blur Building (Diller Scofidio + Renfro, 2002), Cloudscapes (TRANSSOLAR + Tetsuo Kondo Architects, 2010) and Philippe Rahm Architectes, all challenge the conventional building and how we see and use architecture today. Architecture does not have to be four walls and a pitched roof, it can be an experience that is designed to evoke feelings. It can be subtle changes in temperature and air humidity that your body reacts to. It is about experiencing architecture as weather. Through previous studies in the preparatory thesis work: Time and Weather, this project combines the awareness of presence through the experience of cloud.

Both The Blur Building and Cloudscapes are great examples of how to use cloud as a medium in architecture. What Le Temp contributes with and explore is how to design and control microclimates within the cloud, but also how the solid architecture elements enhance the experience of the cloud. What are the possibilities to control and direct the uncontrollable? Is it possible to make one part of the cloud rain? Can air pressure or perforations in the structure create types cloud formations that provides different experiences? Can one part be very colorful, almost like a sunset, and can one part be completely dark? How can one raise awareness in presence through microclimates?

The project explore the possibilities of designing with cloud and time, since there is yet a lot to discover in terms of design. That is the subject matter and what this thesis contributes with.

The design approach is to achieve knowledge by conducting design experiments. The findings in the experiments (as seen in chapter 06. Design Experiments) were implemented in the design through drawing iterations and a systematic work with references (see chapter 9. References). These where continuously iterated and refined throughout the project, going back and forth between findings, experiments, scale and references resulted in a design proposal that answers the questions; what role can artificial weather play in the changing of awareness of presence, and why is this change of awareness important?

A series of design experiments have been conducted in order to understand the qualitative aspects of designed microclimates, such as temperature, transparency, light, shadow, color and pressure. The project also investigates how clouds behave in relation to solid elements that are planar, curved and perforated. The project treat these design experiments with as much control and strategic planning as possible, but still allowing an amount of ignorance and surprise.

The design experiments are part of the design, combined with the case studies, old knowledge from the preparatory thesis work, new knowledge of climate engineering, new references of invisible boundaries defined by air, have set the ground for the development of Le Temp and the scenarios that they create. Combining these scenarios in a parallel narrative describes the different experiences of moving between microclimates.

The previous preparatory studies has been a research of prototypical qualities in both weather and time, which has given a solid ground of research of both subject in the thesis. The studies has been about finding and defining the architectural qualities of clouds and how time relates to architecture. The thesis has merged both studies and enabled deeper research on the microclimates within the cloud; the subtle changes of for example temperature and air humidity within a larger climate.

To understand the engineering system of how to control and create climates in indoor spaces, a collaboration with Torbjörn Lindholm, Senior Lecture/ Head of Division of Building Services at Chalmers was founded early on. This enabled experiments and research in the Laboratory together with research engineer Håkan Larsson and Torbjörn.

One can claim that this part of the project has been trial and error where many of the discoveries in the unexpected outcomes has been used in the design, such as the amount of condense, scent, rain and operative temperature created in the space.

Companies with other area of expertise was contacted and visited later on for the development of microclimates such as Frico, a manufacturer of air curtains to understand the system of air curtains to understand if it is feasible or not to use as a design tool for creating subtle or invisible boundaries.

DELIMITATIONS

The project take an interest in the experience of the cloud and the feel of being in presence, but due to the time given, the research is limited to the references. This is a field of research and design that is interesting and something to continue researching and developing further on with.

The small scale experiments have been conducted with dry ice. This is because of practical reasons, but also because Fujiko Nakaya started experimenting with dry ice in the beginning of her career as a fog artist. The properties of dry ice are very similar to the properties of a cloud, which resulted in a great understanding of cloud.

The technique behind the indoor cloud is based on years of research, experiments and calculations made by the German engineering firm TRANSSOLAR. This is what the projects technical system builds upon. What has been proven is that it is possible to create an indoor cloud, and what Le Temps add to this discourse is how it is possible to modify the clouds through microclimates.

This is an interdisciplinary project, and it is indeed a challenge, but it is also fun because it brings new ways of thinking and seeking possibilities to the table. We are aware that our lack of experience with climate engineering is limiting us in some technical aspects, but it is also a great opportunity that we are able to see all the possibilities rather than delimitations already from the start. The architect's role in this is to focus on the experience, while the engineer tends to focus on the physical law in how to create an indoor cloud.

Le Temps is structured chronologically with the design proposal first and the origin of clouds as the last chapter describing cloud formations created naturally in the atmosphere. The thesis is divided in ten chapters. The introduction and background part answers why, what and how this thesis came to develop. The following chapter is representing the final result and the design proposal in drawings and describing diagrams. The designed microclimates have an own chapter where they are illustrated in pictures to describe the different experiences in the cloud with a narrative. These are complementary to the illustrated microclimate symbols in the drawings. The next chapter explains the physical experiments with climate conditions and research made that lead to the findings and the development of the different microclimates. An explanation of how the structure of a narrative in film is applied in Le Temps with references used in the project comes in the two last chapters.

Thesis question: What role can artificial weather play in the changing of awareness of presence, and why is this change of awareness important?

Spaces that could have a countless of characteristics when allowing changes in air, humidity and temperature are regulated to standard measures with lack of physical change. This static indoor environments are the same day and night through seasons however, our minds are orientated in a constant changing world, as the weather outside. Weather stimulates our body and mind and affects our mood. When choosing to work with artificial weather, the aim was to design indoor spaces using the architectural qualities of clouds for enabling changes in presence through microclimates. Through physical experiments with air, temperature, humidity and color we realized that climate conditions are endless and educe feelings. These are very subjective and play a big role in how we use spaces depending on our personal preferences. By providing more options in temperature, spaces can be used differently due to their climatic conditions. This brings not only more diversity but also create invisible spatial boundaries within a space like for instant a solid wall would. Most indoor spaces are designed after function or activity. Using artificial weather provides another type of use to space that is more flexible than solids in order to stay presence.

When manipulating the air, humidity and temperature in the experiments provided different results and experiences that resulted in microclimates. When being inside a dense cloud the user cannot see further than 1-2 meters and other senses get more active such as hearing and the sense of touch. It made the user slow down its pace due to the climate condition created by the cloud. This gave the understanding that the qualities of the cloud effects how the user feel, move and use the space in relation to its body. Manipulating parts of the cloud to achieve different microclimates pushes the understanding of how climate can be used in order to create different spaces where each and every one is different. Spreading the microclimates in different levels horizontally and vertically on a walkaway of ramps, stairs and platform, the user get to experience the differences within the big cloud. Imagine walking through a dense cloud and suddenly you step into an invisible clear space where you can study your surroundings from distant? The different perspectives provided by the microclimates keep the user connected with itself and its surrounding at all times. Walking through the microclimates the user will experience surprises, suspense, and playfulness among other thoughts and feelings that is sometimes even uncomfortable.

We wanted to showcase how working with artificial weather can be used in different ways and strategies to stay presence in indoor spaces. Our claim is that the same type of space will eventually disconnect people from being presence since it becomes static. Using artificial weather we learned it is possible to achieve through designing an artificial indoor cloud with microclimates. Philippe Rahm Architect uses climate as architecture when designing their buildings where the rooms in a building are placed according to climate conditions. Using the same thinking we developed different strategies on how to use air conditions to create spatial boundaries, in a large scale and not by a specific use but rather for the atmospheric changes designing with time in mind. The technique behind creating different air conditions has been investigated in a laboratory with help from engineers, though not tested thoroughly with right equipment to work fully. We believe that a further development and understanding on the technical part of this thesis would enable more possibilities of designing with artificial weather. Working with artificial weather is a fairly new unexplored ground with a lot yet to discover in terms of design possibilities. With today's climate change we believe that this sort of approach can also be used with other types of weather conditions both artificial and natural - indoors and outdoors.

02: BACKGROUND

OBSERVATORY FOR WEATHER AND TIME

The proposal is a pavilion on Heden as a part of Gothenburg's 400th anniversary, celebrating architecture through weather and time. An architectural experience that is responsive, dynamic and a unpredictable for the user.

To Observe

To observe is to: detect, discover, examine, inspect, look at, mark, monitor, note, pay attention to, recognize, regard, scrutinize, study, view, watch, witness, beam, behold, catch, contemplate, dig, discern, distinguish, mind, perceive, read, spot.

How?

The preparatory thesis work has been part of the research of both Time and Weather. The findings and knowledge set the ground and define the approach in the thesis where further development and work with key findings are brought in to the design.

WEATHER AS ARCHITECTURE

Object to Atmosphere

Atmosphere: Physical atmosphere is something that surrounds you, and embraces you. Mental atmosphere is when you look into yourself and are just being presence with your own thoughts.

Transition of Density

The transition from object to atmosphere can be both direct and gradual. Mist, fog and cloud are a part of a gradual transition. The change of density is important for the transition from object to atmosphere.

Dematerialize Architecture

The weather has the power to dematerialize the architectural boundaries, as well as blurring them to create new dimensions and experiences. This is when it becomes an atmosphere.

Architectural Qualities

When you are inside of the mist/fog/cloud, you are in a state of distraction and the fog is dissolving, formless, massless, depthless, scaleless, featureless, dimensionless and purposeless. When you are inside of a cloud, there is nothing to see and nothing to do, except for being in the presence.

Controllable and Uncontrollable

There are two ways to approach the weather as architecture; as controllable and uncontrollable. Outdoors equals an uncontrolled state of the cloud, indoors equals a controlled state.

Formless Dynamic and Formless Static

The cloud is formless dynamic while the structure is formless static.

WHAT TIME IS THIS PLACE?

Three Levels of Integration on Our Perception of presence

The different levels on integration is the feel of intensity in the interaction of three states; closed, semi open, and open between the structure and natural phenomena

Sequence of Levels based on Integration

Intensify the experience of "now" through the changes of space interacted with or without nature. Context and site based assemble. It creates a rhythm. Raise awareness of presence.

Breaking of Pattern in the system of sequences by Movement

Making people aware and connected to presence require a change of pattern both in space and movement. If not, same sort of space and repetitive pattern will eventually feel the same (boring) and the subjective time will feel faster, and as an outcome it makes people more disconnected to presence. In order to remain present in the moment and keep the viewers' attention, breaking a movement in the sequence can make the viewer's felt time slower.

Change of Space and Material

Materials have an own language when talking about presence. They speak about age, about the environment they are in, about decay, impermanence, existence, and the place they come from. They enhance the feel of presence through their properties and create a certain atmosphere and feel when exposed to natural phenomena.

Form follows Microclimates

Form is defined by the use of the design. By use we mean not the function but rather the experience and atmosphere of the space we are aiming for.

The Use

The project is a design proposal that is a response to the static non-changing buildings of today. By constructing spaces for experiencing changes through clouds and the understanding of passage of time, it seek to make the user stay focused in presence. The strategy to construct these spaces comes from the key findings in the preparatory thesis work where tool boxes of prototypes where developed with the qualities and definitions of clouds and time.

The User

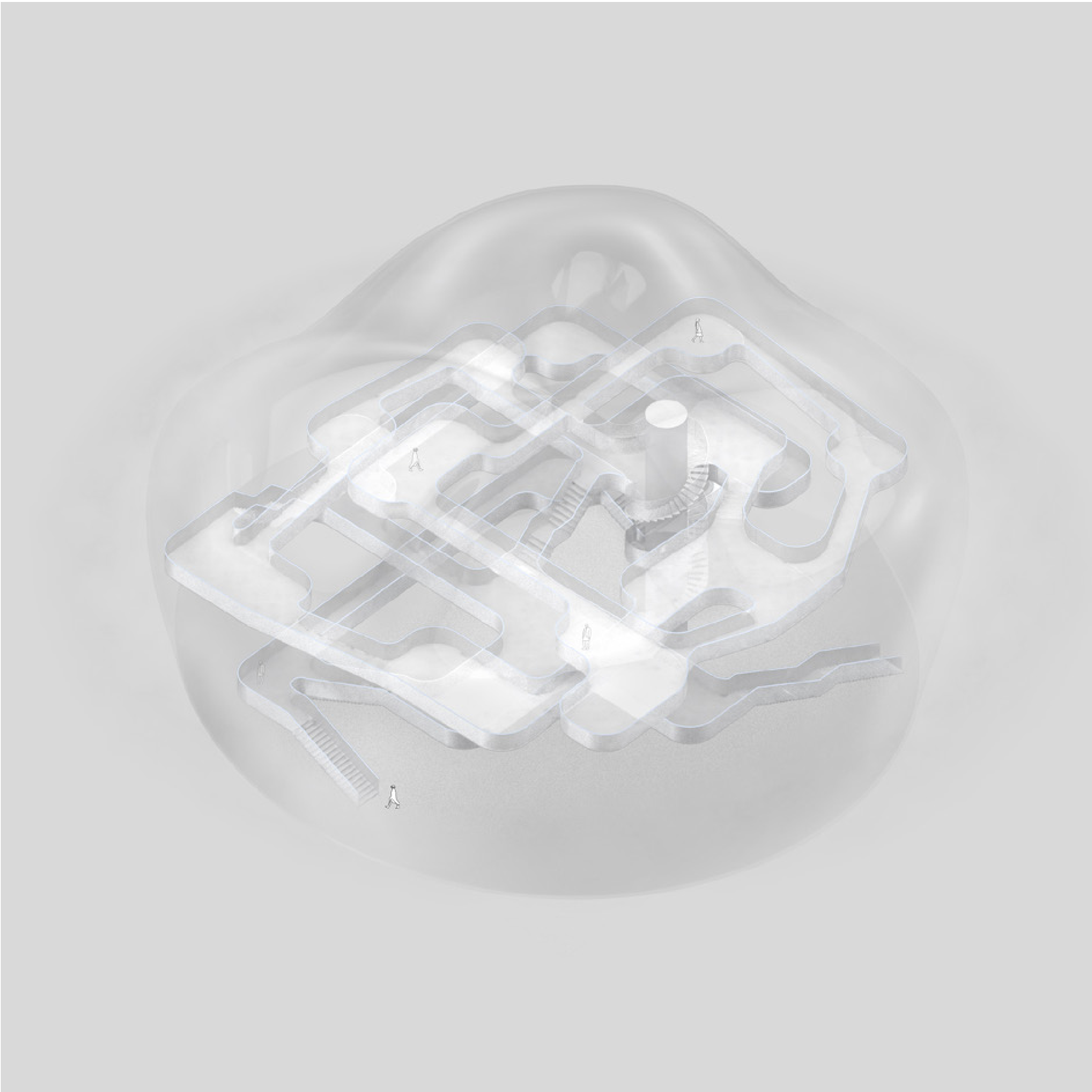
Today buildings have a fixed and regulated temperature in indoor spaces where there is no changes. Even the light conditions and air are mostly controlled. The project Le Temps have a more dynamic space where the natural changes in our environment can be experienced and where the users experience changes in temperature, air, humidity and light. The projects achievement is to intensify the feel of each space for the user, through an invisible architecture, defined by microclimates that allow these changes.

Focus

Buildings today are mostly generated by their functions. The recommendations for temperature in indoor spaces are between 18-20 degrees in Sweden (Folkhälsomyndigheten, 2018). Temperature changes, air and humidity within a space is considered problematic. We believe that temperature should be a part of the function of the building connected to activity and use. Le temp seek to re-evaluate the general view on designed spaces by allowing changes in temperature, light and air that enables numerous indoor weather conditions. The climate change and global warming are challenges that needs to be addressed in our future buildings. We need to find innovative ways of working with the climate and weather instead of excluding it.

The project Jade Eco Park in Taiwan designed by Philippe Rahms architects is a great example of working with climate. The projects is about creating different climates using the existing one in a park to meet different activates by using, air, temperature and humidity. By increasing coolness, dryness and cleanness in the natural subtropical warm and humid conditions into the park, they have created microclimates. The architects firm has successfully worked with all sustainability aspects as well as the social sustainability where they have enabled different use of activities in the park. We believe that this philosophy could be used in interior spaces as well.

03: DESIGN



This is how the structure looks like before starting the climate engineering process of creating the cloud, which consists of filling the lower part of the space with air that is +18°C and 40 % RH, the middle part with air that is +25°C and 100% RH, and the upper part with air that is +37°C air and 60 % RH. To create 100 % RH in the middle layer, moist is added to the air through high pressure warm water nozzles.

CONTROLLING THE DENSITY OF THE CLOUD

Depending on the effective output of the technical equipment, it takes a couple of hours to create a dense cloud to appear and stabilize in the middle of the space, provided the effect of the technical equipment of the bottom layer and the top layer are the same.

CONTROLLING THE DENSITY OF THE CLOUD

When people start to move around the cloud, the density of the cloud decreases. To prevent this to happen, the high pressure warm water nozzles are adding moist then and then. The water is around +37°C but rapidly stabilize to +25°C so there are no risk of burning your hand if touching the nozzles.

After adding the high pressure warm water nozzles,
the cloud is once again dense.

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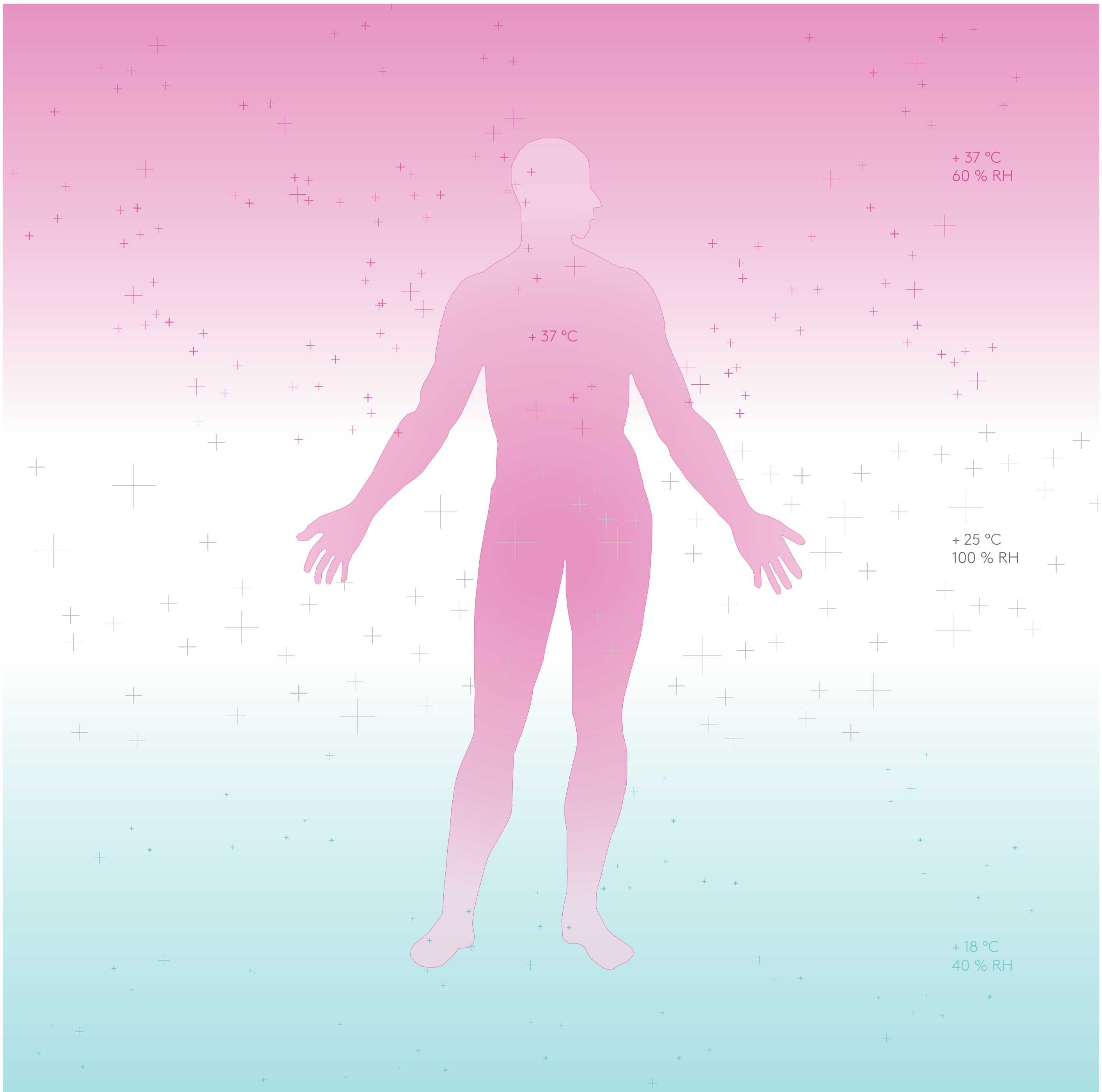
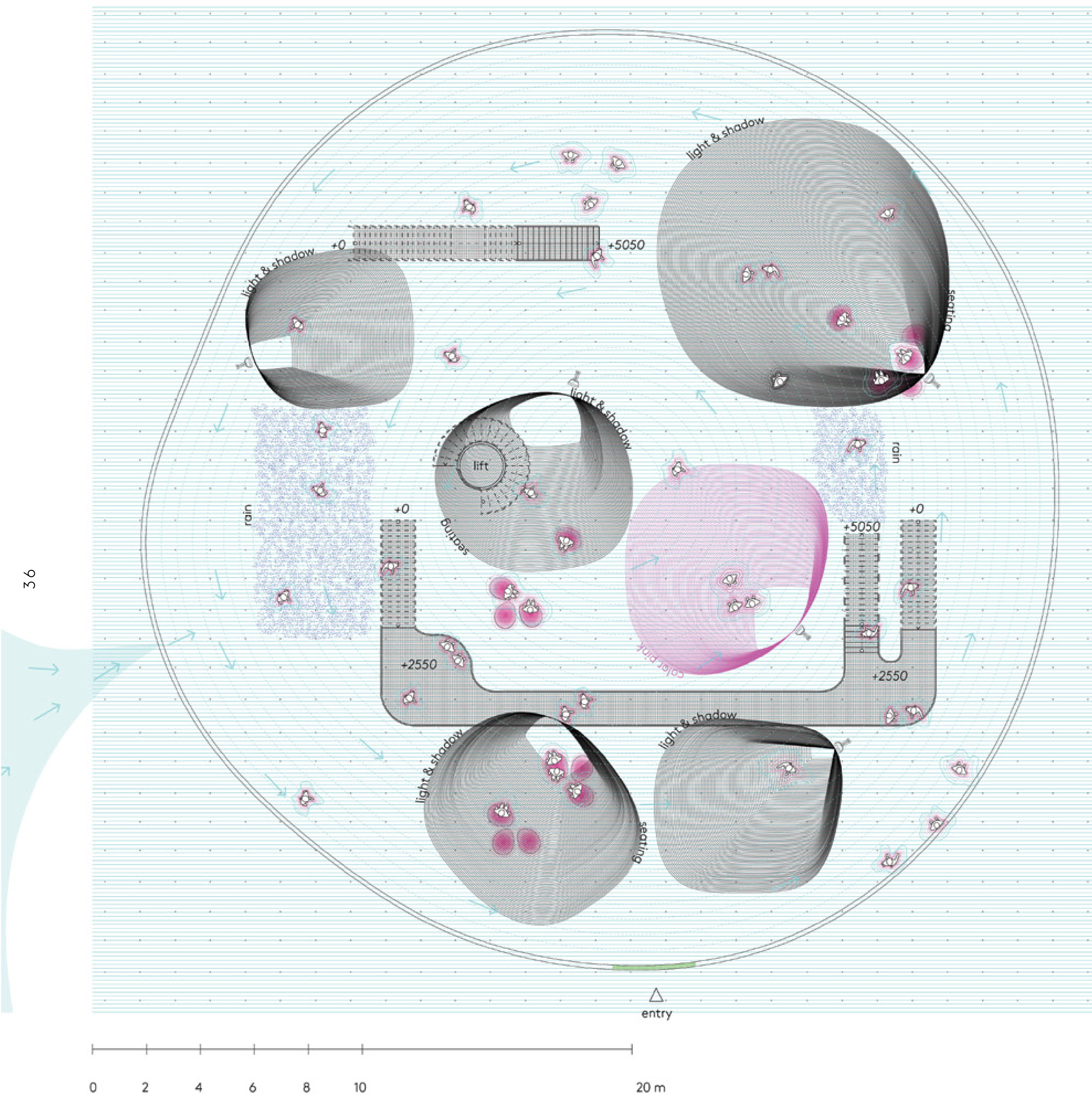
The symbols are describing the microclimates that are used in the plans and sections.

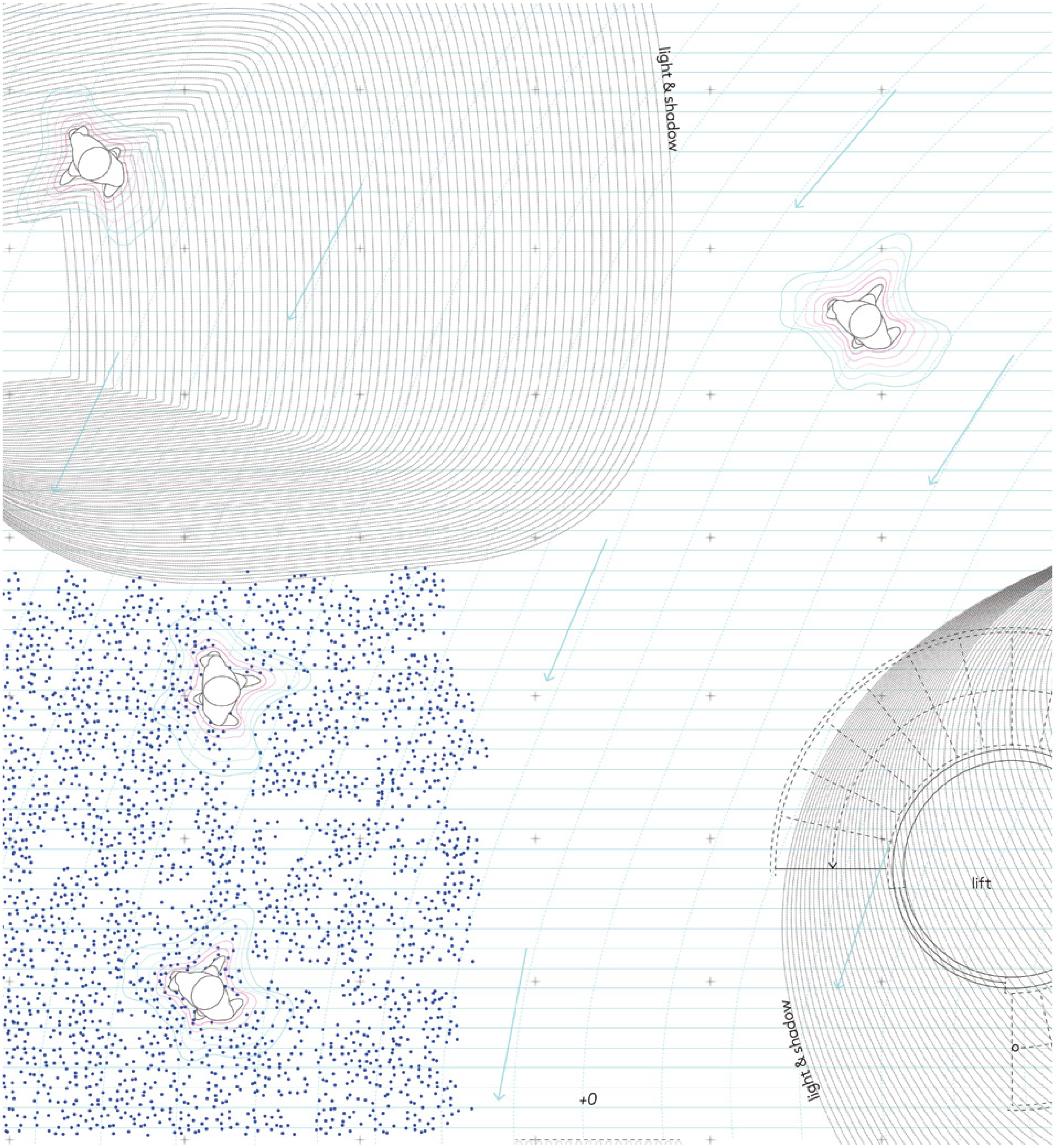


The human body in relation to the different air layers in the pavilion, makes the human body a microclimate of it’s own.

LEVEL I, SCALE 1:200



LEVEL 1, SCALE 1:50, MICROCLIMATE RAIN



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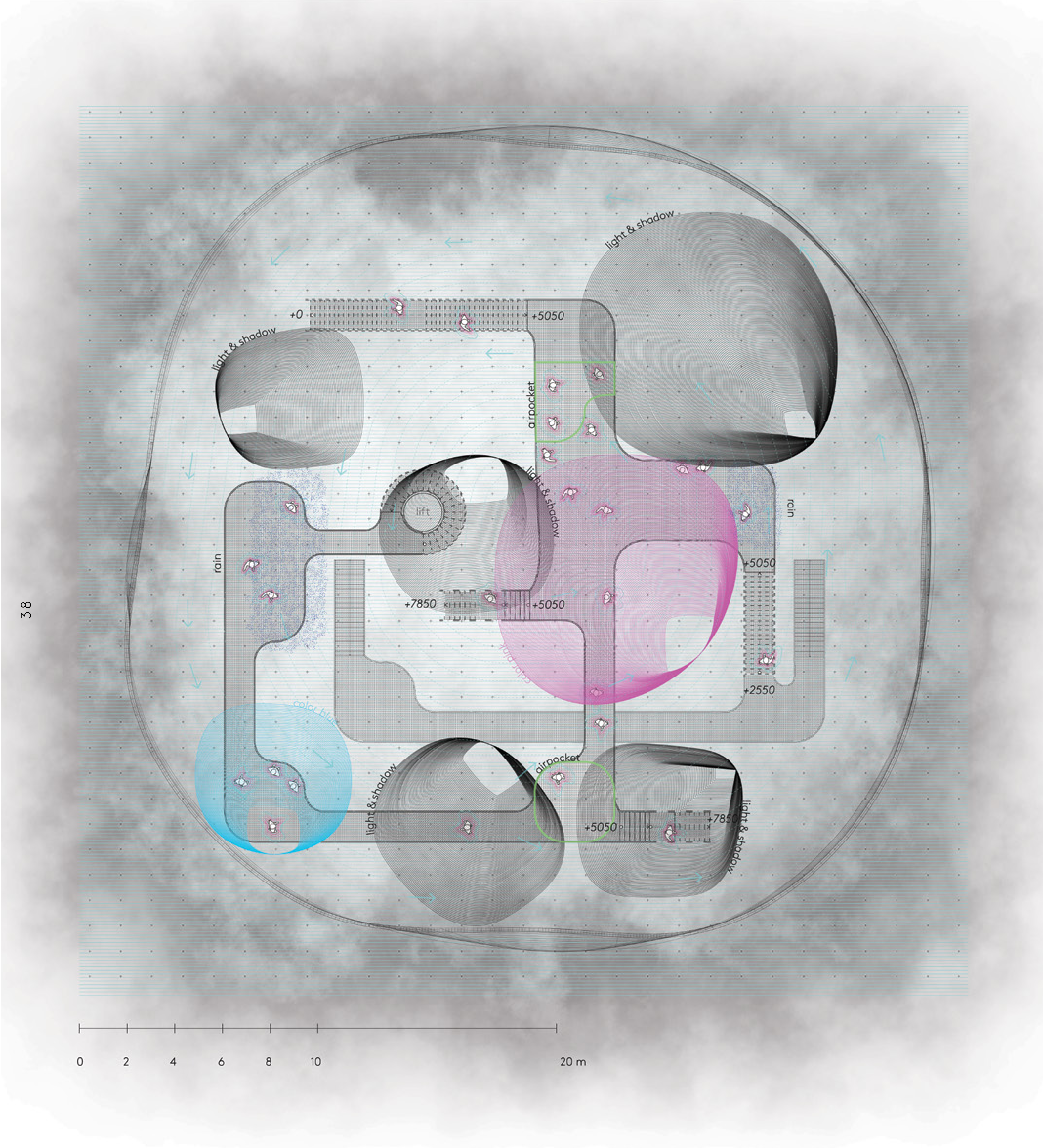
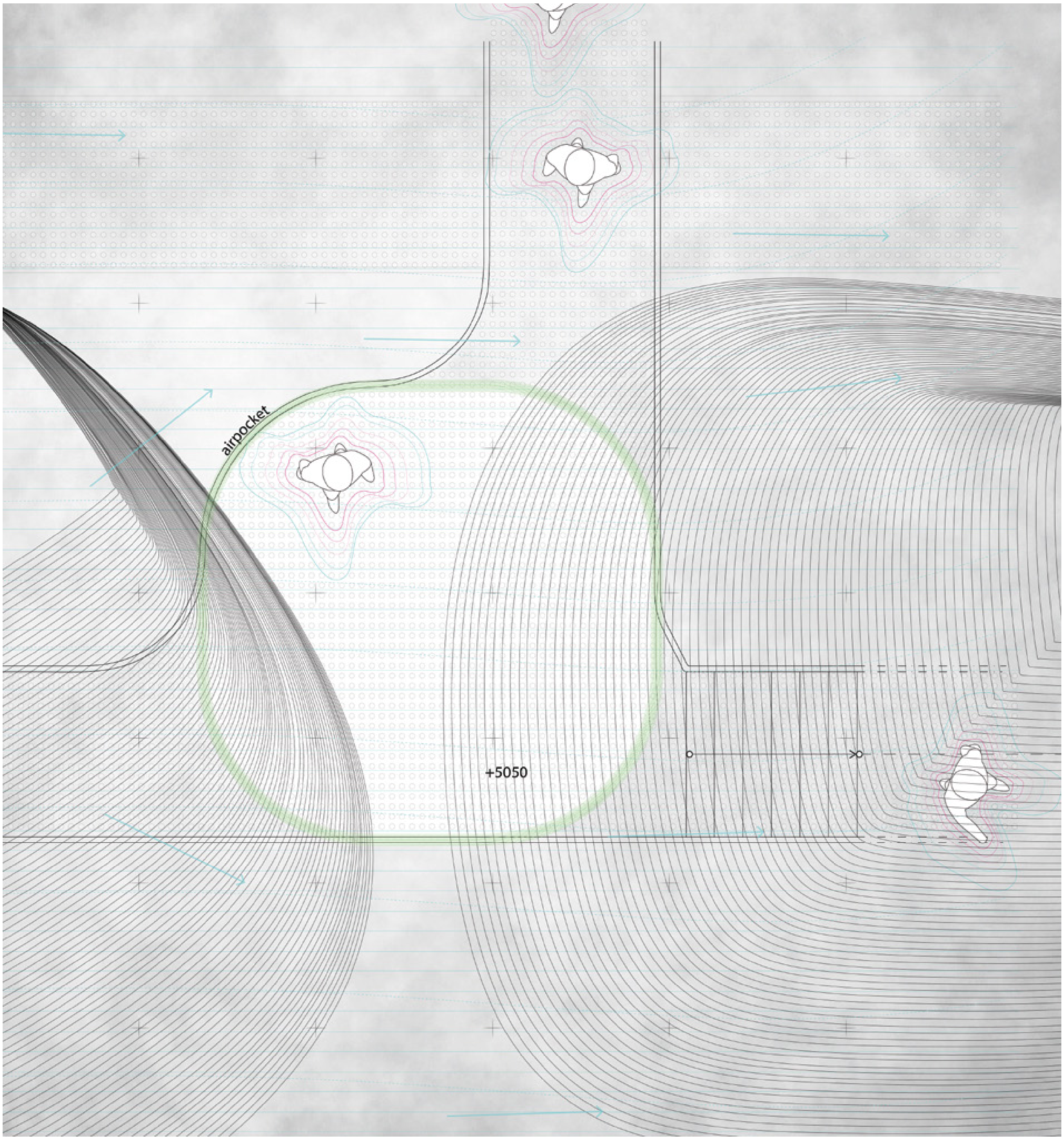
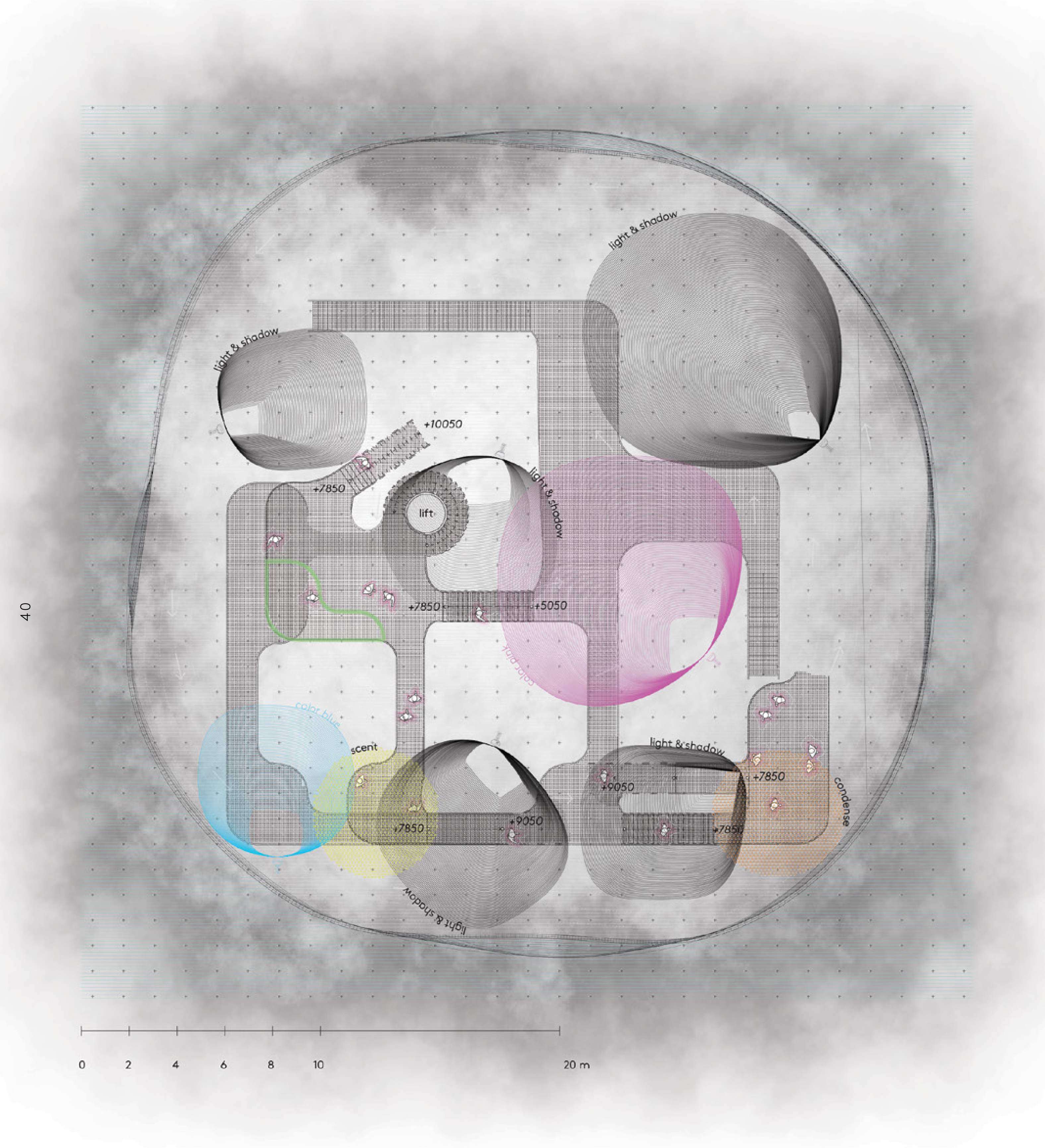
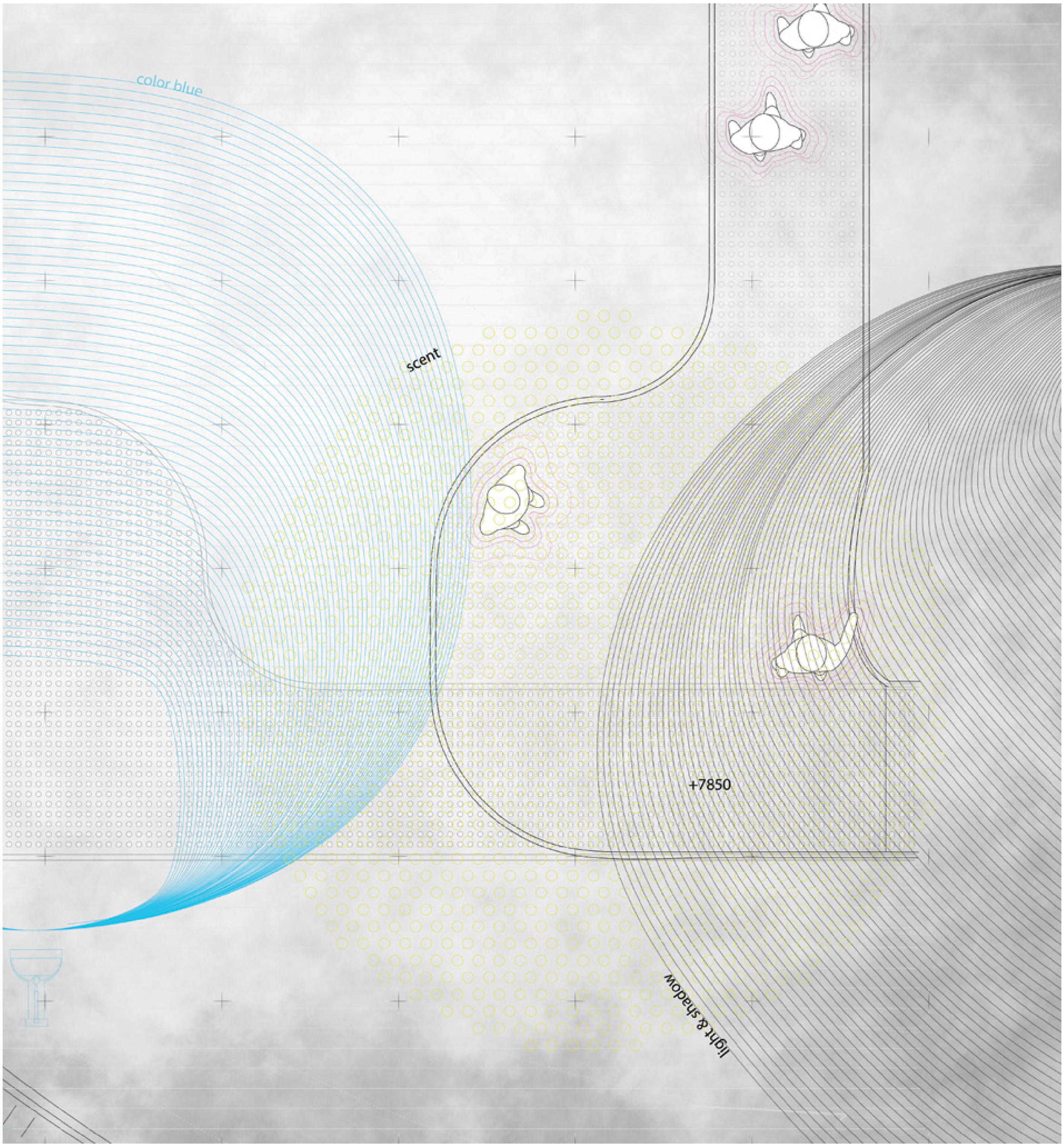



airpocket
+5050

LEVEL III, SCALE 1:200



LEVEL III, SCALE 1:50, MICROCLIMATE BLUE & SCENT



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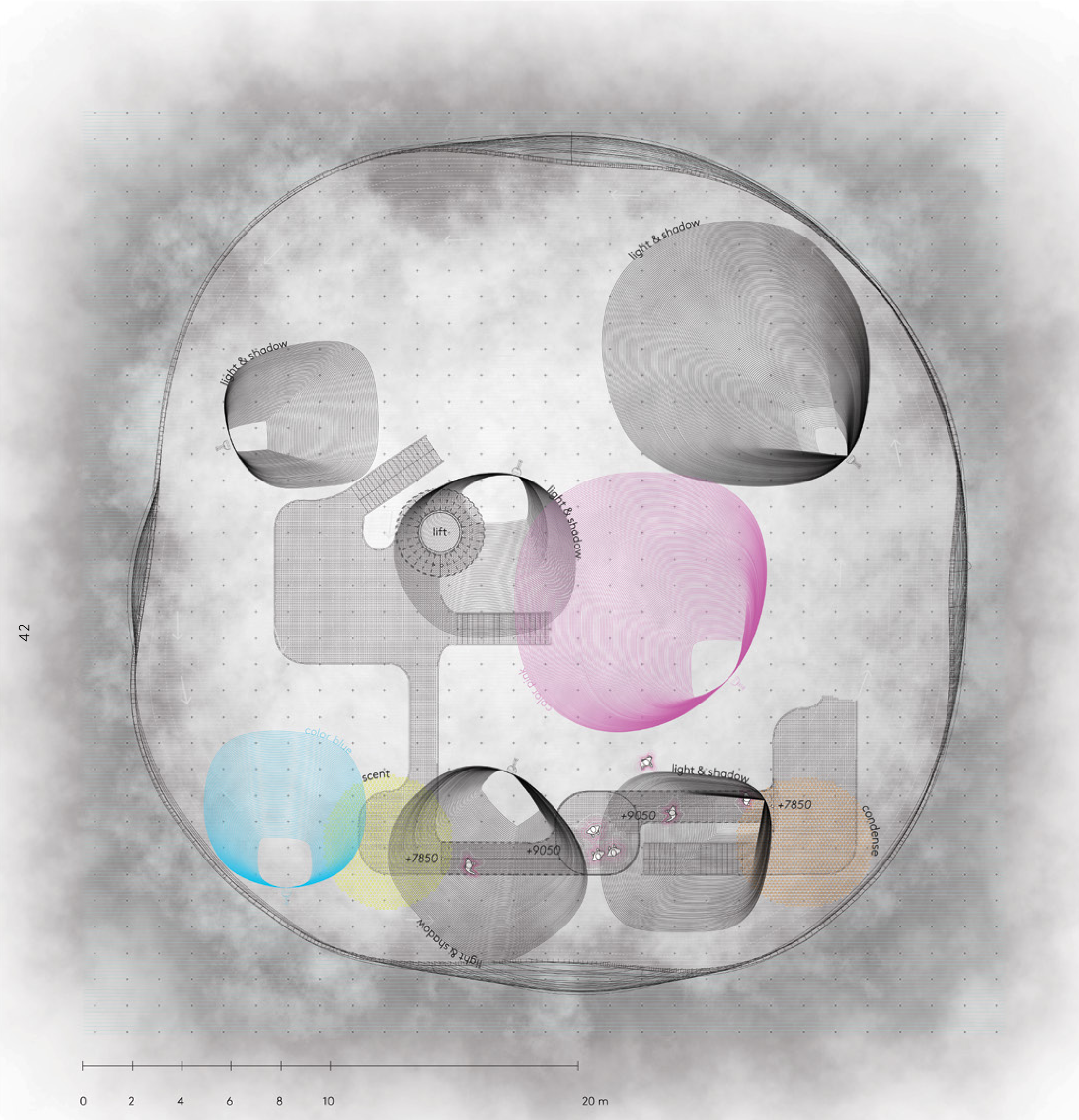
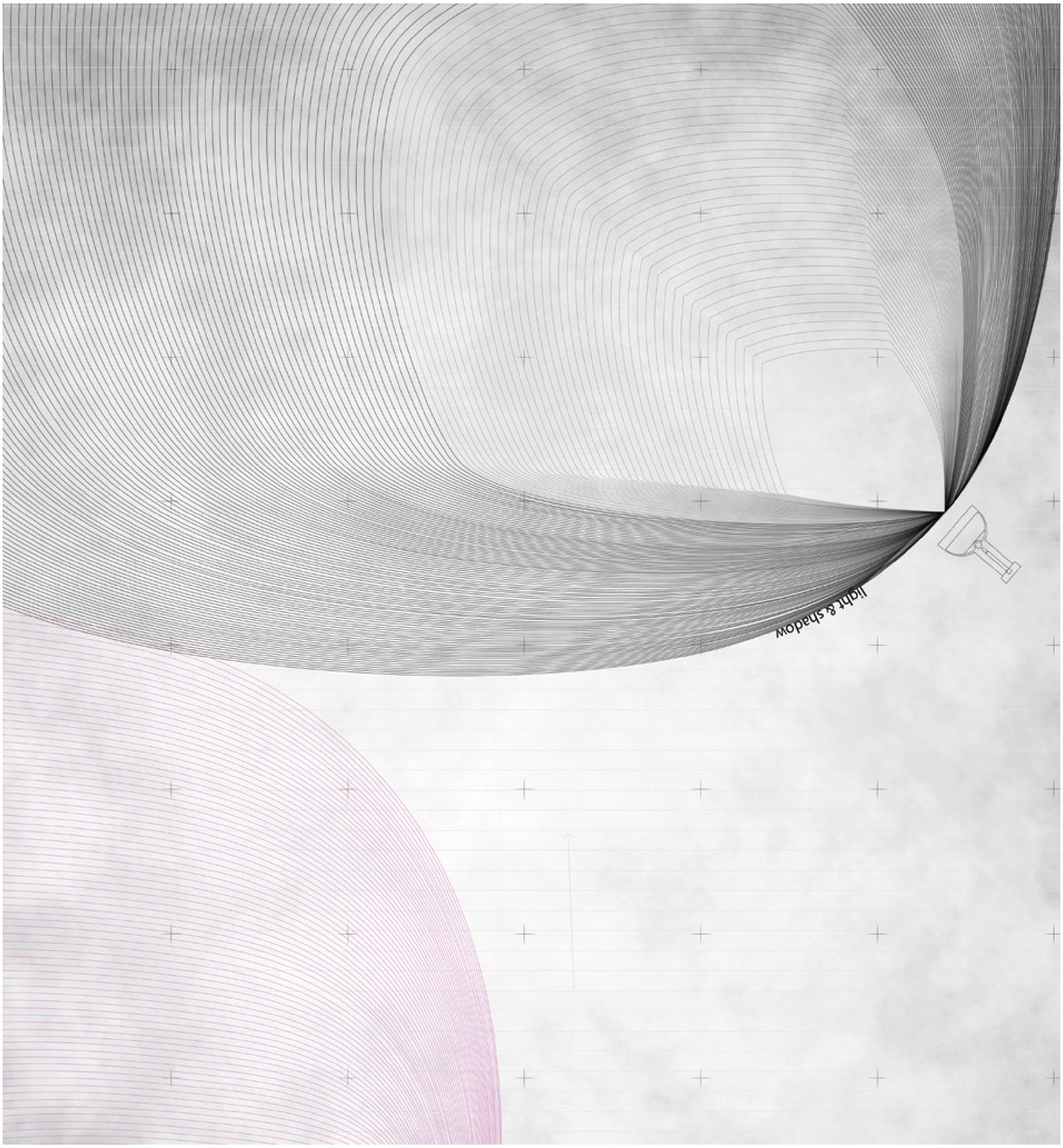
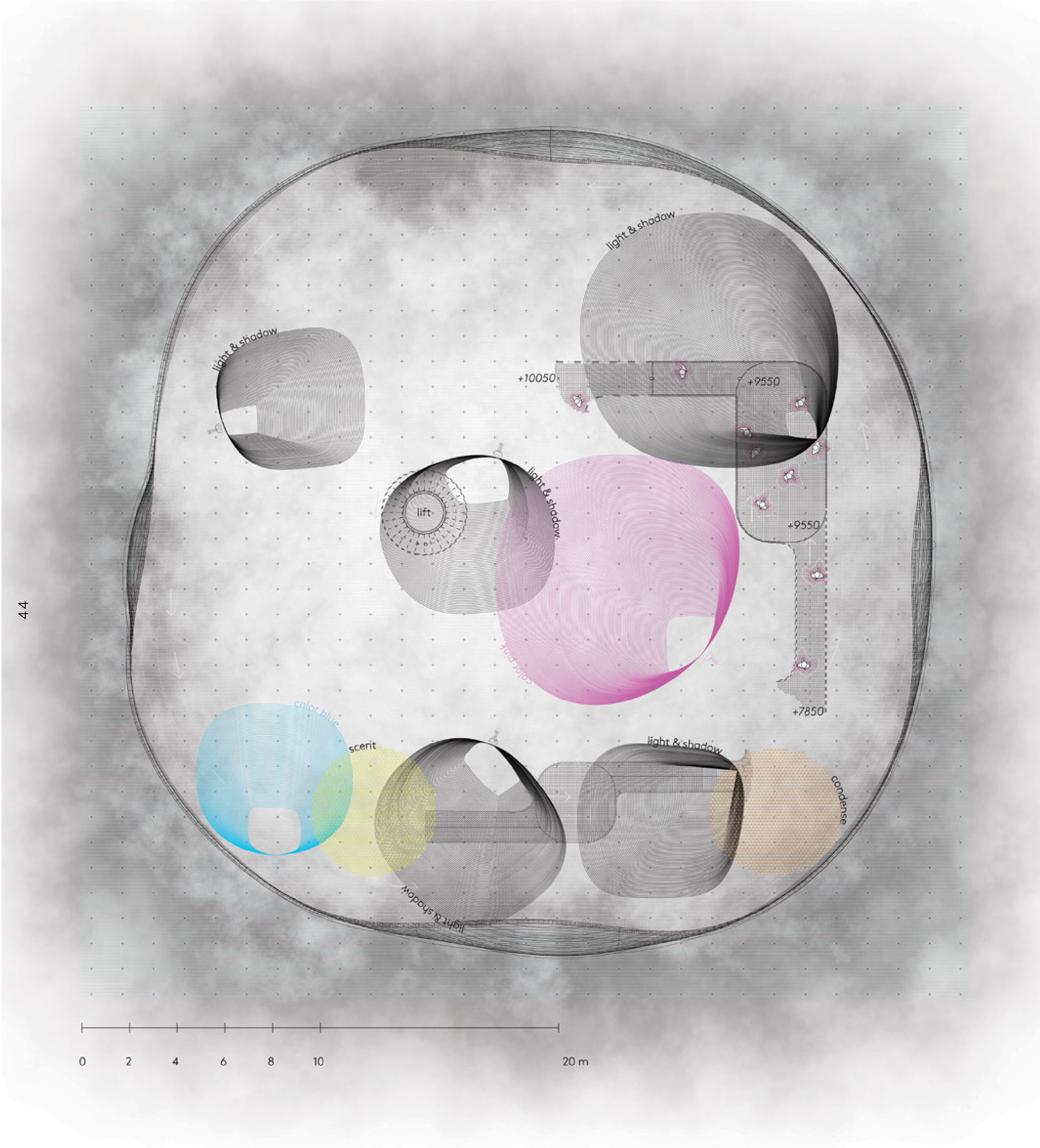
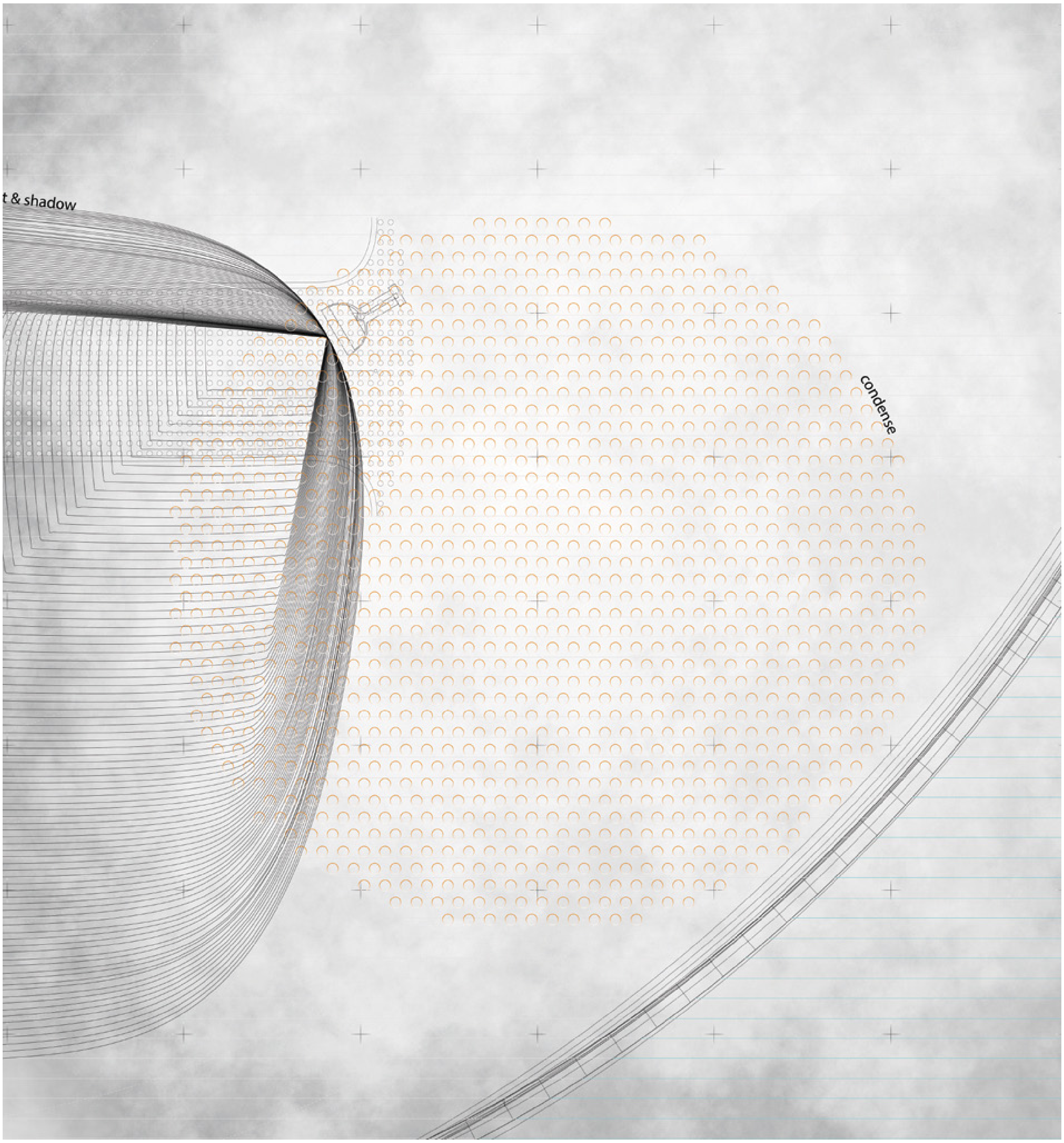


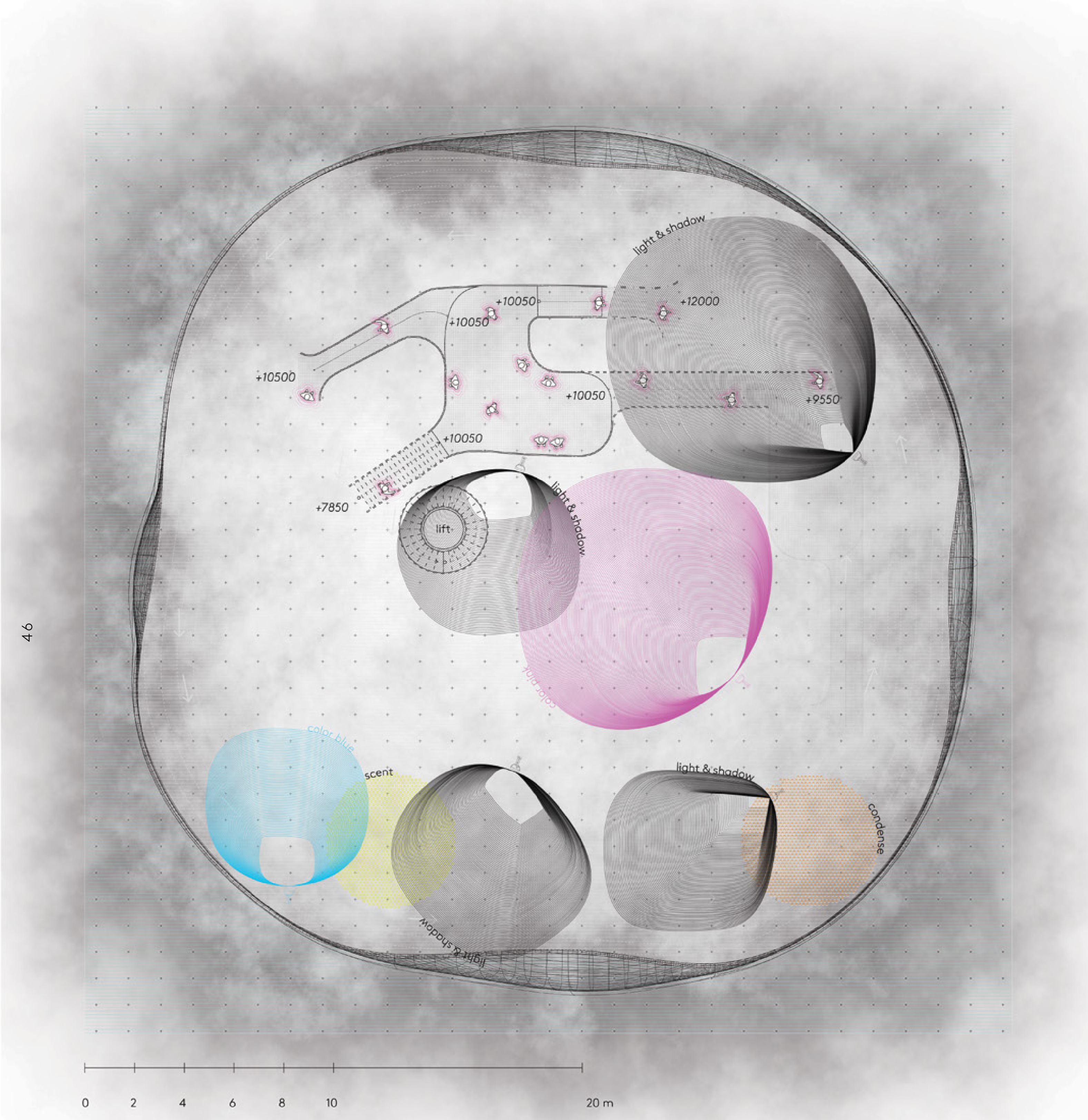

light & shadow

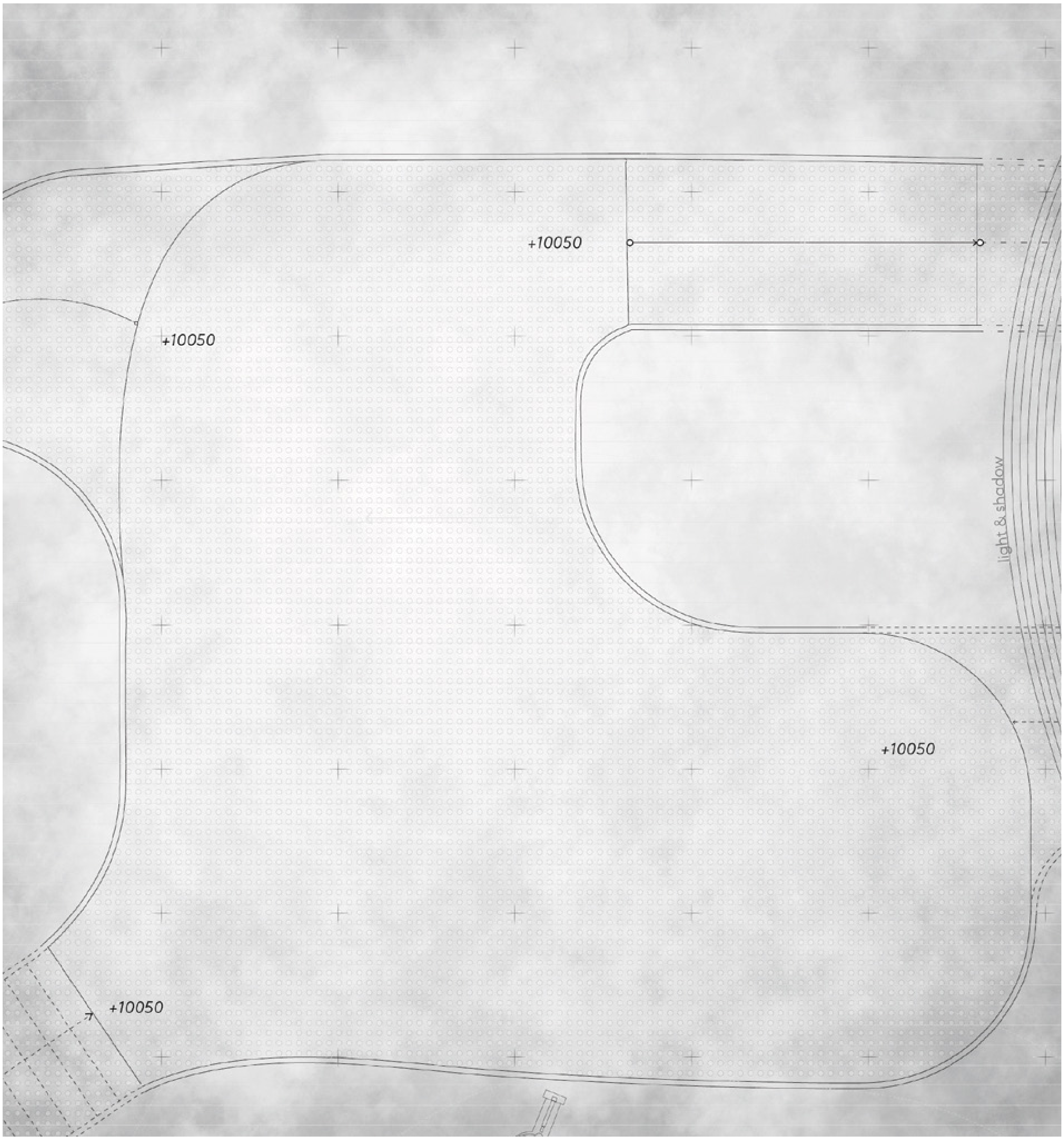
LEVEL V, SCALE 1:200




t & shadow
condense

LEVEL VI, SCALE 1:200




+10050
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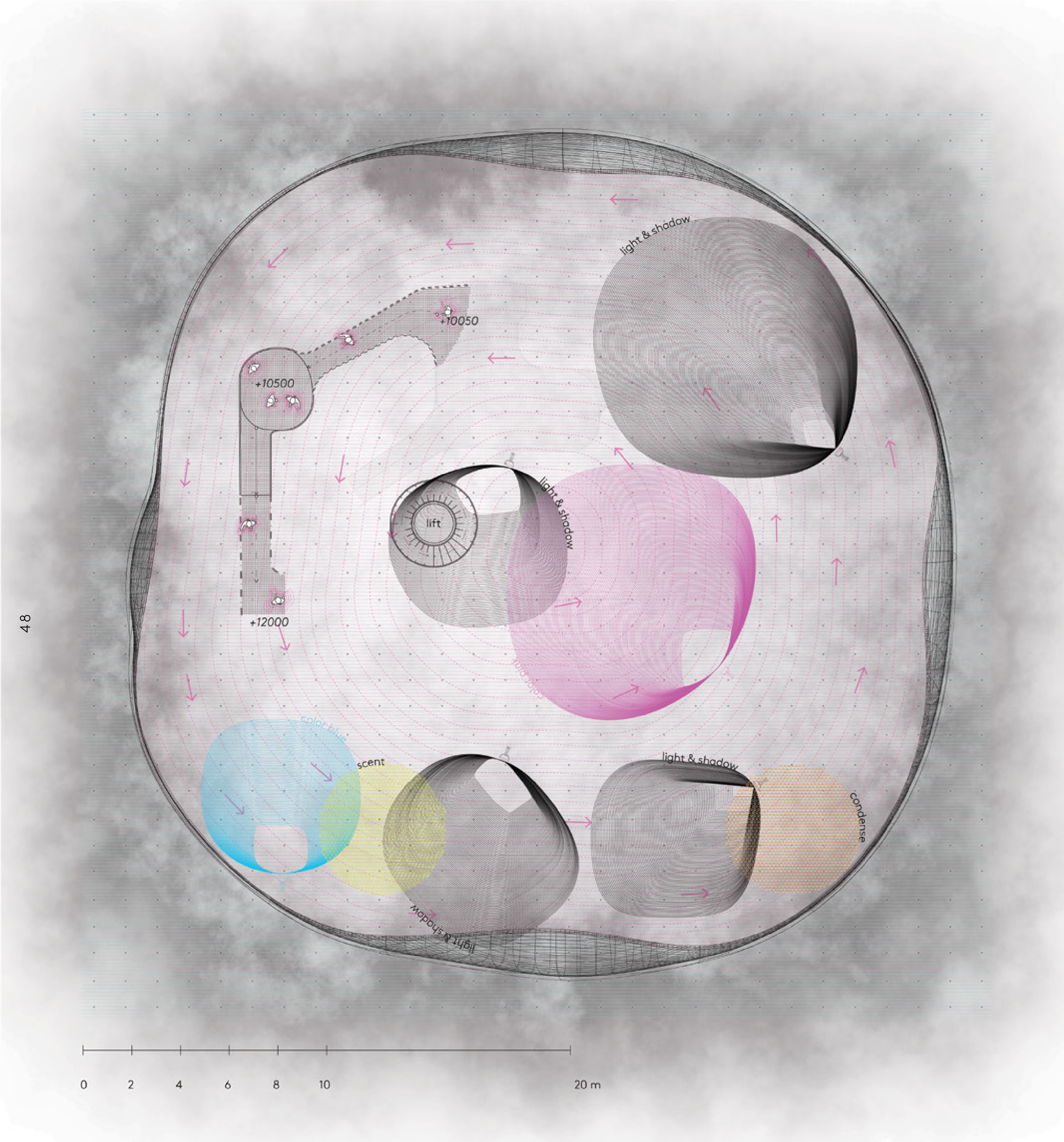
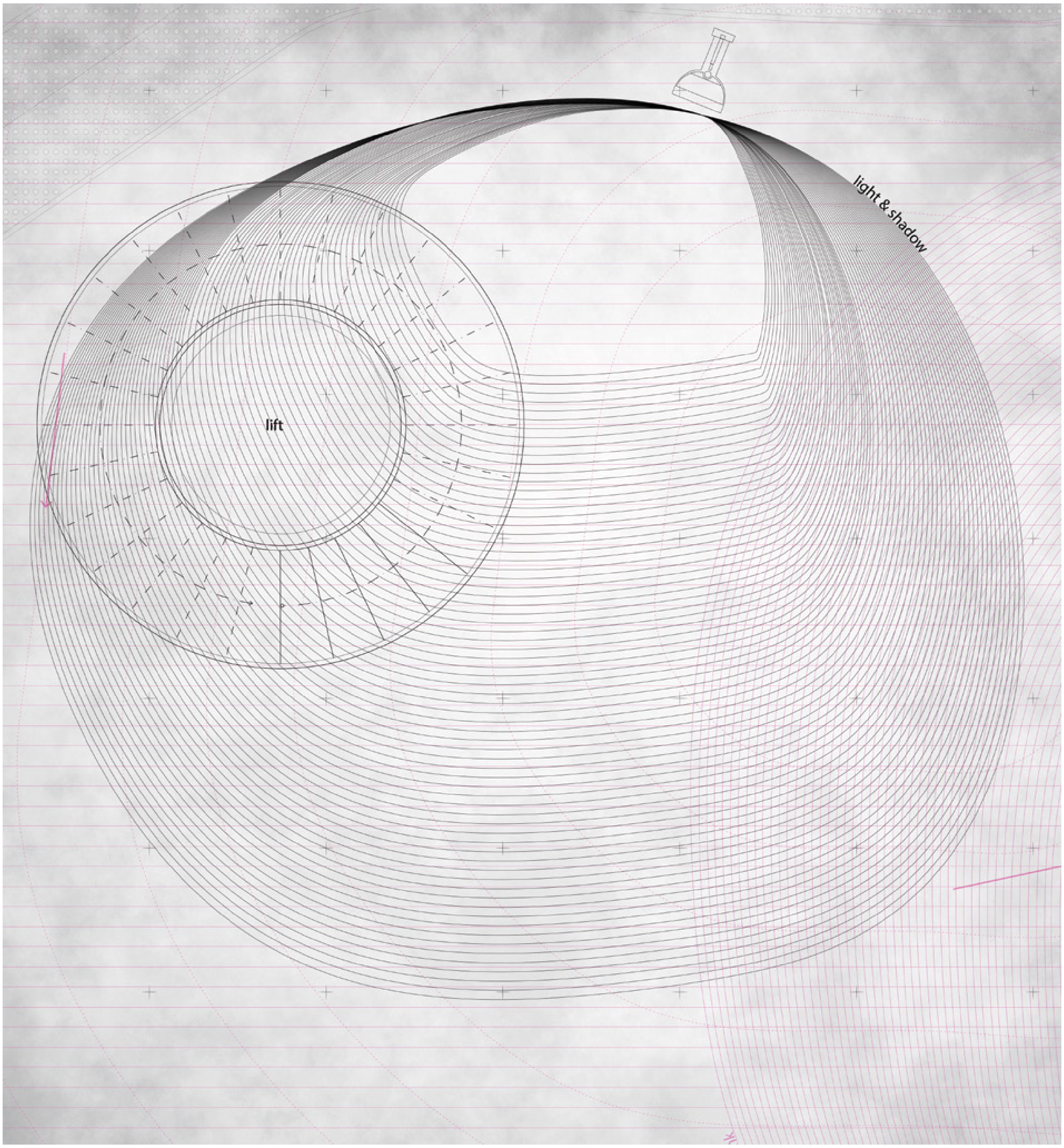
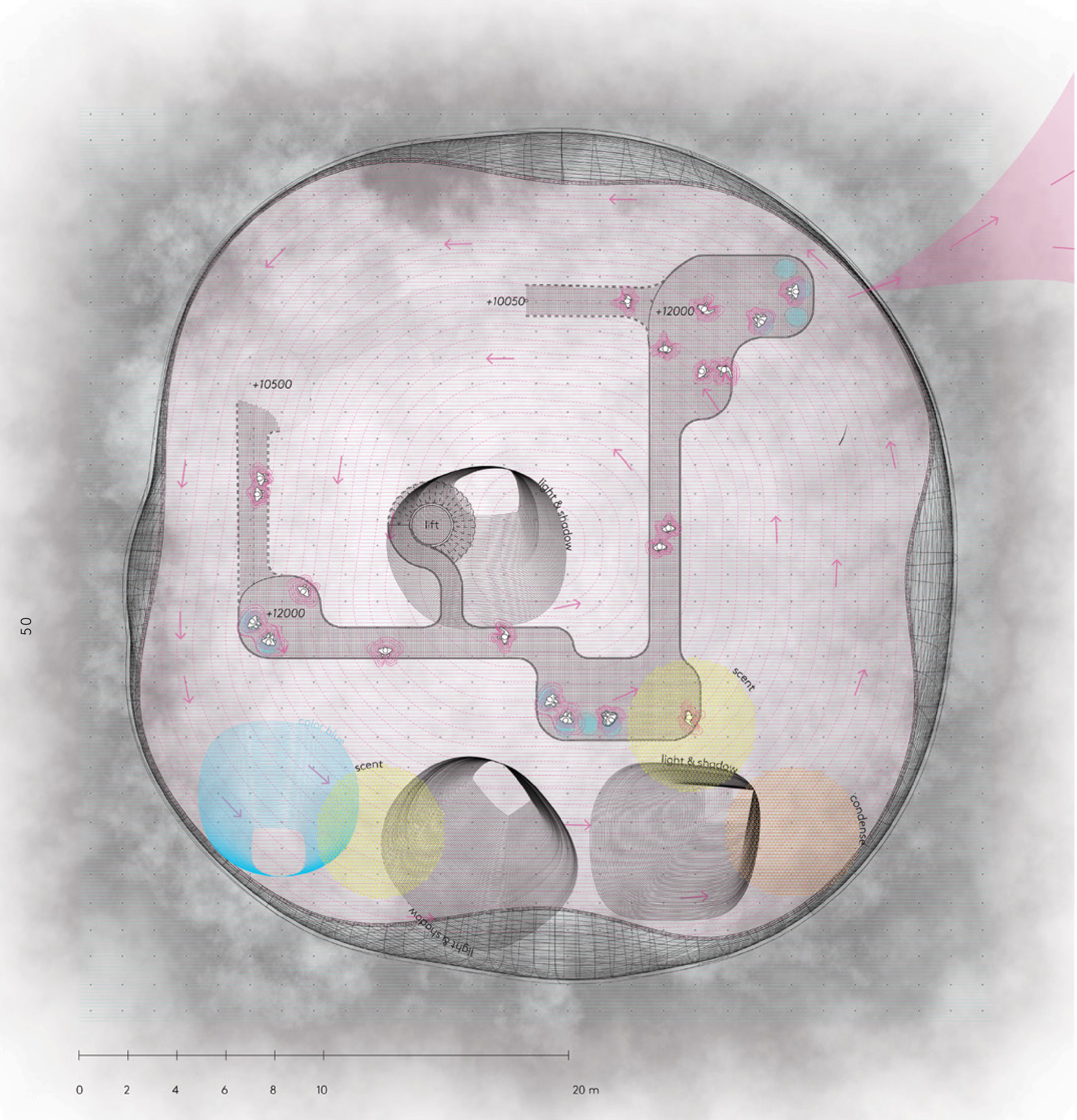
+10050

LEVEL VII, SCALE 1:200

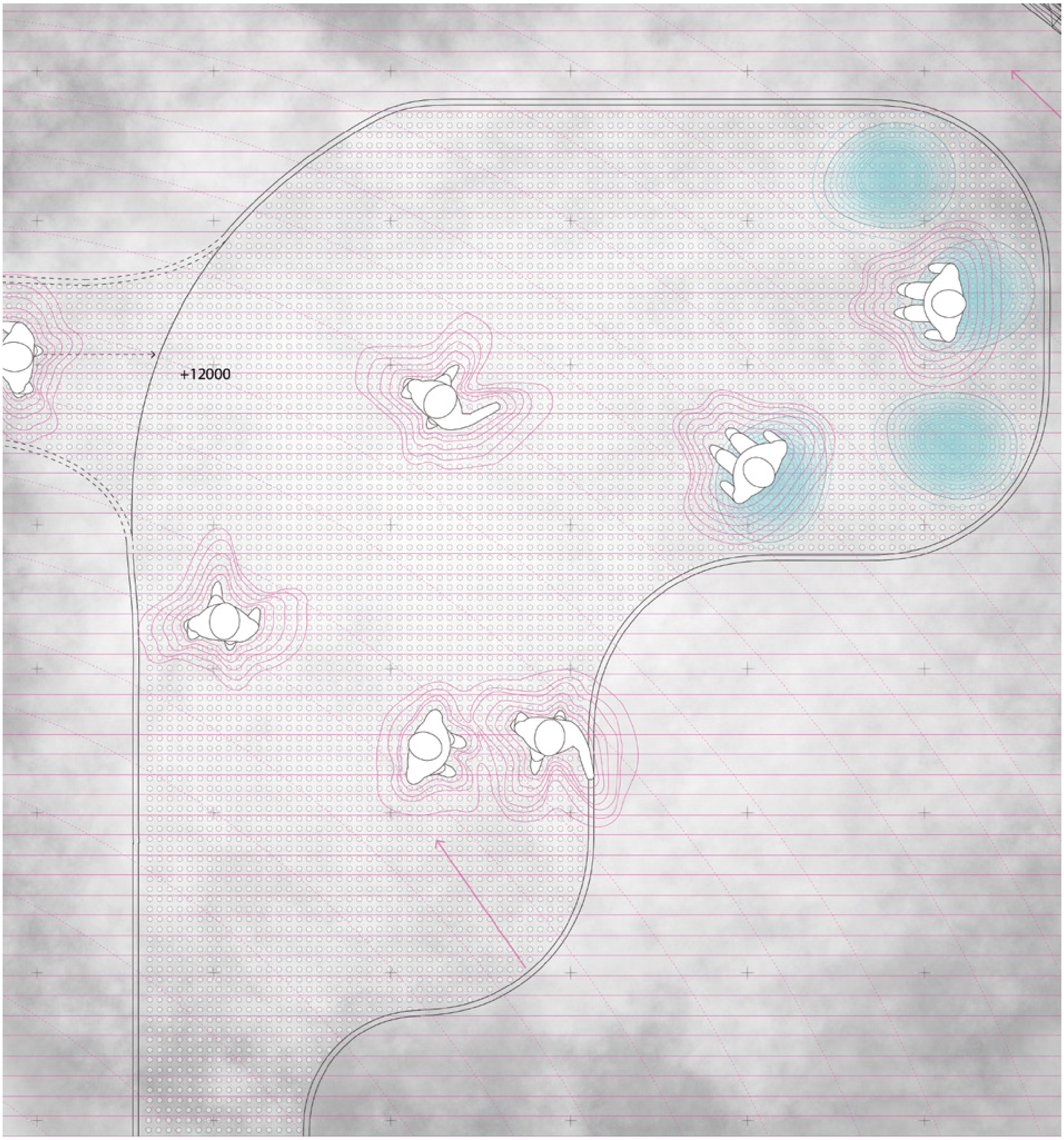



light & shadow
lift

LEVEL VIII, SCALE 1:200

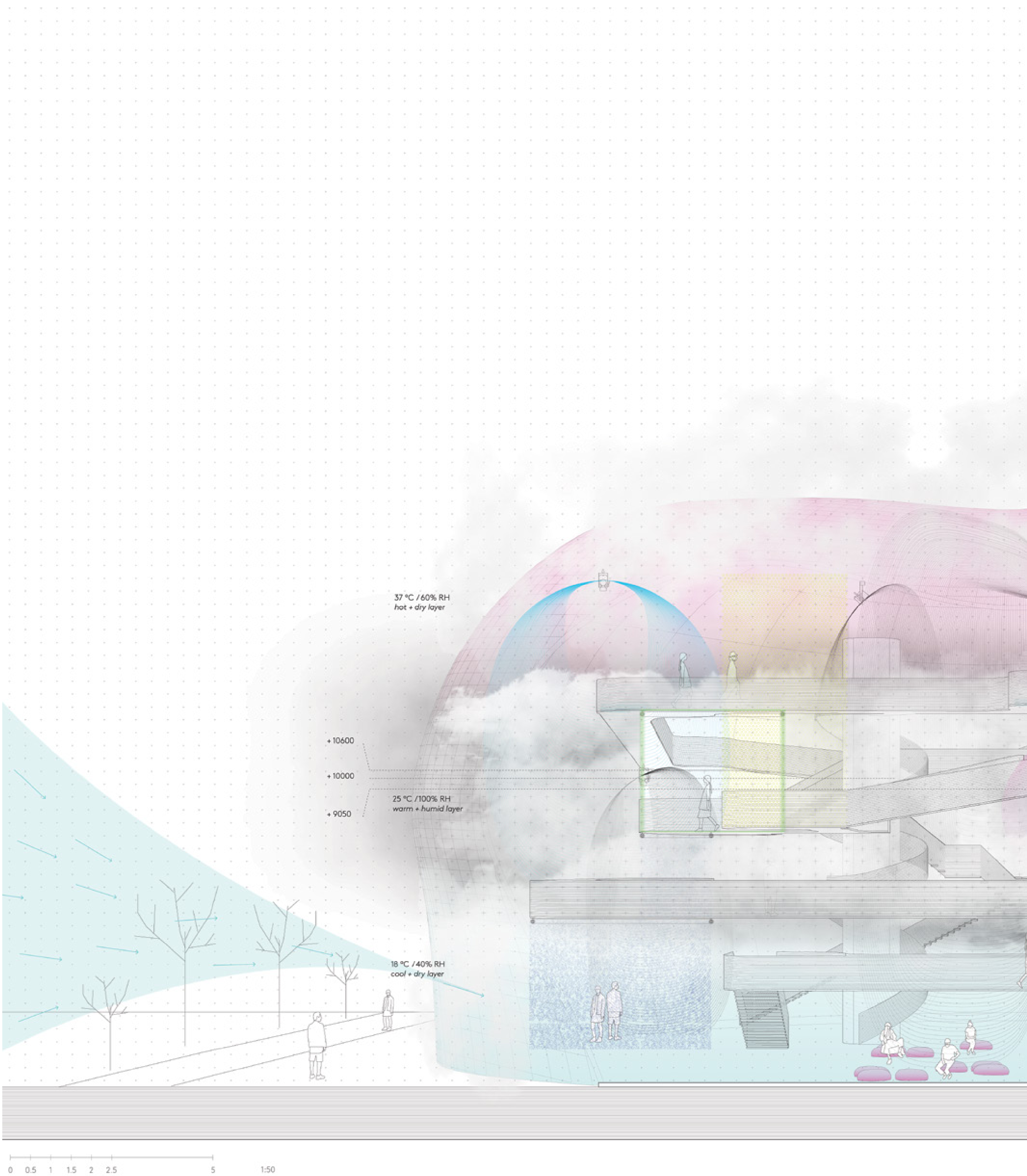


LEVEL VIII, SCALE 1:50, PLATFORM



The plastic envelope is stabilized by the pressure of compressed air and supported by internal air pressure. Cables are used to stiffen the fabric. It is needed for the climate engineering to keep the air layers in control.

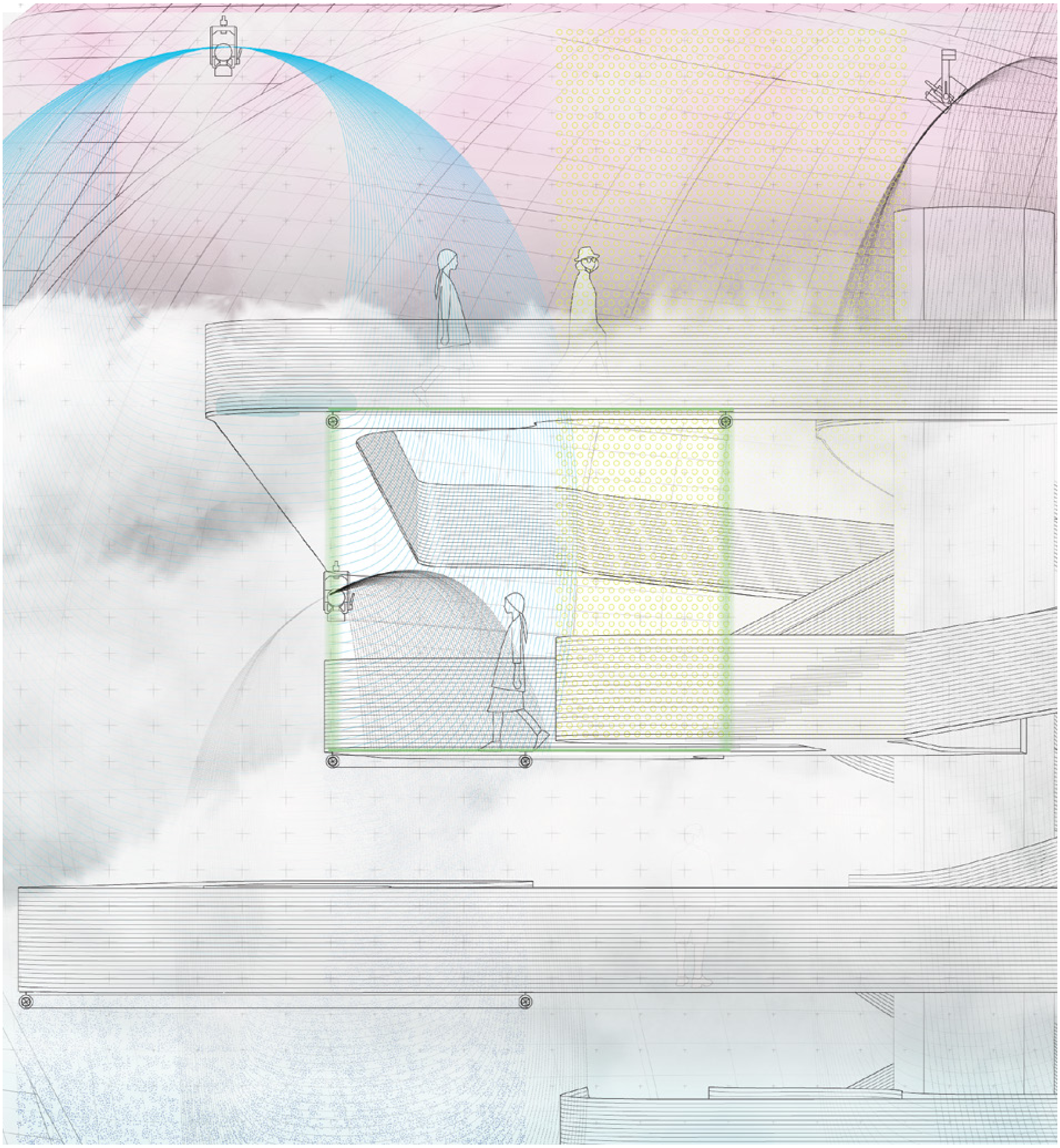
SECTION

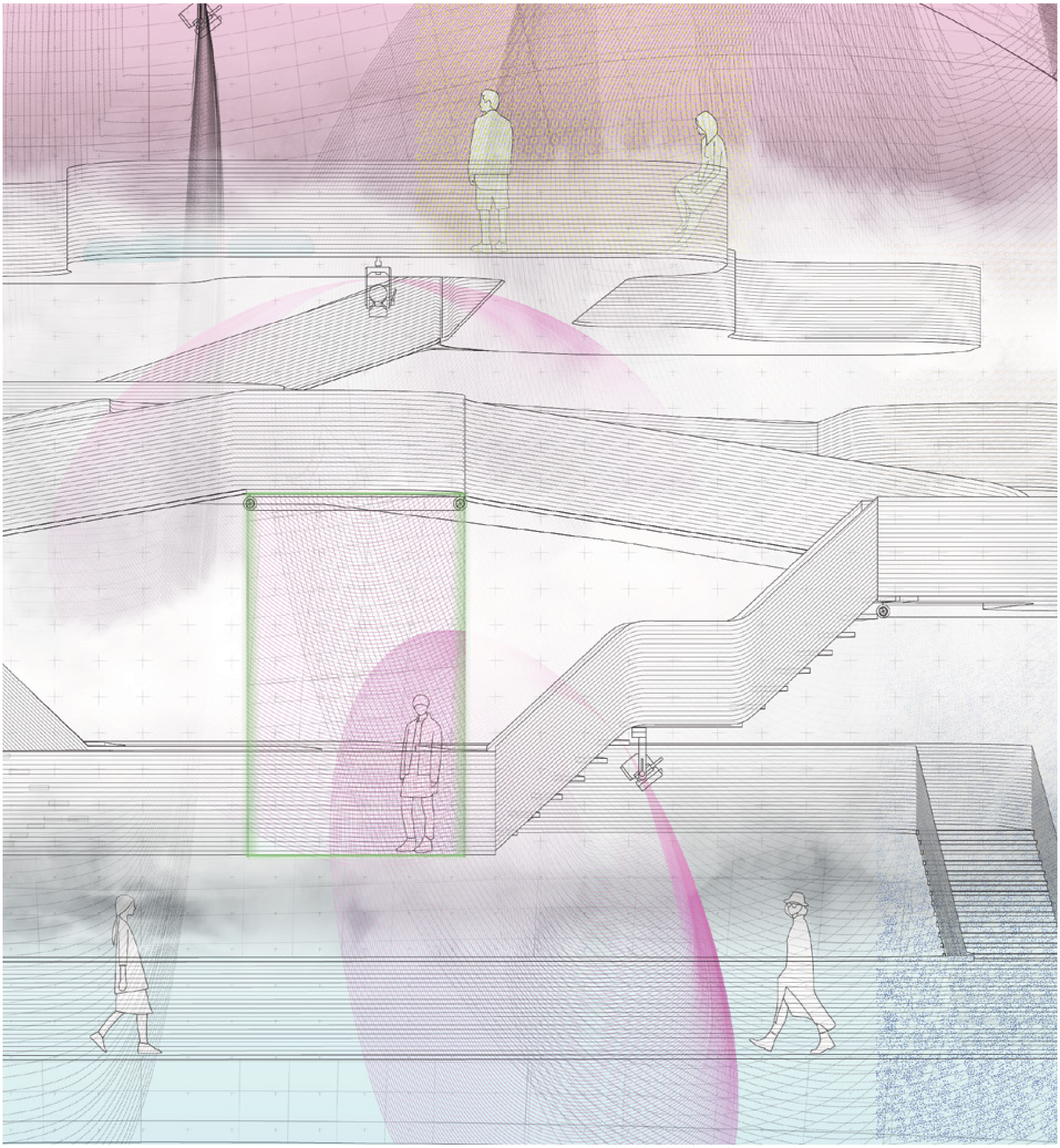


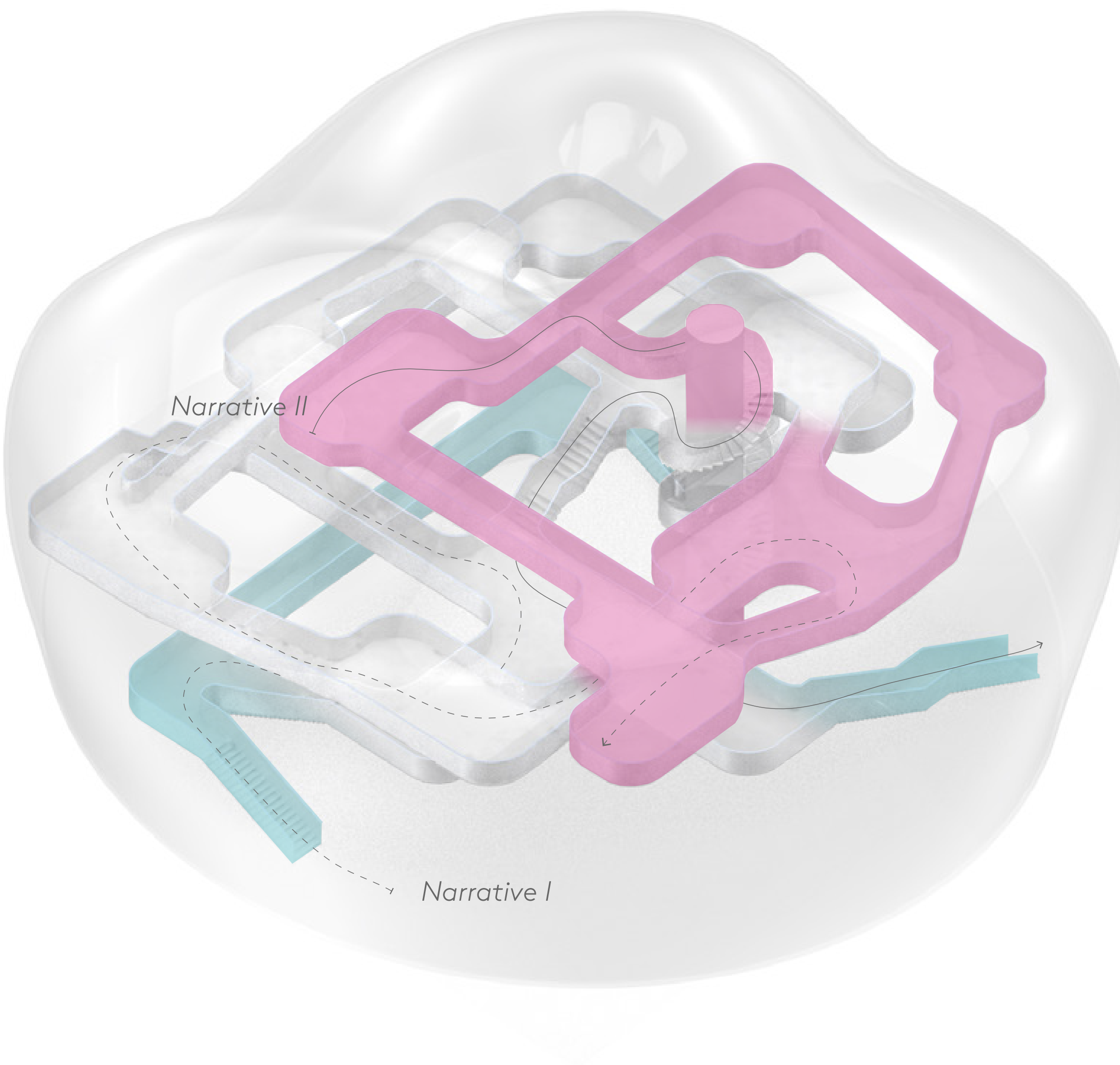
37 °C / 60% RH
hot + dry layer
+ 10600
+ 10000
+ 9050
25 °C / 100% RH
warm + humid layer
18 °C / 40% RH
cool + dry layer
0 0.5 1 1.5 2 2.5 5
1:50


+ 12050
+ 9550
+ 7850
+ 5050
+ 2550
+ 0

DETAIL SECTION, SCALE 1:50

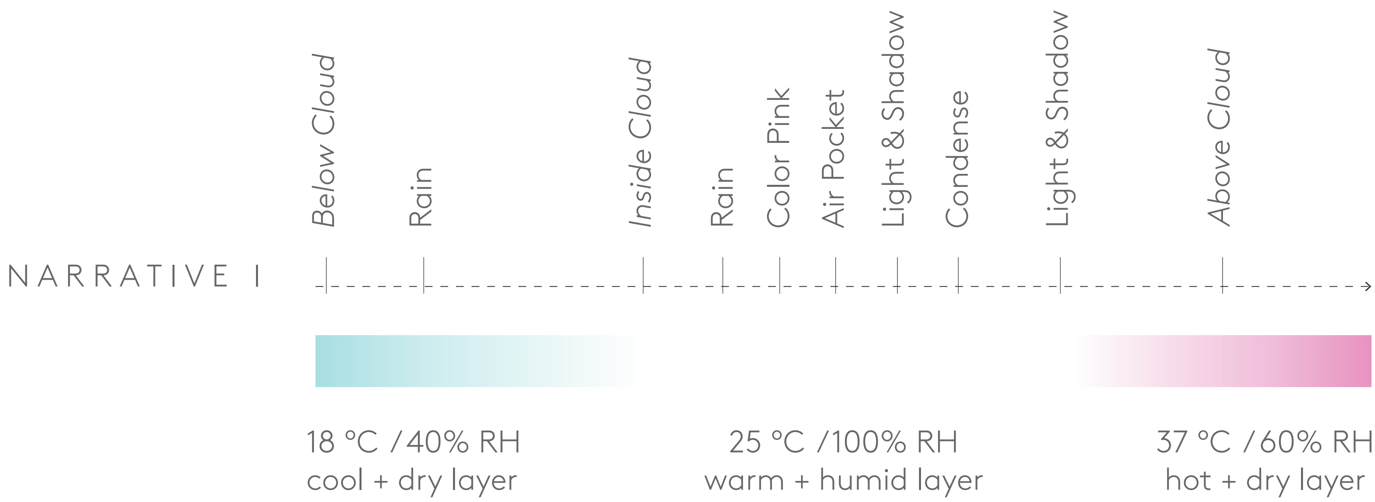


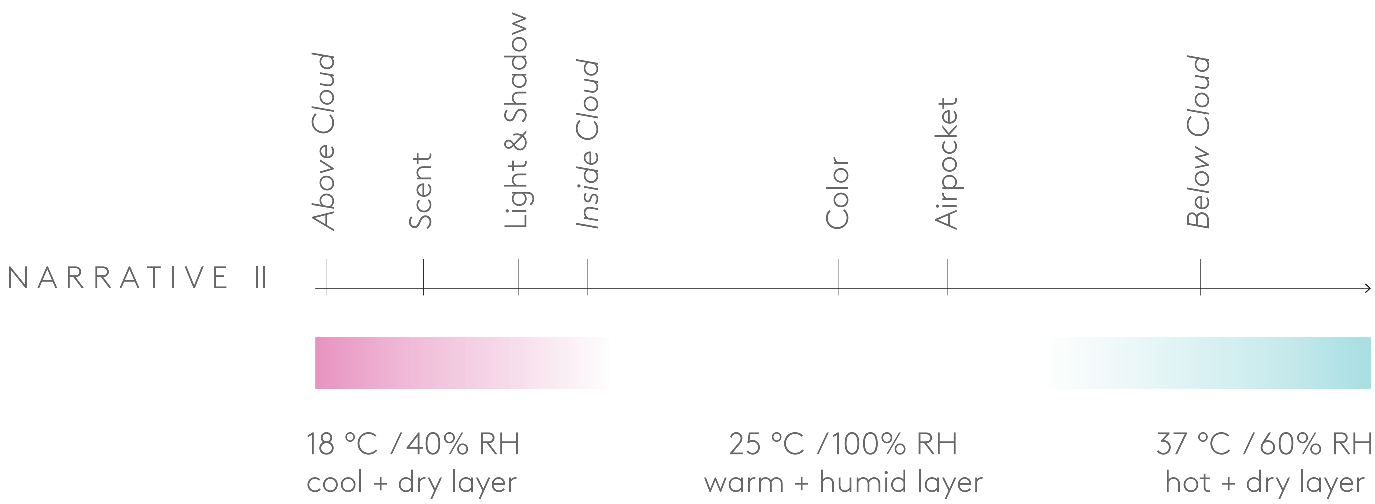




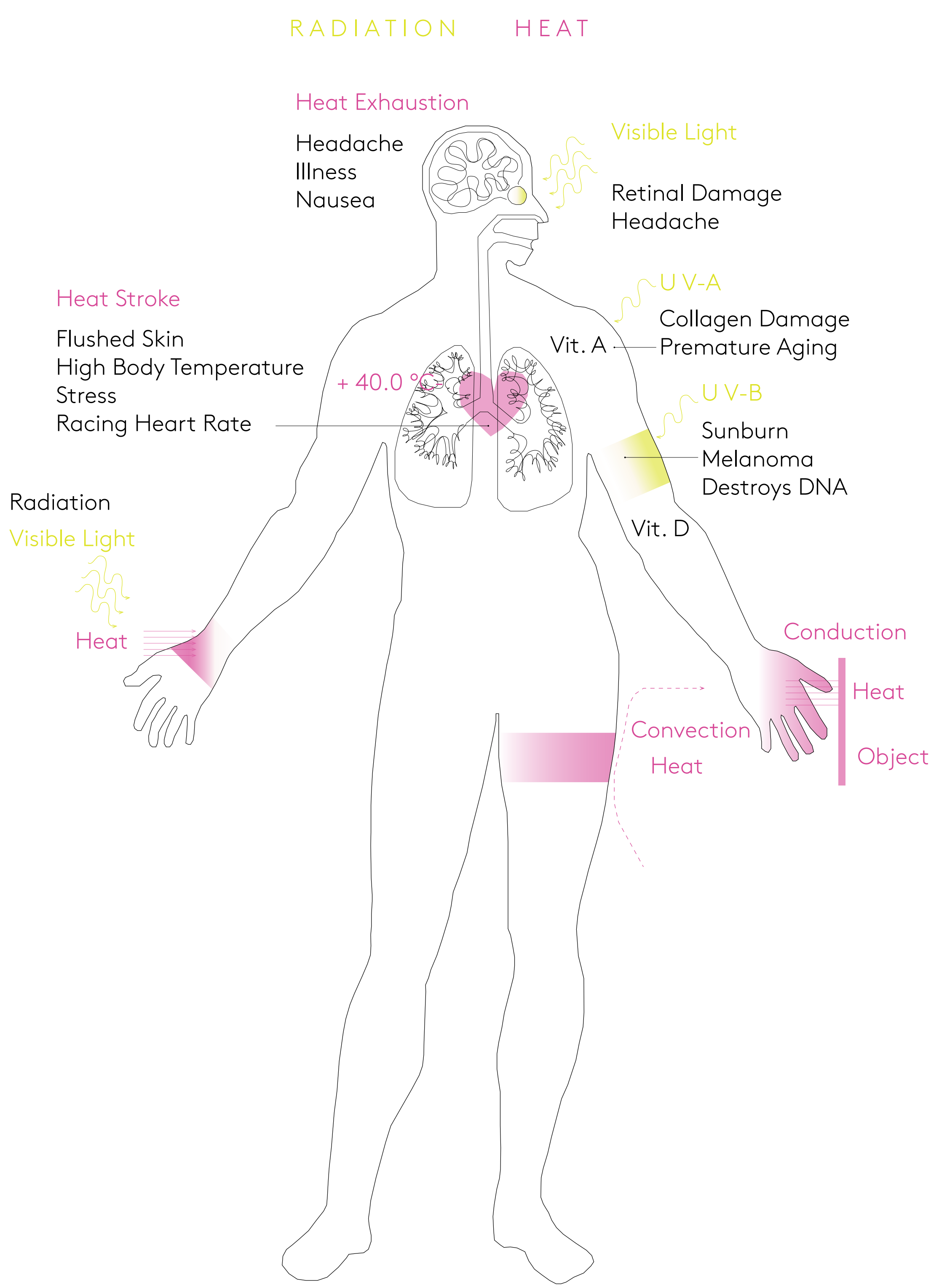
The perspective above showcase one narrative walk though the pavilion. Staring on the groundfloor, walking though the cloud and above it, and then descending down to the ground floor again...

PARALLEL NARRATIVE



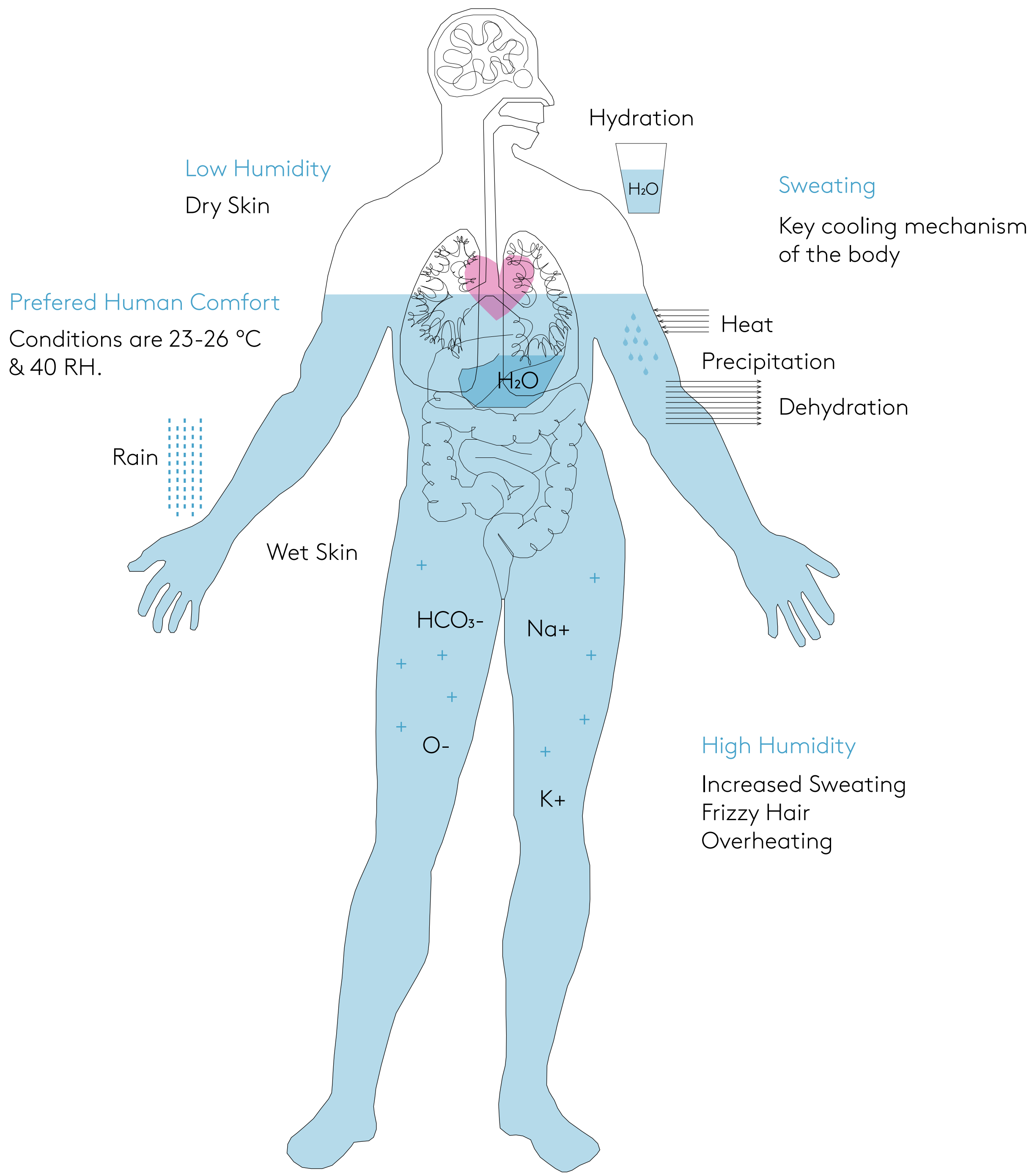


...Though this narrative walk, the user encounter no less than 16 microclimates within the cloud, as well as a temperature gradient ranging from +18 °C to +25 °C to +37 °C, and then back to +25 °C and finally +18 °C. These temperatures are also connected to a relative humidity that ranges from 40 %, to 100 %, 60 %, and then back to 100 % and 40 %. If this user choose another path, the experience will be different.

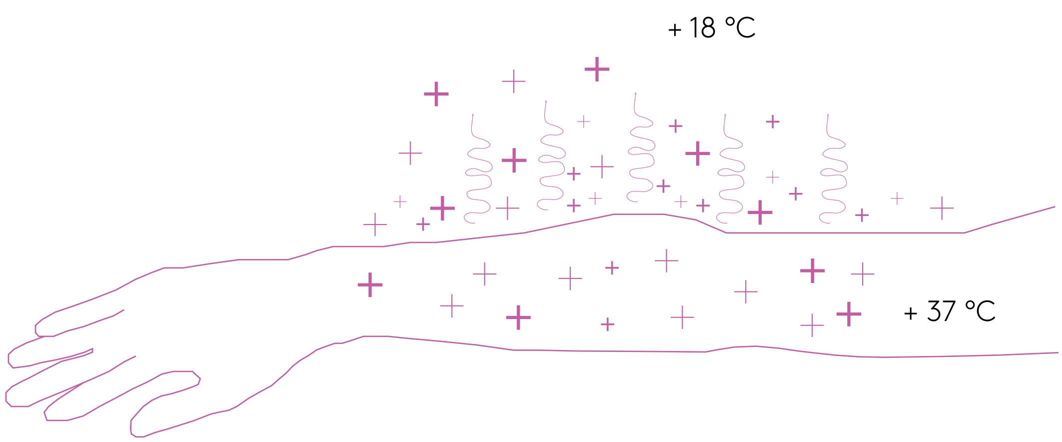


The drawing describes how radiation and heat relates to the human body. Part of the experience in the project is to walk though a gradient in increasing or decreasing temperature, which makes is important when designing microclimates to understand how the human body physically react to high temperatures.

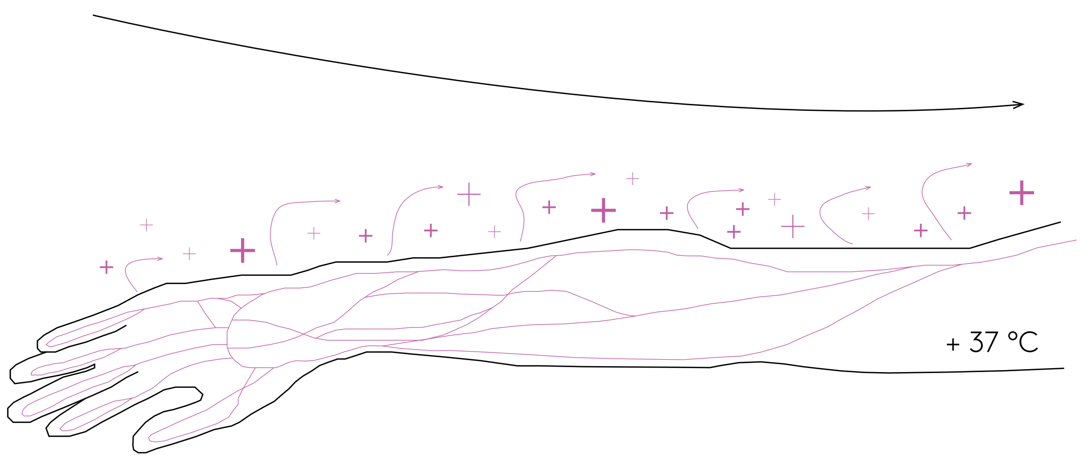
HUMIDITY



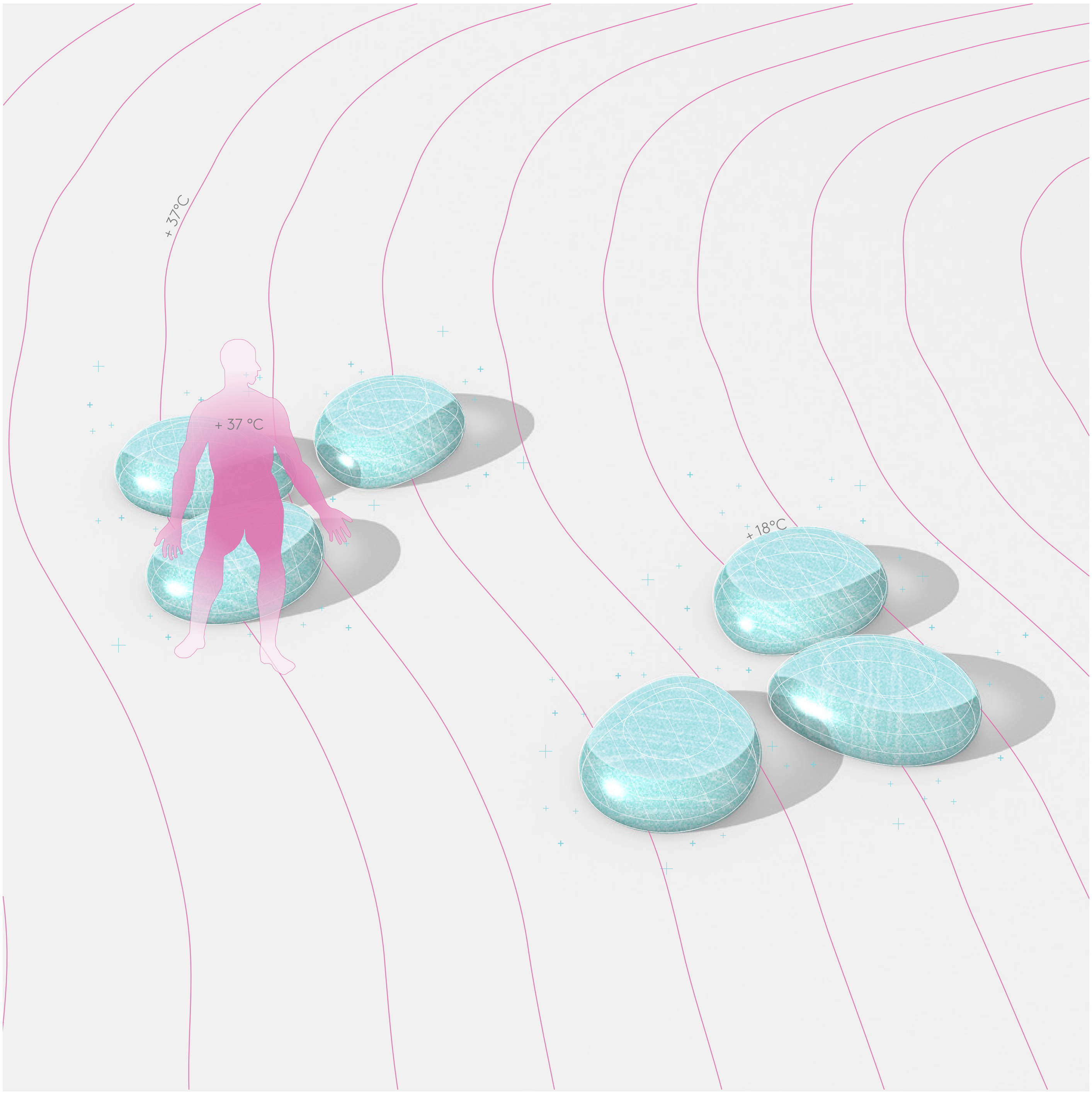
The drawing describes humidity in relation to the human body. Part of the experience in the project is to encounter levels and spaces with different relative humidity, which makes is important when designing microclimates to understand how the human body physically react to that.



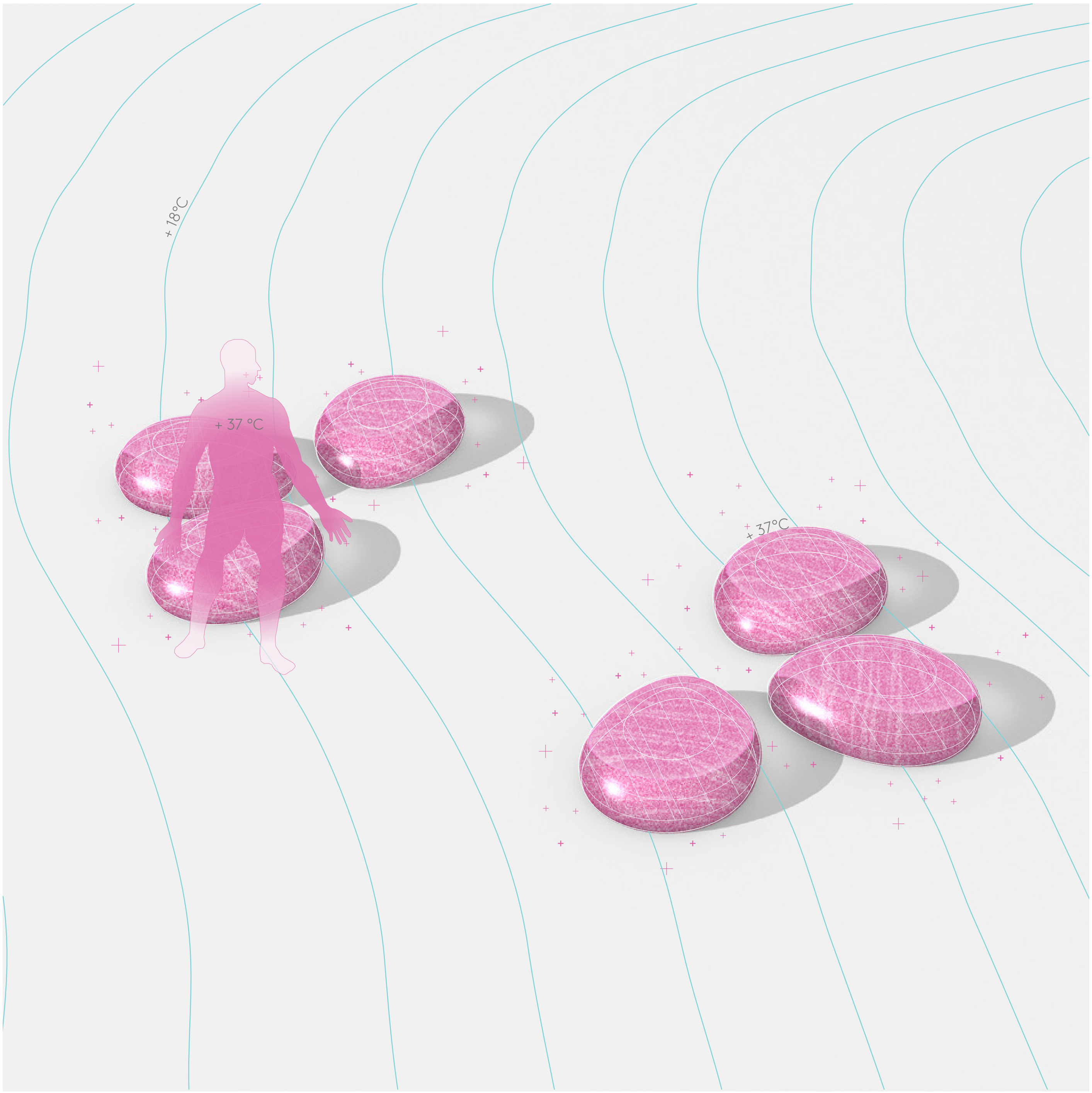
Heat transfer from the hot skin to the cooler air through direct contact, a process that is called conduction. This physical process describes what happens in the ground floor of Le Temps, where the air is + 18° C and the relative humidity is 40 %. The experience is that the space is perceived as cool and dry on your skin.



Breeze facilitates convective heat loss from the skin, something that we experience as a cooling effect on the skin. This happens if the breeze reach a velocity that is more than 5 m/s. This is considered in the project, so that the windspeed in the air curtain system is less than 5 m/s to avoid abrubt transitions and instead embrace the subtle changes of air and density. The height of the microclimates that are designed with air curtains, is not higher than 4 meters so avoid the 5 m/s limit.



At the top level, the temperature is +37°C, while the seats are +18°C. This changing of temperature increase the moment of presence and enable time for reflection and understanding. The seats are considered as small clusters of microclimates.



At the ground level, the temperature is +18°C, while the seats are +37°C. This changing of temperature increase the moment of presence and enable time for reflection and understanding. The seats are considered as small cluster of microclimates.

04: DESIGNING MICROCLIMATES

WHAT IS A CLOUD?

Clouds are formed when the water vapor in the air is condensed on small particles that is in the air. This happens only when the air is supersaturated, which means when the relative humidity (RH) is more than 100 %.

Clouds are important elements of our atmosphere; it is a crucial, and visible, part of the terrestrial water cycle; carrying water from the oceans to the land and enabling life on earth, filtering sunlight and regulating temperature by embodying and releasing solar energy. Clouds are marvelous. They naturally find balance while constantly changing. We often daydream of clouds, silently moving high above earth, dreaming of what it would be like to live in the ethereal world of fluffy water vapor.

The indoor cloud in Le Temp resembles an Altostratus Cloud, designed with different microclimates, to enhance the experience of the cloud. The cloud has many architectural qualities; it is formless, depthless, massless, scaleless, purposeless, featureless, dynamic and dissolving. Everything that architecture is not but wants to be. Some of the characteristics of clouds are different levels of visibility that ranges from mist, to fog and cloud.

WHAT IS A MICROCLIMATE?

We encounter microclimates every day, but we might not notice it or think about it as microclimates. A microclimate is often an unintentional by-product and can be shadows or reflection from a facade that affects the temperature or ambiance of light, or even excess heat from computer use or body heat from being too many people on the tram. All these create local microclimates that are very present in our lives. The transition from a microclimate to another can be both distinct and subtle. In Le Temps, the microclimates are defined through invisible spatial boundaries within the cloud by changes in temperature, air humidity, light, color, sound, and scent.

Parts of the cloud have been manipulated to behave differently to create different local experiences. These changes affect how the user will perceive a space both visually but also physically. The microclimates are spread vertically and horizontally in 8 different levels in the cloud. The placement provides different experiences for the user, where some such as the rain, color and 3D shadows can be seen from distant while some are hidden within the cloud. These do not only enhance the experience of being inside of a cloud, but also show the possibilities to design architectural qualities through climate.

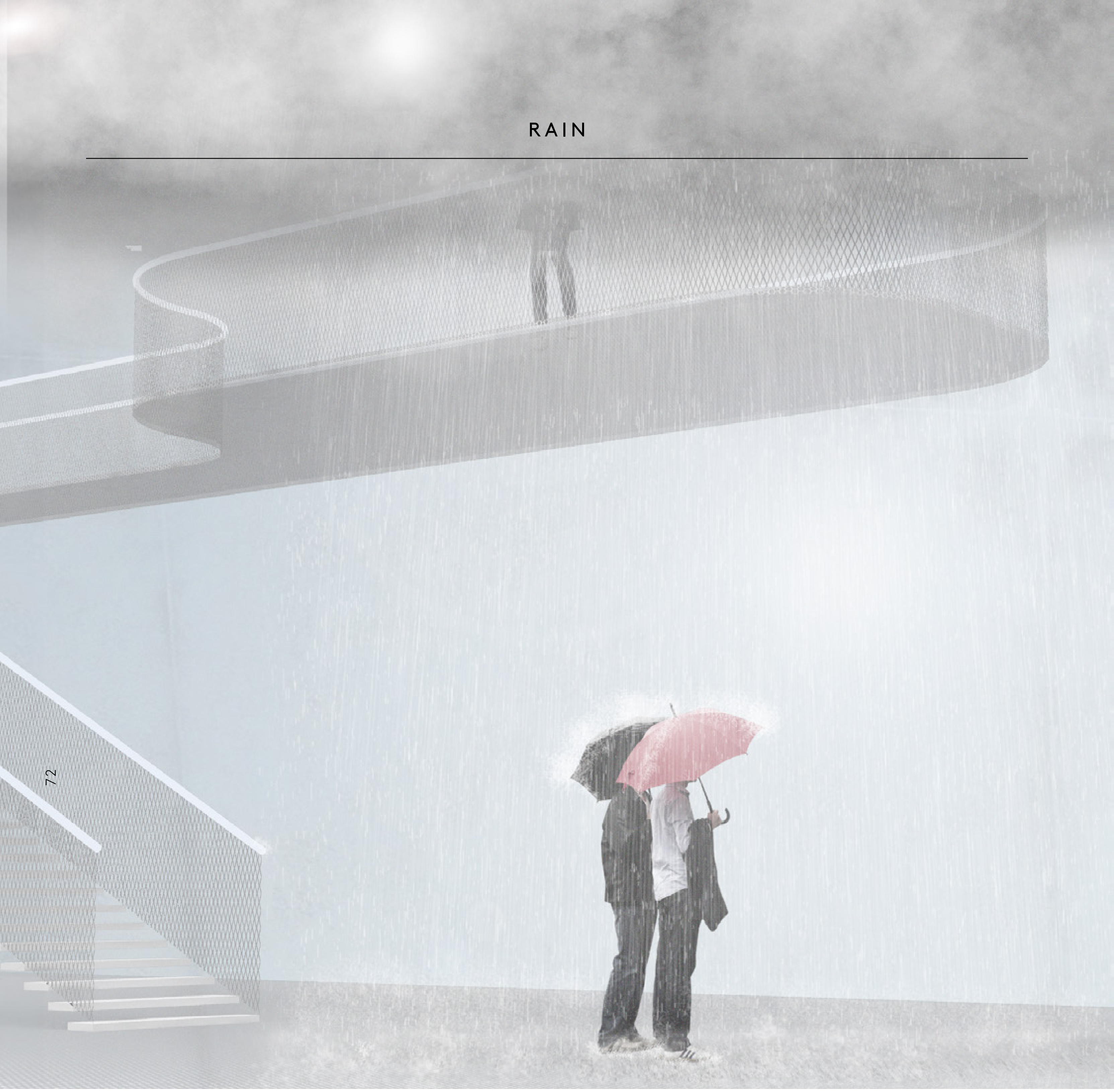
Instead of using solid walls, the project seeks to implement a more subtle change in dissolving spaces and experiences, that is implemented through the use of air curtain systems.

Example of fluids are air temperature, relative air humidity, air pressure, scent, color, and airflow.

To achieve these specific climate conditions, pipes are placed around the space in three levels. The cold air layer on the ground floor, a hot air layer at the highest level 8 and a middle layer where high pressure nozzles are used to feed the cloud with.

The cloud is in constant change and is a part of our natural environment (air), that surrounds and engages us. The invisible differences in temperature and air humidity influences the experience and together with the microclimates, makes for an interesting and engaging experience.

RAIN

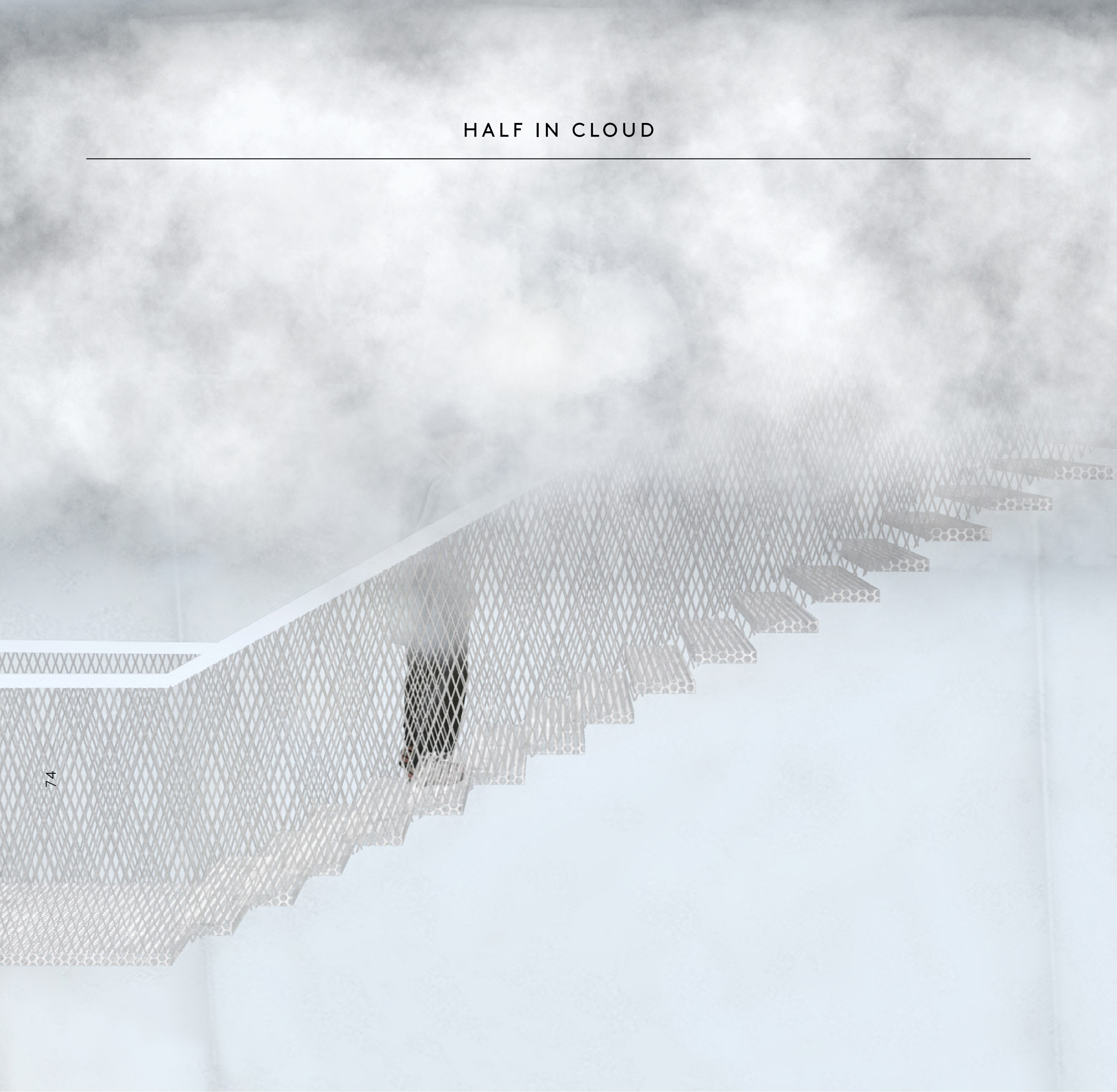


The first microclimate in the narrative walk (narrative I, page 59) is rain. Clouds consists of small water droplets or crystals. Since they are very small (micrometer), they can float in air in contrast to rain droplets. Rain droplets are created when the cloud droplets grow and become heavy enough to fall down. One possible way to create rain as a microclimate is to add small water droplets that through condense evolves to rain droplets.

Another method to create rain is to sow rain in an artificial way. By adding dry ice to a saturated cloud, the water droplets freeze the particles, which eventually melts and fall down as rain.

Walking up the stairs, moving through mist, fog and cloud, the user instantly and surprisingly experience another microclimate with rain. Since the visibility is less than normal, the microclimate is not noticeable until the user is right upon it.

HALF IN CLOUD



Heat transfer from the hot skin to the cooler air through direct contact, a process that is called conduction. This physical process describes what happens in the ground floor of Le Temps, where the air is + 18° C and the relative humidity is 40 %, since the human body is approximately +37°C. The user will experience the air as cool and dry on the skin. The ground floor gives you a clue of what to come, looking up at the cloud, the user might feel curiosity and suspense.

Gradually entering the cloud, the user might feel surprised as the temperature and air humidity changes, the visibility decreases and the user has to rely more on other senses rather than sight and therefore slow down its pace. The cloud has the power to dematerialize the architectural boundaries, as well as blurring them to create new dimensions and experiences. To create visibility, light is added to the railing for guidance. The temperature is now +25°C and the relative air humidity is 100 %.

The color affect the experience of the cloud, it highlights texture and densities, changing the cloud by simple means. A cold blue light is very different for the experience than a warm pink one, creating different appearances, using the white cloud as a canvas. Each microclimate is a surprise, or climax, and in between each microclimate, evoking curiosity and anticipation.

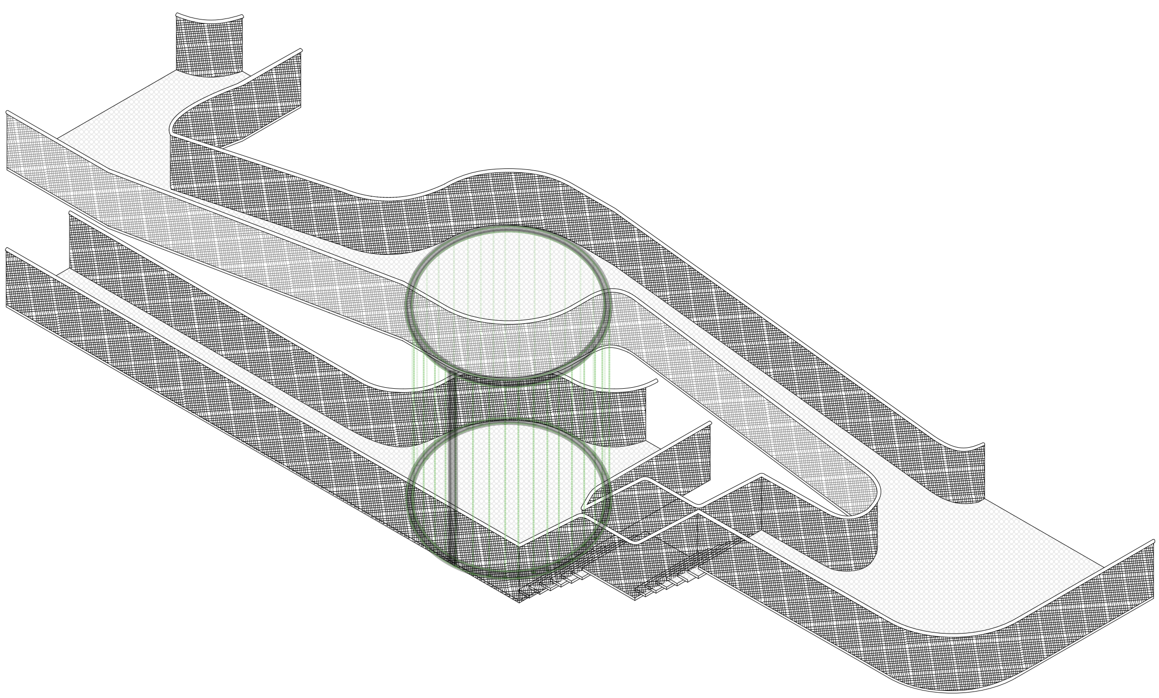
A shadow cast on a solid surface is a shadow cast in two dimensions, while a shadow cast though a cloud or fog is cast in 3D. This phenomena happens due to that the fog and the cloud are dense enough to be illuminated by light from within, but thin enough to let light pass through and illuminate objects further on. This is visible though parallel beams. This creates textures to the cloud, creating yet another experience of the surrounding.

The cloud is lit by lamps in different colors, to highlight the textures and densities of the cloud, but also to create different spatial qualities. A cold, blue light is perceived as colder than a warm pink light, which changes the experience by simple means, but is also very effective as spatial boundaries. The color adds another dimension to space.

Breeze facilitates convective heat loss, something that we experience as a cooling effect on the skin. This happens if the breeze reach a velocity that is more than 5 m/s. This is considered in the project, so that the wind speed in the air curtain system is less than 5 m/s to avoid abrupt transitions and instead embrace the subtle changes of air and density. The height of the microclimates that are designed with air curtains, are not higher than 4 meters to avoid the 5 m/s limit. This means that the transition from cloud to air pocket is barely noticeable on the skin, though visible as a subtle gradient of density.

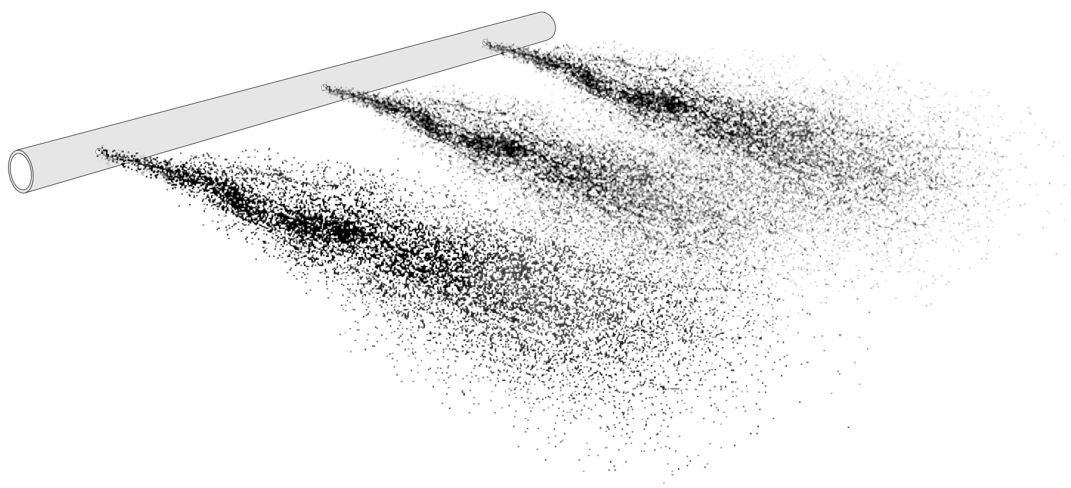
The microclimate air pocket is created by air curtains and creates a pocket inside the cloud, that enable the user to view the cloud as an object instead of an atmosphere while still being inside of the cloud. Walking through the subtle wall of air, evokes a feeling of anticipation and surprise. Being in the clear room within the cloud, offers the user a place to stay and reflect upon the experience before moving on.

Instead of using solid walls, the project seeks to implement a more subtle change in dissolving spaces and experiences, that is implemented through the use of air curtain systems.

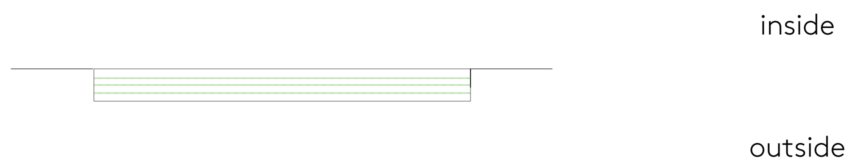


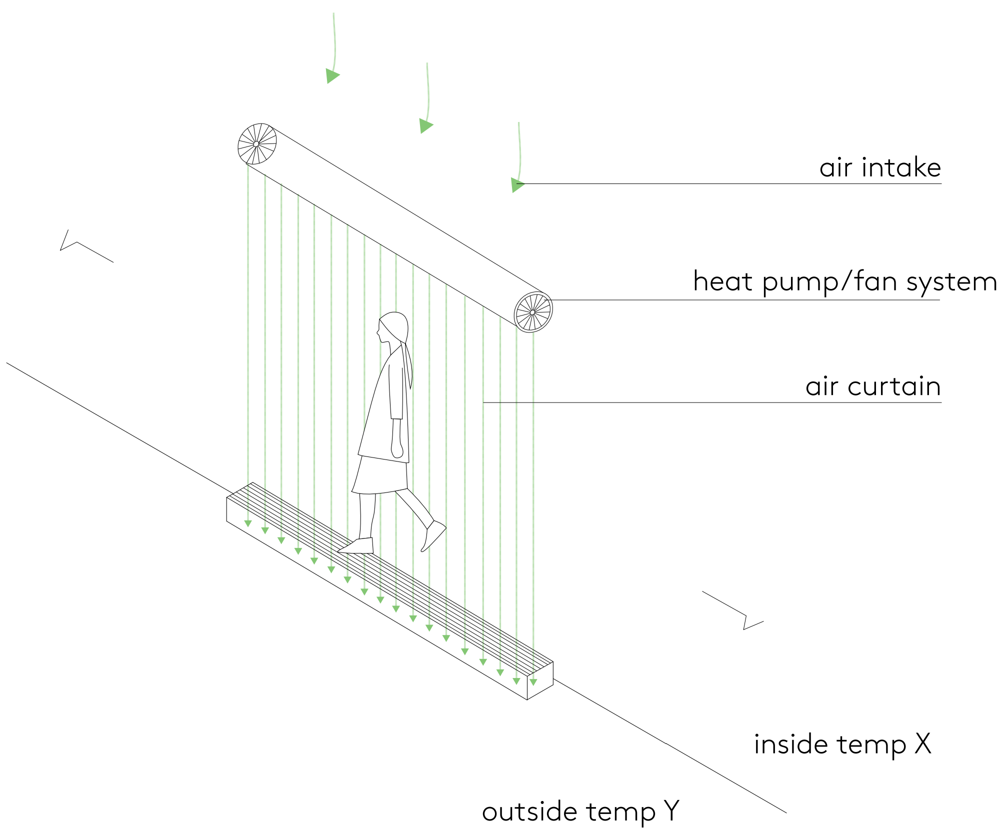
FROM EXPERIMENTATION TO DESIGN

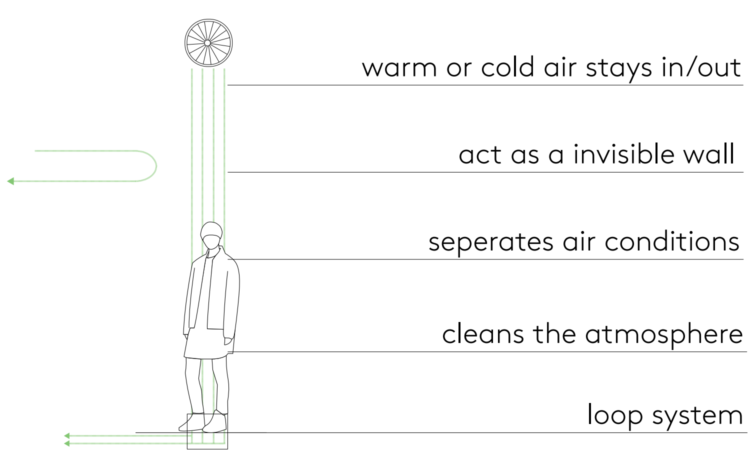
In the beginning of this project, dry ice was used to experiment on air pressure. That was later implemented in the design in how to increase the relative humidity in the middle layer (cloud layer). Along the walls and the walkways in the pavilion, there are small pipes with high pressure warm water nozzles, creating formations like in the photo from the experimentations (see page 153) .

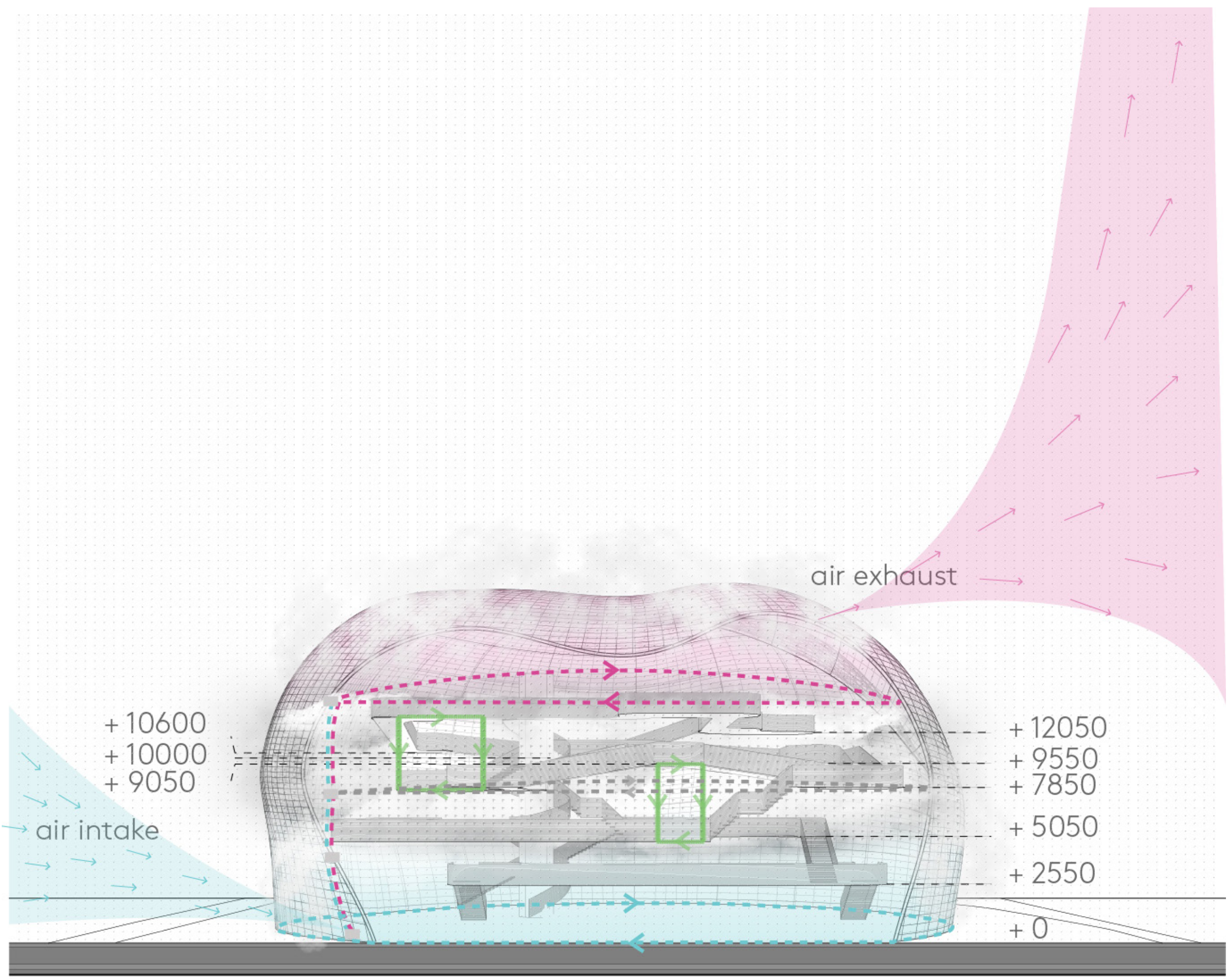


The user is now watching the cloud from above. It appears like a filter, but still gives clues of what goes on within the cloud at different levels. The air is 37°C and the relative air humidity is 60 %, which makes it hot and dry. The user find a seat to sit down and are surprised that the seat feel so cold. This is because, just like the human body, the seats are microclimates too, with a temperature at +18°C. Being seated, the user is given the possibility to slow down and reflect upon the experience before moving on, back inside the cloud.

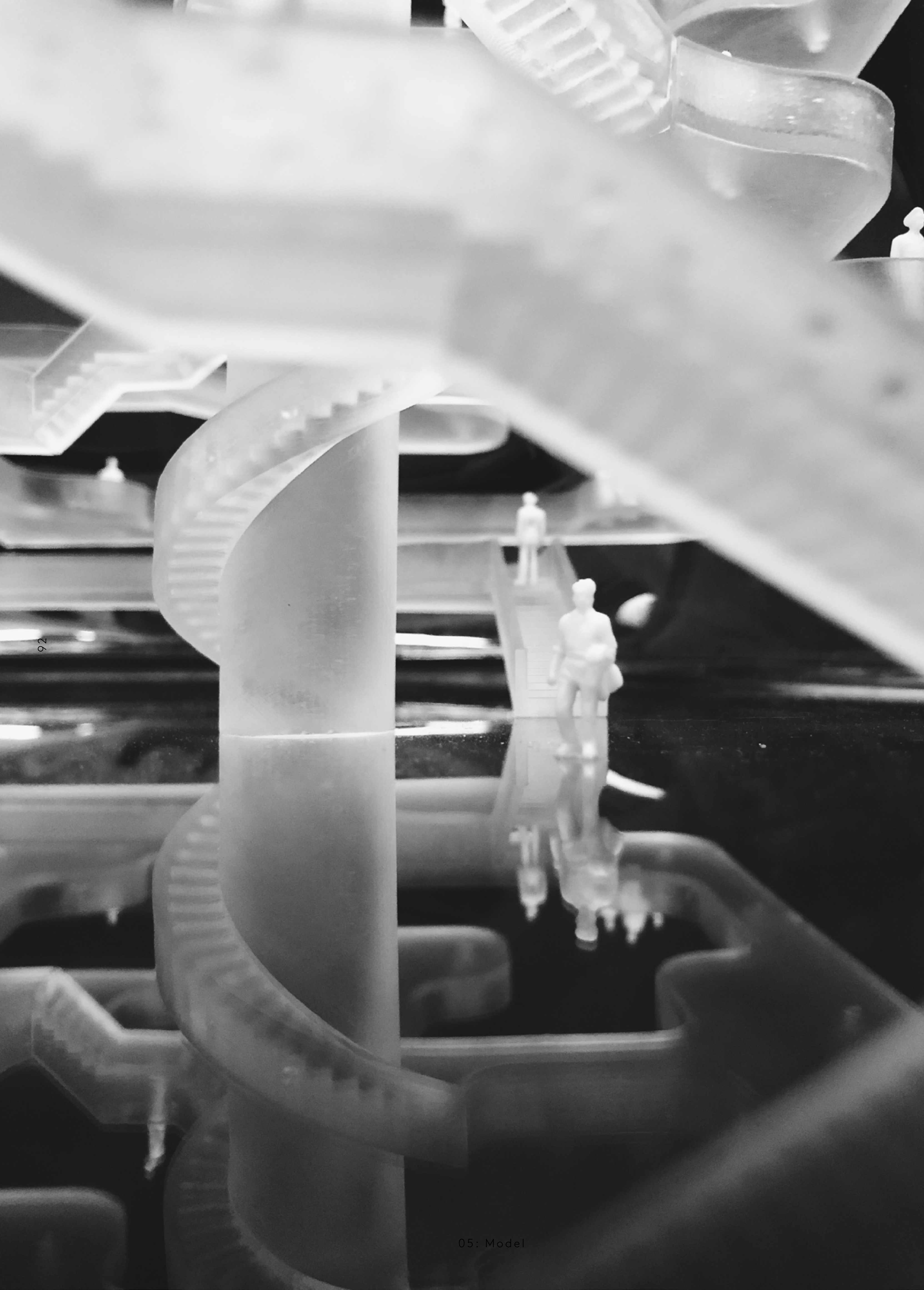

inside
outside

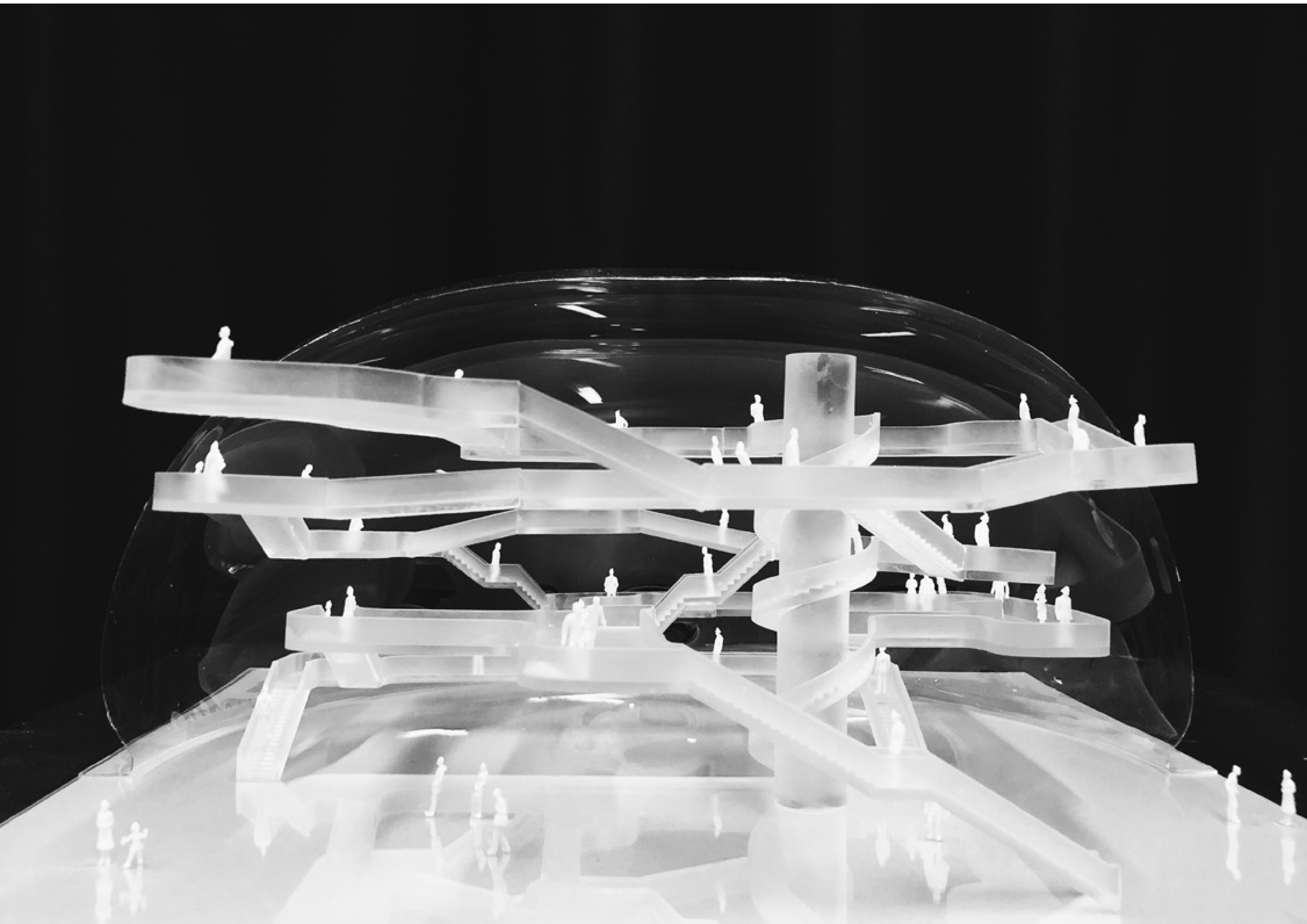

air intake
heat pump/fan system
air curtain
inside temp X
outside temp Y


warm or cold air stays in/out
act as a invisible wall
seperates air conditions
cleans the atmosphere
loop system

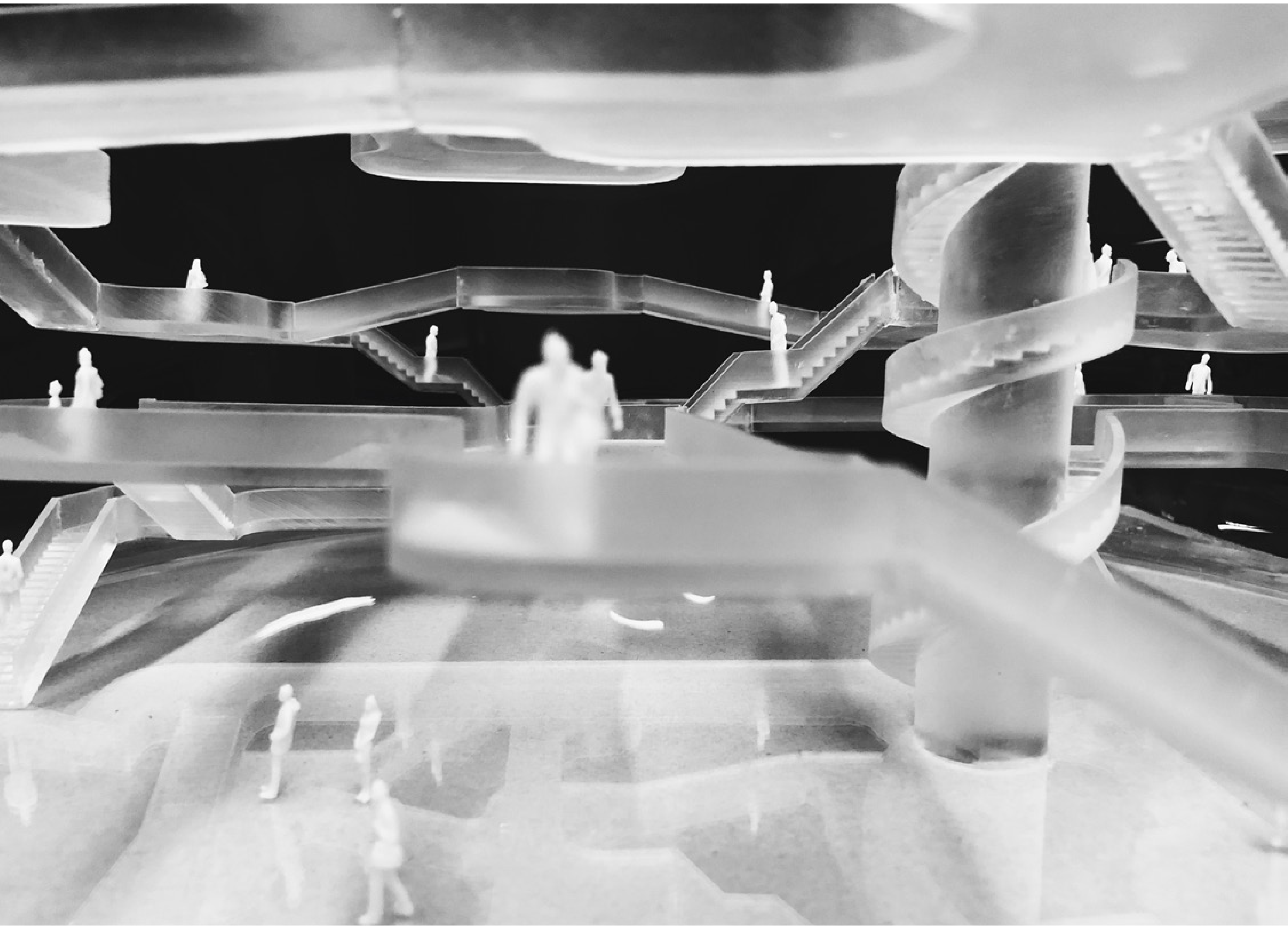

+ 10600
+ 10000
+ 9050
air intake
air exhaust
+ 12050
+ 9550
+ 7850
+ 5050
+ 2550
+ 0

05: MODEL





05: Model



06: DESIGN EXPERIMENTS

WHERE

Building Services Engineering Laboratory CTH

PARTICIPANTS

Julia Dandebo, Mimmi Amini, Håkan Larsson, Torbjörn Lindholm

PROPS

Room made of triple glass walls and ceiling, 4 m x 3 m x 2,7m, one lamp, two radiators 4000 watt, portable hob 2000 watt, 1 saucepan with 2 L boiling water. 1 tiny fan, 1 larger fan, a Mollier Diagram, tripod, 3 buckets of snow, 1 spray bottle, 2 hygrometers, bergamot scent

WHAT

Creating a cloud in an enclosed space by using air, temperature and humidity. To create a cloud, three air conditions was needed; one cold and dry air layer of +18°C and 40 % RH, a middle layer of hot and humid air that is +25 °C and 100% RH, and one dry and hot humid air that is +37°C and 60% RH. When these conditions meet, a cloud appears in the middle. However, in this experiment the aim is to get the right hot humid air condition in the space. Since the room is placed within an enclosed space the cold air could simply be taken in by opening the door and let the air conditions meet and then study the outcome.

WHY

The purpose for this experiment is to understand how different air conditions can be manipulated artificially in order to create a cloud, and to get a whole body experience of being inside a cloud. This will also give us, and the user, a feel on how these differences corresponds to the sensorial experience of moving between different air conditions and temperature. A scent was used to experience the effect of it in different temperatures and humidity.

FACTS

There are multiple ways of how a cloud can be created. In nature, a cloud can appear when cold air meets warm air in the stratosphere. In this experiment this is used as a strategy since the hot air has a lower density and will therefore rise. In an enclosed space it is easier to manipulate and keep the air conditions according to their density, than in a space that is not enclosed.

HOW

The experiment started by insulating the holes in the ceiling and gaps between the floor and door openings to make sure there was as little air leakage as possible. A fan was placed on the floor level and one around 1.5 m above floor level to make sure the steam from the boiling water was well distributed over the space. A 2000 watt radiator was placed in the space to start with. By using Mollier Diagram the outcome of the air condition could be predicted by reading the relative humidity and temperature curve in the space.

QUANTITATIVE MEASURE

Temperature, relative humidity, air conditions

QUALITATIVE MEASURE

Creating a cloud is not an easy task. One big learning from this experiment was that it is possible to create the anticipated air conditions in an artificial way with the amount of heat and steam by using the Mollier Diagram.

The amount of relative humidity and temperature can be regulated in the proportion of the desired cloud formation. By adding or reducing warm or cold air and humidity the formation and outcome of the cloud will be different due to the air layer proportions. In this case, the hot and humid air layer, which was the entire space were over represented for the cold air layer. By adding snow (-1 degrees) into the space of 32.4 (see figure 1) a fog like cloud appeared around the snow.

Since there were no cold air layer in the lower part of the space that would keep the cloud floating in the middle of the space, the fog sank due to the density. For the next experiment, a cold and dry layer is crucial to create a cloud and to keep it in the middle of the space. The thickness of the cloud will also be greater when having a cold air layer. This will be achieved by taking in cold air (around 5 degrees) directly from outside through a tube and let it circulate in the lower part of the space.

The scent of bergamot was enhanced when the space was hot and humid. It gave a feeling of a blooming summer day. The humid air carried the scent in the air in a different way, whereas the cold air just gave a locally strong scent in the spot it was sprayed.


DEMAG
500 kg
Esselte
ICA
PREMIUM BANANAS

TIME	TEMP. C°	RH%	OBSERVATIONS
10:00	19.8	10%	
10:10	22.2	38%	
10:20	23.2	65%	
10:30	24.4	86%	2000 Watt Radiator added
10:40	25.7	90%	Condesation on half the glass walls
10:50	27.2	92%	
11:00	28.3	91%	
11:10	29.1	90%	Condesation on entire glass walls
11:20	28.4	93%	Spraying water - adding humidity
11:30	29.0	94%	
11:40	29.5	94%	
11:50	30.1	93%	
12:00	30.7	92%	
12:10	31.0	91%	
12:20	31.3	91%	
12:30	31.4	92%	
12:40	31.8	91%	
12:50	31.9	92%	
13:00	32.1	91%	
13:10	32.2	92%	
13:20	32.2	90%	
13:30	32.1	91%	
13:40	32.2	91%	
13:50	32.4	92%	Turning off the radiators/max temp.
14:00	31.8	85%	
14:10	30.9	85%	
14:20	29.6	86%	
14:30	28.5	85%	

Figure 1

KEY FINDINGS

Studying different temperatures and relative humidity while doing the experiment gave an insight on the amount needed for creating the different layers and their relations. The more humidity in the room (middle layer) the most likely it is to rain and create condensation on the walls. This strategy was later applied in the rain microclimate using air curtains.

Another finding is the importance of the air layers. As seen in figure 2, the hot and humid air was created but the lack of cold air layer created a fog that sinks to the ground level. This can also be used when designing the cloud to get the right proportions of air layers for the desired cloud.

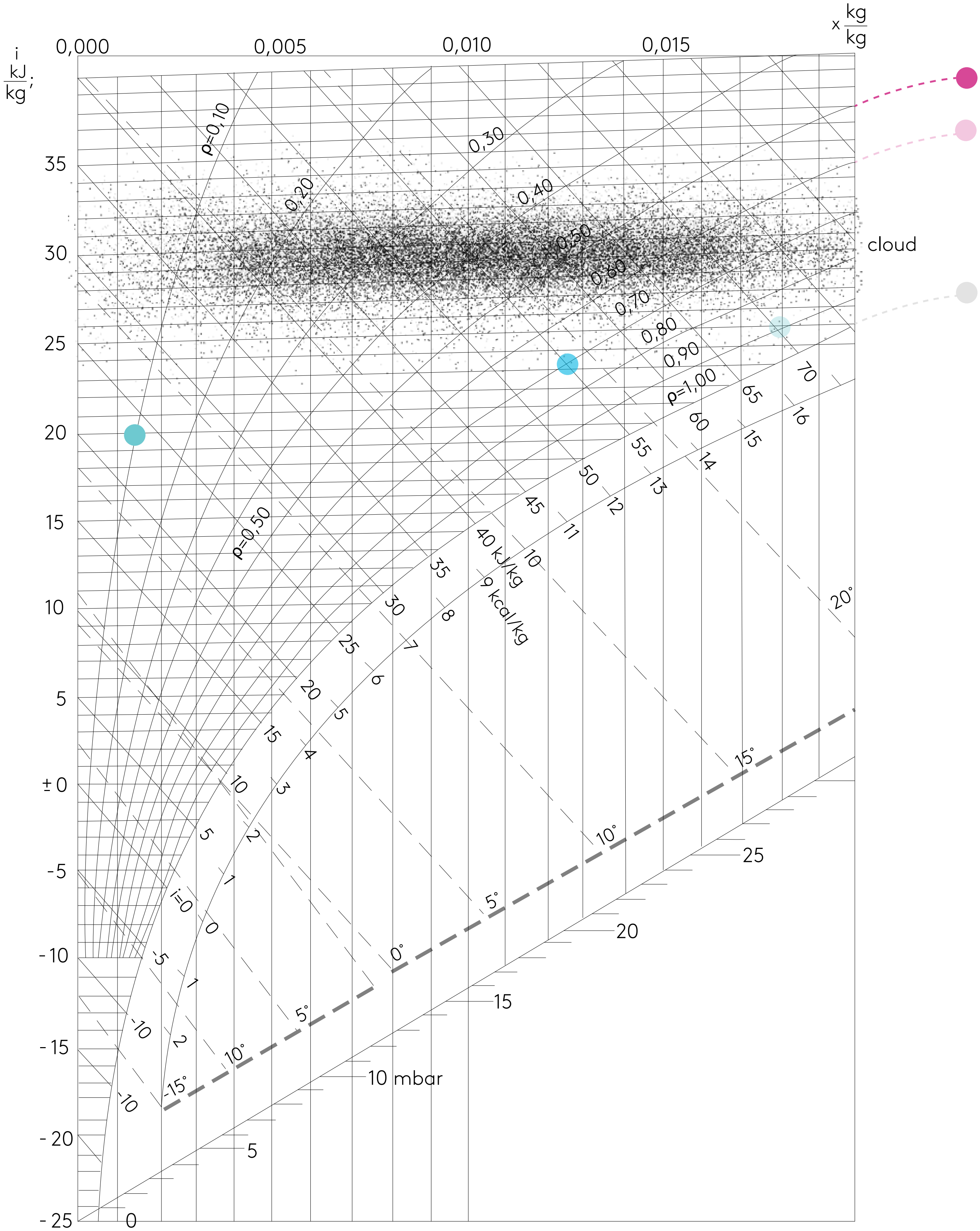


Figure 2 *Using Mollier Diagram for creating air conditions*

5 seconds

10 seconds

15 seconds

20 seconds

25 seconds

30 seconds

WHERE
Building Services Engineering Laboratory CTH

PARTICIPANTS
Julia Dandebo, Mimmi Amini, Håkan Larsson, Torbjörn Lindholm

PROPS
Room made of triple glass walls and ceiling, 4 m x 3 m x 2,7m, one lamp, two radiators 4000 watt, portable hob 2000 watt, 1 saucepan with 2 L boiling water. 1 tiny fan, 1 larger fan, a Mollier Diagram, tripod, 2 hygrometers, 1 pipe with cold air intake.

WHAT
In the previous experiment the cold air layer was not enough for the hot and humid air layer for creating a cloud. In this experiment a pipe taking in cold air from outside (3 degrees) was placed in the lower part of the room to fill the lower part of space with. In theory, the air layers should react with one another and create a cloud in the middle.

WHY
The purpose of the experiment was to see how air layers can be controlled in order to create a cloud. Since the previous experiment gave the successful result of two air layers the aim was to also create the cold air layer to see how this would work in a more complex system, similar to the one that is meant to be in the design.

HOW
The cold air layer that was taking in from outside was 3 degrees with 82% RH in a 30 cm in diameter wide pipe. The space was warmed up with the two radiators and boiling water. When the space was 30.9 degrees celsius with 85% RH the cold air flow was switched on. Studying the Mollier Diagram, these condition should be enough for a cloud to appear.

QUANTITATIVE MEASURE
In this experiment the focus was more to actually manage to get the right proportions of the three air layers. When the cold air intake flow was switched on it seemed very promising. The cold air temperature however, measured 14 degrees when reaching the space which was then too warm.

The result was no cloud. Even though the air flow was set on a low speed it was enough to cool down the space with 3 degrees. The hot and humid air layer did not manage to hold the cold air that also dried up the space quite quickly. Studying Mollier Diagram it was understood that it was now impossible to get the right climate conditions. The cold air needed to be at least 10 degrees cooler for it to work.

QUALITATIVE MEASURE
Going from hot and humid air 30.9 degrees, 85% RH to a space that is 24 degrees and 65% RH feels cold. The operative temperature is much colder than the actual temperature given. This is interesting in terms of experience and useful in how the user interact with different parts of the cloud. Being inside, below and above the cloud will not only feel different but it is also important from which temperature and humidity the user enter the cloud from.

KEY FINDINGS
When cooling down the space with a couple of degrees the experienced temperature was much colder than the actual temperature in the space. In a user perspective this is interesting for how the user will experience the different levels and the micro climates that are based on air, humidty and temperature differences such as in the airpocket, rain and condense.

TIME	TEMP. C°	RH%	OBSERVATIONS
14:35	19.8	10%	
14:45	20.2	38%	
15:55	22.2	87%	
16:05	25.9	85%	
16:15	27.8	85%	
16:25	28.8	92%	
16:35	29.2	85%	Condensation on the floor and walls
16:45	29.5	87%	
16:55	30.5	90%	
14.35	3.0	85%	Outdoor temperature 3 C° 85% RH
16.55	14.0	31%	Air intake in the space

Figure 3 *Air layers created for constructing a cloud*

Mollier diagram is a design tool for creating an indoor cloud, but also to understand the physics behind it. With a starting point in what is known about the technique developed by Transsolar, it is possible to read the metereologic conditions of creating an indoor cloud, as well as understanding how to control it in terms of size, circulation, height, width and density in an enclosed space.

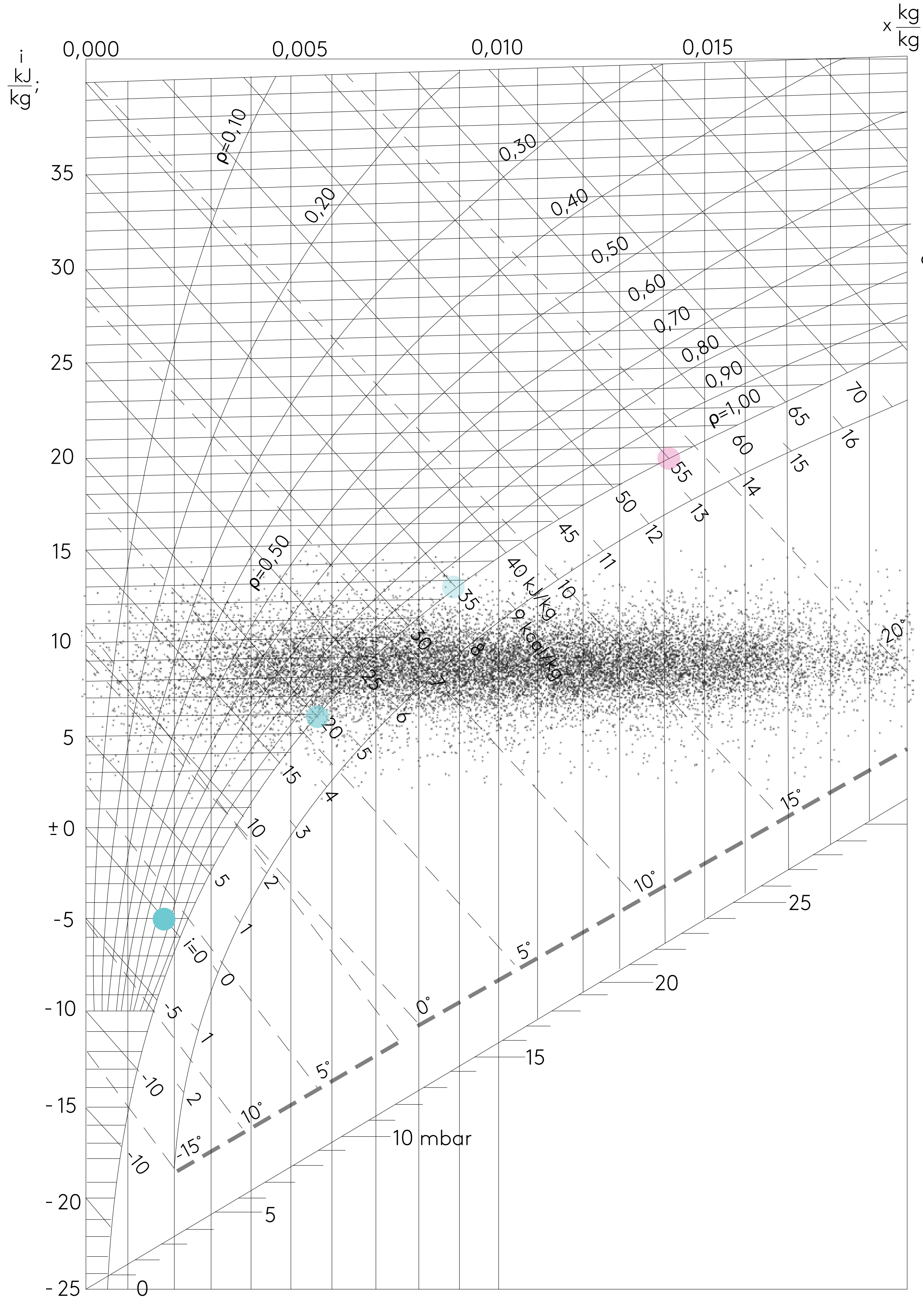


Figure 4 *Using Mollier Diagram for creating air conditions*

WHERE
Building Services Engineering Laboratory CTH

PARTICIPANTS
Julia Dandebo, Mimmi Amini, Håkan Larsson, Torbjörn Lindholm

PROPS
Room made of triple glass walls and ceiling, 4x 3x 2,7m, 3 cameras, 3 light sources, smoke machine, 2 users (Mimmi & Julia)

WHAT
By gradually filling an enclosed space with smoke the users, in this case us, studied how the different senses get activated depending on the amount of smoke. The amount of smoke, could be used instead of a real cloud since both creates an atmosphere that surrounds the user. It can be manipulated in terms of density which can be related to fog, mist, or cloud. Lights will be used to study how it will behave in a larger scale.

WHY
The purpose of this experiment is to experience and study the feeling of being inside a cloud and how that affects the user's perception of space and interaction with others. The different densities of the cloud will provide an understanding of how the user respond and behave. The outcome will be used when designing the cloud and the position of lamps. This is important for blurring out visibile boundaries and to create microclimates.

FACTS
The transition from object to atmosphere can be both direct and gradual. Mist, fog and cloud are a part of a gradual transition. The change of density in the cloud is important for the transition from object to atmosphere. When you are inside of the mist/ fog/cloud, you are in a state of distraction, where there is nothing to see and nothing to do, part from being in the presence.

HOW
The light sources were placed in different positions, two from below, one set from the middle of the room. The positions of the lamps were chosen carefully due to how the light behave in relation to smoke (see experiment 5.0 light shadow, page 157). The smoke machine was on and stopped 4 times to measure how the users, experienced the atmosphere that was created by the smoke. In each stop different lights were used in different positions and the users would walk around the space to understand the differences of atmosphere. These were documented in pictures and with short film clips.

QUANTITATIVE MEASURE
Amount of smoke in space in relation to the human body and light.

QUALITATIVE MEASURE
Being in an atmosphere is fantastic. It is mysterious and it makes one want to play with it. It works as a tool for understanding oneself in relation to a space and to others. The more smoke in the room, the more limited sight. Other senses such as touch, feel and hearing became all more important.

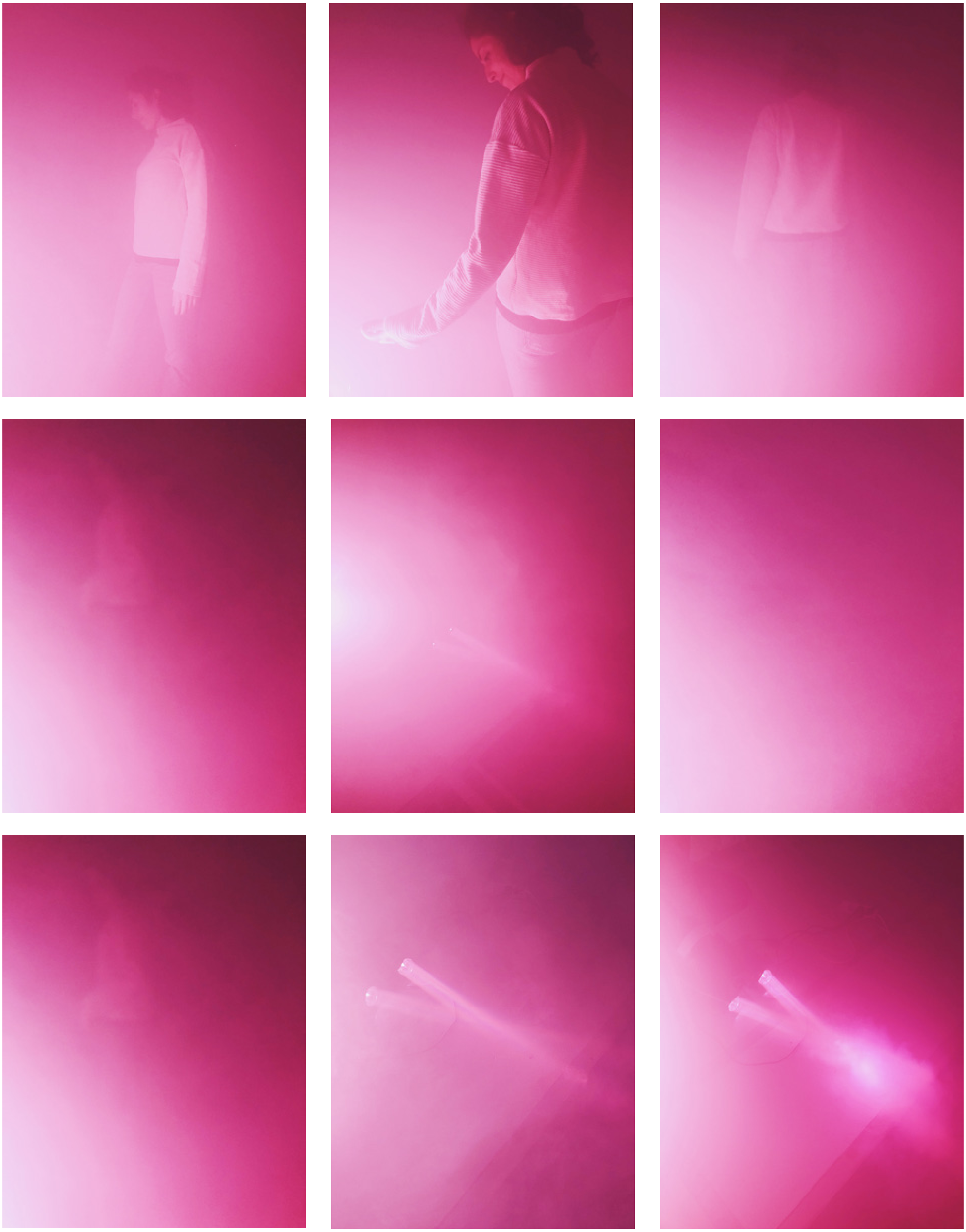
Each step and movement in the space became very important as it forces the user to be in presence. The user is put in an uncontrollable state where the atmosphere decide the users speed, movement and senses in a way that static buildings with regulated temperatures would not provide. The speed and movement of the user depend on the density in the atmosphere.

When the room was filled on the fourth stop, the user could only see about 2 meters in front, anything else were totally blurred out and invisible. The light gave the smoke a density as well. It blurred out visible boundaries due to the smoke. When placing the light in the middle, the user and everything below the waist would be invisible and almost made the smoke look like it was floating. The user could not see its feet with the lights on, but could however when they were switched off, in the same amount of atmosphere.

The formation of stairs and ramps may be considered due to the visual sight of the user, the movement and the speed of the user. Light is very important for enlighten the cloud and its beautiful formations but also for guidance.

CLOUD AND THE HUMAN BODY

Study of the cloud and the microclimates colour blue and light



Study of the cloud and the microclimates colour pink and light

PROPERTIES

Dry ice is the solid form of carbon dioxide (CO2), a molecule consisting of a single carbon atom bonded to two oxygen atoms. It sublimates from solid to gas form at −78.5 °C. It is colourless and non-flammable. It is colder than water ice and leaves no residue as it changes state from solid to gas.

TEMPERATURE

−78.5 °C celsius

DENSITY

Between 1.4 and 1.6 g/cm3

STATE

Partly uncontrollable, possible to modify with light, shadow, colour, wind etc.

SIMILARITIES TO CLOUDS

It has similar qualitative properties as cloud, such as droplets, colour, feel, touch etc.

DIFFERENCES TO CLOUDS

Unlike mist/fog/cloud, it falls down.

VELOCITY

Fast, depending on temperature of the water it reacts with.

USE

Putting a piece of dry ice in a glass of water 100 °C makes the dry ice to react with the water. The outcome of that reaction is cloud-like formations.

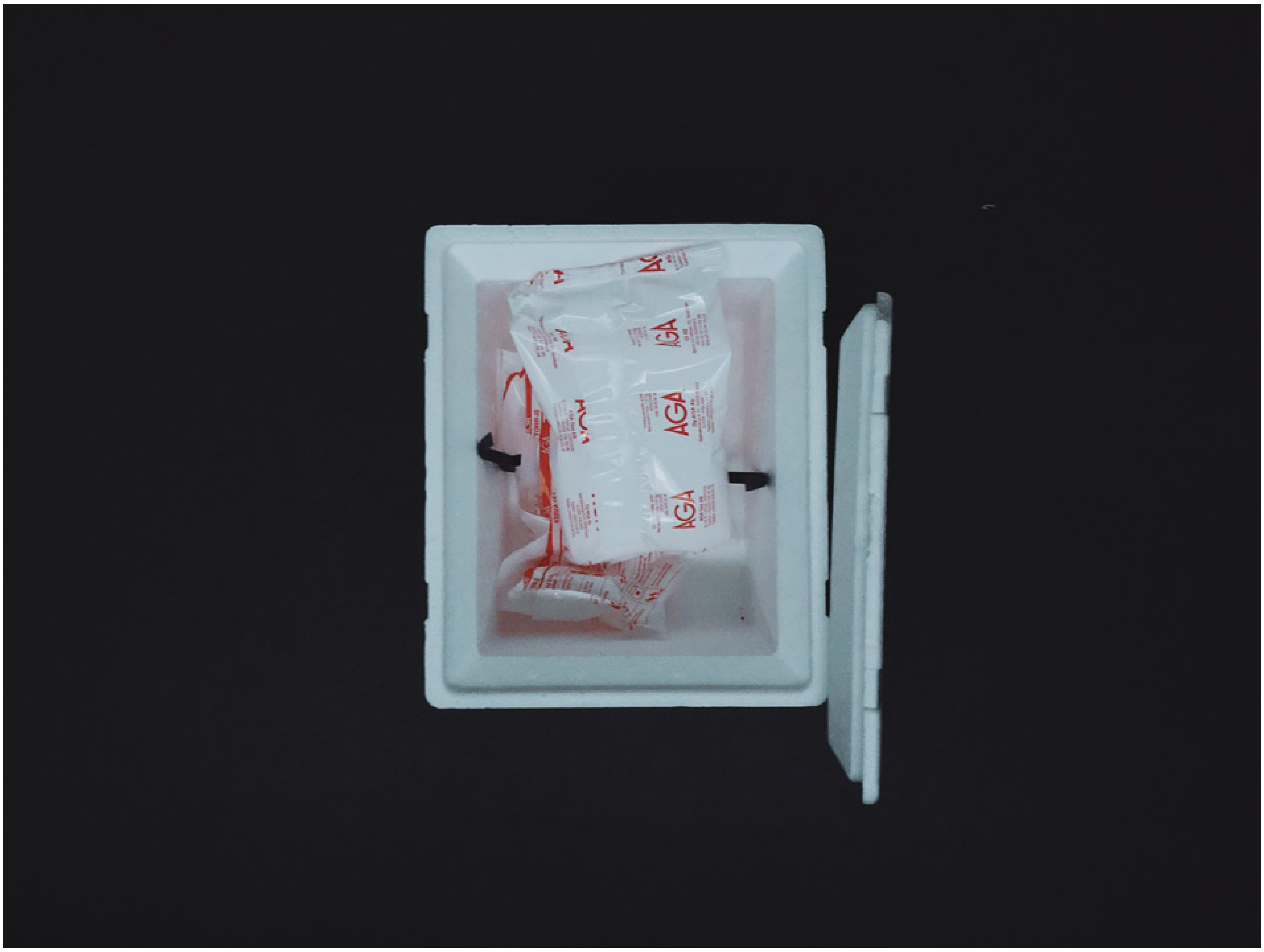
TERMINOLOGY

The aim of doing experimentation with dry ice is to gain knowledge and visualize the cloud with. Depending on the outcome of the experiment, the outcome of the cloud will be referred to as mist, fog or cloud. The terminology is based on:

mist: 25 % density
fog: 50-75 % density
cloud: 75-100 % density

Since the cloud consists of different densities, the cloud is really a combination of mist, fog and cloud. But to avoid writing mist/fog/cloud all the time. The most suitable terminology will be used in each experiment finding.

DRY ICE



The photo above shows 1 block of 25 of the dry ice that was used for the experiments.

EXPERIMENT 1.0

WHAT
Controlling, directing and manipulating the fog through openings.

WHY
The purpose of this experiment is to examine how it is possible to control and manipulate the fog and the experience of it. The purpose is to use the fog as a tool for understanding and defining different experiences in spaces.

HOW
A translucent squared box in plexi glass was made by using the laser cutter with the dimension of 20 *20*20 cm 2mm thick sheets. One side of the box was left open in order to test 6 different perforated sheets on. The sheets have each a diameters in the openings. To get a better understanding of the relation between formation of cloud and the openings, they were multiplied 3 times for each diameter. This gave the percentile area of the openings in relation to the sheet.

Sheet 1A: 5 mm in diameter, 25 holes, 0.43 %
Sheet 1B: 5 mm in diameter, 75 holes, 1.3 %

Sheet 2A: 10 mm in diameter, 15 holes, 2.8 %
Sheet 2B: 10 mm in diameter, 45 holes, 8,4 %

Sheet 3A: 15 mm in diameter, 12 holes, 5.25 %
Sheet 3B: 15 mm in diameter, 36 holes, 15 %

A piece of dry ice was put in a glass of hot water (+100°C) inside the box. each of the sheets to see how it interacted with the perforation.

See next page for visuals.

PROPS
Box made of plexi glass, 6 perforated sheets with different openings in diameter, 3 cameras, water + 100 °C, dry ice, 1 glass, natural light, gloves and a 20 °C degreed room.

QUALITATIVE MEASURE
The relation and experience between the user and fog though architectural elements.

QUANTITATIVE MEASURE
How the size and placement of the openings in the plexi glass will affect the form of the fog. How much the fog can be directed and manipulated by using architectural elements.

CONCLUSION
The same box was used as well as the amount of time and dry ice, water and water temperature for each part of this experiment. The only think that was changed was the sheets with different perforations.

The fog reached three different levels inside the box depending on the diameter of the holes.

The sheets with small openings (5 mm) enabled the fog to rise and stay longer (60 seconds) in the plexi glass box before it evaporated. The sheet with 25 openings held the fog longer than the one with 75 openings, and the result was more of a mist than fog or cloud.

The sheets with 10 mm openings enabled the fog to rise and stay for about 40 seconds in the plexi glass box before it evaporated. The box with 15 openings held the fog longer than the one with 45 openings, and looked like thick rays of fog when coming through the sheet.

The sheets with 15 mm openings enabled the fog to rise and stay for about 20 seconds in the box. The box with 12 opeings held the fog longer than the one with 36.

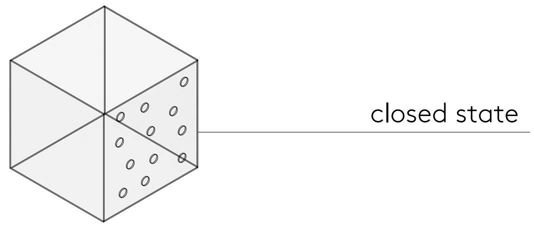
The cloud/fog/mist escaped through the lower openings and none from the above in all experiments. This is due to the properties of dry ice since it naturally sinks in air due to its greater density.

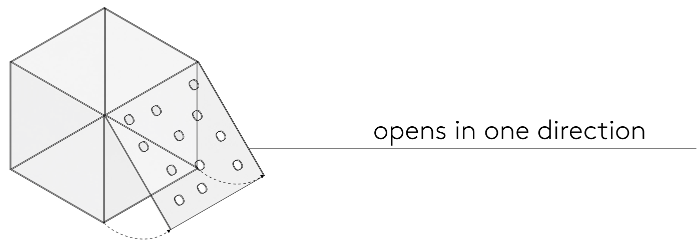
When using this as design, the relation between the perforation, duration and the effect it has on the user in terms of experience needs to take in consideration. The formation of the cloud coming through the openings depends on the shape of the openings to a certain extend. The cloud however spreads out fast and blends with the surrounding air.

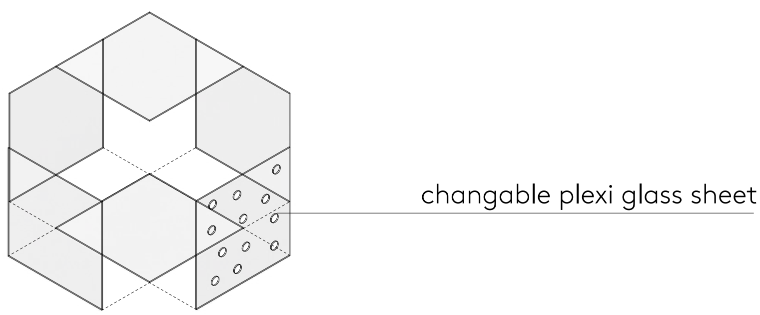
An indoor cloud created by climate engineering does not fall to the floor, but rather spreads into a mist.

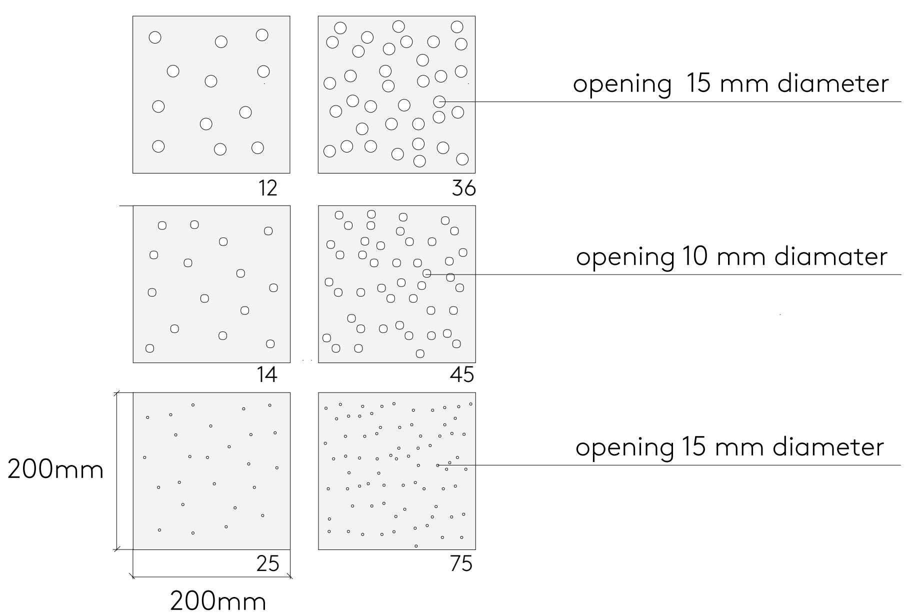
The photos above show the process of making the experiment called directing. For conclusion, see previous page.

DRAWINGS









The drawings on this page show the system of the plexiglass boxes, but also the different perforated surfaces, that was used in this experiment.

25 holes

Close-up, 25 holes

75 holes

Close-up, 75 holes

15 holes

Close-up, 15 holes

45 holes

Close-up, 45 holes

12 holes

Close-up, 12 holes

36 holes

Close-up, 36 holes

EXPERIMENT 2.0

WHAT
Interaction with the cloud

WHY
We are fascinated by how we can interact with the cloud. It changes when we move in a very direct way.

HOW
Pouring boiling water in a glass with dry ice. Then Mimmi placed her arm and hand close to the glass, letting it interact with the dynamic movement of fog and mist.

PROPS
Glass, water 100 °C, dry ice, camera, hand, natural light

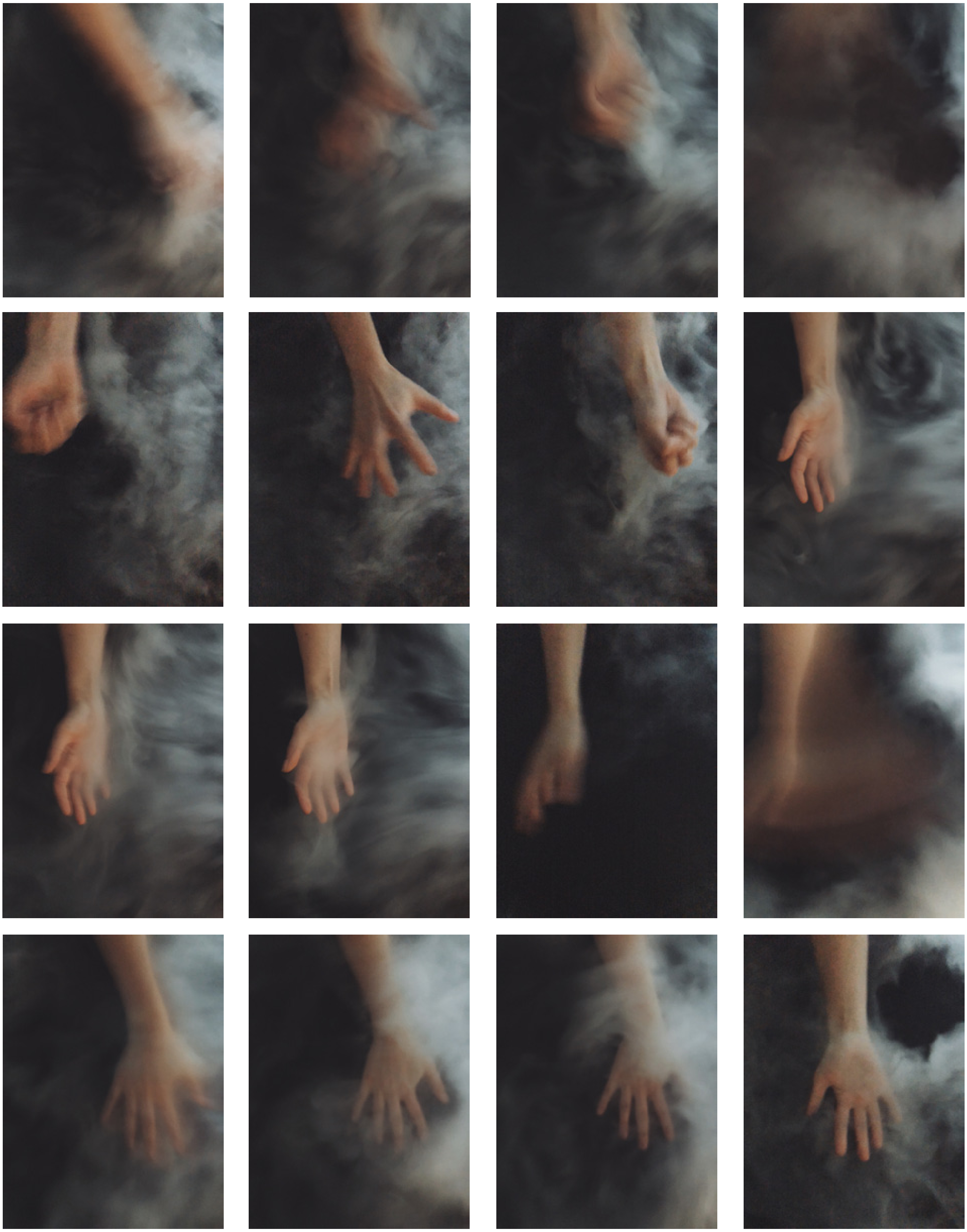
QUALITATIVE MEASURE
The feel of cloud on the skin. The fun factor.

QUANTITATIVE MEASURE
How different movements change the appearance of the fog and mist.

CONCLUSION
Interacting with cloud, fog and mist is fun! It moves choreographed to the movements of ones body. This makes you stay in presence for several moments, just enjoying the feel of cloud on your skin. It is humid, and feels both hot and cold without getting you wet.

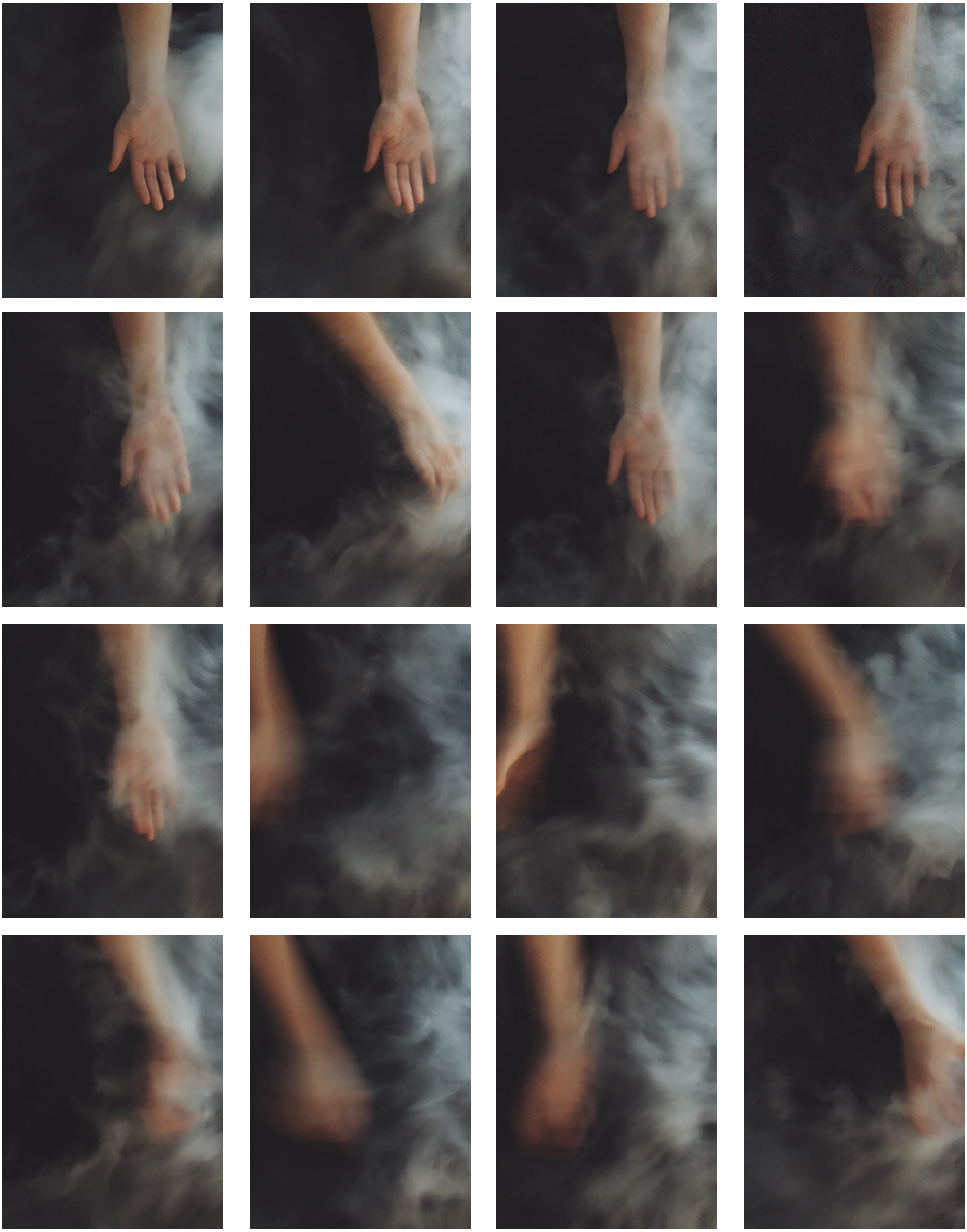
The photos on p. 121-125 are taken in one second intervals to show the responsiveness of the cloud, and how the human body interact with it, which is an important aspect of experiencing the cloud in the project.

INTERACTION



INTERACTION

INTERACTION



EXPERIMENT 3.0

WHAT

Being inside of the cloud, experiencing light and shadow.

WHY

We talk a lot about the experience of being in a cloud, but how does it look like being surrounded by one and how does it feels like?

HOW

Both of us placed the box, filled with clouds over our heads. We then placed an Iphone camera inside it to capture what we saw through the box filled with clouds. See next page for visuals

PROPS

Glass, water 100 ° C, dry ice, Iphone, lamp, and our own observations.

QUALITATIVE MEASURE

The experience of being inside of a cloud.

QUANTITATIVE MEASURE

How far and bright the lamp must be to create a contrast of dark and light inside the cloud.

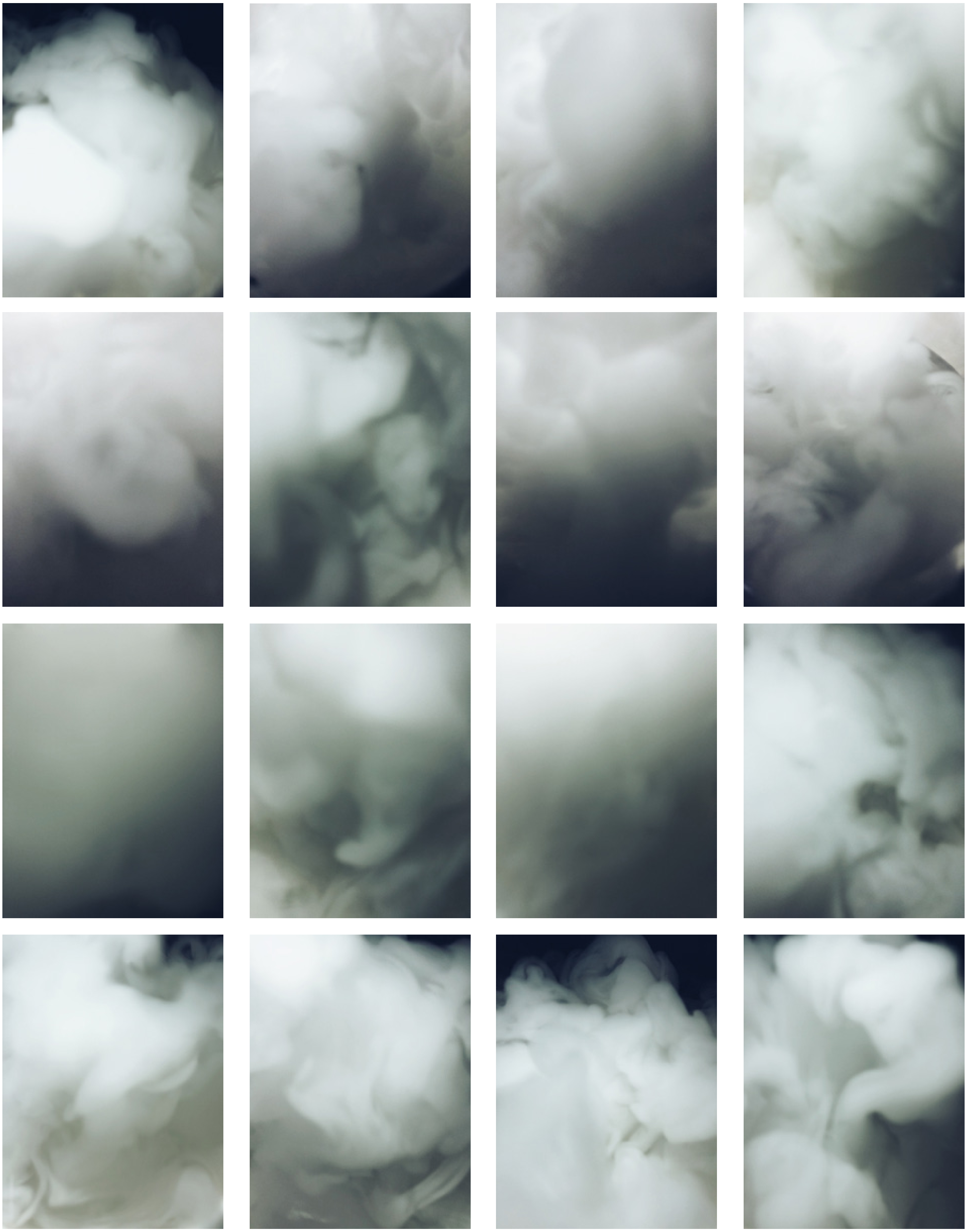
CONCLUSION

It is fun being inside of the cloud! It really comes close and surrounds you, making you forget about time and instead concentrate on the atmosphere. You feel the change of temperature on your skin and think of nothing but how it feels when your body interact with the cloud. You also try to read your surrounding environment and identify what is around you and what you are able to see, hear, feel. You get more conscious about your senses that get intensified by the cloud.

The lamp added light and contrasts to the cloud. This made the cloud to appear more dense and with more texture than it was in a complete dark room. The light source used was directed and concetrated. If the light source was more soft it would have spread light more evenly, and the experience of the cloud would have been more blurred.

The photos on p. 127-129 are taken in one second intervals to show the dynamic capacity of the cloud, which is an important aspect of experiencing the cloud in the project.

ATMOSPHERE



EXPERIMENT 4.0

WHAT
Colour experiencing through fog.

WHY
To see how color can change the perception of fog, but also to see how the passage of time over a day change the experience of fog, due to intensity and temperature of the light.

HOW
Pouring boiling water in a glass with dry ice. Setting up the lamp to illuminate the fog from the left side and then change the colour of the light to get different effects.

PROPS
Glass, water 100 ° C, dry ice, artificial light, colour projection onto wall, camera

The lamp have thirteen different colours: dusty pink, grey blue, green, blue, purple, red, deep blue, orange, light green, violet, cerise, turquoise, and pink.

QUALITATIVE MEASURE
Color projection, the experience of natural and artificially colors surrounding us such as daylight, evening and morning light, but also intense tones of blue, green and red light. Makes the "texture" of the fog visible, as sky and sun does.

QUANTITATIVE MEASURE
The change of colour and how it interact with the movement of the fog.

CONCLUSION
The light adds new qualities and dimensions to the fog. It highlights and makes visible different densities, movements and formations of the fog that is hard to see in daylight. It also makes the contrasts become more visible.

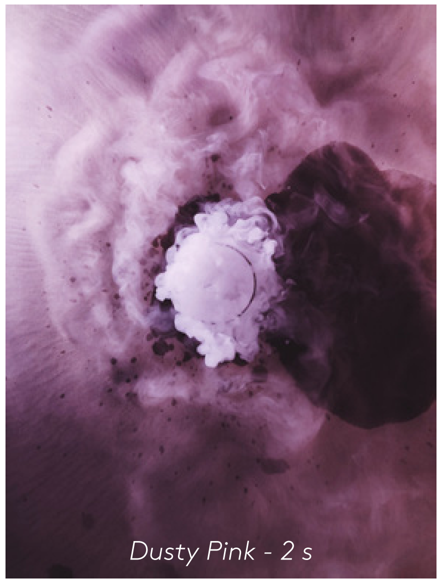
In nature, the colour of the cloud is defined by the composition of the particles that the cloud is condensed on and the angle of incidence from the sun. Here, it is projected by a lamp. The colour intensity of the lamp is more intense compared to natural light, but still gave a feel of how the appearance and perception of the cloud changes with colour. It is an easy tool for controling and manipulating the qualitative experience of fog with.

Each colour is showed in three diferent photos. These photos were taken during three consequtive seconds to explore and show how the colour also make the movement and formations visible.

The photos on p. 131-135 are taken in one second intervals, three for each colour, to show the dynamic capacity of the cloud and how it interacts with colour, which is an important aspect of experiencing the cloud in the project.

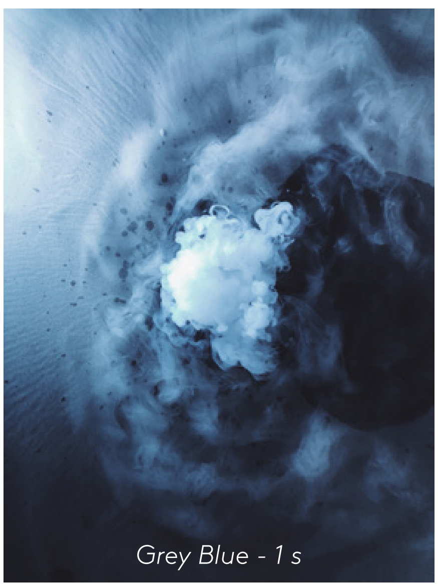
COLOUR

Dusty Pink - 1 s

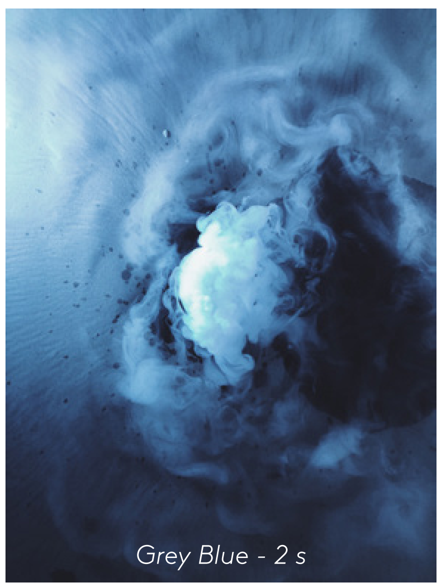


Dusty Pink - 2 s

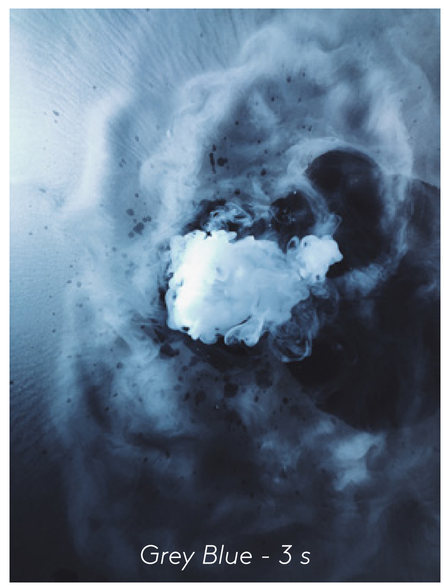
Dusty Pink - 3 s



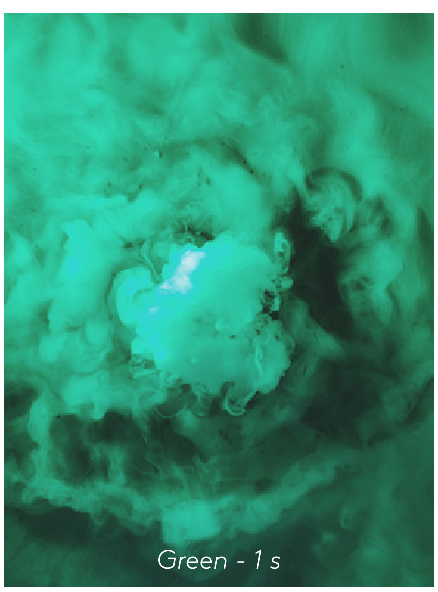
Grey Blue - 1 s



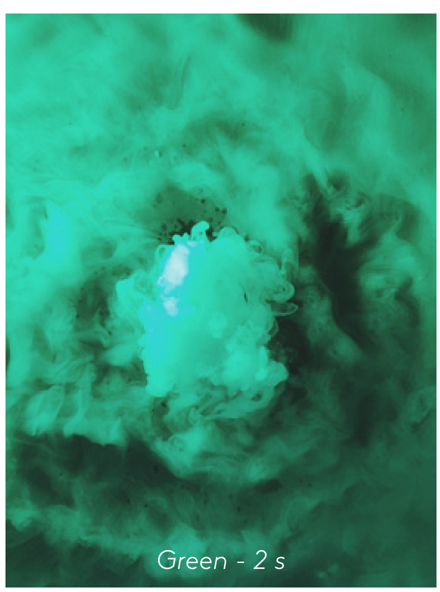
Grey Blue - 2 s



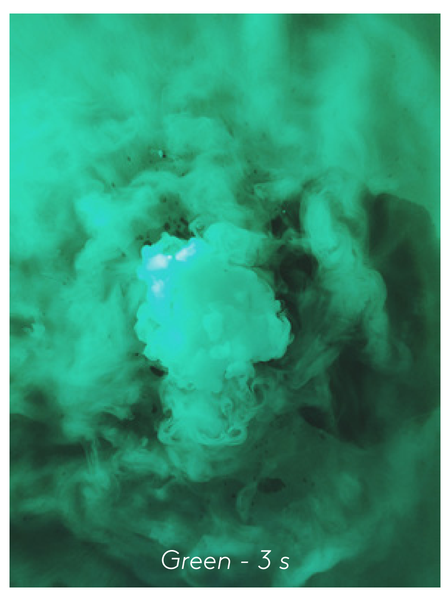
Grey Blue - 3 s



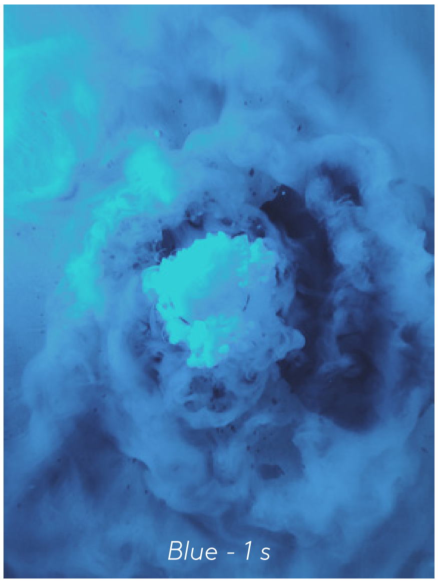
Green - 1 s

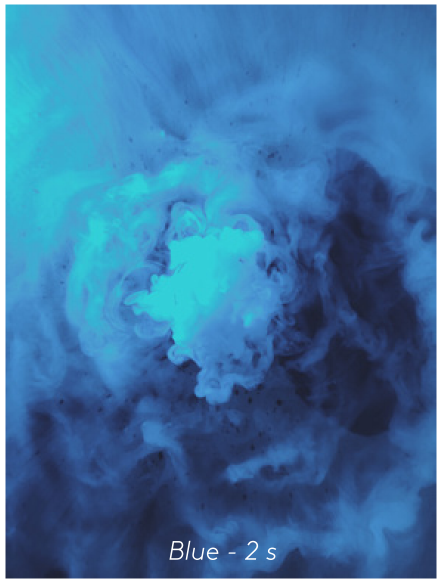


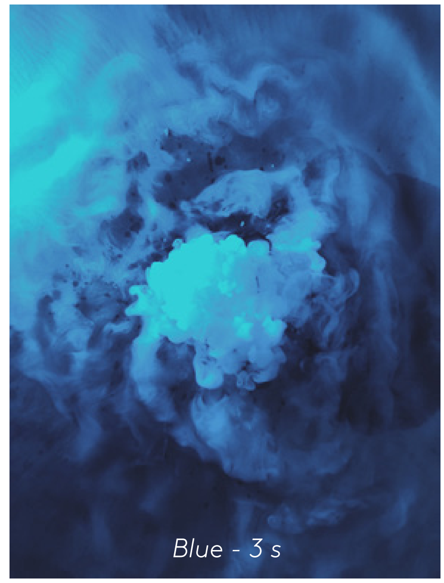
Green - 2 s

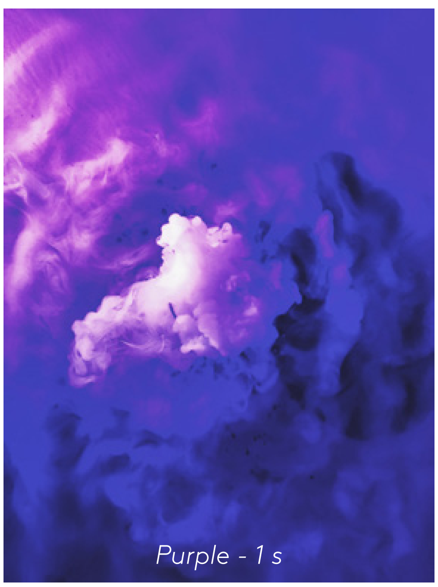


Green - 3 s


Blue - 1 s


Blue - 2 s

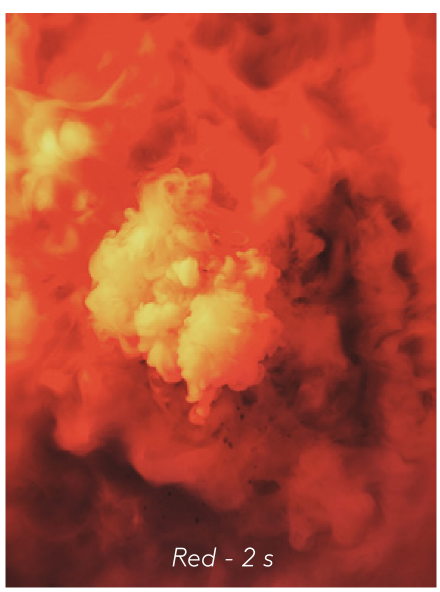

Blue - 3 s


Purple - 1 s


Purple - 2 s

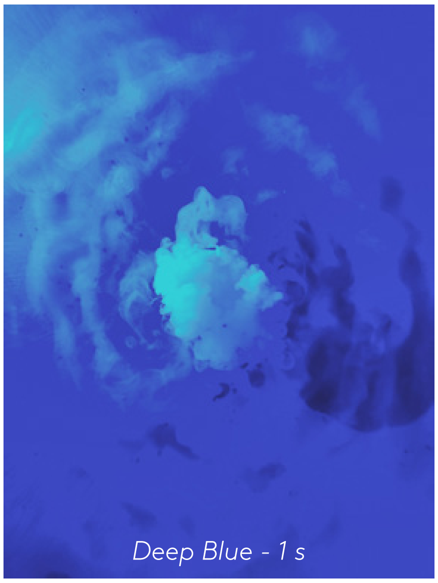

Purple - 3 s

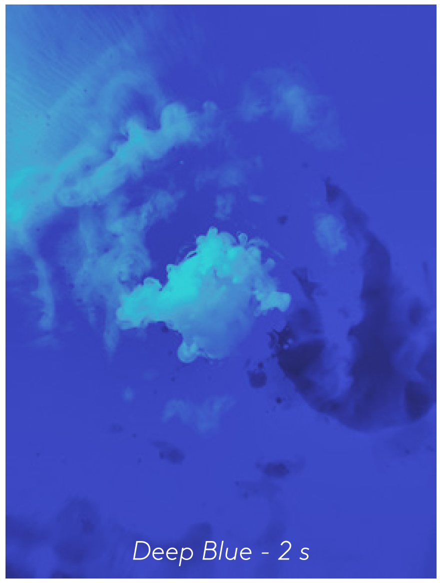

Red - 1 s

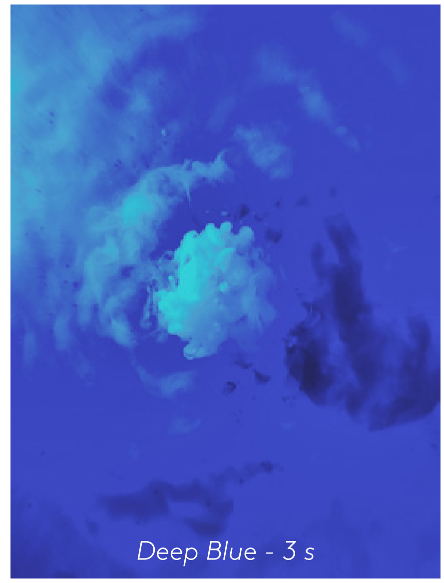

Red - 2 s


Red - 3 s

COLOUR

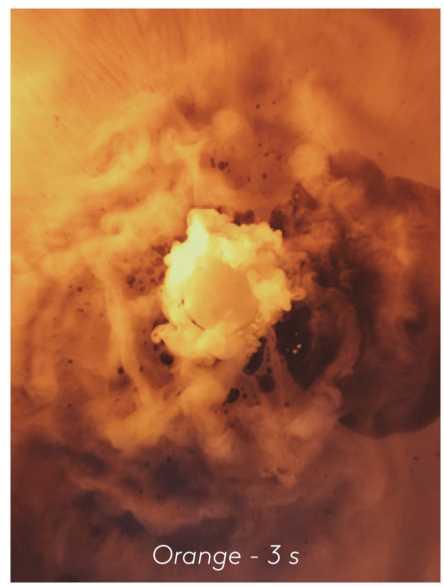

Deep Blue - 1 s


Deep Blue - 2 s


Deep Blue - 3 s


Orange - 1 s


Orange - 2 s


Orange - 3 s


Light Green - 1 s


Light Green - 2 s


Light Green - 3 s


Violet - 1 s

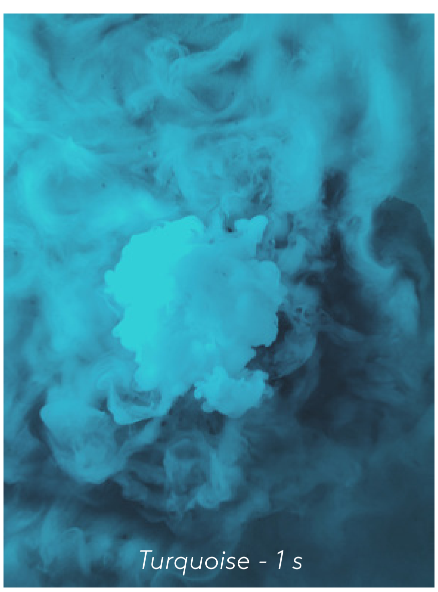

Violet - 2 s


Violet - 3 s


Cerise - 1 s


Cerise - 2 s


Cerise - 3 s


Turquoise - 1 s


Turquoise - 2 s


Turquoise - 3 s


Pink - 1 s


Pink - 2 s


Pink - 3 s

EXPERIMENT 5.0

WHAT

Dematerializing the architectural element of a plane surface through light, shadow and fog.

WHY

The purpose of this experiment is to examine if light and shadow can be projected on fog to see if it is possible to create 3D shadows. Also how light and shadow can change the architectural elements, in this case a simple surface. The aim is to examine how light and shadow can act as agents for disorientation and other visual effects for the user i relation to the space.

This measurements will be the toolbox used in the design later on when designing spaces with fog.

HOW

Pouring boiling water in a glass with dry ice placed on a grey cardboard sheet. Setting up the lamp, one meter from the fog, to illuminate the fog from the left side and and then from straight above.

PROPS

Glass, water 100 °C, dry ice, artificial light, camera

QUALITATIVE MEASURE

Ambience of light projected on the fog.

QUANTITATIVE MEASURE

The direction of light, the amount of light and shadow.

CONCLUSION

The dry ice was probably too elusive and ephemeral to make the 3D shadows visible. It might also have to do with the scale.

When having a direct light from above, the fog, absorbs and scatters the light, which makes the surface underneath it almost invisible. In this case, the surface is dematerialized by the density of fog by the light and shadow.

When instead placing the lamp on the side and directing it from a lower side position, the fog absorbs the light and scatters it, but not as much as when it was directed from above, which makes the surface visible. In this case, the surface is not completely dematerialized by the properties of fog.

This cause a shadowing affect on the surface where the light does not strike evenly on the projecting area. The fog cast shadows that are showcased by the light on the background.

Depending on the levels of the surface, cloud and light source, this will be useful in the design. This investigation gave an insight of how to direct the lamps for a certain desired effect.

The photo above shows the result from placing a source of light from the side below. This puts focus on the solid surface below the cloud, which also creates a contrast and emphasize the dynamic movement in the cloud.

The photo above shows the result from placing a source of light straight above the cloud. This puts focus on the cloud, which also creates less contrast and more disorientation since almost all elements are blurred out.

EXPERIMENT 6.0

WHAT
Experiencing and visualizing the gradual transition from object to atmosphere.

WHY
The cloud appears as an object from a distance, but when you are inside of the cloud, you experience it as an atmosphere.

HOW
Placing a glass of hot water inside the plexi glass box and then putting a piece of dry ice inside the box to create the cloud. Then Mimmi put her hand in the box and changed the position of her hand 8 times. Each time with 3-4 cm going from the front side to the back side of the box through the cloud.

She held her hand at the distances: 20, 17, 13, 10, 7, 3, 0 cm from the front side of the box.

PROPS
Glass, water 100 ° C, dry ice, natural light, camera, plexi glass box, Mimmi's hand

QUALITATIVE MEASURE
Visual perception of the transition of density within a cloud and the disapearing object.

QUANTITATIVE MEASURE
How the transition from object to atmosphere appear through the density of the cloud at different distances starting from the front side of the box.

CONCLUSION
Both weather and time has a gradual transition, and the change of density is important for in the design since that is one of the characteristics qualities of the cloud.

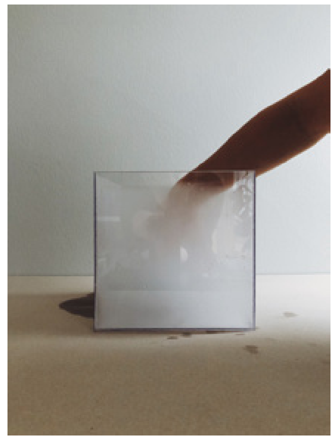
This investigation turned out to be very fun to do, and it played with the feeling of suspense and surprise. When will the hand appear and how? This type of question is important since the aim is to work with a cinematic narrative in the design.

The hand does not appear until 13 centimeters from the surface. This will probably affect the feeling of suspense and surprise in the design. This is important when designing transitional space and the transitional qualities of the cloud as architectural elements.

LEVELS OF DENSITY

Hand in cloud

20 cm from surface



17 cm from surface

13 cm from surface

10 cm from surface

7 cm from surface

3 cm from surface

0 cm from surface

The photos above show the process of making the experiment called Levels of Density. For conclusion, see previous page.

EXPERIMENT 7.0

WHAT
How holding a semi-transparent paper screen in front of the cloud will affect the visual appearance of it.

WHY
How suspense can be applied in the design through architectural elements such as the plane (Tschumi). Perhaps this can give a clue on how to deal with the relation between indoor and outdoor in the pavilion when when looking in to sequences as narrative.

HOW
Placing a glass of hot water on a table and then putting a piece of dry ice inside of the glass to create the cloud. Then placing the semi-transparent sheet in front of the cloud and a lamp behind the cloud to create shadows on the sheet.

PROPS
Glass, water +100 °C, dry ice, natural light, artificial light, camera, semi-transparent sheet of paper

QUALITATIVE MEASURE
The visual, dynamic appearance of the cloud. And the suspense factor.

QUANTITATIVE MEASURE
Source of light, angle of incidence, static versus dynamic.

CONCLUSION
Direct light can be both a dramatic detail but also shift the focus from the silhouette of the moving cloud to the source of light. Indirect light, when the source of light was put 2 meter away, instead of 1 meter, from the sheet generated a more poetic and quiet experience, which we preferred.

The angle of the source of light is also important. When turning it a little bit away from the sheet of paper and out of the camera, it became soft and nice.

The screen can be used as suspense, it might give a clue of what is going on the other side, which can be used in the design as part of the narrative.

The photos on p. 143 are taken in one second intervals to show the dynamic capacity of the cloud and how it interacts with a semi transparent surface, which is implemented in the encounter with the pavilion in designing the envelope as a first encounter with the qualities of the cloud.



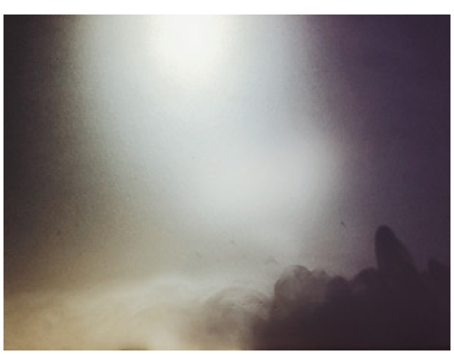
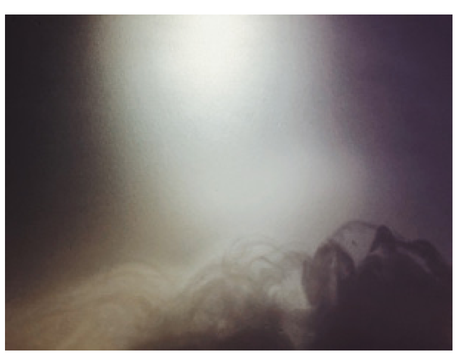











WHAT

Condense on the plexi glass surface

WHY

The purpose for this experiment was to produce condense on a plexi glass surface as a result of the temperature differences of the fog. We also wanted to photograph and document this because it can be a result of creating an indoor cloud but also a design tool for us, since we like this effect.

HOW

Pouring boiling water in a glass with dry ice and placing a plexi glass surface next to it.

PROPS

Glass, water 100 °C, dry ice, plexi glass, camera

QUALITATIVE MEASURE

How the condense changes the plexi glass

QUANTITATIVE MEASURE

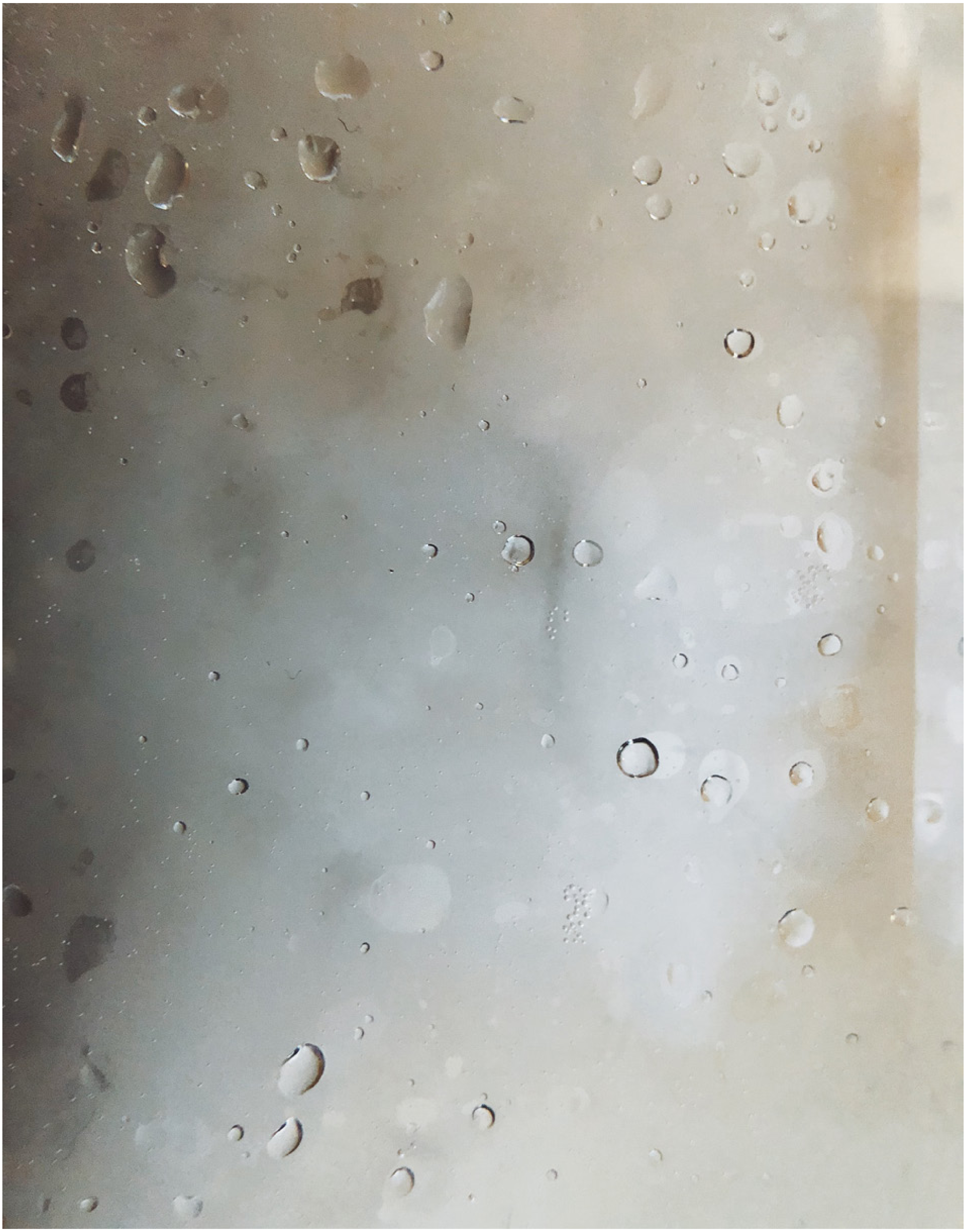
Amount of condense, temperature differences, air humidity, amount of dry ice and time

CONCLUSION

Some self-evident findings was that the bigger the piece of dry ice, the longer the fog lasted and was able to produce condense on the plexi glass. The condense started as small droplets and when they became heavy enough they started to drop, creating new patterns on the surface.

It is fun to interact with condense on a surface, something that we later saw an art gallery use during design week in Stockholm. People had written words on the wall with condense which made people walking outside stop and look at. This can be used as a design tool, and a way to use the effect of temperature differences and air humidity in a fun way.

This experiment also made us realize that TRANSSOLAR probably have a secret ingredient to their technique, since there is no condense in their project. To understand the physics behind this, Torbjörn Lindholm, at the Civic Engineering department was therefore contacted and became a second tutor in this thesis project.



WHAT
Documenting the temperature of the skin with an infrared thermometer

WHY
The purpose of this experiment was to document the temperature of the skin in an indoor climate but also when interacting with the cloud. The purpose was to better understand how temperature differences affect the experience of the cloud.

HOW
An infrared thermometer was used to measure the temperature at 4 different spots; fingertips, palm, forearm and the bend of the arm.

PROPS
Arm, infrared thermometer, camera, dry ice

QUALITATIVE MEASURE
The feel of the cloud on the skin, to be aware of differences in temperature

QUANTITATIVE MEASURE
Temperature

CONCLUSION

Indoor, Air Temperature 20 C

A. Finger tip: 21.8 C
B. Palm: 25.2 C
C. Forearm: 26.8 C
D. Bend of arm: 28.2 C

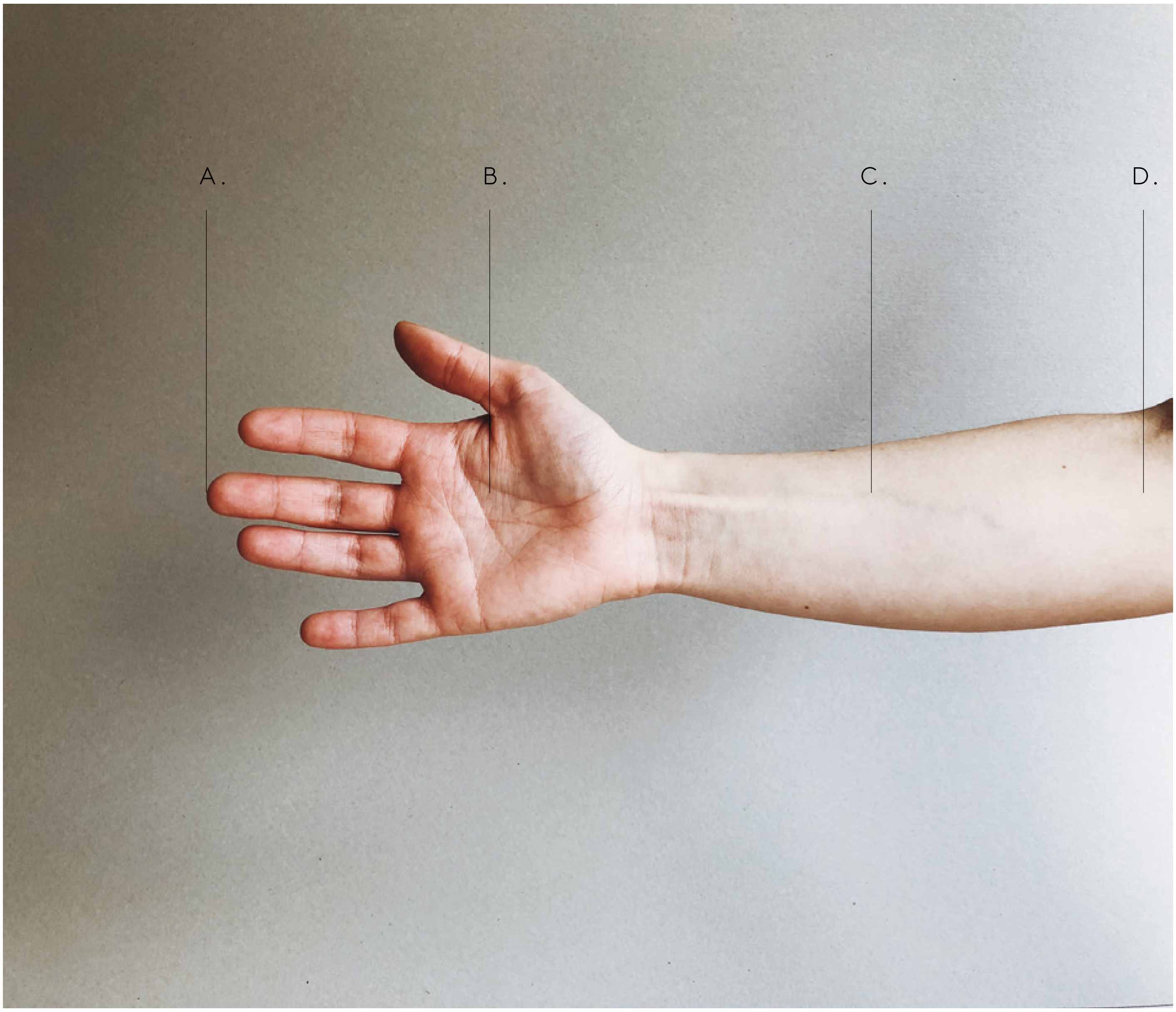
Face:28.0 C

Indoor with cloud, Air Temperature 20 C

A. Finger tip: 29.0 C
B. Palm: 29.4 C
C. Forearm: 31.4 C
D. Bend of arm: 33.2 C

Face: 31.5 C

A natural cloud normally feels very cold on the skin, but in this case it felt warm. We believe that it is because the reaction between water and dry ice that produces warmth. We also realized that this might actually be representative for the indoor cloud that is meant to be in the design, since the indoor temperatures are more similar to the dry ice experiment than being outdoors in a natural cloud. The operative temperature due to the convective and radiant heat transfer within a cloud is something that will be a part of the experience in the design.



For conclusion and explanation of annotation, see previous page.

WHAT

Directing fog with solid elements

WHY

The purpose of this experiment was to play around with curved and planar solid elements to see how the fog behave and interact with the element and the reflections.

HOW

Dry ice was put in a glass of boiling water and then a plexi glass sheet was used to stop, interact and catch the fog with.

PROPS

Glass, water 100 °C, dry ice, plexi glass, camera

QUALITATIVE MEASURE

Formation, reflections in the plexi glass

QUANTITATIVE MEASURE

Amount of fog, placement of the plexi glass sheet, solid or curved element

CONCLUSION

Playing around withdry ice and a transparent sheet of plexi glass, got us thinking about invisible architecture. In the photo, a physical architectural element was used, but what if it was possible to achieve the same effect using air? We talked with Torbjörn about this and he pointed us in the direction towards air curtains, which we will look into further.

We also tried to bend the sheet of plexi glass to see how it interacted with the fog, and noticed that the reflections of the plexi glass became skewed and distorted, which we found interesting. Of course, the formation of the cloud also adapted to the shape of the plexi glass, which made us thinking that this can be an interesting study when we develop site specific narrative sequences.

The photo above shows the interaction between a planar solid surface and the dynamic, ever changing cloud.

The photo above shows the interaction between a curved and reflective solid surface and the dynamic, ever changing cloud.

WHAT

Trying different air pressure to change the formation of the fog

WHY

This experiment was the result of ignorance and surprise, just playing around with different air pressures to change the formation of the fog with.

HOW

The sheet of plexi was put on top of a glass with dry ice in it. Then using the pressure from our hands on top of the plexi glass.

PROPS

Dry ice, glass of boiling water, two plexi glass sheets, hand, camera

QUALITATIVE MEASURE

The feel of the fog in different air pressure

QUANTITATIVE MEASURE

Amount of pressure, velocity, formations

CONCLUSION

The outlet formation of the fog changes due to the pressure from the hand. Changing the pressure by putting placing the hand on the plexi glass, gave the formation on the next page.

WHAT

Looking at the air pressure experiment from different levels

WHY

This experiment was the result of ignorance and surprise, just playing around with different air pressures to change the formation of the fog with.

HOW

We put the sheet of plexi glass on top of the drinking glass with dry ice in it and put our hand on top of the plexi glass. We then treated this setting as architecture and looked at the experiment from different angles and levels to get a feel of the spatial qualities of this experiment.

PROPS

Dry ice, glass of boiling water, two plexi glass sheets, hand, camera

QUALITATIVE MEASURE

Effect of reflection, the feel of the fog in different air pressure

QUANTITATIVE MEASURE

Amount of pressure, velocity, formations, levels

CONCLUSION

After looking at the pressure experiment from above, we wanted to see how it looked from a users point of view. We then discovered the reflection. If the plexi glass sheet represent at reflective ceiling, the visual experience of the cloud is doubled. It is almost like if the cloud dematerialize the architectural boundaries and change the scale of the cloud experience.

The reflections turned out to be more or less visible depending on the pressure that was put on the fog. We realized that we like both the more visible and powerful result (p. 157) and the more subtle shifts and reflections (p. 155).

REFLECTION

The series of photos above are taken in one second intervals to show the dynamic qualities of the cloud, interaction with the props of this experiment, showing how reflective materials can enhance the scale of the cloud.

WHAT

Trying to create a cloud in a plexiglass box using differences in air temperature and relative humidity.

WHY

To understand how it is possible to create a cloud on a medium scale, using differences in air temperature and relative humidity. This will also give a feel on how these differences corresponds to the sensorial experience of moving between different states of these design elements.

HOW

A plexi glass box of 60*40*40 cm was made with two different spaces, separated by a removable screen. The left space in the box, a cool microclimate was created by using ice. The air temperature was about 15-17 degrees and the relative air humidity 100 %. In the right part of the box a hot microclimate was created using various heating devices to create an air temperature that is about 60 degrees and the relative air humidity about 50 %-70 %. To create the air humidity in the hot microclimate, water was sprayed on the walls several times. When the air temperature and relative humidity was about right, The screen was removed between the two spaces to make the two climates react with each other and create a cloud. To create a cloud, the temperature difference needs to be about 40°C.

PROPS

Plexiglass box, styrofoam, ice, hygrometers, kettle, hair straightener, hairdryer, camera, water, spray bottle, tape, acrylic adhesive

QUALITATIVE MEASURE

Feel of temperature and humidity, feel of changes in temperature and humidity, cloud, condense

QUANTITATIVE MEASURE

Degrees, percentage relative humidity, amount of condense

CONCLUSION

Attempt no. 1

The first attempt did only result in a temperature difference that was about 30 °C, which was a direct result of bad insulation of the plexiglass box. The hot air did escape and the heating devices took too long to reach near the desired temperature. This resulted in condense and gave more clues on how to proceed with in the next attempt.

Heating Devices: Flat iron, water kettle, hairdryer

Attempt no. 2

This time the box was moved to a more controlled environment in the fume cupboard in the wood workshop in order to control the surrounding environment better. Styrofoam was used to insulate the box with and more acrylic adhesive was applied at the joints to really get the box completely closed. Another hairdryer with higher watt was used aswell. This time the temperature difference measured +17°C on the left space and the +57°C on right space which took 11 minutes. It was still a lot of hot air leakage from the box.

Heating Devices: Flatiron, hairdryer

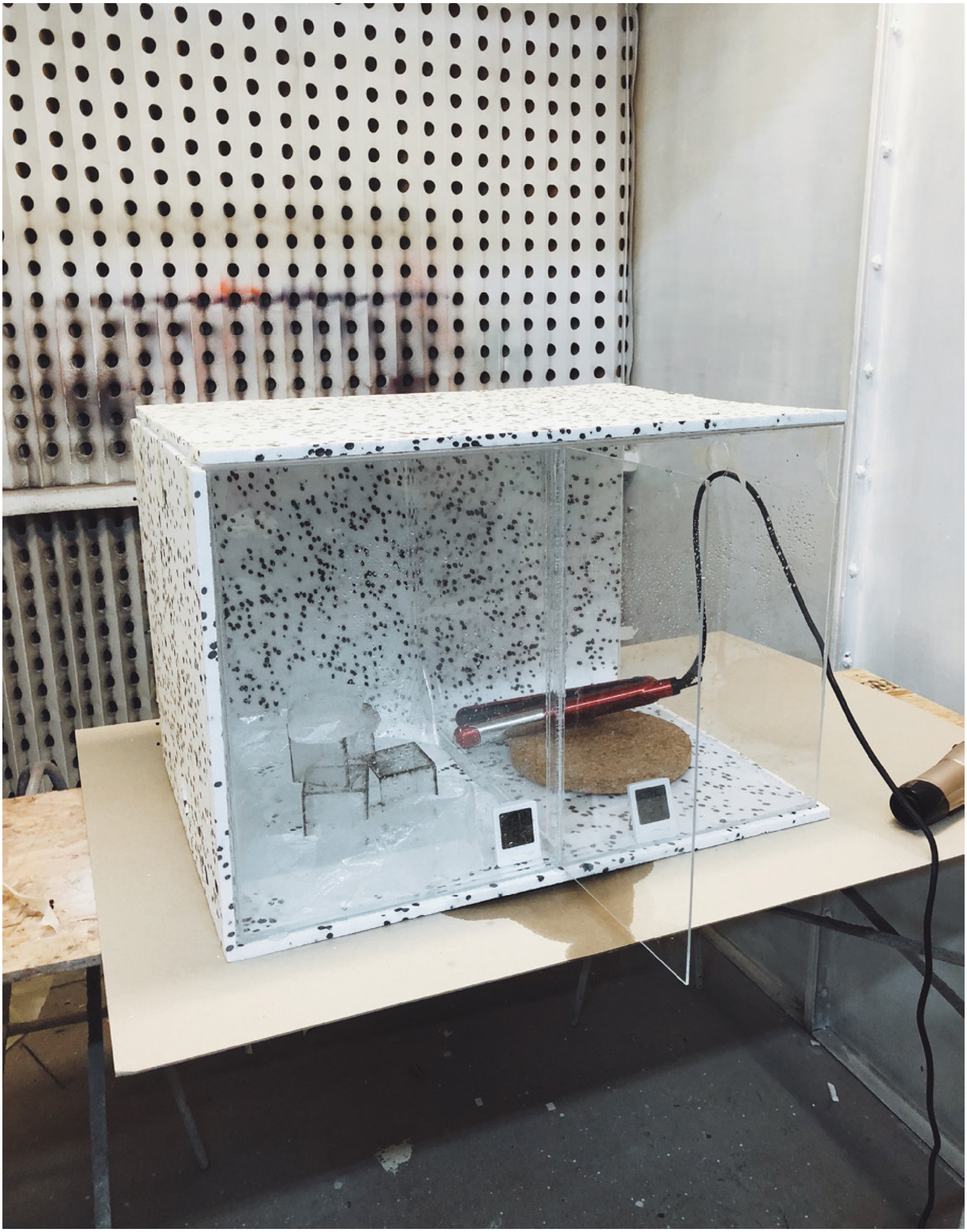
Attempt no. 3

All the joints around the box were taped for preventing hot air leakage. The left side reached +18°C and the right side of the box +58°C, in 10 minutes. When removing the screen between the two spaces nothing happened at first, but when taking a closer look there was a very small cloud, or fog! For the next attempt the background colour of the box needs to be changed so that it is not as white as the cloud. It makes it hard to see. The ice needs to be placed in a higher position so it does not fall to the ground and can be able to react with the middle layer of air. The flat iron will also be used instead of the hairdryer so that the air does not circulate.

Heating Devices: Flatiron, hairdryer 2.0

ATTEMPT NO. 1

The photo above describes the process and setup for attempt no. 1. Using books as weights without insulation.



07: ARTIFICIAL WEATHER

Meeting with Torbjörn 1 february 2018

Torbjörn Lindholm is a Senior Lecturer/Head of Division, Architecture and Civil Engineering, Building Services Engineering. Torbjörn Lindholm's research focuses on refrigeration, especially analysis of evaporative and desiccant cooling, while his teaching focuses on subjects and courses within the broad field of building services engineering.

WHY

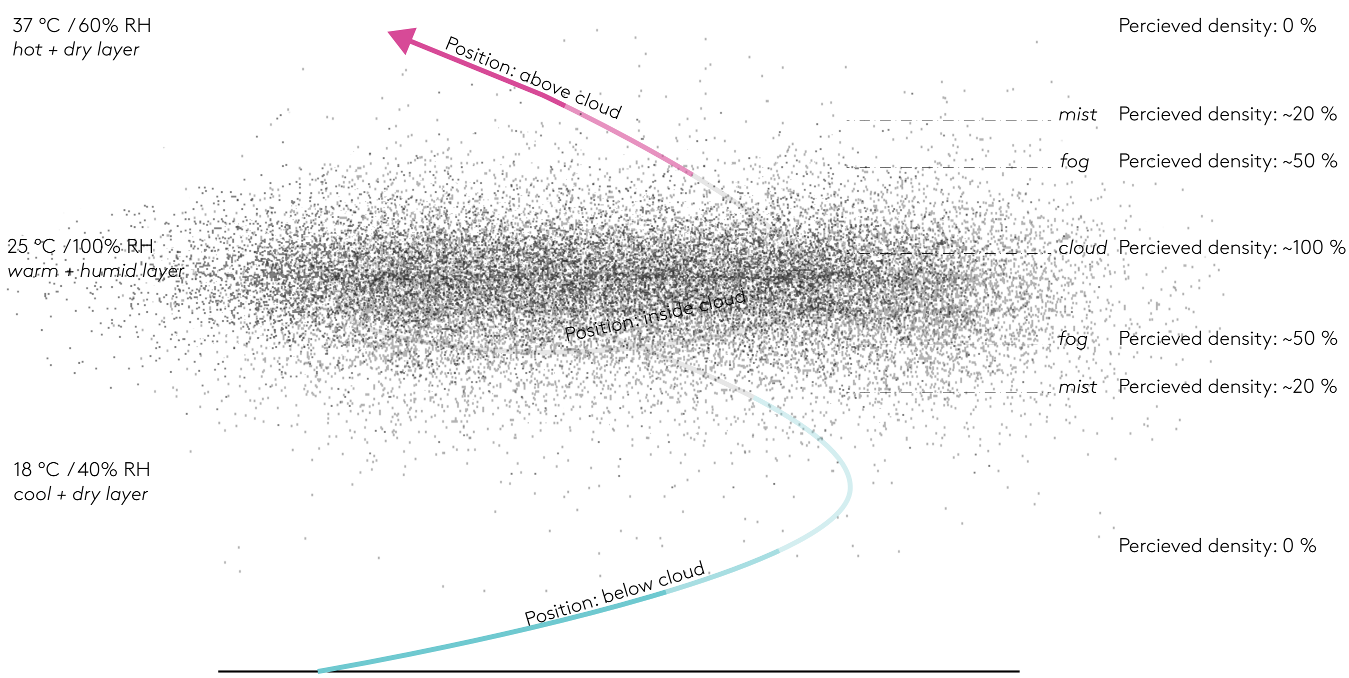
The purpose of this meeting was to see if it it feasible to create an indoor cloud. We discussed the possible methods and techniques that Transsolar and Tetsuo Kondo Architects have used in order to understand the system and create our own. The aim was to get a better understanding of how an indoor climate can be controlled on how it can be manipulated.

CONCLUSION

Through this meeting we learned more about the physics behind a cloud, indoor climate and the possible challenges of creating a cloud. We also got a better understanding of how Tetsuo Kondo Architects and Transsolar have created theirs. What we learned is that the tools required for building a indoor cloud are not only expensive but also uncertain. It is also requires a lot of time and help from electricians and engineers since we do not have the technical skills. After a long discussion with Torbjörn we came up with the idea of trying to build a prototype based on our learnings of the physics of a cloud by using Mollier Diagram to describe the cloud as well as the space. Simplifying the technical part in a prototype gives us more time for design. Our new knowledge of the layers of air and parameters gave us insight of what new ways of experimenting the creation of clouds could be.

CLIMATE ENGINEERING

Creating indoor clouds is possible through climate engineering, which is a way of applying physical principle at the building scale. It is also a way of experimenting in creating new types of architectural spaces that creates integration in engagement with its environment and users. The air in Le Temps is controlled through climate engineering, and is stratified in three different layers; the bottom layer is cool and dry, the middle layer is warm and humid and the top layer is hot and dry. The middle layer, the warm and humid, is where the cloud is created. By replacing pressure differences in the air through mechanically controlled heat and humidity, a temperature gradient is designed in the atmosphere of the space. The balance between the different layers determines the size and the level of the cloud; if the top level is run at a higher effect than the lowest level, the cloud will sink lower to the ground since the circulation of the hot and dry air is larger than the circulation of the cool and dry air. The climate engineering is only possible within a closed container, since the temperature and humidity inside the space are controlled to keep the cloud at the designed height but also to make it appear at all.



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The artificial indoor cloud is achieved through climate engineering, which in this case means that the air is stratified in three layers, an effect created by adding warm and cold air, moist and cloud seeds.

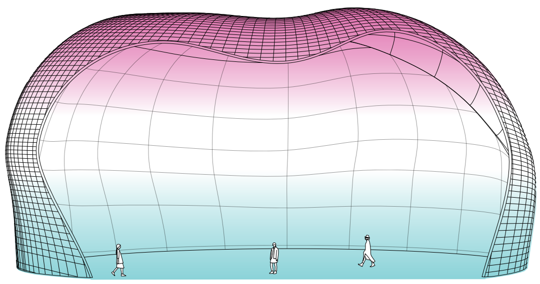


fig 1

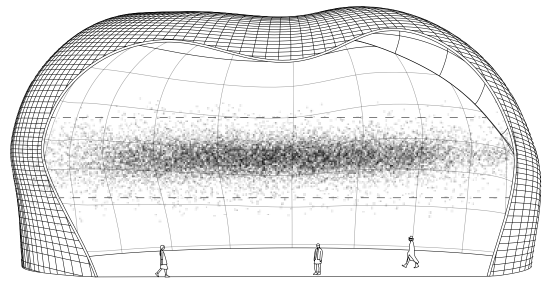


fig 2

37 °C / 60% RH
hot + dry layer

25 °C /100% RH
warm + humid layer

18 °C / 40% RH
cool + dry layer

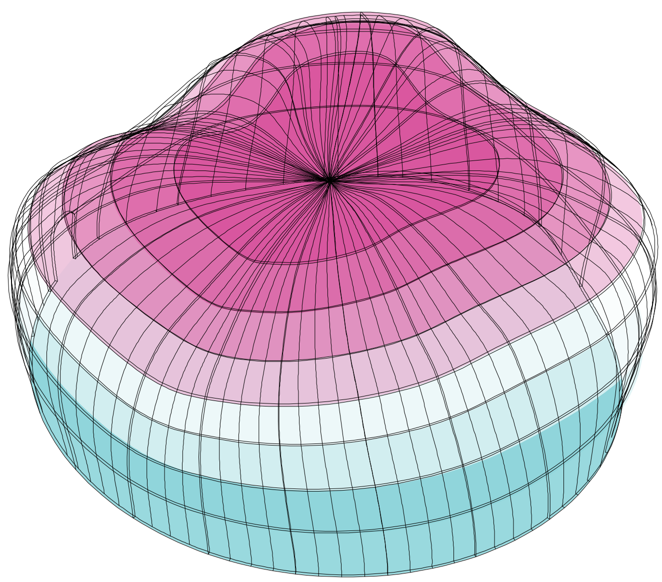
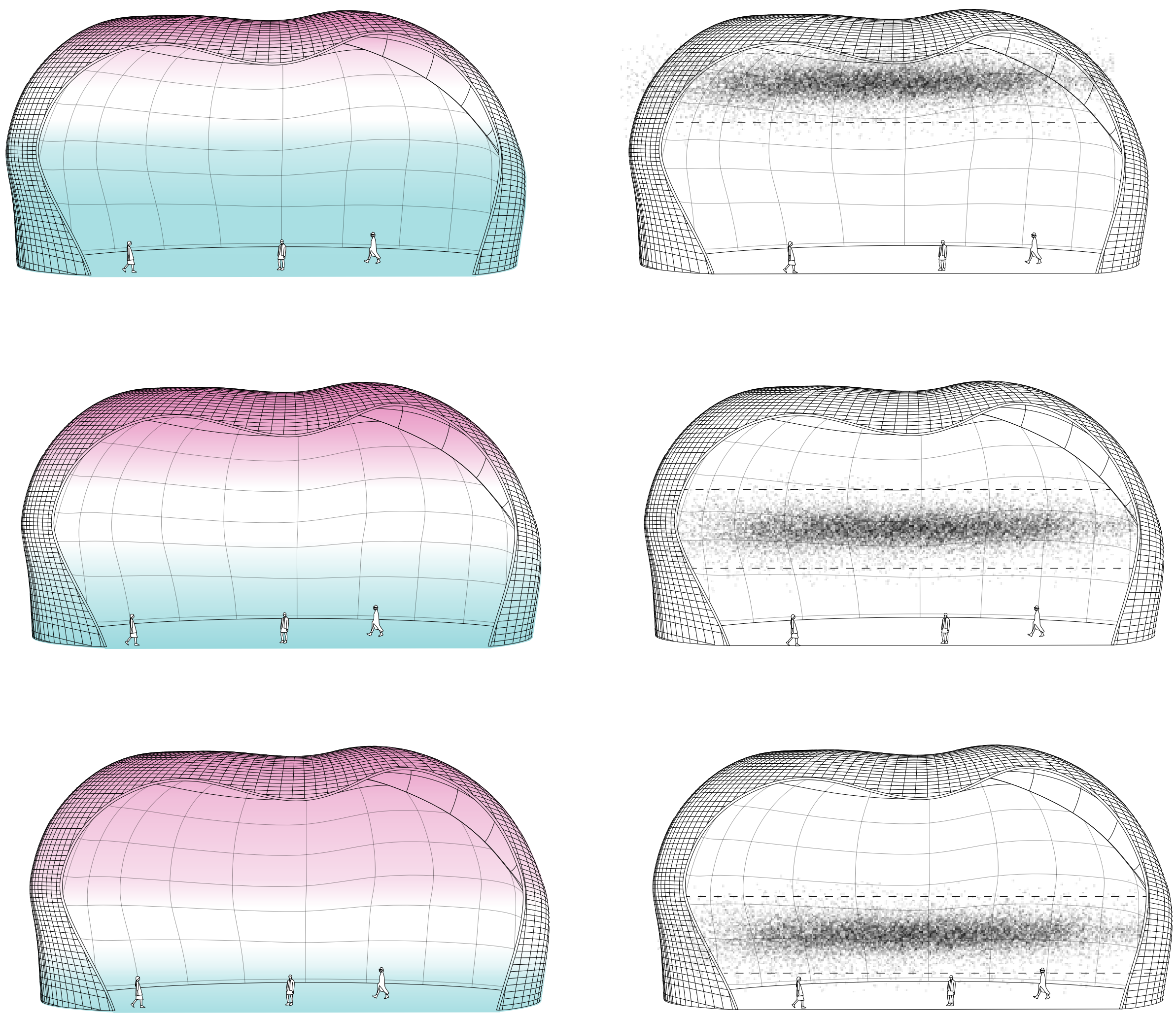


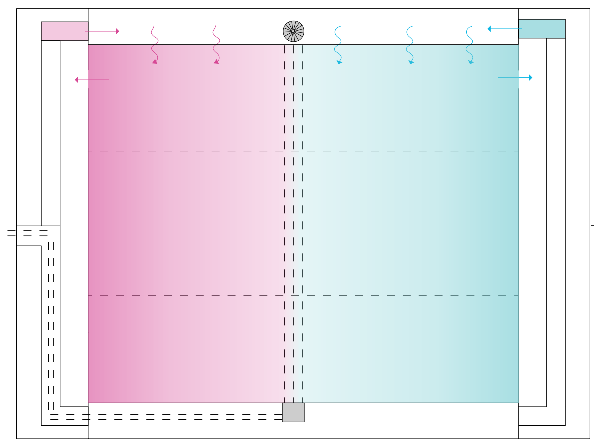
fig 3

Figure 1 & 2 describes the temperature and relative humidity for each layer and how the size of the layer relates to the level above ground of the cloud in the space. Figure 3 show the temperature gradient described in colors for readability. The white color shows where in the space the cloud will appear during the right conditions.

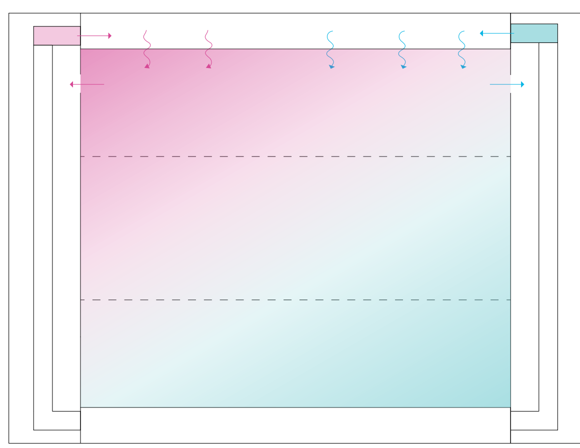
CLOUD IN RELATION TO STRUCTURE



The diagrams above describes the temperature and relative humidity for each air layer, and how it is possible to control the position of the cloud through changes in temperature, heat and humidity.

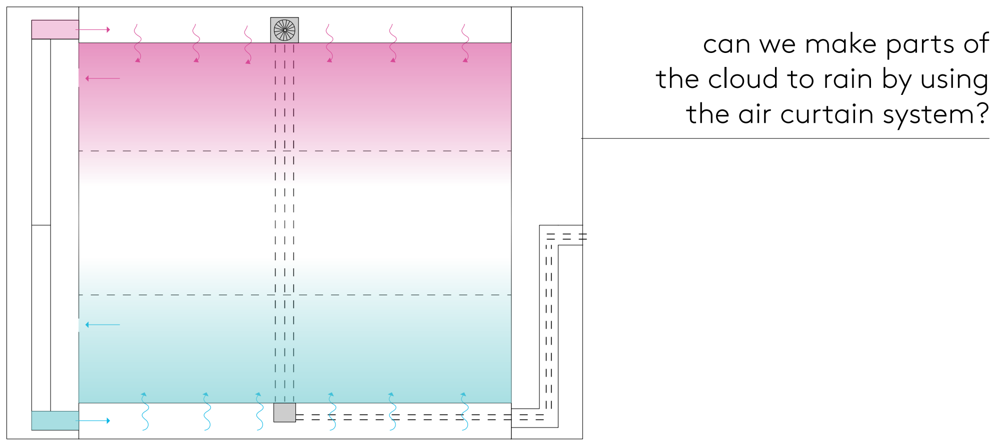


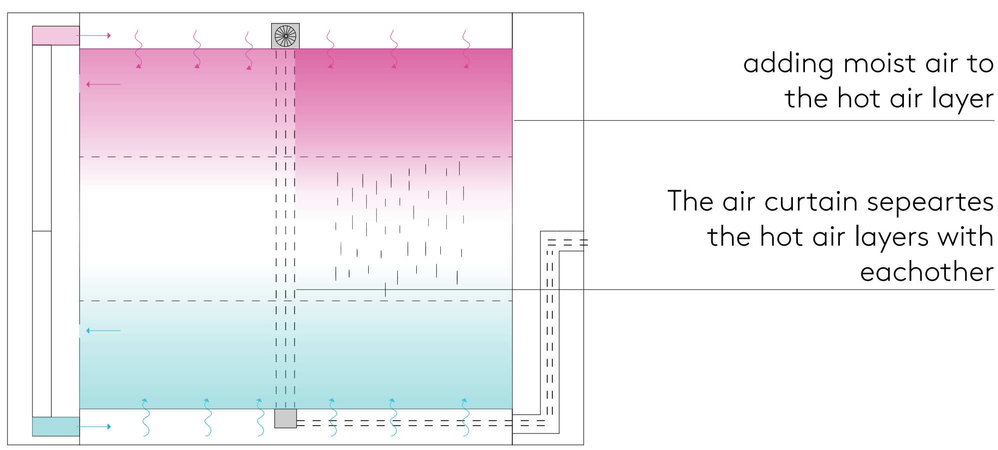
air curtain can
create microclimates



Air layers without
an air curtain

The drawings above show how the air curtain system separates temperature and air layers. The first drawing show how a vertical air curtain separates warm air from cold air. The air curtain has 90 % efficiency compared to a solid wall when it comes to separating temperatures. The second drawing show how the warm and cold air would mix without an air curtain. The warm air would rise and the cold air would sink, since warm air is lighter than cold air.





The drawings above show how the air curtain system is able to create a microclimate within a temperature gradient, technically dividing one climate into two. The second drawing show how an air curtain system can be part of creating rain as a microclimate within the cloud. By using the air curtain system to make one part of the cloud to rain, a specific space becomes separated which increase the level of control over the microclimate.

08: NARRATIVE

narrare: to tell

THE TELLING OF A STORY

Process photo of how we started with the experience, assembling it in a narrative.


BREAKING PATTERN
START
END
Outdoor
Connected
LOST
100
Connected
Breaking Pattern Sequence
Breaking pattern Sequence
HM...
AHA!!
MENTALLY INTROVERT
FULLY INTEGRATED STATE OF MIND
AH!

The relationship between architecture and film is an inspiration in the process of constructing a narrative. The aim of these case studies is to explore the link between architectural space and film space, in order to understand how spatial experience can be used through temporary events. But also how different narratives such as linear narrative and parallel narrative unfold the telling of a story and how it can be used in the design to enhance the experience of being inside the cloud. Film space is generated in our mind by a combination of our experience altered by our personal knowledge, state of mind and memories. The filmic space challenges specific aspects of the physical space on how we perceive and understand them and provides a representation of architecture. It propose a different relationship to architecture based on temporal qualities just like the cloud.

The narrative of a film has the ability to capture sensorial spaces, atmosphere, and emotions in many different points of views and in many different ways. It allows the viewer to switch between parallel time and stories depending on the associations and imaginations, something that is not really possible in reality. A filmic approach in the microclimates using a narrative explores ways of building experienced based scenarios by using cloud. A study on how film can be used as a medium can therefore expand the understanding of spatial experiences that challenges our mental space in the physical space. This is where the architectural qualities of cloud comes in. The cloud is dissolving, formless, massless, depthless, scaleless, featureless, dimensionless and purposeless, and has the power to dematerialize the architectural boundaries, as well as blurring them to create new dimensions and experiences. It means that inside of a cloud, there is nothing to see and nothing to do, except for being in the present. This put empathize on the bodily experience, since the eyesight is somewhat put out of focus.

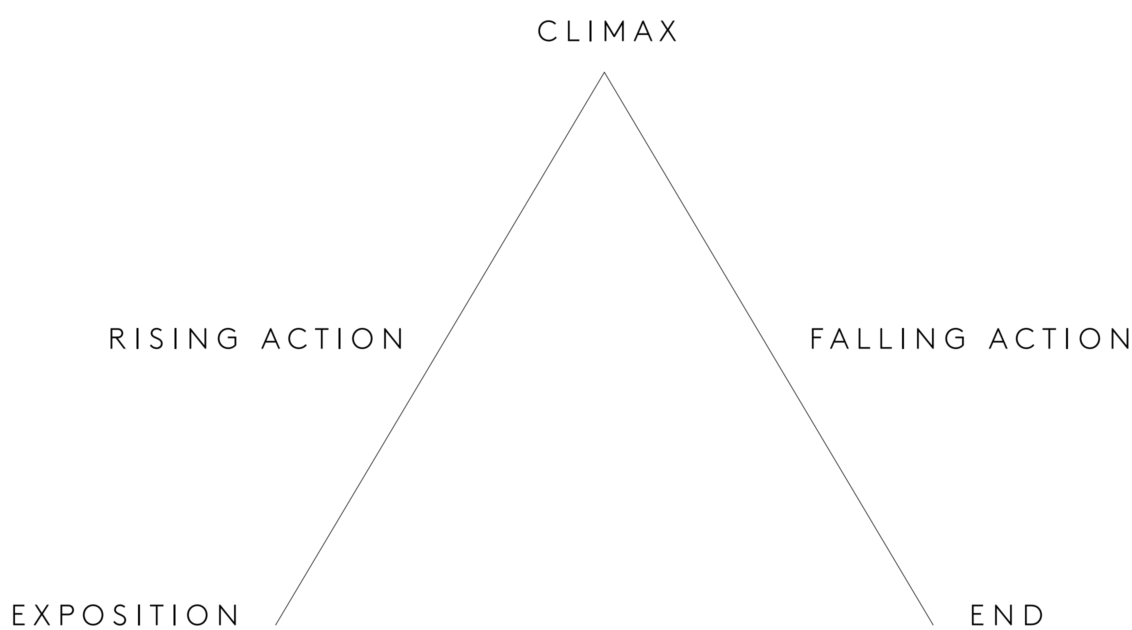
The similarities of architecture, clouds and film are: Light, shadow, sequences, atmosphere, perspectives, spatial experience, movement, experiences of spaces, storytelling, representations of ideas (future worlds, society, environment, and living) spatial vision, suspense, surprise, anticipation, temporality, settings, time and spaces. These have been important in developing a narrative in the design that is both physical and psychological, but also how to design the paths within the cloud to make the most of the experience.

REFERENCE

Narrative theory (sometimes called *Narratology*) has a long history, starting with Aristotle and continuing with great vigor today. Aristotle said that a good story should have three sequential parts: a beginning, a middle, and an end - a concept that has influenced the history of playwriting and screenwriting. French New Wave director Jean-Luc Godard, who helped revolutionize cinematic style in the 1950's, agreed that a story should have a beginning, a middle, and an end but, he added, "not necessarily in that order". Given the extraordinary freedom and flexibility with which cinema can handle time (especially compared to the limited ways in which the theatre handles time), the directors of some of the most challenging movies ever made - including many contemporary examples - would seem to agree with Godard. Today, Aristotle's three-part structure has been expanded into five parts.

p. 119
Looking at Movies. An Introduction to Film
Richard Barsam, Dave Monahan

FIVE-PART DRAMATIC STRUCTURE



The diagram above explains the different parts of the five-part dramatic structure, frequently used in the linear narrative structure.

I. EXPOSITION

Everything preceding and including the inciting moment - the event or situation that sets the rest of the narrative in motion. *The Exposition* provides background information on the characters, setting, and basic conflict, and ends with an inciting moment that sets the action going.

II. RISING ACTION

The development of the action of the narrative towards a climax. During the *Rising Action*, the principal conflict develops and may be complicated by the introduction of related secondary conflicts.

III. CLIMAX

The narrative's turning point. *The climax* is not the end of the action but rather the turning point, where, for example, the protagonists may begin to overpower the antagonist, or the opposite.

IIII. FALLING ACTION

The events that follow the climax and bring the narrative from climax to conclusion. During the *Falling Action*, the principal conflict moves toward resolution, with the protagonist winning or losing against the antagonist.

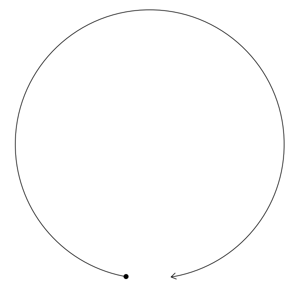
IIIII. THE END

The resolution or conclusion of the narrative. In *The End*, the final part, there should be no question about the resolution unless, of course, ambiguity is intended. We usually say that in a story which is considered a comedy, the protagonist is better off now than he or she was at the beginning of the story; if the story is considered a tragedy, the situation is the opposite.

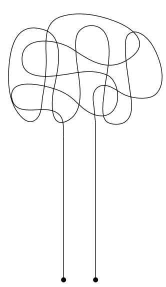
CRITIQUE

A critique to this way of building a story, is that it is predictable and not like everyday life, which is something that is easy for us to relate to. In everyday life we rather have many small climaxes during a day, than just one large life changing. Many parallel stories unfold during the same timeframe irrespective of one another, but occasionally the stories meet, interact and affect each other. This way to build a narrative is called a parallel narrative, and in the following pages both the linear and the parallel narrative will be explored to find ways of building a narrative in the design.

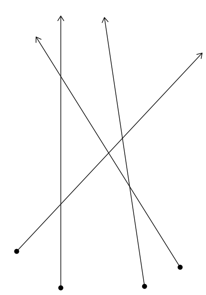
LINEAR NARRATIVE
- Predictable
- Little or no variation
- Traditional narrative
- One single story
- Example: Classic storytelling



CIRCULAR NARRATIVE
- End where it begins
- Repetition important
- Example: heroic storytelling



LINEAR/FRACTURED NARRATIVE
- Free for personal interpretations
- Similar start & end
- Stories within stories
- End where it begins
- Repetition
- Example: The Blur Building (2000)



PARALLEL NARRATIVE
- Alter or intensify the story
- Stories within stories
- Four different narrative intersecting at multiple points
- Analyzed individual but also under the same frame work
- Different start & end
- Example: Parc de la Villette (1982) & Short Cuts (1993)

PARC DE LA VILLETTE

The narrative of Parc de la Villette does not unfold in a linear way with a single exposition, rising action, climax, falling action and end. It rather follows a less predictable pattern of telling the story of the place, the people who visit the park, and the architecture.

Parc de la Villette can be translated into different linear narrative intersecting at multiple points, making it a parallel narrative that unfolds stories within stories. This alter or intensify the experience and makes it more complex. These stories, or experiences, can be analyzed or experienced individually but also within the same frame work. In the park, the expected events happen in the folies and the unexpected event happen in the intersection, enabeling a complex and unpredictable unfolding of the narrative.

This is something that has inspired the project. The increasing complexity of the parallel narrative compared to a linear and circular one, the design developed according to a parallel narrative. This is visible in how the path is designed in Le Temps, but also where the cloud is located, the eight different levels and the location of the microclimates.

PARC DE LA VILLETTE
BERNARD TSCHUMI ARCHITECTS
1982-1983

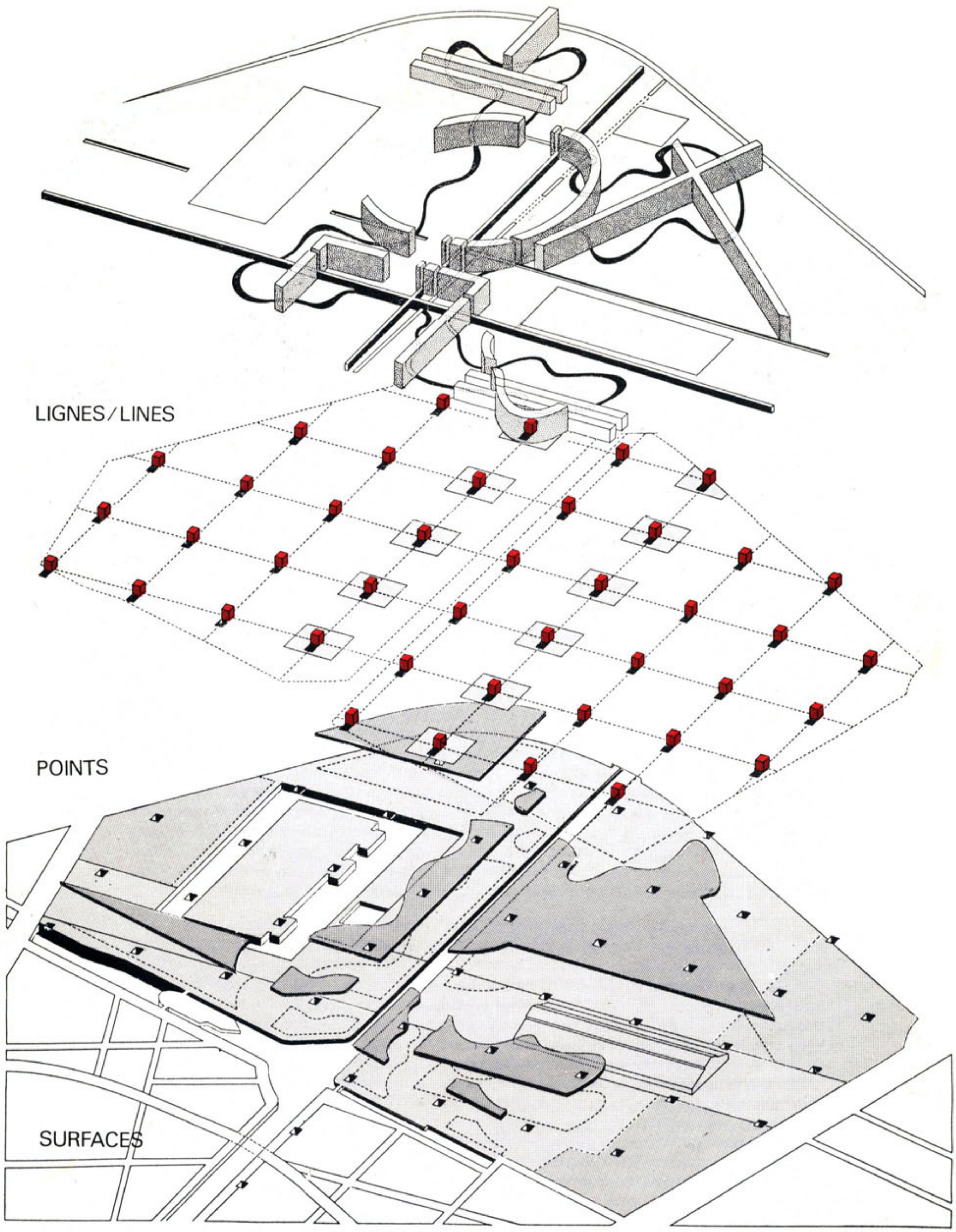
The most significant reference between architecture and cinema in Parc de la Villette, is the cinematic promenade, which is the linear walkway that slices through the park. For example, a sequence of gardens line the promenade, where each garden has a unique conceptual identity and is envisioned as a scene or a shot within the sequence of the cinematic montage. These sequences also play with vertical and horizontal configurations, just like moviemakers do then they plan a shot. With this move, he also suggests that the reading of a dynamic architectural space does not depend merely on a single frame (one garden), but on a succession of frames or spaces (multiple gardens in a sequence), which is an explicit analogy with film. This highlights the potential of montage, or editing, in architecture. Paths that slices through the park in a sinuous manner, intersect at several points, allowing the change of unexpected encounters or decisions to happen at the points of junction. These paths also allow for one to just wander around and get lost and suddenly end up in the most intriguing spots or events. Along the path, there are folies which functions as directional vectors for our perception of space. Tschumi is setting the stage for events to happen, rather than imposing a single, linear narrative, where you are told what to feel and what to think (Preetika, 2017).

Another important link between architecture and cinema is the idea of change. In the cinematic narrative, the viewer expect change to stay focus. This idea is also visible in the structure of Parc de la Villette, according to the intersecting paths but also to the flexibility of the folies which has changed from non-programmed to restaurants, gardening centre and arts workshop. Even though the park has developed since the 1980's, it still retained it's overall identity. All these changes that come about reminds us of our lack of ability to perceive what is going to happen, even in the near future, and helps us understand that architecture is dynamic (Preetika, 2017).

CONCLUSION

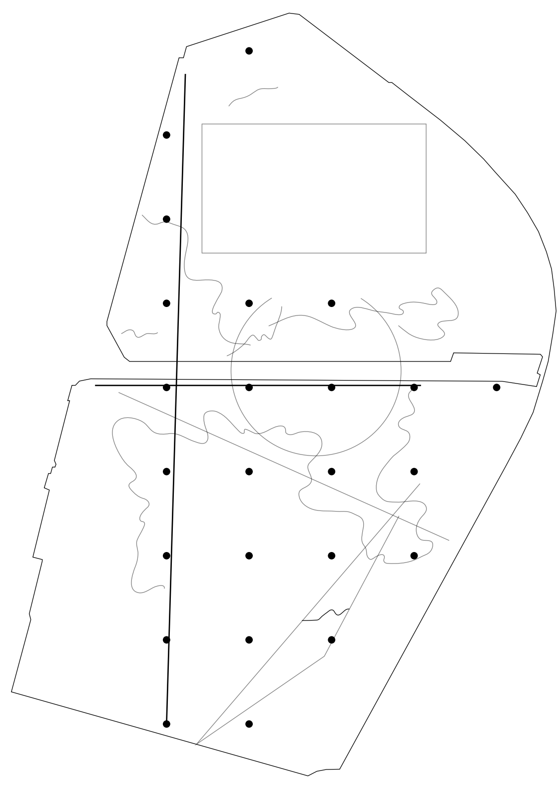
The conclusions that are drawn from the reference is how to work with a parallel narrative in architecture. In Parc de la Villette, Tschumi reached a high complexity of events, intersections, paths and experiences, which all unfold in a parallel manner. Visitors to the park can go there many times but each time the experience will be different, if you choose a different path, happen to intersect with other people or attending the ever changing program of events. This is achieved by offering different options in how to move and what to experience. Framing a path or an event is to focus on the experience of the visitor. What is it that the visitor see, feel, hear, sense while walking this cinematic walk? The project is design and developed in a similar way. Le Temps offer multiple paths below, within and above the cloud, at eight different levels. Inside the cloud, a user can experience different microclimates that change the spatial experience, as well as the subtle changes in temperature, relative humidity, air pressure and air flow. The path that enables the user to move below, within and above the cloud, always have 2-4 possible options, just like in the reference Parc de la Villette and the parallel narrative. This creates a narrative flow that unfolds in complex ways and creates unique experiences every time the user visit the pavilion. This is also why the design is based on a parallel narrative and not a linear one, which is the case in for example Cloudscapes by Tetsuo Kondo Architects.

Drawings opposite side: Bernard Tschumi Architects



THE SUPERIMPOSITION OF THE THREE SYSTEMS (POINTS, LINES, SURFACES) CREATES THE PARK AS IT GENERATES A SERIES OF CALCULATED TENSIONS WHICH REINFORCE THE DYNAMISM OF THE PLACE. EACH OF THE THREE SYSTEMS DISPLAYS ITS OWN LOGIC AND INDEPENDENCE

PARALLEL NARRATIVE IN PARC DE LA VILLETTE



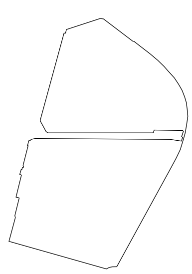
(Expected) Events, the red steel folies. Park visitors go there for a reason

(Unexpected) Events, the crossings of the different walkways

Walkway

Leveled walkway

Irregular walkway



Frame work: The park

NARRATIV SHORT CUTS
ROBERT ALTMAN, 1993

Short Cuts is a movie that deals with a parallel narrative. The stories takes place in Los Angeles in the early 1990, and it is a community united by TV, celebrity, helicopters, and cars. The movie starts with an overview of the city at night, when helicopters are flying over the city, spraying chemicals to deal with insect pest, and ends with an earthquake that affects all of the characters. These, together with a jazzy soundtrack, set up the frame work for the characters in the movie.

The movie consists of 9-10 storylines and the characters are, to name a few; a boy who dies before his parents can pick up his birthday cake, fishermen who finds the corpse of a young woman who has been raped and murdered, but still continue fishing until they catch their limit three days later, a man who methodically destroys everything in his estranged wife home while she is away for the weekend, a phone sex prostitute housewife and mother of two, and an unfaithful motorcycle cop. The characters are all interesting and has overlapping dialogues.

The movie deals with a parallel narrative, which means that the characters all have their own storyline and occasionally are brushing up against each other, which kind of ignites little big bangs and alternative universes to appear as the storylines unfolds. The narrative moves inexorably, rolling over and across one another in a stretchy tumble, steering around the action in lopping circles. This movie lacks the climax, or the excitement of discovery, that we are used to in Hollywood movies, but rather reminds us of real life. We see their shared stories that overlap, without the characters knowledge. It is almost like mini-sequences in a flow that overlap. Short Cuts flows like a river and it never stops.

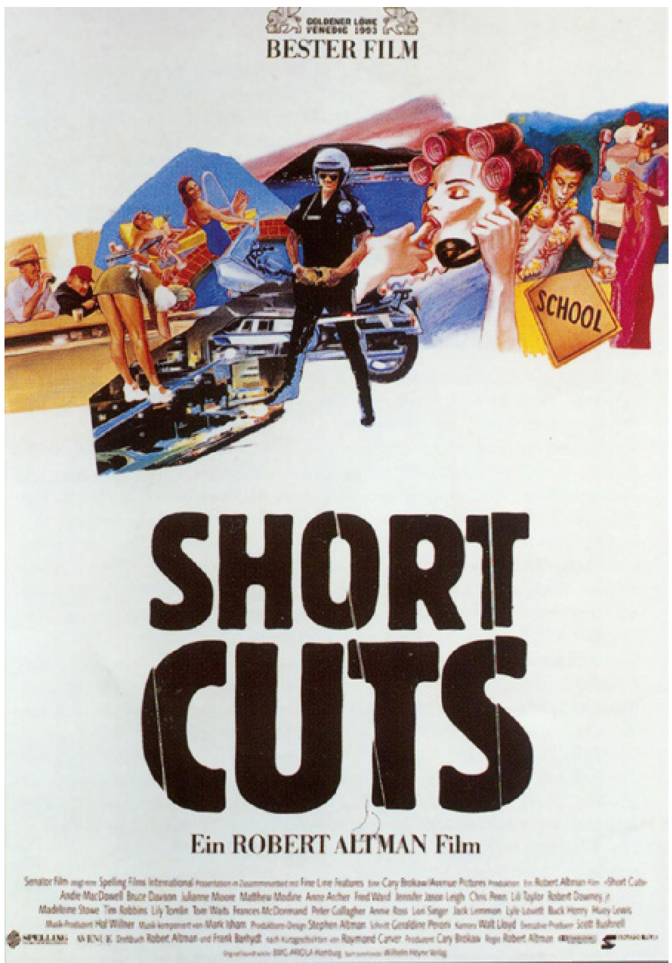
Everything around us are narrative; bedtime stories, tv, film, conversations with friends, architecture, podcasts, books, commercials...

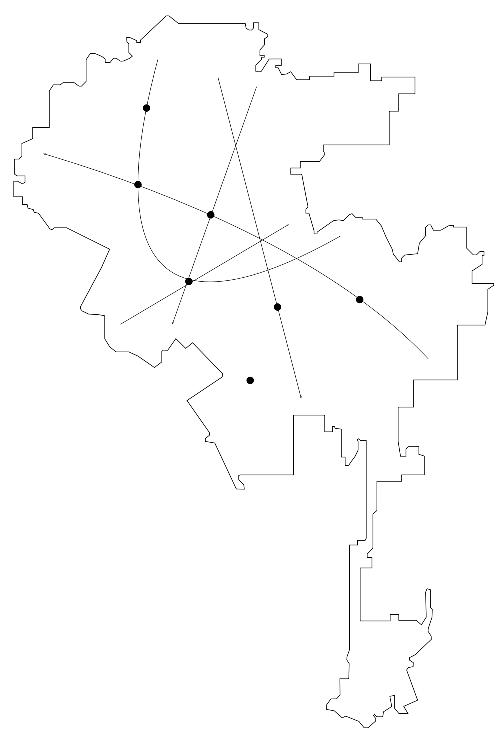
The film offers associations between characters and in-between mini-sequences, that the active viewer can construct along with the stories they see on screen. They are linked in more than one direction; from material that precede it and toward material that later recalls it.

The mayor theme is: What if?... Just like in real life, decisions are made every day, people live and people die. The stories in Short Cuts never end, they continue to play out, loop back in one another, informs what comes before and what comes after. The stories moves like life does; in slow waves that never end.

When watching Short Cuts, we are pure voyeurs, connecting the lives of the characters, that are unaware of those very connections.

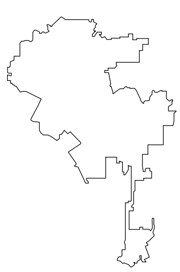
Photo: IMDB, Shortcuts, 1993


BESTER FILM
SCHOOL
SHORT CUTS
Ein ROBERT ALTMAN Film

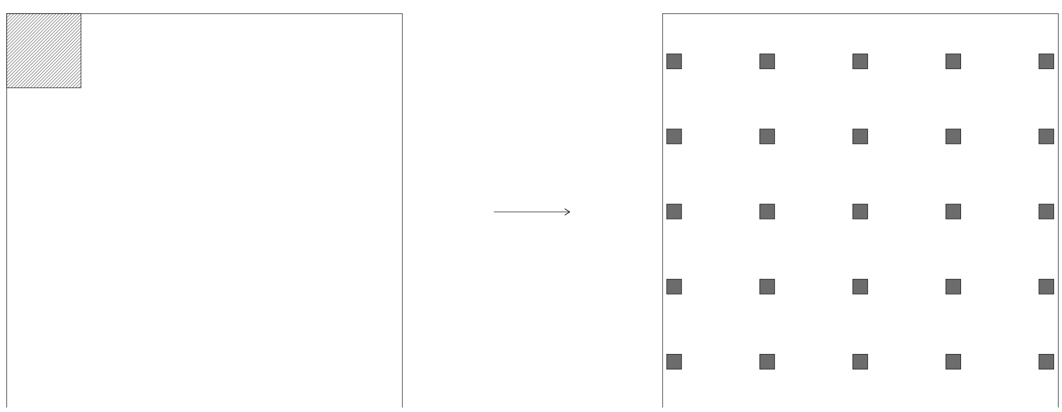


Events, where characters meet. For example: Hospital, bakery, pool, neighbours, party or the park

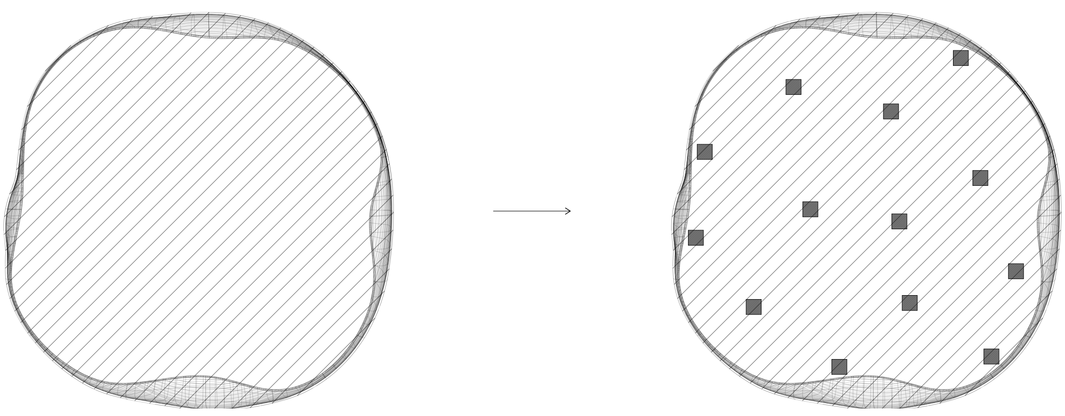
Random movement of characters triggered by something that happens in their life



Frame work: Los Angeles, TV, celebrity, helicopters,cars, jazz soundtrack, chemicals, earthquake



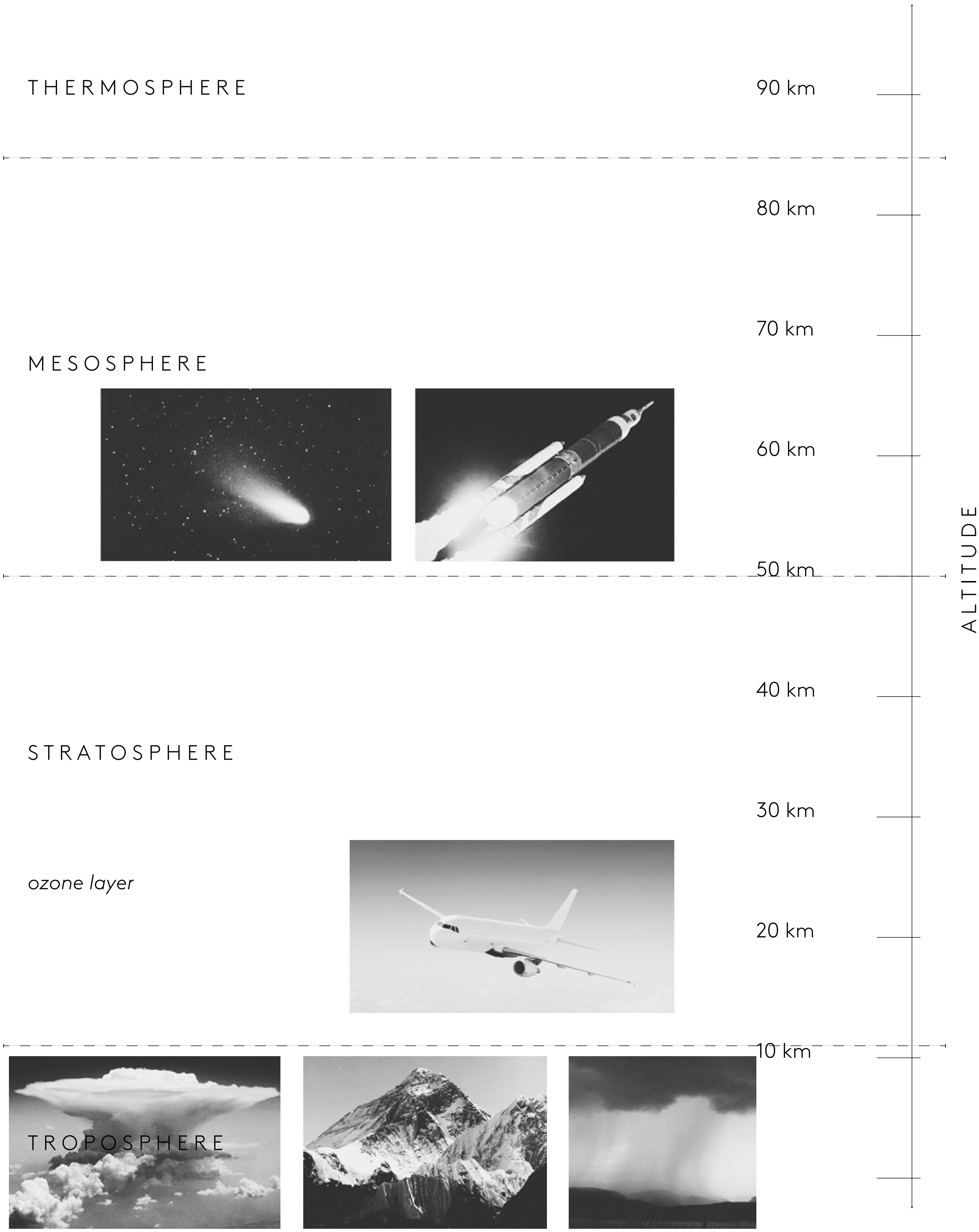
In Parc de la Villette, Tschumi wanted to spread the experience, in this case cultural hubs, throughout the park rather than collect it at one corner. This created the conditions that enable the parallel narrative and rising complexity of the design. The darker square to the left represents the large building, the smaller squares to the right represents how the experiences are spread through the park.



In Le Temps, the design is inspired by the concept in Parc de la Villette, but the difference is that the experiences are spread out within the cloud as microclimates. The square to the left above represents the cloud, and the smaller squares to the right represents the microclimates within the cloud.

09: CLOUDS

THE ORIGIN OF CLOUDS



TROPOSPHERE

The earth's atmosphere consists of three major layers. The lowest part is called the troposphere and that is where almost all weather conditions take place. It is also in the troposphere the weather we experience day-to-day occur. The troposphere contains about 75 % of the atmospheres mass and 99 % of the total mass of water vapor and aerosols (for example particles and gas). The depth of the tropospheric layer differs depending on where you measure it, but the average depths are approximately 7 km above the Polar Regions during wintertime, 17 km above the mid latitudes and about 20 km above the tropics.

Even the troposphere itself consists of different layers. The lowest part is called the planetary boundary layer, and is between 200-2000 m deep depending on for example time of day. The planetary boundary layer is where friction with the earth's surface influences air flow. The top layer of the troposphere is called the tropopause, and since the stratosphere is the middle layer of the atmosphere, the tropopause is the border between these two spheres. The tropopause is an inversion layer, which means that the air temperature ceases to decrease with height and remains constant though its thickness (Troposphere, 2018, 16 april).

STRATOSPHERE

Above the troposphere lays the stratosphere, which is the second major layer of earth's atmosphere. It contains approximately 20 % of the atmospheres mass and is layered in a temperature gradient ranging from cool layers close to earth and warm layers higher up, which means that the temperature increase with altitude, which can be explained by absorption of ultraviolet radiation from the sun by the ozone layer. This temperature phenomena is working in direct contrast to how the temperature behaves in the troposphere, since it decreases with altitude. The temperature varies within the stratosphere, depending on the seasons, and the greatest variations is above the poles. The stratosphere starts at about 8 km above the poles, over the mid latitudes it starts at about 10-13 and ends at 50 km and near the equator, it starts at approximately 18 km (Stratosphere, 2018, 9 april).

MESOSPHERE

The third major layer in the atmosphere is the mesosphere, which is above the troposphere and stratosphere. As in the troposphere, the temperature decreases as the altitude increases. The top layer of the mesosphere is the mesopause, and that is the coldest occurring place on earth that occur naturally; the temperature is below -143 °C. (And yes, it still counts as earth). There are no exact boundary of the mesosphere, since they vary within latitude and season, but the approximately boundaries are between 50 - 100 km above the surface of earth. The troposphere, stratosphere and mesosphere are collectively referred to as the middle atmosphere, and this area spans from about 10-100 km above the earth's surface (Mesosphere, 2018, 14 april).

BASICS

Clouds are an endless source for research, and there are much we still don't know about the phenomena, but we do know that clouds have an impact on temperature on earth, which varies over day. During daytime, clouds are reflecting the radiation from sun away from earth, which makes the earth cooler. During night time, the result is reversed; the clouds are protecting the heat emission from earth to disappear out in space. This is why clear nights are cold nights, since there are no clouds to stop the emission from disappearing out in space, which means that the surface temperature on earth drops. The reason for this is the smallest particles in the formation of clouds, the cloud droplets (Moln - introduktion, 2017, 2 may).

CLOUD DROPLETS

Clouds consists of small water droplets or crystals. Since they are very small (micrometer), they can float in air in contrast to rain droplets that are much bigger (millimeter), and heavy enough to fall downwards.

The radiation from the sun, or emission from the earth, that reaches the cloud are reflected away or absorbed by these tiny cloud droplets. How much that is reflected away from the cloud is dependent on the wavelength of the radiation and the size of the droplets. Small droplets are mostly reflecting radiation with a short wavelength, and larger droplets are mostly reflecting radiation with a long wavelength (droppstorlek och fallhastighet, 2017, 20 march).

The light that is visible to the human eye, consists of a radiation wavelength between approximately 300-700 nm. This kind of light is therefore best reflected by the smaller droplets in the cloud (smaller than 1 micrometer) and not so much by droplets that are bigger than 10 micrometers. Heat radiation consists of longer wavelengths and affects therefore droplets that are a little bit bigger.

The reflectivity and absorption of the cloud depends on the size of the droplets, the thickness of the cloud, the density of the droplets and on the height above ground of the cloud. Every cloud is unique, and there are an ever present dynamics since they are always formed, transformed and disappeared (Clouds, 1999, 1 march).

WHERE DO THE CLOUDS COME FROM

Clouds are formed when water vapor in the air condense on small particles, so called aerosols. This happens only when the air is supersaturated, which means when the relative humidity (RH) is more than 100 %. At this supersaturated state, water in gas form immediately starts to condense on all available surfaces. In the air, it means that the available cloud formation cores are small airborne particles such as droplets and small solid particles. These particles are normally 100-300 nanometres. It means that you cannot see them with your bare eye, but they are needed for a cloud droplet to form.

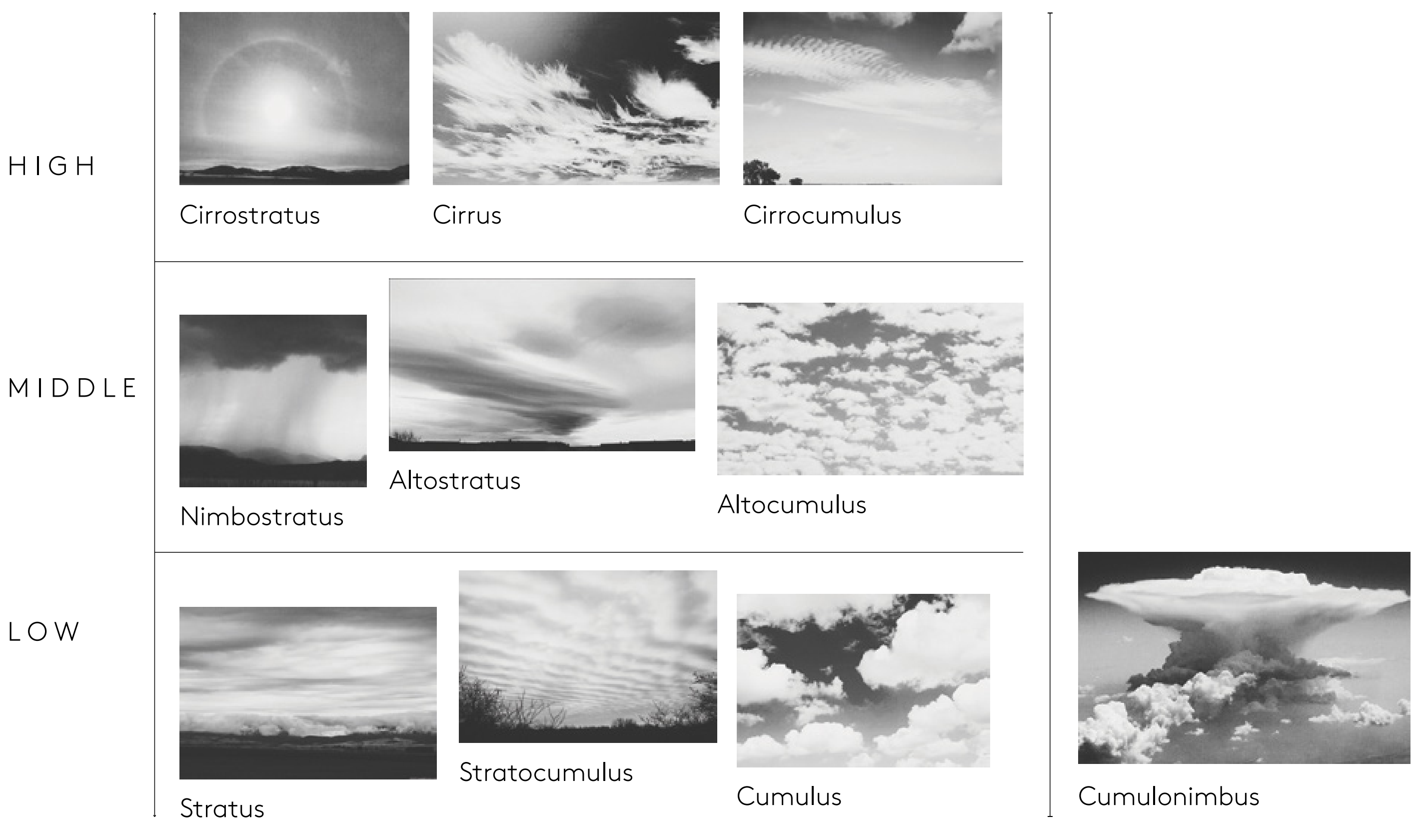
The most common reason that an air mass becomes supersaturated with water vapor is cooling when air rises upwards in the atmosphere. The formation of the cloud is therefore created when air mass rises upwards in the atmosphere, cools off, and becomes supersaturated with water vapor which then condense on all available particles. The small particles then grows and becomes bigger. The larger the particles, the bigger opportunity they have to absorb even more water as they offer a larger surface for condensation. When water is condensed on the particles, the supersaturation decreases and the cloud formation process decreases.

The exact science of how clouds are formed is very complex. Except from size, there are a lot of other factors, for example the chemical composition, how fast the air mass rises and therefore also how fast the cooling process is (Moln, 2017, 29 October).

PRECIPITATION

Precipitation, or rain, occurs when thousands of cloud droplets merge into one large mass that becomes too heavy to stay in the air as clouds. It also means that the fall rate is too high so that they don't evaporate before they reach the surface of the earth. Clouds that consists of small droplets don't give as much rain as clouds formed by large droplets, since they do not form enough droplets that are big enough for sky fall (Moln, 2017, 29 October).

THE ORIGIN OF CLOUDS



BACKGROUND

Tropospheric clouds have latin names and these derive from five different formations; Stratiform sheets, Cirriform wisps and patches, Stratocumuliform patches, rolls, and ripples, Cumuliform heaps and tufts, and Cumulonimniform towers. These formations are also affected by instability and convective activity. These five forms are then cross-classified by altitude level, creating ten basic genus-types of clouds in the troposphere. These are then divided into species, which in most cases can be subdivided into new varieties. These also have latin names and can appear in more than one genera or species. The naming of clouds is a complex business, and this summary will not go into all of them.

Clouds that are created and appear in the other two major layers of the atmosphere, namely the mesosphere and the stratosphere have their own classifications, genera, species, and sub-species (Cloud, 2018, 18 April).

CIRROSTRATUS (CS)

The Cirrostratus formation is characterized by being very thing, flying on a high level above the earth's surface (higher than 5.5 km), hard to detect with the human eye and can form halos when taking the form of cirrostratus nebulosus. It consists of ice-crystals. The genera can also take the form of cirrostratus fibratus, which appears with a fibrous texture and a little bit thicker than its sibling nebulosus. Since its thinker, the fibratus cannot create halos. When a Cirrostratus appear on the sky, its an indication that there are a large amount of water in the upper atmosphere, which can fall as rain in the nearby future. Another way to tell the weather by looking at the Cirrostratus is to see if the formation is fragmented or not. If it is, the from is weak. If the front is strong, the cirrostratus begins as nebulosus but turns into a fibratus formation (Cirrostratus Cloud, 2017, 8 November).

CIRRUS (CI)

The Cirrus formation is characterized by thin and wispy strands and appear at an altitude between 5-14 km above the earth's surface. The color is white or gray and indicates that the present weather might change to rain, since it appear on the sky before a frontal system. The cirrus itself don't produce any rain, since it evaporates before it reaches the earth's surface. While composed by water in the earth's atmosphere, the cirrus formation also form on other planets. So far scientists have detected cirrus clouds on Mars, Uranus, Saturn and Jupiter, and are positive that there appear on Neptune too. The difference is that cirrus on other planets are formed by ammonia- or methane ice instead of water ice (Cirrus Clouds, 2018, 10 April).

CIRROCUMULUS (CC)

Together with Cirrus and Cirrostratus, the cirrocumulus is one of three cloud formation types that appear and are created in high altitude in the troposphere, hence the name high-altitude tropospheric clouds. The Cirrocumulus often appear 5-12 km above the earths surface and when visible, signal for convection. Both Cirrus and Cirrostratus consists of frozen ice, which also is the case with the Cirrocumulus, but the Cirrocumulus also consist of extremely cooled liquid water. The liquid droplets can freeze to ice, which transforms the Cirrocumulus to a Cirrostratus instead. That means that the formation normally is very short lived and ephemeral and perhaps more a part of a transformation than an own state (Cirrocumulus, 2018, 4 April).

NIMBOSTRATUS (NS)

In contrast to the three genera named above, the Nimbostratus is a low flying cloud (about 3km above the earth's surface) and is characterized by its ability to produce rain and other precipitation over a large area and has a relative large thickness; about 2 km. The base is normally a little diffuse and dark grey but the middle and top can seemingly appear to be illuminated from the inside. The Nimbostratus is created in the middle layer of the troposphere but grows vertically both high and low and becomes very big and thick on the sky (Nimbostratus Cloud, 2018, 4 March).

ALTOSTRATUS (AS)

The Altostratus formation is characterized by its color, luminance and uniform shape. Compared to the other middle altitude cloud genus it is a little blue and green. The Altostratus is normally a little bit lighter than the nimbostratus but darker than the higher flying Cirrostratus. This formation is formed when stable air masses lifts up and forces water vapor to condense into a cloud. The formation can produce light rain and can take the form of virga, undulatus (wavy formation on the base because of wind) or a fragmented fibratus. When appearing

a fragmented fibratus, it indicated a warm front coming in (Altostratus Cloud, 2018, 11 April).

ALTOCUMULUS (AC)

Altocumulus descends from two words; Altus that means high and Cumulus that means heaped, which describes the characteristics of the formation very well. The Altocumulus is also characterized by large circular masses that layers, which means that the colorization is varied depending on individual elements. Altocumulus are formed between 2-6.1 km above the earth's surface, which makes it a middle layer in the troposphere. As in the case with other cumuliform and stratocumuliform, the altocumulus indicates convection. If the altocumulus form a towering shape, it's called a castellanus and is a reaction to instability and convection, which indicates an approaching thunderstorm (Altocumulus Cloud, 2018-03-29).

STRATUS (ST)

Stratus descends from the latin word "Strato-" which means layer and is characterized by being horizontally layered and low flying clouds that have a uniform shape. The color ranges from white to grey. It's a featureless cloud that look a lot like fog; it's flat with little or no texture or contrast, and it's sometimes called high-fog because of the similarities. The stratus indicate very little meteorological activity and if anything, it can produce a light drizzle of rain or a few snowflakes during wintertime (Stratus cloud, 2018-04-18).

STRATOCUMULUS (SC)

Stratocumulus clouds are formed below 2.4 km above the earth's surface. The formation is characterized by the same elements that the other clouds that belongs to the cumulus genera, which means rounded masses in groups and ranging from white to dark grey in color. Though groups are most common, the rounded masses can also appear in lines or waves depending on the wind (Stratocumulus Cloud, 2018-03-14).

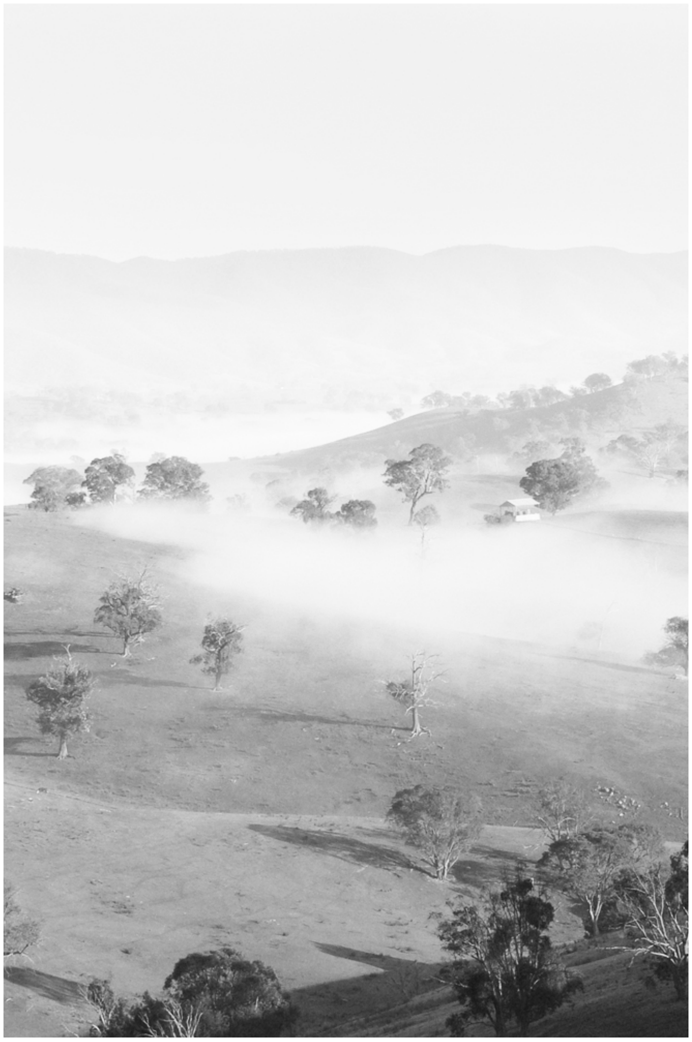
CUMULUS (CU)

The Latin word Cumulo- means pile or heap, which described the formation of the cumulus cloud. Cumulusform clouds are the white, fluffy cotton-like cloud and are very low flying, normally less than 2

km above the earths surface. This formation can be formed by water vapor as well as water droplets and ice crystal depending on the temperature, and they can appear both by themselves but also in groups. The Cumulus cloud can transform to cumulonimbus when the meteorological activity turns unstable (Cumulus Cloud, 2018-04-06).

CUMULONIMBUS (CB)

The Latin word Cumulo- means pile or heap, and the latin word Nimbus means rainstorm, describe the cumulonimbus very well, since it is a cloud formation often associated with thunderstorms. It is a large mass of air and water vapor, in a towering formation created by upward air currents. The appear alone or in groups in the sky, sometimes in shape of a line. The Cumulonimbus can create several dangerous weathers such as lightening, tornadoes and storms, and can even develop as part of a supercell (Cumulonimbus Cloud, 2018-04-07).



MIST

Mist is a natural phenomenon that is caused by small droplets of water vapor suspended in the air. The difference between mist and fog is by definition that mist causes less impairment of visibility than fog does, otherwise, there is no difference. Fog reduces visibility to a distance that is less than 1000 m (Fog, 2018, 9 April).

Photo: *Unknown*

FOG

Fog is a natural phenomena that can be considered as a type of low-flying cloud, but with some differences. It consists of visible cloud water droplets and the origin is often connected to large bodies of water such as seas, oceans and marshes, but also depending on wind conditions and topography. Which means in contrast to clouds, the water and moisture in fog is generated locally instead of globally (Fog, 2018, 9 April).

Photo: *Unknown*

CLOUDS

A cloud is a visible mass of water droplets, particles and crystals that is suspended above the earth in the troposphere. These affect the weather and the temperature on earths surface and therefore our everyday life (Cloud, 2018, 18 April).

Photo: *Unknown*

LUMINANCE & REFLECTIVITY

One of the characteristics of clouds is the luminance, another one is the reflectivity. These two belong together since the luminance, or brightness of the cloud, is defined by how the light is reflected, transmitted and scattered by the component of the cloud, namely it's particles. Rainbows and halos do also affect the brightness of the cloud. The reflectivity of tropospheric clouds are approximately 70-95 %, which is very high. The clouds appear to be white when sunlight can't penetrate the densely packed droplets. How white, or bright, the cloud appear, depends on the clouds thickness and how much of the light that are being transmitted back to the observing eye. Since thin clouds reflect less light, they do not appear as bright white as thicker or denser clouds does.

Rainclouds appear to be grey because when the droplets become too large for gravity to hold, they start to fall down on earth. This is called accumulation, when the increasingly larger space between the heavier droplets permitting light to penetrate further into the cloud. That means that the light is reaching deep into the cloud, but is not reflected back but rather absorbed by the cloud. This creates the grey look (Cloud, 2018, 18 April).

WHITE & GREY

The most common cloud color during day-time is white or grey, because then the sun is in a high position in the sky. This means that one of the factors of colored clouds are the incident light, since the cloud appear to have the same color as the light that shines upon it (Cloud, 2018, 18 April).

RED, ORANGE, & PINK

Clouds can appear to look pink, orange, and red during sunrise and sunset, which is the result of the incident sunlight scattered by the atmosphere. During these times of day, the suns position is below the horizon, and then the low-flying clouds appears to be light grey, middle level clouds appears to be pink, orange, and red and high-flying clouds look white and illuminated.

Though clouds can be colored other ways than the incident light, since it also reflect colors from city lights, light pollution, larger fires, and auroras (Cloud, 2018, 18 April).

GREEN & BLUE

Clouds that contains high amounts of water, such as Cumulonimbus clouds, appear to have shades and tints of blue and green, since hail and rain scatters light in a way that corresponds to that exact wavelength. Green tinted clouds normally occurs when the sun is low in the sky. The color green is often associated with thunderstorms and supercells, but it is more an indication of the potential, not what's to come. It also depends on how strong the updraft is. The stronger the updraft, the severer the storm (Cloud, 2018, 18 April).

YELLOW

Yellow clouds are most common during late springtime or early fall, the so called forest fire seasons. The yellow color appear visible because of pollutants in the fire smoke but also inte urban areas with a high level of air pollution in form of nitrogen dioxide (Cloud, 2018, 18 April).

OPACITY

When identifying opacity in clouds, there are two groups to consider since all clouds fall into one of these groups. One group covers the low- and middle level clouds and comprises the different variations called translucidus, perlucidus and opacus. Translucidus is thin translucent, perlucidus is thick opaque and opacus is thick opaque. Within this group of clouds, the opacity change within each individual cloud. In the other group, that covers high level clouds, there are no variation in opacity since there clouds are always opaque (Cloud, 2018, 18 April).

SHADOWS

A shadow cast on a solid surface is a shadow cast in two dimensions, while a shadow cast though a cloud or fog is cast in three dimensions. This phenomena happens due to that the fog and the cloud are dense enough to be illuminated by light from within, but thin enough to let light pass though and illuminate objects further on. This is visible though parallel beams and are created the same way as shadows in fog and cloud, which is called crepuscular rays or sunbeams(Cloud, 2018, 18 April).

RAYS

Beams of sunlight that appears to originate from the sun and shine in parallel shafts is called crepuscular rays. These beams streams between and though gaps in clouds and are most common during sunset (Cloud, 2018, 18 April).

Photo: Brocken Inaglory, 2006

10: REFERENCES

THE BLUR BUILDING
Diller Scofidio + Renfro (2002)

The Blur Building
The Blur Building was built for the Swiss Expo 2002 on Lake Neuchatel. It is comprised of a lightweight infrastructure equipped with 35 000 water nozzles to farm fog. A built-in weather station controls fog output in response to shifting climatic conditions such as temperature, humidity, wind direction, and wind speed. The architects referred to the project as ”the making of nothing” (dsrny.com, 2002.

KEY FINDINGS

What we bring with us from this reference is the architectural qualities of cloud; dissolving, formless, massless, depthless, scaleless, featureless, dimensionless and purposeless. The cloud has the power to dematerialize the architectural boundaries, as well as blurring them to create new dimensions and experiences. Inside of a cloud, there is nothing to see and nothing to do, except for being in the present. We also learned a lot about the technique of fog nozzles, and how the cloud artist Fujiko Nakaya helped Diller, Scofidio + Renfro to make the cloud appear more natural by varying the pressure according to the weather (www.inews.co.uk, 2017).

CRITIQUE

The Blur Building: The structure is designed to be as invisible as possible, and this is something that could have been pushed further if terms of form, materiality, and color. Another critique is that inside the Blur pavilion, Diller Scofidio + Renfro designed a glass box that was described as representing the feeling of weightlessly being inside of a cloud. We believe that the glass was too much of a obstacle to create that feeling. That lead us to design subtle boundaries using air curtains instead of solid walls.

OUTCOME
enhance the architectural qualities

for example formless, dephtless, scaleless, featureless, & dissolving.

OUTCOME
object

At a distance, you experience the blur as an object

OUTCOME
atmosphere

Coming closer, being surrounded by the fog, you experience it as an atmosphere.

AGENT
fog

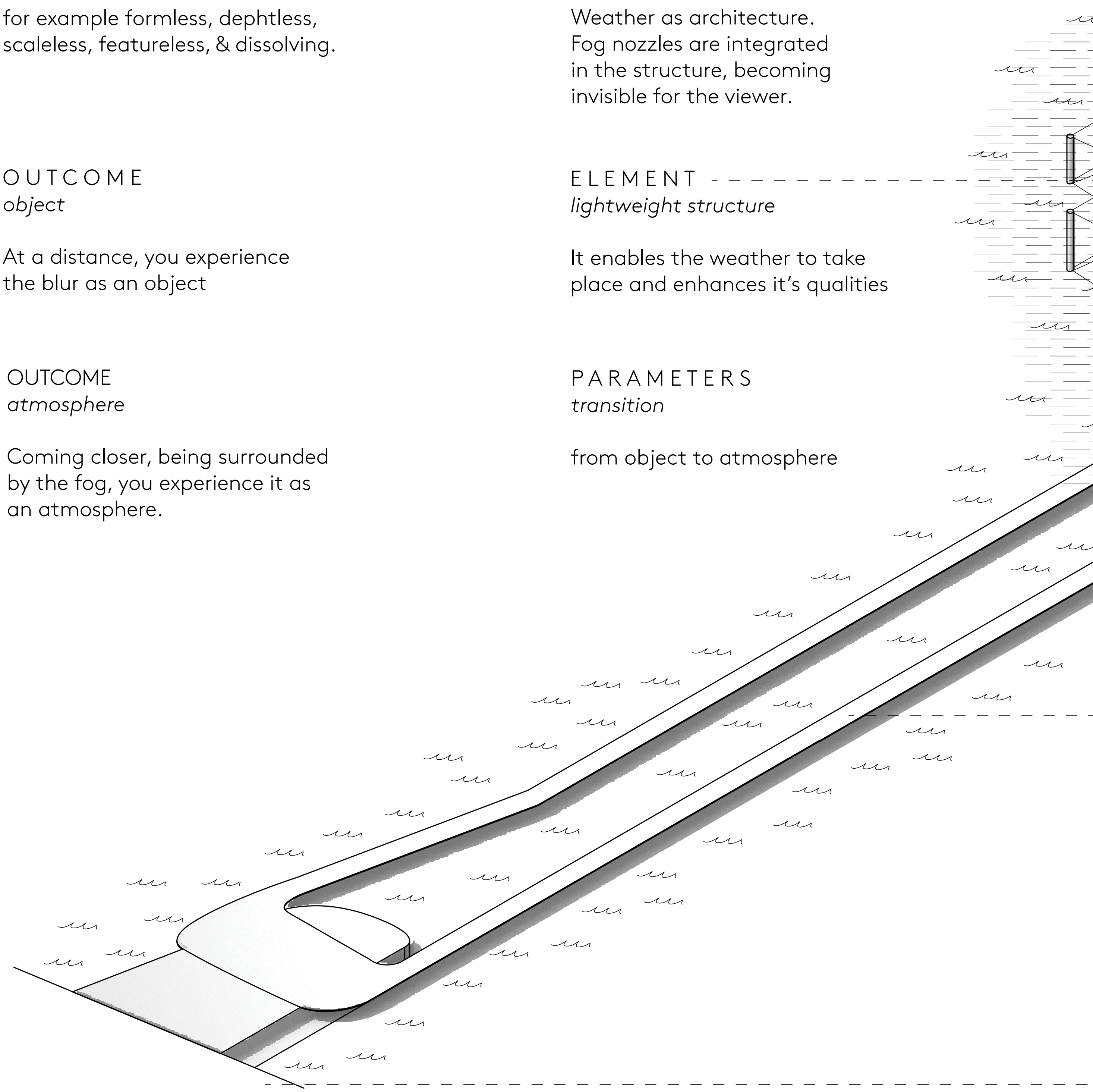
Weather as architecture. Fog nozzles are integrated in the structure, becoming invisible for the viewer.

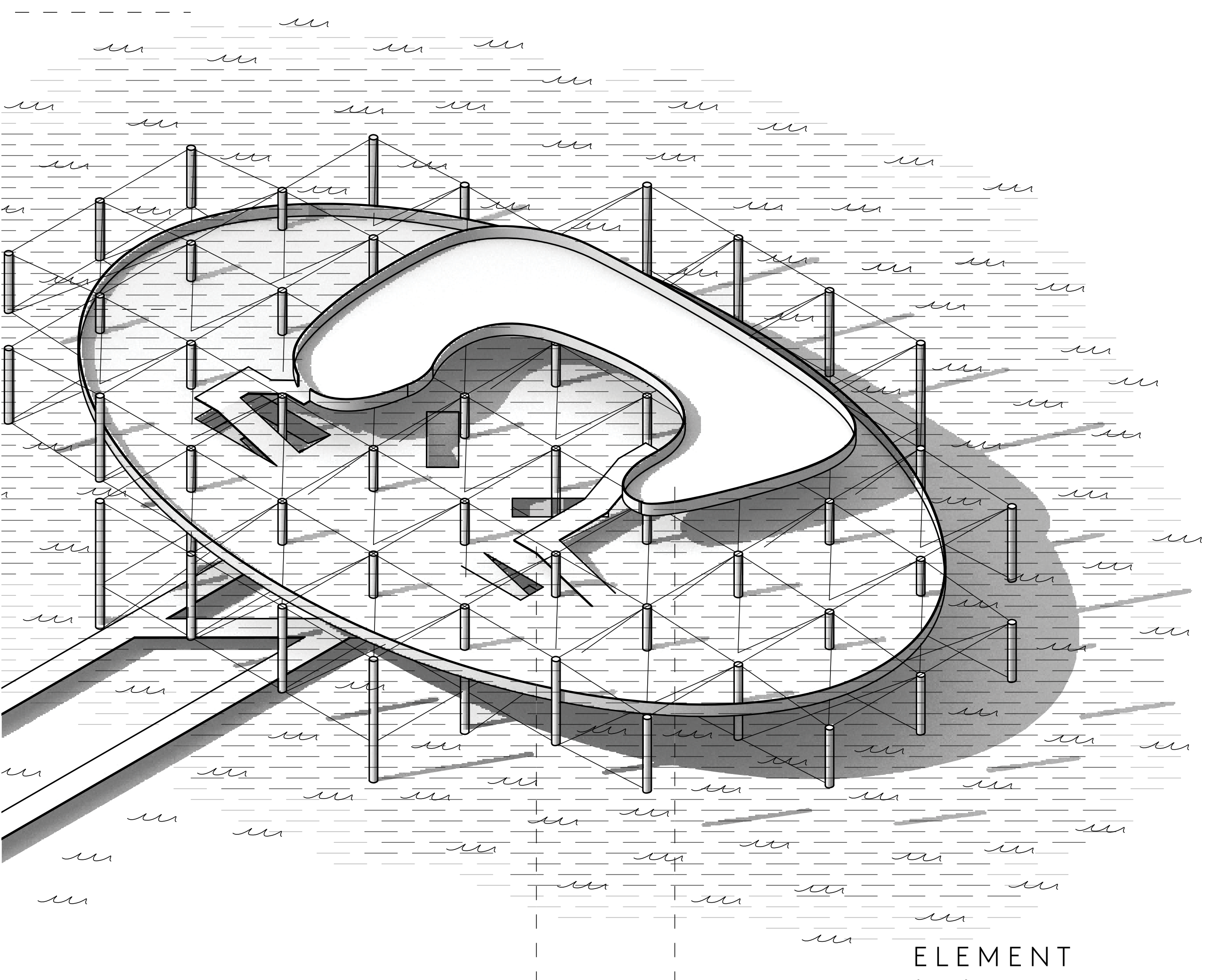
ELEMENT
lightweight structure

It enables the weather to take place and enhances it’s qualities

PARAMETERS
transition

from object to atmosphere





ELEMENT
levels

You have to climb the stairs in order to reach the fog, distancing you further form the water. When you are experiencing the fog, you are almost as distanced from the water as you can be. At the top level you are suddenly above the fog, adding another level of sensation to the experience

ELEMENT
distance

Close to the water but not close enough to touch it, which enchances the expectations

FUJIKO NAKAYA
Fog Artist

Fujiko Nakaya is a japanese fog artist born in 1933, who dedicated her life to clouds. She is known for many different project such as the PEPSI Pavilion at the Expo'70 in Osaka, Fog Bridge #72494 IN San Francisco, Veil, at the Philip Johnson Glass House, but also the Blur Building where she designed the actual cloud experience (Over the Water, 2013).

KEY FINDINGS

What we bring with us from this reference is the experience of the cloud, which is very important to Nakaya and very inspiring for us. Her design is very modest, it's just water vapor, but the poetic effect is fantastic. The fog interact with the environment, the atmosphere but also the people who experience it. It is a kind of soft and subtle architecture (www. inews.co.uk, 2017).

The Blur Building, Diller, Scofida + Renfro, 2002
Photo: Diane Dubeau, 2002

CLIMATE ENGINEERING
Cloudscapes, Transsolar + Tetsuo Kondo

"The installation "cloudscapes" was designed in cooperation with Tetsuo Kondo. It consisted of an indoor cloud and was a tangible depiction of climate engineering at the Architecture Biennale in Venice 2010. A floating cloud inside an enclosed environment can be accomplished by having temperature-stratified air layers, where the air temperature significantly increases with height. The lowest air layer is the heaviest and the coolest, and dry. The highest air layer is the lightest and the warmest. Water vapor is released into the warm, middle air layer until individual droplets begin to condense, and the cloud begins to materialize. Contrary to what we feel, humid air is less dense than dry air, so the cloud does not fall to the ground. The air above the cloud is the lightest due to its high temperature. Thus the cloud is trapped between two pillows of air."

/TRANSSOLAR.com, 2010

KEY FINDINGS

What we bring with us from this reference is the technique and idea behind the climate engineering. But also that it is actually possible to create a controlled indoor cloud that people can interact with as a way of experimenting in creating new types of architectural spaces that creates integration in engagement with its environment and users. The air in the project is controlled through climate engineering, and is stratified in three different layers; the bottom layer is cool and dry, the middle strata is warm and humid and the top strata is hot and dry. The middle layer, the warm and humid, is where the cloud is created.

CRITIQUE

Cloudscapes: We see Cloudscapes as a prototype for how to create an indoor cloud. The solid design itself is quite simple and the only way they modify the cloud is by light, both natural and artificial. The solid design is uncritical towards the design of the cloud, which might be intentional since it is located in an already existing space at the biennale. We would like to see how the solid architecture could follow and enhance the architectural qualities of the cloud instead of contrasting. Also, the cloud

has more potential than just being a cloud. This is something that is developed and pushed in the project Le Temps.

Cloudscapes, Transsolar + Tetsuo Kondo Architects
Architecture Biennale in Venice, 2010

FROM OBJECT TO ATMOSPHERE

TK: Its quite remarkable how the fog waves its way around the hills. After living here for most of my life, I still am amazed by it. Now that you have been living here, with the fog, for some time, do you find that you experience it differently?

HU: I've come to understand much more about it but it never ceases to amaze me. And I honestly can't stop thinking about it. One of the challenges of course, is that we don't have language to describe fog: we would need a hundred different words to capture the incredible variation between, say, a black fog that drifts and a thick white fog that engulfs, or a thin morning fog that hover over the Bay, and a violent avalanche of fog that crashes over the Marin hills. And that's just the visual part; I wouldn't even know where to begin with how it feels, the many different kinds of cold it brings, from a refreshing mist to a bone-chilling cold as harsh as a New England winter storm. So you can never really say what it is and, in that sense, put it to rest. Hardly a day goes by that the fog isn't present somehow; either its there or its not. Except for the rainy season, roughly January until March, you know the fog will return sometimes soon, if not today then tomorrow, but you never know when for sure. Some say theres a three-day rule, it can't stay sunny for more than three days, but I've since found out thats wildly untrue.

TK: It reminds me of the urban legend about the number of words Eskimos have for snow. And, I know what you mean about the unpredictability of fog. Is that what fascinates you, the surprising element?

HU: Yes and no. Thats more to do with fogs temporal aspect but Im equally, if not more, fascinated by its spatial qualities. Fog first appears as an object, as something out there that is separate from you. It often begins far away and has a distinct shape, like a shaft or a wall or a serpent. Then, with time, the object morphs and morphs until it begins to break up and disperse and it changes to a different state of matter altogether; once an object, it is now an atmosphere. And that's when it becomes architecture.

TK: Fog as architecture, how beautiful. Can you please expand on that?

HU: Well, we could talk about how fog interacts with buildings, especially tall buildings and bridges and fantastic TV aerial on Twin Peaks. It makes them vanish, which can sometimes be a good thing, and then they reappear, reassuringly. And it doesn't only obscure, it also reconfigures; taking, for example, the middle out of a building and leaving only the base and the top. Fog also has functions as a kind of urban designer, creating San Franciscos famous microclimates that are subtle and difficult to map. The general rule, though there are many exceptions, is that the further east you go the less likely the fog will penetrate. That's why San Francisco is probably the only city on earth where oceanfront property is not particularly desirable or expensive and also why our coastline is mercifully underdeveloped. We live in the geographical center of the city, on Buena Vista Park, which puts us at above five on a scale of one to ten; across the park, uphill and a quarter of mile away, its more like a seven or eight out of ten. There are many cold and windy summer weekends when we cross the Golden Gate Bridge and, not even ten miles from our house, its sunny and dry and hot. Or we might call some friends in Dogpatch, sheltered by Potrero Hill along the bay, maybe three miles away from us, and they'll be having a barbecue and wearing shorts. Fog makes and unmakes the citys neighborhoods and ways of life as much as any set of planning guidelines or architectural building codes.

TK: Its so true, I live in Noe Valley but I have family in the Sunset and fotens its warm on my back deck and overcast near the ocean. People seem to explore neighborhoods in the city by their sun factor and for a place that is only 49 square miles, its remarkable how much changes within that. What are other ways of look at the fog?

HU: Well, another way to think about fog as architecture is to consider architecture as space more than built form. I suppose that goes back to what I mentioned before, about how fog begins as an object and then becomes atmosphere. The fog of San Francisco reveals the plentitude of space, the ways in which space and spaces are anything but empty. We tend to think of space as void, an emptiness between things. But space is also present and full and overflowing with characteristics and qualities. This is something that I try to reveal and express in my exhibitions - to provide spaces with specific, memorable qualities, spaces that are anything but neutral. I guess you could say I've learned a lesson or two from the fog!

Foggy Eyes, San Francisco Days
Interview between Tania Ketenjian & Henry Urbach, June 30, 2008, p.276-279 in the book -Arium

CONCENTRATION & DISTRACTION

Clearly, this is at bottom the same ancient lament that the masses seek distraction whereas art demands concentration from the spectator. That is a commonplace. The question remains whether it provides a platform for the analysis of the film. A closer look is needed here. Distraction and concentration form polar opposites which may be stated as follows: A man who concentrates before a work of art is absorbed by it. He enters into this work of an the way legend tells of the Chinese painter when he viewed his finished painting. In contrast, the distracted mass absorbs the work of art. This is most obvious with regard to buildings. Architecture has always represented the prototype of a work of art the reception of which is consummated by a collectivity in a state of distraction. The laws of its reception are most instructive.

The Work of Art in the Age of Mechanical Reproduction
Walter Benjamin, 1936

Illuminations
p. 18

PRESENCE

Igualada Cemetry,

Enric Miralles + Carme Pinós

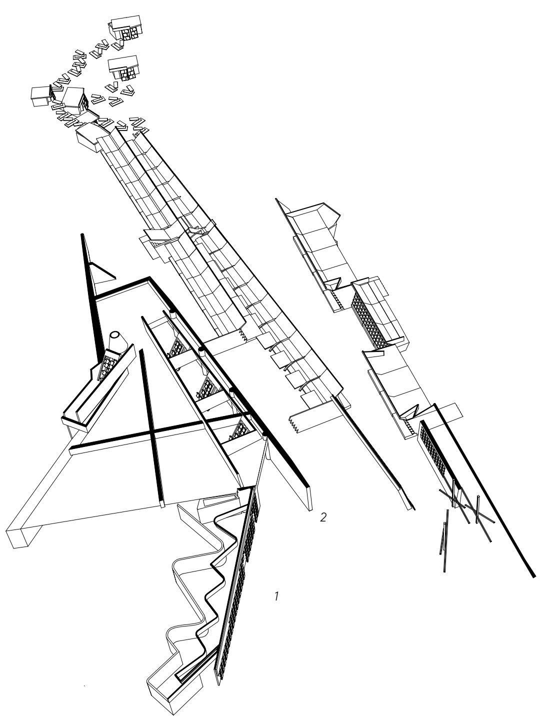
Mirrales explains that architects are thaught to resist time by wanting to build something permanent which is contrary to our existence. The architect claims that if we instead, embrace time and provide people with the experience of the passage of time – people can be more connected to changes in their natural and social environment. This could be achieved by letting in weather in buildings.

Igualada cemetery is embedded in the Catalonian hills and was designed by Mirralles and Pinos in 1995. The structure is partly open and blends into the landscape. It uses external forces such as wind, air, temperature, sun and rain into the structure as a medium of time. The idea is to let the visitors understand and accept the cycle of life as a link between past, present and future.

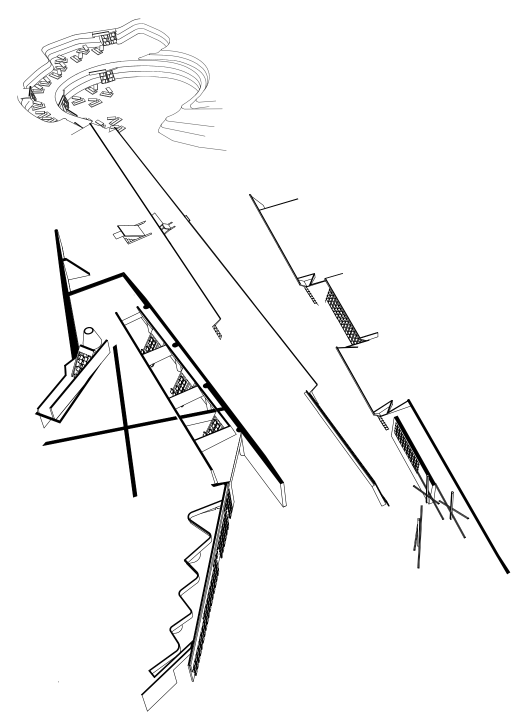
Speranza, P. (2015) Time as a Medium: Early works of Enric Miralles, AD 86(1), pp. 60-65.

KEY FINDINGS

Embrace and allow changes by weather in buildings to intensify a moment in present. To shift focus from the permanent to the impermanent such as temperature, air and light.



The entire structure is exposed



Structure is seen from ground level

Igualada Cemetry, Enric Miralles + Carme Pinós
Barcelona
1995

PHILIPPE RAHM ARCHITECTES

Philippe Rahm Architectes claims that form and function follow climate, which Philippe Rahm stated in an interview with Archithese no 2, 2010. We use Philippe Rahm Architectes as a reference of how to work with climate and meteorology, such as temperature and air humidity, in relation to architecture, and to use the actual experience of the subtle changes of microclimates as a starting point for our project. This helps us see architecture in a way that is very different from how we normally view architecture.

KEY FINDINGS

What we bring with us from this reference is not project that the office designed, rather the theory and thinking behind the project and the philosophy behind the so called meteorological design. Meteorological design builds upon the notion that the brick or concrete in most cases can be replaced by light, temperature, pressure, and humidity, since we face the reality from the inside and that is based on atmospheres rather then objects.

One project that we found especially interesting is the ongoing development of the Jade Eco Park in Taiwan, where they use microclimates to design cool, dry, and clean microclimates to increase the number of comfortable spaces for visitors in the 70 hectare park. The microclimates and the key strategy for each one, is based on natural climate at the site. The techniques they use are similar to the ones that is used in the project Le Temps, but interpreted differently. We see the potential in using these techniques and the importance of meteorological design, now and in the future, for sustainability aspects when the climate on earth is changing. By mapping and using the natural climate on the site to modify and create coolness in tropical environments.

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