“To speak of home in relation to a building is simply to recognise its harmony with our own prized internal song.”

- Alain de Botton

Karolinelund kindergarten

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MSC04 - 2018

PREFACE

AALBORG UNIVERSITY - ARCHITECTURE AND DESIGN

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Project title
Karolinelund Kindergarten

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INDHOLD

ABSTRACT

This project presents an architectural master thesis within the field of sustainability. The project is developed by Saraj Adham Al-Yousefy at Aalborg University 4th semester. The project presents a design approach to a new kindergarten at Karolinelund, Aalborg and it has dealt with the integrated design process (IDP) by Mary-Ann Knudstrup which consists of 5 phases; Problem identification, analysis, sketching, synthesis and presentation. The project seeks to design a kindergarten where children, parents and the pedagogues can be in a safe environment and the kindergarten should be framed as the second home for children. Energy frame, indoor climate and sufficient daylight have been the primary criteria for the design along with the functional investigations that have been examined in the process. Aesthetically the project seeks to design a building where the spatial quality can relate to the children's development of motor skills and the development of children's stimulation of senses. This is done by the visual qualities in the building between children and the adults and also by creating a transition between the learning zones and the social zones of the kindergarten.

ill.1

READING GUIDE

This thesis report is devided into three different sections: program, process and presentation that will be finished off with a conclusion and reflection.

The program contains the preliminary studies, analysis and theories which lead to the vision and the functional diagram of the kindergarten.

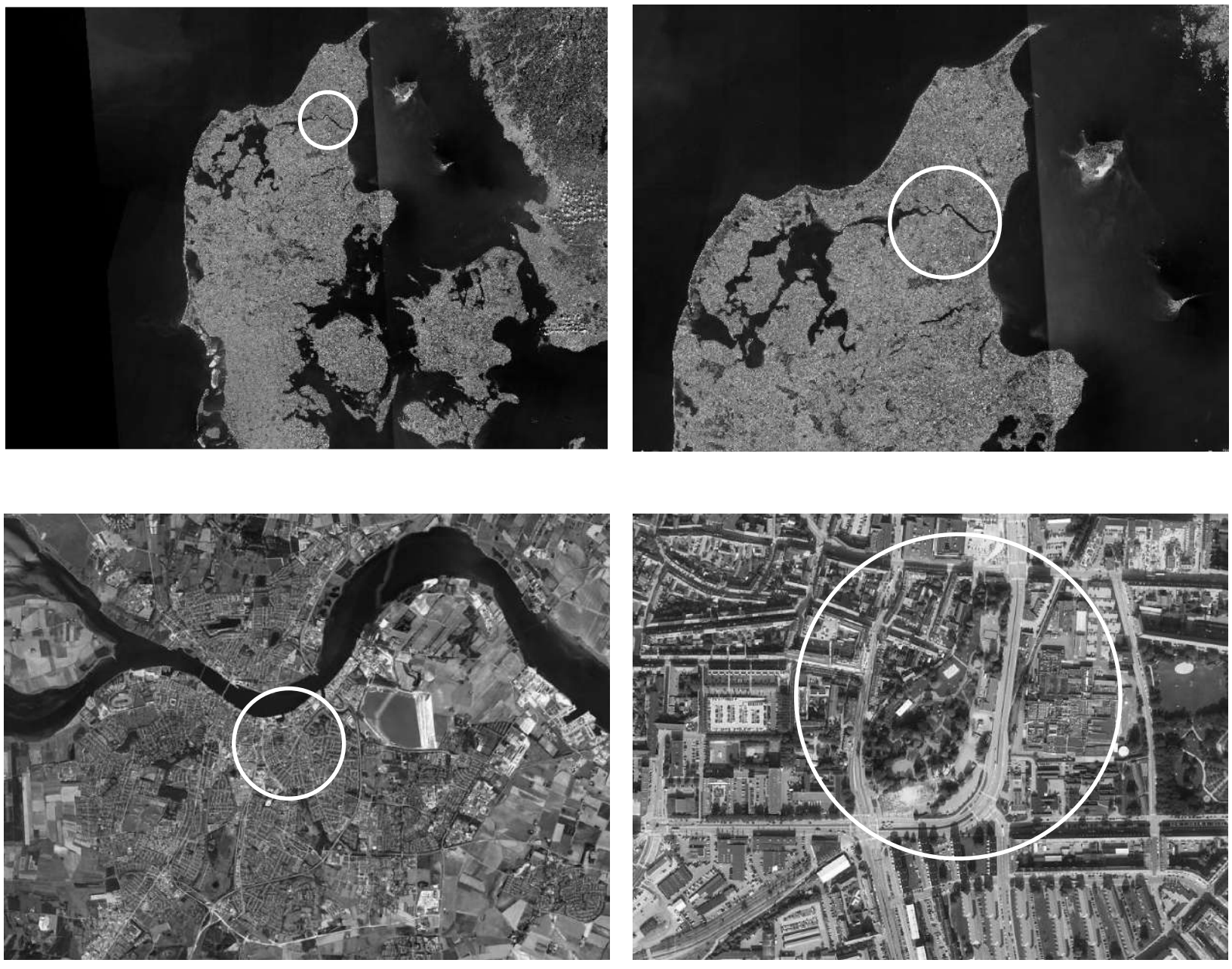
The design process illustrates how the design has dveloped from conceptual design ideas to more tangible and visual concepts for the building that both incorporates aesthetic and the technical aspects and then leads to a final building design.

The presentation illustrates various visualizations of the final kindergarten design including its technical aspects.

Finally, the reflection discusses what could have been done differently based on the conclusion that discusses to what extent the building lives up to the vision formulated earlier in the program.

A part of this report has different kind of pictures both to illustrate a theme but also to mark a new chapter. These pictures also makes the layout easy and understandable. The pictures are not copyrighted and free to use by the website Pexels.com.

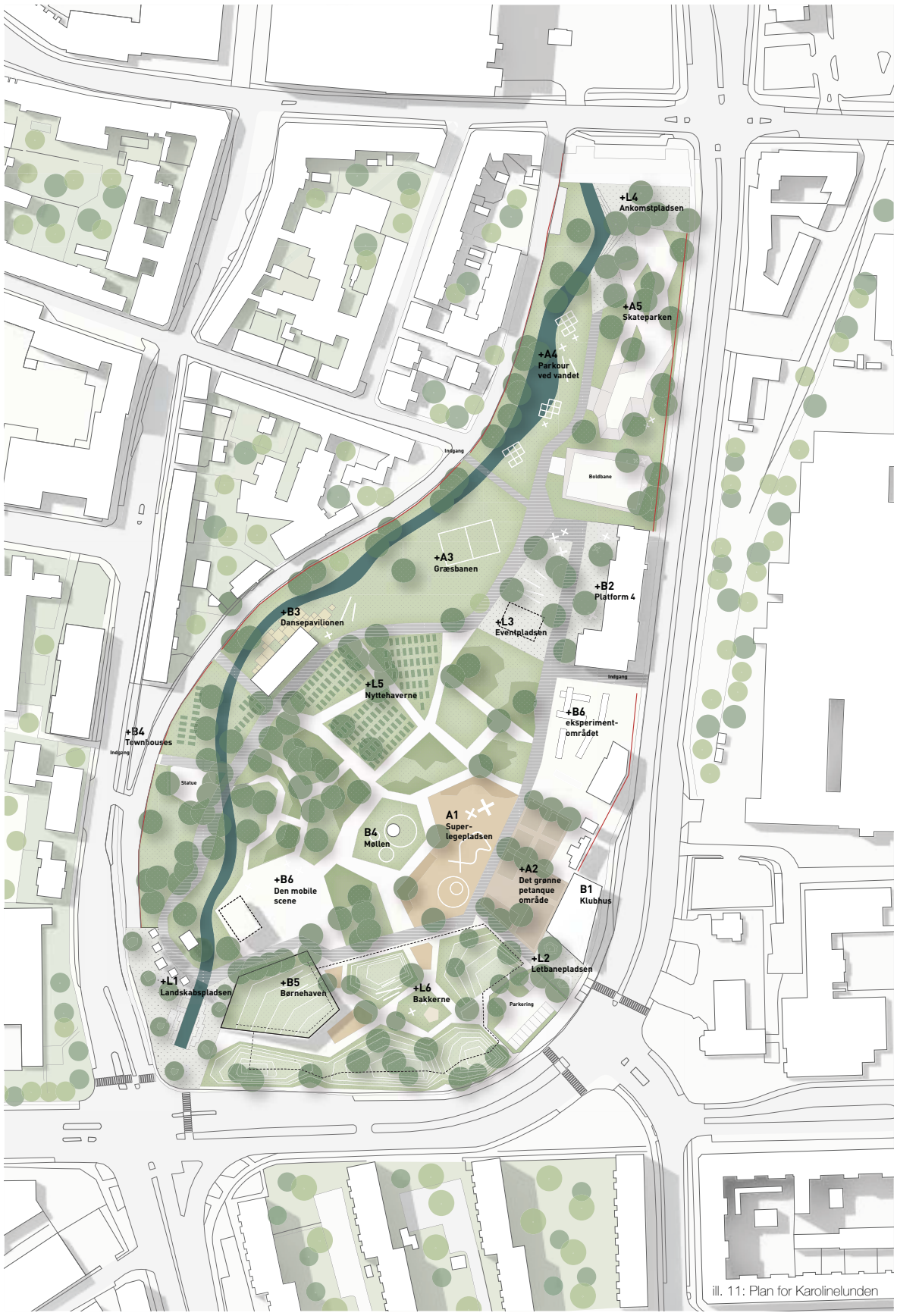
Parts of the analysis are taken from the previous report that Saraj Adham participated in. The following parts are: Integrated Design process, Light, Danish Kindergarten as a typology in a historic perspective, motorskills development in children. Parts of the casestudies are also taken from the previous report.



ill.2 Site location

INTRODUCTION

This master thesis aims to design a new proposal of a kindergarten located in Karolinelund, Aalborg. The municipality have a vision of transforming the area of Karolinelund and within this vision comes the planning of a new kindergarten. The project seeks to investigate the architecture as a framework when designing for children to enhance their abilities of learning and growing in the early stages. Physical environments influence the abilities of improving the human mind and enhances the learning process especially for children as they have got a steeper learning curve than adults. The desirable idea will investigate the affection architecture can contribute to the learning environment and how a design can enable the movement and use of senses. The focus of the project is sustainability and indoor comfort. The conditions of the indoor environment is relevant as people uses the majority of time inside the buildings. The project proposal is based on the competition brief that was given by Aalborg municipality which is described further in the project. This master thesis takes inspiration in parts of the competition brief such as room program and some materials that should be implemented in a new kindergarten. The competition brief is described more detailed.

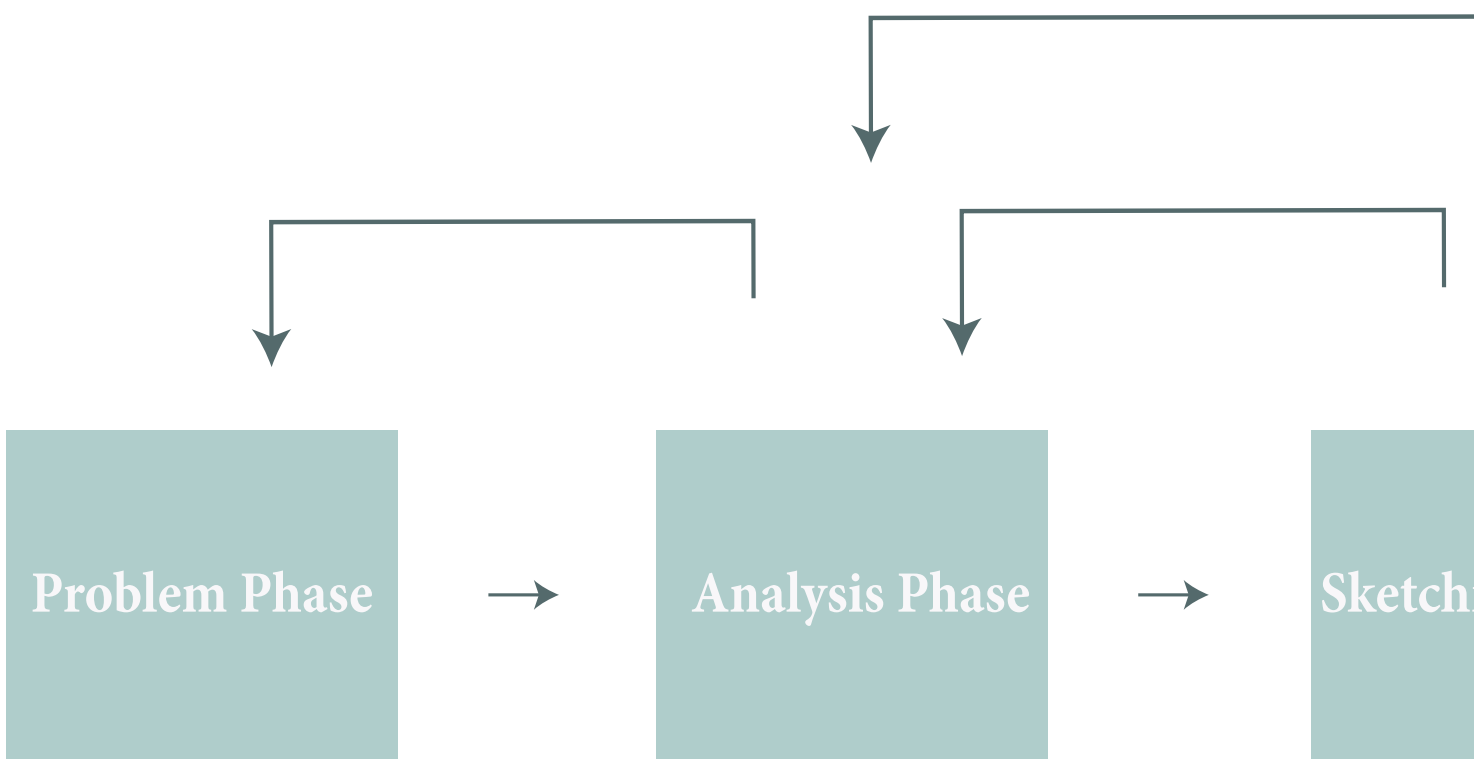


ill. 11: Plan for Karolinelunden

ill.3 Area development plan

COMPETETION BRIEF

The master thesis is based on a competition for a kindergarten that was set by the municipality of Aalborg, and their vision for how Karolinelund should be developed and in which direction it should follow in order to attract people as well as showcase a new and innovative part of Aalborg. The local plan sets up a vision for a building that must fit in the characteristic environment of Karolinelund. Therefore, the competition must take departure in the history of Karolinelund and the green element of the area as well as the history of the amusement park that was a big landmark both in Karolinelund but also in whole Aalborg.
The kindergarten should space 99 children and it should have high architectural quality. It should look modern and attractive and at the same time have a clear connection to the landscape of the park that is a big part of the location that the building is situated in. Therefore, nature and landscape should be part of the project and should form space between the building just like the architecture so that kids can interact with built environment as well as nature and give the children sensory experience both in and around the built environment. Moreover, this nature should not only be a place where you can access outside but there should be a possibility to have a view out to the landscape and nature so that you can have an overview of the different seasons. The plants in the garden should have a wide variety and the trees should be mainly big and distinctive like conifer and broad-leaved tree to again connect with the existing trees in Karolinelund so that the landscape will grow into each other and create harmony.
The building must be built after the building regulations 2020 and must accord to the Aalborg municipality's sustainability manual. The building must also get a certification by DGNB.



INTEGRATED DESIGN PROCESS

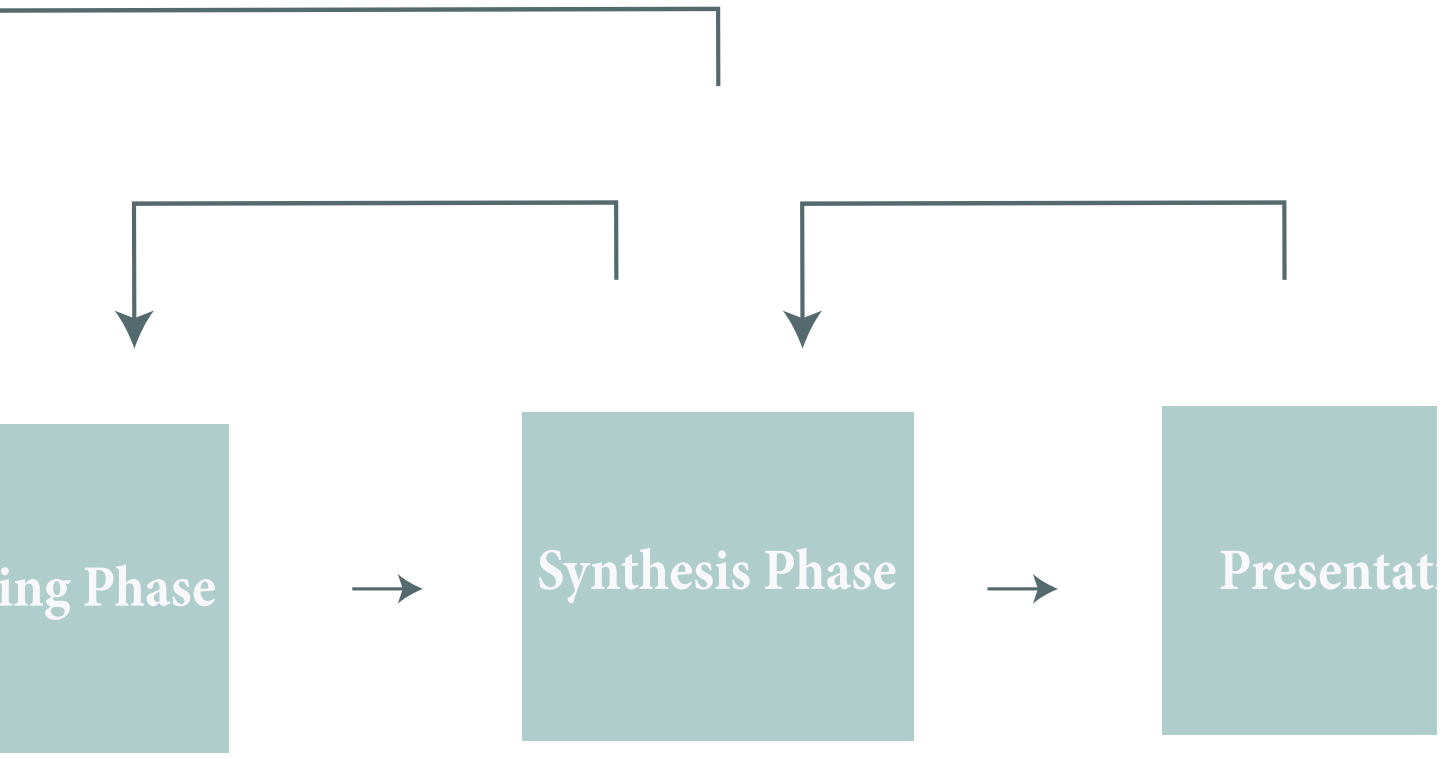
MARY ANN KNUDSTRUP

The integrated design process is based on problem-based learning and describes how a design can be developed through a combination of technical knowledge, aesthetics and spatial-bound design processes. The integrated design process is divided into 5 phases starting with the problem phase followed by analysis phase, sketching phase, synthesis phase and lastly, the presentation phase. These 5 phases will be formed as an iterative process. (Knudstrup, 2004)

Problem phase:
The entire prelude to this project is the problem phase. In this phase, the idea or problem, which forms the project, gets defined and described. For this project, the problem definition has been based on the tender for a new kindergarten in Karolinelund by the municipality of Aalborg.

Analysis Phase:
The goal of the analysis part of the project is to examine the site condition to describe an approach for the aesthetics, functionality and technical features of the project. When analyzing the site, different methods have been used such as mapping and serial vision to give a better understanding of the context. Document analysis and phenomenological analysis has been done to gather more information about the history of the site. Furthermore, the same approach is used for the case studies along with the phenomenological knowledge from visits to the two case studies.

Sketching phase:
This phase of the project is an iterative process, where sketching, 3D visualization, and physical models are used. The various sketching tools give the opportunity of understanding the different aspects of the design which



ill.4 IDP diagram

also benefits the design solutions and makes it possible to optimize the design. This phase is intensively iterative where the different design decisions need to be held up against the analysis. This phase continues until a clear design concept is chosen where the analytical and critical parts are evaluated in the perspective of the aesthetics, technical qualities, and functions.

Synthesis Phase:
In the synthesis phase, the final design takes shape based on the process and knowledge from the previous phase. It is in this phase where it all comes together,
both the architectural overall design, the technical aspects, and the architectural details. It is important to start this phase early on in the thesis to ensure that the technical aspects are not forgotten and works in collaboration with the aesthetics and the functionality. Technical calculations and simulation tools such as Bsim, Be15, and Velux light analysis are used to implement and reach a sustainable building design solution.

Presentation Phase:
This is the concluding phase where the project is presented so to show its strengths, qualities and how the vision and design criteria are achieved. The presentation materials will include the final design of the Kindergarten within the final site plan and context, sections, elevations, visualizations and physical models. The presentation materials aim to show the qualities of the indoor and the outdoor areas. (Knudstrup, 2004)

RESEARCH THEORY


RENAU
CAMPO BAEZA
ALBERTO CAMPO BAEZA
西班牙
La imagen de España en China

ill.5

DANISH KINDERGARTEN AS A TYPOLOGY IN A HISTORIC PERSPECTIVE

In 1828 the first children asylum in Denmark opened by the female charity banquet with Frederick the VIs and Queen Marie in the lead. These were the predecessors of the daycare we know today. The first children asylums were funded by private individuals as part of a charity project for poor families that could not handle childcare while working. But the purpose of the children asylums was also to teach the children discipline, order and to give them the skills that were needed for a further education. The asylums were part of that period's social services where the richer part of the population paid for and helped the poorer part of the population by creating institutions ect. (Holm et al., 2004) The children asylums were often placed in villas or apartments and were equipped with a school room and a sleeping room. The school room was equipped with an asylum staircase where the children slept, read and played, which made it possible for one teacher to look after many children at the same time. It was not until the postwar period of the second world war that there was put an extra effort into making new buildings specially designed for institutions. This resulted in the standardization of the new buildings that often could house many children. (Gammelby, 2013)

Frederich Frøbel was a German pedagogue (1782-1852) that after having worked with bigger children for some years decided to create an educational service/institution for smaller children. In 1840 he issued his "Theses about the kindergarten". Frøbels idea for a new kindergarten was not just revolving around childcare but also contained ideas about pedagogy and politics. Frøbel saw the kindergarten as being a place where the citizen could get new possibilities. After Frøbel issued his theses he began to educate teachers in this new field. (Holm et al., 2004)

In 1873 Frøbels great-niece founded the Pestalozzi-Frøbelhaus Seminary. It was here that most of the Nordic pedagogy pioneers were educated and here that some of the key traits for the public kindergarten in Denmark were formulated. The Public kindergarten grew out of the recognition that it was necessary for both the father and the mother to be working if their household economy should function. The pedagogy that was used in the new public kindergartens was built on the understanding that the child was playful and creating. A new thing in the public kindergartens was that the children were divided into smaller groups of approximately 20 children, the rooms were shaped to mimic the home environment and the rooms were often equipped with many tables and chairs turned towards the teacher like in a school so the children's attention were directed towards the teacher. (Gammelby, 2013) (Holm et al., 2004)

Maria Montessori (1870-1952) was the first female doctor in Italy. She choose to focus on pedagogy rather than medicine. Montessori was influenced by the scientific approach of her time and see the children's imagination as being important. Instead, she worked towards developing the children's knowledge in mathematics and languages, through the use of their senses, by using materials with specific didactic purposes. (Holm et al., 2004)

The first kindergarten in Denmark was established in 1871 in Copenhagen by Erna Juel-Hansen. She was a Zahle educated teacher and kindergarten teacher. (Holm et al., 2004)

The social reform of 1933 included the kindergarten in the law as a preventative social institution. Here daycare institutions were defined as the preventative care in the child services and the 24 hours care were seen as the shielding care. (Holm et al., 2004)

In the 1940's and 1950's, there were many companies that established kindergartens for their employees so to ensure female employees. But this became rather problematic because the children got attached to their parent's workplace instead of a local community. (Holm et al., 2004)

wIn 1964 the Danish parliament passed a law on child and youth welfare that stated it was the duty of the municipal to have the necessary spaces for children in daycare. This was the start of institutionalizing the childhood that had gone on until this day. (Gammelby, 2013) The new drawings for institutional buildings had to be approved by the social ministry. The ministry's architectural consultant and leading administrator, Thomas Having, made some pattern drawings for daycares that were inspired by his earlier work for central schools. This resulted in kindergartens that like Having's central schools had long hallways that separated the rooms for the teachers such as meeting rooms and offices on one side of the hallway and the rooms for the kids on the other side. The signals this typology sent were more like a clinical, clean and almost hospitalized daycare building. (Gammelby, 2013)

In 1963 architect Max Siegumfelt got his drawings for a new typology approved by the social ministry. This new typology was revolutionary because, instead of the earlier school rooms he now suggested the use of group rooms and small group rooms instead. These rooms were smaller in size and the children were now divided into smaller groups and assigned to one of these rooms that had their own group of teachers. (Gammelby, 2013) Because of women entering the workplace in the 1960's there was now a bigger need for childcare and this resulted in many kindergartens being built in the 1960's.

In the 1970's a new typology broke through that consisted of a big and flexible room where it was possible to put up partition walls as a way of dividing the big room into smaller sections. By doing so it was possible for the teachers to make the room into their liking. (Gammelby, 2013)

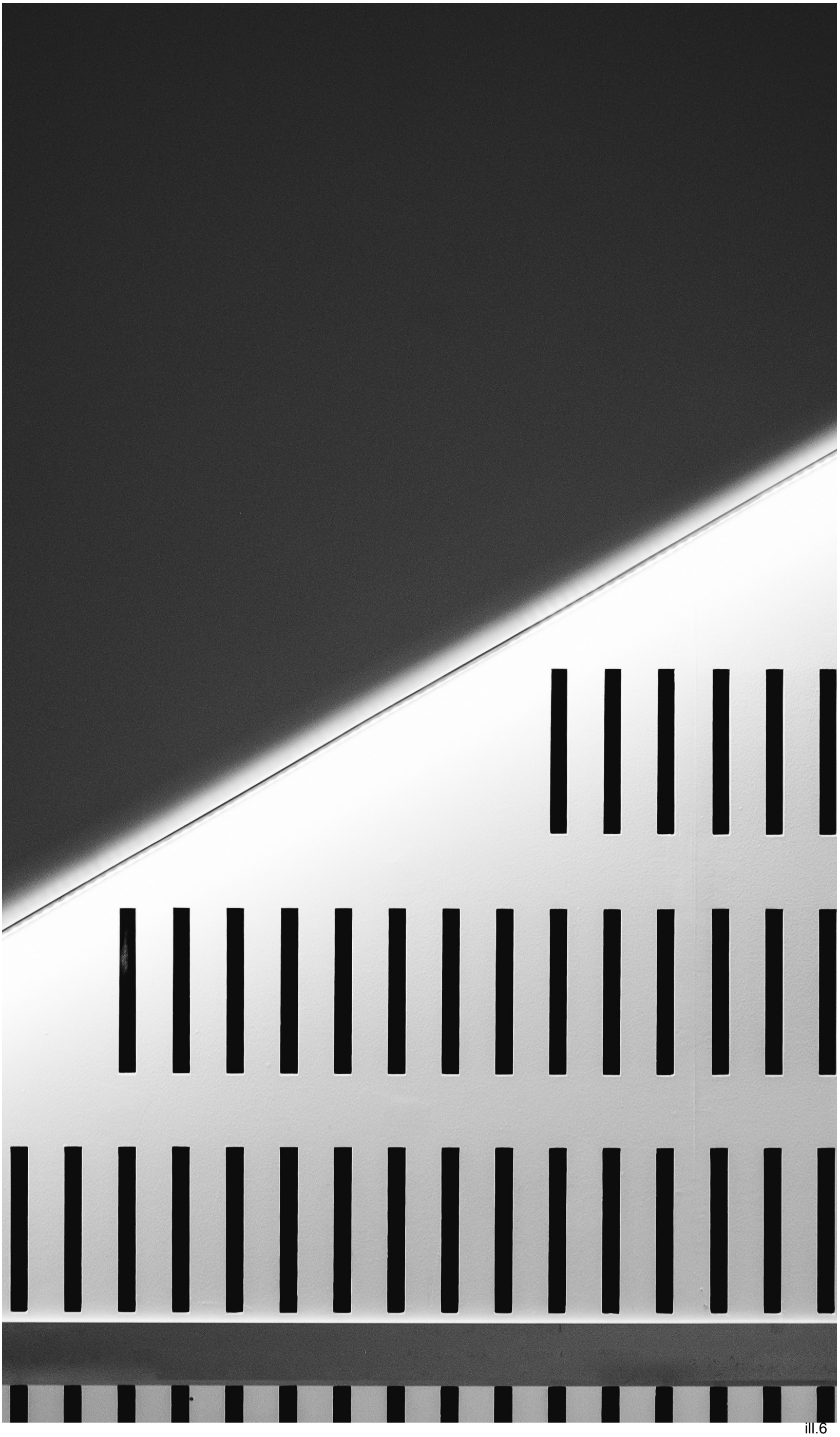
In the mid-1990's a focus on supporting the children's aesthetic learning process was in session. There was now a focus on a good natural lighting in the building and inspiring the children's senses with the help of the building. (Gammelby, 2013)

In the 1980's and 1990's, a new debate arose about the square meter space of free floor area for each child in the kindergarten and how it affected the indoor climate and the contamination risk amongst the children. This debate was among others based on a sample survey from 1992 by Medical Officer Anne Rindel. The survey that was conducted now concluded that if the free floor square meter space for each child was raised by just one square meter from the 2 m2 that was required then, and still is today, to 3 m2 then the number of sick days would drop by 9.8 percent per child. (Gammelby, 2013)

If there is too little space in a kindergarten it can also lead to a too high level of noise. A study done by BUPL measures the sound in 52 kindergartens. the study showed that the average sound level was 79.9dB. This meant that half of the institutions had a sound level higher than the limit of 80dB that the Working Environment Authority has set as the limit, for people to start to wear ear protection when working.(Albæk Nielsen & Nygaard Christoffersen, 2009)

As mentioned above the requirement of minimum space for each child in a kindergarten is still 2 m2 of free floor area today and is described in the building regulations 2010. But psychological research has shown that when there is less than 3 m2 of free floor area per child, there is a decrease in the number of children in the playroom, a decrease in group play and an increase in aggressive behavior amongst the children. (Kampmann, 1994) (Gammelby, 2013)

The two m2 of free floor area rule was introduced in the 1920's where the pedagogical outlook was more scholastic than it is today. At this time the children were occupied with the same thing at the same time. It could, therefore, be argued that the rule needs to be changed because when it was introduced the need for more space to move around was not there as it is today with the new outlook on pedagogy. (Kirkeby, Gammelby, & Dyhring Elle, 2013)



ill.6

ill.7

ARCHITECTURE FOR CHILDREN: UNDERSTANDING CHILDREN PERCEPTION TOWARDS BUILT ENVIRONMENT

To build for children one must understand how the built environment is perceived by them and how it affects their development, which are crucial in order to understand how architecture can contribute to children's understanding of their surroundings. First and foremost the architecture is perceived differently by adults than children meaning that children focus more on function while adults tend to care more about aesthetics, form and function (bin Said, 2017). A lot of buildings today are final, meaning that everything is decided by architects, leaving merely any place for children to unfold their creativity and giving them no control or flexibility and the consequence of that is the failure to stimulate children's cognitive functioning (ibid). One example of the lack of understanding of the kids needs in architecture is the design of a kindergarten, where the focus on children's activities is inside the building with occasionally stay outside in the garden where children have the opportunity to run freely and play with each other. Nature helps them explore and play as they please without having to think about the inside world where the walls limit their behaviour, creativity and their will to explore. The quality of freedom and flexibility that is visible in nature should occur in the interior design where their senses is stimulated by greenery and animals and their understanding of nature will be enhanced because of its dynamic rhythm such as the wind, rain, sunlight, temperature etc. These different elements will make them understand that nature is not man made, but living phenomenon that is timeless. It changes throughout the day as well as throughout the year and it has many different kinds of visuals, which triggers their fascination and satisfaction. Therefore their perception of the building will be man made whereas the landscape is natural making it very clear that architecture is not an integrated part of landscape. (bin Said, 2017). Being able to be outside in nature will also encourage them to create a bonding with it since they will be cognitively alert with their surroundings through movement and social actions. It is also a social space where kids can play with each other and learn how to interact and be creative with other children as well as other adults and create great memory and place of belonging.

ill.8

MOTOR SKILLS DEVELOPMENT IN CHILDREN

Perception of the body and motor learning are closely linked, because the senses send signals to be used by the child to learn and coordinate its movements. It is a prerequisite for the child to develop motor skills, since all of its senses contributes with vital information concerning that movement the child is about to make or is making. Sensory perception is what provides us, and the children, with information about what is happening in our surroundings and provides information about our own bodies. The child needs to be able to interpret the stimuli correctly and be able to integrate the stimuli in a meaningful way. For this to be able to happen there is a need for an interaction between the motor skills and senses. This is depended on an integration of the sensory impressions. The interaction between the child's motor skills and its senses is dependent on sensory impressions. This means that the child needs to be able to interpret the sensory stimuli correctly in order to integrate them together.

The development of motor skills in children is also dependent on the possibility for different experiences in different scenarios. The more movements the child learn to master the more experiences the child gets with that movement which can then be used for planning new movements.

Good motor skills have a big impact on the child's self-esteem, it strengthens the child's ability to be physically active and it also has an impact on how the child participate in social setting.

(Maxmilling, Kristensen, & Piilgaard Hansen, 2016).

ill.9

LIGHT IN KINDERGARTEN

Achieving a good light quality in a kindergarten is important for children and pedagogues as 80% of time is spent indoors. The daylight helps children improve the development in various ways such as sight, movement and balance skills. The sense of the sight is mostly developed during the childhood and 70-80 % of all sensory impression are happening through the sight. Kjeld Johnsen claims that he best light for children is the natural daylight, which can be obtained even in already existing buildings. This can be done by having white window frames while ensuring that there isn't any furniture indoors that block the light and prevent trees and bushes from blocking the sunlight to enter the rooms as well. Additionally, there should be screening for preventing direct daylight. The children play and act differently where some kids like to play on the ground and others at a table or even standing which makes it important to have flexible lighting. This can be done by having low placed windows mixed with artificial lighting if needed. It should be possible to adjust the light and at the same time creates spots for the children to play in.

Daylight can be categorized into three type of lightning; diffuse skylight, reflected light and directional sunlight.
Direct sunlight has very high intensity and constant movement and the brightness of the sunlight depends on season, location, sky conditions and time of the day.
Diffuse skylight is sunlight scattered by the atmosphere and clouds results in soft diffuse light.
Reflected daylight appears when direct sunlight or diffuse skylight when it hits a reflectance surface such as ground, terrain or neighboring building. Reflected daylight can sometimes account for 15% of the total daylight reaching a façade.
The task when designing a building with good daylight conditions is to create a pleasant visual environment that suits the users needs.

SUBCONCLUSION

The theories help to understand how to build modern kindergarten and how to create life in the house of kids. Already in the 1964 the Danish parlimant passed a law on child and youth welfare that stated it was the duty of the municipal to have the necessary spaces for children in daycare. The necessary spaces for children gives the opportunity of learning by using their bodies and by the architecture that is framed around these children. The development of children's motor skills depends on the experience of movements and hereby can the architecture contribute to activate the children physically. The paper " Architecture for Children: Understanding Children Perception towards Built Environment" explains the importance of nature in architecture and the benefit of it for small children leading them to develope their skills, senses and how they can learn to explore the world alongside the built environment. Therefore the integration of nature and natural elements are important factors that must be further developed and examined in the sketching process.

CASE STUDIES

ill.10 Solhuset playground
ill.11 Solhuset facade and roof

SOLHUSET

Solhuset is an environmentally friendly building that was built in 2011 by CCO Architects in cooperation with Velux and Rambøll engineers. The building is located in Hørsholm, Denmark, and is 1300 m2 and contains 100 children and 30 adults. The vision of the building is to create a holistic view for architects, for how to create a building which positively affects the human health, which is done through the indoor- and outdoor climate, in cooperation with renewable energy. The focus of the indoor environment is to create daylight and fresh air. The footprint of the building is shaped like a triangle. The roof of the building is pitched in several places, which makes the building expression dynamic. On top of the roof, is placed both PV and solar collector panels to incorporate renewable energy into the building so that the building doesn't use more energy than what it consumes as part of one of the strategies in an active house. Furthermore, the architects have played with straight lines through, the facades, roof and the windows. The materials for the façade is wood, which is painted black. The first impression when entering the building is an open area, with a low amount of activities due to the placement of the main entrance, and due to the fact that the heart of the building is mainly used as a canteen, where the children get to eat in shifts divided by age. This area is pretty much a dead zone except for lunch time. When walking deeper into the building the room geometries differs, which gives the kids an experience, but at the same time makes the flow complicated to understand for the adults. The connection between the rooms is well functioning because of the necessity of the adults assisting each other in case of problems or sickness. When visiting the building, the staff described what they found were the pros and cons of the building. Overall the rooms are well used, but lacking when it comes to how the children can be challenged in form of learning but also movement, even though there can be some changes which can incorporate this. In Solhuset, they had tried to use moveable objects for incorporating working with the senses, but this made some of the rooms very chaotic. This could have been helped by changing some of the objects to fixed object and incorporating them in the walls and floors. There

ill.12 Graple room
ill.13 Solhuset Common Space

are two rooms which are connected with the outdoor. These rooms can be looked into from the inside and are randomly used at the moment but could easily be adapted to be used as a greenhouse or for keeping rabbits. This would give the children an experience to participate in and look at. The indoor climate of the building works very well. As a testament to this, it was stated by several of the staff that since coming to work at Solhuset none of them ever had a headache which they had experienced several times at their old place of employment because of a bad indoor climate. The only problematic part of the building is in the nursery where it, in the summer time, can become very warm because of the orientation of the windows.

ill.14 Streetview
ill.15 Playground

MARTHAGÅRDEN

Marthagården is known for being one of the most sustainable kindergartens in Denmark. The building is located in Frederiksberg. The size of the building is 1000 m2 and contains around 130 children. It was renovated in 2013, but the project planning was started early 2008, but due to several problems, the project got extended. Earlier there were two kindergartens which were separated into two buildings, but when renovating the building the architects, Lendager Group, was asked to combine both of the buildings. This was done by creating a building in the middle which is now used for connecting both buildings but at the same time used as a barrier from the traffic noise and a protection for the children from this as well. The middle building is also used as the heart of the building, where the children start their day with eating breakfast, and later in the day works as the central point when there aren't many children in the kindergarten. The building is constructed with materials that are friendly to the children and to the environment. Walking through the building, each room gives different experiences, due to the different colors, the shape of the room and the personal touch each child has made for the room. Furthermore, the children are involved in learning the procedure of harvesting vegetables. The children are learning to share their toys, at an early age, by giving unused toys which can be picked up by other children and be used by them. From the outside, it is pretty clear that the building is combined with two different institutions. This can be a confusing element since it is one building, which can be seen in Ill. 35. Where two parts of the building is concrete and have two different colors, red and grayish yellow, the extension is made out of wood. Aesthetically it is confusing due to the fact that it is three renovated buildings which have been combined, but it functions well for its purpose which is being a kindergarten and nursery.

ill.16 Interior
ill.17 Grapple room

SUBCONCLUSION

Upon what have been beneficial of concluding on these two casestudies is that solhuset have a complicated plan solution which makes the flow is hard to understand if you are not familiar with the building. In this master thesis the flow will be actively worked with in sense of making the flow and the transition between the rooms as transparent as possible.
Marthagården had the good qualities of creating the heart of the building which connect the old section with the new addition building. Also the common space which creates the heart of the building have the qualities of the homely environment which will also be actively worked with in this project. Another quality in marthagården is the small zones that are created in the outdoor areas where children can utilize. These qualities of the outdoor areas will be studies implemented in Karolinelund Kindergarten.

SUSTAINABILITY

This master thesis seeks to achieve a sustainable kindergarten. It has been an overall subject in proportion to what defines the sustainability and how to achieve it. Sustainability can be defined for anything that improve life quality and the world in general. In this case the term sustainability is used in relation to environmental, economic and social sustainability. To connect sustainability to architecture all three categories should be implanted respectively [Larsen, 2013].

Social

The term social sustainability relates to the society and the people. Social sustainability within the field of architecture enable diversity and the safe environment where the demands and needs of the users is a high priority. Transparency to the surrounding environments have also a huge impact when designing especially schools and daycare institutions.

Economic

This term consideres the cost and maintenance of the building over a period of time. Energy consumptions and operation of a building is a highly priority to fulfill the energy frames of building class 2020 [Larsen, 2013].

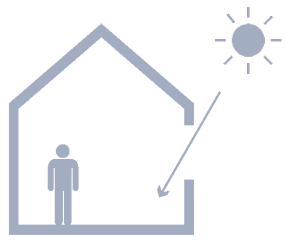
Environmental

Environmental sustainability consider attaching the architecture to the nature and green materials. The society can have a huge impact on the environment which leads to environmental suffers. Environmental qualities that enhances the sustainability as a term is the life cycle impact of assessment of a building. In relation of the economical qualities, passive strategies will be implemented in this master thesis to ensure that the energy consumption of the building and the users be kept at the minimum [Larsen, 2013].

Indoor climate

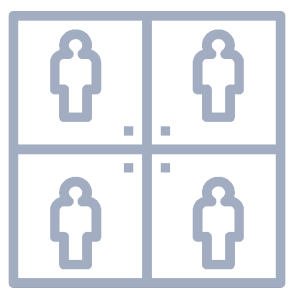
A kindergarten has to have a good indoor climate which have a huge impact for its users. Passive strategies can

Building max energy consumption



- >2.5 m height
- Average daylight factor >3 %

- Hours above 26 C: <100 , Hours above 27 C : <25 , winter: 20-24 C , Summer: 23-26 C



- >12 m^3 pr. working person

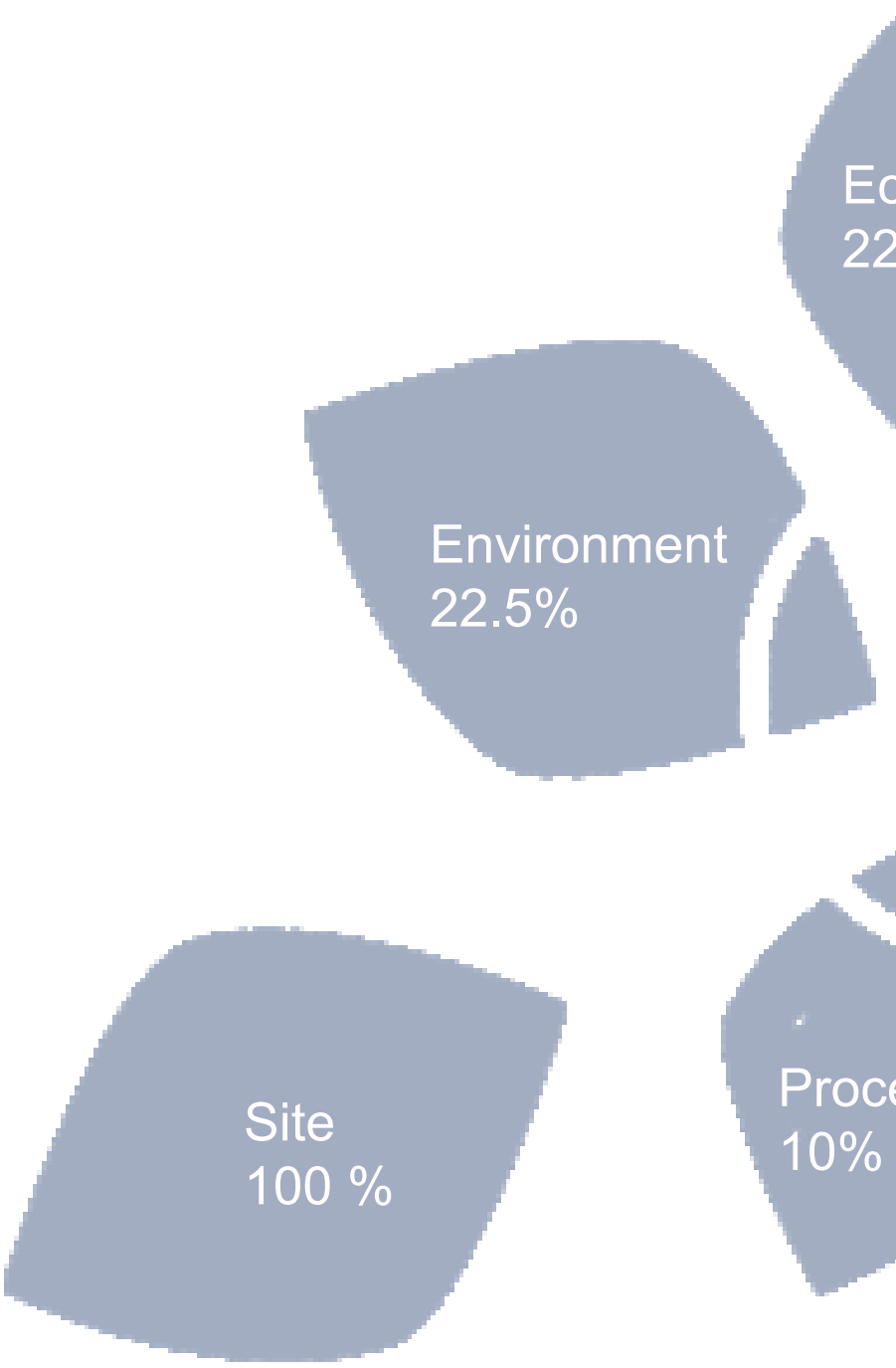
Ventilation with fresh outdoor air and heat recovery:
- Pr child 3 L/S , Pr. adult 5 L/S , Pr m^2: 0.35 L/S

- At least one toilet pr. 15 employed

ill.18

help reaching a good indoor climate which results in less use of energy and therefore less CO2 emission. What contributes to the passive strategies is parameters such as daylight, temperature, air quality and the acoustics.
The main parameter to define a good and healthy indoor climate is daylight. Danish building regulations establishes that a window ratio of minimum 15% in comparison with floor area should be able to reach the demands which will just provide a daylight factor of 2% in half of the room[Bygningsreglement 6.2, 2018].

Regulations:
Danish building regulation states some laws that will be essential to include in the kindergarten. For a building to achieve building class 2020, the building for as an institutional class must not exceed 25 kWh per square meter per a course of year. Illustration above is used as a guideline to fulfill the regulations [Bygningsreglement, 2018].



DGNB

DGNB is a manual that defines the sustainable regulations for buildings in Denmark. The manual includes six categories that scan give a building a sort of score in relation to sustainability. The higher score it is given, the design can reach different type of awards.
[Green Building Council Denmark (oktober 2016)].

Environment
Considers the use of materials and its affect on the environment. Materials can also lead to reduce of the energy consumption.

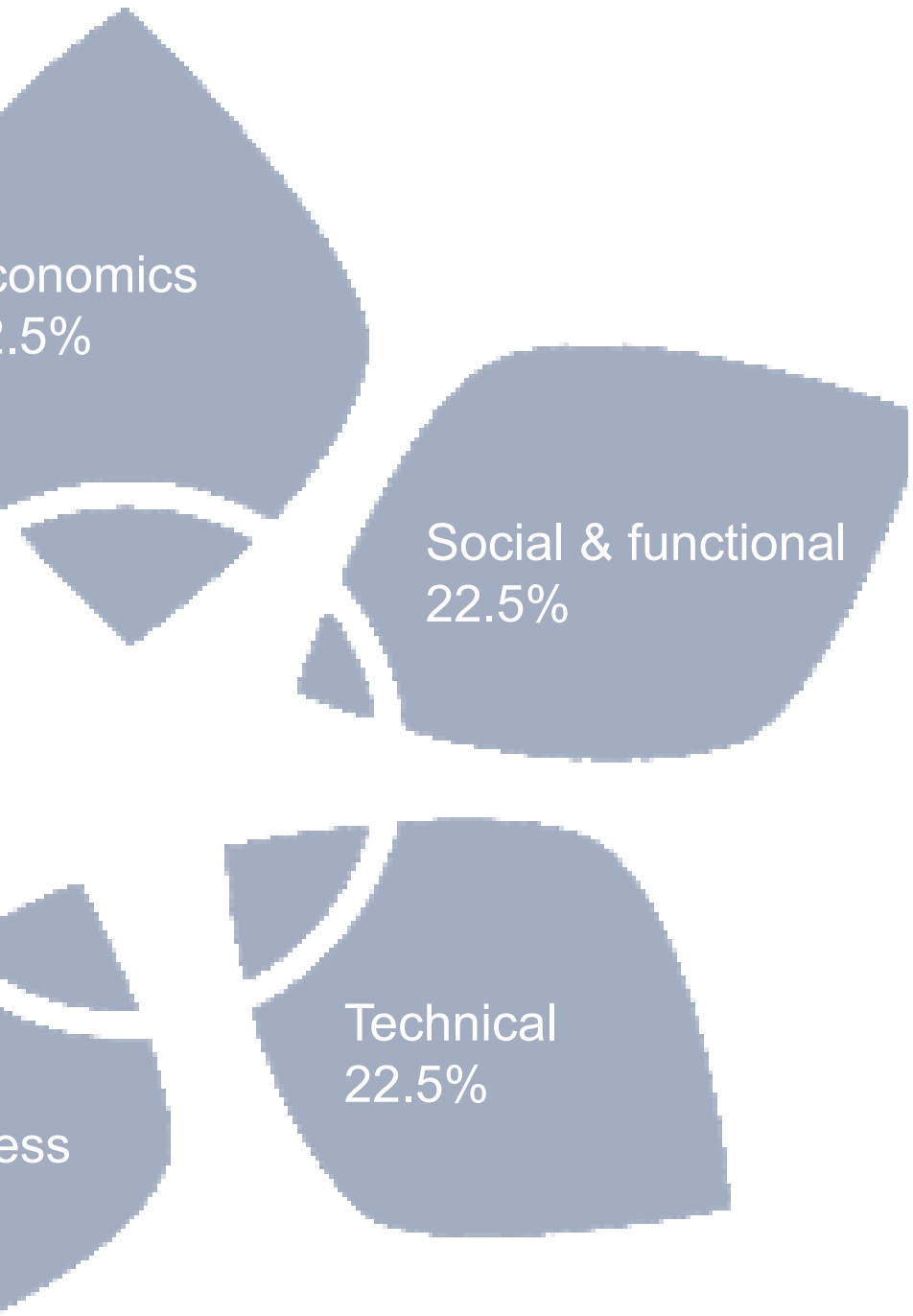
Economy
Considers the cost of maintenance and operation of the building over period of 50 years.

Social & functional
Considers the flexibility of the building regarding accessibility to the site and inside the building, but also the indoor climate which creates the wellbeing to the users of the building.

Process
Considers the integrated design process where the architect and the engineer works with iterative process from the beginning and follows the design criteria from early stages of the design process to reach a design that fulfills the aesthetic and sustainable criteria.

Technical
Considers the physical frames such as the envelope and fire strategies of the building. The envelope of the building is very essential as it is one of the main passive strategies that can assure reaching the zero-energy building.

Site
Site conditions is essential parameter when designing for the city. Hereby the arrival to the site, surroundings and climate conditions of the site helps to design a building. The urban qualities of the site can also be used to design a kindergarten with pleasant outdoor areas.



ill.19 DGNB

[Green Building Council Denmark (oktober 2016)].

These categories summarize the criteria of each category, meaning each category consists of many criteria. Social Criteria consists of key points such as indoor air quality, thermal comfort, acoustic comfort, visual comfort, outdoor qualities, safe and sound and area utilization. This project will deal with the social category as it is mentioned previously, it is essential to design a kindergarten that has the safe qualities for both the staff and the children.

The project will use DGNB as a guideline working with following parameters.
- Good indoor climate
- Implement Passive strategies
- Reducing energy consumption
- Low operation costs

ANALYSIS

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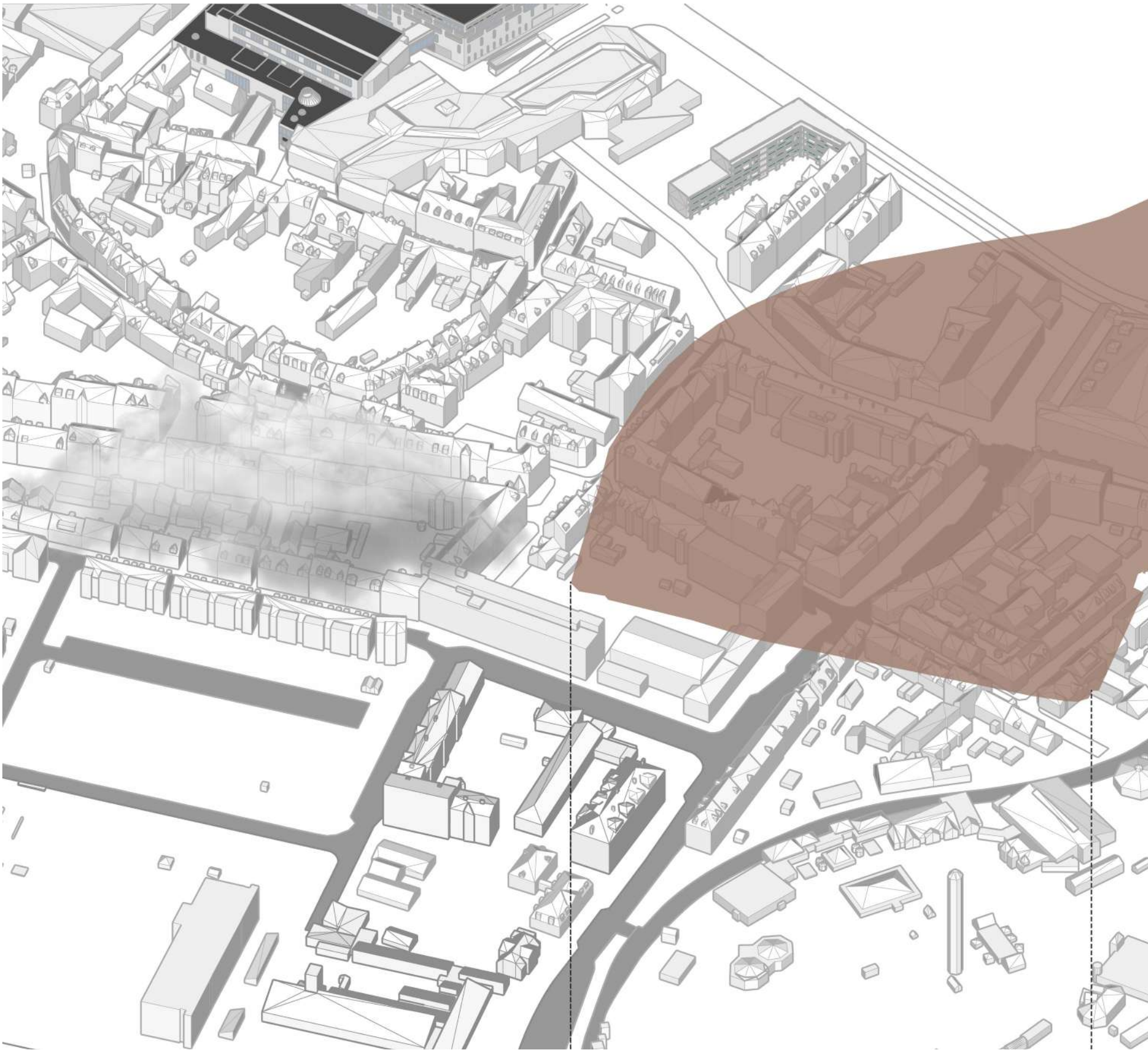


SITE HISTORY

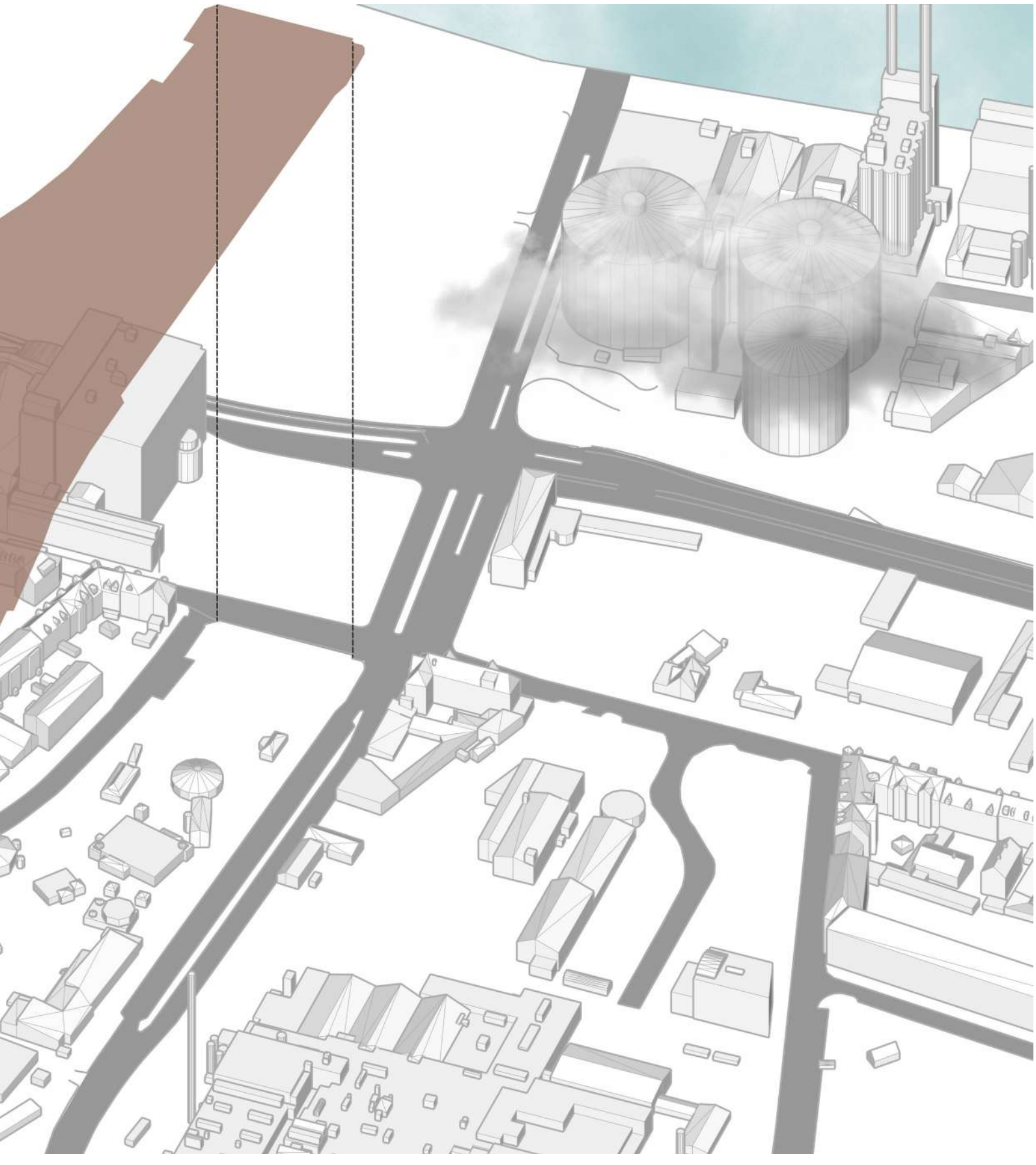
KAROLINELUND

Karolinelund is a popular park among the people located in the heart of Aalborg. It was established in 1946 by the Lind brothers. In the mid 70's the place was changed into an amusement park. Unfortunatly, Karolinelund Tivoli was closed and sold to the municipality of Aalborg due to the deficit in 2007. The municiplaity of Aalborg took the control and leadership of Karolinelund Tivoli in 2010 and decided to stop operating the amusement park. Later, Karolinelund was reconstructed as a city park.

Nowadays the park offers various cultural activities such as concerts, artistic shows etc. Furthermore, several places in Karolinelund were redesigned as green areas and sports areas in 2013. At the same time, the municipality reserved their areas for other purposes. In october 2015 the municipality decided to build a new kindergarten in Karolinelund.

The vision of a new kindergarten is to create a local park that includes a different range of activities. Here, the construction of a childcare instituion has been pointed out. Furthermore, the purpose of the park is to keep the nature related characteristics by maintaining old trees of the park. This gives character to the park by appearing as a quiet and green oasis within the surroundings of the center of Aalborg that is characterized by busy roads with heavy vechicles. The vision for the park considers five substantial elements in depth;

1. Trying to keep the area as green as possible by keeping old trees and making sure that there is space to plant new replacements.
2. Trying to create accessibility from the outside, so the park can be used as a shortcut and/or destination.
3. Strengthening and developing the edge or border of the park through developing objects which works



ill.21 Site history

by shielding Karolinelund from the noise and gives the area a peaceful atmosphere.
4. Combining Østerå with Karolinelund so it works as one natural element.
5. One of the major advantages of the park is that it is used by different age groups, due to the many activities which surrounds the area. These makes it possible for creating places where the different users can meet, but still making possibility of separating to prevent conflicts between different age groups.
These element were decided by the municipality to create the framework for the future of Karolinelund. (the new “helhedsplan)

TIVOLI

Tivoliland was a 63-years old amusement park that has had a big impact on Aalborg and people living there as well as people living in the surrounding cities. Because of its central location, Tivoli attracted a lot of people and the big roller coasters could be seen from a far distance because it shooted up to the skies attracting people from far away to participate in the fun that was happening inside the park. Amusement parks are fun because of their great social and emotional expectation and it is the families opportunities to explore happiness with their children (Cardell, 2015).

However, since Tivoli closed in 2010 because of the municipality and their decision not to o support it anymore because of money issues, some elements of the amusement park needed to remain in the area in order to keep traces of the valuable memories it created for not only the residents in the area but people from all over northern Jutland. The vision of keeping a piece of history in Aalborg needed therefore to remain as a part of the areas identity. One of the element to be kept is the gate to the area that still remains, making a statement of its history and existence in Karolinelund along with the walls that worked as a barrier or as a transition between the busy life around the park, to the inside of the park where the fun and exciting world existed. Moreover, the platform and the flowers will also remain for future usage of the public (Karolinelund Baggrundsinformation, 2011). As the famous Architect Frank Gehry stated: “Architecture should speak of its time and space but yearn for timelessness”.

Now Karolinelund is still used by many people because of its central location. People use it every friday for mu-

ill.22

sic and concerts, people use it to workout and exercise their bodies and since a healthy lifestyle is attracting people a lot, urban gardening is a hit in Karolinelund. (Visit Aalborg, n.d.). Urban Gardening is a big hit in Aalborg because it brings people together and creates a great social aspect where people can help each other learn about the value of organic, healthy food and this contributes to a healthier lifestyle.

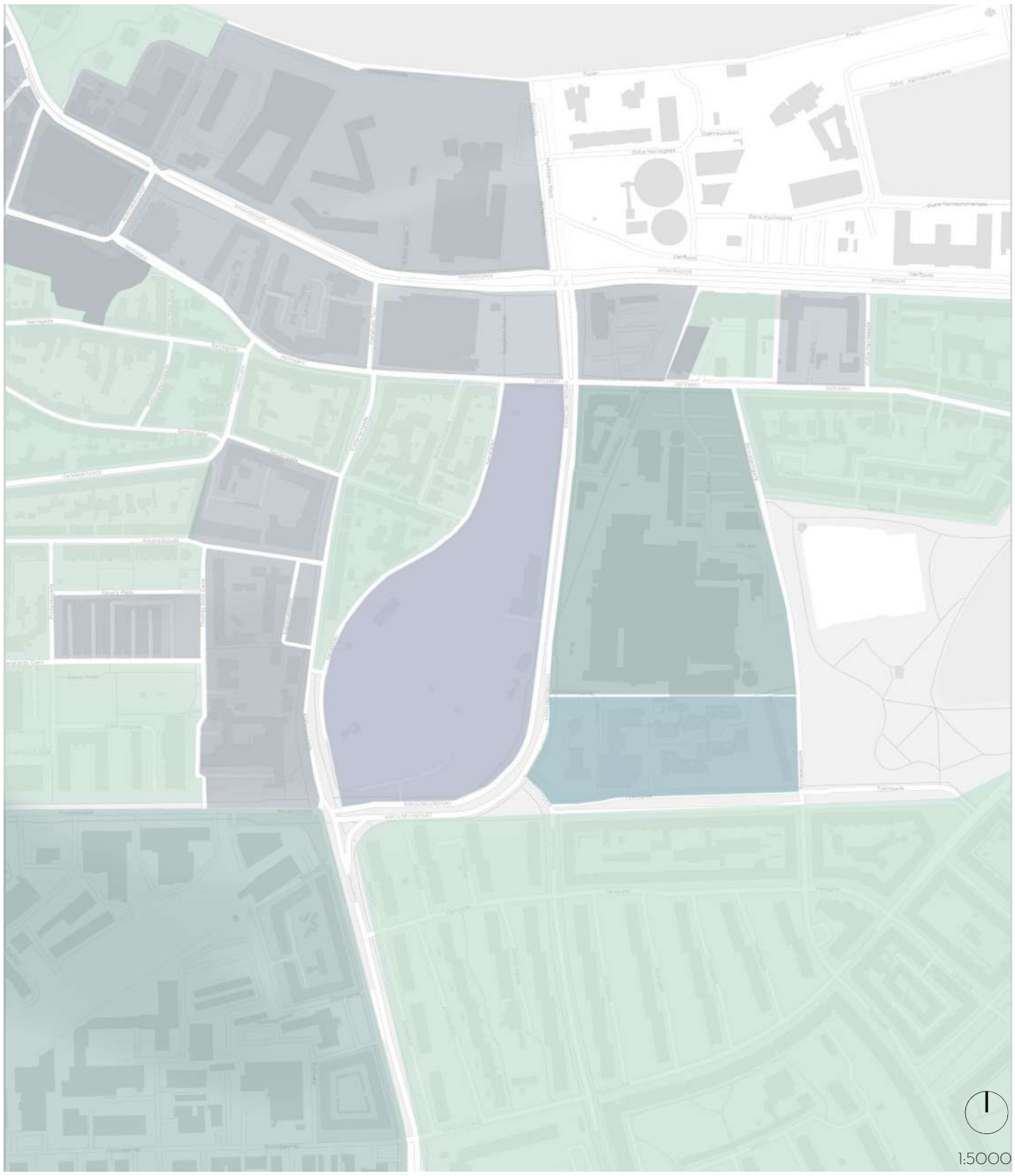
ill.23 Area development

1:2000

AREA DEVELOPMENT

The municipality has completed a district plan for the area where the vision for the area is to respect and strenghten the curious, experimenting character of the park. Therefore the vision of the area is to be flexible in order to give opportunites to people for future change. (Lokalplan 1-1-124, 2016)

This vision contains many strategies for how the area is supposed to be developed and look like in order to achieve the above-mentioned vision. The first strategy is to keep the green character of the park apparent in every future project in order to keep a coherent character of the identity of the place and one of the criterias to keep in mind is that big trees and other valuble plants must be kept and at the same time allowing more greenery to be planted.
Accesibility is another topic that is addressed in the district plan. The municipality wants to make sure that people have easy access to the park and want to use it even more.
The edge of the park needs to be well-defined so people can feel more safe when they are in the park for instance by having hills towards south not only to create an intimite space in the middle but also to have a noise barrier (ibid). The quality about Karolinelund is that many people with different ages, backgrounds and interests use the area for different functions and activities and therefore one of the big plans is to develope a kindergarten where these different user-groups can meet in the south part of Karolinelund. The kindergarten is for 100 children and the area is 700 m^2 and is supposed to use the public park in the daytime and after the closing time some parts of the outdoor area for the kindergarten can be used by the public.



Residential Industry Public institution gas station Site

ill.24 Typology

The site within the boundaries of Karolinelund is located in the very middle of Aalborg. It is surrounded by residental areas toward the south and the east. To the west are the Kennedy Arkaden and other educational institutions and student accommodations which make that area very attractive by young people. North of the site starts the new modern part of Aalborg where new dwellings and apartments are being build to replace the old industrial part of Aalborg. Musikkens Hus and Nordkraft are located at the northern part of Aalborg and towards northwest of the site there are already many different activities available that succesfully attract people like the waterfront, Jomfru Ane Parken, Utzon Center and City campus which creates a lot of life and diversity.

ill.25

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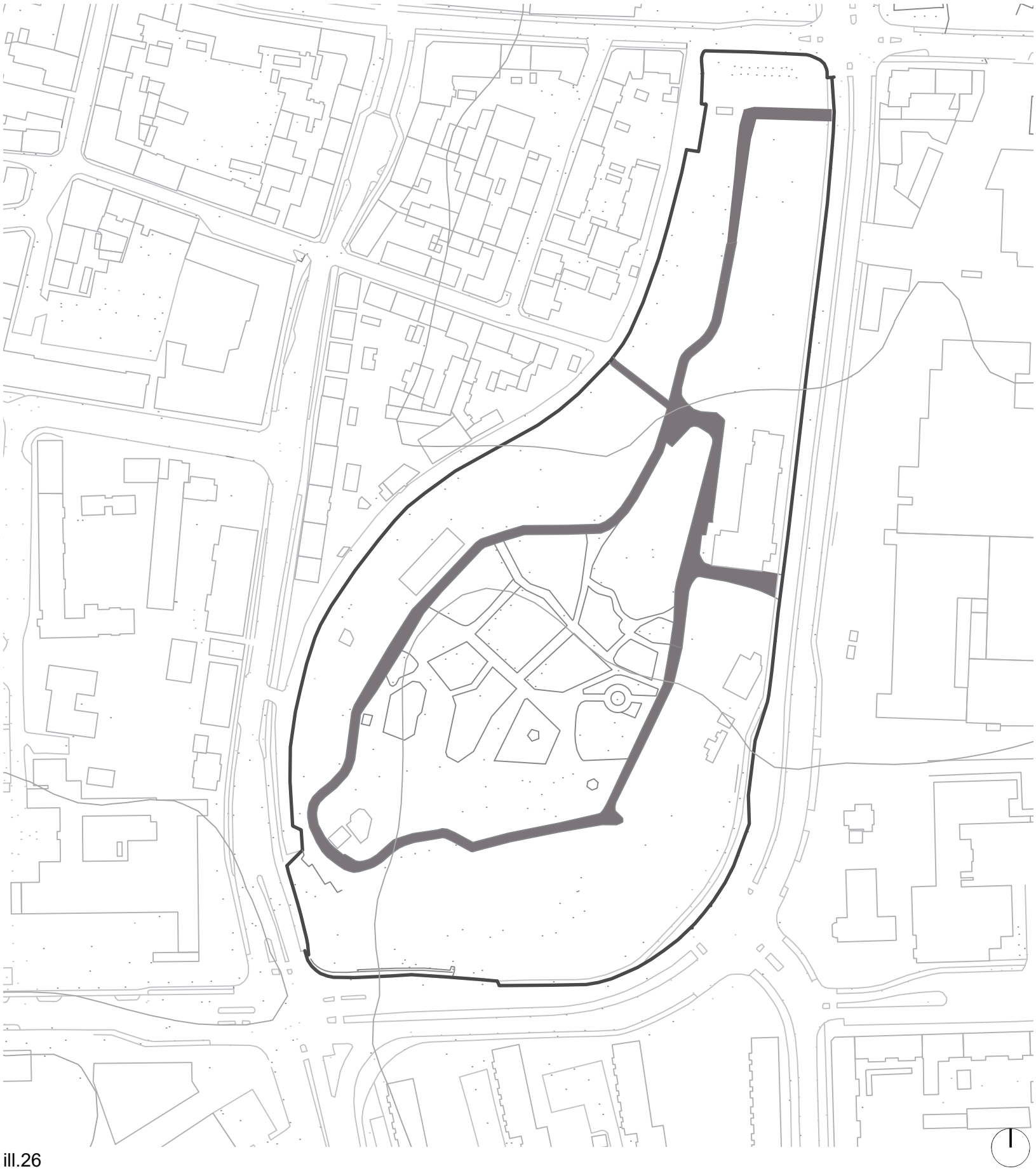
GREEN AREAS

Karolinelund is know for its big green areas that is used and loved by a lot of people because of its central location in Aalborg. As seen on illustration 16 it is close to Aalborg univeristy, apartments etc. and thereby it is loved by many different kinds of people. The park allows people to use it in many different ways for instance sport activities, events, concerts, playgrounds and art exhibition and that is due its flexible program.
An example is that the park is used by people who want to workout and the flexiblity of the area allow people to be creative and use it in many different ways like for instance urban gardening where they plant flowers, vegetables and much more (Visit Aalborg, n.d.). This flexibility gather diversity and create great atmosphere by the public in Aalborg and thereby it makes it to an attractive and modern area. This is also why in the district plan the municipality has restrictions according to it use and how the built environment on Karolinelund should take into consideration the green character of the site when building.



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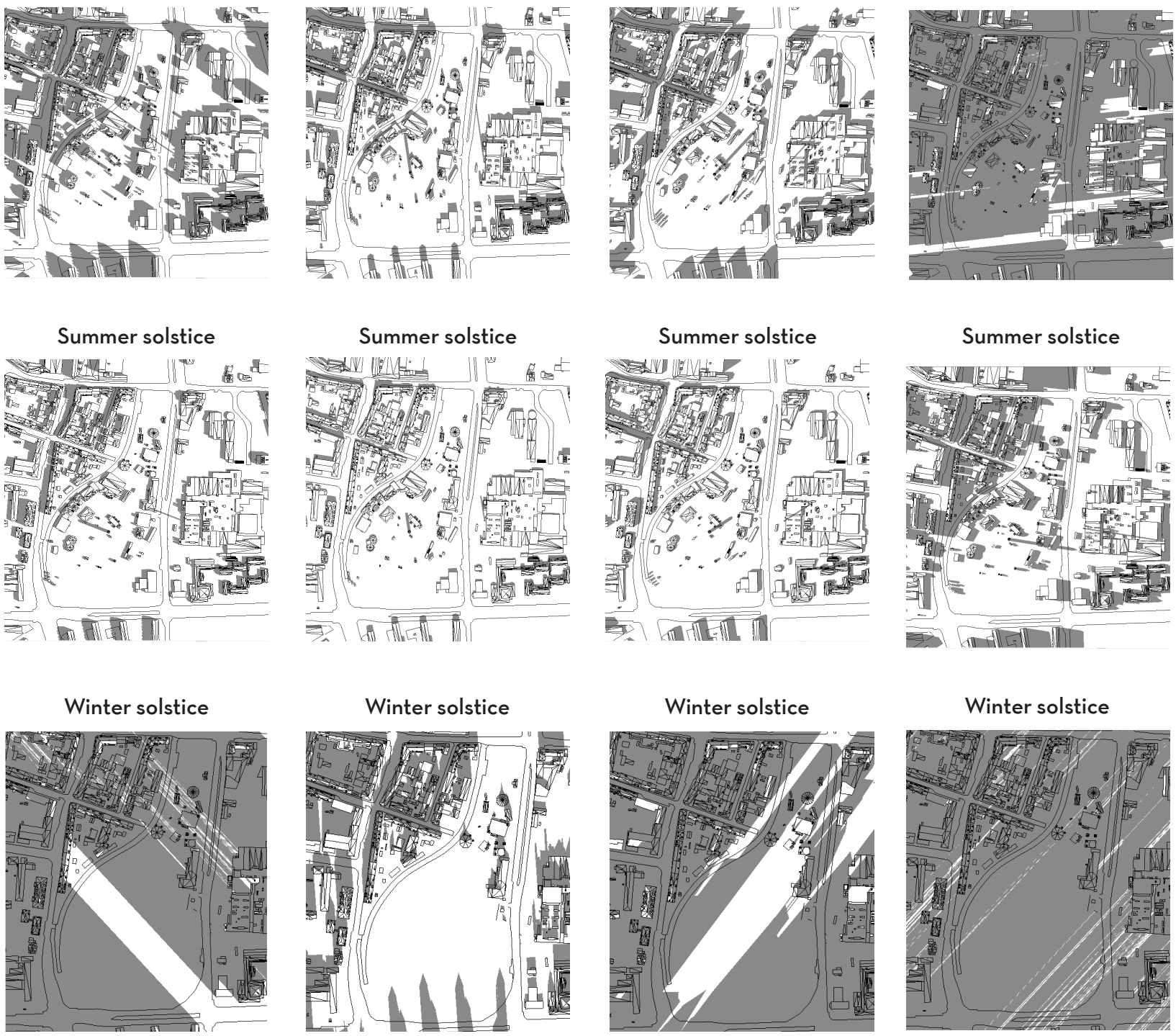
MAIN PATH

The main path in Karolinelund takes you around the whole area and gives you possibility to participate in the different activities that goes around the site. The road starts all the way from Østerbro, which is a busy road in Aalborg and leads you on a journey through the famous park of Karolinelund. Therfore there is a good possibility of pavement in the area and thereby it is not covered by merely grass.



ill.27 Shadow Analysis

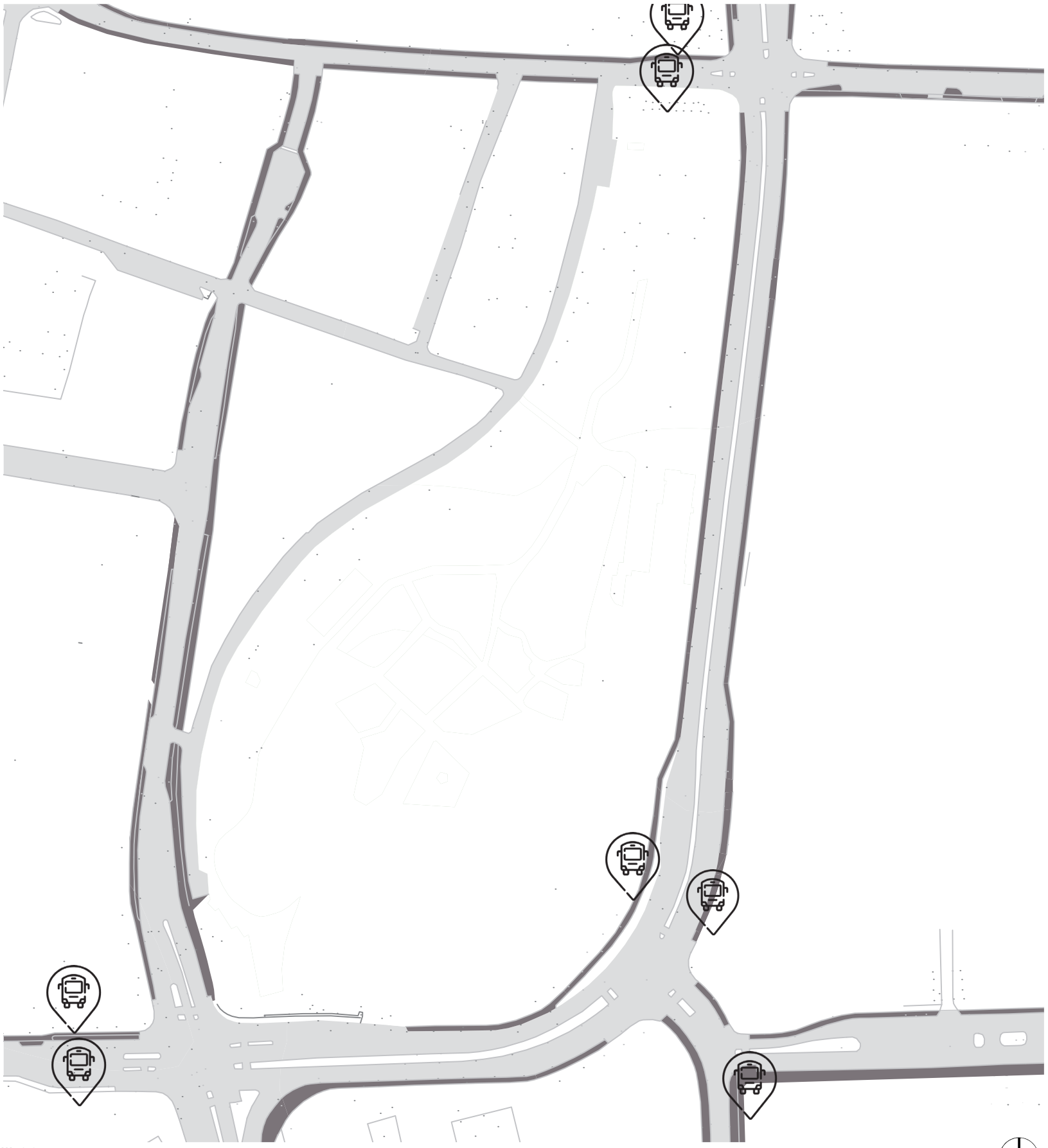
SHADOW ANALYSIS

Shadow analysis are crucial to make in order to have a clear understanding of the site and if neighboring buildings can have an effect on the design of the building. The shadows can have effect on the indoor climate in terms of daylight and direct sunlight therefore an analysis is made for spring/autumn, summer and winter at 9:00, 12:00, 15:00 and 18:00.

Spring/autumn:
This study shows that the area is free from shadows until the sunset at 18:00. Moreover the area can unfold outdoor activities in the sun where people can enjoy the outdoor area without disturbance from surrounding shadows.

Summer soltice:
Because of the high sun the area does not get shaded throughout the day, making the area open and inviting for people to stay outside.

Winter soltice:
The area gets shaded at 12 O'clock because of the low winter sun and because of the surrounding buildings. This is though a typical situation when the site is located in a city.



ill.28

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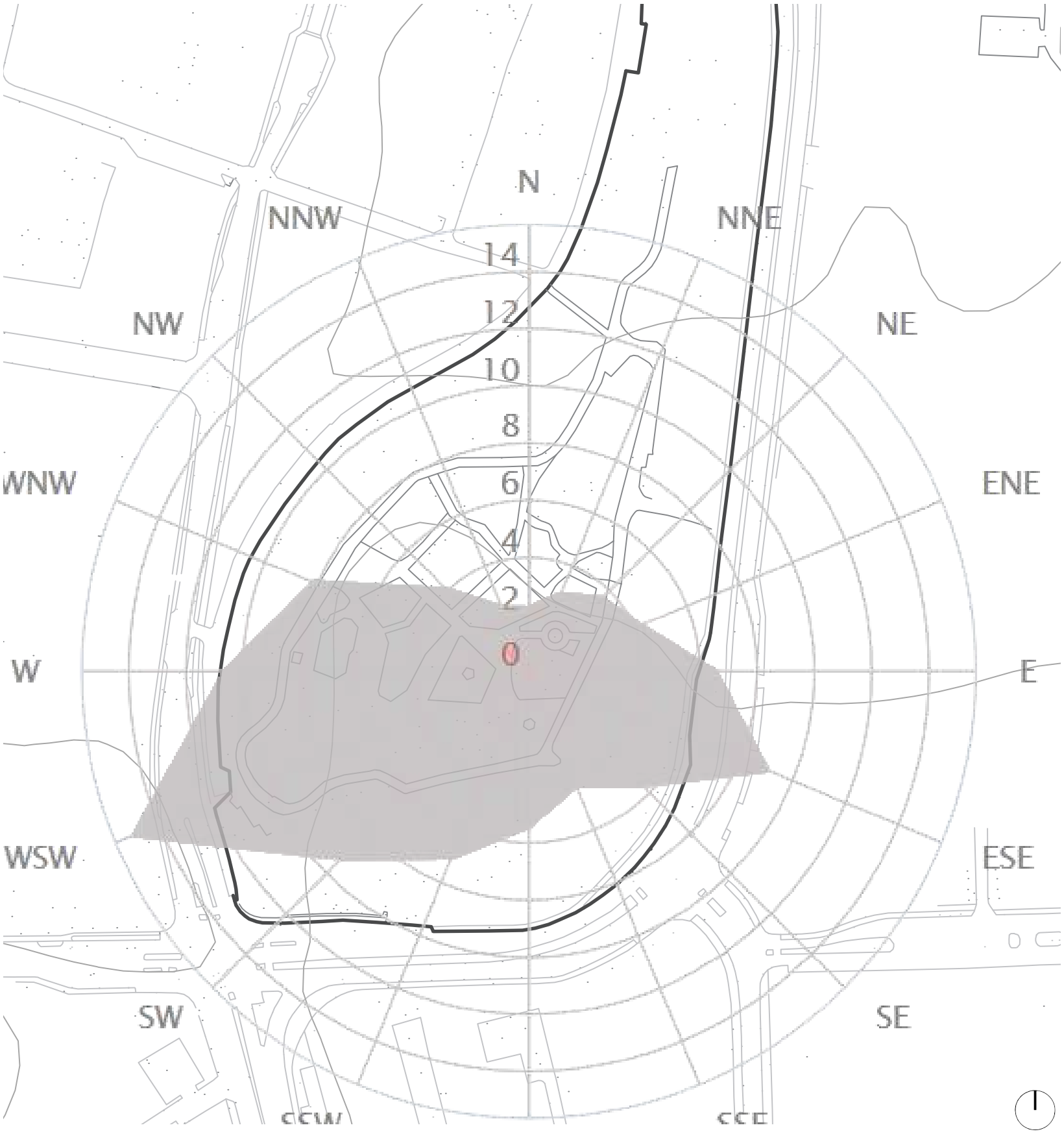
TRAFIC INFRASTRUCTURE

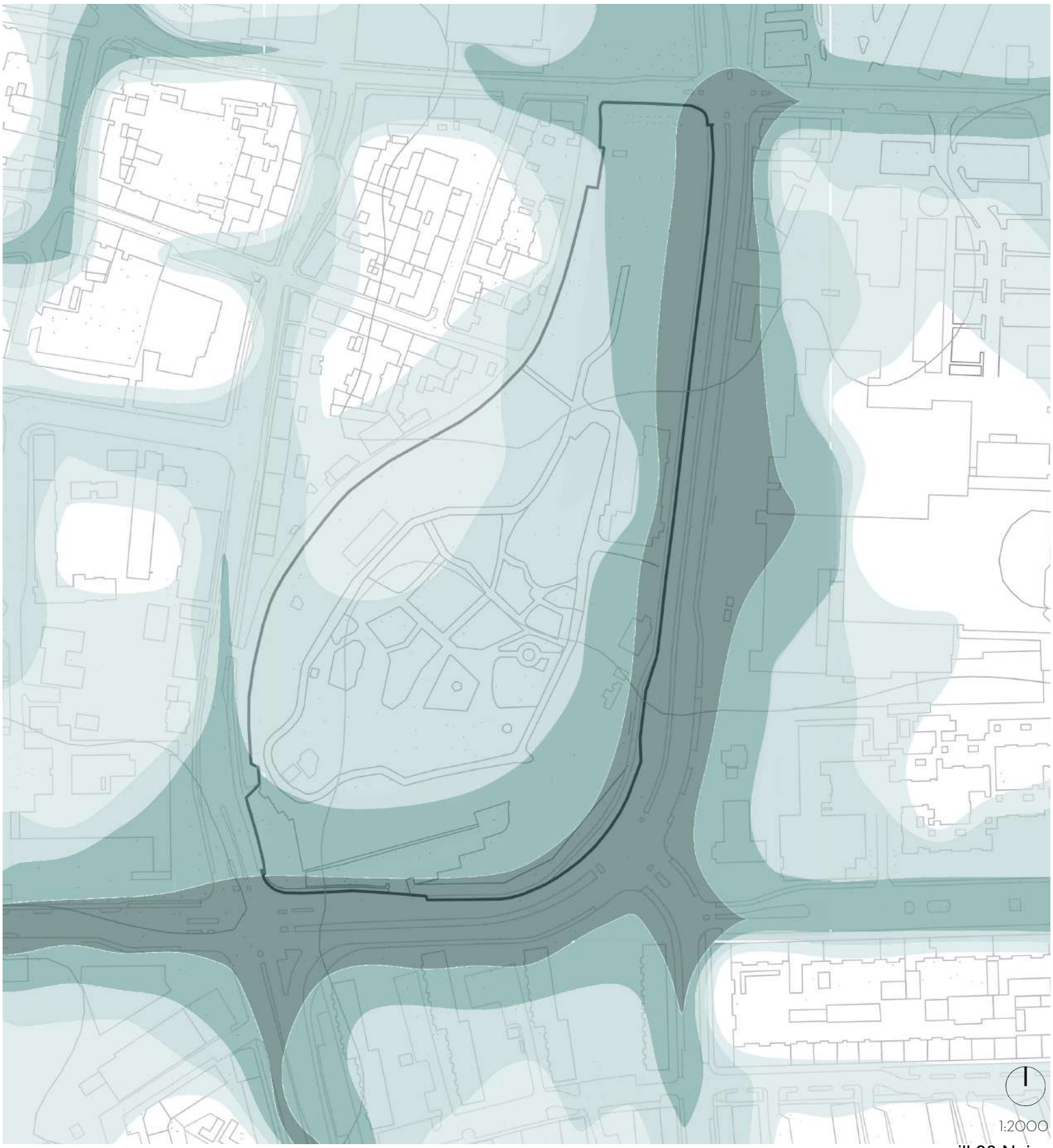
The main road is running south to the site and usually a very busy road where busses passes this road heading to Kennedy station. It connects Aalborg Øst with the rest of Aalborg City and its surroundings areas. Therefore it is a very important road where lot os people pass by.
This gives a great oppurtunity to use public transportation, which is easy and available around the site as seen on above illustration, which makes the area attractive because of the easy connection.



ill.29 wind

WIND

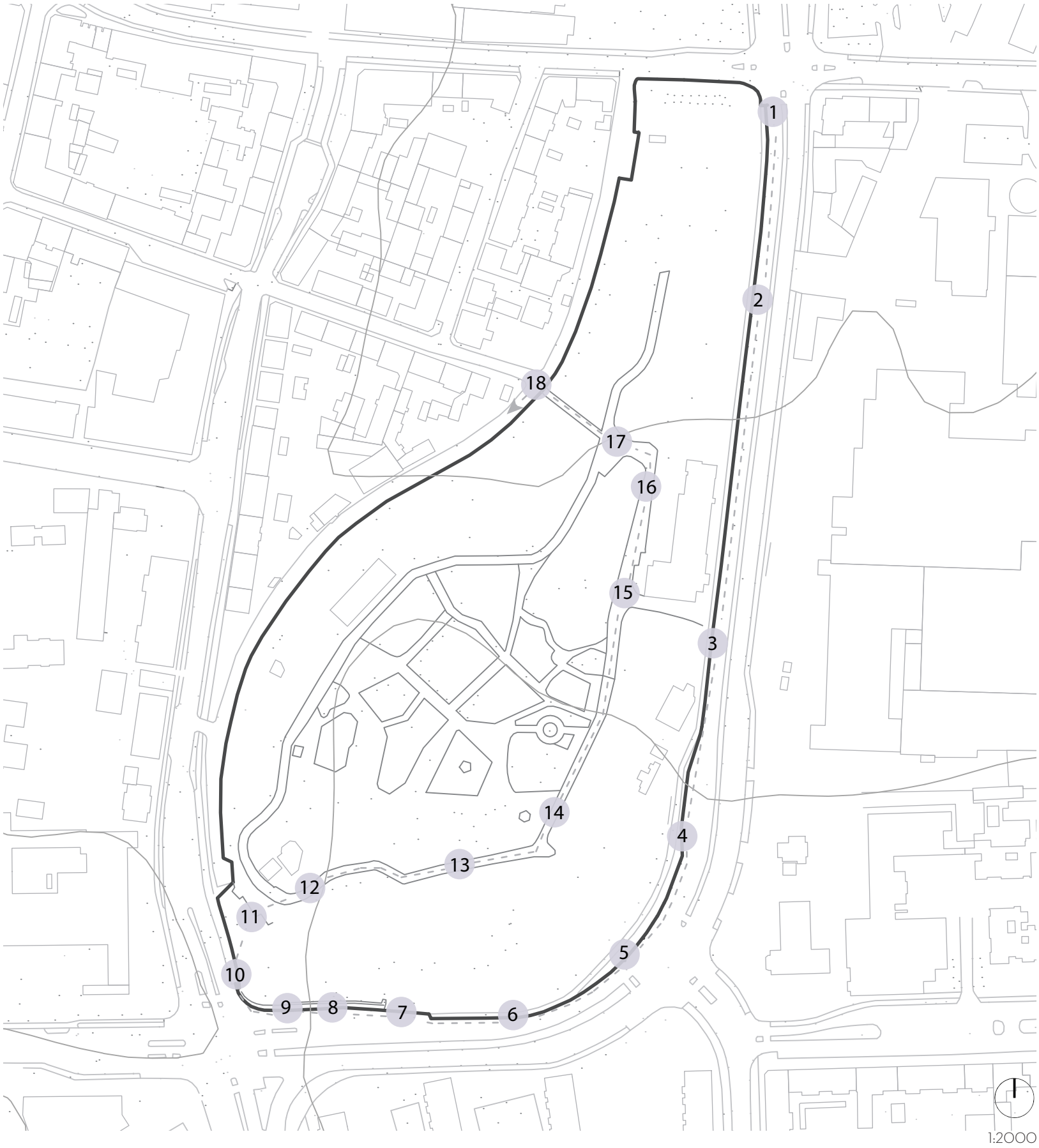
The area is exposed to both noise and wind since it is placed in an ”open” field without building covering it. The dominant wind directions area: south, southwest and West and need to be taken into consideration when designing the building.



ill.30 Noise

NOISE

The Level of noise is pretty high since the site is located near one of the busiest streets in Aalborg; Karolinelundsvej/Fyensgade. However the site does not get more than 60-70 dB because it is not placed directly to the street but pushed back. For the programme it means that functions like the staff area and the outdoor garden for children need to be orientated towards north both to avoid children running out to the streets, which is a safety regard but also not be distracted by cars and heavy vehichles, and a plus is to have a green connection to the park of Karolinelund .



ill.31 Serial vision

SERIAL VISION

To achieve an understanding of the area and the surrounding context a serial vision method is used where a route is chosen throughout the site and pictures are taken along that route. In total 18 pictures were taken.
The first three pictures shows the starts at the street ”Karolinelundsvej” and it shows how it is too wide and the pace in that area, both for the cars and the pedestrian, is quite fast. There are no functions that open up to people like shops or cafees and thereby people go through the area in a fast pace because there are nothing that interacts with them. Karolinelund is on the right side and is hidden behind a tall hedge, which leads no relation to the human scale.
The next six pictures revelas very tall apartment blocks that follow the curved route, however the area is still surrounded with busy roads and a bit of human activity.
However, when entering Karolinelund, from picture 10-18, another atmosphere occurs. The area is surrounded with tall green trees, grass and a variety of plants. The noise from the cars and busy streets slowly dissappears and a green oasis takes over Karolinelund. The existing Kindergarten integrates perfectly with the landscape mostly through its roofscape and creates a harmonious unity with the surrounding nature. Picture 14-17 shows different zones of Karolinelund that are used to different activitites, however many of these zones are not defined, which makes the park flexible so that people can use them freely as they wish.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ill.32 Serial vision

USER GROUPS

The main user groups of the kindergarten will be the children, the staff and the parents.

Children

The kindergarten will house 99 children in the age of 3 to 6 years old. The children develop in these ages where they begin to learn and prepare for preschool. Children in age 3-6 years old develop rapidly mentally and physically but still the smaller kids will hold back for interfering with the older kids. That can be solved by dividing children into two groups in ages of 3-4 and 5-6 years old where they can feel a little more safer. When designing the kindergarten, functions can be placed in a way that the two groups of children still can meet and do some activities together.

A kindergarten is a place for children where they can develope and grow in safe environment while providing the different needs of children. The kindergarten must therefore be designed in a scale that relates to the children by for instance placing low windows and special made furniture with a form of flexibility that can also be used by the staff. For the rest of the kindergarten rooms can be designed as small rooms with low ceiling heights so different spatiality can be achieved where children feel that the architecture responds to them and their motorskills. Low placed windows is also a feature that can be implemented where children can explore the outdoor garden and nature from their perspective.

Staff

The kindergarten will house 20 staff member which 17 of them will be the pedagogues. The estimation of 17 pedagogues is made by looking at the regulations set by Aalborg municipality, which states that for daycare institutions such as kindergarten, there should be one pedagogue for 5.72 children [KORA og forfatterne, 2016]. The building needs a good indoor climate as well in sense of providing the working staff the best working conditions. The staff's main task is to have control and overview of the children and of that reason the building need to be transparent while opportunity for the staff to have private rooms for meeting or administrative purposes. As

ill.33

mentioned the furniture needs to be adaptive for both the pedagogues and the children and by that way both the pedagogues and children can be at the same level of communication.

Parents

The parents play a significant role in the kindergarten. For many parents, it is a new experience where children are for the first time leaving home and staying in another environment than what they are used to. Parents needs to feel safe as much as their children. Therefore the kindergarten must give the parents the secure feeling of being there most of the day. The delivery and pick up of the children needs to be done properly and smooth. Parents need also to have a good overview of the build up of the kindergarten to navigate as best as possible in case of trying to find their children. They also need to know the accessibility to the building and its outdoor areas. Here will the staff and parents corporate.

VISION

The vision of the project is to design a kindergarten in Karolinelund that integrates with the exisiting landscape that is already a big part of the site and strongly holds on to the identity and the history of the site, while giving a great architectural quality to the context. The architectural proposal should create a focus on sensory experience, where children can enhance their abilities of learning and exploring through the built environment. The building should at the same time take into consideration the sustaniability aspect in terms of providing healthy well-being for both the staff and the children plus incorporating passive and active strategies through the design.
Through this vision the parents and children will get a feeling of a well defined building where they get to experience a safe environment and a feeling of being at their second home.

ill.34

DESIGN CRITERIA

Aesthetical:

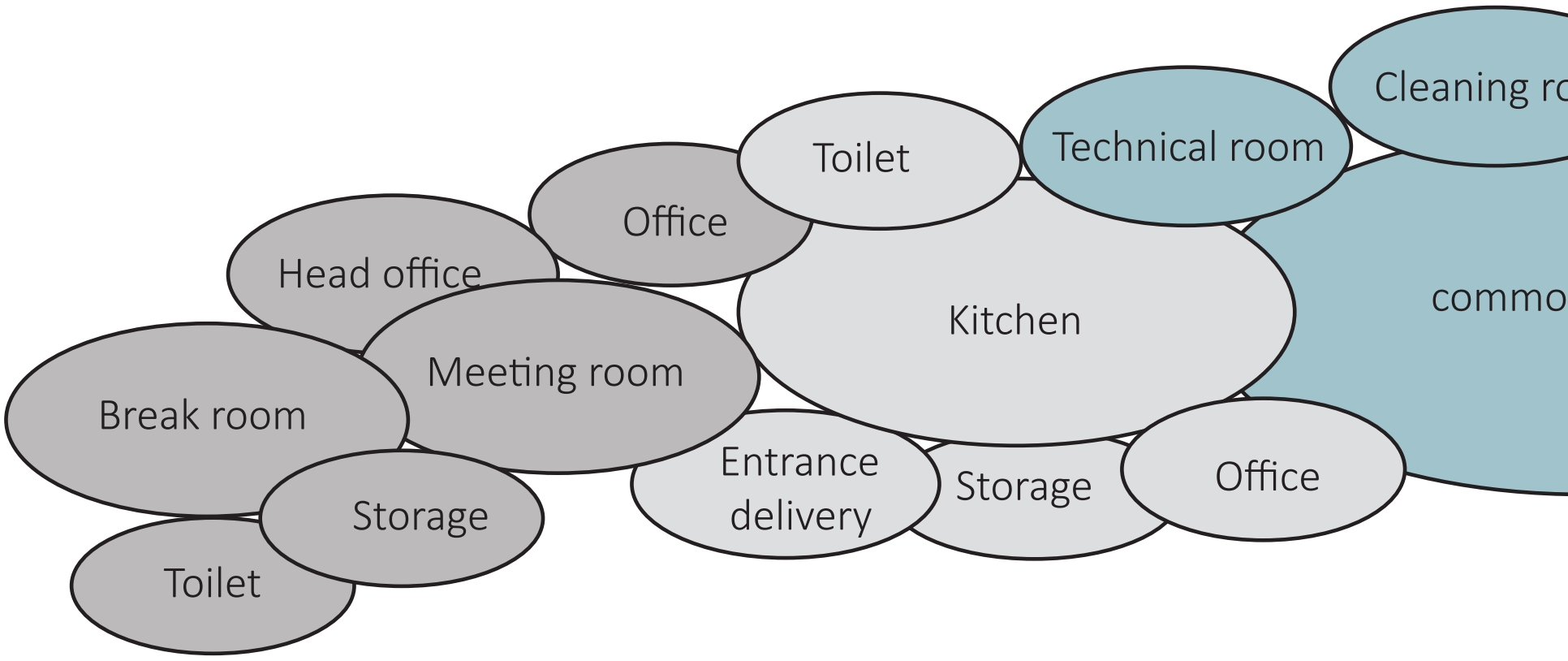
- Green recreational areas between the building
- Bright colors inside the building to stimulate play
- Connect the building with the context through the existing-typology and nature
- The functions of the Kindergarten should be decoded through the facade
- The form should incorporate the children's scale so that they feel welcome in the building

Functional:

- Interaction to the outdoor areas
- Easy accessibility toward the site and inside the building
- Allow children to unfold their creativity in safe indoor and outdoor areas
- Visual connection through the main rooms

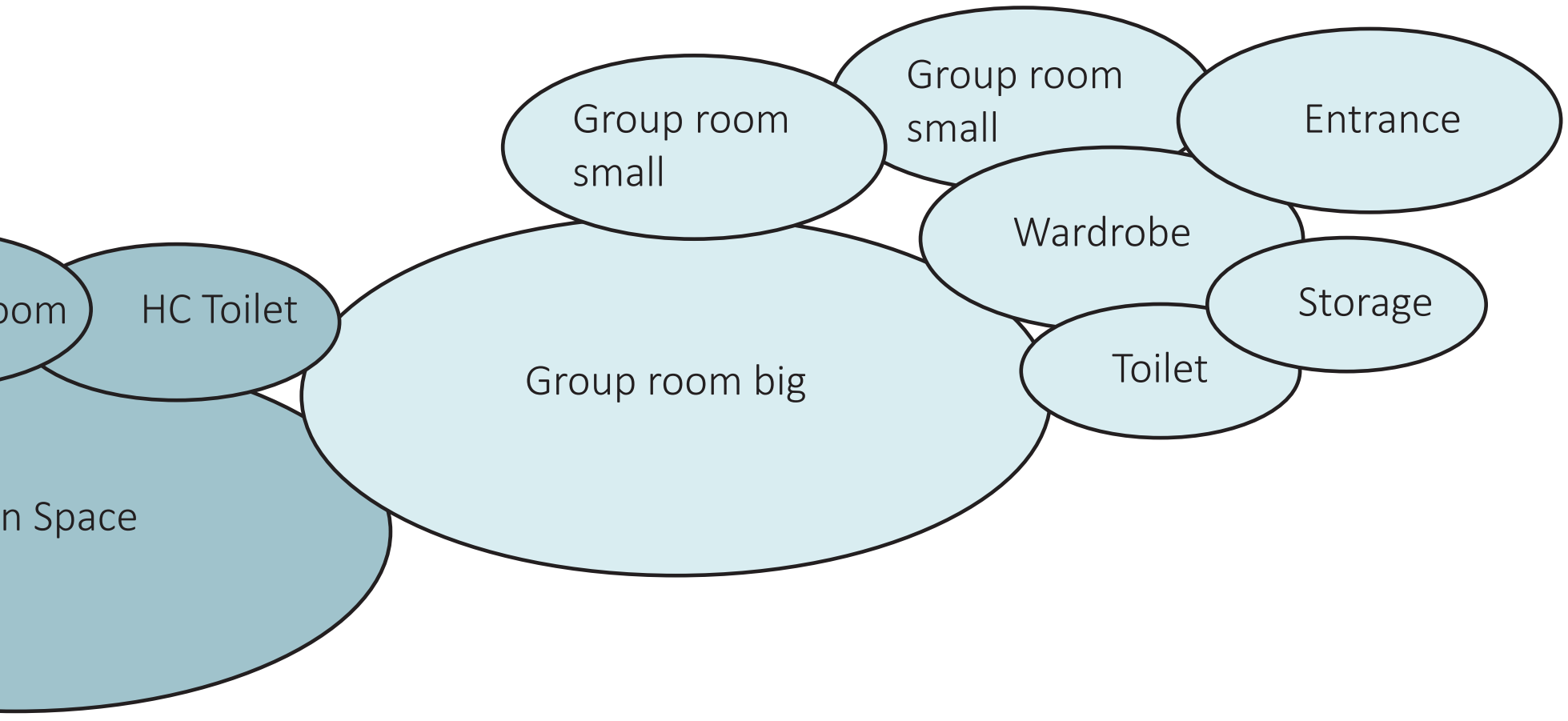
Technical:

- Comfortable indoor environment
- Integrated passive and active strategies
- Sufficient daylight in living rooms



FUNCTION DIAGRAM

The functions in the kindergarten will be divided with a clear transition in-between. The children are divided into two groups of 50 and 49 children. Every group will have their own facility of big and small group rooms. Furthermore, every facility will have an entrance with wardrobe and will have the accessibility toward the playground. The staff will have their private zone and an entrance for easy and quick access to the kindergarten. The same staff entrance can be used as a entrance for goods delivery. The children and staff zones will be connected directly to the common space and kitchen and this will create the center of the building where all children and staff can meet. The idea behind dividing the kindergarten into functions and groups of children is to create organization in the building where children get the feeling of secure environment and can quickly adapt to their zone. [MODELPROGRAM FOR DAGINSTITUTIONER, 2010]

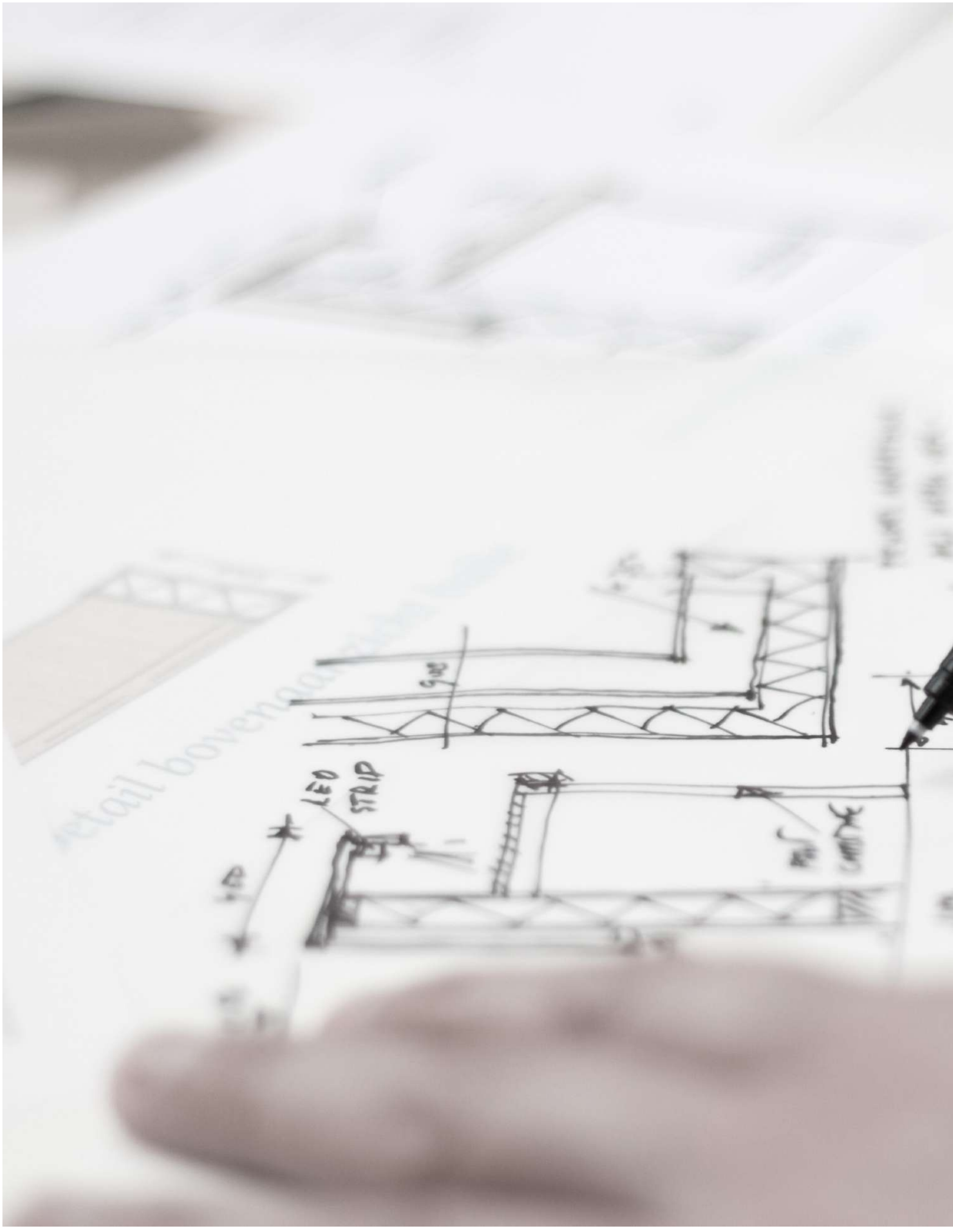

Group room small
Group room small
Entrance
Wardrobe
Storage
Toilet
HC Toilet
Group room big
n Space

ill.35

Category		Function	Area m2	NO.	Area sum	Operativ
Kids areas						
	1,1	Group room (small)	12	8	96	20-24*
	1,2	Group room (big)	40	4	160	20-24*
	1,3	Grapple room	22	3	66	20-24*
	1,4	Wardrobe	35	1	35	20-24*
	1,5	Entrance	8	2	16	20-24*
	1,6	Toilet	10	3	30	20-24*
	1,7	Common space	40	1	40	20-24*
	1,8	Workshop	20	1	20	20-24*
	1,9	Storage	10	2	20	20-24*
Staff areas						
	2,1	Entrance	3	1	3	20-24*
	2,2	Head office	12	1	12	20-24*
	2,3	Offices	10	1	10	20-24*
	2,4	Break room	15	1	15	20-24*
	2,5	Meeting room	12	1	12	20-24*
	2,6	Wardrobe	8	1	8	20-24*
	2,7	Toilet	10	1	10	20-24*
	2,8	Staff Kitchen	6	1	6	20-24*
Kitchen facilities						
	3,1	Kitchen	25	1	25	20-24*
	3,2	Office	5	1	5	20-24*
	3,3	Storage	4	1	4	20-24*
	3,4	Toilet	5	1	5	20-24*
	3,5	Entrance / delivery	3	1	3	20-24*
Secondary functions						
	4,1	Technical room	15	1	15	20-24*
	4,2	Cleaning room	10	1	10	20-24*
	4,3	Handicap toilet	10	1	10	20-24*
Gross Area Sum					**636**	

ROOM PROGRAMME

e winter	Operative summer	CO2 Niveau	Air flow rate		Daylight factor
			l/s pr. M2	l/s pr. Person	%
	23-26*	900**	0.35	5	2***
	23-26*	900**	0.35	5	2***
	23-26*	900**	0.35	5	2***
	23-26*	900**	0.35	5	2***
	23-26*	900**	0.35	5	2***
	23-26*	900**	10	-	
	23-26*	900**	0.35	5	2***
	23-26*	900**	0.35	5	2***
	23-26*	900**	0.35	5	
	23-26*	900**	0.35	5	2***
	23-26*	900**	0.35	5	2***
	23-26*	900**	0.35	5	2***
	23-26*	900**	0.35	5	2***
	23-26*	900**	0.35	5	2***
	23-26*	900**	0.35	5	2***
	23-26*	900**	10	-	
	23-26*	900**	0.35	5	2***
	23-26*	900**	20	-	2***
	23-26*	900**	0.35	5	2***
	23-26*	900**	10	-	
	23-26*	900**	0.35	5	
	23-26*	900**			2***
	23-26*	-	0.35	5	2***
	23-26*	-	0.35	5	2***
	23-26*	900**	0.35	5	



DESIGN PROCESS

ill.36

ill.37 Kindergarten in Xieli Garden / UDG + SEU

ill.38 Kindergarten in Xieli Garden / UDG + SEU

ill.42 Tezuka Architects' Fuji Kindergarten

ill.39 Kindergarten Valdespartera / Magen Arquitectos

ill.40 Farming Kindergarten / Vo Trong Nghia Architects

ill.41 Farming Kindergarten / Vo Trong Nghia Architects

REFERENCES

Before starting the designprocess the different analysis and theory must be implemented in the process. These should be present in the design and therefore many different drawings and sketches should experiment those design strategies.
Therefore, a start is to find some reference projects that have good qualities or good solutions that could be inspiration to the design process.
The references should have different geometric character that should give a different architectural expression to Karolinelund.
The above references show two main ideas that could be worked on in the design process. The above pictures shows a more rounded forms that collect the kids in a safe outdoor environment. What the buildings also have in common is that they open up to the surrounding buildings by having big glass facades that look out to the context. These buildings connect and gather people through the form and thereby creates dynamic rhythm in the architecture as well as people's lives.

ill.43 Dominik Górecki Architekt, Kindergarden in Lą-
dek-Zdrój

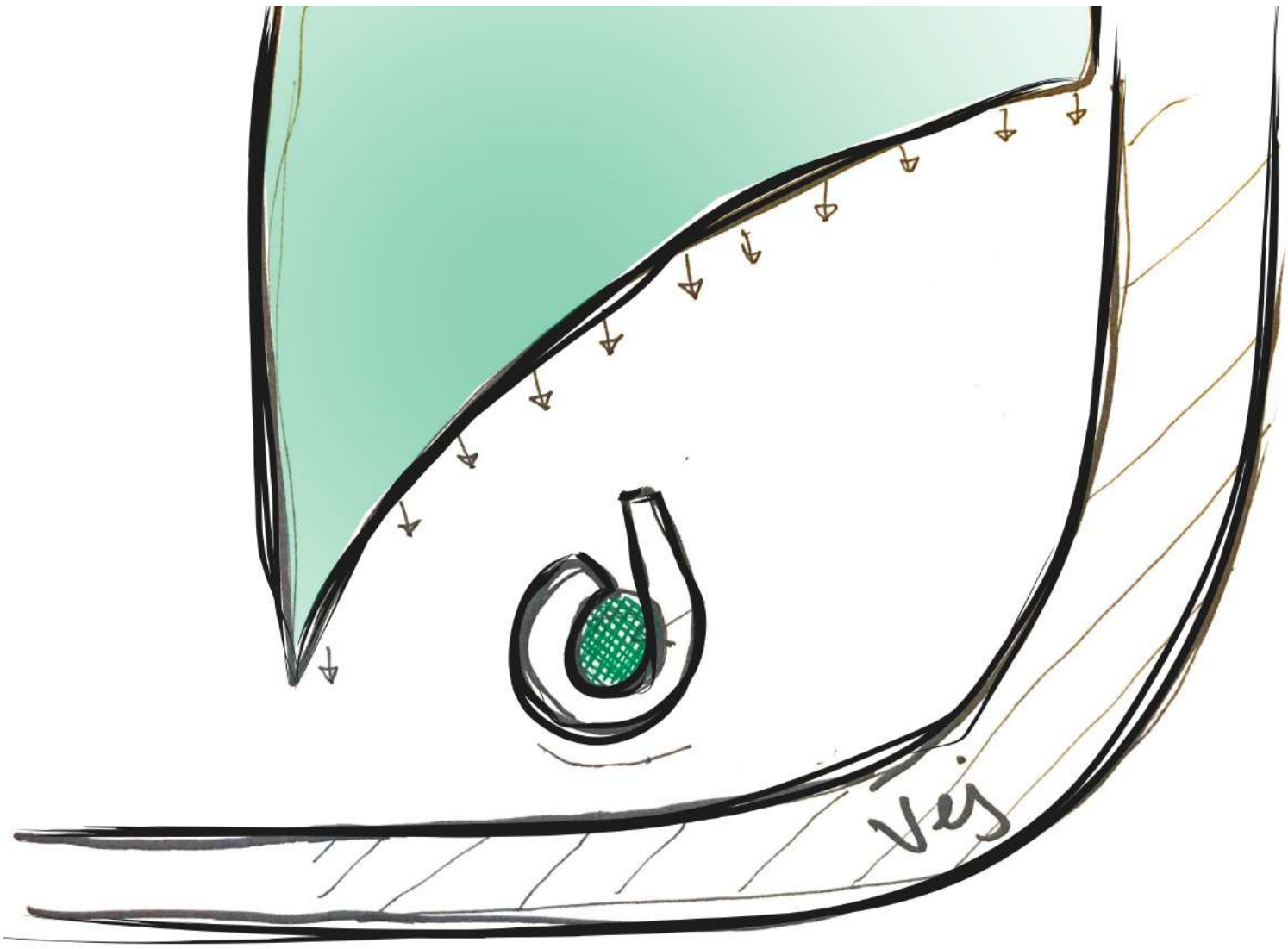
ill.46 CNLL - Atelier Nuno Lacerda Lopes, Mouriz
School Center

ill.48 Nursery Fields Forever

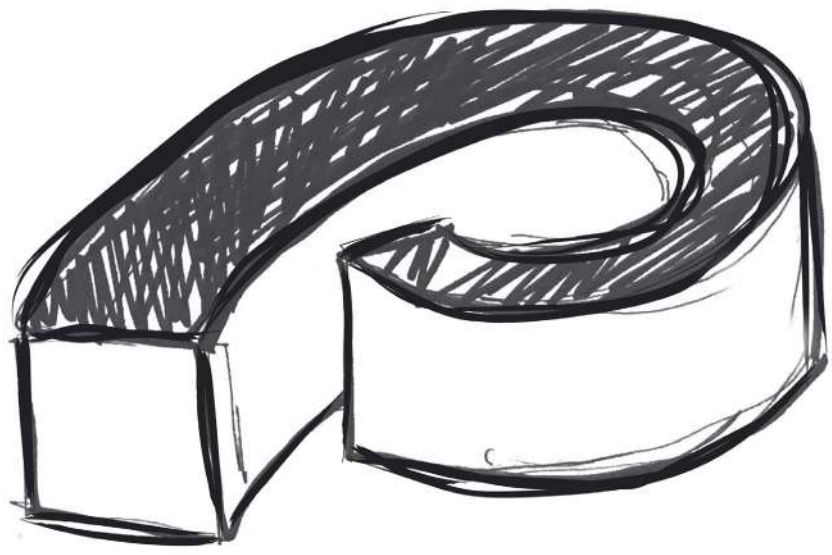
ill.44 Klab Architecture, Public nursery in
Glyfada, Athens

ill.45 COBE, Frederiksvej Kindergarten.
Copenhagen, Denmark

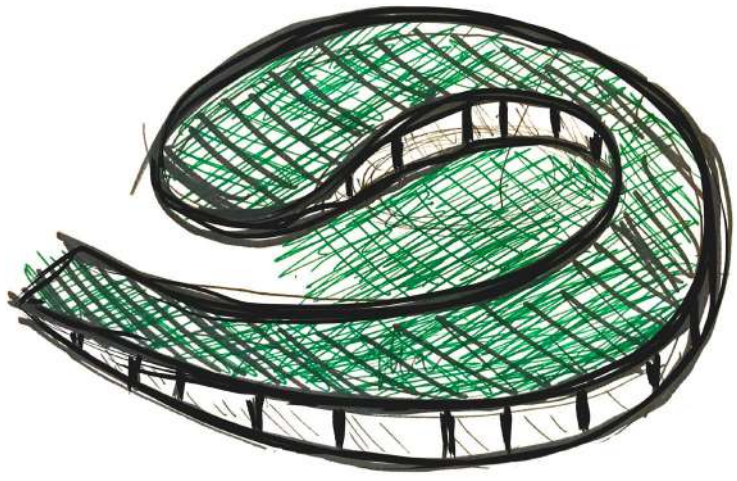
ill.47 Taika Kindergarten / OOPEAA



ill.49 Sketch 001



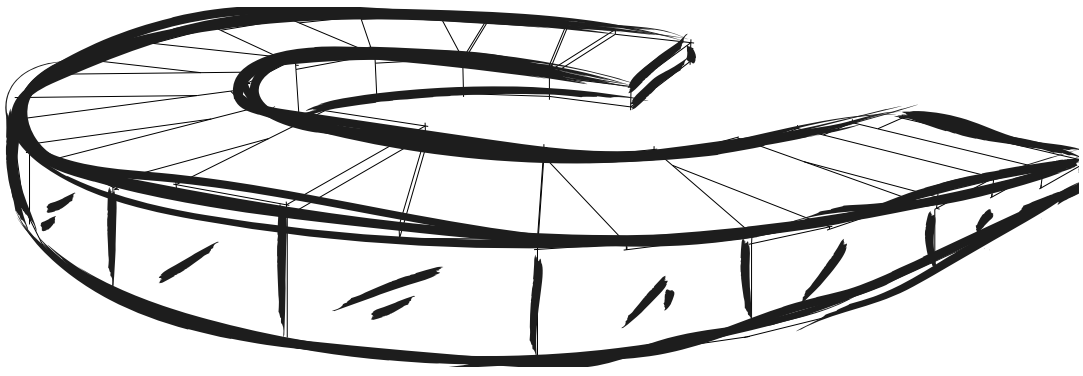
ill.50 Sketch 002

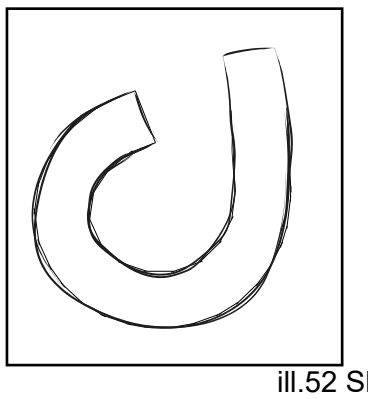


ill.51 Sketch 003

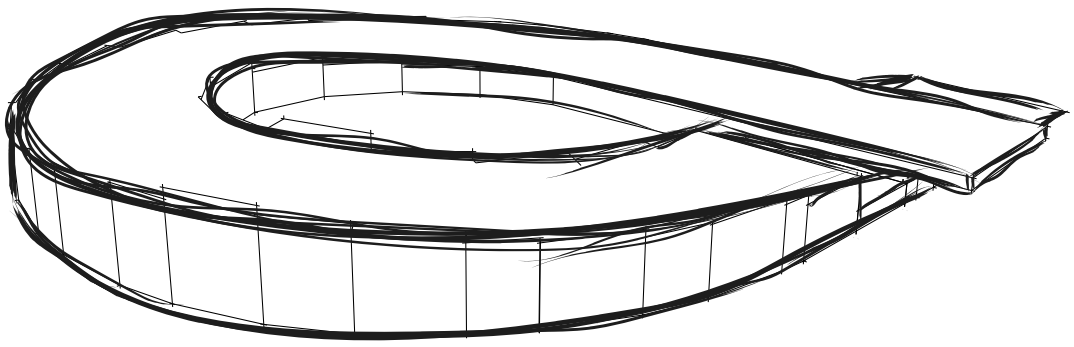
DIFFERENT ANGLES

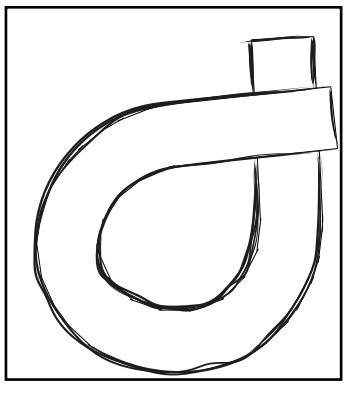
The organic shape takes part in the identity of the site that consists of nature and landscape in the northern part of Karolinelund as well as the organic shape of the road ”Karolinelundsvej/Fyensgade”. The first sketch shows how the shape continue the landscape unto the building and creates a small and safe area in the middle that takes into consideration the kids scale and allow them to play in an outside area that is safe and controlled by the kindergarten. There should also be a possibility though the form to have view from every room to the nature to allow everyone in the building to have access to daylight and integration of nature.
The shape itself relates also to the history of the site where Tivoli once was a big part of. Tivoli was not only an important destination in Aalborg but Northern Jutland as well where people made great memories there. Therefore the element of fun, dynamic and movement from the roller coasters is brought back through the simple and dynamic shape that is seen from the streets.
The form is simple yet should appear light, welcoming and embracing through the light gesture that appears as a hug. The building’s promising feature also protects against the noise from the main road and makes the middle area fun for kids to explore without having the fear that they might run out to the street.
Sketch 003 shows that a feature that could be integrated in the design is that the roof could start from the terrain and allowing the public people to use the building outside working hours so they could engage with the built environment. That way the building is also a big part of the landscape and people are allowed to experience the city from a higher perspective, which makes the building more valuable.
Sketch 006 shows how the building is perceived from human perspective and the relation between the existing buildings towards south. It opens up to people while at the same time connecting the built environment and people.



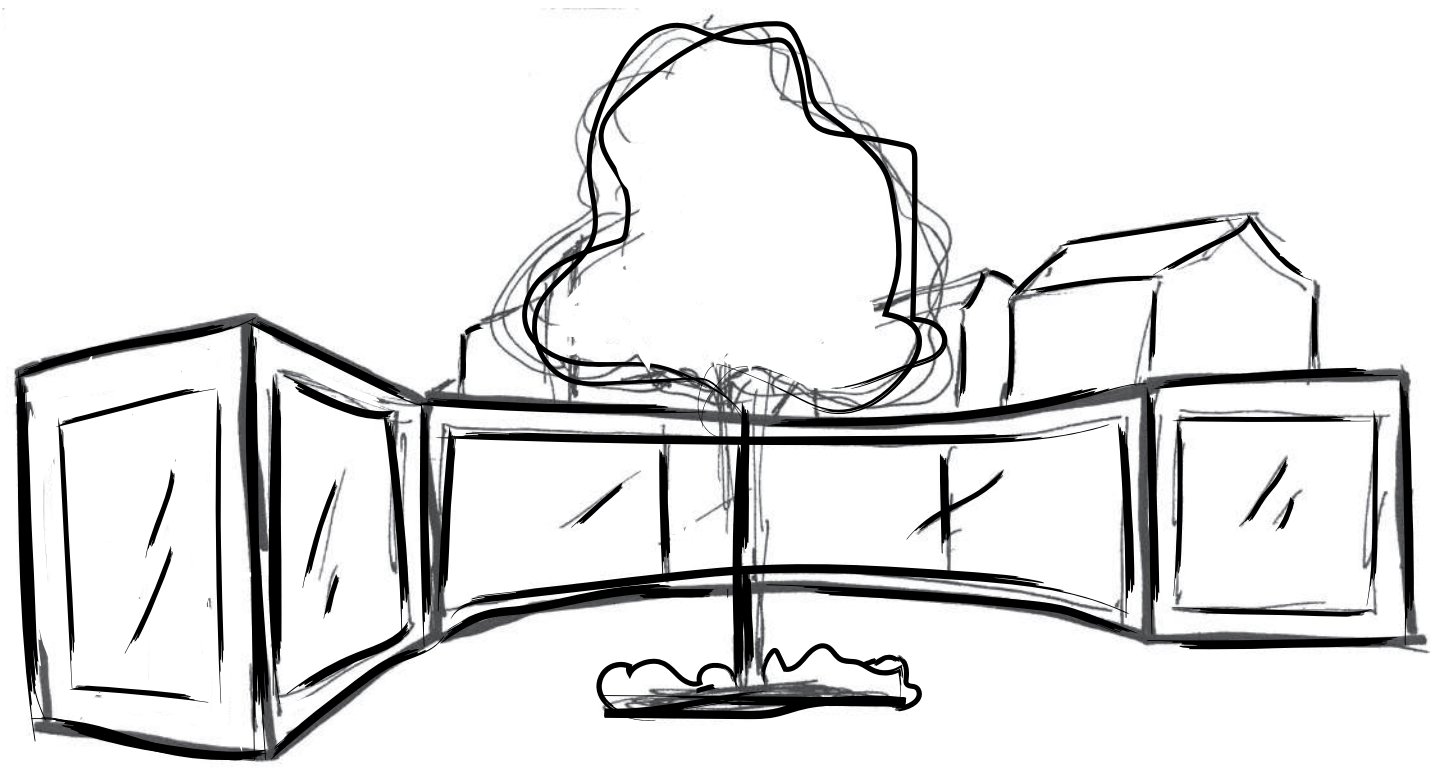


ill.52 Sketch with
top view 004

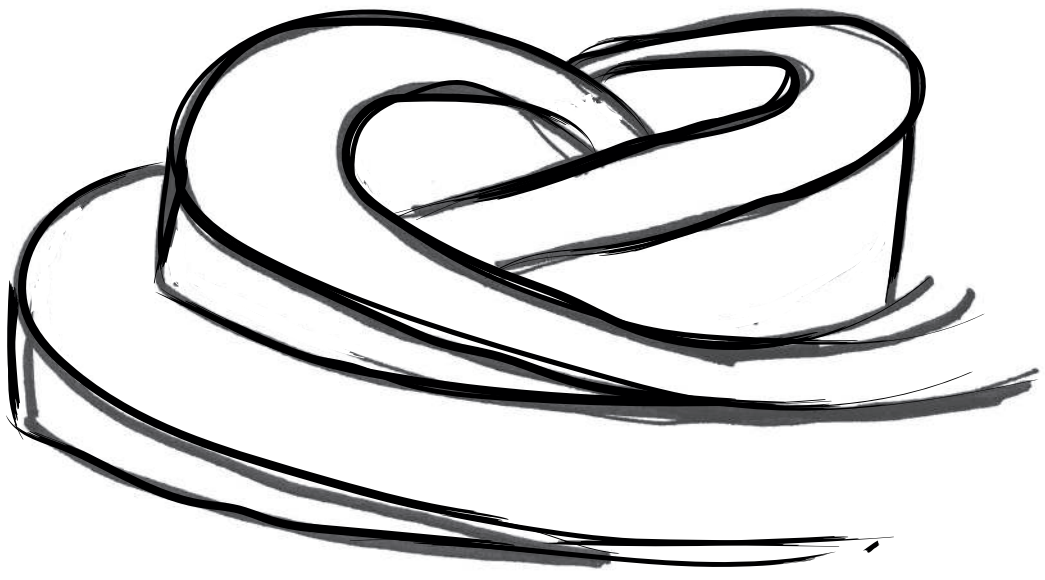




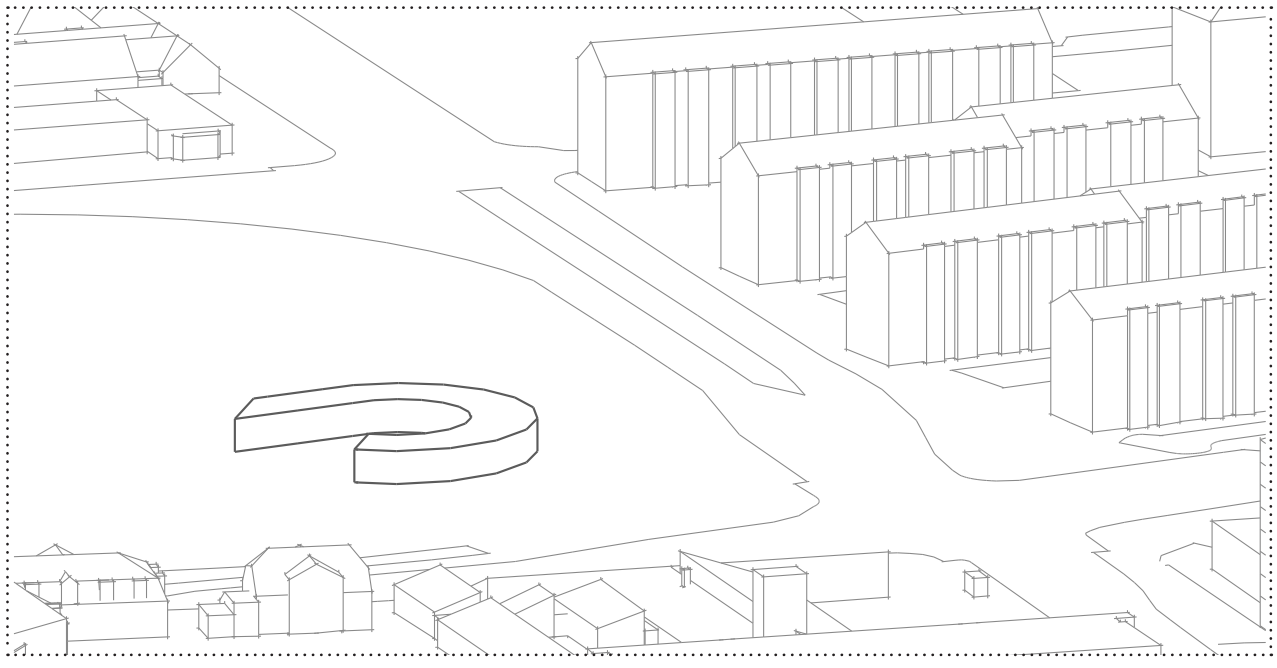
ill.53 Sketch with
top view 005



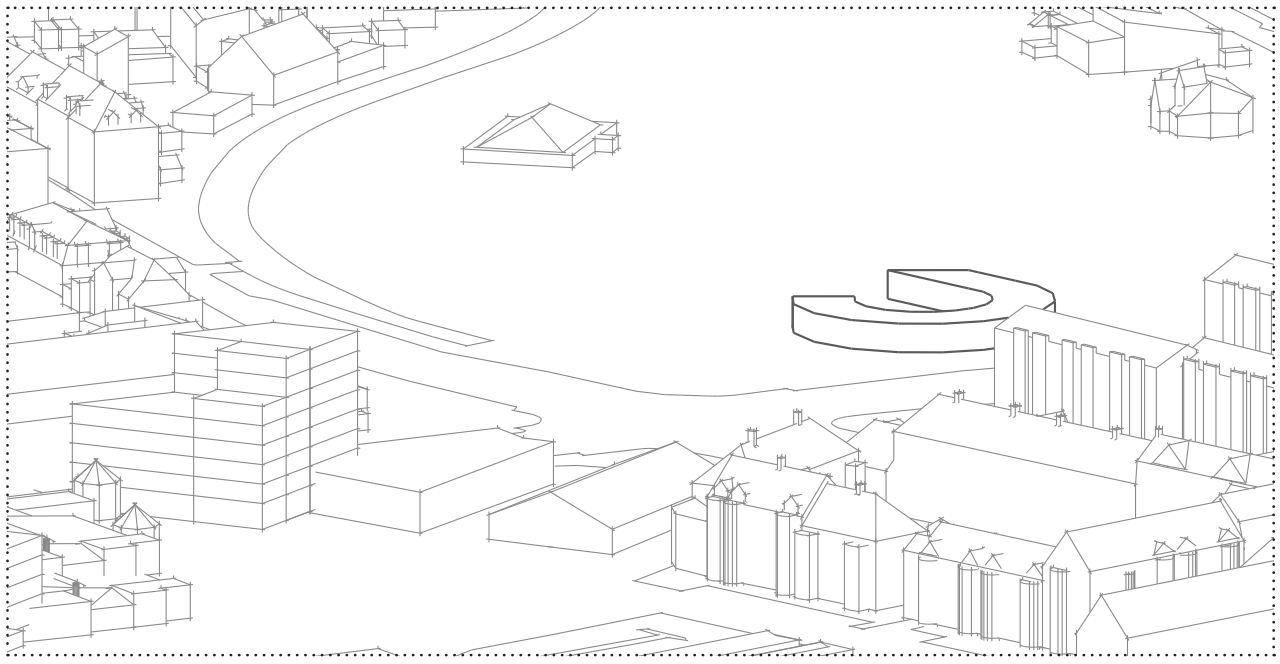
ill.54 Sketch with
top view 006



ill.55 Sketch with
top view 007



ill.56 perspective of the building with site

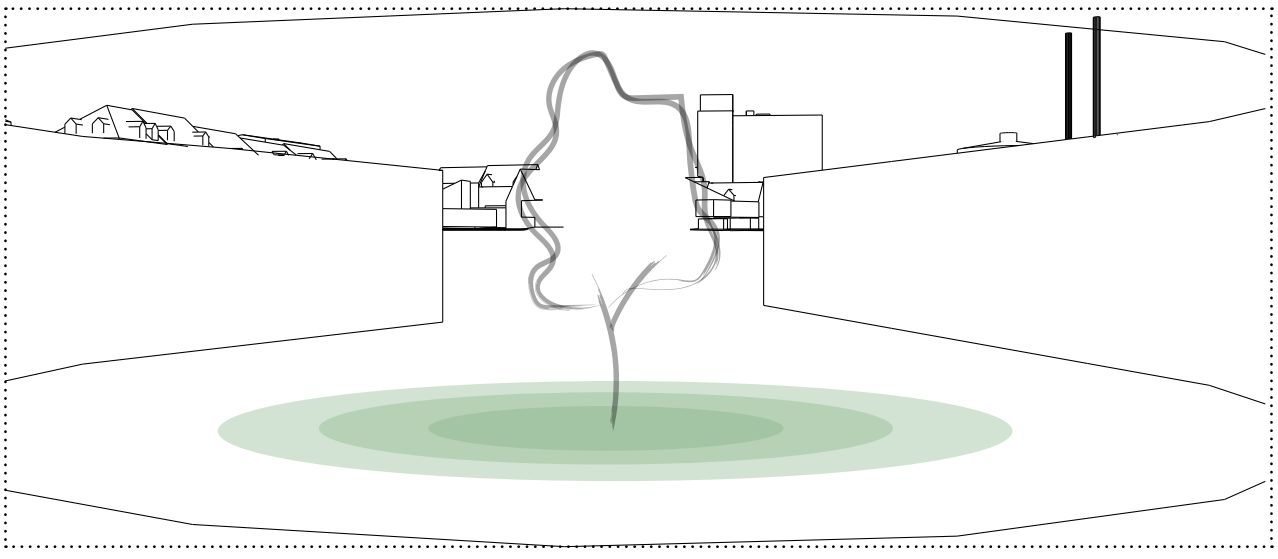


ill.57 perspective of the building with site

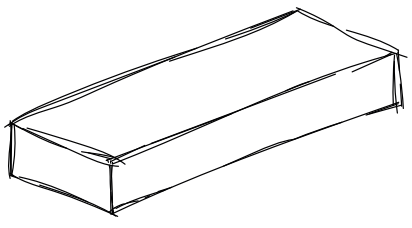
CONSIDERATIONS

When this shape was tried out in real scale in Sketchup some of the design features in this form turned out differently. First and foremost it accoured that it might be to closed up leaving it with a back turned towards Karolinelund. It might also fail to include the big park that is a big element of the site and that might be perceived negatively in the area beacuse the building will seem to outshine the context and not trying to fit at all. It also might fail the fact that it follows the road ”Karolinelund” even though the main idea was to follow the swing. It needs to be a lot bigger in size in order to follow the big swing of the road.
Moreover when one is standing inside the building and looking out to the park and nature, the building blocks the view entirely which is also a big problem for this particular shape.

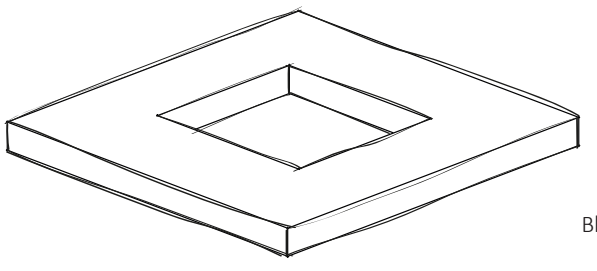
ill.58 top view



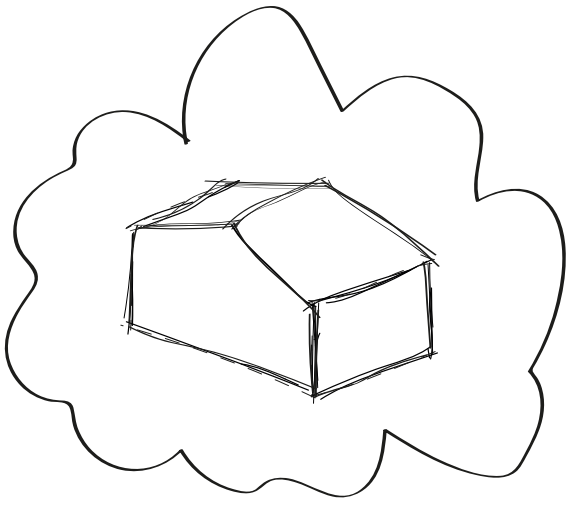
ill.59 Interior view to outside



Linear
block



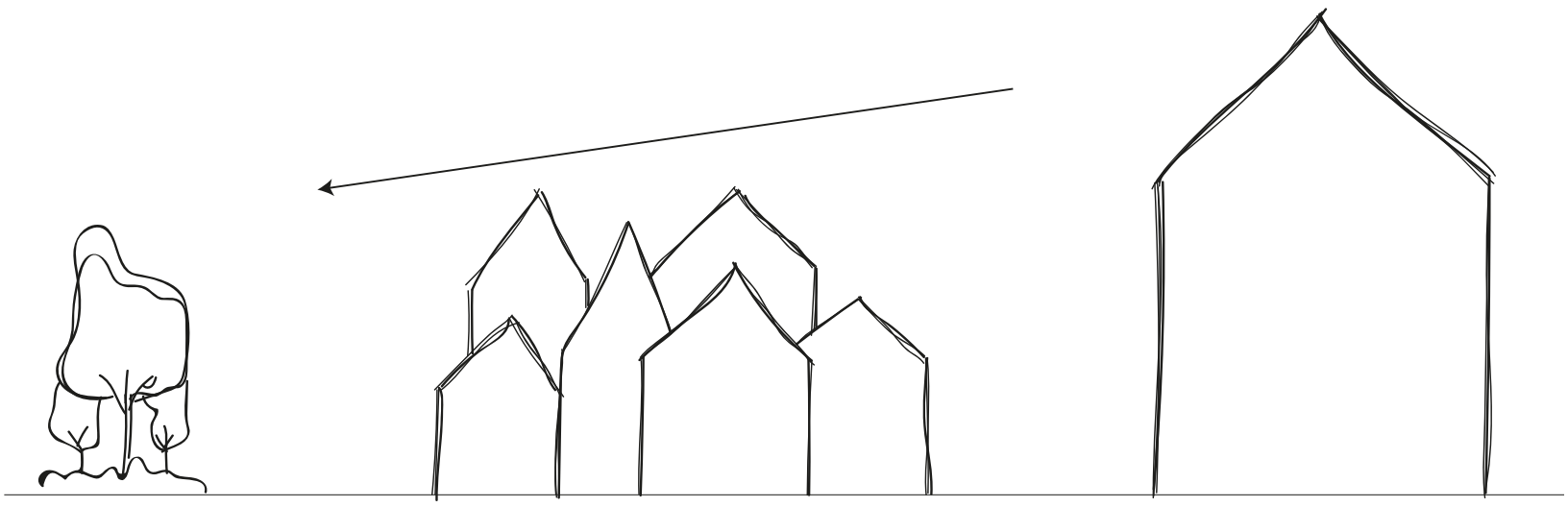
Block



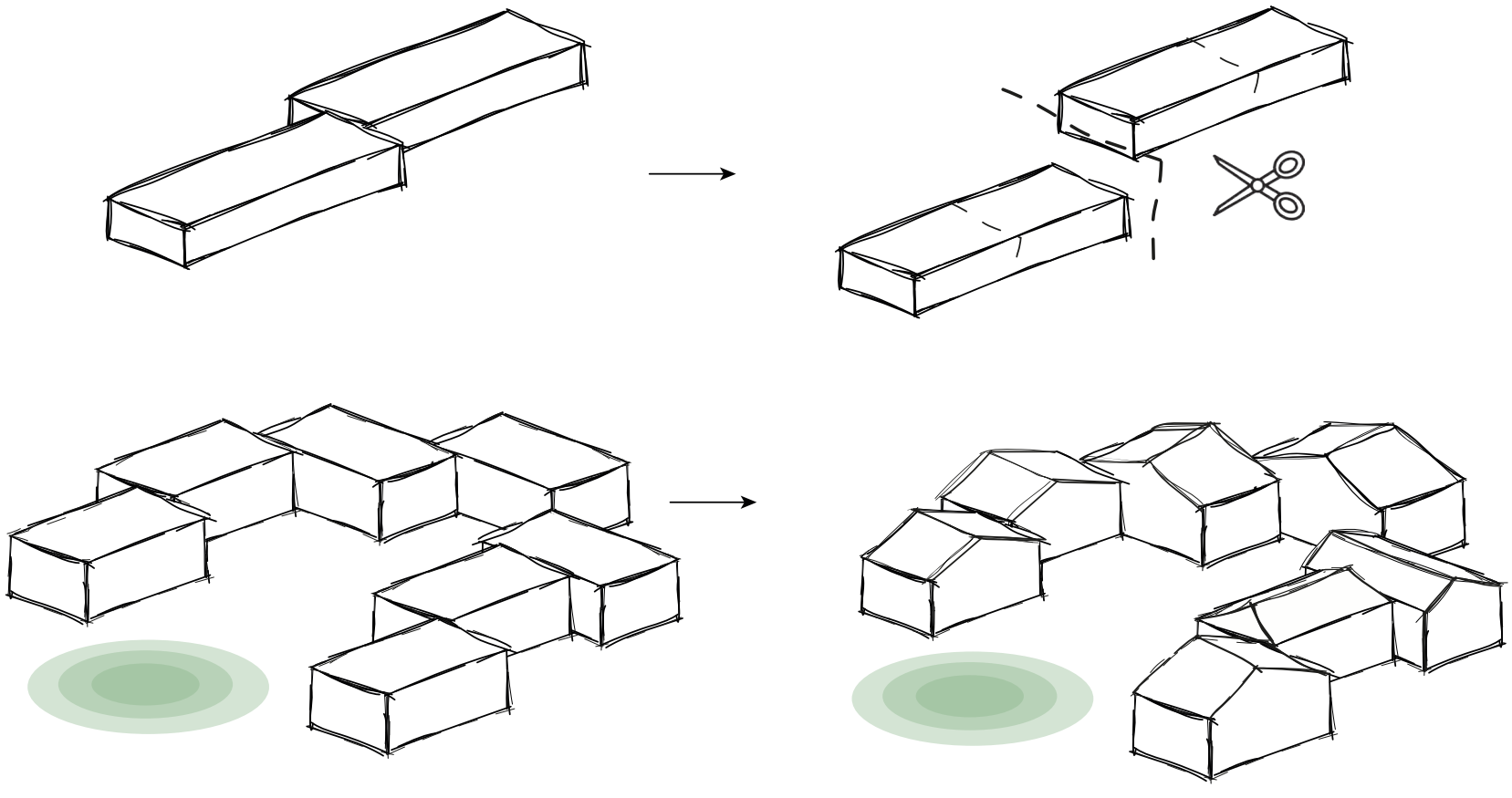
A typical one story
home

ill.60 Contextual Sketch

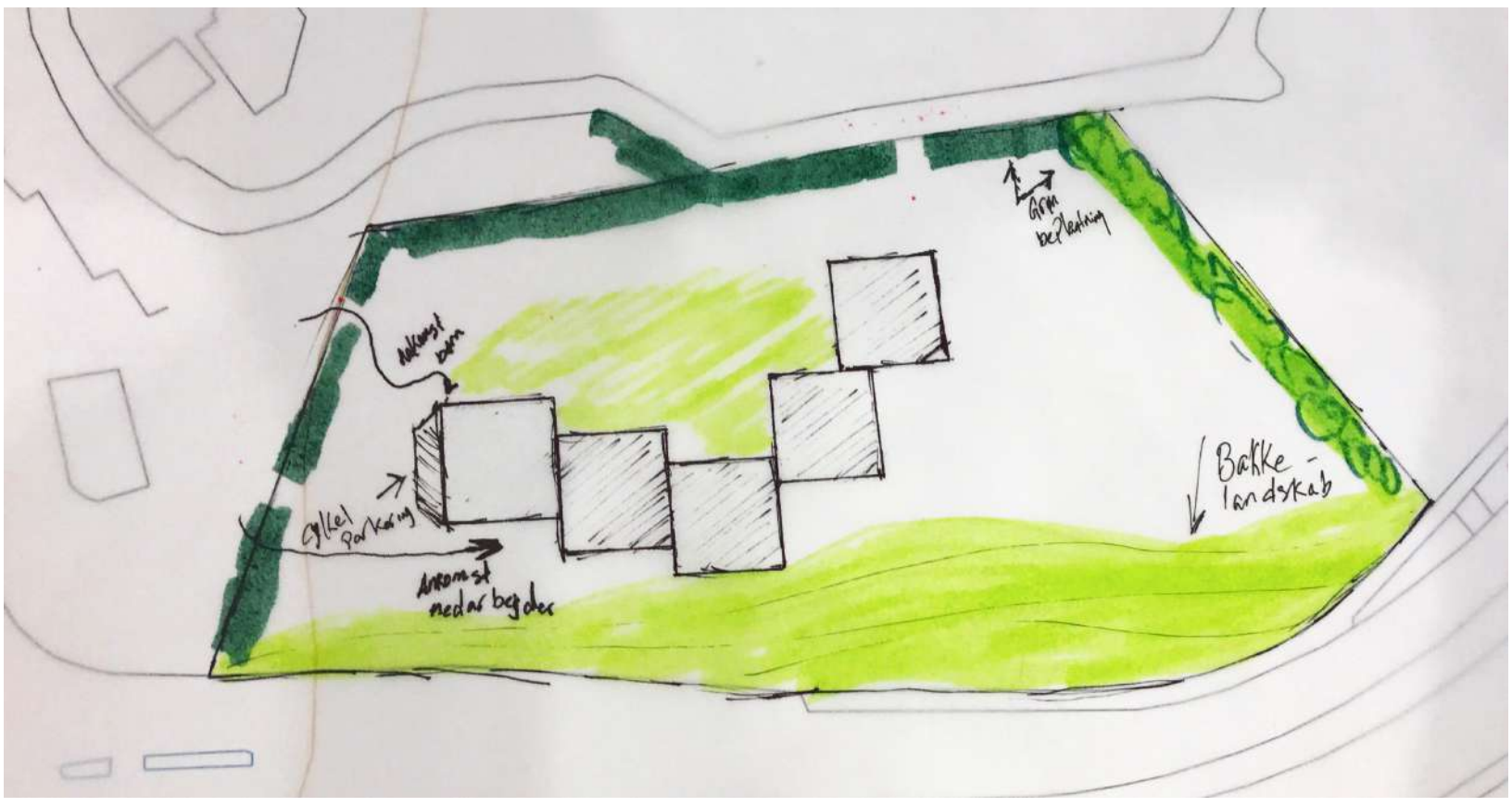
When looking at the typology of the nearest context of the site one would fine many different blocks, which is also a typlogy that is found nearly everywhere in Aalborg. Apart from this the linear block is also found mostly at the south part of the context. These are taking into consideration when designing this kind of concept where the nearest context play a huge role in forming the the building.
Lastly a single family house is introduced. These three typlogies are then worked on in order to make a building that fits into the context but at the same time introduce a new kind of architecture to the area that has a distinctive architectural impact on the site but at the same time relate to children scale and make them feel a kind of belonging. This is done by by dividing the linear block into small units that fit to the children scale and thereby placed together around a small courtyard that opens up to Karolinlund. The different units should all be distinctinve and have different character that correspond to their function, however they should overall create harmony and unity. The small units remind children of a house, a booth in an amusement park or simply doll houses that have a element of fun. These are than placed according to a regular block, however they open up to Karolinelund and let the nature flow into the space in the middle.
The different units or houses have different functions which make it easier for parents and children to decode the buidling from outside. Moreover the units are higher towards the mainstreet so they can block out the noise and make it more harmonic and safe to play outside in the garden.
The idea of breaking down the scale accordingly to children and rather than designing a traditional uniform volume is a main design element that should give children a sense of safety and belonging, and by dividing the functions of the kindergarten into small houses (units) the human scale is promoted as well as variation in the overall spatial experience.



ill.61 Breaking the scale

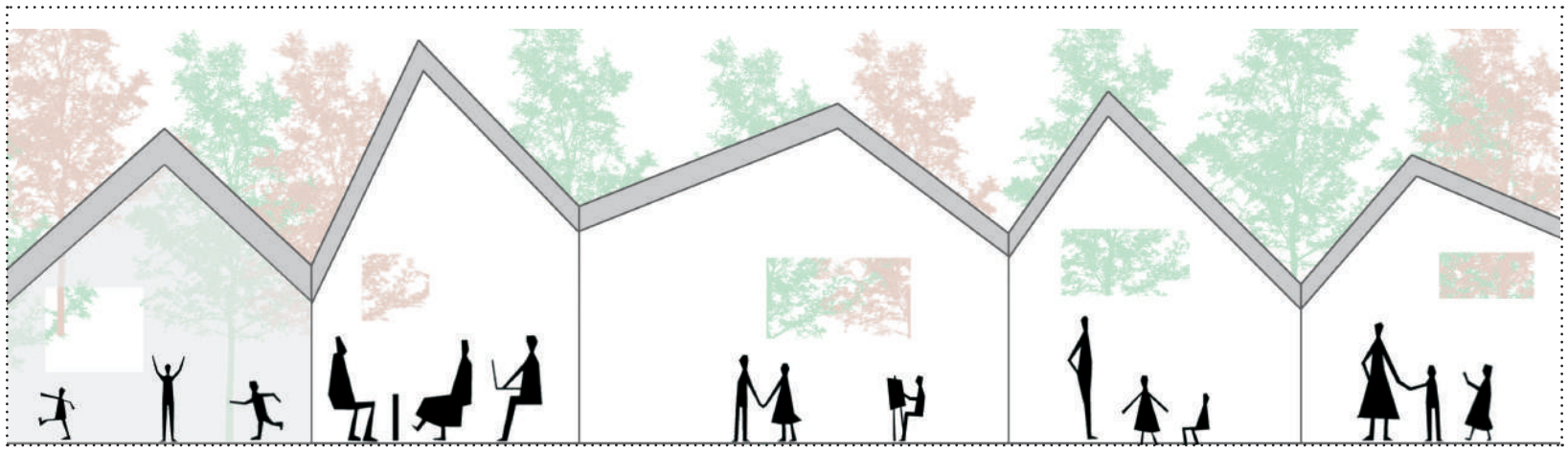


ill.62 Form sketch

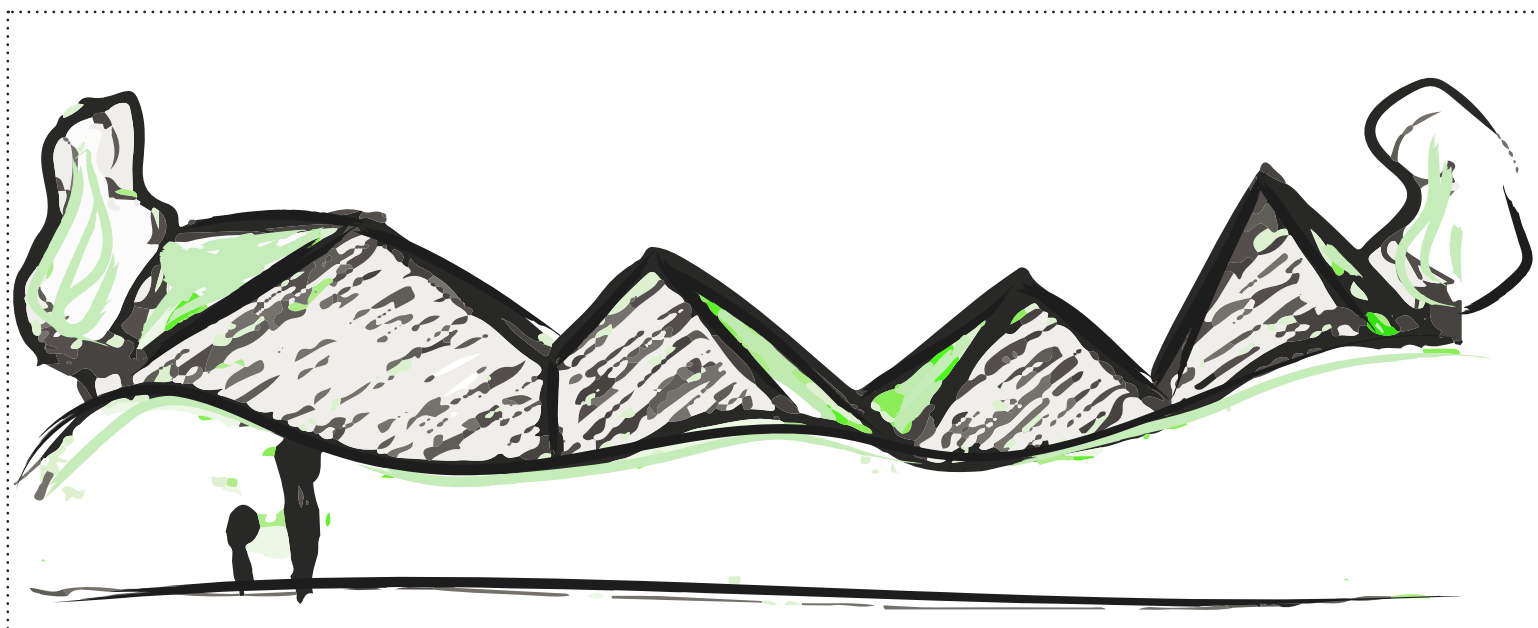


1:500

ill.63 Sketch of building with context



ill.64 Roof sketch

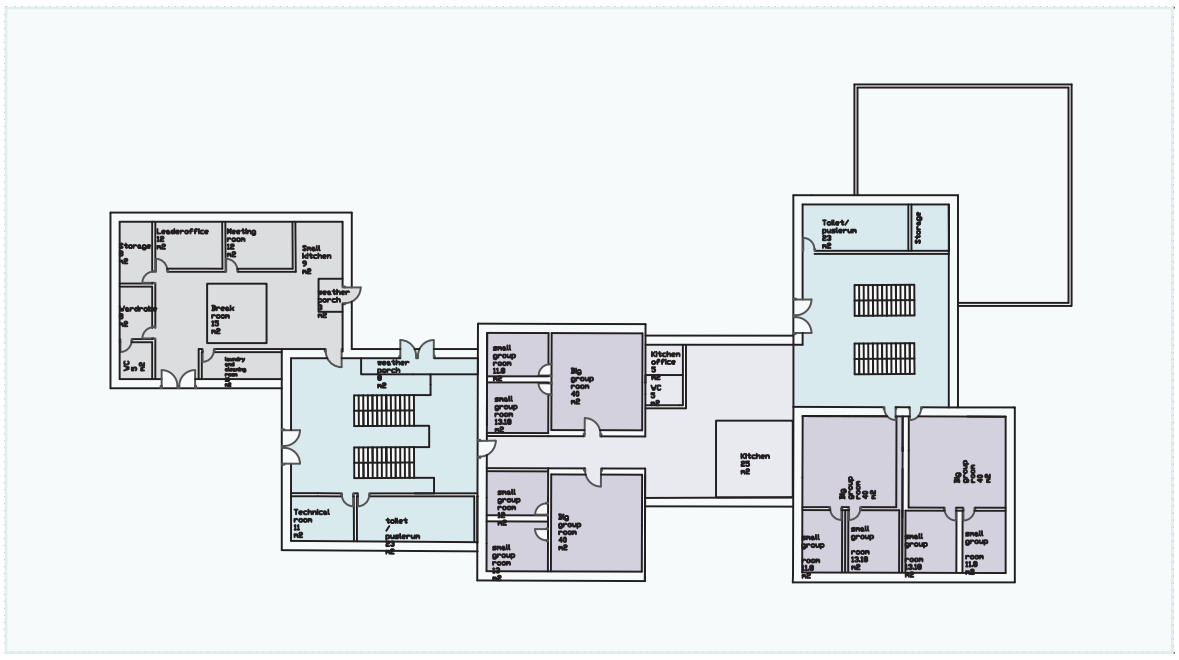


ill.65 Green roof sketch

One way to make the building more dynamic and thereby react to the busy streets surrounding the site, is by making the roofs more dynamic with different surfaces that look in different directions. By doing that the roof will become more integrated in the landscape as well as having some roof surfaces that look straight south so that PV's can be implemented, while other surfaces will have a green roof.

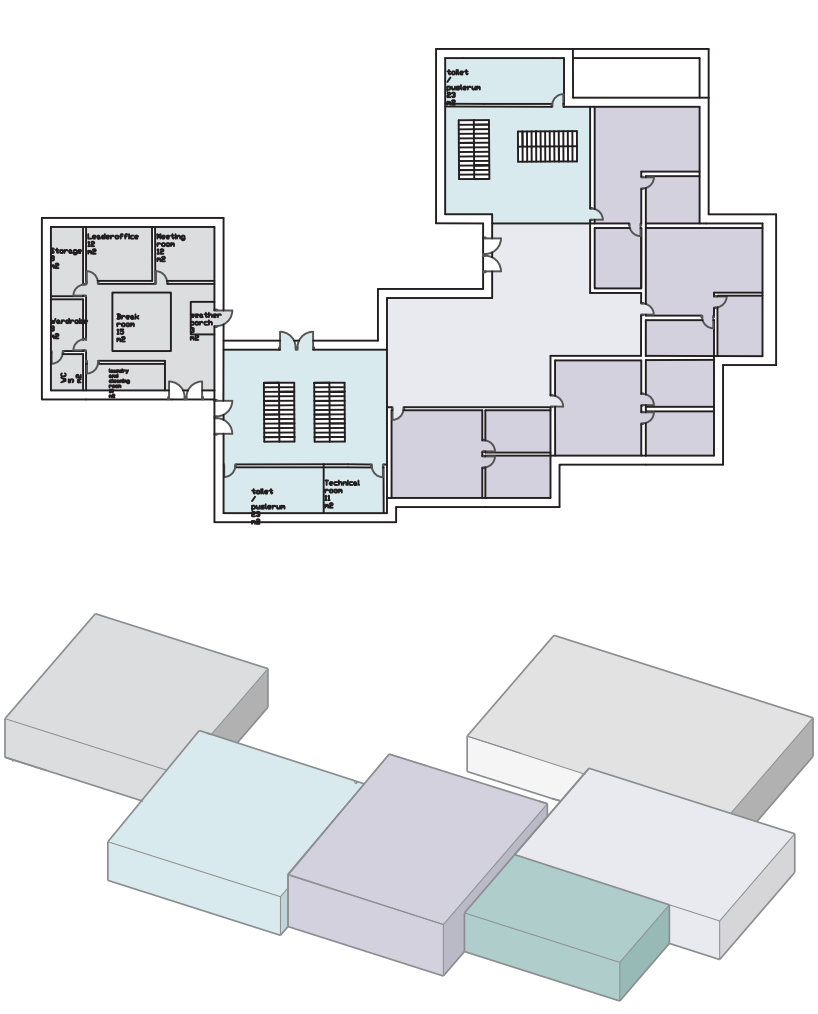
The benefits of having a green roof are numerous. In summer the green roofs have the ability to protect the building against direct solar heat while in winter the green roof can protect the building against heat loss (Team et al., 2018).

A green roof generally purifies the air, reduces the ambient temperature as well as the ambient noise outside and inside. It absorbs the noise, which gives a more quiet environment. It also increases the efficency of Photo Voltaic since they perform less good when the roof is too hot. (Sempergreen.com, 2018)



1:500

ill.66 Plan sketch



ill.67 Plan and form sketch

In order to make the building volume work one must understand how the different rooms functions fit into the volume. First and foremost, the functions of the kindergarten are divided into 6 main volumes: Staff, Group rooms, common area, entrance and winter garden. By putting these functions in different ”boxes” it made it easier to decode where the functions are placed because of it systematic approach. However, this method destroys the flow in the building and makes the design quit strict and static. Therefore, a different arrangement was made, where the functions are placed differently. The group rooms are now placed towards south so passive solar heat can be gained during winter. Moreover, a common area and the entrance are faced towards north and these zones should have contact to nature and Karolinelund. Therefore, the atmosphere of these zones should have a clear transition between outside and inside the group rooms so that kids can feel a smooth connection between nature and built environment.Thereofre the idea is also to have different ceiling height so they know that the building is also a lively place with different atmospheres and different spatialities.

This layout should though still be easy to decode from outside through the different volumes that shift its position. By doing so the volumes will create a lively and dynamic rhythm that respond to the busy traffic surrounding the site.

ill.68 Daniel Valle Architects, Maebong Daycare Center

ill.69 Kraus Schönberg, Kinder-kreisel

ill.70 Architekti.sk, Kindergar-ten over the vineyard

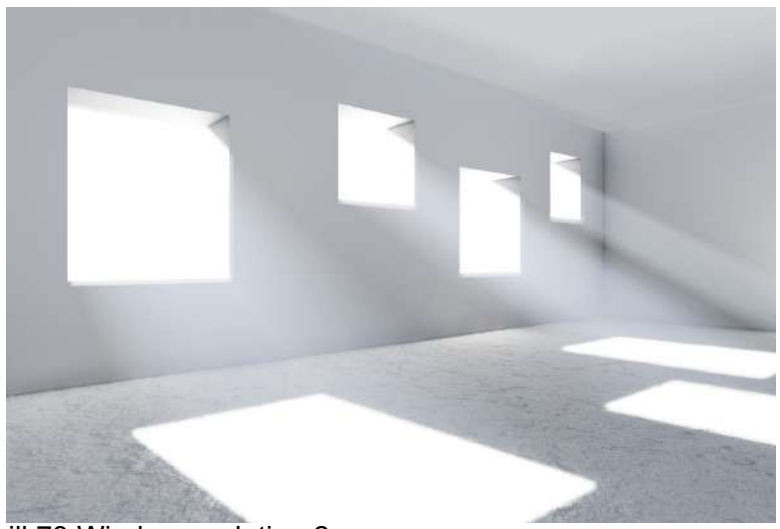
ill.71 Kids Academy Taiyogaoka Hoikuen

WINDOWS AND ATMOSPHERE

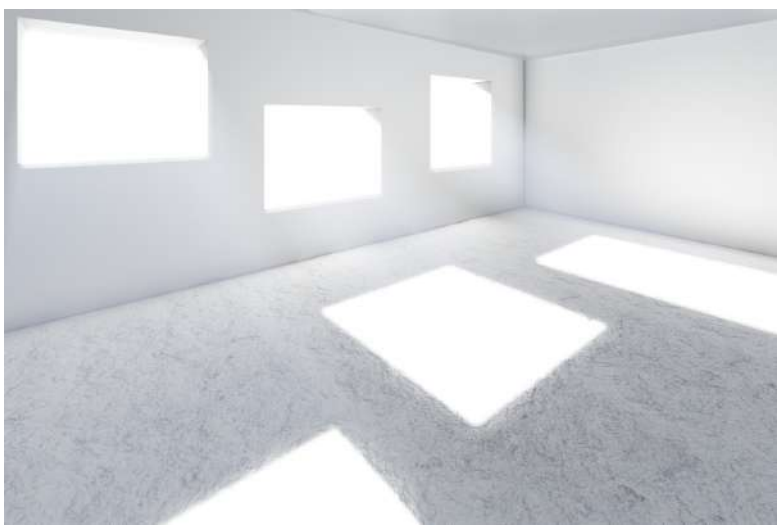
Windows are important design features in architecture. They have the ability to connect the built environment with the outer world, letting in light, though reflect the change that occurs outside, gives character to a room and provides a sense of freedom in the building. Windows allow people to explore the outer world within safe environment and the distance allow people to control how much to see and how much they can be seen. Windows also is a frame of a view and thereby makes it controllable what to see. (Vogler and Jørgensen, 2005). Therefore, when designing this kindergarten, it is important to work with different kinds that both kindergarten teachers and children. It is important to connect kids especially to nature and context for their growth and learning process. They need to know that architecture is not separated from nature but a part of it. This kind of design will make kids understand the connection and thereby they will see the interior and exterior as a continuity of each other.

The op references show how placement of windows are different taken its users into consideration. Those windows, however, create an amazing atmosphere in the room because it looks like thw windows are creating an dynamic and alive architecture that responds to its users. The lights in the room are different and playful and thereby transforms the room into fun and open spaces.

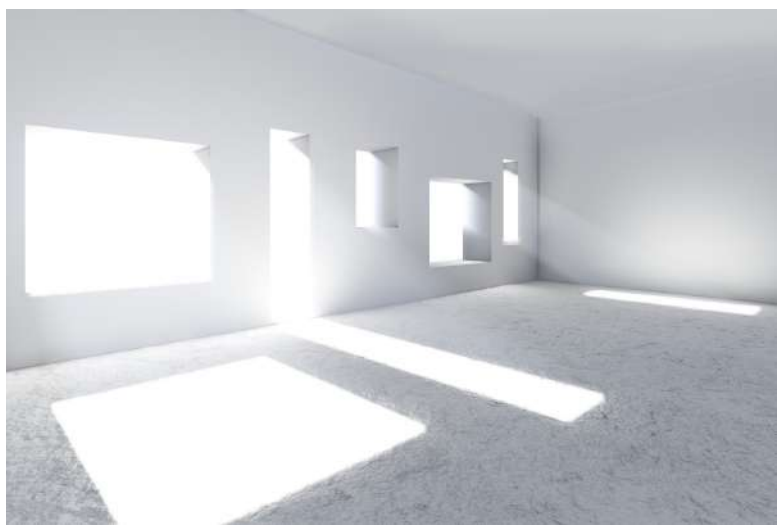
ill.72 Windows solution 1



ill.73 Windows solution 2



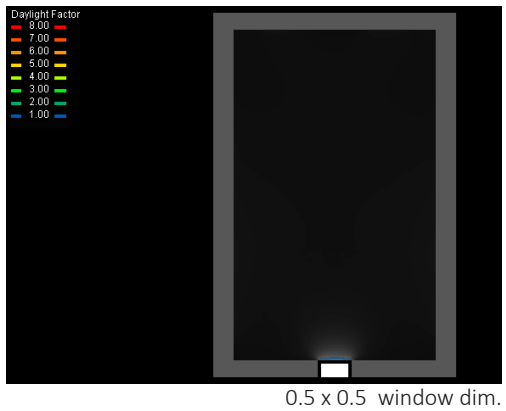
ill.74 Windows solution 3



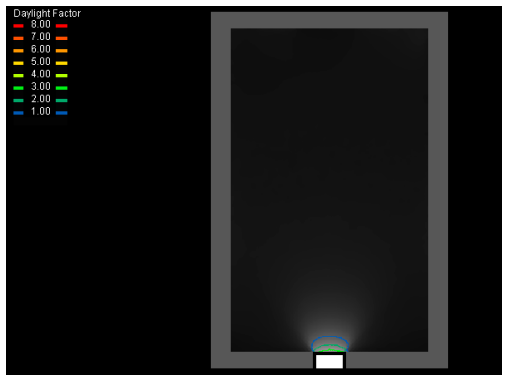
ill.75 Windows solution 4

The focus on this workshop is to work with different window sizes in order to work with light and atmosphere. The aim was to have a connection to outdoor areas, create variety in the atmosphere that the window sizes and placement create and a good indoor environment.
The investigation of windows is made on the basis of giving the functions of the kindergarten rich amount of daylight which provides a healthy wellbeing indoor climate plus playing with light effect in the room to make it playful and enjoyable to be at. Moreover, some of the windows should have a possibility to sit on so that the built environment interact with children.
During the process 4 investigations were made. The first solution [ill.72] shows 4 standard windows that are placed alligned with each other. The room gets a lot of light, however the placement of the windows make the room static and boring to be in. Morever, the windows are not placed in childrens height and therefore they will not have the possibility to look outside and interact with nature and the outside world. The feeling of the room is hospital-like and quit strict.

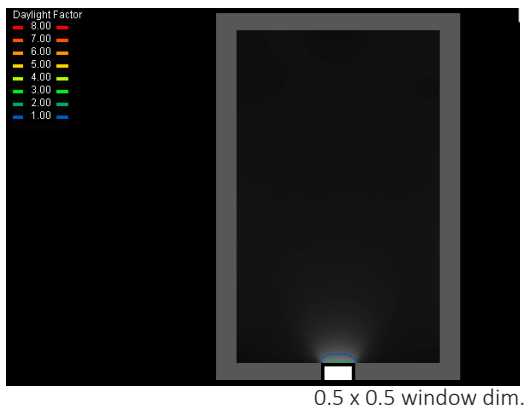
[Ill. 61] has now shifted every second window downwards and thereby creates a more dynamic rhythm in the facade likewise the shape of the concept where the different units shifts according to eachother. This choice makes it integrated with the overall concept, however the windows are still very high compared to children's height.
The fourth solution [ill. 75] shows how different windows with different height gives the room a more lively atmosphere with light penetrating throughout the whole room and gives a clear connection to the outside environment. Children have the possibility to look outside and feel that the nature is integrated with the indoor environment.



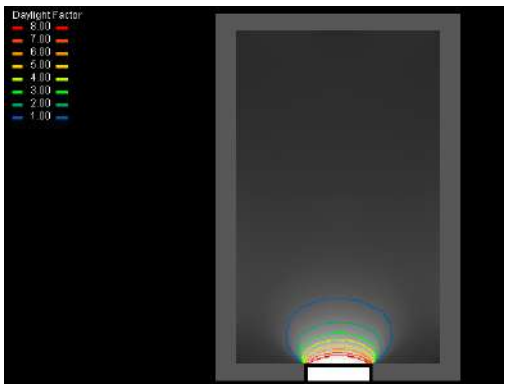
0.5 x 0.5 window dim.
Sill height 0.5 m



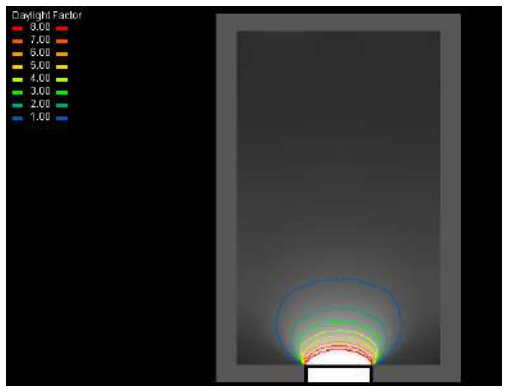
0.5 x 0.5 window dim.
Sill height 0.7 m



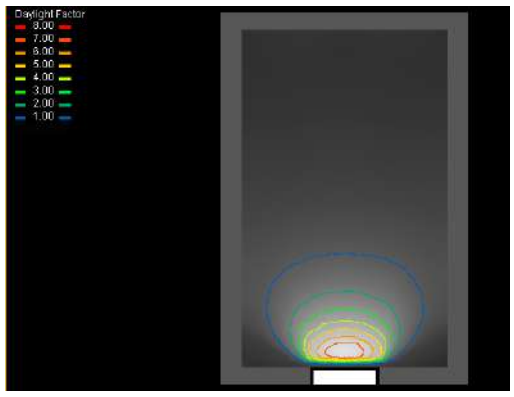
0.5 x 0.5 window dim.
Sill height 1 m



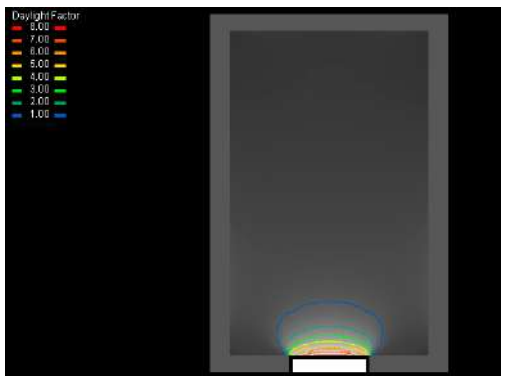
1 x 1 window dim.
Sill height 0.5 m



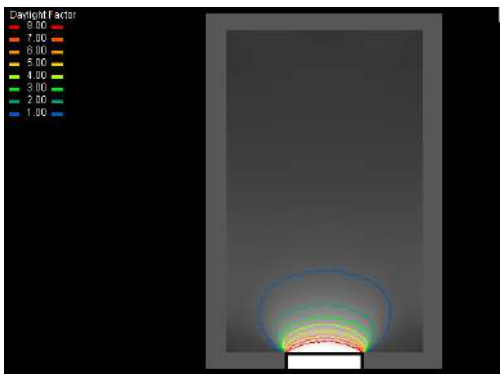
1 x 1 window dim.
Sill height 0.7 m



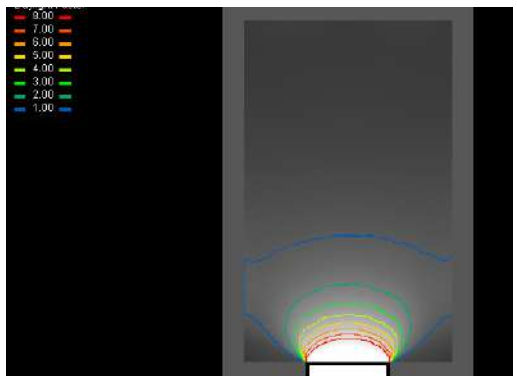
1 x 1 window dim.
Sill height 1 m



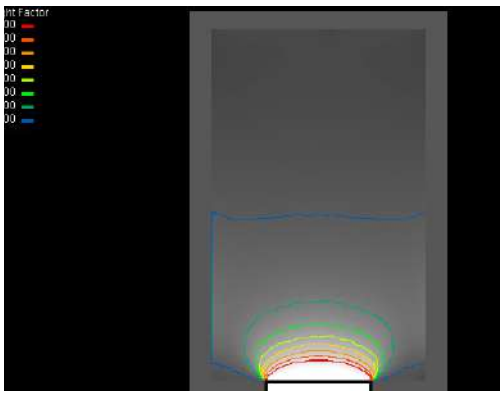
1.2 x 1.2 window dim.
Sill height 0.5w m



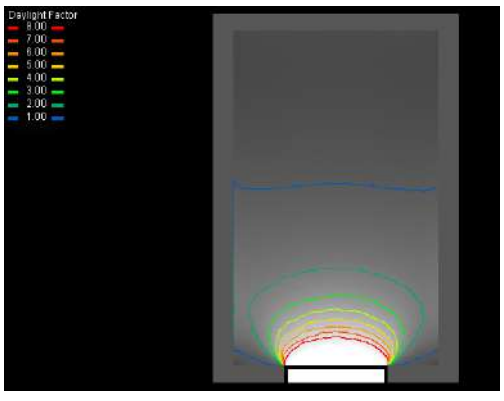
1.2 x 1.2 window dim.
Sill height 0.7 m



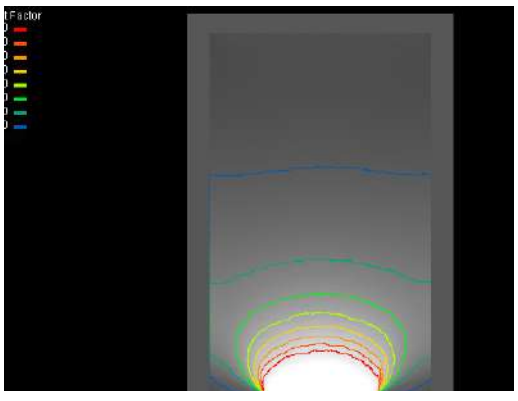
1.2 x 1.2 window dim.
Sill height 1 m



1.5 x 1.5 window dim.
Sill height 0.5w m



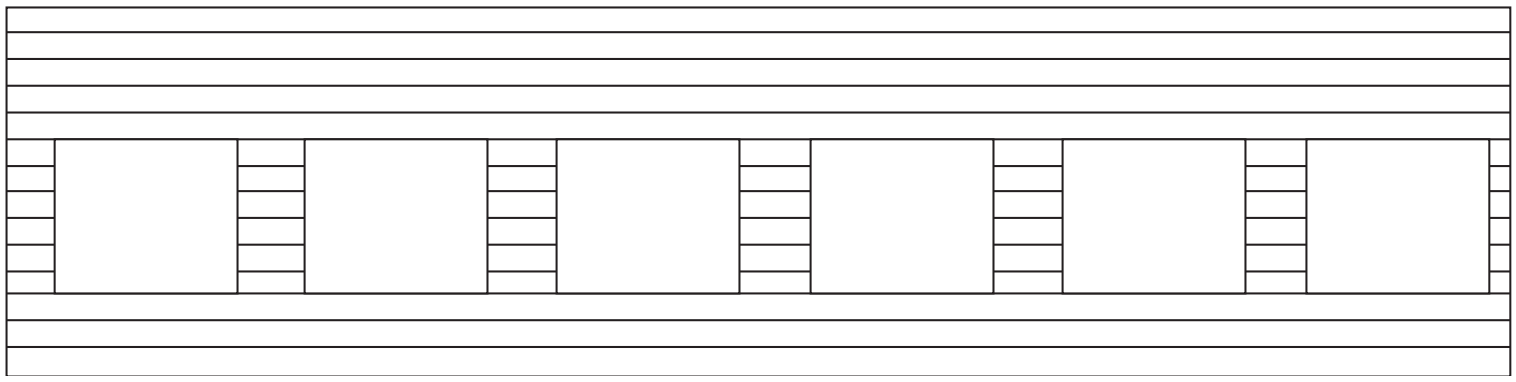
1.5 x 1.5 window dim.
Sill height 0.7 m



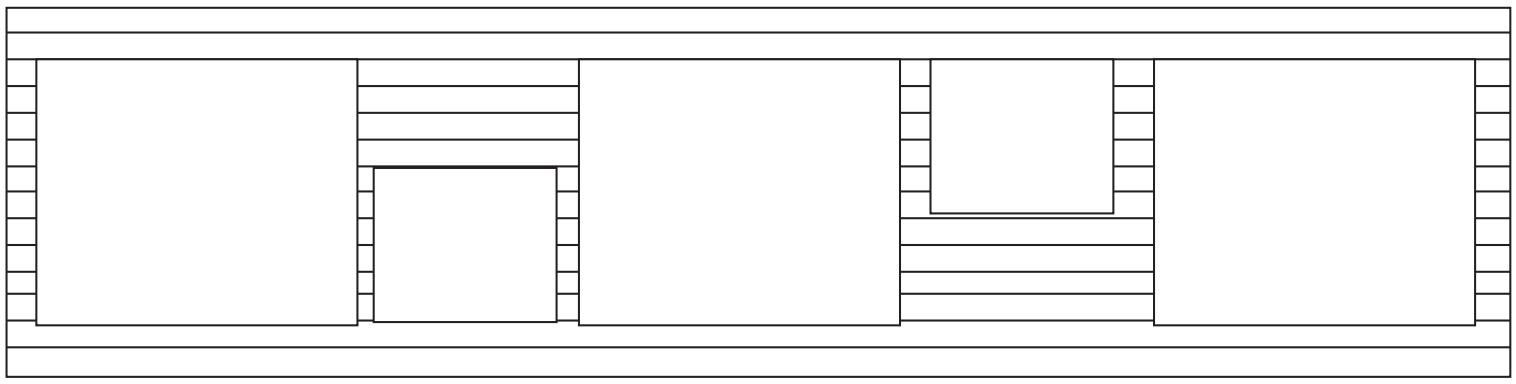
1.5 x 1.5 window dim.
Sill height 1 m

DAYLIGHT & FACADE

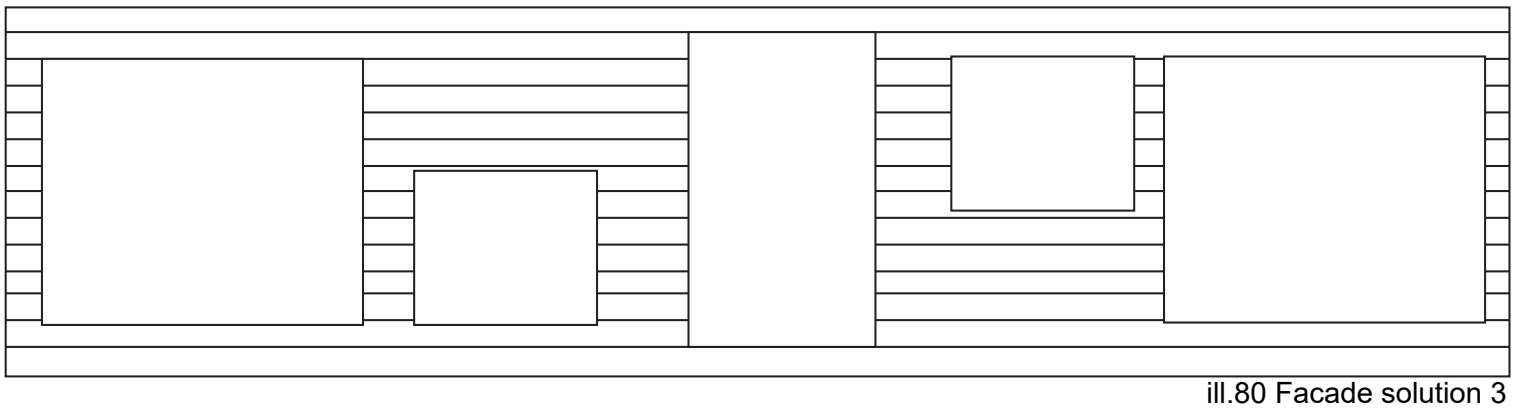
This study was made in addition to the previous study (windows and atomosphere) where several windows types were investigated in relation of daylight factor. Four sizes of windows were examined. The main goal was to test which size of window and which height above the floor will be sufficient enough to bring the daylight deeply in the room. The window dimensions ranges from 0.5 to 1.5 meters square windows. The study gave possibilities to compare different layouts regarding the daylight. This study have been an active design tool as the shaping of the facades will include some of these window types. Low placed windows in combination with high placed windows is needed in a kindergarten to enable the visual contact both for children and adults. For children will the required preferable height be 0.8 to 1.3 meters while 1.6 to 1.9 meters for adults. This study gave also in idea of which type of windows brings the deepest light into the room, which is both 1.2 x 1.2 and 1.5 x 1.5 meter which is i this case sufficient to reach the minimum regulation of 2% daylight factor.



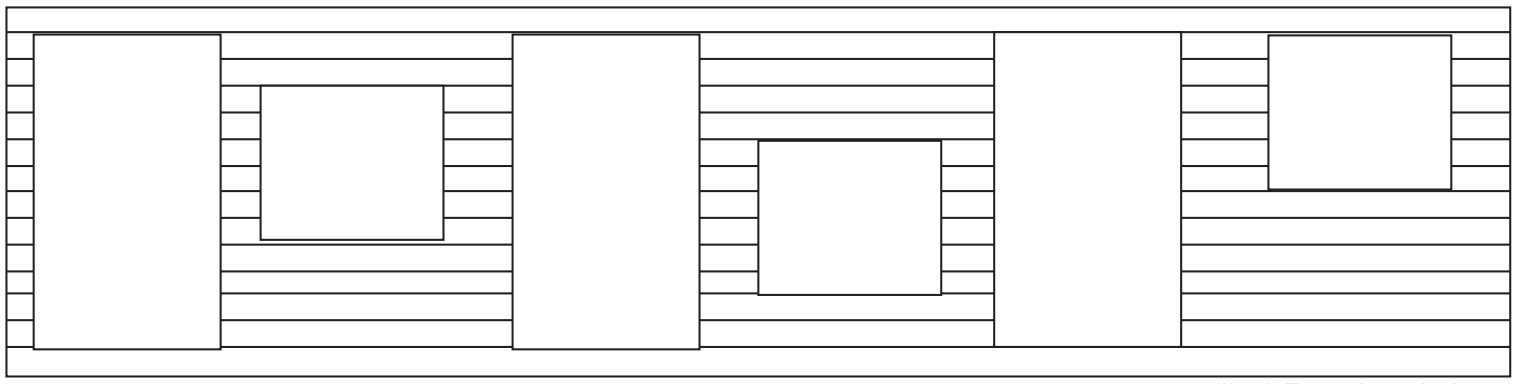
ill.78 Facade solution 1



ill.79 Facade solution 2

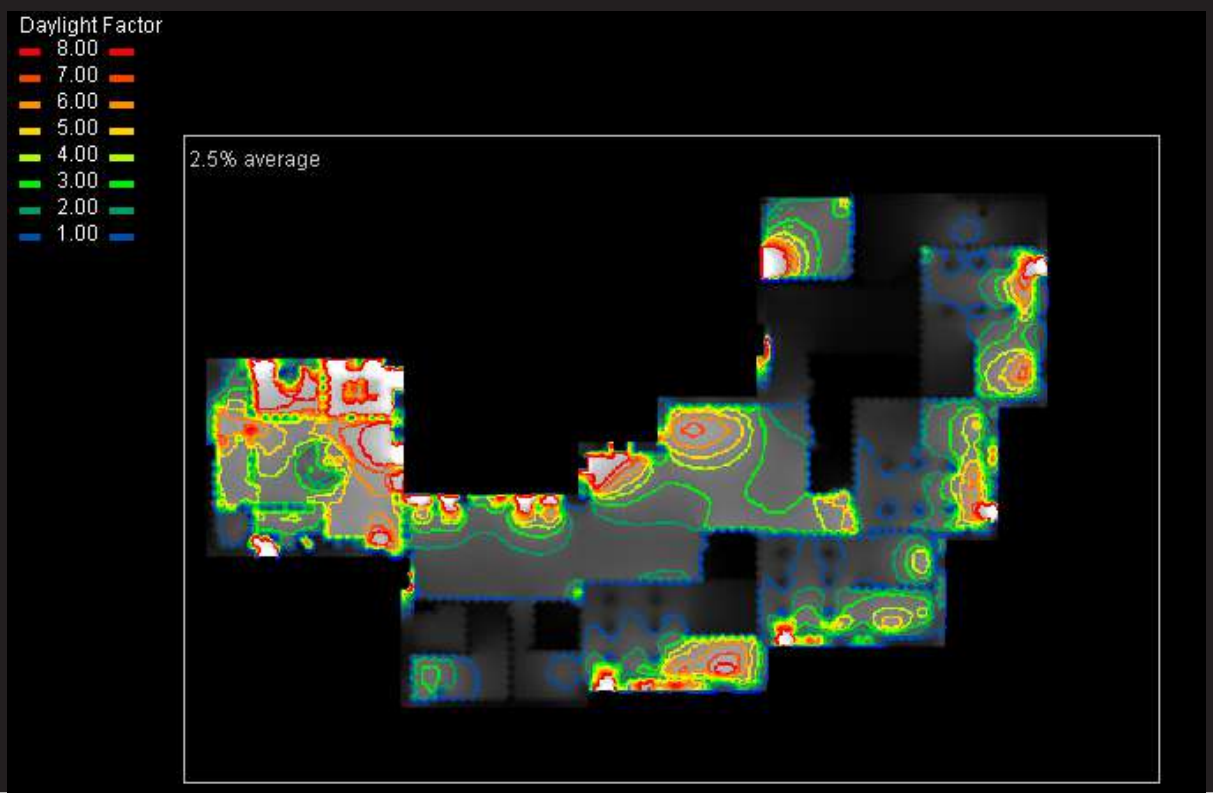


ill.80 Facade solution 3

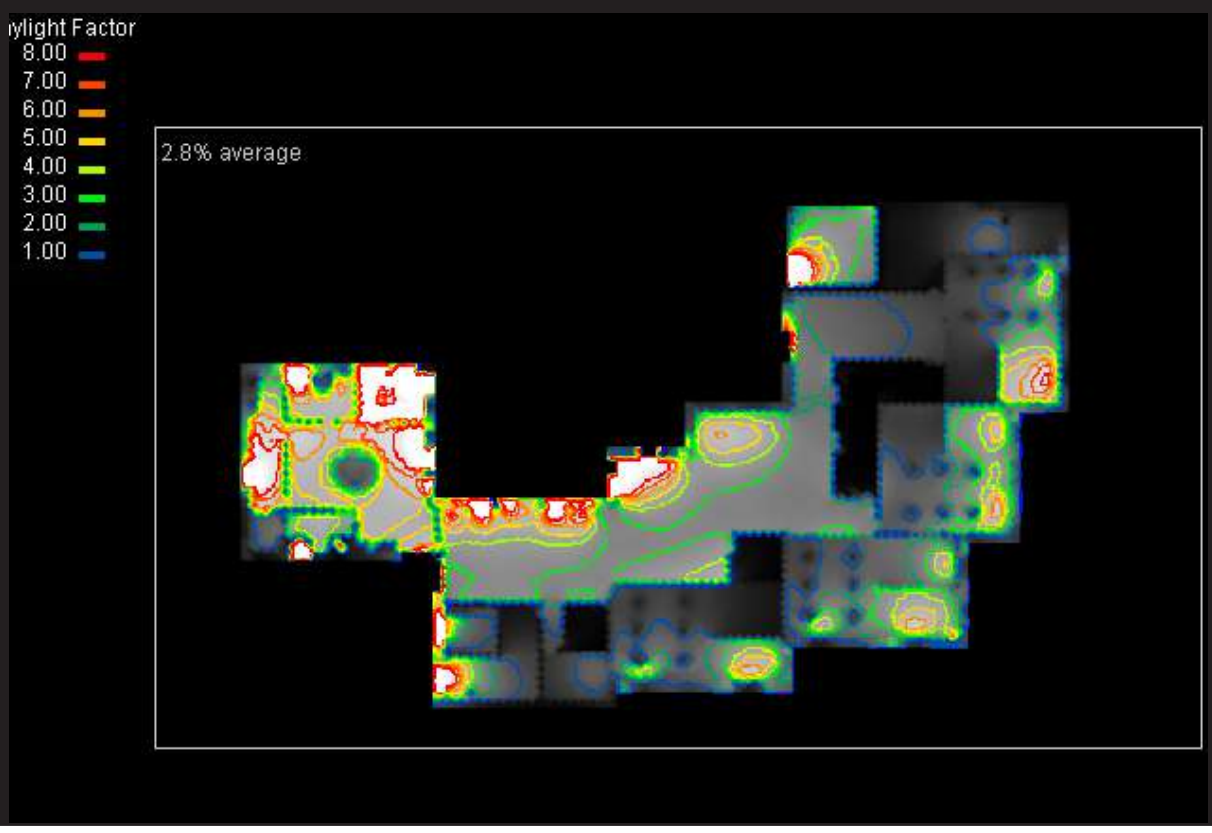


ill.81 Facade solution 4

The process of facade development and windows placement was made based on the previous study. The first iteration [ill. 71] was made with one type of windows through the whole building. In this case it was chosen the 1.2 x 1.2 m windows. This initial iteration was made to test the daylight in general through the building [see page 68. ill. 82]. However this iteration did not add the aesthetical and functional values that were intended to be implemented in the building. The next three iterations [ill. 79-81] worked with different type of windows which consisted of big and small windows and lastely the vertical and smaller windows. The reason behind choosing two types of windows [ill. 81] is that the vertical windows can be used by the children and the adults and at the same time can be used as a door to the outdoor areas from children's group rooms. The smaller and higher placed windows is chosed to bring the daylight deep into the room. The vertical windows/doors will be placed with ground level meanwhile other of them will be placed at 22 cm above the ground and higher windows at 1.8 meter and these differ in the placement creates a dynamic facade, as the windows will follow the shape direction of the roof.



ill.82 Daylight Analysis 1



ill.83 Daylight Analysis 2

Daylight analysis was tested through the whole building to examine the critical rooms that does or does not get the beneficial daylight factor. The four analysis above presents each the windows placements on the facade process from the previous page. Daylight analysis 1, 2 and 3 reached good results in the the primary rooms such as grouprooms and the staff area. However some problems were detected in the smaller playrooms and the commonspaces where daylight factor reached only 2% at maximum which is the minimum daylight factor and the goal was to reach 3% for good daylight quality. They also have an average daylight factor ranging from 2.5% to 2.9% for the whole building. However some adjustments were done to the design to improve the daylight factor which consisted of implementing skylight in the common area and in the smaller playrooms which improved the daylight intake through the whole building. However it was also detected that daylight analysis 4 [ill. 85] can have issues of having direct light intake which can be solved by manual shading to adjust the visual comfort.

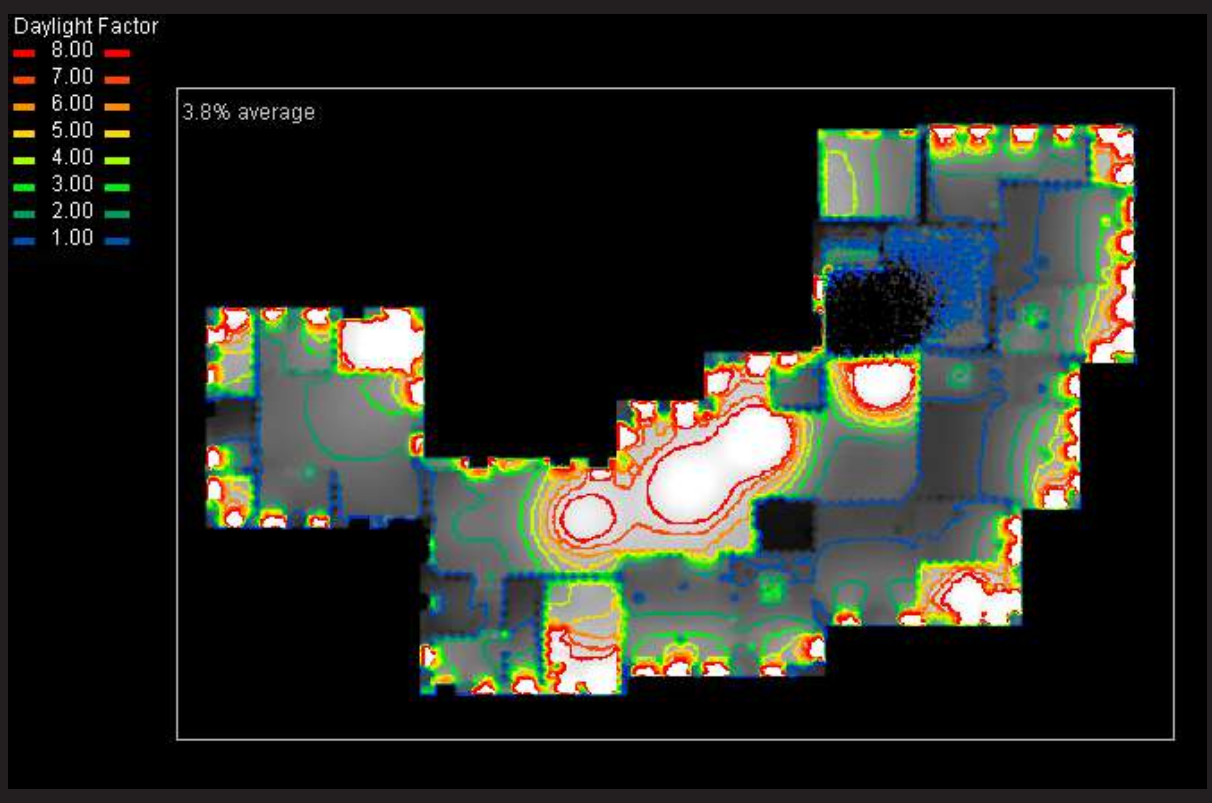
Daylight Analysis 1: Window ratio- 13.5 % in comaprison to floor area.

Daylight Analysis 2: Window ratio- 14.3 % in comaprison to floor area.

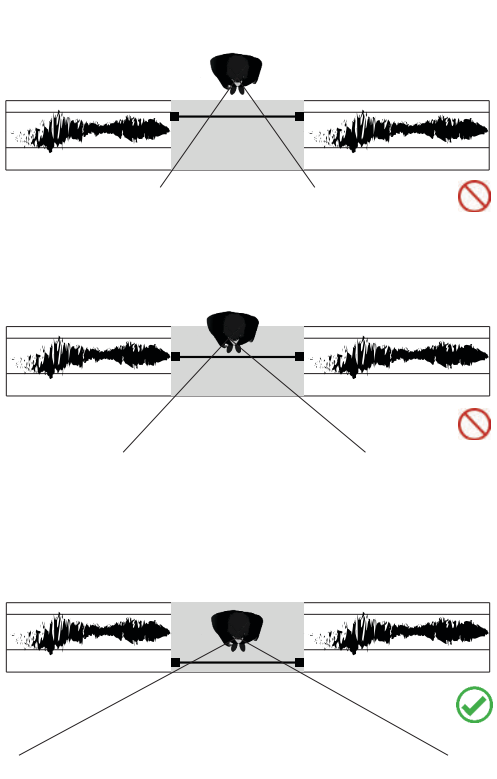
Daylight Analysis 3: Window ratio- 14.7 % in comaprison to floor area.

Daylight Analysis 4: Window ratio- 19.7 % in comaprison to floor area.

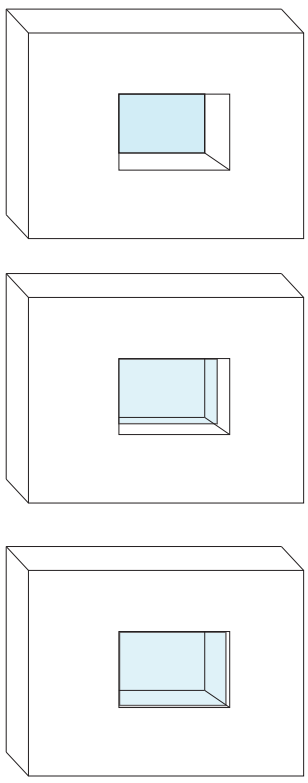
ill.84 Daylight Analysis 3



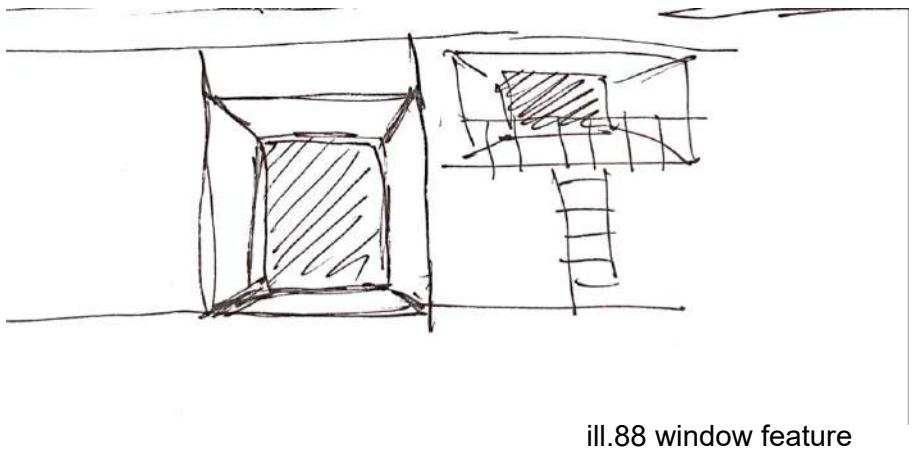
ill.85 Daylight Analysis 3



ill.86 windows placements



ill.87 Window sill as niches



ill.88 window feature

WINDOWS DETAILING

Windows detailing have been considered in sense of functionality. The first approach is the placement of the window in the facade. This is done to utilize the functionality of the window sill. In [ill. 52] three scenarious are made where window is placed in the interior, center and exterior facade. This study lead to implement the third consideration of placing windows on the exterior side of the facade. The reason for this particular solution is based upon the functional benefits for children and the adults. It benefits the children as the window sill becomes furniture [ill. 87].

Another technical benefit of this solution is the possibility for utilizing the passive solar heating by the solar radiation which can lead to decrease the energy consumption which also will be tested within the indoor climate to avoid overheating.

The third reason of selecting this solution is the opportunity it creates for wide visual connection to the outside which is preferable both for adults and children and connects with the nature and surroundings. Another window consideration beside the low placed windows, is the higher placed windows where children should be able to use their bodies and furniture to get up on.

Key numbers, kWh/m² year

Renovation class 2

Without supplement	Supplement for special conditions	Total energy frame
139,2	0,0	139,2
Total energy requirement		36,6

Renovation class 1

Without supplement	Supplement for special conditions	Total energy frame
73,5	0,0	73,5
Total energy requirement		36,6

Energy frame BR 2015

Without supplement	Supplement for special conditions	Total energy frame
42,3	0,0	42,3
Total energy requirement		31,8

Energy frame Buildings 2020

Without supplement	Supplement for special conditions	Total energy frame
25,0	0,0	25,0
Total energy requirement		23,5

Contribution to energy requirement

Heat	23,9
El. for operation of bulding	5,1
Excessive in rooms	0,0

Net requirement

Room heating	18,1
Domestic hot water	5,2
Cooling	0,0

Selected electricity requirements

Lighting	4,6
Heating of rooms	0,0
Heating of DHW	0,0
Heat pump	0,0
Ventilators	0,4
Pumps	0,0
Cooling	0,0
Total el. consumption	13,3

Heat loss from installations

Room heating	0,5
Domestic hot water	0,0

Output from special sources

Solar heat	0,0
Heat pump	0,0
Solar cells	0,0
Wind mills	0,0

U-value roof: 0.08 W/ m2k [Isover, 2018]

U-value windows: 0.6 W/m2k [Isover, 2018]

U-value floor: 0.08 W/ m2k [Isover, 2018]

U-value wall: 0.12 W/ m2k [Rockwool, 2016]

U-value doors: 0.77 W/m2k [Safco Doors, 2016]

ill.89 Energy frame

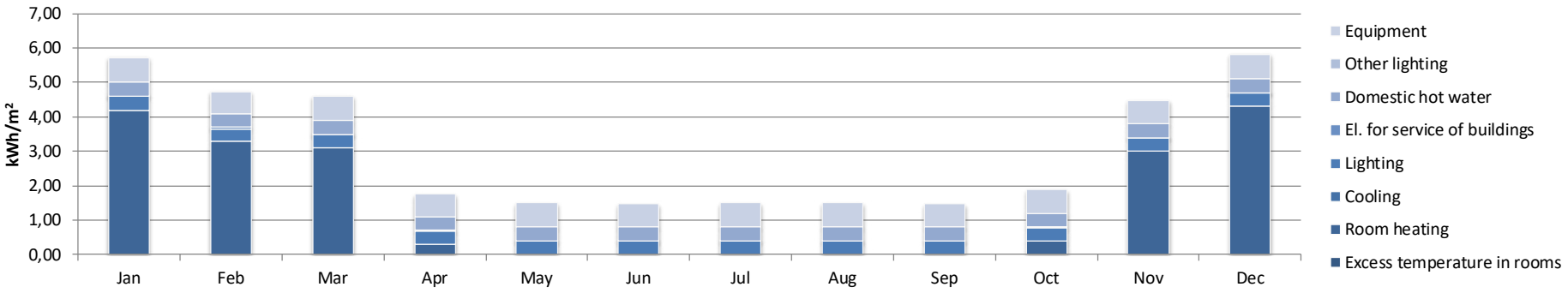
ENERGY CALCULATIONS

Energy frame 2020

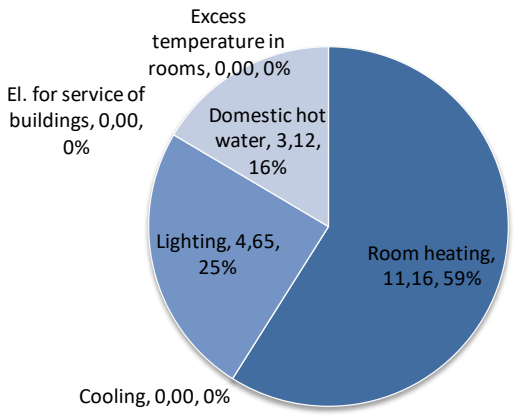
In sense of achieving energy friendly building, the energy frame for building regulations 2020 must be met. The software BE18 has been used to test the buildings efficiency abilities in terms of the energy consumption and production. In the early stages of the process the design intended to implement active strategies such as solar cells to achieve zero energy building, however this parameter was removed later because of the shape of the roof didn't have the necessary inclination to place the solar cells on. Thereby the goal was to achieve a 2020 building which by iterative process became efficient and met the 2020 building regulations. Educational institutions and offices can be considered as building class 2020 when supplied energy for heating, cooling, ventilation, domestic hot water and lighting does not exceed 25 kWh/m2 per year.

Elements that have been essential to secure a energy-optimized building are the building orientation, envelope and windows with low transmission loss as these have huge impact on heat loss and heat gain. The glass area in comparison with floor area is essential in sense of securing the necessary daylight but also to avoid passive overheating and heat loss. Be18 calculates with primary factors that is multiplied to the energy consumption. For electricity the energy factor is 1.8 and 0.6 for district heating meaning energy factor for electricity is an expensive energy form. Offices and institutions has to include lighting which then contributes to the high primary energy factor for electricity [see page 72 ill. 91].

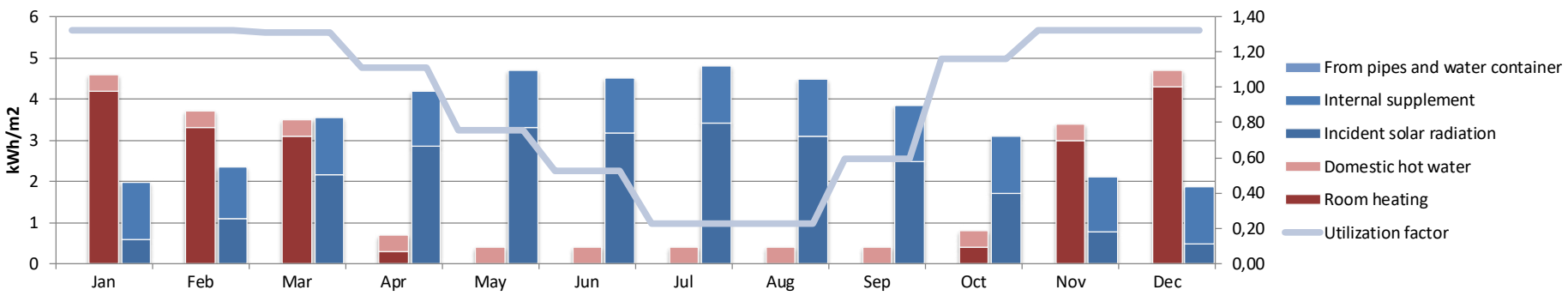
For ventilation it is chosen to be a hybrid ventilation as this solution will minimize the electricity use during summer and only apply the mechanical ventilation in winter period which can utilize heat recovery and enable a low heat loss and low electricity consumption.



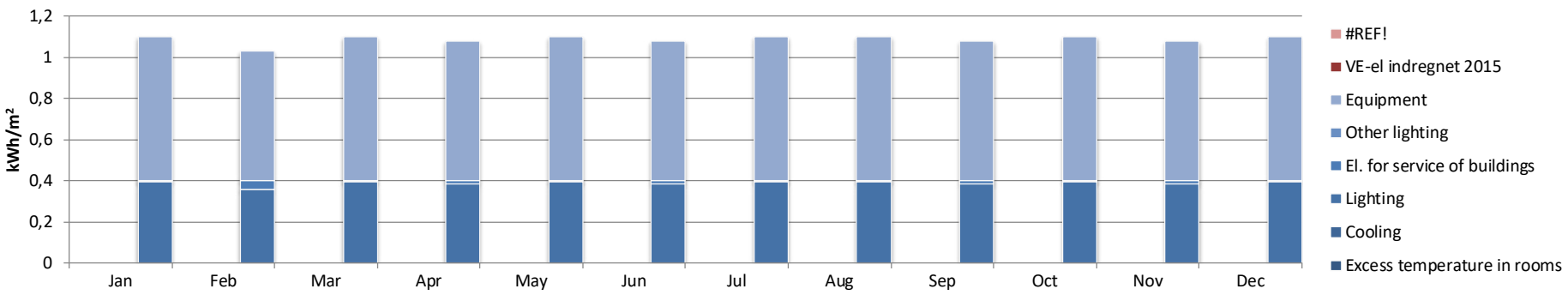
ill.90 Energy consumption



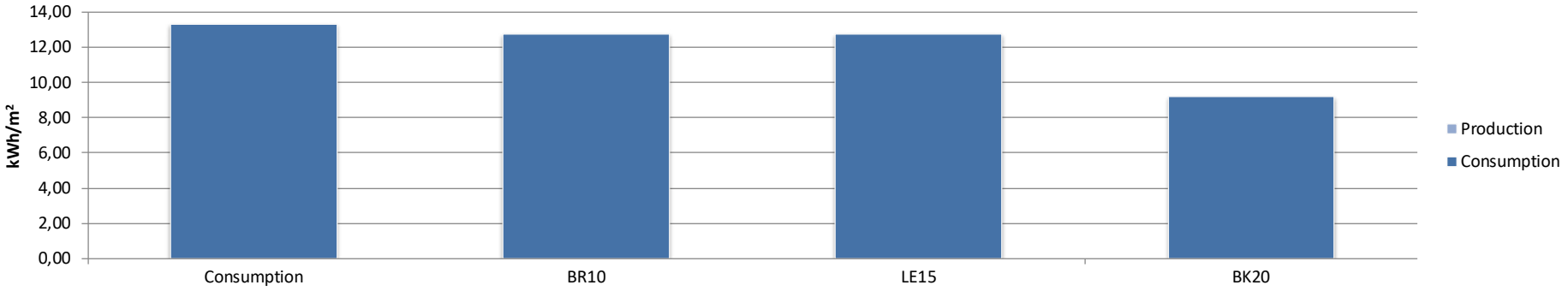
ill.91 Energy distribution



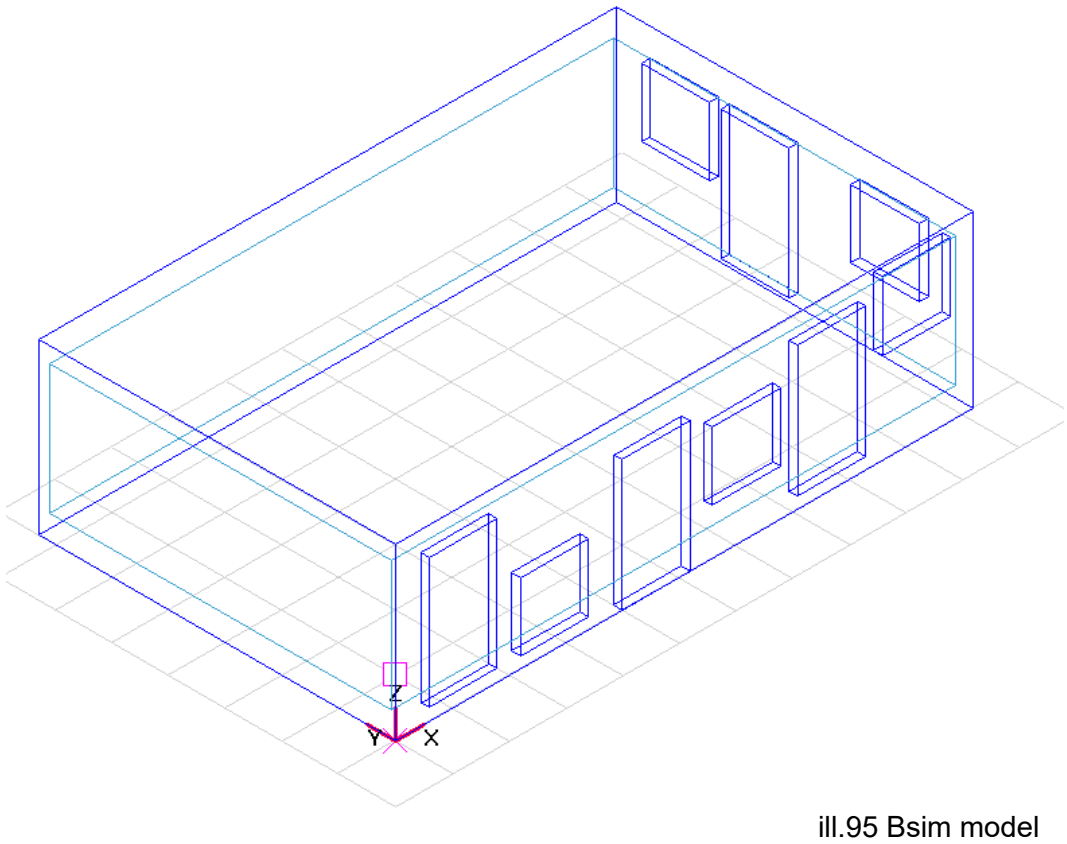
ill.92 Heating demand vs. Heat supply



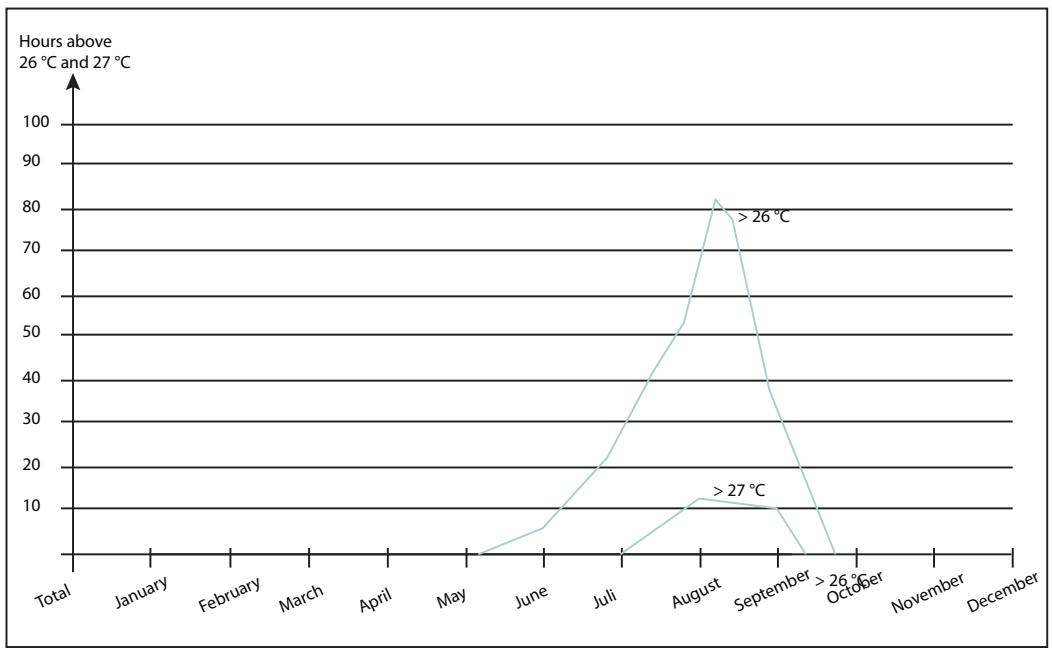
ill.93 El production vs el consumption



ill.94 Energy Frame: Energy consumption



ill.95 Bsim model



ill.96 Hours above 26 °C & 27 °C

BSim Input

People Load: 25

People Load Schedule
Monday- Friday: 8 Am To 17 Pm

Evening, nights
weekends and holidays- Not in Use

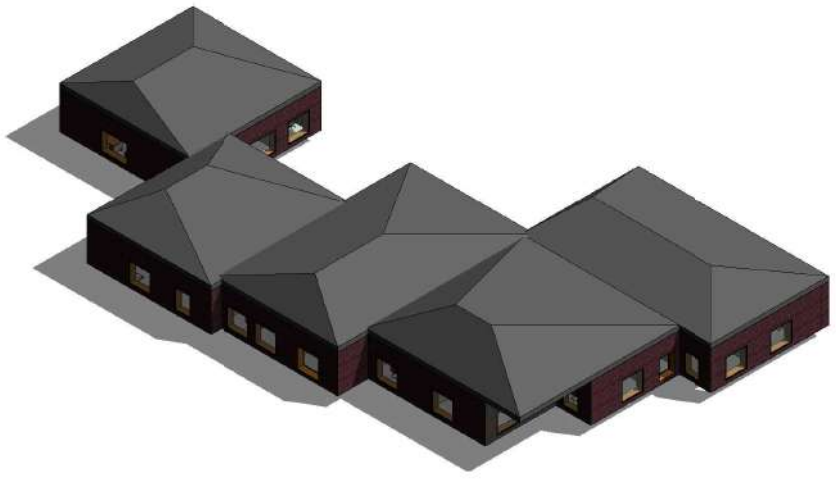
Ventilation: Applied
Lighting: Applied
Equipment: Applied
Venting: Applied
Heating: Applied
Infiltration: Applied

INDOOR CLIMATE

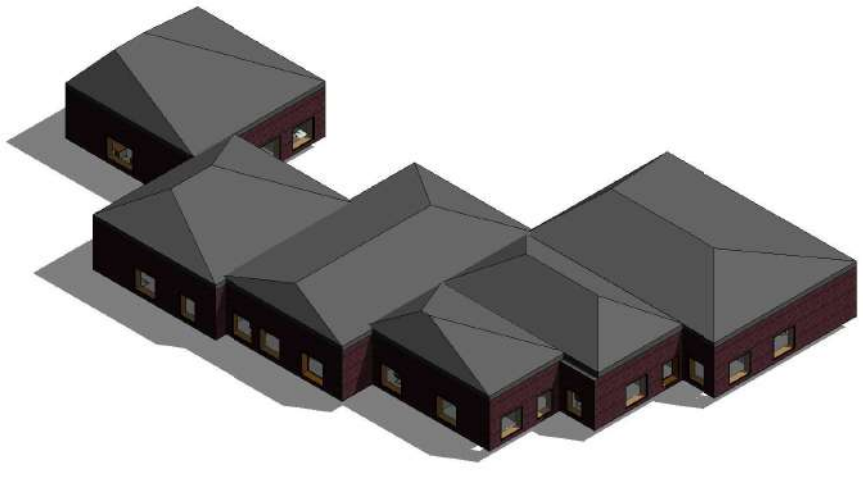
When the placement of the rooms and the plan were found, the indoor comfort was analyzed through a building simulation software (BSim). An estimate was made regarding the most critical room which is the group room placed southeast of the building. This room was selected as being a worst case scenario with full people load duing the using hours. The data used to model the room in Bsim is the same data used for ventilation data and for energy calculations with the same equipment, ventilation needs and people load. Only to fulfill the building regulations regarding thermal comfort it is essential to understand that over a period of a year there are a certain amount of hours above 26 and 27 degrees that should be determined. In this project the number of hours is decided to be the regular 100 hours above 26 degrees and 25 hours above 27 degrees [Bygningsreglement 6, 2018]. The output data shows that the temperature exceeds 26 °C with 81 hours and above 27 °C with 11 hours. The temperature can only become too high if the room is exposed to extreme solar radiation or high internal loads.

Atmospheric comfort has also been analyzed in Bsim which is very important for the users of kindergarten especially the children in sense of their health and learning abilities. Air quality is determined by simulations for CO2 pollution level. The regulations for CO2 concentration has to be less than 900 ppm. As for thermal comfort are also to be considered as the operative temperature has to be minimum 17,5 °C in the winter period and maximum 26 °C in the summer period [DS/EN – 15251, 2007]. Activity level play a role (1.4 met) and amount of clothing people are wearing (1 clo for winter period and 0,5 for summer period.

The necessary air change rate has been calculated according to OLF [see appendix 1] and CO2 Levels [see appendix 2].

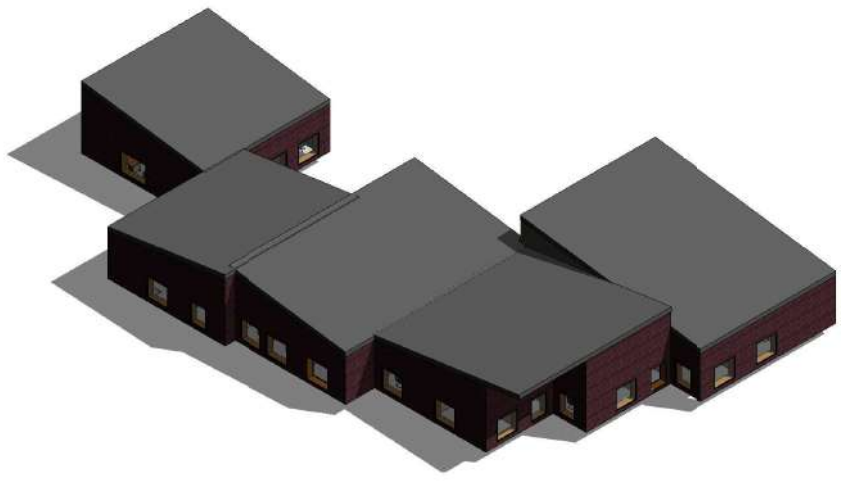


ill.97 Roof sketch 1



ill.98 Roof sketch 1

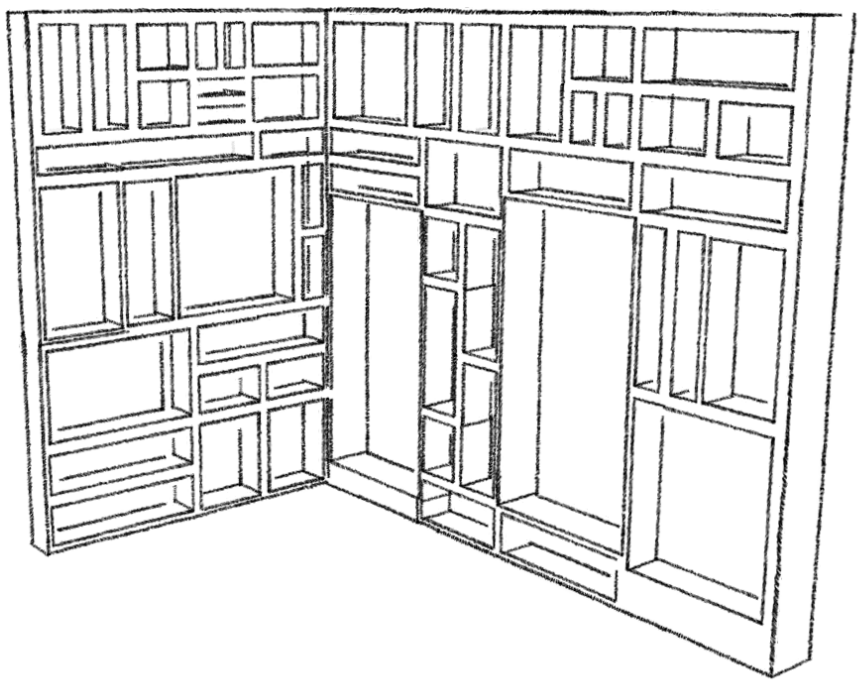
ill.99 Roof sketch 3



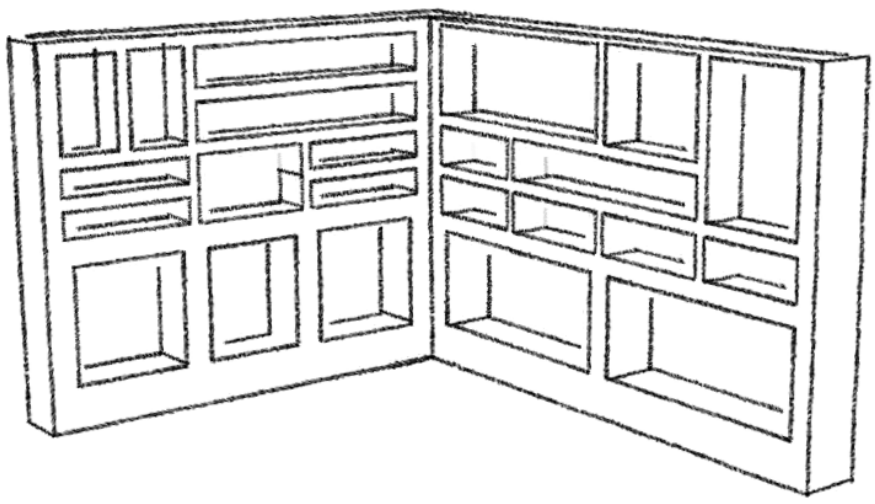
ill.100 Roof sketch 4

ROOF SHAPE

The roof of the building was tried out in order to have an understanding of the visuel effect as well as how it can fit to the overall concept and therefore different tries were made. The first try was a normal pyramid hip roof that were put on the different volumes, However the roof gave the building an uninteresting feature and the volumes were perceived static and gave it a feeling of a small houses and not a fun place where kids go to. The second roof illustrations shows the same concept but the volume towards east has two roofs to give it a better feeling of a small village for kids.
Third illustrations experiments with different kinds of roofs and different angles where the highest angle is 48^{o}, however this gives the whole building volumes visuel noise and it makes the area looks messy and unattractive sice the volumes are two big and the highest point of the volume will be above 8 meters. This led to a simpler design where only the shed roof is introduced. The angle of the roof is 8^{o} and this design still gives the volumes its own unit but the work hamonies with each other and it creates a unity in the design. It also gives the building a flow that seems like a part of the landscape and since the idea was to have a green roof this will fit perfectly.



ill.101 Niche sketch
1



ill.102 Niche sketch
1

NICHES

As a part of the design of the plan layout, niches are introduced as a design feature to make the furniture placement a fun part of the interior design.
In these niches different strategies are taking into considerations in order to make it fun and enjoyable to use. Therefore two designs of the niches were implemented where a big shelving units were customized to fill in the wall in the common space where it took into consideration the opening of the windows, which then were transformed so that kids can sit in the shelf and look out onto nature. T
Shelf number two is placed towards two group rooms and made window opening where kids outside the group room could sit in the niche and look at the kids inside the rooms. This feature makes it easy and fun for kids to interact with each other. Moreover, it makes group rooms open and transparent, which gives the building an airy and light atmosphere. These shelving units also have different shelves vertically to allow the pedagogues to place books, toys, plants and other equpiment vertically and create fun walls.

ill.103

ill.104

ill.105

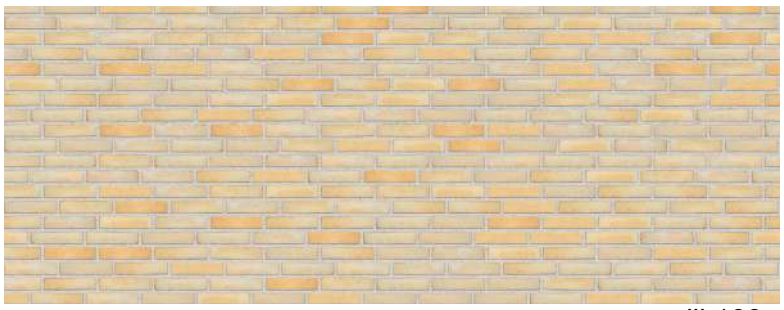
MATERIALS

Since the idea of the kindergarten is to make a distinguished character of the different volumes, an method could be doing that through the choice of materials in order to make it easier for children, their parents and the public in general to decode the different units from outside. This idea was also to make the building fun for the public and it reminds of the that connection to Tivoli that consisted of many colors and visual experiences. However, the choice of materials should not be foreign to the site but rather interact with it. Therefore, different considerations were made. Another point is that the material should also be sustainable and environmental friendly.

The first considerations were brick because this material have the quality of connecting the kindergarten to the surrounding context. Brick is a well-known in the area and thereby it connects to the home and the place where people fell safety and welcome. This could have different shades.

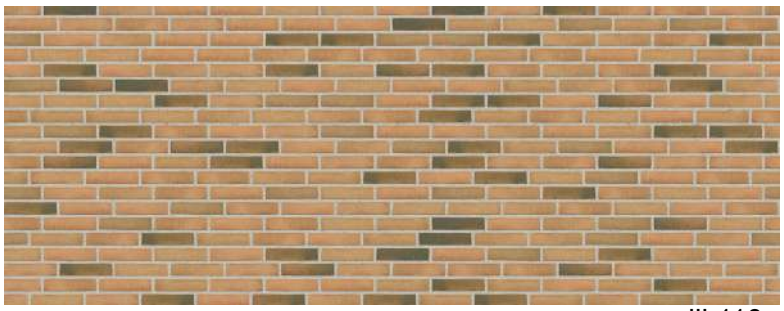
Wood is a second option because it could make a great connection to nature and Karolinelund. It is a light material and it is sustainable, however since the concept takes departure in the exscisting typology, then the material should have a connection to the concept. A smart way to do it is using the excisting material in the area in a new and innovative way, which could be through the material screen tiles. This material are relatively new in the market and many architects are starting to use them in their design because of its unique character that it provides buildings. Even though from it looks like the regular brick , it also has the ability to stand out through its longs and thin sttructure.
It has the ability to make a building look light and slim and gives an elegant character. These factor appealed therefore for the use of the material.

ill.106



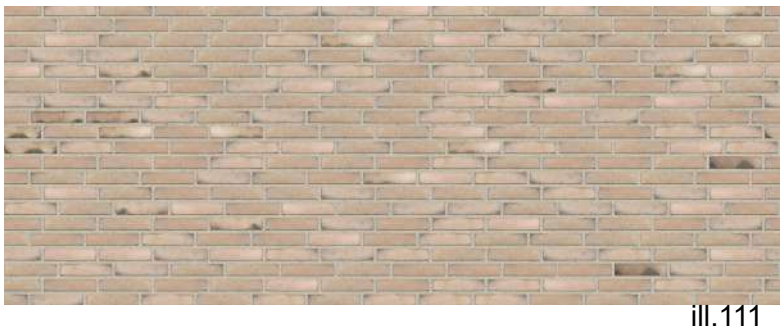
ill.109

ill.107



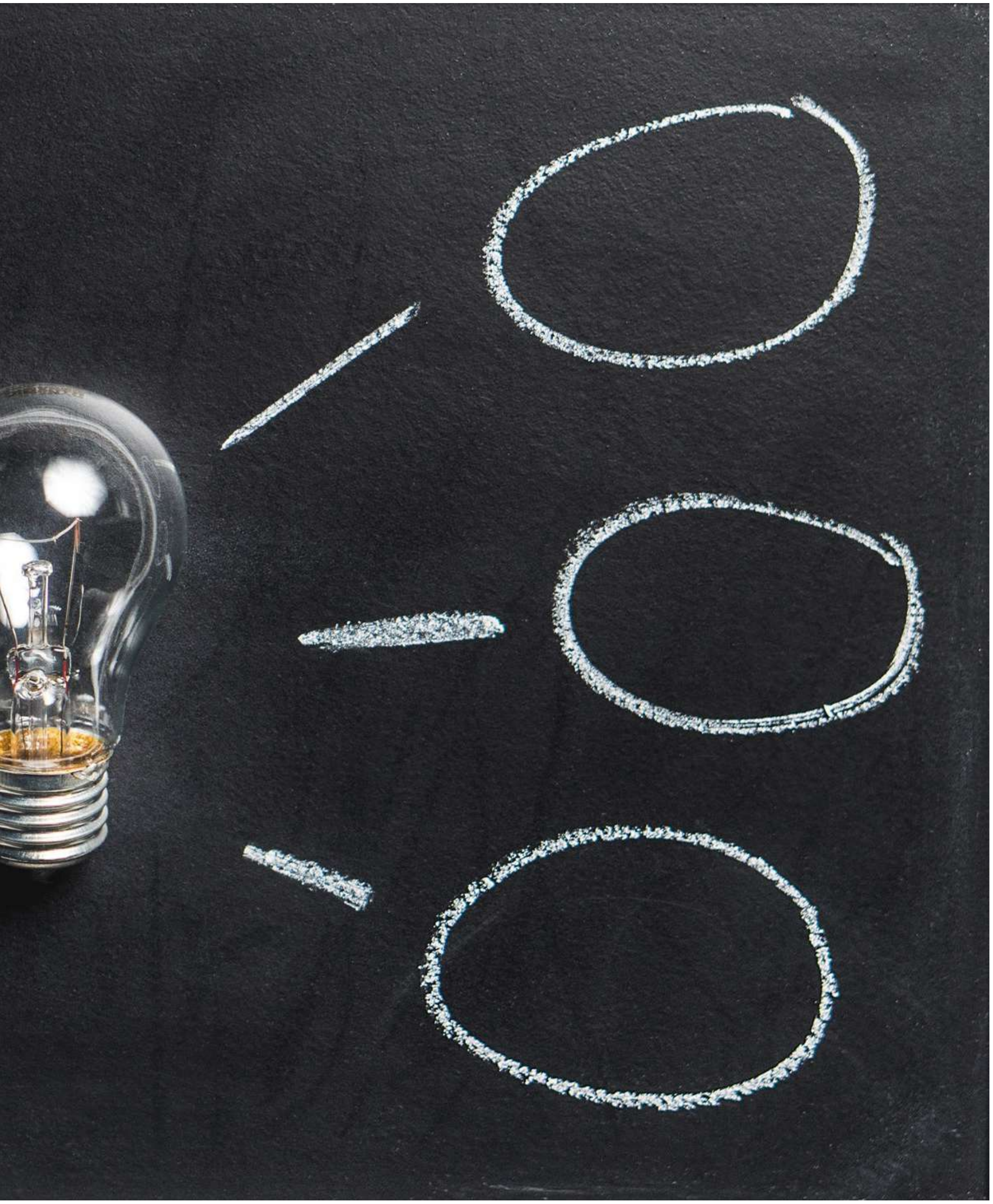
ill.110

ill.108



ill.111

PRESENTATION



ill.112

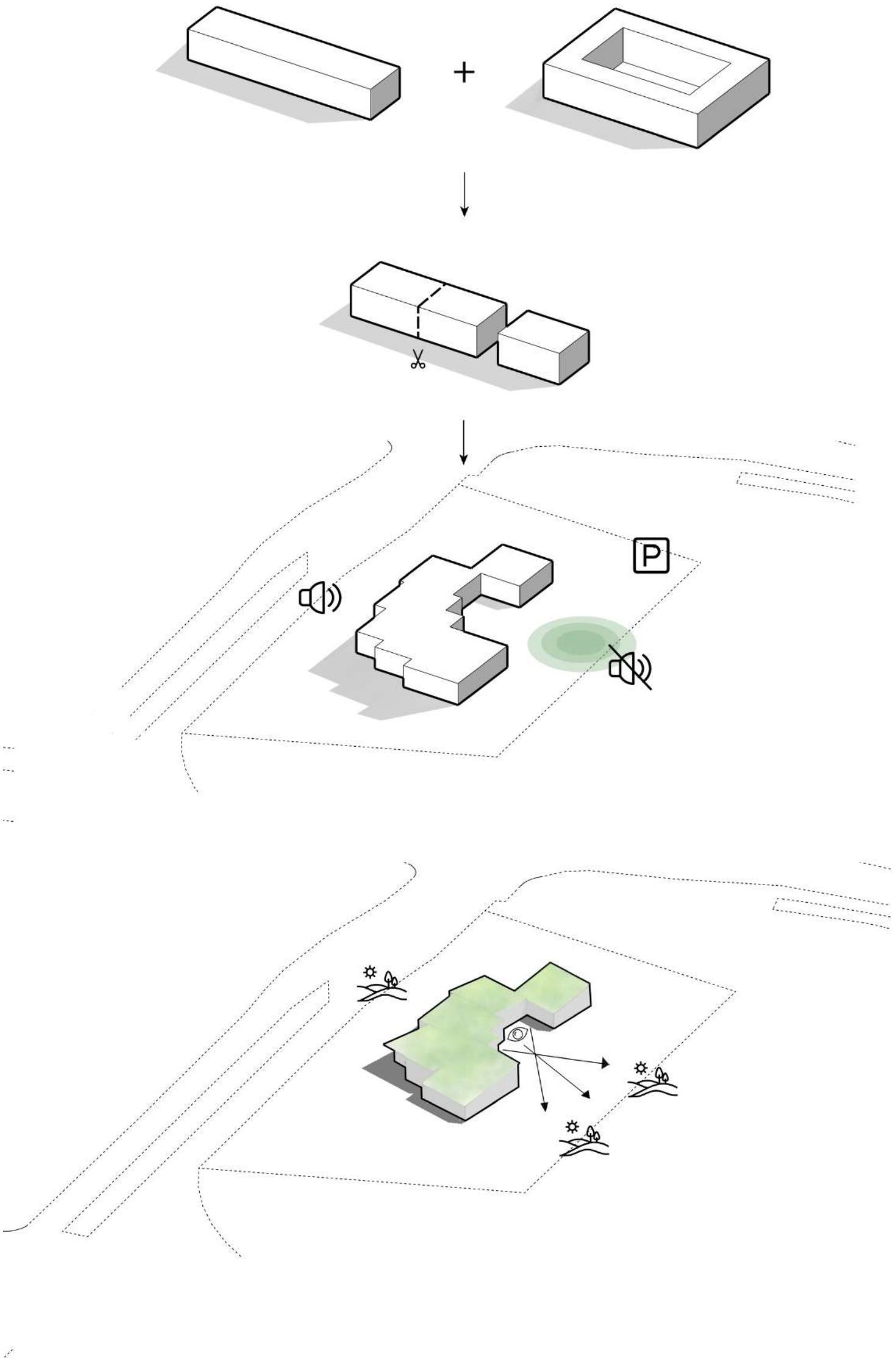
RENDERING OF THE OUTDOOR AREA

ill.113

CONCEPT

The concept takes departure in the existing typologies of the surrounding area, which are mainly the linear block and the well-known squared block that is found not only in Aalborg but in many big cities throughout Denmark. These two typologies were then mixed together in a way that the linear block is taken and cut in smaller units that fit the children scale but also allowed the division between the different functions inside the building. These units are then combined and placed in a typical squared block shape, however it is not completely closed since it opens towards Karolinelund and the greenery which makes that side more harmonic and idyllic since it also closes towards the busy and noisy street, Fyensgade.
Lastly the concept becomes more alive through the roofscape, which allows the building to respond to the hills that are going to be placed around the building to protect from noise. Moreover, it also responds to the surrounding trees, hills and the lively nature that characterize Karolinelund. This feature makes the building dynamic and fun to interact with since it does not seem static in its architectural expression.

The way it opens up to Karolinelund also allows nearly every room in the building gets to have a view to nature outside, which is important since it has great effects on the working environment as well as children's development that is connected to the freedom of interacting with nature.



ill.114 Concept diagrams

MASTER PLAN

1:500

ill.115

GROUND PLAN

1:500

ill.116

ELEVATIONS

North Elevation 1:100

ill.117

South Elevation 1:100

ill.118

ELEVATIONS

East Elevation 1:100

ill.119

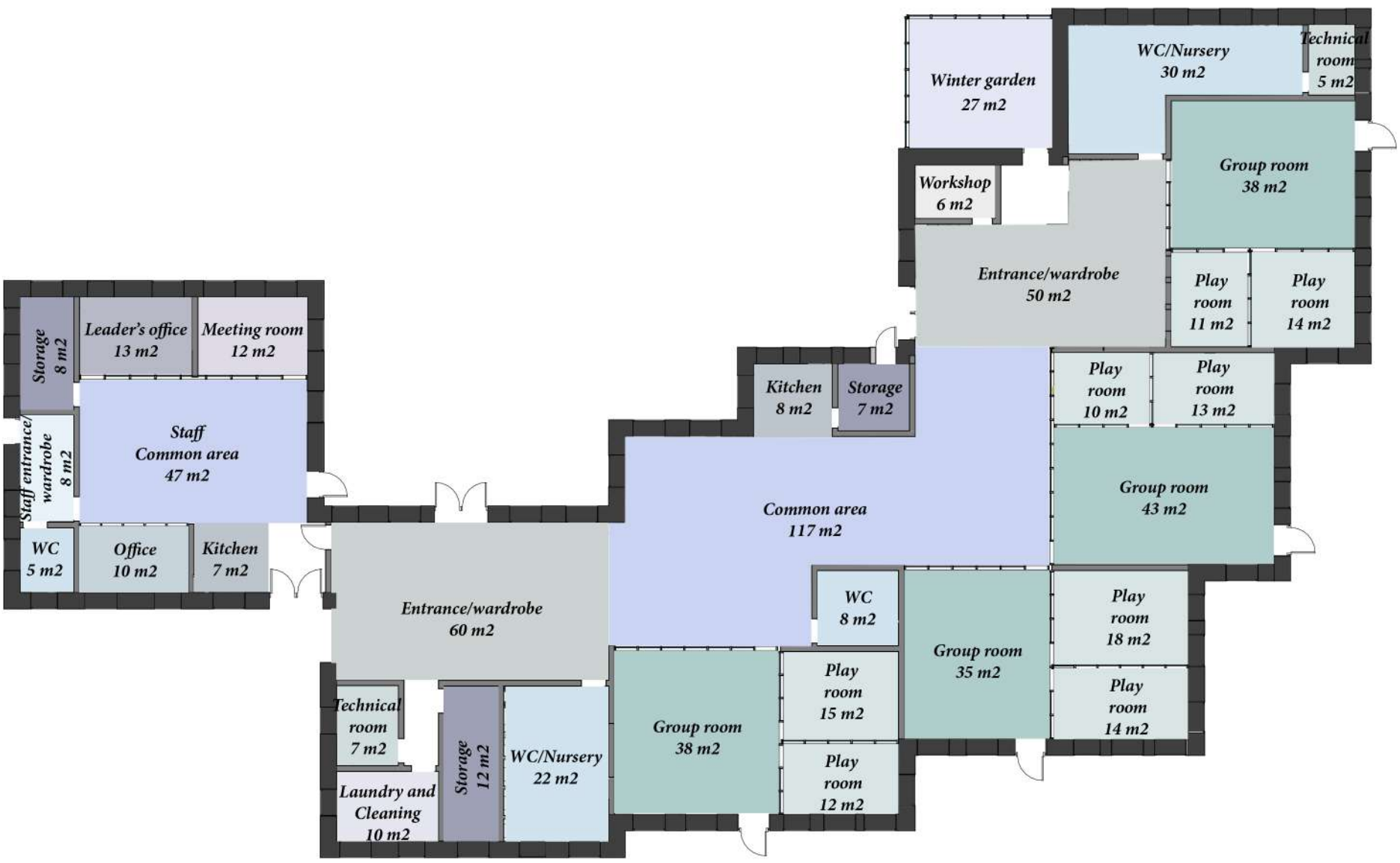
West Elevation 1:100

ill.120

1:200

ill.121

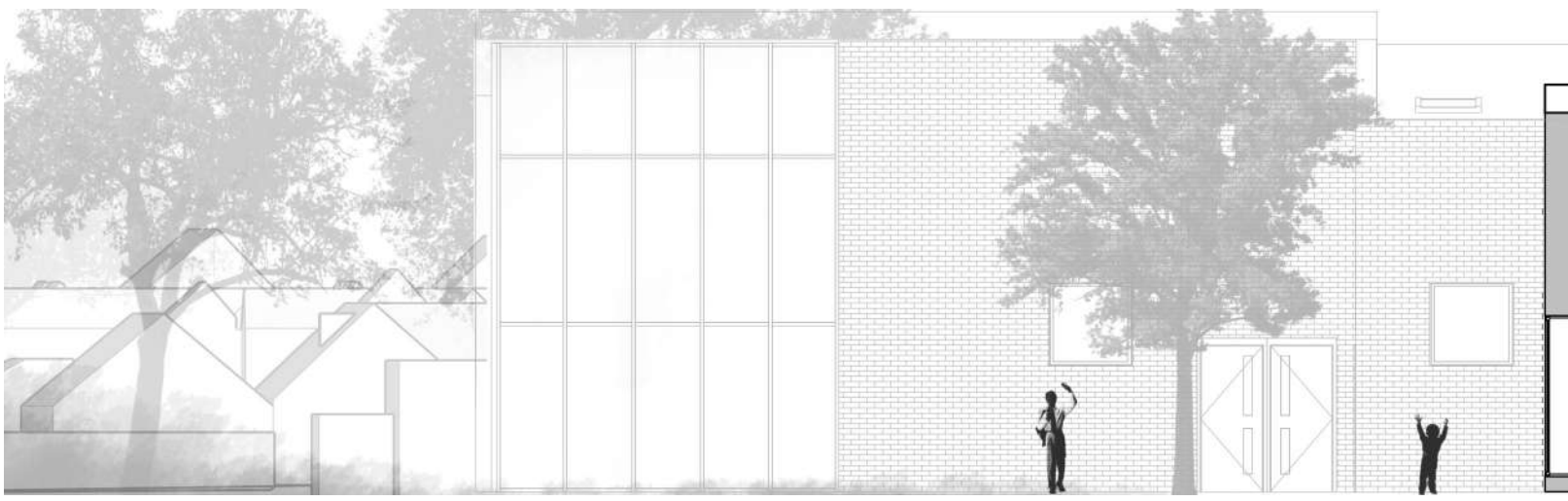
PLAN



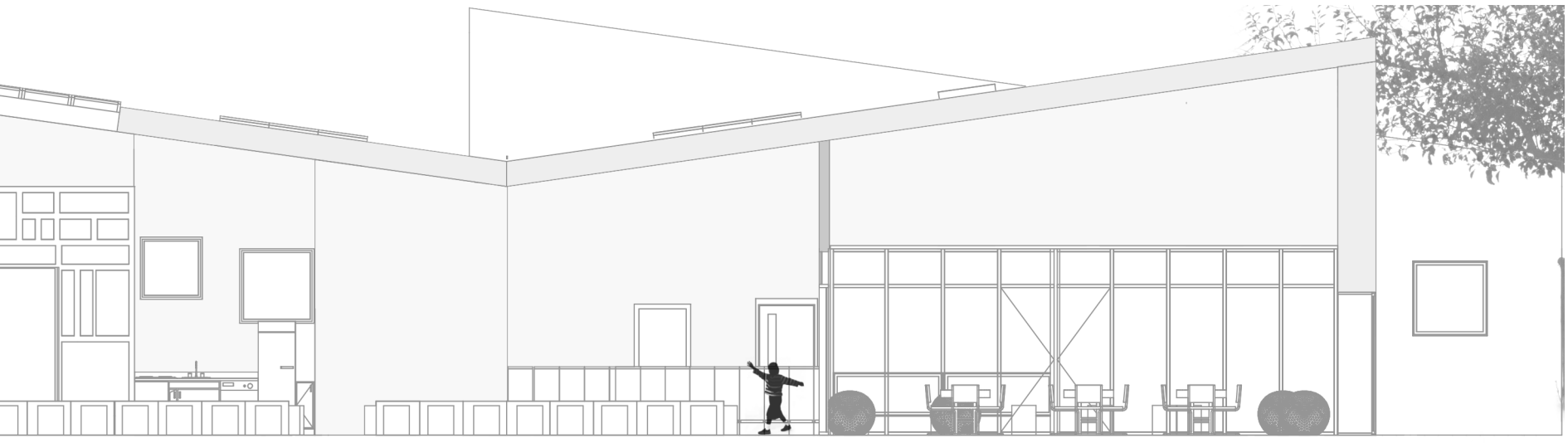
Plan 1:200

ill.122

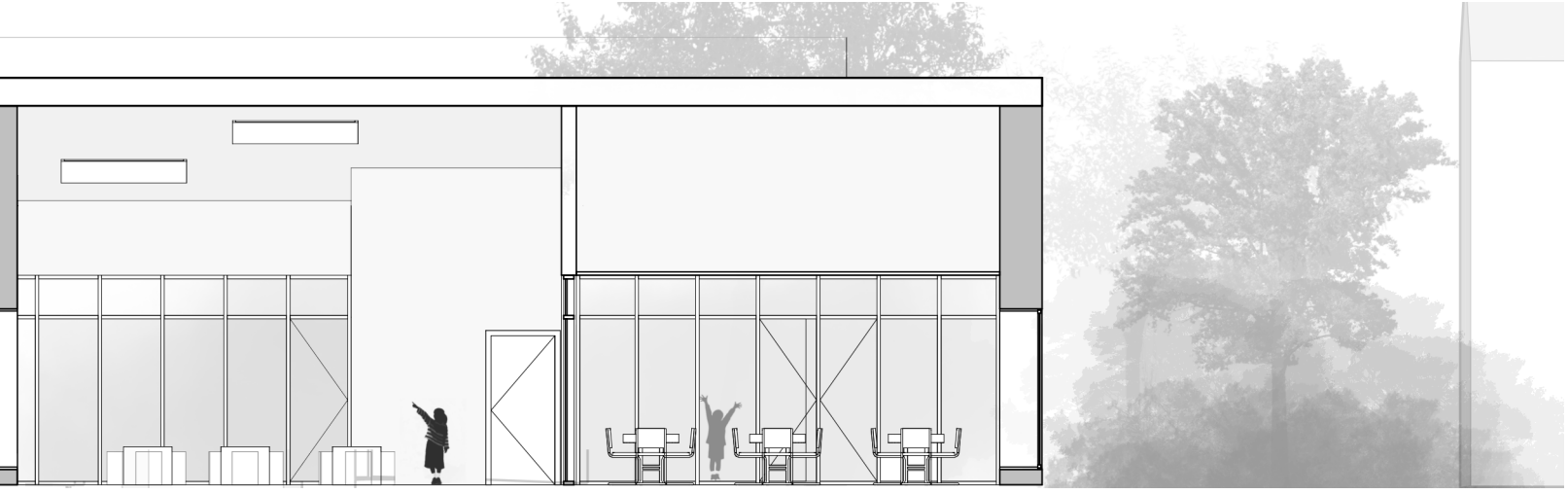
ROOM DISTRIBUTION



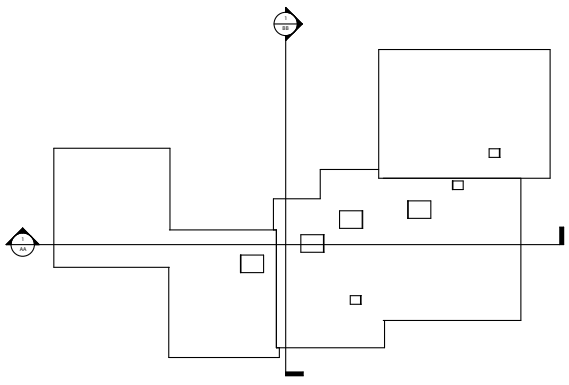
SECTIONS

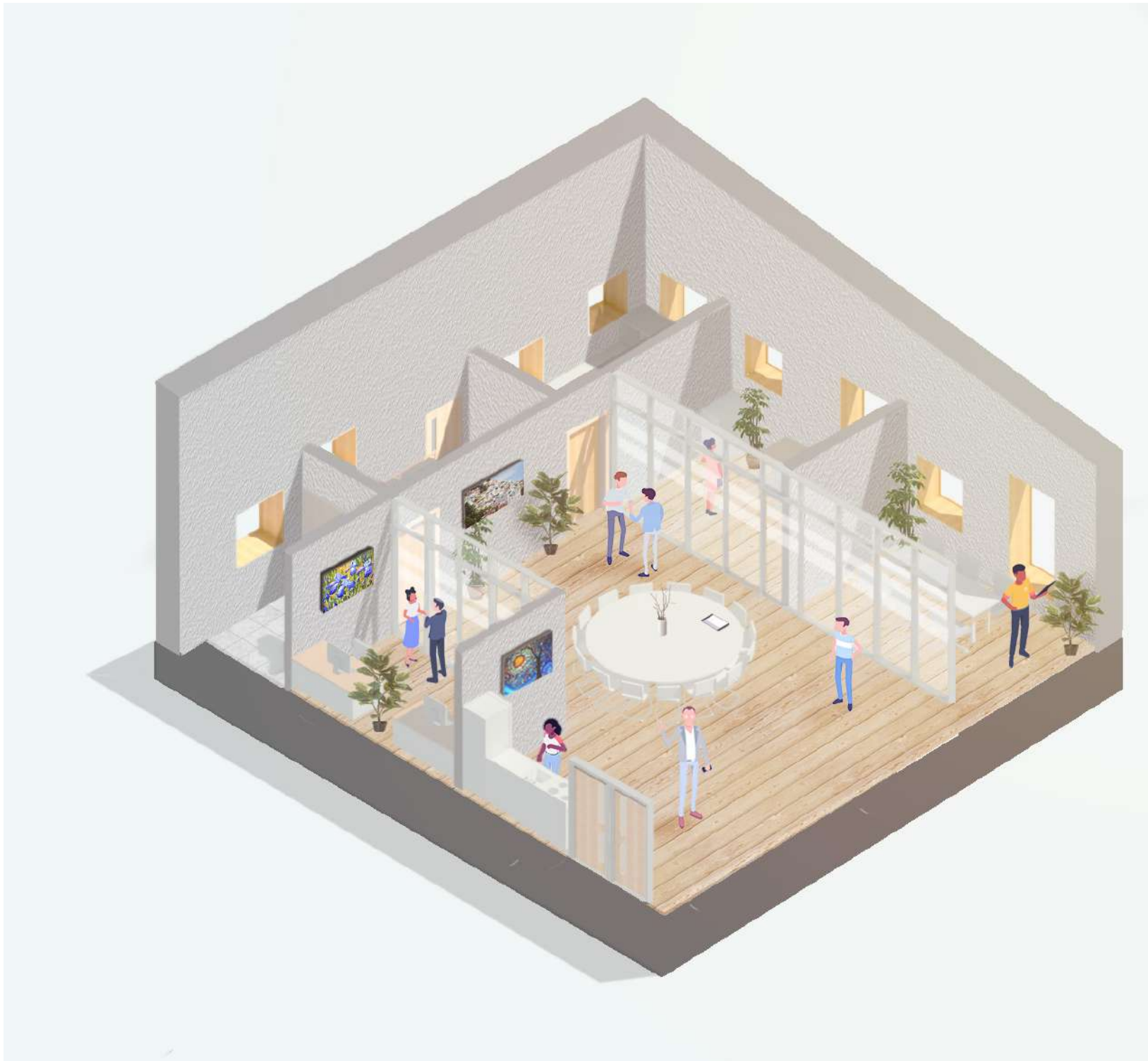


ill.123 section AA - 1:100



ill.124 section BB - 1:100





ill.125 isometric rendering

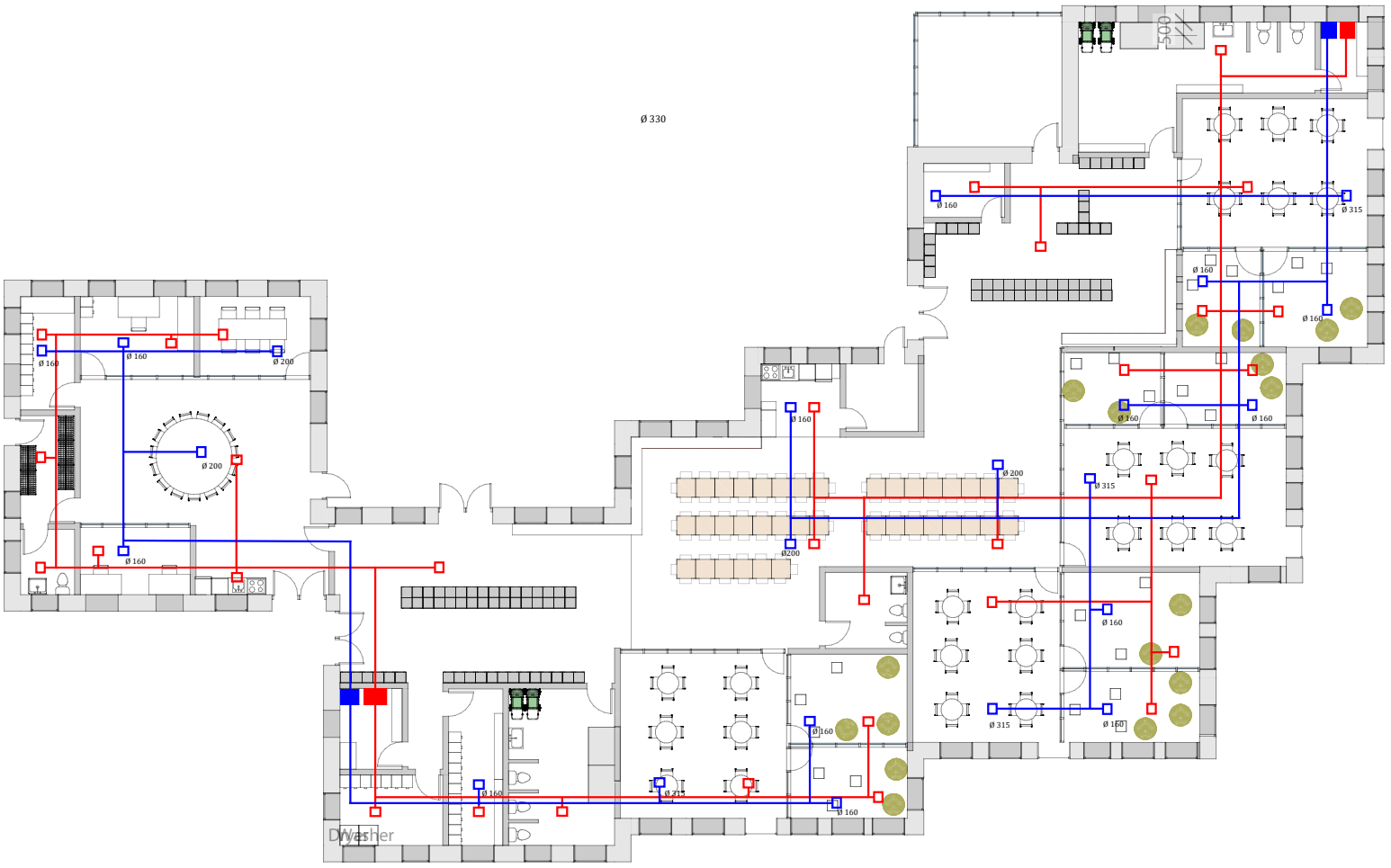
STAFF

The above render shows the staff unit that consist of a group room, a leader’s office, storage, a back entrance/ changing room that is connected to a toilet, an office with two computers, a small kitchen and a big common area in the middle. The staff area should give a space where the pedagoges are able to retrieve and relax in their own boble when needed and therefore the space is light and open in the middle where they also have the possibility to look outisde to the garden. In the different rooms however it is more intimate in the sense of the closed rooms have a suspended ceiling, where the staff can feel more in their own space, but still keeping the space light and airy by having glazed windows towards the middle space of the unit. Therefore, the flooring material is wood the continous throughtout the room in order to give it a fluidity and a continous flow. The walls are white to make the room seem bigger, cleaner and lighter since that color is great at reflecting the light.
The windows all have a light and warm wood material since that makes it more inviting to sit on.

ill.126 isometric rendering

GROUP AND PLAY ROOM

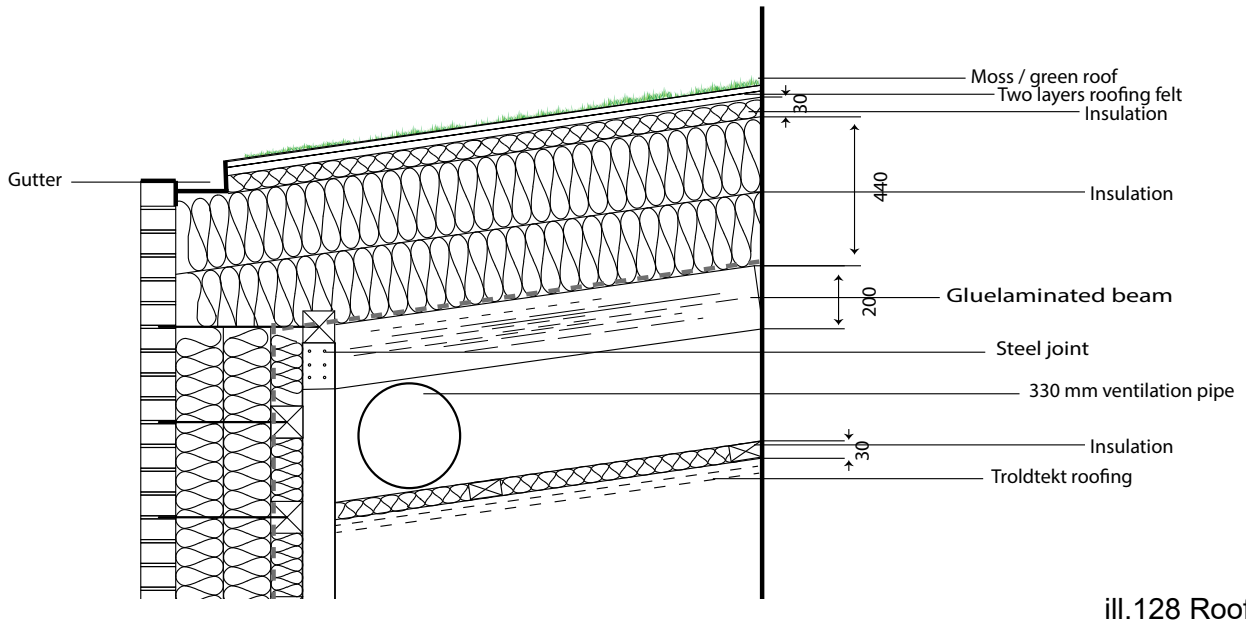
The above render shows the group rooms and the idea behind placing one big group room and two small play-rooms next to. When the children and staff are inside it feels more enclosed and safe because of the suspended ceiling with the material troldtekt. It makes it intimate and fun because it reminds kids of the safe frame of a home where they are able to unfold their creativity in a controlled environment.
The materials that are used in the group rooms are linoleum because it is easy to clean and maintain and it is practical for play purposes. It is also the material that is required in the competition brief for the flooring in the group rooms. The walls are white gypsum boards, which gives the freedom to put different wall decorations that kids can interact with. Lastly the windows have different heights that makes it enjoyable for kids to sit and interact with, since it gives them possibility to look out and see the outside world.



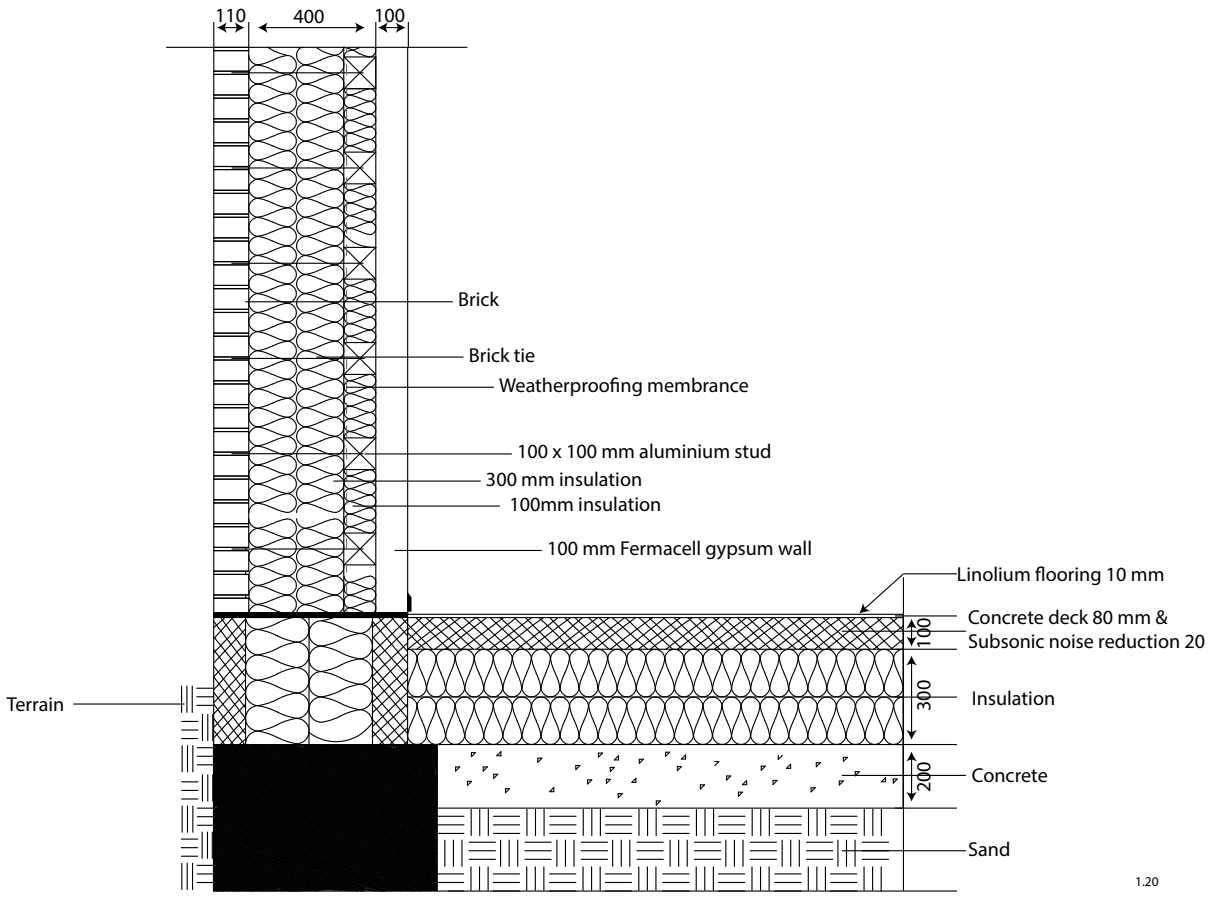
ill.127 plan of ventilation strategy

VENTILATION STRATEGY

The plan reveals ventilation principals which consists of two central aggregates that operates the mechanical ventilation. The two central aggregates are placed on the west and east side of the building and provides with in-and outlets. Another reason to operate with two central aggregates is to minimize pressure loss through the pipes. There are two systems for mechanical systems; CAV and VAV. CAV is a system of constant air volume while VAV is Variable air volume and can be adjustewd according to the need air volume and is more energy efficient[Den lille blå om Ventilation, 2007]. Therefore, a VAV system has been selected to be used in the project. There will be different activities in the building where the air pollution will change according to the activity level and for that reason the ventilation systems need to regulate for the needed amount of air flow. Air change rate has been calculated [See appendix 1 and 2]. There has been made calculations for both OLF and CO2 to find out which of them is the dominating source of pollution. For this case it was found out that the sensory pollution [OLF] that will be the dominating source for the ventilation rate. These calculations were also used to find the proper size of ventilation ducts. Furthermore, the calculations of air change rate has also been used to test the building's energy frame in be15 and the indoor climate in Bsim. The ventilation system in this project is a balanced mechanical system which means that inlet and outlet ducts is placed in the ceiling where fresh air is added to the air which will mix with the polluted air [indeklimaportalen 2016]. As mentioned before, this systems is often used in schools, daycare institutions and offices that allows to regulate air flow and temperature. The ventilation plan above shows the distribution of the pipes in the building with pipe diameter size. The size is made based on the needed ventilation rate and air flow rate. In [appendix 3] there is made a calculation of how pipe size is dimensioned. The hybrid ventilation strategy is supplied by the variable air volume control that regulates according to the air pollution in the room. If the natural ventilation provides enough fresh air then the mechanical ventilation system till turn off and the oppsite happens as if the natural air change is not enough then the mechanical ventilation system will turn on.



ill.128 Roof detail 1:20



ill.129 Foundation and wall detail 1:20

CONSTRUCTION DETAIL

EPILOGUE

CONCLUSION

Karolinelunden Kindergarten is a new design proposal for a new kindergarten located in Karolinelund, Aalborg. The design shapes an exciting environment for children where they can visually interact with the surrounding ongoing activities. The kids can also get the feeling of anticipation when they can visually locate each other from a distance. The architecture is shaped in a form that should relate to the children's scale and this have been an active integrating tool throughout the project. The building is organized in sort of three zones with different spatial qualities. The first zone is the children group rooms and playrooms which are placed toward south and southeast. In this zone the rooms have suspended ceiling to keep the children in controlled environment and the rooms should reflect the ongoing activities for children. The transition to the next zone will be common space where the ceiling goes all the way up to the roof. This transition will be explained as the ¨going out to the big world¨ where children here can be social and interact with each other. In the common space the walls are integrated which creates niches by windows and the walls have also other functionalities.

Regarding accessibilities, the design took relation to the already existing paths towards the site that are primary from west and north of the site. A parking lots are available at the west side of the site which is therefore the main path to the site.

The kindergarten is designed to fulfill building class 2020 and energy frame. Through the process the architectural and engineering tools have been applied in an iterative process that secures the design becomes environmental and economical sustainable.

The spatial experiment is also achieved by daylight which benefits user comfort and health. The plan solution is organized according to sun path to utilize the needed amount of daylight factor. Lastly within the daylight, the design considers highly the visual connection to the outdoor nature areas and this have been integrated in the process from the beginning.

REFLECTION

When working with a kindergarten many different aspects can be considered in order to make a well functioning building that suits both staff and children. One of the things that can be further developed is the integration of the building with nature. Since kids love to explore through their senses and running freely outside, the design of the outdoor landscape could have been examined further in order to achieve a coherent final result. Thous the thought behind a winter garden was for kids to access throughout the years and learn about the plants and nature in general this could have been implemented further in the design of the outdoor spaces.
Another aspect to reflect upon is the sketching phase. This phase took departure in two different directions, which were the examination of round shapes and rectangular shapes. These designs both took departure in the geometry of the site as well as the surrounding building typologies, because danish people like buildings that “fit in” the context, which is evident in the existing buildings around Aalborg and also in general around the country, which meant extravagant shapes that required organic forms were not examined in the sketching phase. This could though still have been implemented in the sketching phase since the area has had a history with Tivoli, that made every kid excited to see and go into.
Another point to discuss in the reflection is the implementation of BE15 and Bsim in the sketching phase. Since at the sketching phase different designs were tried out the usage of these two programs were hard to implement because of the fact that many ideas were just sketches, which means that placement of windows, amount of windows as well as the construction were not determined and thereby it is hard to know the data at that point. Moreover, if these were still used a huge amount of time will be lost, since Bsim requires a lot of data and numbers that are simply not decided at that stage. That is why the implementation of those programs began at the synthesis phase where that shape of the building was decided from the sketching phase.

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Ill. 105: https://www.pinterest.dk/pin/769131061059944450/

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Ill. 112: https://www.pexels.com/photo/abstract-blackboard-bulb-chalk-355948/

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APPENDIX

Content

ill.130

Ventilation calculations

Rooms	Square meters	Height	Volume	Persons	Materials	Olf	Background pollution	Total Pollution	Discontent	Ventilation rate	Air flow rate	Air change	
	[m2]	[m]	[m3]		[Olf]	[Olf/pers]	[Olf/m2]		[Decipol]	[l/s]	[m3/s]	[h^-1]	[l/s pr. m2]
Kids Group Rooms	256	3	768	99	51,2	1,4	0,2	189,8	1,4	1064,59	1,06459	4,99	4,16
Kids Wardrobe	68	5,8	394,4	25	13,6	1,4	0,2	48,6	1,4	269,33	0,26933	2,46	3,96
Kids WC	53	3	159	10	10,6	1,4	0,2	24,6	1,4	111,56	0,11156	2,53	2,10
Workshop	10	3	30	5	2	1,4	0,2	9	1,4	53,33	0,05333	6,40	5,33
Common Room	114	5,3	604,2	55	22,8	1,4	0,2	99,8	1,4	587,26	0,58726	3,50	5,15
Kitchen	25	5,3	132,5	2	5	1,4	0,2	7,8	1,4	24,44	0,02444	0,66	0,98
Head Office	10	3	30	1	2	1,4	0,2	3,4	1,4	11,85	0,01185	1,42	1,19
Offices	10	3	30	1	2	1,4	0,2	3,4	1,4	11,85	0,01185	1,42	1,19
Meeting Room	12	3	36	4	2,4	1,4	0,2	8	1,4	43,26	0,04326	4,33	3,60
Break Room	15	5,8	87	5	3	1,4	0,2	10	1,4	54,07	0,05407	2,24	3,60
Staff Entrance & Wardrobe	10	3	30	2	2	1,4	0,2	4,8	1,4	22,22	0,02222	2,67	2,22
Adult Toilet	5	3	15	1	1	1,4	0,2	2,4	1,4	11,11	0,01111	2,67	2,22
Technical Rooms	12	3	36	1	2,4	1,4	0,2	3,8	1,4	12,15	0,01215	1,21	1,01
Storage	25	3	75	2	5	1,4	0,2	7,8	1,4	24,44	0,02444	1,17	0,98
Total	625												

The calculations is made on all the grouprooms

Air Change Rate based on [OLF]

$$C = C_i + 10\frac{q}{V_l}$$

Stating that the discontent percentage is set to 20% which determine to $c = 1.4\ dp$.

The air quality of the outdoor air is according GKB [(Grundlæggende Klimateknik og Bygningsfysik) page 40-43 (Hyldgård et al. 1997)], if you are situated in the city with moderate air pollution, set to: $Ci = 0.05\ dp$

c: $experienced\ air\ quality\ (decipol)$

ci: $experienced\ air\ quality\ of\ outdoor\ air\ (decipol)$

q: $pollution\ load\ (Olf)$

Vl: $Air\ flow\ supply\ (l/s)$

$1\ person = 1.4\ olf$

$Building\ materials\ and\ furniture = 0.2\ olf\ pr.\ m^2$

$$V_l = \frac{10 * \left(1{,}4\frac{olf}{person} * 99\ personer\right) + \left(0{,}2\ \frac{olf}{m^2} * 256\ m^2\right)}{1{,}4\ dp - 0{,}05\ dp} = 1064{,}6\frac{l}{s}$$

$$n = \frac{v_l * 3600\ s}{1000l * V_{room}} = \frac{1064{,}6\frac{l}{s} * 3600s}{1000l * (256\ m^2 * 3m)} = 4{,}99\ h^{-1}$$

APPENDIX 1 - AIR CHANGE RATE [OLF]

CO2 Calculations

Rooms	Area [kvm]	Height [m]	Volume [m^3]	Persons [pers.]	Activity niveau [met/pers]	CO2 caused by pers. [l/h/person]	Added CO2 [l/h/m2]	Added CO2 [m3/h]	Concentration diff. [PPM]	Air quality [m3/m3]	nV m3/s	Air change [n=h^-1]
Kids Group Room	256	3	768	99	1,0	24	2376,0	2,376	500	0,00085	6,19	4,75
Kids Wardrobe	68	5,8	394,4	25	1,0	24	600,0	0,600	500	0,00085	3,04	1,20
Kids Toilet	53	3	159	10	1,0	24	240,0	0,240	500	0,00085	3,02	0,48
Workshop	10	3	30	5	1,0	24	120,0	0,120	500	0,00085	8,00	0,24
Common Space	114	5,8	661,2	55	1,0	24	1320,0	1,320	500	0,00085	3,99	2,64
Kitchen	25	5,8	145	2	1,0	24	48,0	0,048	500	0,00085	0,66	0,10
Head office	10	3	30	1	1,0	24	24,0	0,024	500	0,00085	1,60	0,05
Offices	10	3	30	1	1,0	24	24,0	0,024	500	0,00085	1,60	0,05
Meeting Room	12	3	36	4	1,0	24	96,0	0,096	500	0,00085	64,00	2,30
Break Room	15	3	45	5	1,0	24	120,0	0,120	500	0,00085	5,33	0,24
Staff Entrance and Wardrobe	10	3	30	2	1,0	24	48,0	0,048	500	0,00085	3,20	0,10
Adult Toilet	5	3	15	1	1,0	24	24,0	0,024	500	0,00085	3,20	0,05
Technical Room	12	3	36	1	1,0	24	24,0	0,024	500	0,00085	1,33	0,05
Storage	25	3	75	2	1,0	24	48,0	0,048	500	0,00085	1,28	0,10
Total	625											

AIR CHANGE RATE BASED ON THE CO2 LEVEL.
The calculations is made on all the grouprooms

According to EN/DS 15251 the air change rate is determined by the outdoor concentration. The CO_2 concentration ca maximum be 500 ppm higher that the outdoors concentration which is 350 ppm in Denmark. It is also assumed that a person cause 4% of 10 l/min CO_2. For one person it is 24 l/h/person.

$$C = \frac{q}{nV} + C_i$$

$$n = \frac{q}{(C - ci) * V}$$

$$C = \ concentration\ of\ pollution\ in\ the\ room\ (m3/m3)$$
$$Ci = \ concentration\ of\ pollution\ of\ inlet\ air\ (m3/m3)$$
$$Q = \ pollution\ load\ (m3/h)$$
$$V = \ Volume\ of\ room\ (m3)$$
$$N = \ air\ change\ pr.Hour\ (h-1)$$

C_i= 350 ppm

The added CO^2 calculation

$$q = 24\frac{l}{h} pr.person * 99\ persons * 10^{-3} = 2{,}376\frac{m^3}{h}$$

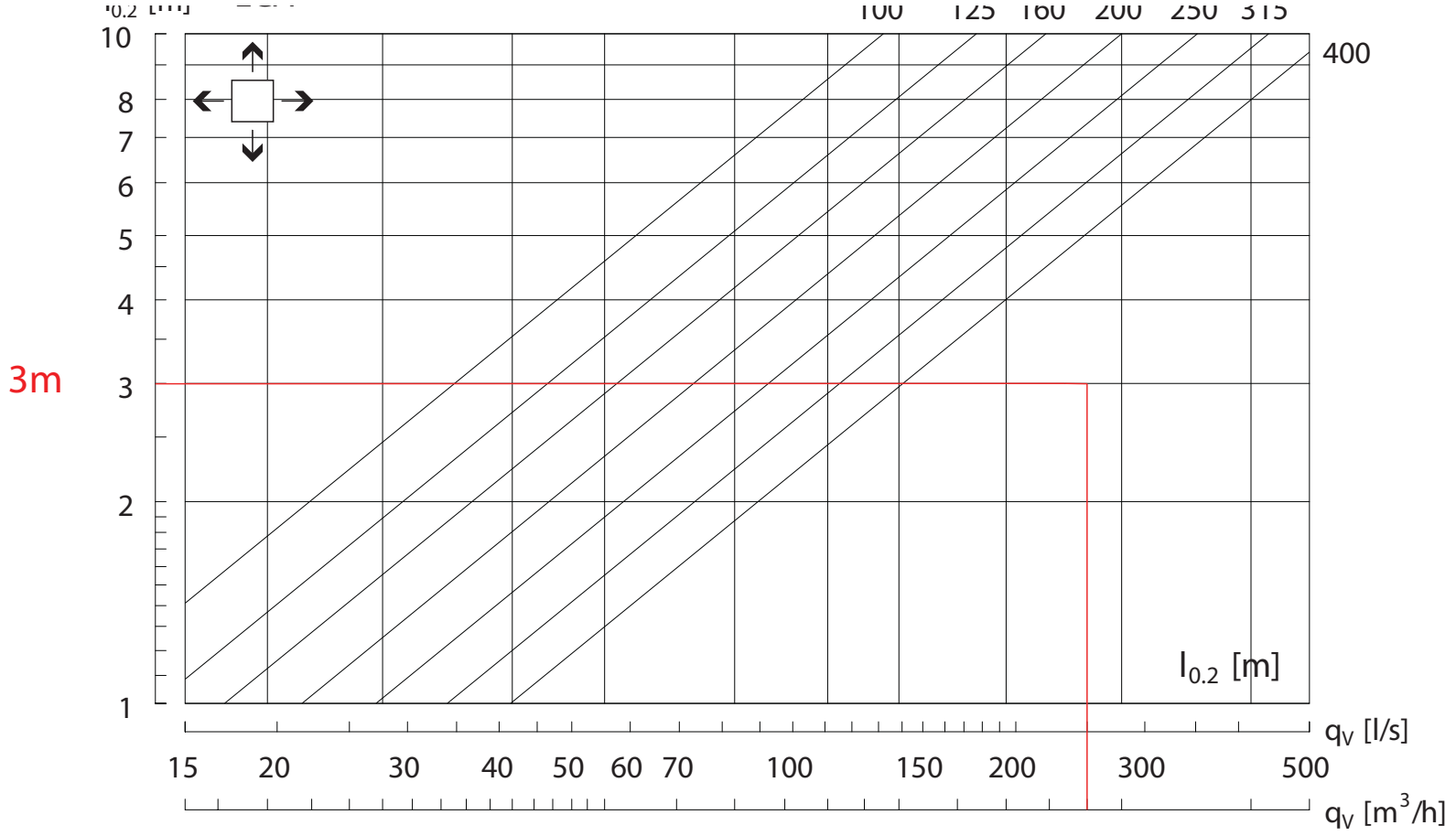
The ideal indoors concentration blended with outdoors concentration is 850 ppm

$$c = 850\ ppm$$

$$n = \frac{2{,}376\frac{m^3}{h}}{(850 - 350) * (256\ m^2 * 3\ m)} * 10^6 = 6{,}1875\ \frac{m^3}{s}$$

$$\frac{6{,}1875 * 768}{1000} = 4{,}752\ h^{-1}$$

APPENDIX 2 - AIR CHANGE RATE [CO2]



Pipe dimensioning

This equation is made to support the data of pipe size through the building that provides the building with mechanical ventilation in winter period.

The equation is made for single group room.

The previous calculation of OLF for group room, there was found the needed air flow rate for all group rooms. As in this situation, this calculation will need to be done for only one group room, therefor:

$$\frac{1{,}065}{4} = 0{,}265\frac{m^3}{s}$$

$$0{,}265 \approx 954\, m^3/h$$

The following equation is for pipe dimensioning

$$\left(\frac{\pi}{4}\right) * d^2$$

The diameter needs to be calculated, therefore

$$d^2 * 3\frac{m}{s} = \frac{0{,}265\frac{m^3}{s}}{\left(\frac{\pi}{4}\right)}$$

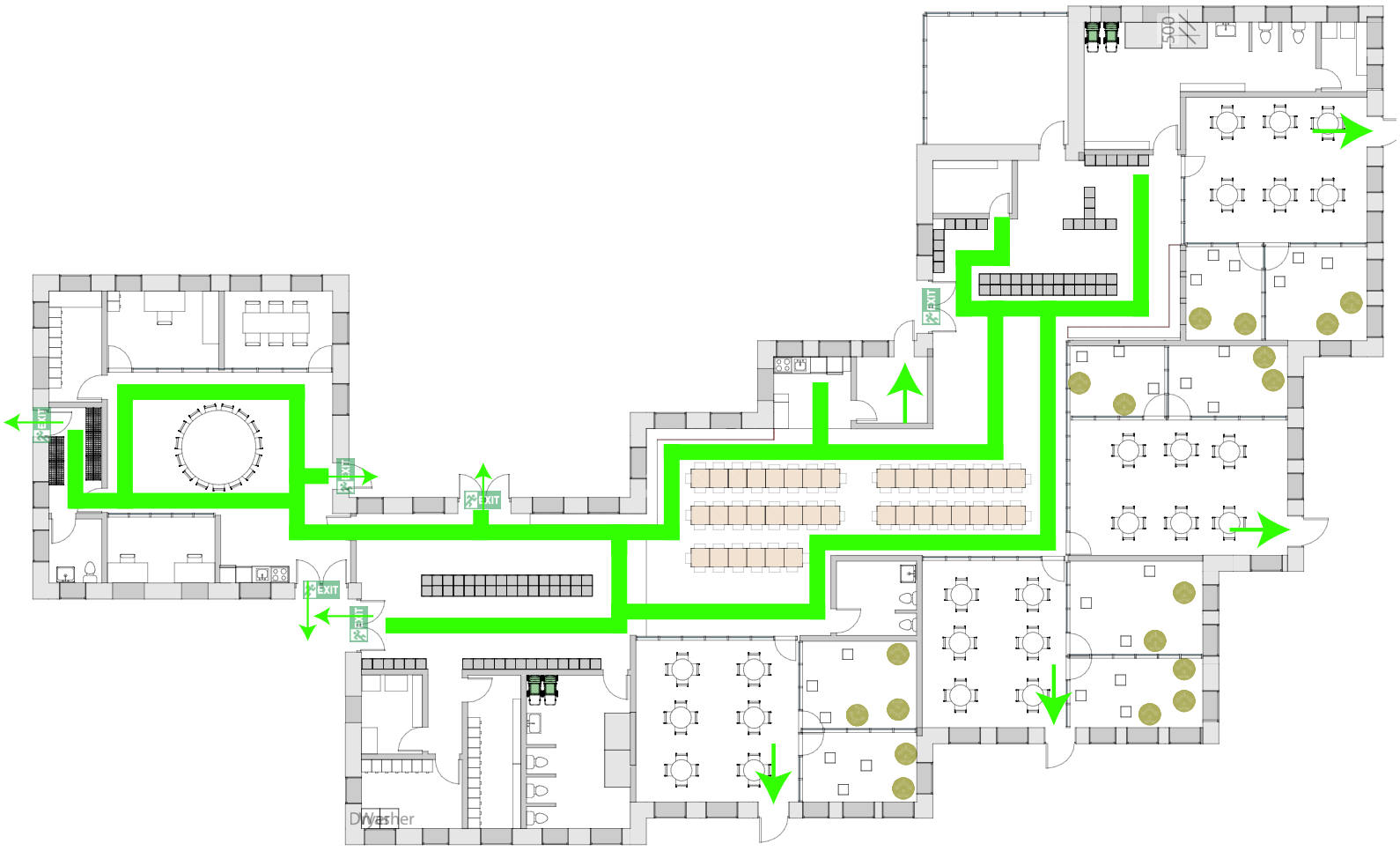
$$d^2 * 3\frac{m}{s} = 0{,}34\frac{m^3}{s}$$

$$d = 0{,}34m \approx 330mm$$

For a group room, the inlet pipe needs to be 330 mm in diameter but as there is no such dimension, a dimension of 315 mm will be used instead as it is the closest dimension for the calculated. (Itsolution.lindab.com, 2018)

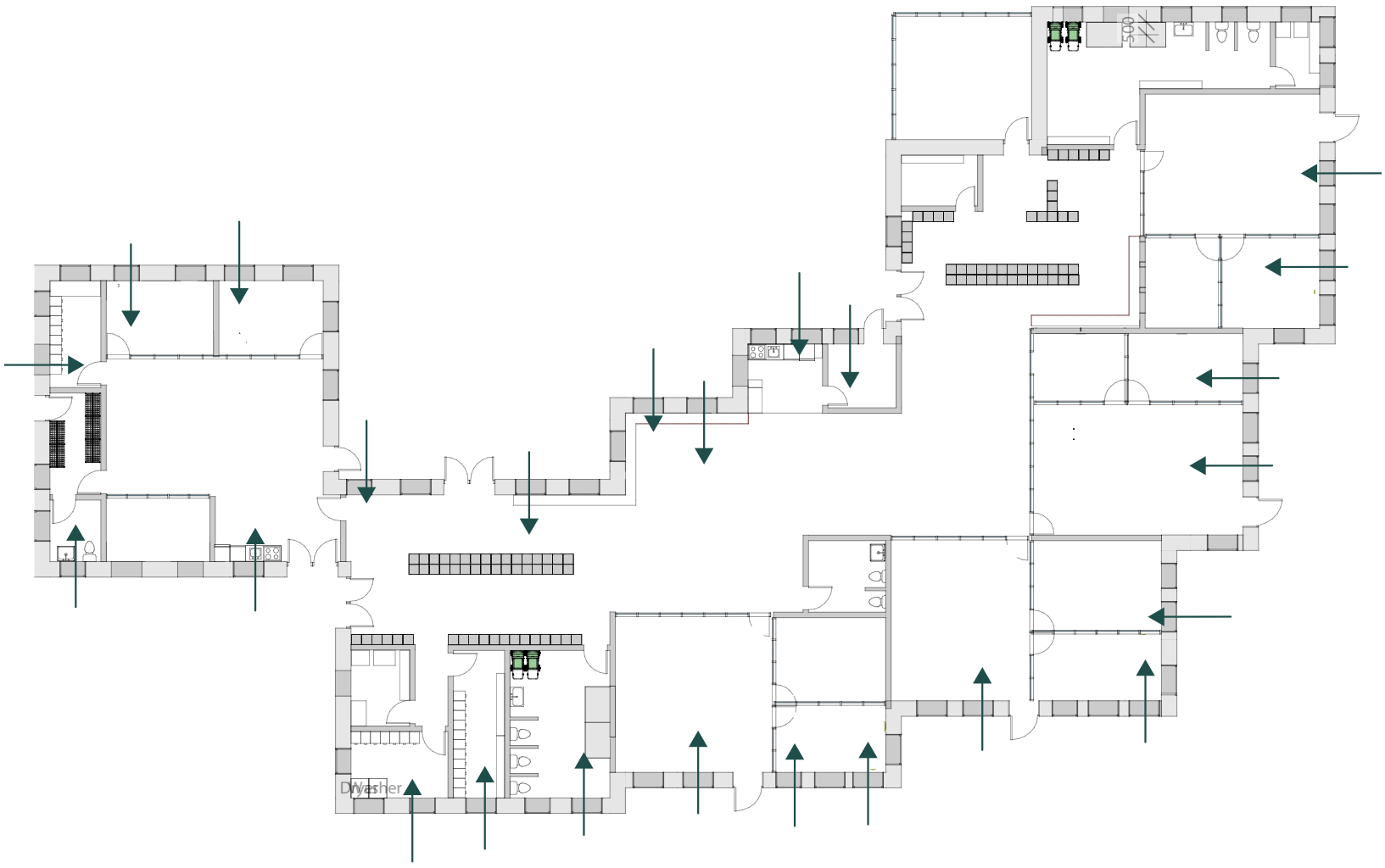
Itsolution.lindab.com. (2018). *90*. [online] Available at: https://itsolution.lindab.com/LindabWebProductsDoc/PDF/dk/PL_Kanalsystemer_Juli_2011.pdf [Accessed 26 Nov. 2018].

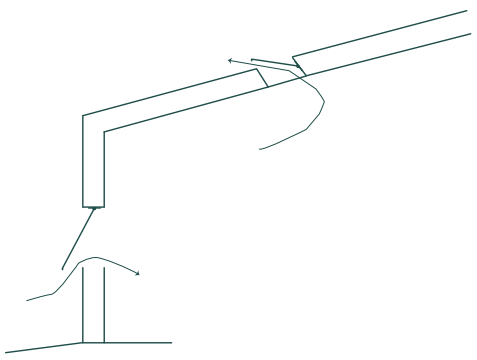
APPENDIX 3 - PIPE DIMENSIONING



APPENDIX 4 - FIRE STRATEGY

The fire strategy is made according to category 6 which states that the building is for day time use and the users of the building can not be able to bring themselves out to the safe environment [Bygningsreglementet 2017].
Furthermore, the longest distance to an exit must not exceed 25 meters. The escape routes must have a width of 1.8 meters. The building is an open floor plan and there are exits available within the distance of 25 meters. Furthermore, all the group rooms have a door that leads directly to the outdoor areas.





APPENDIX 5 - NIGHT COOLING

The section above shows how the windows are intended to be opened. In summer periods and during weekends and holidays where the building is shut down it can become warm inside the building. By automatic mechanism that can be implemented in the building, it can be possible to natural ventilate the building. However it can be problemtaic if the windows at the facade opens automatic which can lead to damage in sense of burglary. Alternative solutions could be that the skylight opens automatically and ventilate the building. The other solutions could be that the high located windows at the facade opens from upside. The plan presents the zones that could implement these principles.