KLARUP KINDERGARTEN

PROJECT REPORT

MSC04 - Group 26 - February 2015

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Architecture & Design Aalborg University,
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Subject: Tectonic Design: Sustainability
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GROUP 26

Mahamed Ali

INTRO

PROGRAM

DESIGN

PRESENTATION

EPILOGUE

ABSTRACT

Opgaven i dette projekt, handler om at designe en Børnehave i Klarup, som Aalborg kommune har fremtidig planer om. Sitet der er udpejet af Aalborg kommune er placeret i et stille kvarter, hvor hovedvejen til og fra stedet er nord for sitet. Der er valgt et Nordisk tema med tektonisk og bæredygtigt deisgn. Med de nævnte udgangspunkt er der formuleret et vision, som skal give børnerne et fredligt men lærerigt opvækst, og skabe rammer der giver mulighed for sikkerhed, tryghed samt lære via. lege. Dette opnåes ved at filtrer alt støj "ude" fra og vende de udendøres lege områder i den sydlige del af sitet, hvor børnerne kan frit ududfolde sig uden at være påvirket af hovedvejen og dens larmende køretøjer.

READING GUIDE

This report is separated in five part: introduction, Program, Design, Presentation and Epilogue. furthermore are these chapters further divided into sub-headings. the report are set up in a way that the reader always are is guided through the design and the analytical part of the project before the presentation of the final product are revealed. All drawings are faced up which indicate that you always have north up, unless otherwise is stated. Regarding the references to the used literature, is the Harvard method taken in for use.

METHODOLOGY

The goal for this project is to achieve an integrated kindergarten design, with strong architectural and technical quality. To gain that has there been investigated the methodology presented and formulated by Mary-Ann Knudstrup - "The integrated design process". This process contains five steps: Problem: Which is a phase where the problem or the idea for the project is defined, this is the phase where the goal for the project is described. Analysis: This is a phase where, all the research and analysis for the given idea demands, it contains all the site analysis, subject analysis, the approche for this project; what is tectonic and Nordic architecture what is sustainable deisng? is investigated, furthermore case studies which accommodate the project, to gain more knowledge and understanding in thiese types of projects. Sketching: This phase is where the ideas are shown, a phase where the designer evolve the problem/idea. There will be many different ideas, which are analysed and sorted out, so the best fitting idea can be further developed. In this way every possible possibility are taken in for consideration. Synthetic: In this phase there are choosen one design from the sketching phase, to further developed the design, in the matter of structure and sustainability, so the final idea can be build. This is a "loop" process which means that the designer can go back to the sketching phase to optimize the design and go back to the synthetic phase, or change the design to follow another direction. Presentation: This is the last phase of the integrated design process methodology. This is a phase where the idea is presented by models, drawings and visualisations. To sell the idea, it is important the external person understands the project and the process from beginning to end, therefor is it important to make the project easy to understand.

The integrated design process is a design process which has been used throughout every semester at Aalborg University. It is a holistic design approach, which takes the aesthetic as much as the technical aspect of the project in focus. The design method has been presented in the image of the Vitruvian principles, where utilitas, firmitas and venustas come together and shape the building.

SUBJECT ANALYSYIS

PROJECT BRIEF KINDERGARTEN

Aalborg commune have made a local plan for the future plans for the area. One of those whishes was a kindergarten in Klarup. the area is 28000 m2 which is divided in three parts A, B and C. The kindergarten is placed in the A part with a size of 7600 m2, the B section is planned for around 10 villas and the last section C a common living area.

There is a desire for a child care center for approximately 100 children at an approximately 7,600 m2 area, with an estate of approximately 1,000 m2 kindergarten, a parking area, a play area etc. The parking and buildings placed on the northern part of the area - play area in the south towards the green wedge. Around the Day-care center established fencing and planting.

The architectural idea for the building is a tectonic and sustainable approach, to gain a "green kindergarten" in terms of materiality, energy consumption and choice of construction.

TECTONIC ARCHITECTURE

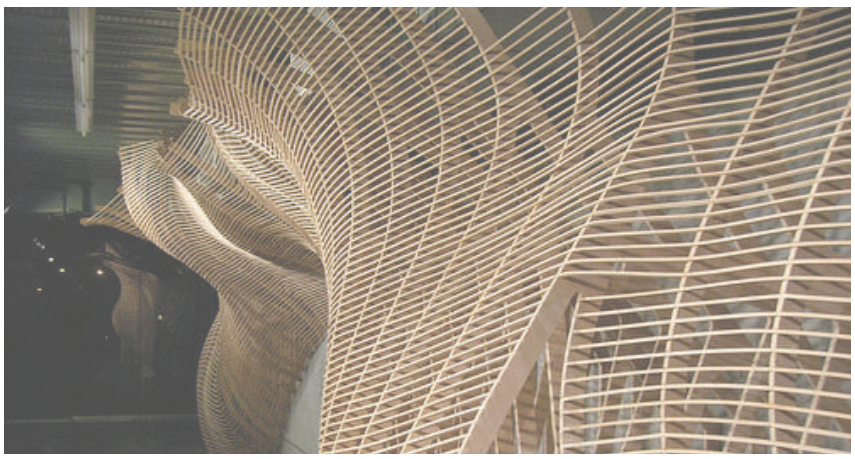
Tectonic architecture, is a design which strives of the truth in every scale of the building, every detail has a role to fulfill and is part of a bigger picture it responds to. Truth within materiality, construction, structure, the gesture has to be the principal which means that nothing in the structure can be added or removed without risking to lose the atmosphere of "whole" in the building. "when everything refers to everything else and it is impossible to remove a single thing without destroying the whole" (Zumthor 2006) http://vedenina.ru/blog/archives/551

This project will strive for merging the three element mentioned earlier in methodology, the function, structure and aesthetic qualities of the building, in a way that they all play a vivid role for the understanding of the building.

"The joint, that is the fertile detail, is the place where both the construction and the construing of architecture takes place." - Marco Frascari, "The Tell-the-Tale Detail". http://www.donaldearmstrong.com/tag/kenneth-frampton/

This project is a kindergarten project, which means that the architecture are responding to kids, and therefore has a role to play and become part of the kids "play". First and foremost shall the building appeal to it's users when it comes to the interior and exterior.

Tectonic architecture doesn't have a set of rule, which can be gained if followed, it exist within a large scale, which strives for the quality of the space. I wish to work with the honesty gained from the tectonic design throughout the whole project.



ill. 1 Laser-cut wood wall

ill. 2 Details Architecture

ill. 3 Continuous wooden elements U-shaped staircase at a Mumbai apartment

ill. 4 Nezu Museum Kengo Kuma

NORDIC ARCHITECTURE

Like tectonic architecture, does nordic architecture also strive for honesty and truth in materiality. Nordic architecture speaks of it place and its surroundings, it simplistic humbleness throughout its language. The physical surroundings of the building, when talking about in the Nordic countries can vary in a large sort, everything from dense urban city in the big cities to silent landscape where the nature plays the biggest role. It's the interest of the buildings surroundings which gives the richness to the architectural design approach. There is no specific way to design, so the building always can relate to the site. There is many different ways a building can relate to its surroundings. This is where the site analysis come in, understand the spirit of the place.

Because of the harsh climatic changes in the Nordic countries, and understanding of the climatic issues and make them to a quality. By understanding the sun path, the wind load, the changes in the weather, these analysis can be a guide which can be used to decide which direction the building should be orientated, to gain as much natural light as possiable, to minimize the wind load and create comfortable outdoor spaces ect.

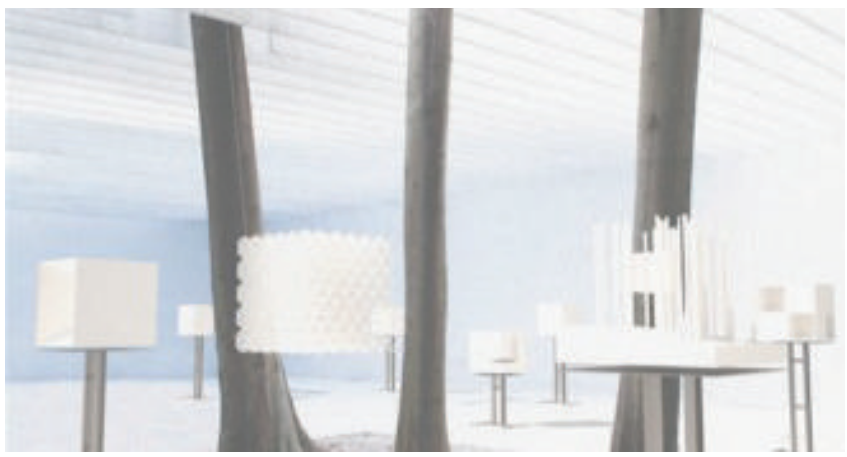
One of my favorite Nordic masterpiece is the Norwegian Reindeer Centre Pavilion, this small building which is places 1,25 km above sea level, is a great example on Nordic design. With its wooden core, covered with steel and glass, is shaped as a rock. This indicates the understanding of a shape which protects a warm gathering place from the harsh climate. The design itself defines the contrast between the stiff outer with the organic inner.

"buildings represent the world to which they are belong" (Norberg Schulz, C. 1996)

ill. 1 Jensen & Skodvin Architects (NO) Juvet Landscape Hotel, Gudbrandsjuvet, Norway.

ill. 2 Tverrfjellhytta / Snøhetta, Hjerkinn, Dovre Municipality, Norway

ill. 3 Louisiana Museum of Modern Art, Humlebaek, Denmark



ill. 4 Venice Biennale 2012: Nordic Pavilion

KINDERGARTEN

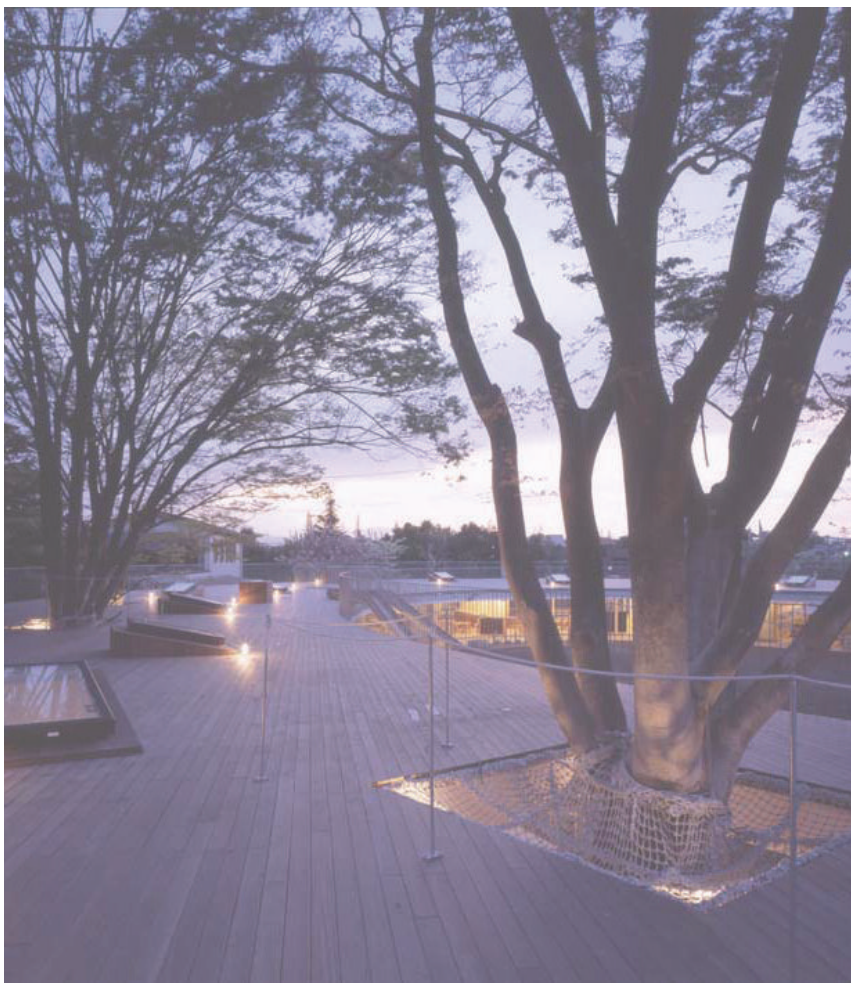
The term kindergarten signifies two ways of understanding, which has huge impact on each other; the first signifies "a garden for kids" which is a place the kids can interact with the nature. While the other understanding is "a garden of children" where they can freely grow and learn through experience.

Friedrich Frobel was one of the first to take the task up about Kids and Social imperatives. Back in the days, it was the females' job to raise their children, but in the modern times both parents can have fulltime job, which means that they have to send their children to someone else to take care of. Friedrich Frobel had an understanding of the term Kindergarten which is the one we are familiar with today:

The kindergarten was essentially tripartite:

- Toys for sedentary creative play (these Froebel called gifts andoccupations)
- Games and dances for healthy activity
- Observing and nurturing plants in a garden for stimulating awareness of the natural world - (http://www.froebel-web.org/ viewed 06.02.2015)

Kindergarten is the first step of many for a child to grown and learns to understand their surroundings. It is a place that provides with skills set which the child will shape and form on the rest of their life. It is place where the child can grow socially and emotionally. Through play and joy, the child will improve their way of thinking, recognize and use things, but also the creativity ability will improve, like painting, dancing, music, movement through interaction with others. Kindergarten is a place where the kids learn as they grow, they will develop communication skills, develop their self-confidence, learn to be creative, a place where they can through fun and games learn reading, writing.



ill. 1 Fuji Kindergarten, The Roof House

Denmark is the one of the countries in EU, which has the most amount of kids to be nursed in kindergarten, especially with kids under 3 years. compared with Germany where the amount of kids under 3 are in daycare center is 24 pct. while in Denmark is 74 pct. This shows the different understanding of how to raise the children, an ethical choice.

Another important factor is also the amount of hours the children spends in the daycare center, in Denmark is it normal for kids to spend 34 -35 hours weekly, while the parents are busy working. This means that the kids are spending most of their "awake" time in the kindergarten. This is an important factor in the design.

ill. 2 Kids room in small house by Mizuishi Architect Atelier

ill. 3 "Free Play" Kindergarten in Guntramsdorf, Austria by g.o.y.a., 2010.

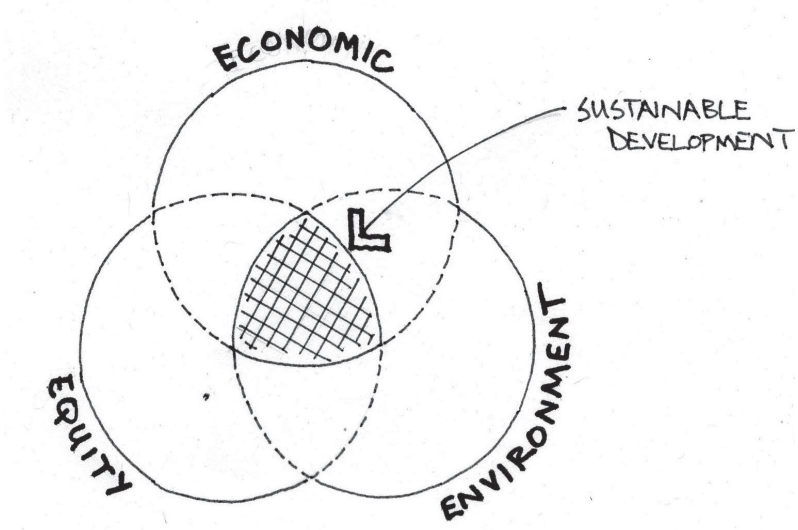
ill. 4 Open Air Kindergarten Architecture.

SUSTAINABLE ARCHITECTURE

Sustainable architecture:
There are different ideas of how obtain sustainability, but it is important to understand what sustainability is and use them as a guide towards an integrated design solution for the project. Term sustainability went from being "just a word" to an important factor in architecture and the approach to designing a new building. To narrow down the understanding of the term, The World commission on environment and development has published a report, "Our Common Future", which defines sustainability by merging the social and economic sustainability with the environmental sustainability. (http://www.environmentalmanager.org/wp-content/uploads/2011/09/Article2Morelli1.pdf)

"…if sustainability is to contribute to a better life for all, then it will be necessary to gobeyond technical fixes and begin to address profound issues of opportunity, distribution,material needs, consumption and empowerment. These questions in turn raise importantissues of social and political organization and governance "(Robinson 2004: 379) http://www.academia.edu/3678834/Social_sustainability_a_useful_theoretical_framework

Environmental sustainability:
Environmental sustainability is one of the pillars, of the total understanding of sustainability; some might say it's the most important part of the term. This part of the sustainability a large set of topics as avoiding acidification, preserving biodiversity, toxins, water shortage, recycling and saving renewable materials. To understand the climatic changes, because of the emission of greenhouse gasses, we have to look at the energy consumption in the building. This is the architects' job and has large role in how to design and affect the building in sustainable way.



ill. 1 Sustainable development

The energy consumption of the building has a vivid role to play dramatic global climate change, which means that it is important to design energy saving buildings in order to reduce the CO2 emissions. In Denmark, there is the Danish building code, which defines the amount of energy consumption for the specific building, there are three frames: BR10, BR15 and BR20. Where example in BR20: the goal is to achieve energy consumption 20kWh/y/m2.
There are two ways to do that: Step one: passive strategies, which mean that the building is isolated well, so the heat loss is minimized, avoid overheating by sun radiation ect. And fulfills the requirement of the BR(10, 15 or 20) when it is done, move to step two: active strategies, which is to apply energy producing technologies.

ill. 2 Playing kids in the nature

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" - Our Common Future (1987)

Social Sustainability
The social aspect of the sustainability has stranded in the shadow of the environmental and economic aspect of sustainability. The main reason is that social sustainability is not measureable as the environmental, which means that there is not a one true factor to compare the design with. There has been several input on what social sustainability really is. One of them is the British Joseph Rowntree Foundation, which have investigated the term social sustainability and divided in four categories:

ill. 3 Kids and sustainability

1) Amenities and social infrastructure
2) Social and cultural life
3) Voice and influence
4) Space to grow

These four elements can be further understood as: quality housing, good schools, safe environment, clean and friendly neighborhood, pre-school child care, supervision of the outdoor space and areas.

CASE STUDIES

INSPIRATION

I have made research and studies over several projects, to understand what tectonic and nordic architecture is. Furthermore to gain knowledge over how nordic kindergarten are compared to the japanese and and african. These case studies are to gain knowledge on the different types of kindergartens, the culture of how to raise kids, and to see the similarities and difference of them.

In my search for inspiration for this project, i've decided to look at two kindergartens, Fuji Kindergarten in Japan, and RÅÅ kindergarten in Sweden, these two kidnergartens has some of the qualeties i want to work with like, light, open spaces, work with the landscape.

FUJI KINDERGARTEN TOKYO

I was on a study trip to Japan, with my study, where we visited the famous Kindergarten, Fuji kindergarten in Japan. With its Oval shape is one of the biggest pre-primary institutions in Japan, which has over 600 children to care for. The design facilitate learning by doing principles, a child development based on the Montessori principles, where the children learns things through working with it, rather than hearing about it. The design uses it's space fully in the urban space, by providing secure but unrestrained space to play both on the ground floor and on the roof deck over the single storey construction. To provide safety, are there placed railings on the roof so the kids can run around freely, sit and look around with their legs hanging over the roof.

"This design is striking, in many ways spectacular, and also playful. It succeeds in combining a clear and legible form while integrating the mature trees into the building. It is a building where play and learning are intelligently nurtured, where the building is grounded in the earth and linked to the sky" - CELE jury (http://www.oecd.org/edu/innovation-education/centreforeffectivelearningenvironmentscele/48533289.pdf)

This is a traditional Japanese architecture, where the nature is invited in, and are part of the spatial quality, and with it's big courtyard gives the kids freedom to play, while providing an easy way for the teachers to watch over the kids.
The kindergarten has plenty of sunlight, great view and natural ventilation, which gives the kids good learning environment.

"We've created an environment that allows children to play all around the building, with playground equipment made of natural trees and a slide that connects the roof and the yard. At the playground there are zelkova trees to

ill. 1 Open Classes Fuji Kindergraten, Japan

ill. 2 Fuji Kindergarten, Birdview, Kids playing on the roof

climb, a large sandbox and other elements for play. Children look around the whole kindergarten from the rooftop and then decide where to play, which fosters their ability to make their own choices" - Principal's Opinion (https://www.nier.go.jp/shisetsu/pdf/e-kinder.pdf)

Site area: 4791.69 m2

Building area:1419.25 m2

Total floor area: 1304.01 m2

No. of classes:19

No. of children:620

ill. 3 Kids playing on the roof, where a tree are sticking through the construction.

RÅÅ DAY CARE CENTER / HELSINGBORG, SWEDEN / 2013

Råå day care, is a kindergarten built between the beach and the old fishing town Råå, the kindergarten itself is in direct connection to the local school, which gives an easier transmission from kindergarten to school for the children. The shape of the building provides with a lot of daylight which create interesting space inside the building for the children

"The skill the architect has demonstrated in giving shape to the needs of the users with great integrity and responsiveness - in a way that raises the bar for the contemporary architecture of Skåne. And the care for details and the workmanship that, with respect for the architectural form, characterizes the construction of the Day Care Center." - (http://www.dortemandrup.dk/raa-day-care-center-helsingborg-sweden-2013)

This award winning project contains four groups of children, and every group is provided with their own room, which identify themselves in the facades with a pitched roof. In between the pitched roofs are the common spaces.

The big glazing in the facades and the shape of the building creates close contact with its surroundings, and provides with great daylight, both from the facades as well as the pitched roofs

ill. 1 råå day care center / helsingborg, sweden / 2013

ill. 2 råå day care center playing kids/ helsingborg, sweden / 2013 2013

ill. 3 råå day care center / helsingborg, sweden / 2013

Project: New construction

Client: Helsingborgs Stad

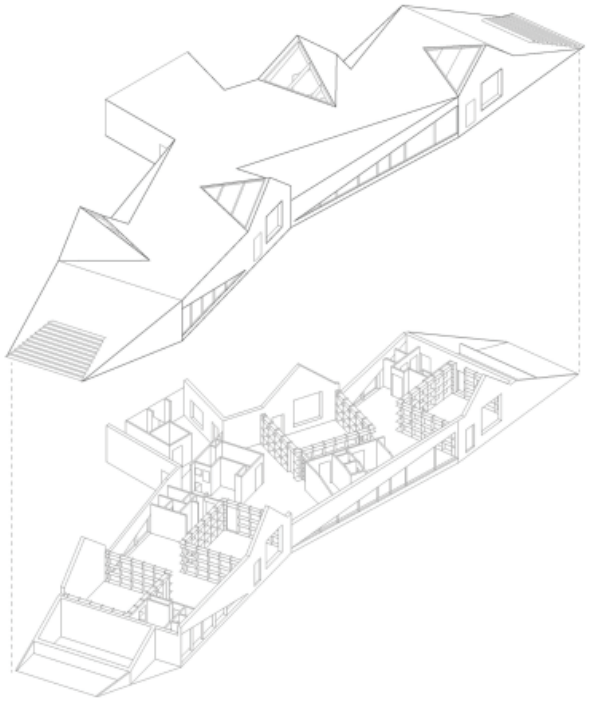
Size: 525 m^2

Engineers: Tyréns AB & Ramböll Sverige AB

Landscape: Marklaget AB

Status: Inaugurated august 2013

Photographer: Adam Mørk
Adress: Elektrogatan 1, Råå



ill. 4 råå day care center / helsingborg, sweden / 2013 pitched roofs and space inside

INSPIRATIONS

ill. 1 Architecture Projects Subsecretary, Barranquitas South Municipal Kindergarten

ill. 2Kindergarten 8 Units: Spain

ill. 3 Segrt Hlapic Kindergarten: Zagreb, Croatia

ill. 4 Neufeld an der Leitha Kindergarten: Leitha, Austria

ill. 5 Instant House @ School Winning Proposal / B² Architecture

ill. 6 Fuji Kindergarten, Japan

Fuji Kindergarten, Japan

ill. 8 Kindergarten Sighartstein

ill. 9 Fagerborg kindergarten, Oslo

ill. 10 'Design Kindergarten' by CEBRA, Kolding

ill. 11 JSRACS KINDERGARTEN, Australien

ill. 12 Farming Kindergarten

SITE ANALYSIS

AALBORG KLARUP

Klarup is a small community of with 4,640 inhabitants in the urban area, located 11 km east of Aalborg center and 5 km east of Aalborg University. The city is located in North Denmark Region and belongs to the municipality of Aalborg.

REGIONAL ANALYSIS

The site is on the east Aalborg within Aalborg kommune. it is in a suburban area with a lot villas and vegetations, which make the site a safe and peaceful area. The site has a good connection to Aalborg Centrum, with only 11 km from site to centrum makes it bike friendly distance, but there also busses if public transportation is preferred.

WHERE IS KLARUP?

The map below shows where the area is located in North Jutland, the two big Square defines Aalborg and Klarup. The blue square defineds Aalborg centrum, while the red square defines klarup, the little square within the red one is the site.

To get the atmosphere of the site, and what it around it, a serial vision is made where the rute it mapped out. 6 pictures has been taken, and each area where the picture is taken from has been noted in the rute. Starting from the main road, Klarupvej and moving op towards Septembervej and ending the serial vision Majvænget. This tells the story of how to arrive to the site and from which direction one can come and leave, the green areas, the small predastrian/ bike roads ect. This is a site where there is heavy

ill.1-6 serial vision of the kindergarten in the region

1

2

3

4

5

6

LOCAL INFRASTRUCTURE

There is a big road, for busses and cars which is north for the site, this is the main road to come and leave the site. West for the site is a predastrian and bike path which saperated from the main road.

- bus stop
- project area
- pedestrian-bycicle roads
- vehicle

LOCAL VEGETATION

There is a lot of vetigation in the area, as marked in the map. west for the area is a big green field for outdoor activeties which can be used by the kindergarten if wanted.

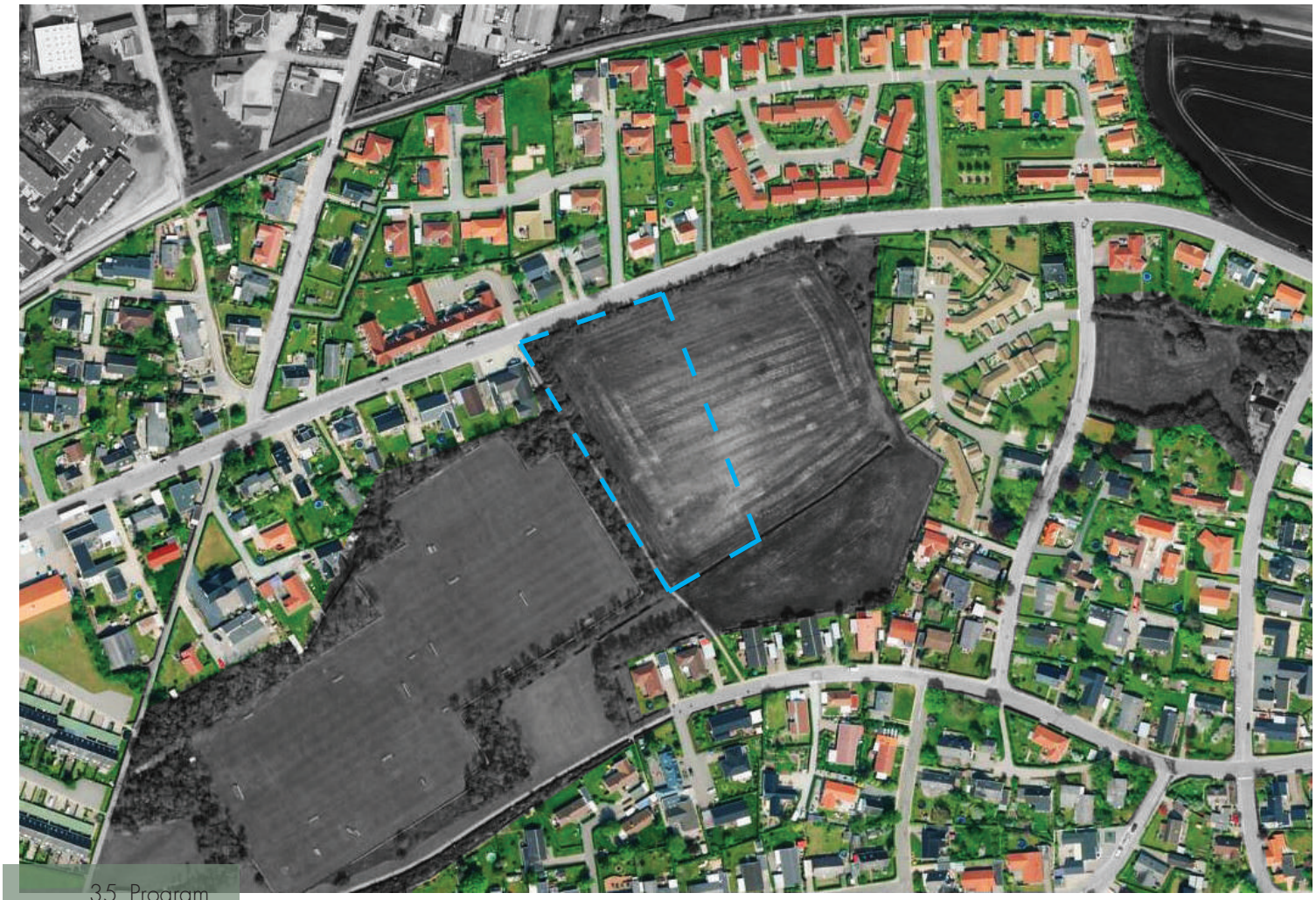
project area

Vegetation

LOCAL SETTLEMENTS

Southeast for the site is villa houses, which can been seen in the map, while there in the west side is a football fields and Klarup sports hall. Northwest for the area is a small grocery store, fakta.
Towards the North for the site, are the more housing complexes.

project area

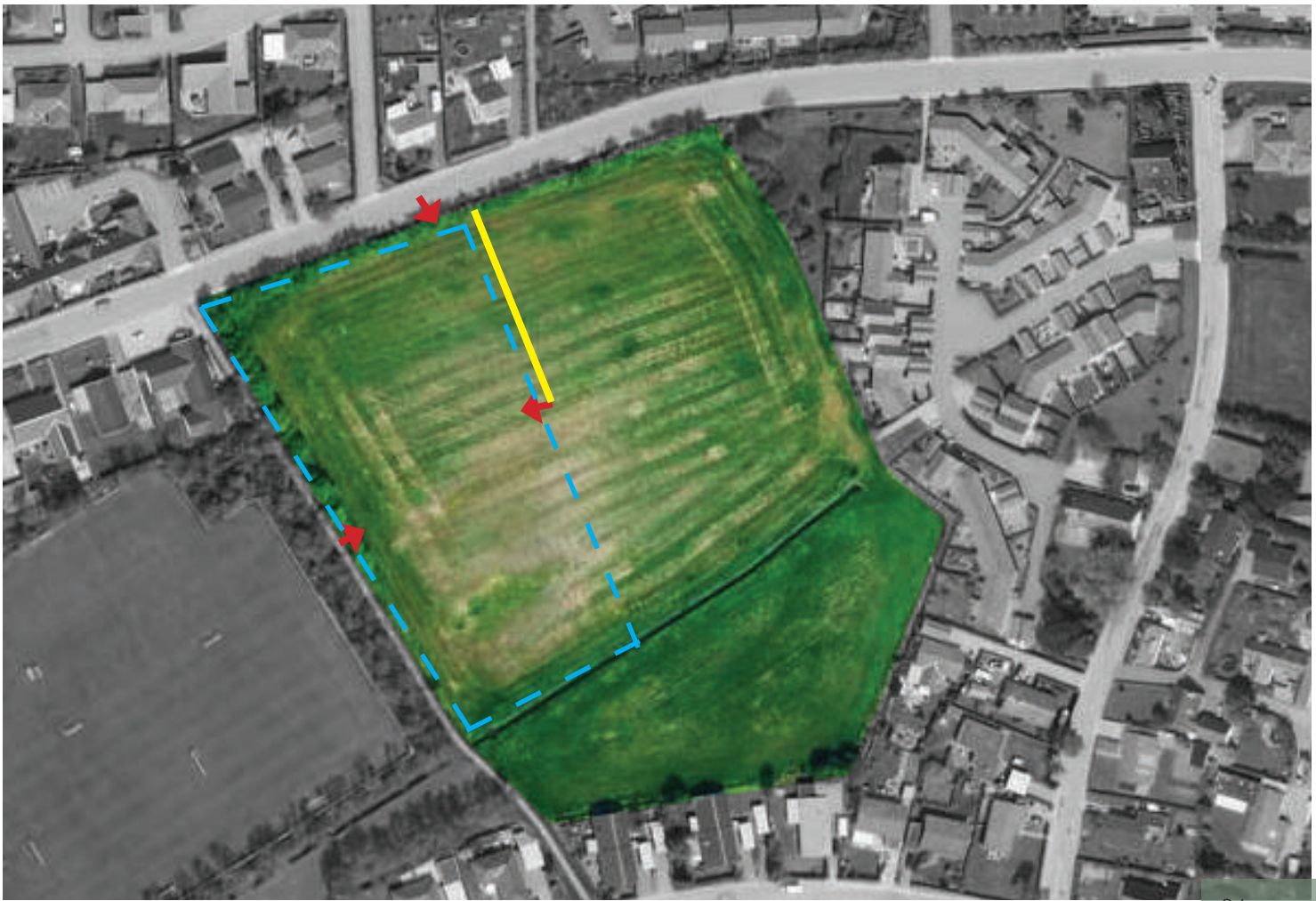


SITE ACCESS

As it is now there are two places from you can enter the site, one is from the Klarupvej, north for the site, which is perfect for those in cars and busses. The other one is from the pedestrian or on bike, which is a little path west for the site.

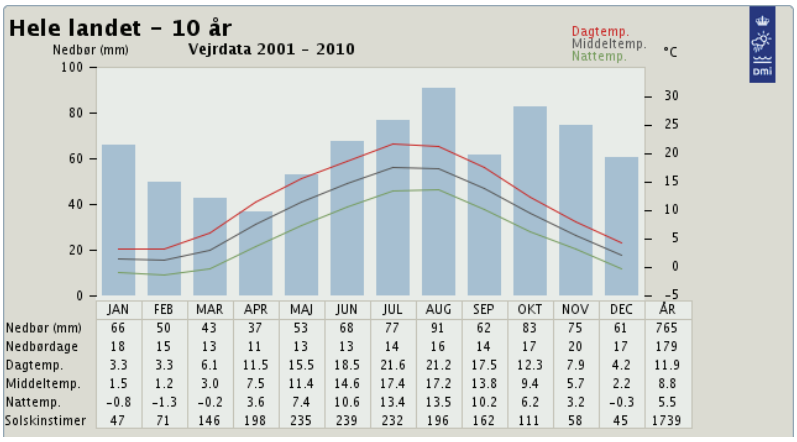
In the future plan made by Aalborg cummone, there will be another access path to the area. the yellow line defines the path, and there will be a parking spot for the kindergarten north for the site.

project area



CLIMATE

The climate plays a big role in how to design the building, and the amount of isolation need to achieve thermal comfort.the average temperature in Aalborg is 7-8 celcius. The figure below shows the temperature for the day, a middle and a night temperature. Where the red curve is the day temperature the blue one the middle temperature and the green for the night temperature

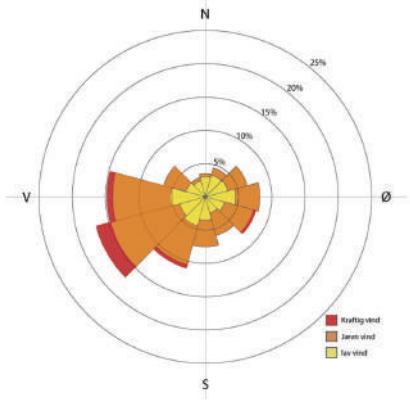


	JAN	FEB	MAR	APR	MAJ	JUN	JUL	AUG	SEP	OKT	NOV	DEC	ÅR
Nedbør (mm)	66	50	43	37	53	68	77	91	62	83	75	61	765
Nedbørdage	18	15	13	11	13	13	14	16	14	17	20	17	179
Dagtemp.	3.3	3.3	6.1	11.5	15.5	18.5	21.6	21.2	17.5	12.3	7.9	4.2	11.9
Middeltemp.	1.5	1.2	3.0	7.5	11.4	14.6	17.4	17.2	13.8	9.4	5.7	2.2	8.8
Nattemp.	-0.8	-1.3	-0.2	3.6	7.4	10.6	13.4	13.5	10.2	6.2	3.2	-0.3	5.5
Solskinstimer	47	71	146	198	235	239	232	196	162	111	58	45	1739

ill1. Climate in Danmark

WIND PATTERNS

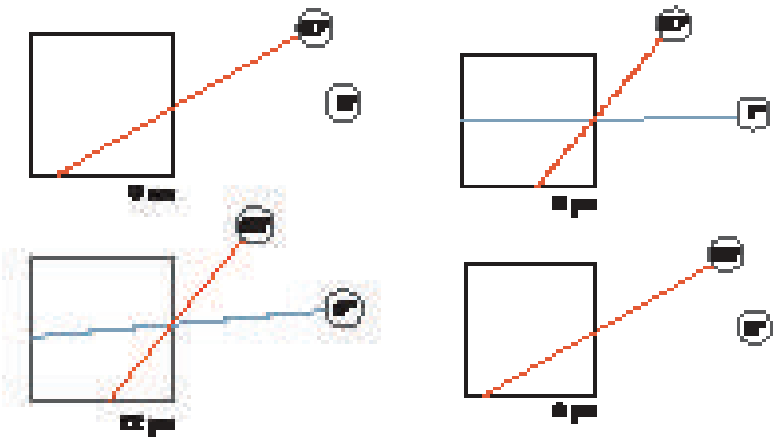
The wind conditions, in the area is important factor to take in for consideration, as you can see on the windrose, comes the strong wind from west. All throygh the west ind has some obticals, can the quality be to utilize in the passive strategies, when it comes to natural ventilation. The west wind has to be taken in for account to give the kindergarten good outdoor spaces



ill. 1 Wind rose Aalborg

SITE SUN PATH

Climate analysis is crucial for the project, to understand the extreme sunlight change from winter to summer. There are in the winter period a low sun angle which provides with a little sunlight and long shadows, in a very short amount of time, while in the summer are the complete opposite, with a high sun angle and long hours with sunlight.



summer sun

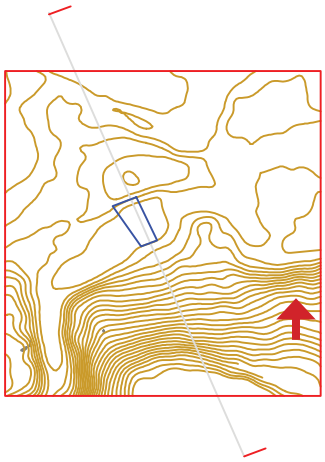
winter sun

spring and autumn

ill.3 Diagram of the solar radiation angle over the year

SITE SECTIONS

To understand the site, it's important to see the different heights in the terrain, the site is in this section marked in the white box. As you can see, is the specific site flat, but has a raises op towards sourth



PROBLEM FORMULATION

FORMULATING QUESTIONS

Through the analysis and research i have made earlier, do i have some problems i would like to address to optimise my propose to Aau and Aalborg commune of designing a Kindergarten in Aalborg east - Klarup.

How to draw the nature, and invite it into the building, and let it be a spatial quality which can give the kids something to play with but also part of the structure.

How to create a tectonic space, where the children are protected from the everyday noise and provide them with good learning environment.

How to create a tectonic but sustainable kindergarten, which can provide the same qualities for the next generation

DESIGN PARAMETERS

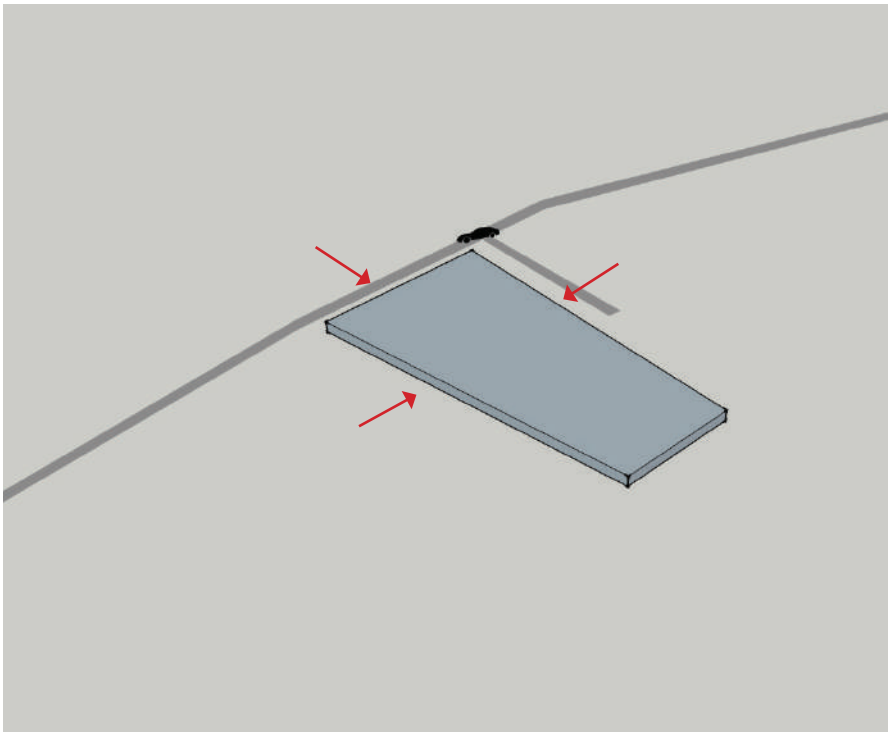
The diagrams shown to the right side shows the initial design parameters, i would like to work with,

Accessibility is very important for the project, because i want the parents to easily come with their kids to the kindergarten and go for work or. and there will be some busy days where the parents are late for work etc.

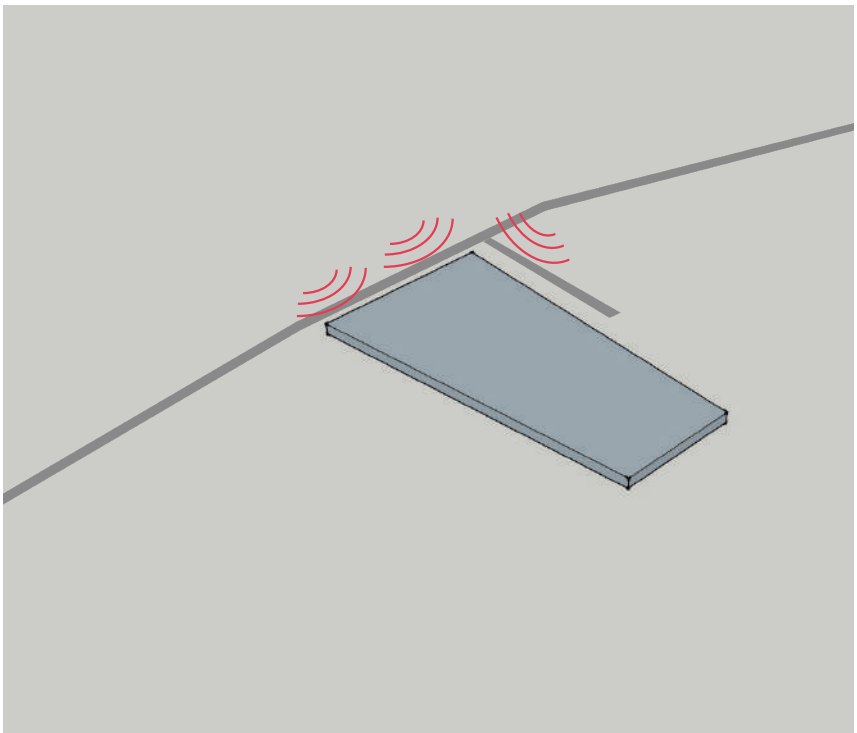
Because it is kids I'm working , I've decided to filter the traffic noise from the kids. By having the parking lot north and the playground south.

Sunlight is a very important factor for the spatial quality and the learning environment. Therefore am i working with a building which will allow as much sunlight as possible.

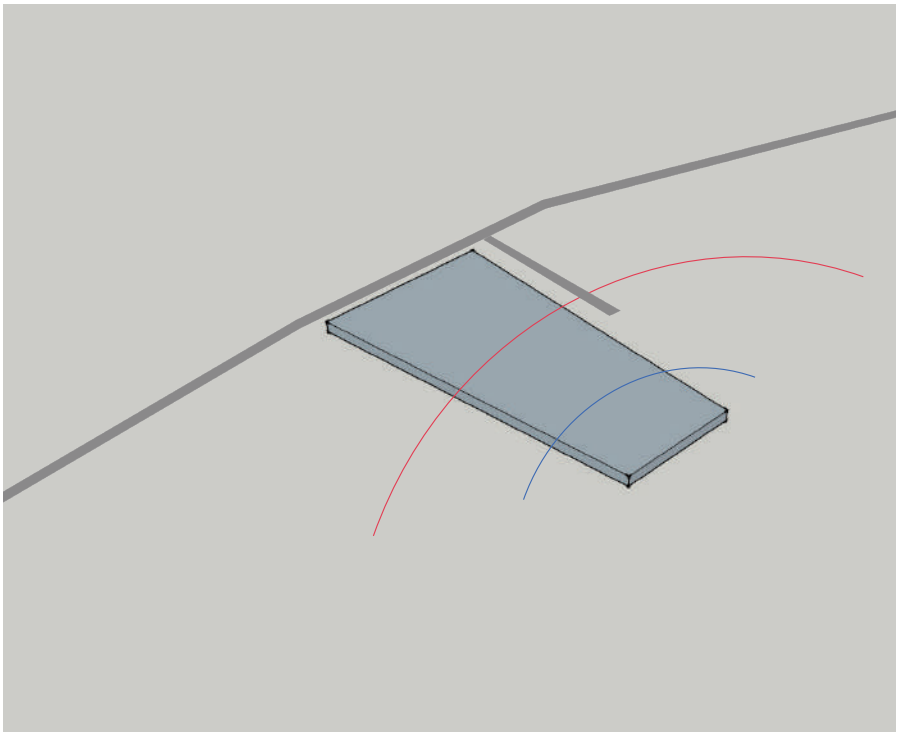
The west wind is also a factor i would like to work with when i'm designing my outdoor space, where the kids can play free



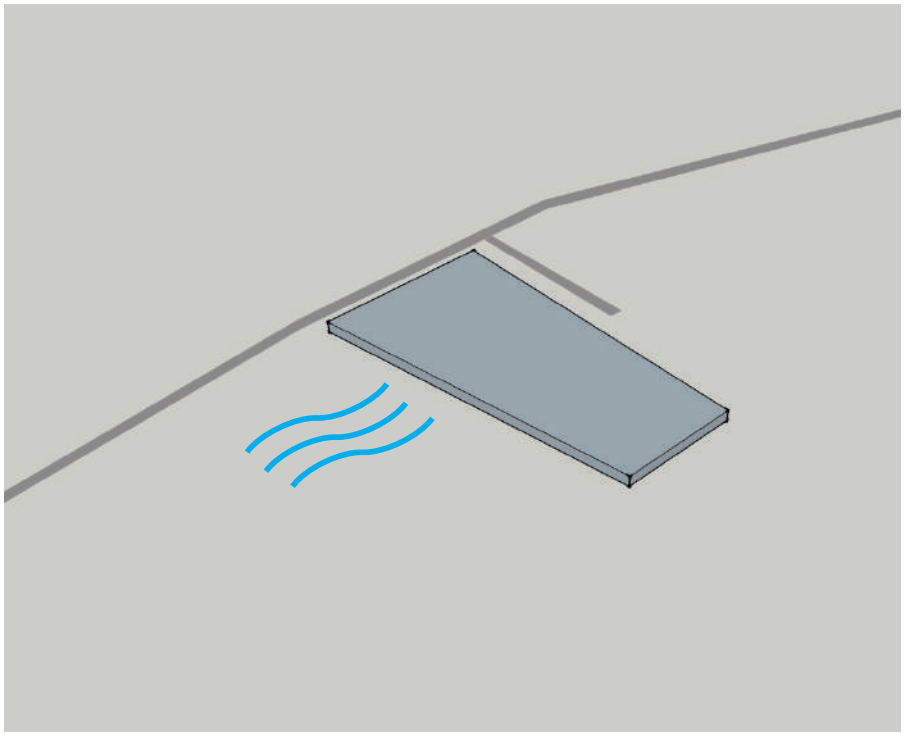
ill.1 Accessibility



ill.2 traffoc noice



ill.3 Sun path



ill.4 Wind

SUMMARY OF ANALYSIS

Taking all the analysis and research made earlier, have I come to a conclusion for the project: The kindergarten must be integrated in the site and use its qualities, by means that is shall stay humble and honest in its form and shape. Is has to create a space for the kids to grow without interference from the outside world, provide them with the opportunity to grow freely but safely. The final product must be honest throughout every aspect. Furthermore has it to be sustainable, in the matter of environmental and social, which will be the main focus point in this project.

ROOM PROGRAM

A kindergarten contains different types of rooms; by enlighten the needs of these rooms, by light and view, the size and amount of them get a well-functioning kindergarten. This program divides the rooms in three categories, Kids rooms where the different functions that is for kids is illuminated, Staff rooms where the staff is in focus and secondary area. To gain a fluent flow in the building the positioning of the different rooms has a big role to play.

CATEGORY	PROGRAMME	QUANTITY	SIZE m^2	LIGHT	VIEW
	Group room	*6*	*210*	■	■
	Aktivity room	*2*	*-*	■	■
	Sleep/rest room	*2*	*30*	■	
Kids functions	*Multiroom*	*1*	*28*	■	■
	Common space	*1*	*-*	■	■
	WC	*2*	*30*		
	Wardrobe	*2*	*-*	■	■
	Staff room	*1*	*38*	■	■
	Office	*1*	*16*	■	■
Staff functions	*Staff WC*	*2*	*8*		
	HC - WC	*1*	*6*		
	Kitchen	*1*	*45*	■	■
	Technical room	*1*	*13*		
Secoundary functions	*Storage*	*1*	*10*		
	Guest wc	*2*	*8*		
	HC - WC	*1*	*6*		

ill.1 Room program

VISION

STATEMENT

A KINDERGARTEN WHERE KIDS CAN GROW FREELY IN A SAFE ENVIROMENT, WHICH GIVES GOOD LEARNING AND PLAYING FACILITIES. A TECTONIC KINDERGARTEN WHERE SUSTAINABILITY IS PART OF THE KEY ELEMENT FOR THE DESIGN

A SPACE TO GROW FREELY WITHOUT INTERFERENCE FROM THE OUTSIDE WORLD

CONCEPT

DESIGN FORMULATION

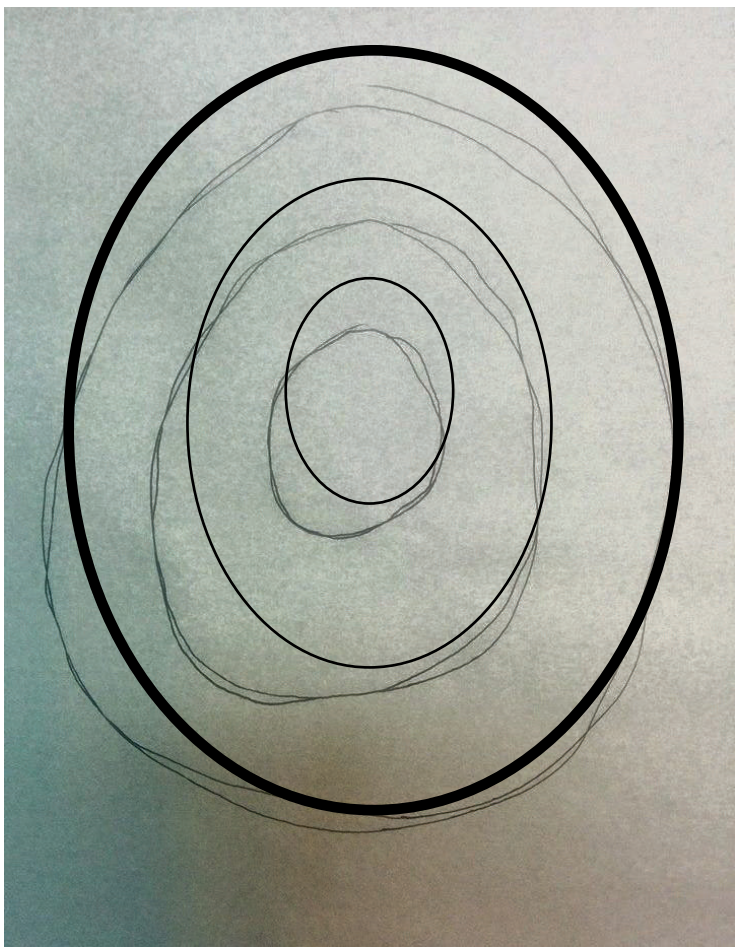
For my overall proposed design of kindergarten in Klarup, will I use the design parameters, site and subject analysis and formulate a concept which can provide the qualities wanted in a kindergarten. I will use the room program and explore the connection. Will separate them into four categories, where I look at the light and atmosphere, which rooms shall be provided with natural light, diffused light, filtered/play with light, and the space weather is should be casual/closed or open/sheared

Furthermore are the connections and placement of the different rooms investigated, because it is important for the movement and flow in the kindergarten, and define which areas are sheared and which are not. Therefore are the rooms divided based on which functions they have and what types/age of kids the rooms are for.

THE EGG

The story of the egg is a concept which illuminates the relationship between the three main elements in eggs and projects it in architecture. The three elements which is taken is, the shell, the white and the yolk. The shell works as a protector and with its "hard" shell provides safety for the white and the yolk. This idea of the shell can be understood as the building, which provides shelter and safety for the users. The white which comes in the next layer is the pedagogue, which provides for the kids, and their responsibility for kids growth. As the white in egg is to provide for the yolk, has the pedagogues the responsibility provide for the kids. The last layer is the yolk which is the center and focus point. It is dependent and needs the white; this can be reflected to the kids, where they need the help and guidance from the pedagogue as they grow older and become more and more independent.

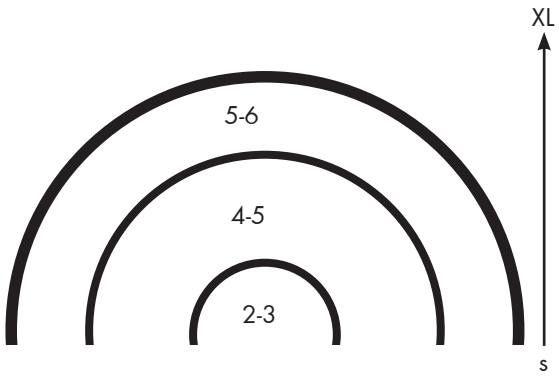
The concept of the egg shell can be further investigated in the materiality as well, where the shell illustrates heavy and protective material. Where the exterior material articulates hard and protective while the interior material articulate soft
t.



SMALL TO XL

From s-XL is a concept which further development from the egg concept, where the small illustrates the e the smallest group of kids in the age of 2-3, the medium as the group of kids in the age of 4-5, the large as the 5-6 years old and the XL is when the child is ready to leave the kindergarten to start school. The connection between the different sizes tells a story of hierarchy

This provides the opportunity to create different size dayrooms, and make the dayrooms increase in size as the kids grow, which makes it a room that grows with kids.



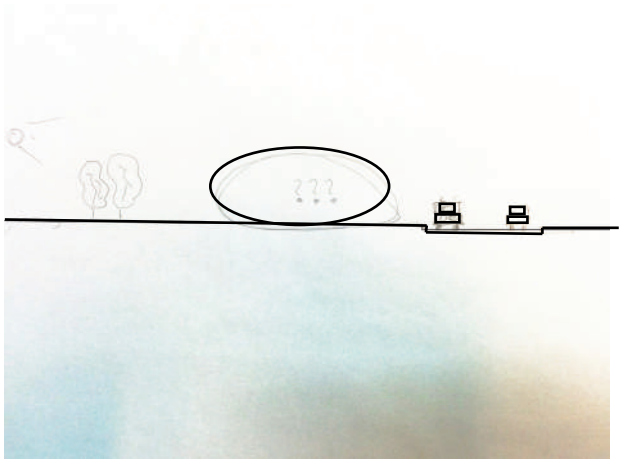
In my understanding, is it more comfortable for kids at the age of 2-3 to be in a more intimate and small rooms, where they can get more attention from the pedagogue, and have the right amount of space to grow and learn how to connect and interact with other kids.

The Egg is the overall concept and the s-xL is the process the kids go though before they hatch out of the egg.

DESIGN PROCESS

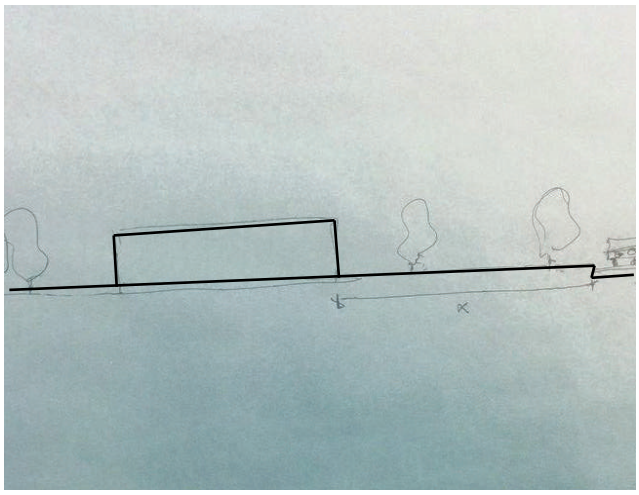
The main design parameter for this project were safety and freedom to grow, finding the right balance between these two can provide the right learning environment for the kids. In between the design are parameters are light and flow also investigated.

The main road is towards north, and a green space towards south. To provide more safety did i make the openings towards the south, but also to gain as much daylight in the rooms. Furthermore are there made parking lot between the main road and the kindergarten building, which means bigger distance to the main road.

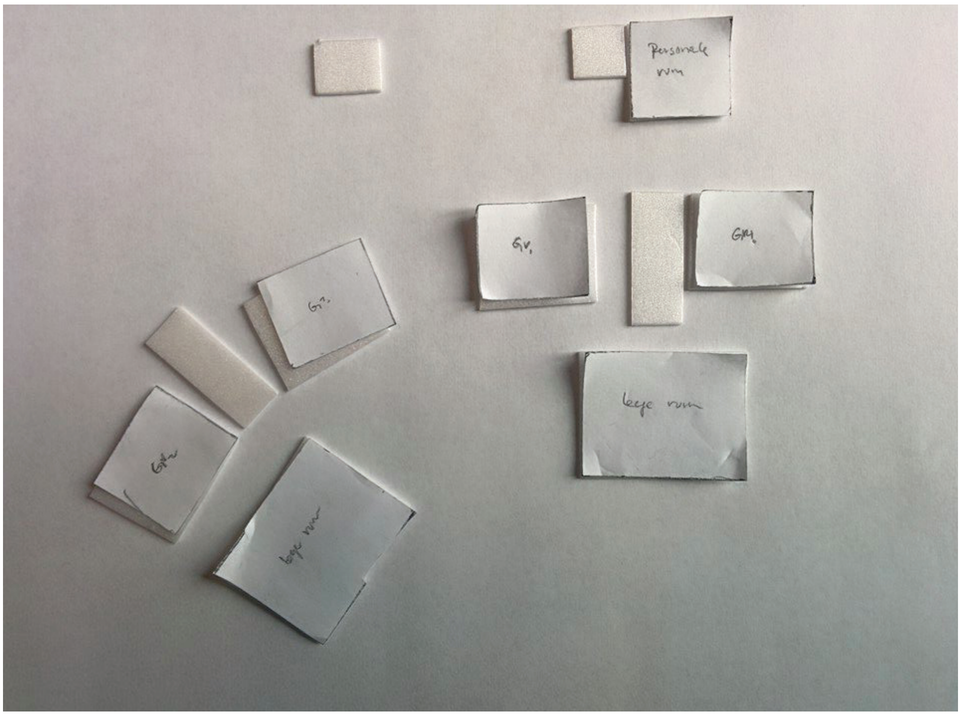


The rectangular shape is then further investigated, by looking at the movement and flow inside the building, and the appearance on the outside.

The round shape was more appealing to the eye, because of it no edge "shape" When you meet the building from the north. The idea is, to make a whole circle, where the "half" of the circle is the building, and the other half is the outdoor play area.



The two shapes fulfill the wished parameters for safety and freedom, by sheltering for the main road, and opening towards the south side. They also fulfill the light and view parameters. Where they get good amount of light from south and have the view towards the green area in south. The reason the half circle shape is taken, is because of the movement it creates, by having the half circle you have a continuous movement, where you can experience the building by moving with its shape. By having no corners also gives the visual satisfaction of a continuous building.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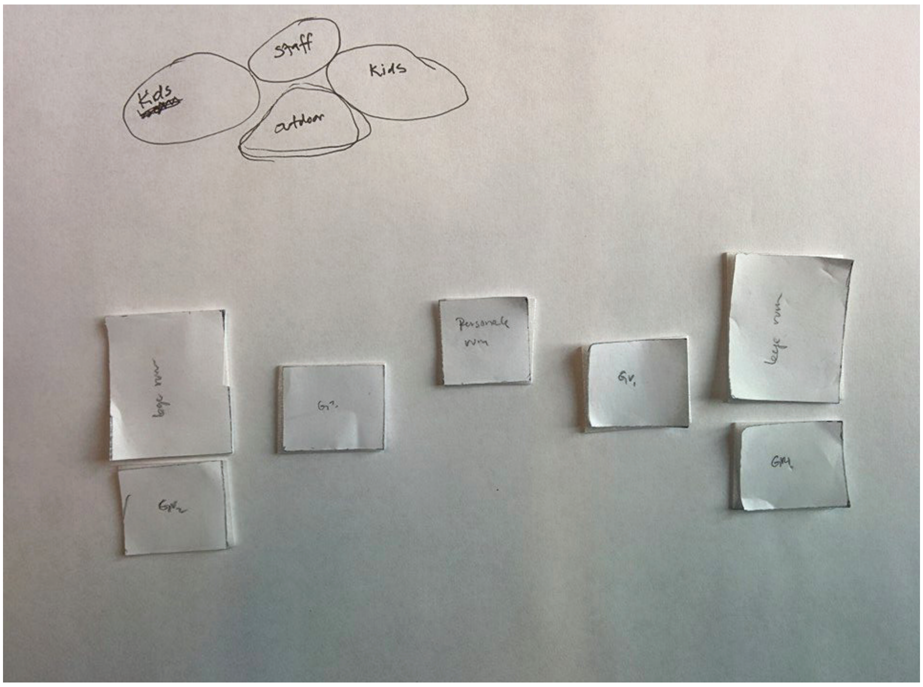
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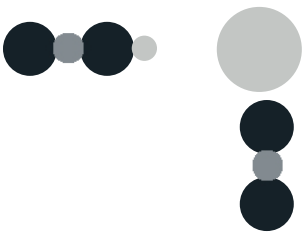
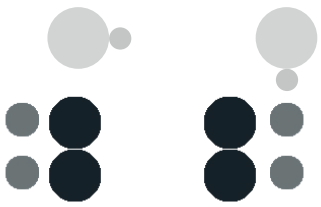
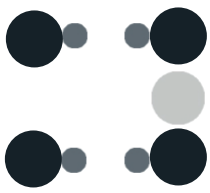
ROOM PLACEMENT



Leyout 1



Leyout 2



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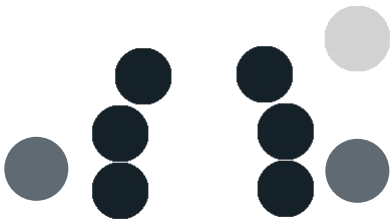
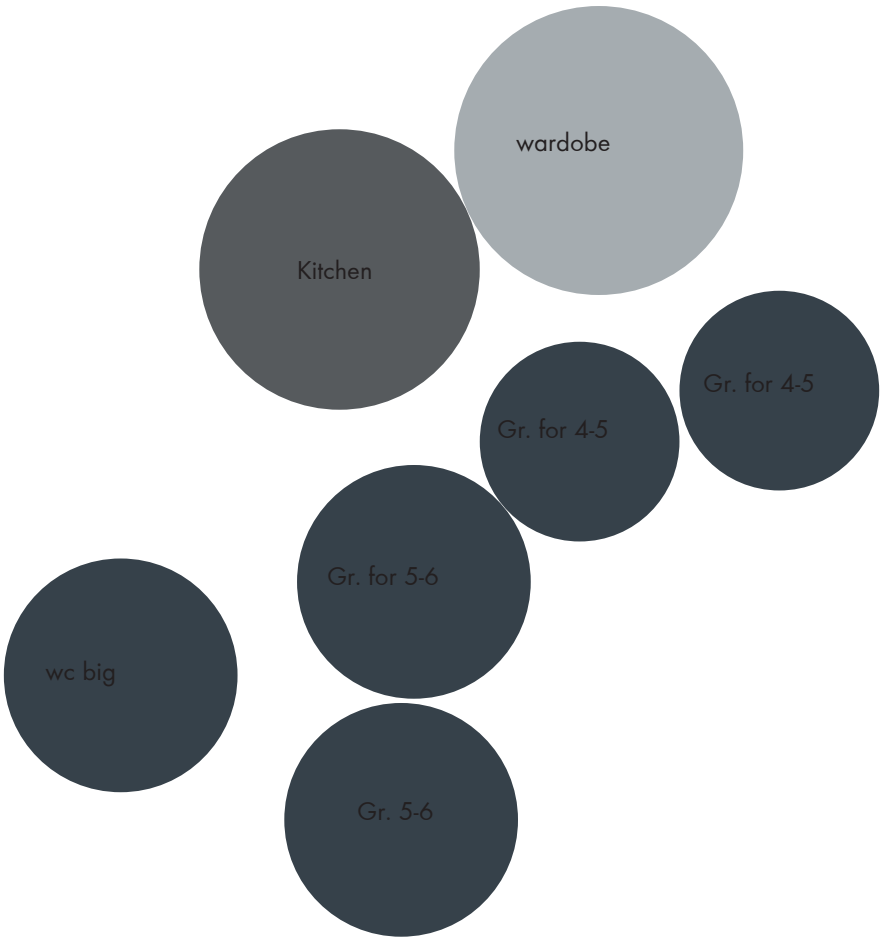
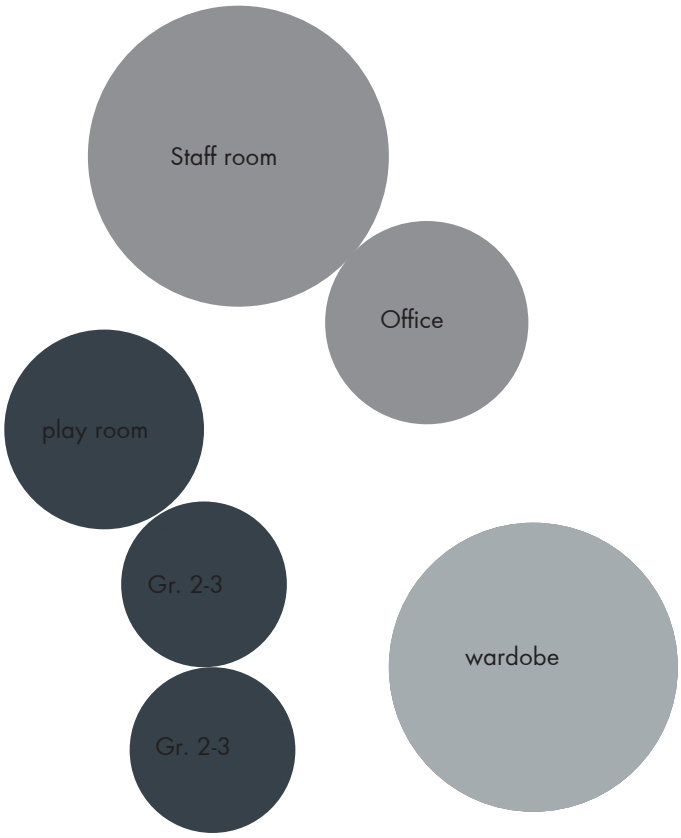


Leyout 4



Leyout 5

There has been different placement of the rooms inside the building. I've made five different ways to place the rooms.



The last one is the one which fulfills the concept which is developed simultaneously by having this type of room placement; the kids will always be in focus "in the center" this give, more focus on the kids, and more safety. But is also gives the kids the right amount of freedom, so they don't feel like they are locked in. All the rooms were the kids are, have a view towards south, which will give them a good learning environment, but also the give them the opportunity to choose whether they want to play inside or outside, and they can always see what is going on outside. I've placed all the "Adult" rooms towards north, because this is where the parking lot and the main entrance are. They have view outside to the parking. The other idea of small to xL is taken in for the room placement,

by translating this concept to a building I've divided the children in 3 groups, where each group have two group rooms. Kids in the age of 2-3 have two separated group rooms of 24 m2 . Kids in the age of 4-5 have bigger rooms, 36 m2 x2 and the last group is 5-6 and have the biggest rooms, 42 m2. x2

DAYROOMS

The dayroom is the room where the kids will spend most of their time at the kindergarten, which means that the rooms have to be comfortable to be in. The first step towards that was to give the room at much daylight as possible without overheating and gain blinding sunlight. Therefore are they placed towards south, by placing the dayrooms towards south also shelters the kids from the visual noise from the main road and parking.
The dayrooms are divided in six rooms, where the age from 2-3 have two small rooms, from 4-5 has a bigger room, and from 5-6+ has the biggest dayrooms. This is based on a discussion with my supervisor Mogens Fill, where the discussion was about how kids play in groups. Kids in the age of 2-3 want to play alone or with one more, where kids in the age of 5-6 like to play in groups. This means that they demand more space. But also placing few kids in a small room means better overview for the pedagogue. And as they grow the group rooms increase in size and grow with them.

The small dayrooms:

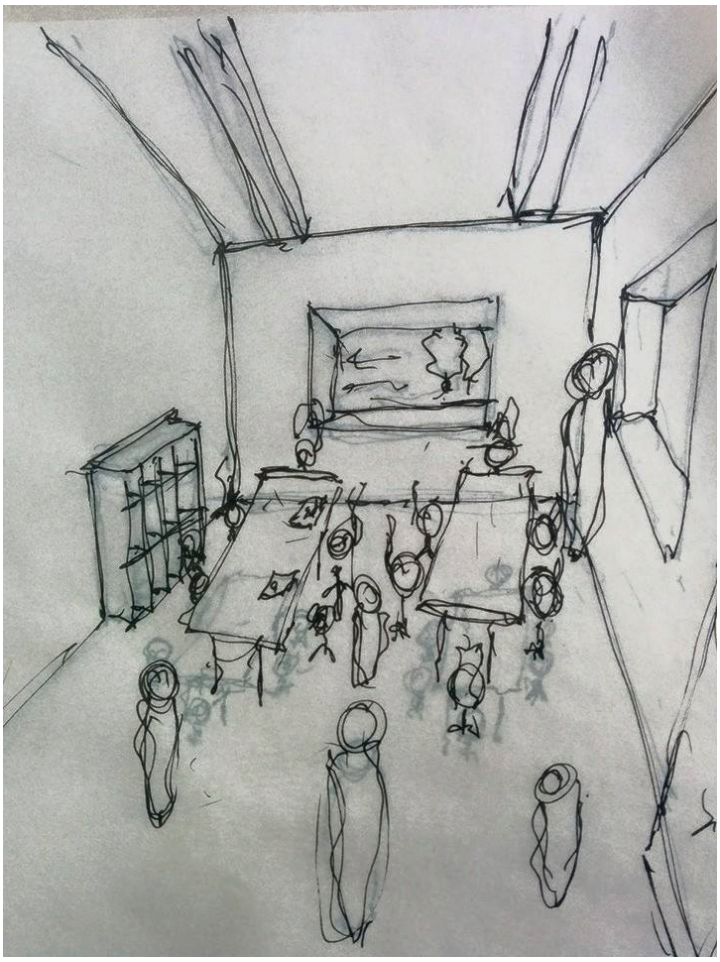
As it is their first step towards the society, can it be hard to go from being with your mother to stranger, this feeling of being surrounded by strangers can be overwhelming for kids in the first two or three days, and has to have a space to get use to the change. By providing those with smaller rooms, where they are more intimate and gain more attention from the pedagogue is a good way of letting the kids take their first step with comfort. There is two rooms of 25 m2 and each room can fit 12 kids and two or three pedagogue. Furthermore does each of the rooms have their own toilets and nap room. Kids in 2-3 shall have rest room connected to their dayroom, so they can have midday nap without disruptions from the other kids. Furthermore do they have their own wardrobes and toilets where they can in comfort use.

The medium rooms

ill. 1http://ad009cdnb.archdaily.net/wp-content/uploads/2009/01/498673511_interior-2.jpg

ill. 2 http://prifx.net/wp-content/uploads/2012/10/Colorful-Wall-Stickers-Decoration-for-Preschool-Kindergarten-Classroom-Decorating-Design-Ideas.jpg

ill. 3 http://ad009cdnb.archdaily.net/wp-content/uploads/2011/08/1314739108-solid-032-i-7657-kuku-1000x666.jpg



When the child is four years they move over to this room, which is bit bigger than the small one, where the size of the dayroom is 36 m2. The child doesn't see the other kids as strangers but familiar faces at this time, and have gained more friends. The reason this room is bigger is that the kids are less dependent and can do more things alone or with other kids. The beauty is that the kids learn to interact with more and more kids as they grow. The changes are that the nap room, the "private" wardrobe and toilet is removed, and they are shearing the space with the other kids (the oldest one) this is also a method to learn the child to interact and shear with others.

The Large rooms

The concept for the large dayrooms are the same as the medium, but bigger, where the medium dayrooms where 36 m2 it the large dayrooms 45 m2. They shear the wardrobe and toilets with the others.

Dayrooms.

Each room has skylight, to maximize the daylight, and provide the opportunity to ventilate through there. Furthermore can every dayroom see what is going on in the center of the courtyard so the kids can decide whether they want to go out and play or stay indoors. Every dayroom fulfills the standard requirement of 2m2 pr. child which provides them with enough space to play and learn. http://bygningsreglementet.dk/br10_04_id62/0/42

INDOOR CLIMATE

The indoor climate has been investigated in B-sim, where there has been different simulation, like the size of the window, placement, different types of ventilation, weather to have mechanical or natural or hybrid ventilation, shading or not shading, the indoor temperature.
I've taken the most critical room in matter of overheating, and used it as an example of how to avoid overheating and bad air change.

The size of the room is 43 m2, where there are 20 kids inside the room plus pedagogues, the room is getting the sun from two windows plus the skylight. One of the windows is facing south while the other one is facing east.

OVERHEATING

There will easily come overheating in this type of room, and to avoid it, is the roof used as shading where there is an overhang of 1 meter, plus shading in the windows.

VENTILATION

Furthermore can natural ventilation be used so the hot air can be replaced with a fresh one.
There is mechanical ventilation in every dayroom, which has both insufflations and extractions, to avoid CO2 level inside the rooms can be kept at minimum, which means that it is not allowed to excide 2000 ppm for a longer period then 15-20 minutes.

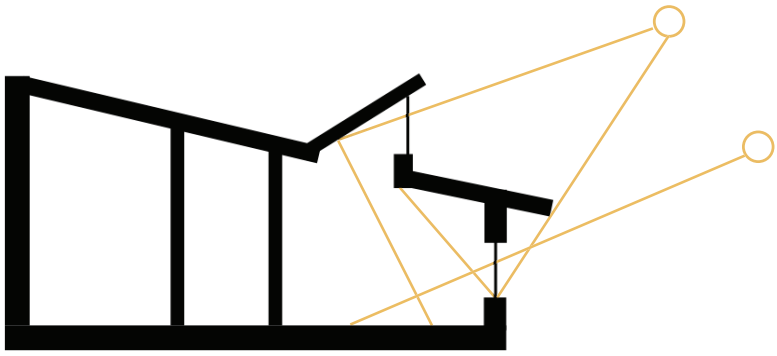


Fig 1.70

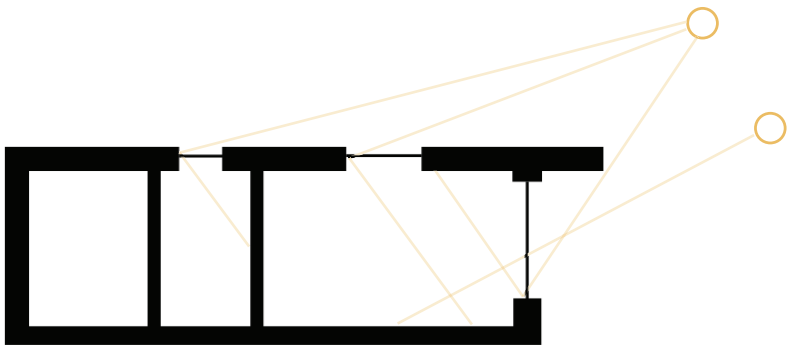


Fig 2.70

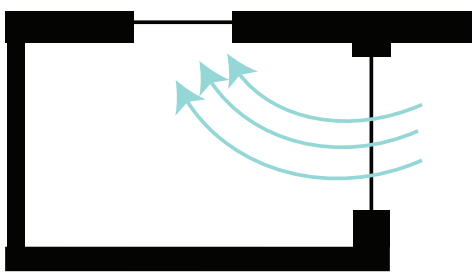
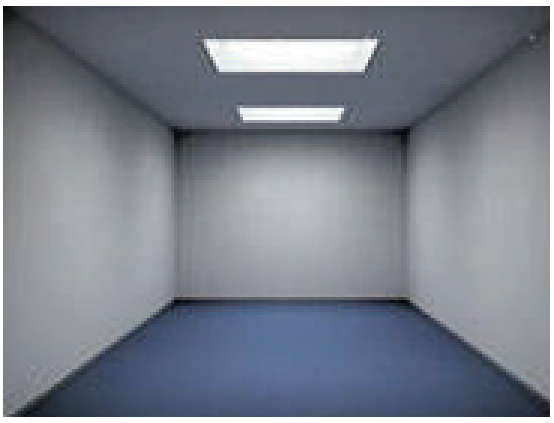
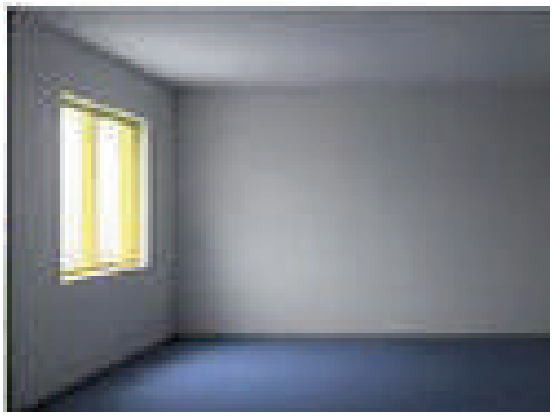


Fig 3.70



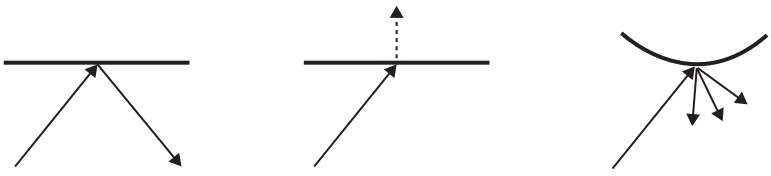


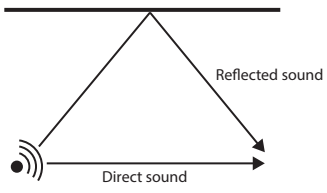
LIGHT

The daylight factor plays a big role in the experience in the room, to create a satisfying rooms for the kids and staff, is a good amount of daylight important different types of room. Daylight must not be less than 2% when cloudy sky with 10,000 lux. But daylight factor effects of several parameters which each play a role in how much lux coming into the room, it could be, for example, window shape, reflectance, room depth, vegetation and buildings round. Here is an example of how to let the light inside the building, and what it brings to rooms spatial quality

ACOUSTIC

The acoustic in the room is important for the learning and the overall quality of the room. To provide the right reverberation time, is the materiality chosen with care. The diagram to the left shows how the sound reacts when it meets a surface.





OUTDOOR SPACE

This part is about the connection between the interior and exterior of the kindergarten, which has almost equal amount of importance. The first thing that comes to mind when talking about outdoor space for kids is safety, and to provide the right amount of safety for the kids, the outdoor area has to be encircled. The interesting part is to find the right balance between safety and freedom. When is the kindergarten too safe? How much "danger" can the kindergarten allow?

Fig 1 shows a brainstorm of what the outdoor space shall provide t for the kindergarten.

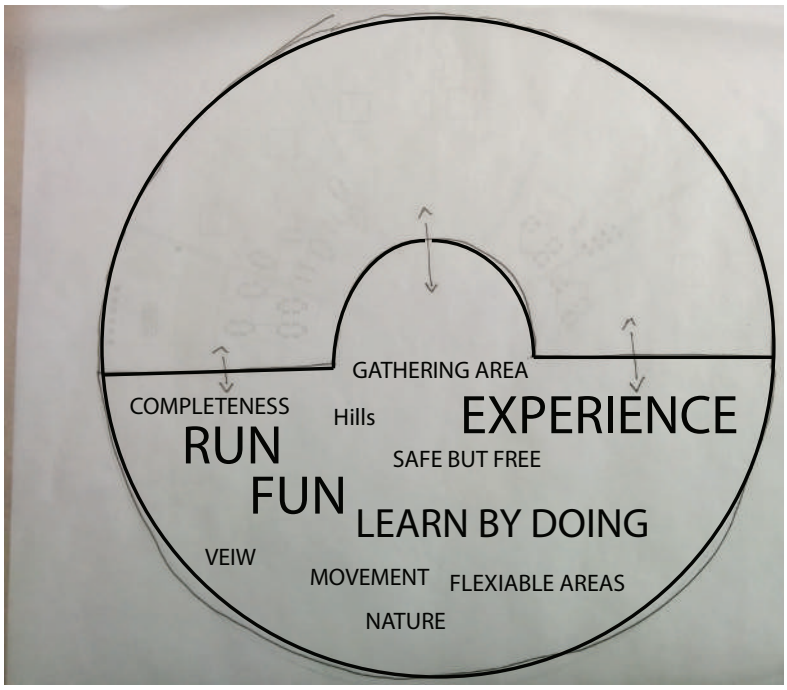
The first step is what the footprint of the outdoor space is, because of the half circle building shape, is the obvious choice to continuing the half circle to a complete circle.

Movement and Experience: Kids have big imagination, and providing them with the tools to tell the stories is a great ways of letting the creativity lose. While straight line is seen as destination A to B path, is the curved one associated with experience. Therefore is it wished to create a curved path where the kids can run around or drive moon cars or bikes.

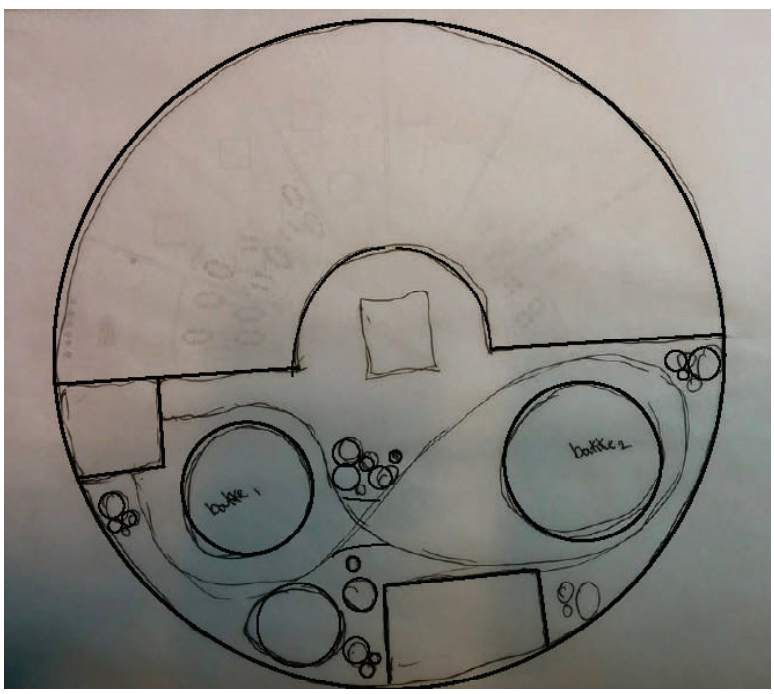
Learn by playing:
The concept of leaning while playing is a way of teaching the kids how to interact with other kids, but also learn from their mistakes.

Nature:
Be surrounded by nature, is a good learning environment, where the kids are sheltered from the noise everyday life outside. This gives the kids the right environment to grow in.

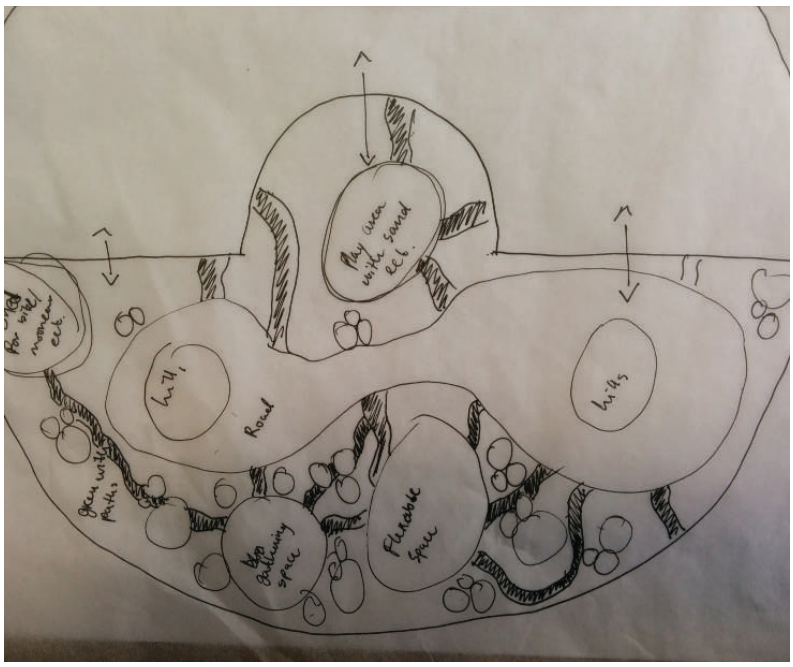
The secondary functions as flexible areas and gathering space, is also a quality which can be come in handy for the kindergarten.



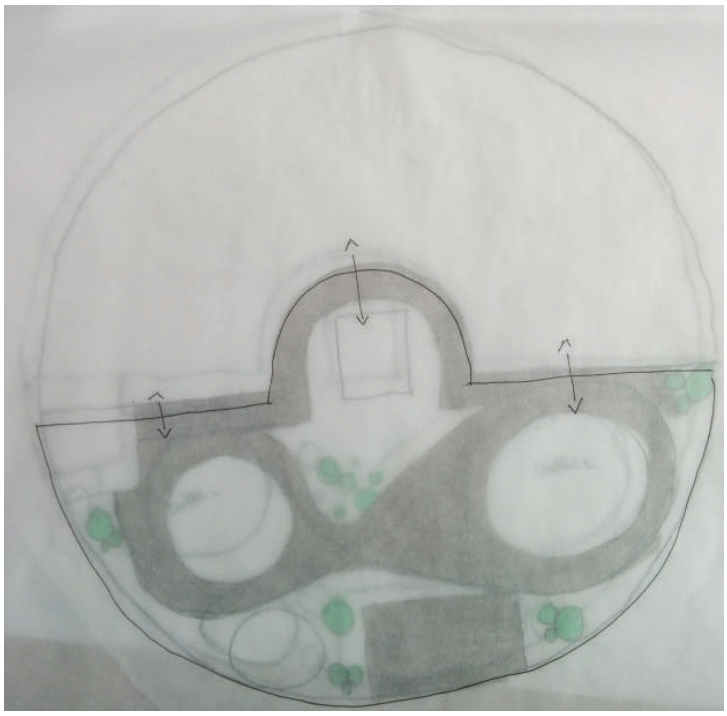
ill 1. Brainstom for the outdoor space



ill 2 Initial ideas of placement of different functions



ill 3 movement and connections between the functions



ill 4 Movement aroudn the hills, green areas

The brainstorm made earlier provides with guideline for the distribution of the different functions for the outdoor space. As the fig XX showing, are there placed to small hills in each sides, this provides with many different opportunities, like in the winter and snowy season, can the kids use the hill for sledging or snow fight.
There is also placed a curving path, which invites the kids to run or drive around with the moon cars.

Towards south are there placed a gathering place where there is opportunity for bonfire or water games.

East for the gathering space is a flexible space where the kids can play football or other activities as they want. By having the flexible area, the kindergarten can decide whatever to do with that area.

In the center of the kindergarten is the sandpit for the kids as well, if they don't feel like running around and just want to be outside and play with the sand.

In the west side of the outdoor space, it a shed, where all the tools and materials need for the outdoor play is locked in.

Around the outdoor space, are there planted different types of threes, which brings nature in to the site

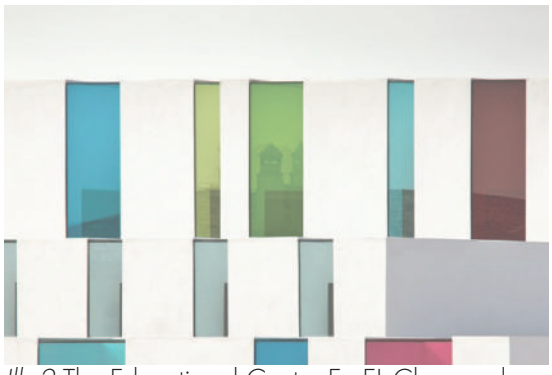
FACADES

Want my kindergarten to express fun, color, movement, safety by minimizing the edges. To achieve that is different types of facades experimented with. Inspiration for this task is taken from, several facades solutions which have the expression which is wanted for this project. Ill. 1) The Educational Center En EL Chaparral, by Alejandro Munoz Miranda has the play with color and how the windows continue up in the roof gives some interesting interior as well as exterior. Is can also be a simple oversized window like the ones Raa Daycare Center has used in their project, this brings simplicity to the project.

Hiribarren – Gonzalez + Estudio Urgaris New building for nursery and Kindergarten in Zaldibar, where the different size windows with colors creates a mood of joy, diversity and fun is also an interesting way to approach the facades.
LosdelDesierto has also some interesting Kindergarten facades in their "Kindergarten 8Units Velez Rubio" where they also use colors, but round windows in different size which is placed randomly so it gives an impression of "free" building

The first meeting with the building is from the parking lot, which I've decided should have the different size square windows to illustrate a building for kids. And towards the south is the simple "one big window" chosen, to give facades towards the courtyard a simple expression, but also to give one big window that can frame the activities in the courtyard

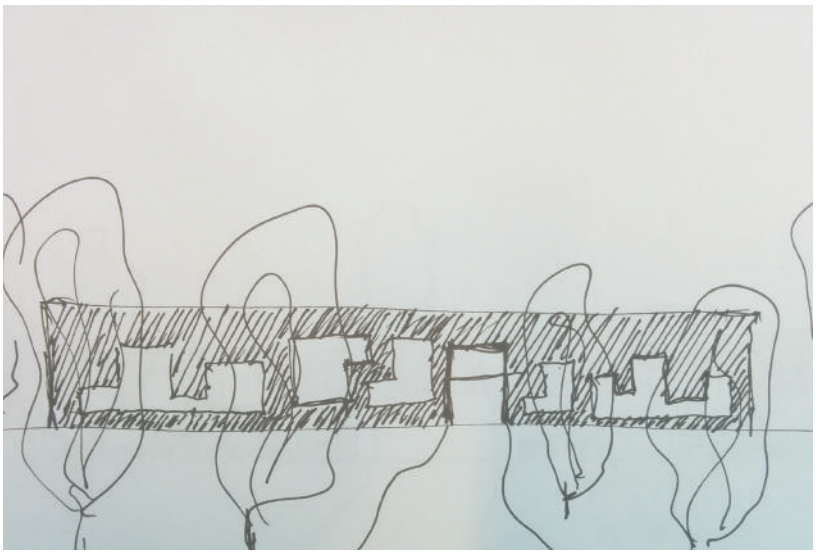
Ill. 1 Hiribarren – Gonzalez + Estudio Urgaris New building for nursery and Kindergarten



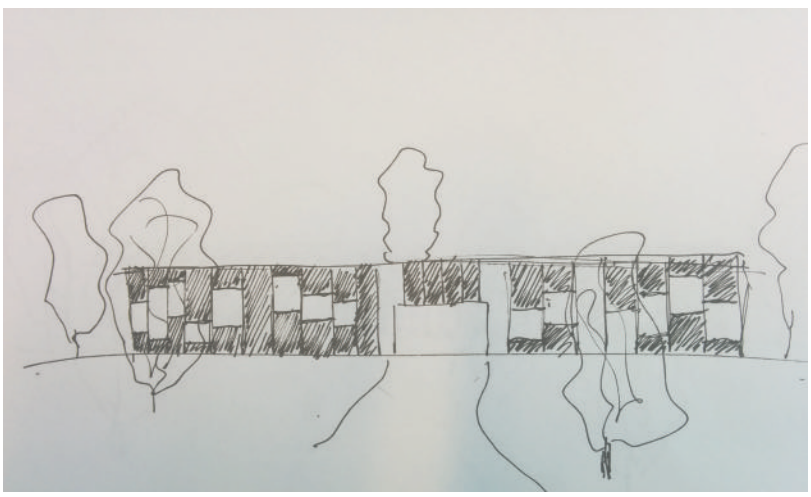
Ill. 2 The Educational Center En EL Chaparral

Ill. 3 Raa Daycare Center

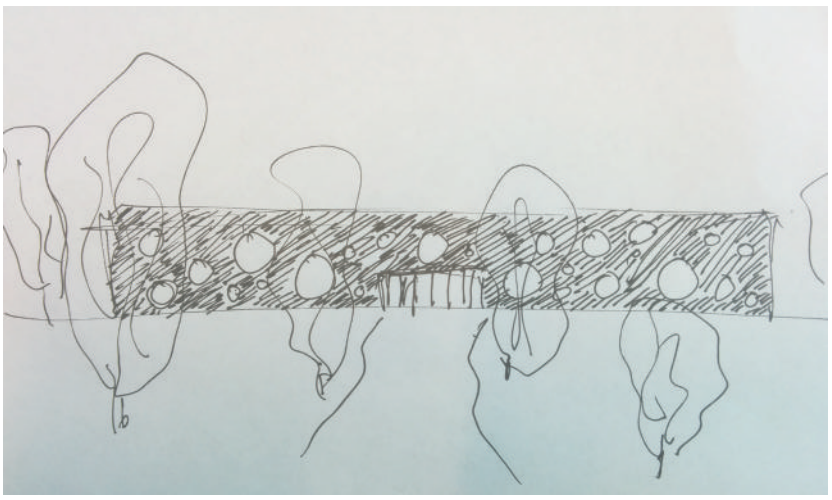
Ill. 4 Kindergarten 8Units Velez Rubio



Ill. 5 play with different types of windows



Ill. 6 Random placed windows different size



Ill. 7 Different size windows, round

STRUCTURE REFERENCE

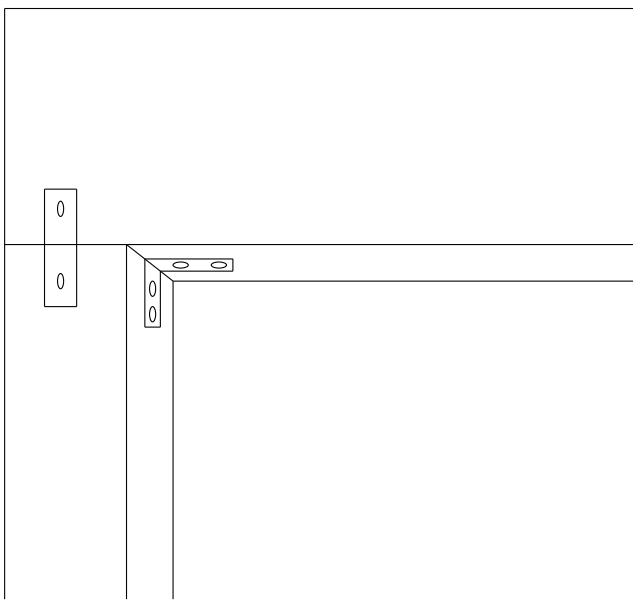
The material timber has been used over many generations which has proved to be a strong material, and in case of frame building, if it is built well can carefully will it last for many years. To minimize the amount of money spent on the material, the timber frames has to be calculated and design to use the right amount of material for the strength. Another factor is that timber is renewable, which means that for every tree there is used, another has to be planted which makes the supply of the material infinite. The material has also environmental profits, like their ability to take the CO2 and absorb it. Another think that makes the use of timber frame favorable is they need less CO2 producing activities compared to other materials like steel. Even the "waste" from the timber production is been used for other purpose like paper.

The chosen timber frame is a repetitive structure, where the frame goes throughout the building with a distance of 2,5 in one side and 1 in the other side. This gives an interesting appearance throughout the building, where the connection between The frame structure has the capability to transport the load throughout the whole structure. To the right is some illustration which defines the main idea for the frama structure, and the quality it brings to the room. furthermore is the joint between column-beam and beam-floor invastigated.

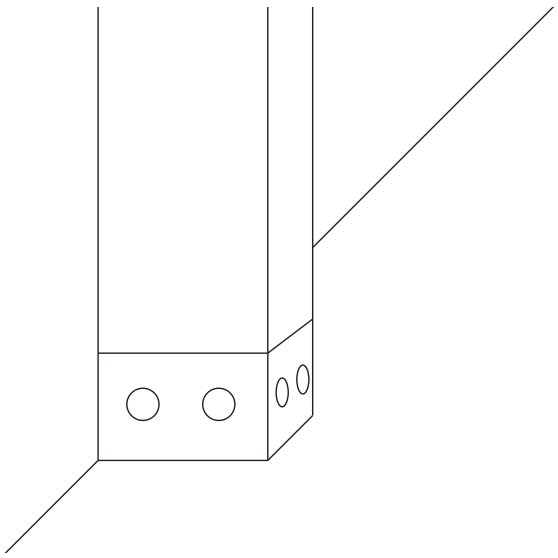
ill.1 Frame structure exampels

ill. 2 Frame structure exampels

ill. 3 Frame structure exampels



ill.1 Beam - column joint



ill.2 Bracket

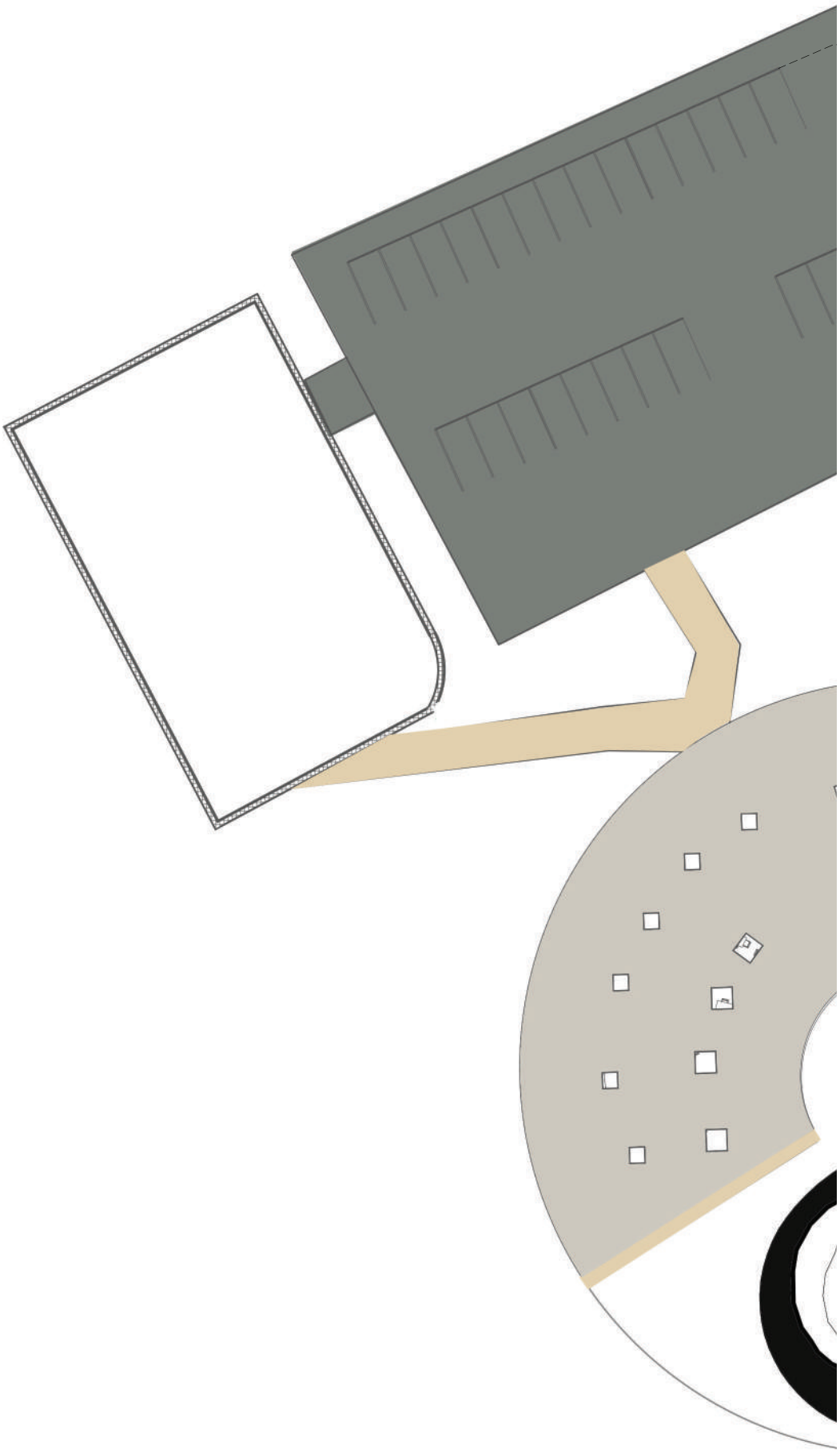
PLAN

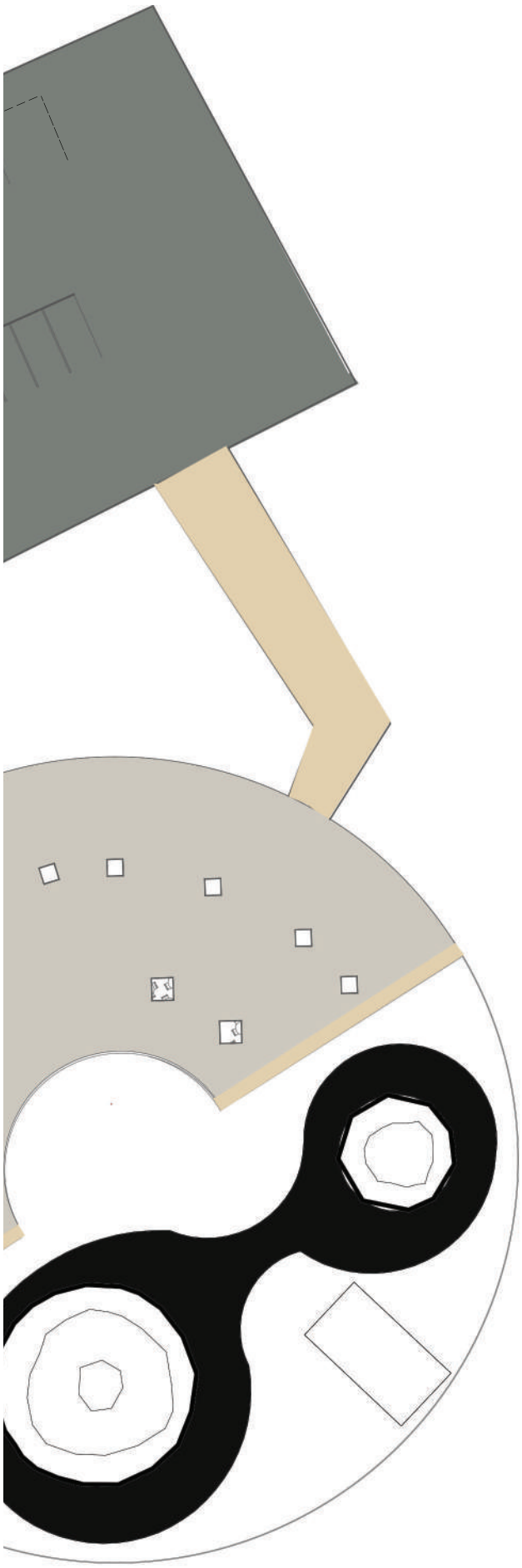
PLANS

This chapter is about the plans of the proposed kindergarten. Worked with different scales for the final plan, everything from the master plan to the different sized rooms furthermore is diagrams over practical service investigated such as ventilation system, flow fire escape. The main focus point for the plans is to shelter the kids from the heavy traffic in the north and open op towards the south and bring the nature inside the building. There is planted trees in the access areas to illuminate that this is a peaceful and green environment the visitors/users are stepping in to. There is no stairs in and out of the building which provides first and foremost safety for the kids, but also makes the building handicap friendly.

MASTERPLAN

ROOF PLAN





ACCESS AND PARKING

The main entrance is from the north side of the building, where the parking lot is placed. It is placed there because of the connection to the main road and by given the parents and visitors easy and quick way to drop of their kids and go to work. The other reason is, to make the south side of the building on the kids term, which is safe, filtered noise, light, movement and learn by play. All these requirements require that the cars don't interrupt the kids.

Furthermore are there planted trees so the kindergarten, are placed in a "green" environment, to make the contrast between the calm and quite nature against the noise and stressful traffic

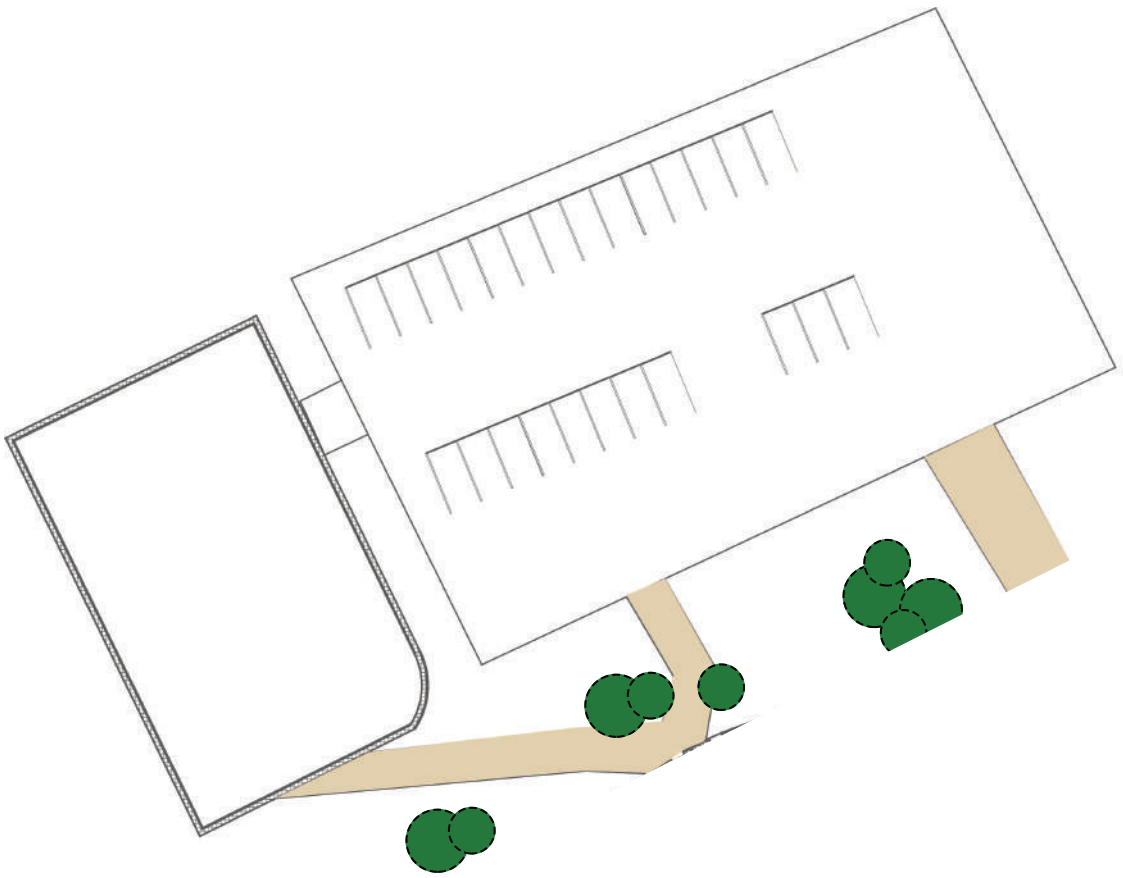
The secondary entrances in the southern side, where there will be three different places to enter the building. But these entrances are for the coworkers who are walking or taking the bike to work, or fire escape. But the main use for those is to go out to the outdoor play area.

There will be 22 parking lots plus two handicap parking, so there will be parking enough for the staff and for the parents to drop off their kids, furthermore are the parking lot made so there will be space to quick drop, which means that the cars is allowed to park in that spot for 10 minutes.

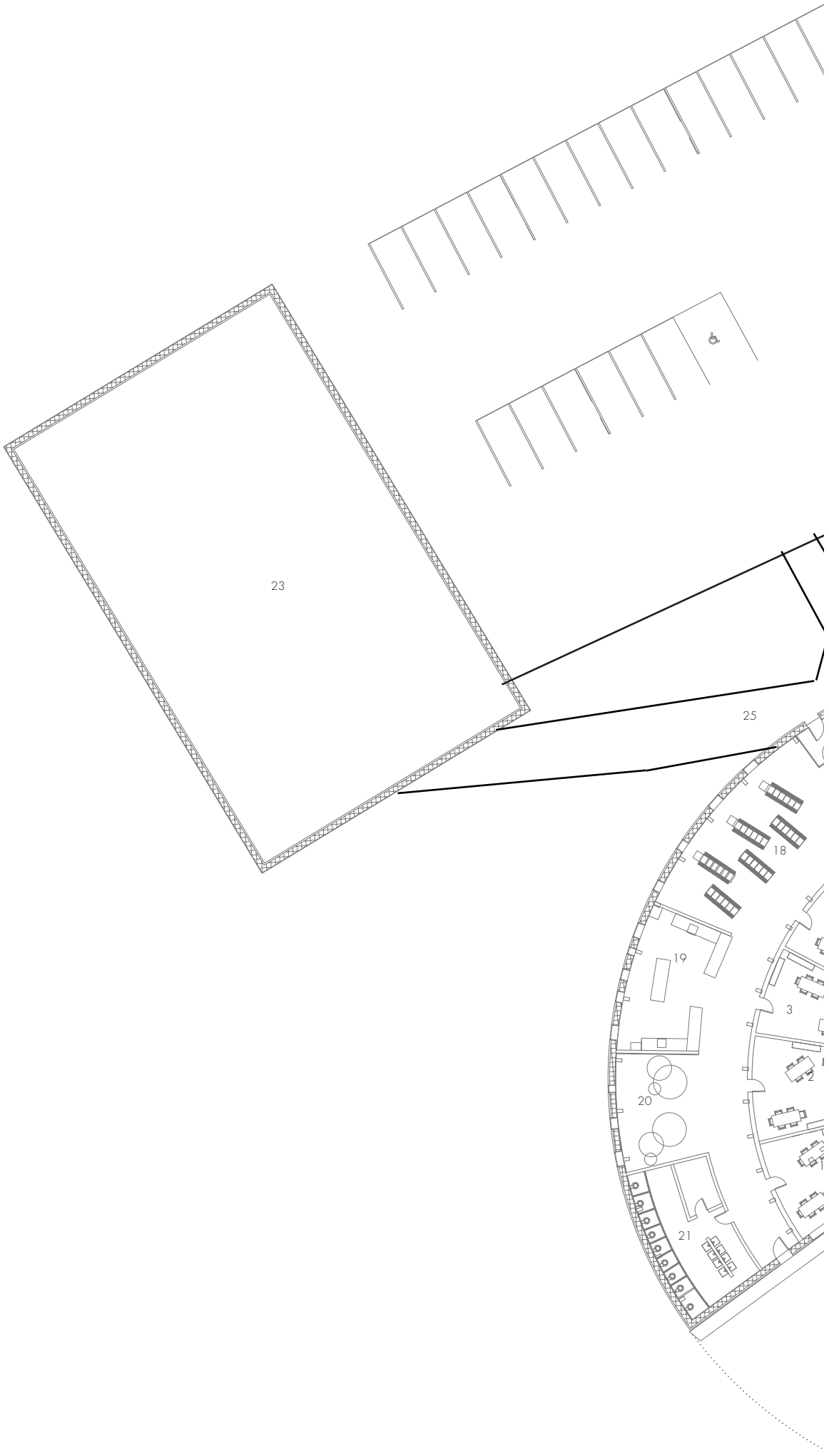
ill. 1 Green inbetween the parking lots

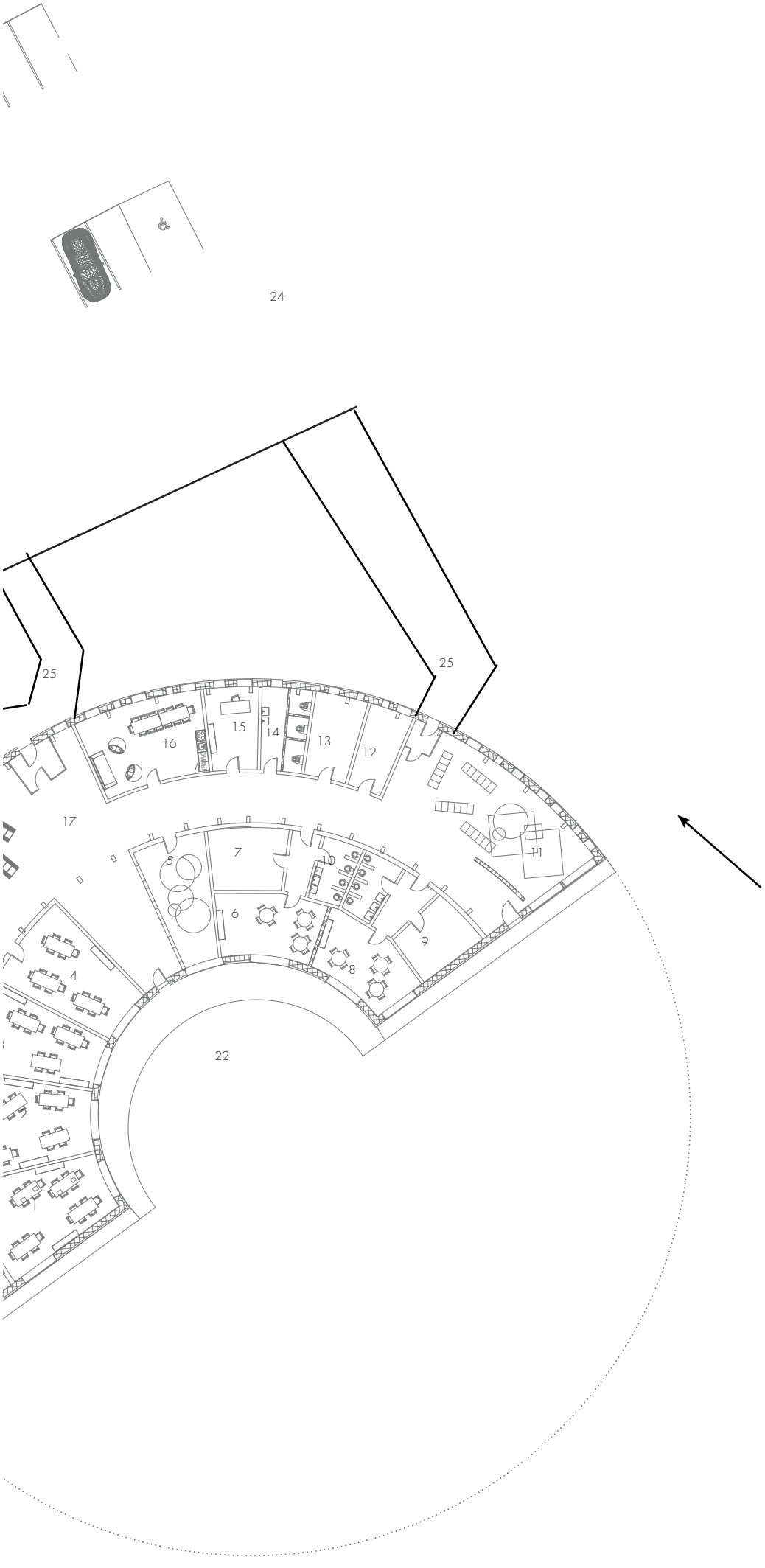
ill. 2 Open parking area

ill. 3 Green parking area.



FLOOR PLAN





1.Dayroom for 5-6+
2.Dayroom for 5-6+
3.Dayroom for 4-5
4.Dayroom for 4-5
5.Multi room/ everything room
6.Dayroom for 2-3
7.Rest room
8.Dayroom for 2-3
9.Rest room
10.WC and wardrobe
11.Play area for everyone

12.Technical room
13. laundry room/depot
14.Staff Toilet

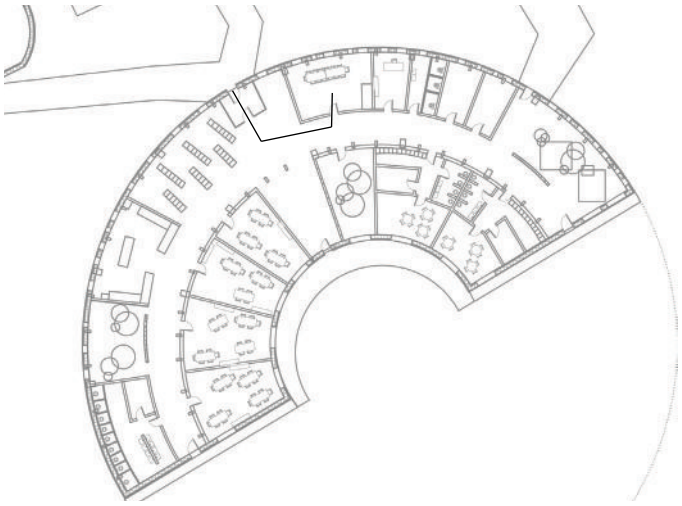
15.Office
16.Staff room
17.Foyer
18.wardrobe for 4-6
19.Kitchen

20.Play area for everyone
21.toilets and showe room
22.Courtyard

23.Sports hall
24.Parking lot
25.Paths to enter the building

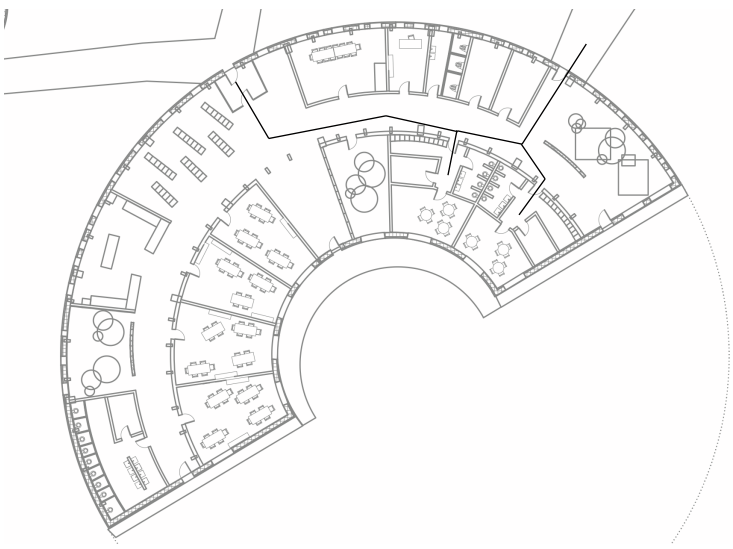
FLOW

The dayrooms are divided so that the youngest kids is in one end of the building and the oldest is in the other, while them in between is in the middle. The youngest kids in the age of 2-3 will be in pram when they arrive, which means that they have to have a quick and easy access to the building, therefore is secondary entrance placed in the eastern side of the building, which is close to the small kids' wardrobe and day rooms.

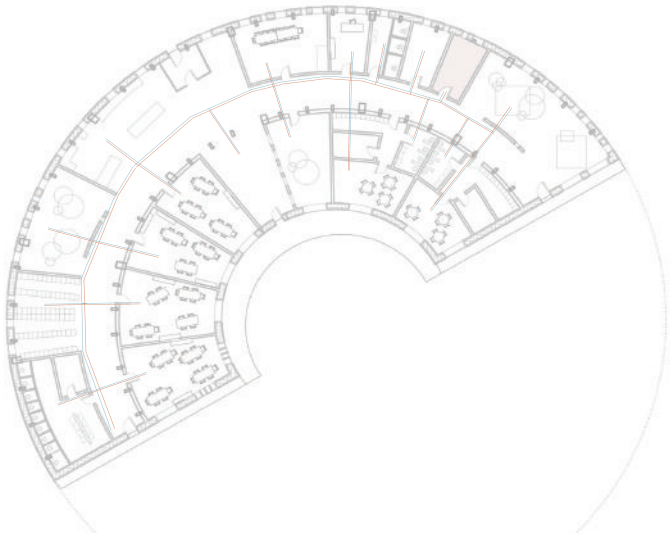


ill.1 flow staff

ill.2 flow Older kids



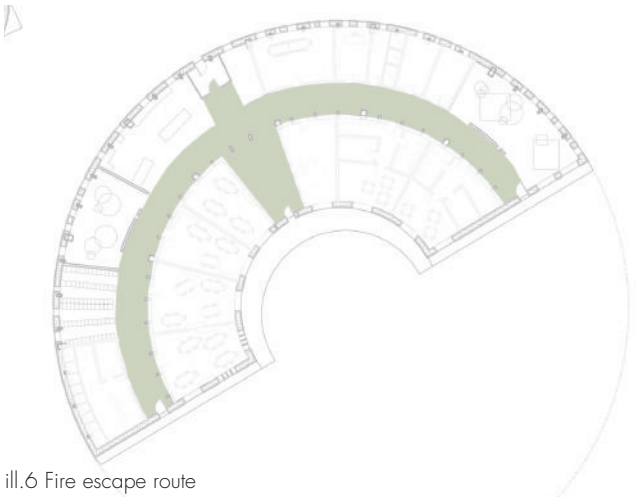
ill.3 flow younger kids



ill.1Ventilation system diagram

SERVICE PLANS

Plan diagrams which highlights the practical and service function in the kindergarten. There is placed one technical room, which is located east side of the building, where the mechanical ventilation system has its base. From the technical room goes the channels throughout the building where each room can get ventilated mechanically.
Fire escape routes has been considered in the design for the kindergarten, there is four places to exit in case of fire, which meets the requirements of, a person must be minimum 30 meters from an exit. Furthermore are there placed open able windows which are large enough for kids and adults to seek escape. There is placed two big doors at the center of the building and two in each side of the building. No matter where you stand inside the building there will be less than 30 meters to and exit point. Illustration 1 shows the ventilation system and how the channels are placed, while illustration 2. Show the fire escape routes.



ill.6 Fire escape route

DETAIL

DESIGN IMPLEMENTATIONS

This chapter goes deep into the details of the project of the proposed kindergarten. There are four elevations so the kindergarten can be seen from every side. To get an understanding of how the building is sitting on the site. Furthermore is two sections of the kindergarten been made to captures the concept of the egg, where the kids are sheltered from the traffic, and open op towards the green environment. It also tells the story of the connection between the different functions inside the kindergarten, from entry to the dayroom, and the connection between the different dayrooms and the courtyard. There is made two sections which are enough to get the story, one which shows the entrance to day room and another from dayroom to courtyard. Over each sections and elevations is a little map made to show where the section is taken from. Furthermore are two detailed sections made to see the different layers of the wall, the roof and the deck

MATERIAL

The materiality of a building has a big impact on the mood and appearance, for this kindergarten is four types of materials used for the interior; concrete, plaster boards, wood, and glass, the combination is chosen specifically to create a specific mood and atmosphere inside and outside of the kindergarten. The story is to make the building look hard and heavy on the outside and soft and natural inside. The contrast between the wood and concrete is also the warm against the cold.

Furthermore is the roughness of the concrete investigated, to create an appealing and inviting surface which the kids, staff or the visitors want to glide their hands on while walking around it, the surface of the concrete has to be smooth.

The white plaster boards is chosen, so the light can be reflected on them, to increase the amount of light inside. This also gives a clean and pleasant appearance.

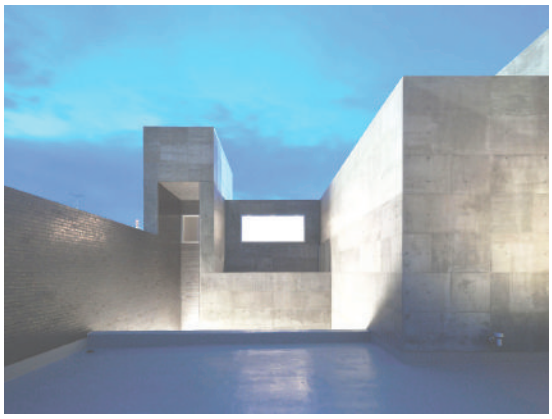
The warmth of the wooden floor is chosen, to give the kindergarten a feeling of "home" for the kids, and bring nature inside the building.

ROOF_ASPHALT

ill 1. http://www.langley.co.uk/images/sized/max800/01img_9054_clean-qx100.jpg

EXTERIOR WALL_CONCRETE

ill.2http://wafy.org/wp-content/uploads/2014/04/Graceful-Warm-Lighting-Exterior-Decor-With-Elegant-Dark-Wall-Concrete-Concept.jpg



GLAZING

ill.3 J http://www.belowtheclouds.com/uploads/2010/03/kindergarten_bizau06.jpg

FLOOR_TIMBER

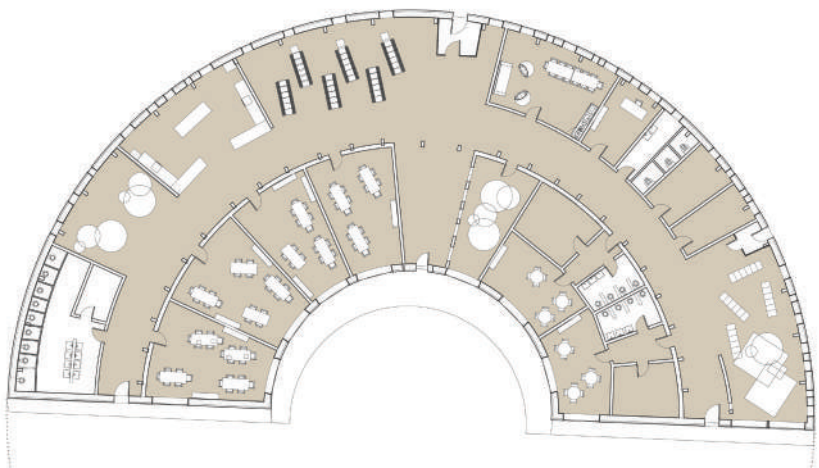
ill.3 https://s-media-cache-ak0.pinimg.com/736x/c6/c2/80/c6c2804393c0fab-1d33259675749e50b.jpg

CEILING_PLASTERBOARD

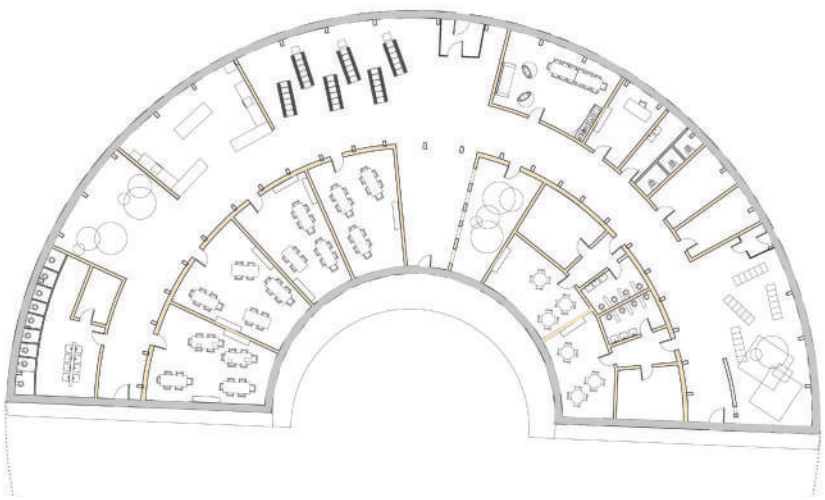
ill.5https://s-media-cache-ak0.pinimg.com/736x/3f/62/69/3f62694eaa036d3278c58feb0a78fed0.jpg

INTERIOR WALL_PLASTER-BORDS

ill.6https://s-media-cache-ak0.pinimg.com/736x/3f/62/69/3f62694eaa036d3278c58feb0a78fed0.jpg



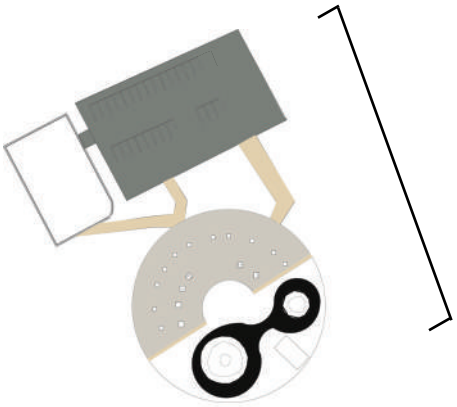
Timber laminated



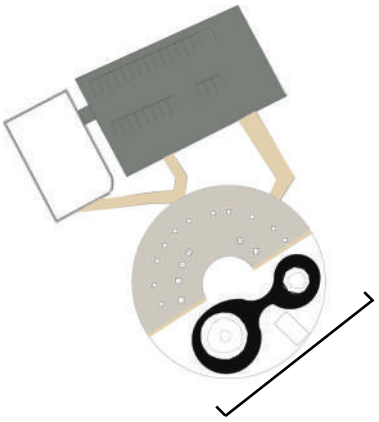
Concrete

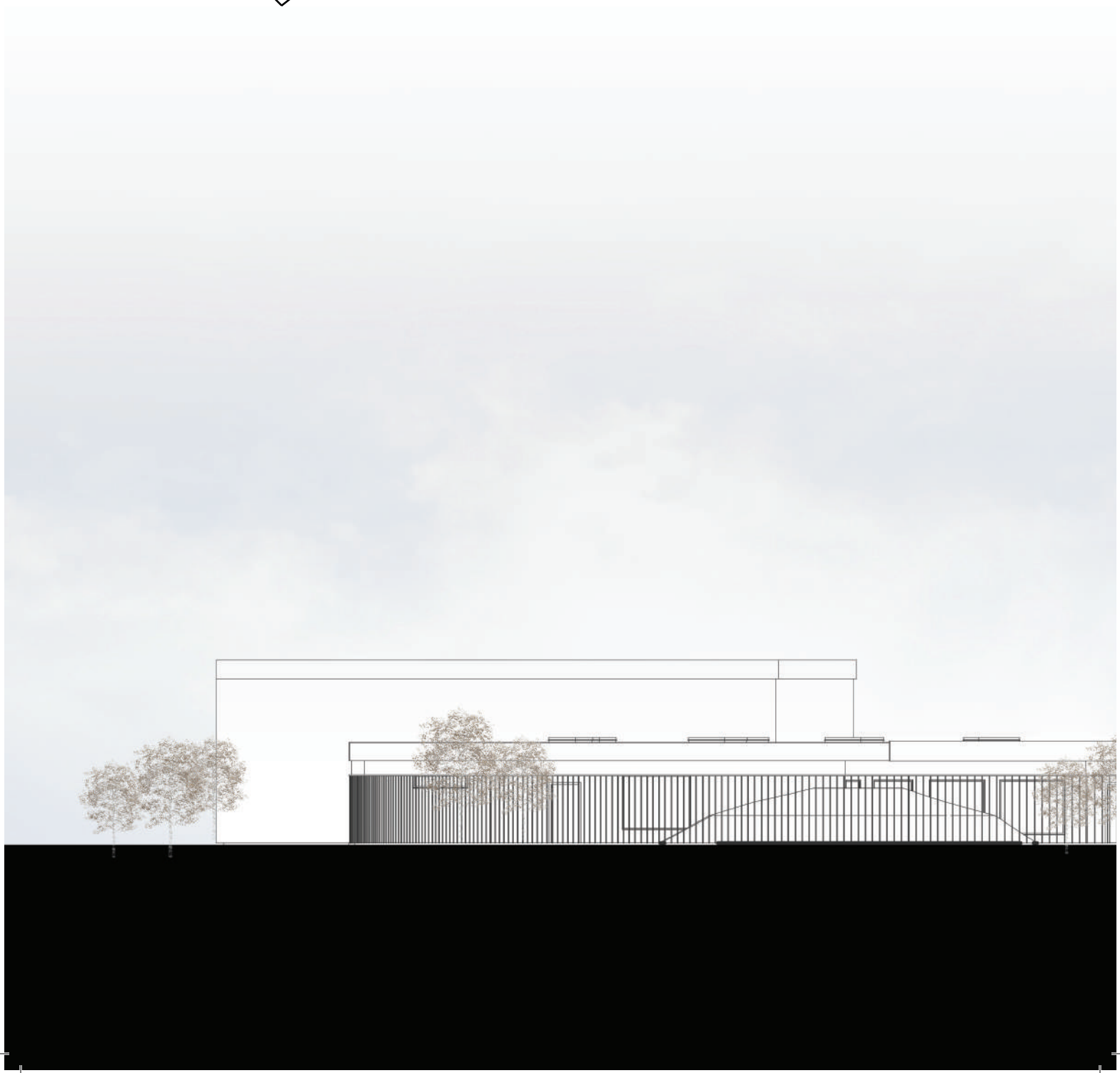
Plasterboard

ELEVATION

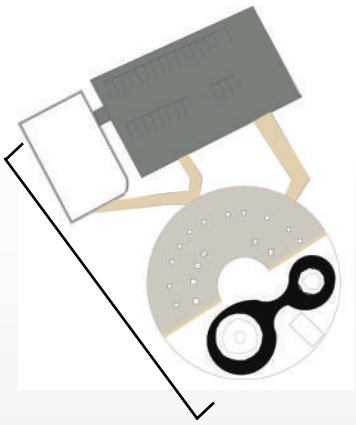


ELEVATION

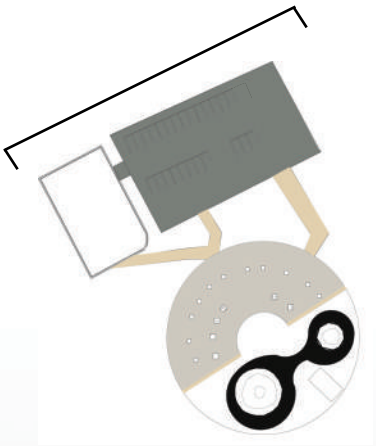


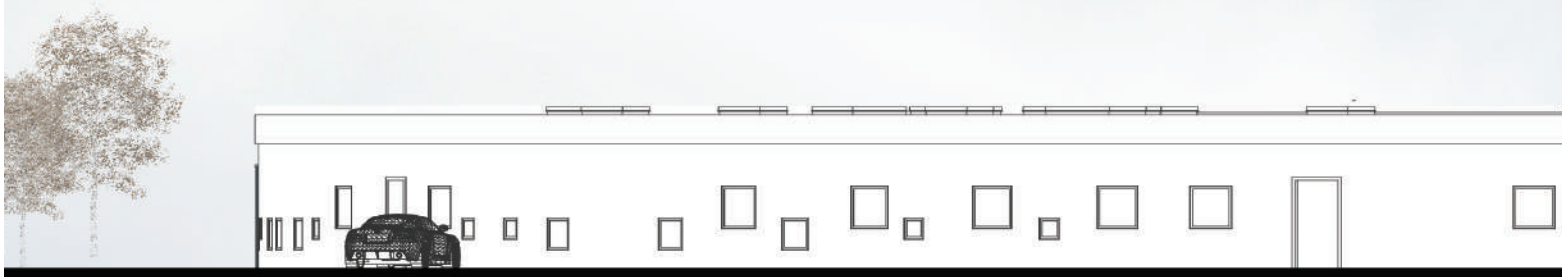


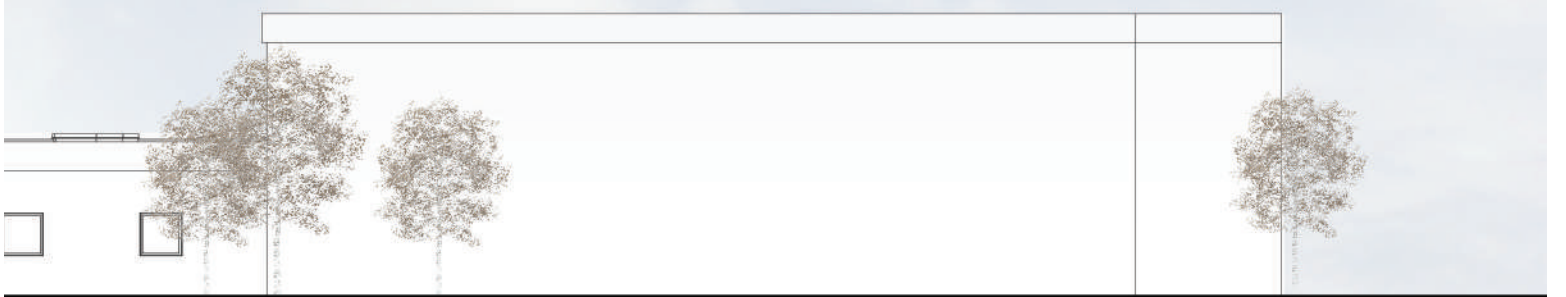
ELEVATION



ELEVATION







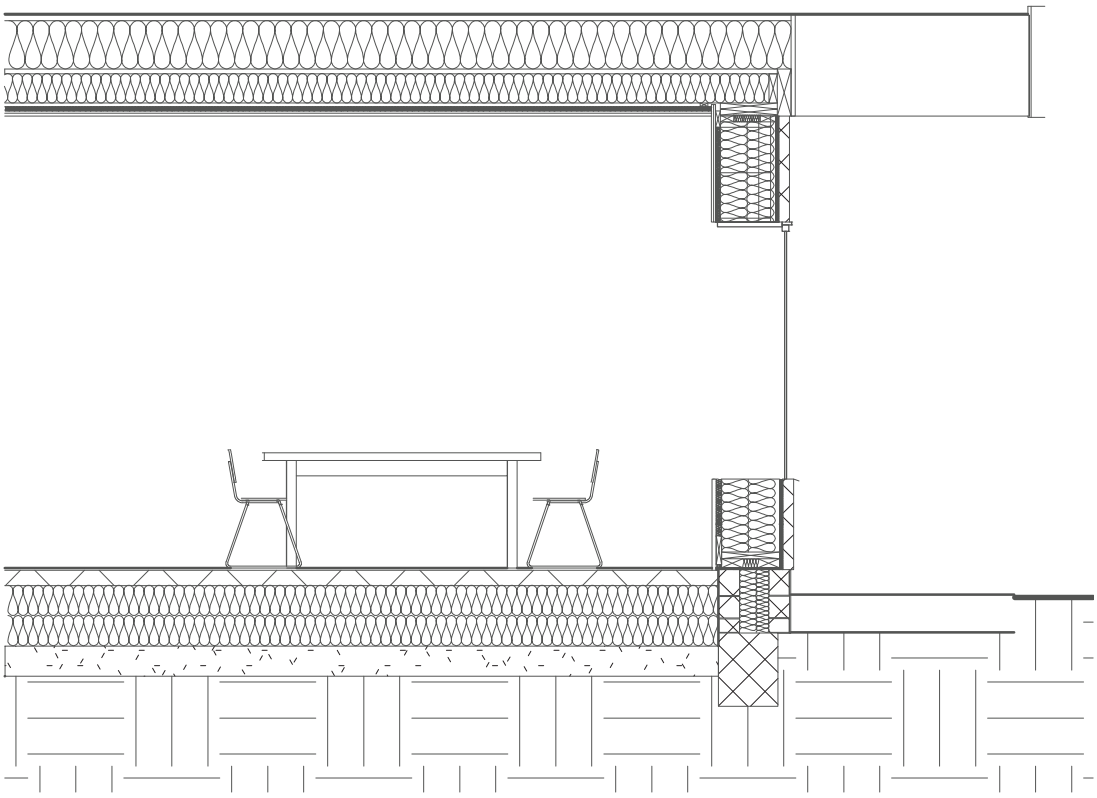
SECTION DETAIL

ROOF

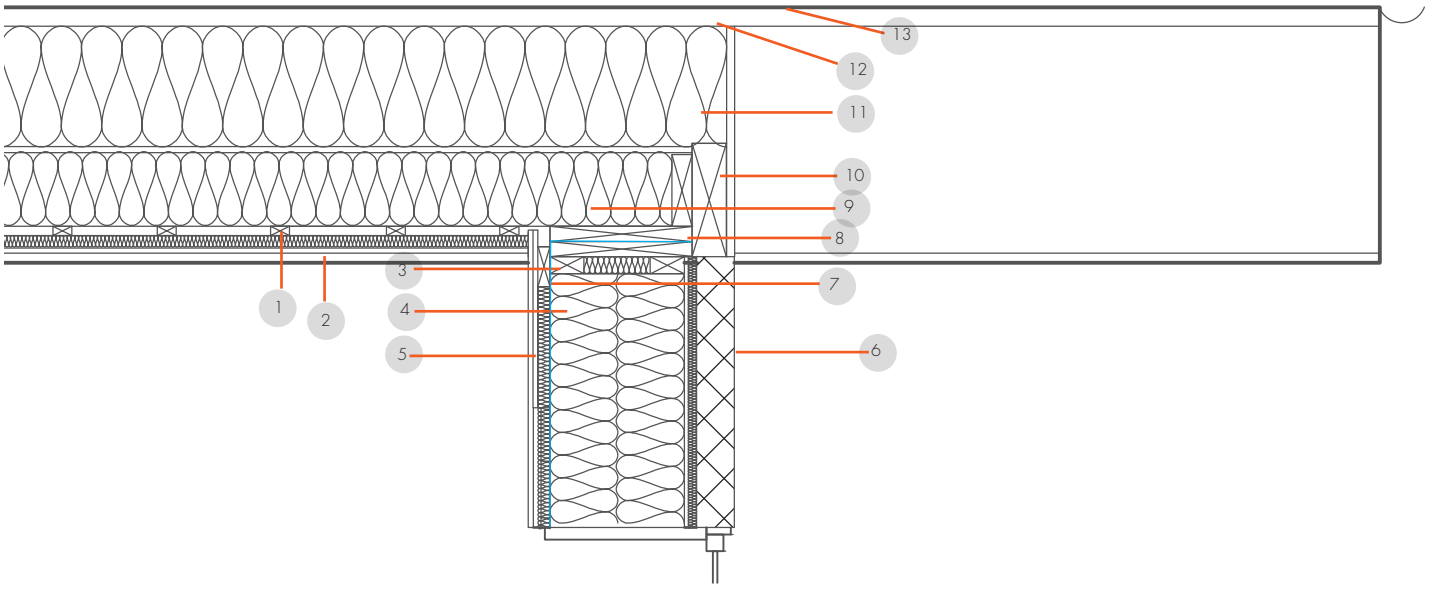
1. Formwork cc. 250 mm
2. Acoustic ceiling system 40 mm
3. Top strap wall element
4. 500mm insulaion and structural beam beyond
5. 26 mm plasterboard
6. 75 mm concrete
7. Climate membrane squeezed under wall strap
8. additional wall strap
9.195 mm insulation
10. Glulam strap 90 x 300 mm
11. 310 mm Insulation
12. Roof plywood
13. asphalt roofing

FLOOR

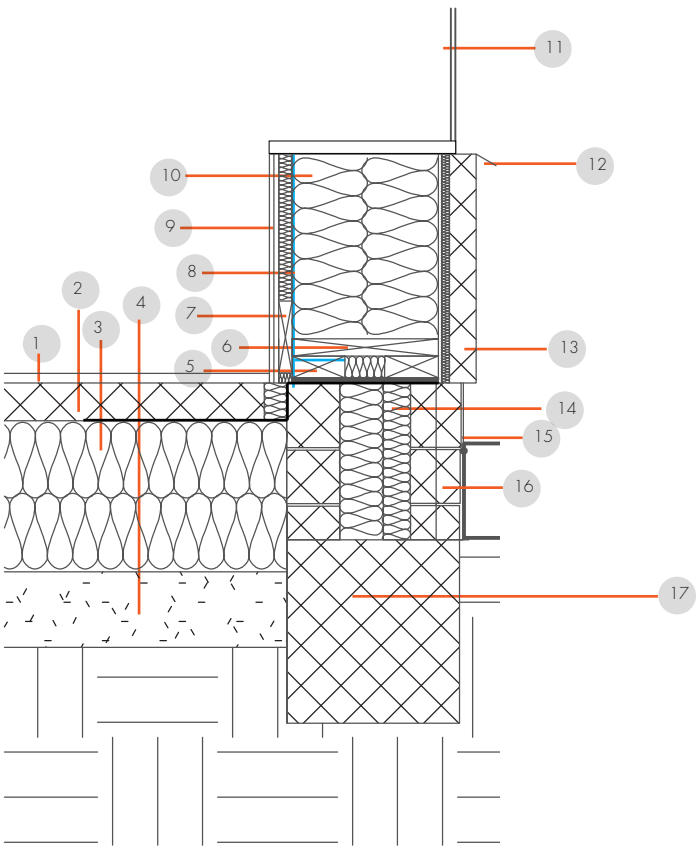
1. 25 mm Wood flooring
2. 100 mm concrete deck
3. 400 mm insulation
4. sand cushion
5. Bottom strap fixed to the foundation
6. Additional strap
7. 35 x 190 mm strap
8. Climate membrane
9. 26 mm plasterborad
10. 390 mm insulation
11. glazing with timber frame
12. WIndow flashing
13. 75 mm concrete
14. Insulation
15. plinth plaster
16. light concrete blocks
17. concrete foundation



ill.2 Detail section of the facade_1:50

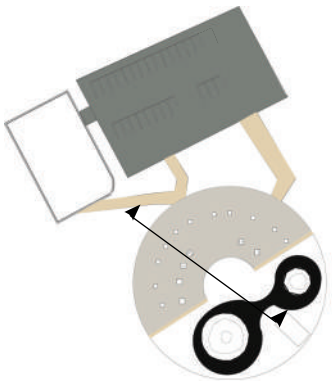


Detail section of the roof 1:20



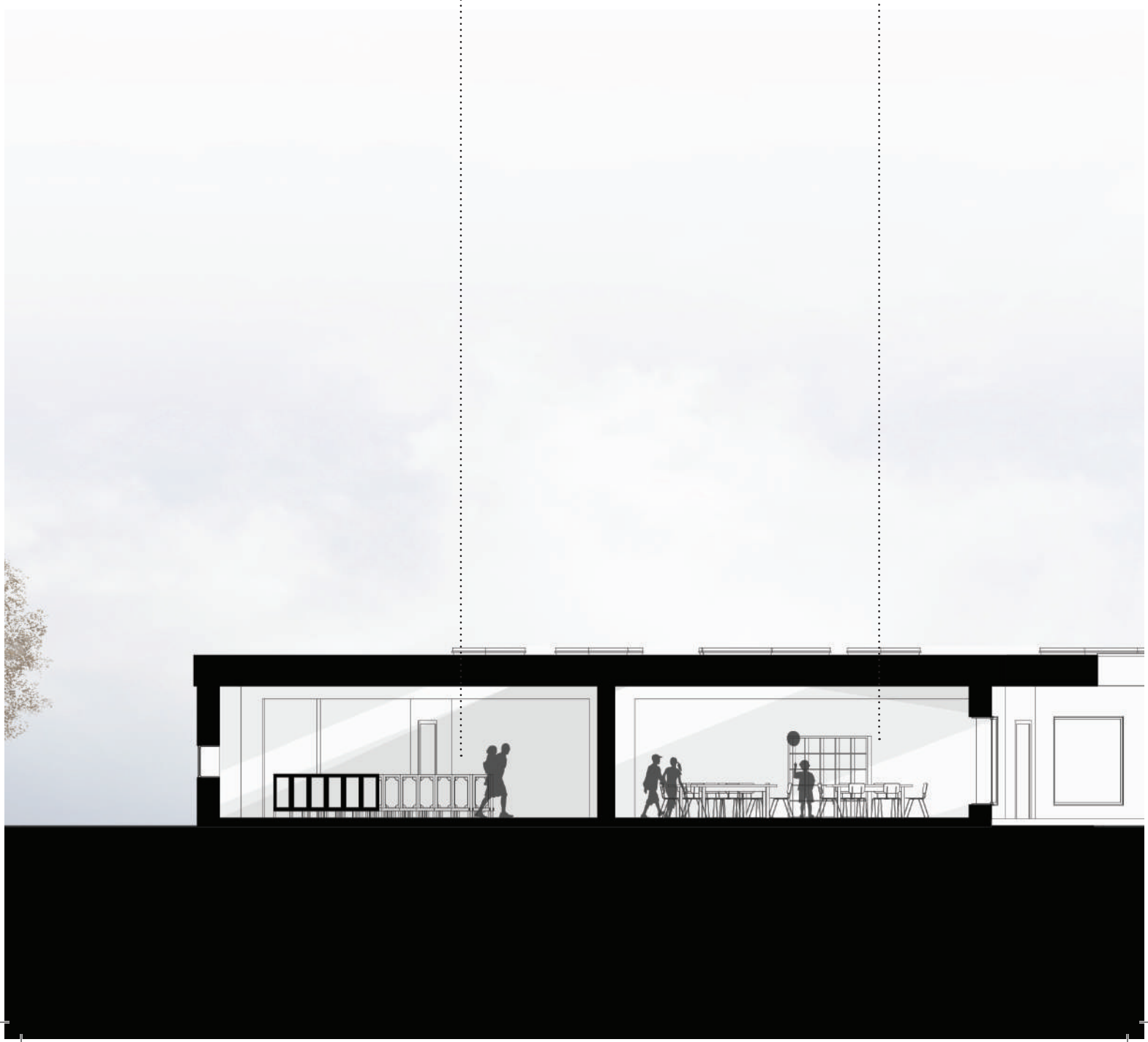
ill.1 Detail section of the wall - deck_1:20

SECTION_AA



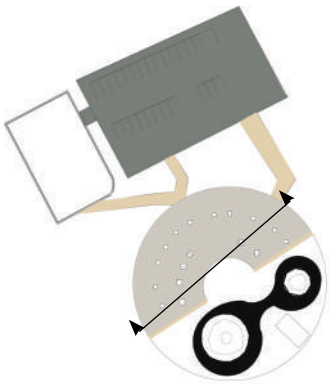
ENTRANCE HALL

DAYROOM



OUTDOOR SPACE

SECTION_BB



LARGE DAYROOM

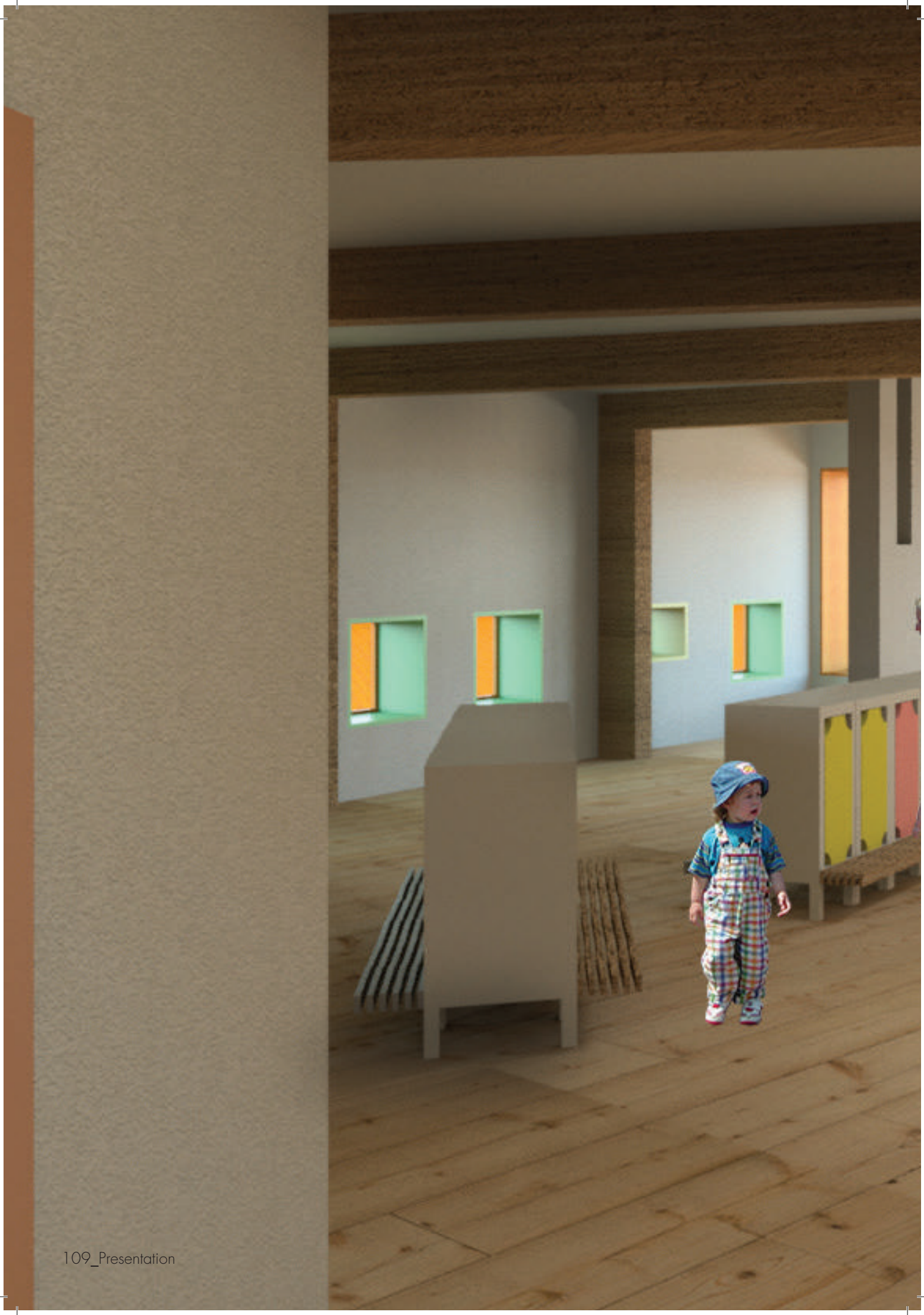
OUTDOOR SPACE

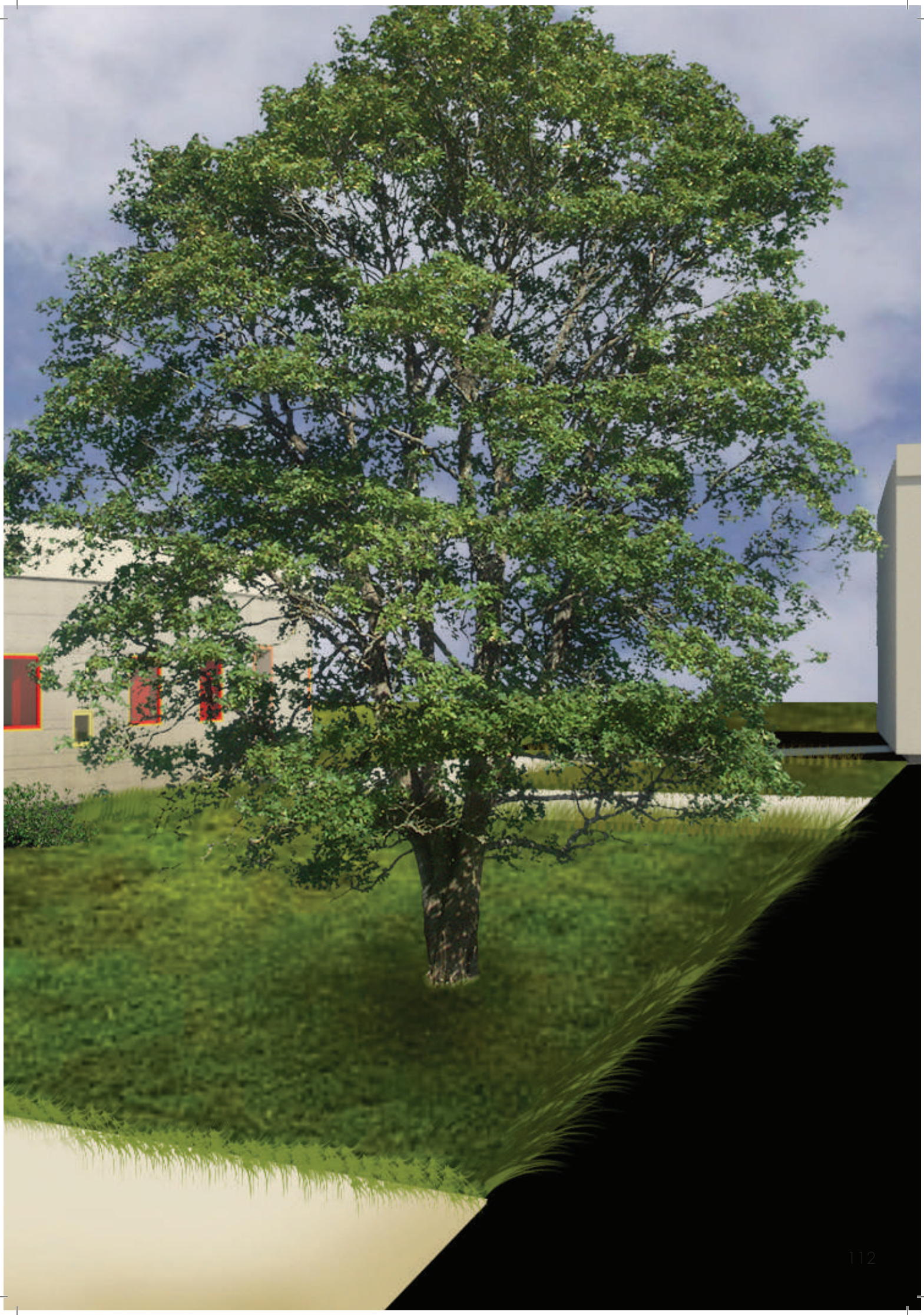
SMALL DAYROOM

PRESENTATION

PERSPECTIVES

This chapter is about the atmospheres and the spatial qualities inside and outside of the proposed kindergarten. Where the renders shall create the wanted atmospheres for the different spaces.
Highlights how the kindergarten is inviting the nature in while sheltering the kids from the heavy traffic in north. This chapter further highlights the concept of the design, where the kids are centered and placed closest to the nature.





CONCLUSION

REFLECTION

The project "Klarup Kindergarten" is the final proposal for Aalborg Kommune, I have created a kindergarten which in its language is humble, sustainable and modest. A space from where the kids can grow freely, but safely. The final proposal has the touch of Nordic architecture, because of its honest language, materiality and humbleness on the site. The Identity of the building is a green space to grow and learn in a safe environment
The hall placed north-west for the site, is an opportunity to add more lift in the area, to increase not only the kindergartens quality but also the neighborhoods, a place where they can meet and interact to create a strong and friendly neighborhood

The repetitive frame structure plays a role in the kindergartens spatial quality; it brings another dimension and stands in contrast to the concrete outer wall, the white plasterboard in the inner walls illuminate the glulam timber frame which provides the room with the feeling of safe and warmth. Is has been a back and forward process to dimension and find the right size, in order to create an honest structure. There is opportunity to further develop the frames so they are spot on. But the question in the end were weather I should make all the frames in the same size, and have one end a bit over dimensioned or dimension them after the load they carry and have frames which is decreasing in dimensions as they go towards the courtyard. This could be one of the things I would like to further investigate. (Further explanation can be found in the appendix)
The sustainable part has been interesting as well, is was bit hard to achieve the perfect reverberation time, which is 0,6 and below, while mine is 0,7 very close. Further work could be playing with acoustics panels inside the walls as they do in Aalborg University new building in Reberbansgade. The light studies has been a success same with the indoor climate according to the overheat and CO2 level

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ILLUSTRATION INDEX

All the illustration number which is not stated below are selfmade diagrams, pucture or drawings

Pages 11-12
ill. 1 Laser-cut wood wall viewed 04.02.2015 https://wvcarch64.wordpress.com/tag/wood/
ill. 2 Detaile architecture viewed 04.02.2015 http://arqvac.tumblr.com/post/68974072435
ill. 3 Continuous wooden elements U-shaped staircase at a Mumbai apartmentviewed04.02.2015http://www.dezeen.com/2014/08/18/arquitectura-movimiento-wood-staircase-sdm-apartment-mumbai/
ill. 4 Nezu Museum Kengo Kuma viewed 04.02.2015 http://n-architektur.tumblr.com/post/31112815077/nezu-museum-kengo-kuma-photographed-by-guen-k

Pages 13-14
ill. 1 Jensen & Skodvin Architects (NO) Juvet Landscape Hotel, Gudbrandsjuvet, Norway: View 03.02.2015 https://lbstadler.wordpress.com/2012/07/28/defining-new-nordic/
ill. 2 J Tverrfjellhytta / Snøhetta, Hjerkinn, Dovre Municipality, Norway: viewed 03.02.2015 http://www.archdaily.com/180932/tverrfjellhytta-snohetta/
ill. 3 Louisiana Museum of Modern Art, Humlebaek, Denmark, viewed 03.02.2015 http://www.bbk.ac.uk/sculptureparks/gallery/gallery-archive/GiacomettiRoom.jpg/view
ill. 4 Venice Biennale 2012: Nordic Pavilion Viewed 03.02.2015 http://www.archdaily.com/266246/venice-biennale-2012-nordic-pavilion/

Pages 15-16
ill. 1 Fuji Kindergarten, The Roof House viewed 03.02.2015 http://www.e-architect.co.uk/images/jpgs/japan/fuji_kindergarten_cta110908_crkatsuhisakida_5.jpg
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ill. 2 Fuji Kindergarten Birdview, kids playing on the roof, viewed 04.02.2015(http://edfacilitiesinvestment-db.org/images/facilities/9/74/image74.jpg
ill. 3 Kids playing on the roof, where a tree are sticking through the construction. viewed 04.02.2015 http://www.e-architect.co.uk/images/jpgs/japan/fuji_kindergarten_cta110908_crkatsuhisakida_7.jpg

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ill 2 viewed 04-05-2015 concrete walls http://wafy.org/wp-content/uploads/2014/04/Graceful-Warm-Lighting-Exterior-Decor-With-Elegant-Dark-Wall-Concrete-Concept.jpg
ill 3. viewed 04-05-2015 glazing J http://www.belowtheclouds.com/uploads/2010/03/kindergarten_bizau06.jpg
ill 4. viewed 04-05-2015 https://s-media-cache-ak0.pinimg.com/736x/c6/c2/80/c6c2804393c0fab1d332596757 49e50b.jpg
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APPENDIX

STRUCTURE AND SUSTAINABILITY

The Appendix contains different analysis for the project, where it starts with the structural part, a Beam has been calculated and dimensioned, where the whole frame structure is built in Robot and calculated, to find the right dimensions. The software used for the structural part is Grasshopper/Rhino Karamba and Robot.
There has also been investigated on the sustainable part where indoor climate has been analyzed from acustic, light, CO2 level and overheating has been the main focus point. A model has been built in B-sim to test a critical room for overheating and CO2 level. A dial Europa has been used to see the daylight factor for the rooms, here is 3 different types of rooms tested for Daylight, the staff room, the big kindergarten with three windows, and the average kindergarten with two windows.
The acoustic has been calculated by hand/excal where the focus point was on finding the right balance between the right acoustic and the right materials for the spatial quality. Last has the building been simulated in Be-10 to test the energy consumption, where the goal was to achieve 2020 by using passive strategies.

STRUCTURAL VERIFICATION

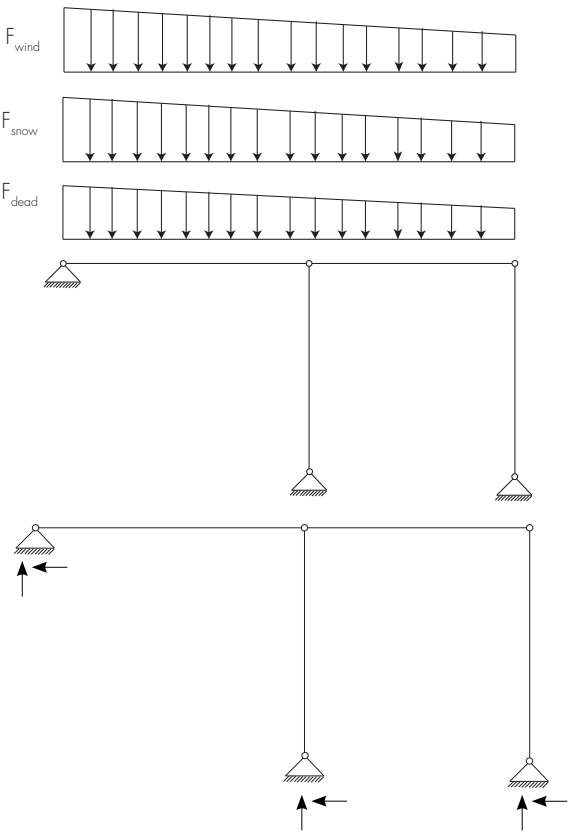
IMITATIONS

The secundary structure of the roof which is not detailed in terms of load and structure, but used a standard value for a heavy roof which is 1kN/m^2

All loads are described here in unit loads, ie. load/m or load/m^2. The calculations of the total values can be found on the attached CD in the Excel spreadsheet "LoadCalculations".

FREE BODY DIAGRAM

The structure is a frama structure, which is supported by a bracket on the ground. The elements from the beams to the brackets are pinned in both side, to minimize the moment of the elements. Charnie on the top. The force which is used to test the structure are dead, snow and wind load. The calculation of the structure is explained in the following part.



ill.1 Free body diagram

LOADS

DEAD LOAD

The dead load of the beam is calculated by looking at the dimension of the chosen material muliplyed by its density and the gravity, while the secundary deadload is set to be 1 kN/m^2

$$s = \mu_i * C_e * C_T * s_k \qquad \textit{(Eurocode 1.3, 5.1)}$$

μ_i : *form coefficient*
C_e : *exposure coefficient*
C_T : *thermal coefficient*
s_k : *characteristic snow load on the ground*

$$s = \mu_i * C_e * C_T * s_k = 0,8*1,2*1*0.9\frac{kN}{m^2} = 0,72\frac{kN}{m^2}$$

Snowload equation

The mean wind velocity, vm(z), depends on the terrain roughness and on the basic wind velocity, vb

$$v_m(z) = c_r(z) * c_o(z) * v_b$$

$v_m(z)$: *mean wind velocity*

$c_r(z)$: *roughness factor*

$c_o(z)$: *orography factor*

v_b : *basic wind velocity*

$C_r(z)$ = the roughness of the terrain which can be found:

$$c_r(z) = k_r * \ln\left(\frac{z}{z_0}\right), \quad _{min} \leq \quad \leq \quad _{max}$$

z : *height over terrain*

z_0 : *roughness length*

$$v_b = c_{dir} * c_{season} * v_{b,0}$$

c_{dir} : *directional factor* $= 1$

c_{season} : *season factor* $= 1$

$v_{b,0}$: *fundamental value of basic wind velocity* $= 27$

Peak velocity pressure, qp(z), at height z, is defined

$$q_p(z) = \left[1 + 7 * l_v(z)\right] * \frac{1}{2} * \rho * v_m{}^2(z)$$

where

$\rho = 1,25 kg/m^3$ *= The density of the air*

$$F_D = c_s c_d * c_f * q_p(z_e) * A_{ref} = 1 * 0,8 * 0,5673 \frac{kN}{m^2} 0,54 m = 0,25 \frac{kN}{m}$$

$$F_E = c_s c_d * c_f * q_p(z_e) * A_{ref} = 1 * -0,5 * 0,5673 \frac{kN}{m^2} * 1,7 m = -0,2 \frac{kN}{m}$$

ill.6: Zones on pitched roofs

SNOW LOAD

The snow load is calculated by using the formula in ill. 2.
The roof slope is small which gives an snow load of

WIND LOAD

Calculating the wind load is the roughness of the terrain an important factor. The roughness can be found by verifying which category the terrain which the site is located is. There are four different types of terrains, where it goes from a flat area with no vegetation to areas where the at least 15 % of the surface are built with an average height over 15 meters. my
$C_r(z) = 0,578$

Basis wind velocity are defined as the basic wind velocity in 10 meters height over 10 minutes.

v_b=1·1·27=27 m/s

To calculate the final wind pressure q_{kast}, for a specific constructions area, the formula in ill. 5 is used, and the result is:

$q_p = 567,3 N/m^2$

The wind forces will be calculated on each surface by multiplying the wind pressure with the surface area.

The last load which is missing to make the load combination is the deadload for the beam. A random dimention for the beam has been chosen which is h = 833 mm and width = 140 mm , GL32h.
The beams deadload is calculated to be 0,584 kN/m

Now can the load combination be made. Snow load is the dominant load which is the one I have used. b (width) has to be multipleid to all the loads except the beam deadload, becuase it already is in kN/m while the other loads are in the unit kN/m^2

The loadcombination where the snow laod is the dominant is 23,78 kN/m. which is the load that i'll apply to my structure.

$$g_{beam} = h * b * \rho * g$$

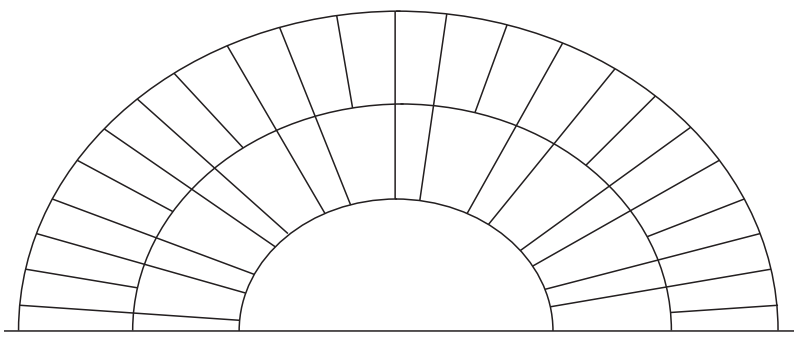
P= density 510 kg/m^3
g = gravity 9,82

$$\sum \gamma_{G,j} G_{k,j} \text{ "+" } \gamma_{Q,1} Q_{k,1} \text{ "} \sum \gamma_{Q,i} \psi_{0,i} Q_{Q,i}$$

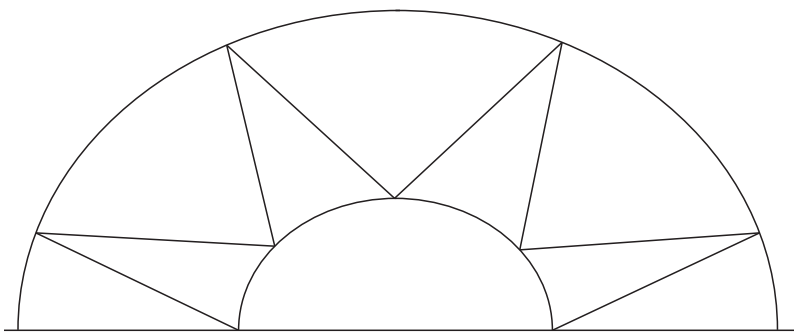
$\gamma_{Q,1} = 1,50$ *= snow load partial coefficient*

$$\Sigma\left(1,1*1,0*beam_{deadload}\frac{kN}{m}\right)+((1,1*1,50*roof_{deadload}\frac{kN}{m^2})*b)+\left(\left(1,1*1,5*snow_{load}\frac{kN}{m^2}\right)*b\right)((1,1*1,5*wind_{load}*03)*b)$$

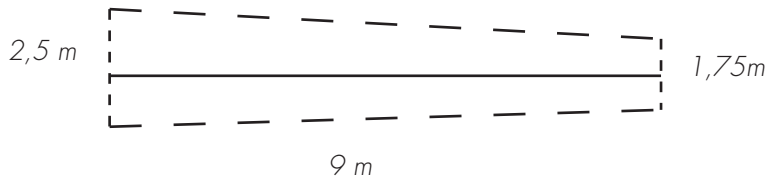
$$Total\,ULS = \Sigma\left(1,1*1,0*0,584\frac{kN}{m}\right)+((1,1*1,50*1\frac{kN}{m^2})*9)+\left(\left(1,1*1,5*0,72\frac{kN}{m^2}\right)*9\right)((1,1*1,5*0,57*03)*9)=23,78\ \boldsymbol{kN/m}$$



ill. 2: defining beams and beam zone



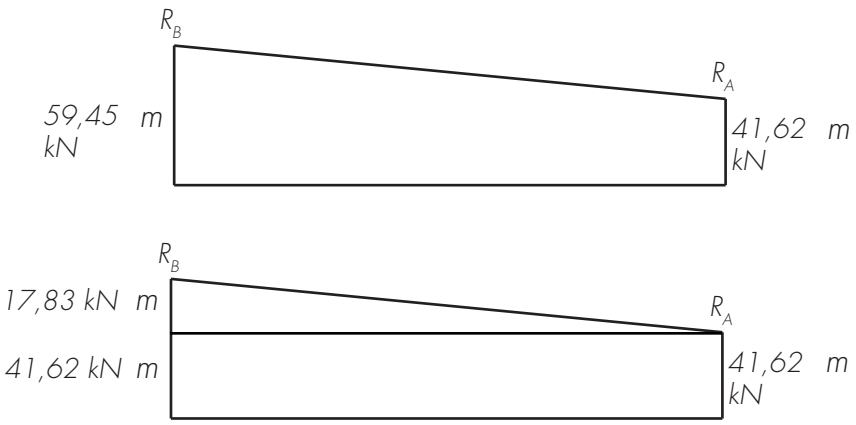
ill. 3: Roof stabalizing diagram



ill. 2: loads on the four main beams

B side = $2,5 * 23,78 = 59,45\ kNm$

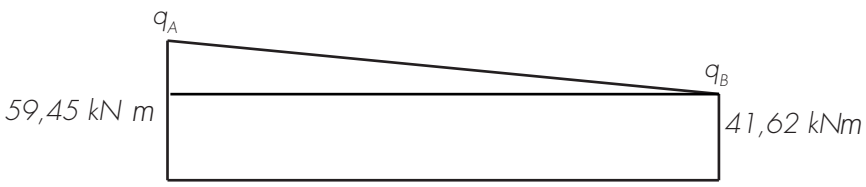
A side = $1,75 * 23,78 = 41,62\ kNm$



ill. 3: Not even divided load

$$R_A = R_B = \frac{1}{2} * q * l \quad \textit{for even divided load}$$

$$R_A = 1/6ql \ ; \ R_B = 1/3ql \quad \textit{for not even divided load}$$



ill. 3: For the moment

$$M_{even}^{max} = 1/8 q_B l^2 = M_{even}^{max} = \frac{1}{8} * 41,62 * 9^2 = 421,4 kN$$

$$M_{not\ even}^{max} = 0,064\left(q_A - q_B\right) * l \ = \ M_{not\ even}^{max} = 0,064\left(59,45 - 41,62\right) * 9^2 = 92,43 kN$$

$$M_{max} \leq M_{Even}^{max} + M_{not\ even}^{max} \ = 421,4 + 92,43 = 513,83 kN$$

A random beam has been chosen where the load area for the beam is in the B side: 2,5 while in A side is 1,57.

The dom. Snow load has then multiplied to get an understanding of how big the load in both side is.

I understand that there are not even divided loads on the structure, which is what was expected; because of the bigger span in B side.

The result is illustrated in ill. 2 it is then further investigated, where the load is divided in two types in ill. 3. Where I have an even divided and one that is not.

For even divided loads:
RA = 0,5 *41,62 *9 = 187,22 kN

For not even divided loads:

RA = 1/6 * 17,83 * 9 = 26,75 kN

RB = 1/3 *17,83 * 9 = 53,5 kN

Multiplying the loads to get an final RA and RB

RA = 187,22 + 26,75 = 213,97 kN

RB = 187,22 + 53,5 = 240,72 kN

The result can be used to dimension the columns, where the R_A should have a column that can withstand the 213,97 kN while in the R_B should be 240,72 kN

Moment:

To find the moment did i divide the load the same way as earlier. Where I find the moment for the even divided first, and then the not even one.

The moment is now found, can the calculation can go further can see when the beam break. ULS

fm,k = 32 MPa for GL32h (teknisk ståbi p. 314) which is my design strength value

kd = 0,692/1,3 = 0,53 (teknisk ståbi p. 315)

Kh = 1 when the height of the beam is over 600 mm. which mine is (833 mm)

Now i know the amount of load my beam can take, which means that i now can find the load which is placed on the beam.

where:

M: 513,83 kN (is my moment calculated earlier) and
W : 16200 mm3*103 is my section modulus: which can be found in (teknisk ståbi p. 318)

Here i can see that my beam is strong enough to carry the load, and can go down in size because it is over dimensioned.

The closer the ratio gets to 1 the more is the material being used.

This example is a way of showing how to calculate the the loads on a beam.

$$f_{m,d} = f_{m,k} * k_d * k_h$$

$$k_d = k_{mod} / \gamma_m$$

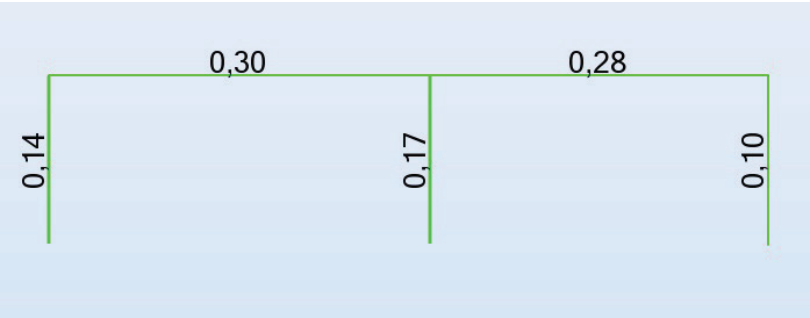
$$f_{m,d} = 32 * 0,53 * 1 = 16,96\,MPa$$

$$\sigma = \frac{M}{W} \qquad f_{m,d} \geq \sigma$$

$$\sigma = \frac{513,83 * 10^3}{16200 mm^2 * 10^3} = 0,0317 * 100 = 3,17\,MPa$$

$$\frac{\sigma}{f_{m,d}} \leq 1 \qquad \frac{3,17}{16,96} = 0,18 \leq 1$$

A simple model has been buildt in robot, to show the reaction of the structure. and compare the result to the handcalculation.

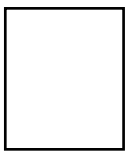


Frame structure with the same types of material and dimensions of the handcalculated beam is tested in robot.
The load combination has been calculated by hand and used the same result in Robot. Where the snow load is the worst case.

Member	Section	Material	Lay	Laz	Ratio	Case
1 Timber Member1	søjle rigtig 267X1	C24	51.90	74.90	0.14	2 dom snow load
2 Timber Member1	rigtig bjælke	GL32h	37.43	222.69	0.30	2 dom snow load
3 Timber Member1	rigtig bjælke	GL32h	33.27	197.95	0.28	2 dom snow load
4 Timber Member1	søjle rigtig 267X1	C24	51.90	74.90	0.10	2 dom snow load
5 Timber Member1	søjle rigtig 267X1	C24	51.90	74.90	0.17	2 dom snow load

Robot is calculating for the whole structure, and the hanscalculation is for a beam, will the result deviation

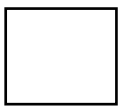
Beam



400 mm

140 mm

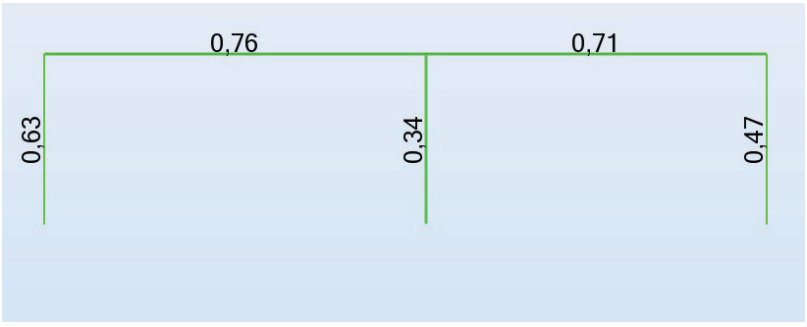
Column



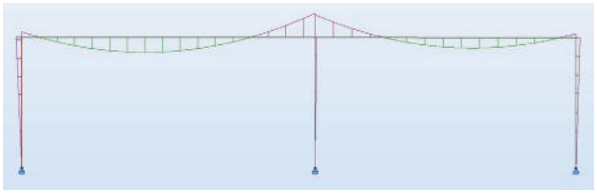
267 mm

140 mm

To use the materiality more, is the dimension for the beams and the columns decreased in size, there is used GL32h for the beams, with a section dimension 400 x 140 mm.
For the column is the material C24 with a section dimension on 267 x 140 mm



Member	Section	Material	Lay	Laz	Ratio	Case
1 Timber Member1	søjle rigtig 267X1	C24	51.90	98.97	0.63	2 dom snow load
2 Timber Member1	rigtig bjælke 6040	GL32h	77.94	222.69	0.76	2 dom snow load
3 Timber Member1	rigtig bjælke 6040	GL32h	69.28	197.95	0.71	2 dom snow load
4 Timber Member1	søjle rigtig 267X1	C24	51.90	98.97	0.47	2 dom snow load
5 Timber Member1	søjle rigtig 267X1	C24	51.90	98.97	0.34	2 dom snow load



ACOUSTIC EVALUATION

The acoustic has been calculated in excel to find the right reverberation time. The reverberation time tells the time is take for a sound to fall with 60 db. To find out is several factors important to address. The rooms volume is V, the equivalent absorption area is sat to be A. The reverberation time is affected by the size of the room in matter of volume, the different types of material used in the room and their absorption coefficient, the number of people and the interior objects inside the room.

In this analysis, is the focus point on the biggest dayroom. It is desired that an RT60 for a dayroom not to be over 0,6 seconds . The test has been calculated in excel sheet, where different combination of material has been tested.

Scenario 1 (ill. 3)

The scenario which fullfills almost the requirement but still brings the aestetic spatial quality which is wanted, is the one that is chosen. the combination of material is:
plasterborder on the roof and walls, glass, and timber on the flooring. to further develop and get closer to the wished result is acoustic panels used on the roof and small ones on the walls. This Brings the dayroom down to an reverberation time which goes from 0,7 - 0,2 which is very close to what the wished one is.

$$T = \frac{(0{,}16 \cdot V)}{((\sum \alpha \cdot S) + (\sum n \cdot A) + (4 \cdot m \cdot V))}$$

where

α = absorption coefficient

S = surface area

n = number of persons

A = absorption coefficient for person

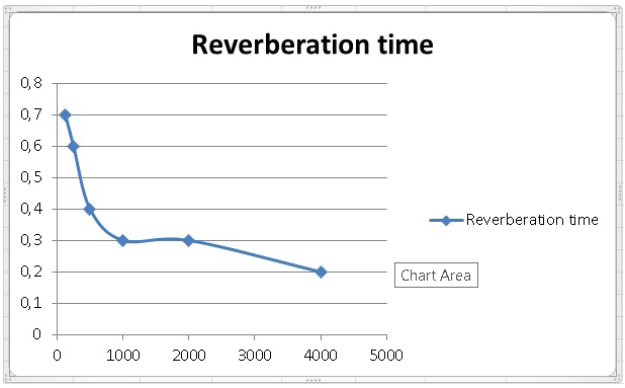
m = air absorption

V = volume of room

ill. 1 Sabines Equation

Ceiling: 45m2
Floor: 45 m2
Walls: 100 m2

ill. 2 Surface areas



Efterklangstid Reception

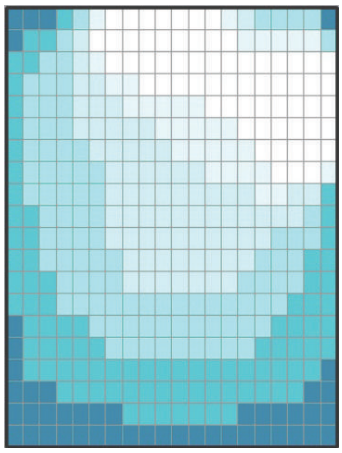
Equivalent absorption area	**Material**	**Areal**	**125 Hz**		**250 Hz**		**500Hz**		**1000Hz**		**2000Hz**		**4000 Hz**	
		S(m^2)	α	Sα	α	Sα	α	Sα	α	Sα	α	Sα	α	Sα
Gulv træ	Træ (valnød)	45	0,15	6,75	0,11	4,95	0,1	4,5	0,07	3,15	0,06	2,7	0,07	3,15
Alm loft	plaster board	45	0,013	0,585	0,015	0,675	0,02	0,9	0,03	1,35	0,04	1,8	0,05	2,25
window	glass	5	0,35	1,75	0,25	1,25	0,18	0,9	0,12	0,6	0,07	0,35	0,04	
Loftplader	Akustik paneler	50	0,15	7,5	0,11	5,5	0,1	5	0,07	3,5	0,06	3	0,07	3,5
Vægge	plaster board	100	0,013	1,3	0,015	1,5	0,02	2	0,03	3	0,04	4	0,05	5
Acousti-Board	50% pre-consumer recycled synthetic fiber	45	0,05	2,25	0,12	5,4	0,32	14,4	0,69	31,05	0,83	37,35	0,87	39,15
Gulv træ	carpet	20	0,08	1,6	0,24	4,8	0,57	11,4	0,69	13,8	0,71	14,2	0,73	14,6
wall	Akustik paneler	10	0,15	1,5	0,11	1,1	0,1	1	0,07	0,7	0,06	0,6	0,07	0,7
Absorption from persons		**Antal**	**Sα/stk**	**Sα**	**Sα/stk**	**Sα**	**Sα/stk**	**Sα**	**Sα/stk**	**Sα**	**Sα/stk**	**Sα**	**Sa/stk**	**Sα**
Persons		25	0,25	6,25	0,35	8,75	0,42	10,5	0,46	11,5	0,5	12,5	0,5	12,5
møbler?		40	0	0	0	0	0	0	0	0	0	0	0	0
Absorption in air														
v/ 50% RF		**Volumen**	**125 Hz**		**250 Hz**		**500Hz**		**1000Hz**		**2000Hz**		**4000 Hz**	
		[m3]	m	mV	m	mV	m	mV	m	mV	m	mV	m	mV
		126					4E-04	0,0504	0,001	0,126	0,0024	0,3024	0,0061	0,7686
Total absorption				29,5		33,9		50,6		68,7		76,5		80,9
Efterklangstid	T=(0,16*V)/((Σα*s)+(Σn*A)+(4*m*V))			**0,7**		**0,6**		**0,4**		**0,3**		**0,3**		**0,2**

Daylight

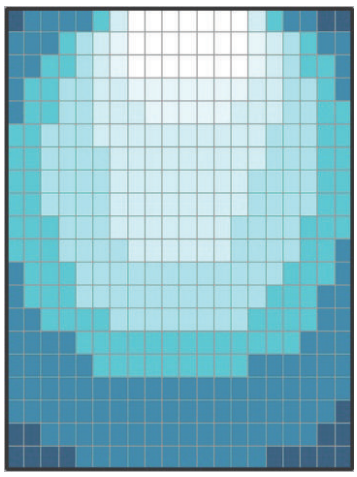
The analysis of the light, is studiet in the rooms where the users will spend most of their day, therefore is the day-rooms and staff room taken.
LIght is a important factore for the learning enviroment, it brings life in to the rooms. There is placed a skylight in each dayroom, plus one window towards the courtyard. The dayrooms in each end point have one additional window.
The biggest dayrooms, are invastigated, becuse every dayroom have same size windows.

The result was satisfing and can be seen in ill. 1 to 3 where the first one is the big dayroom with three windows, and the second one is the dayrooms with only two windors.

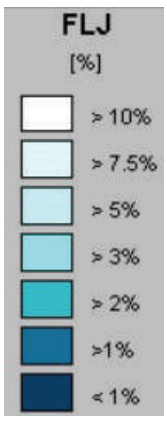
Artificial light will be used as an additional light source to illuminate the space.

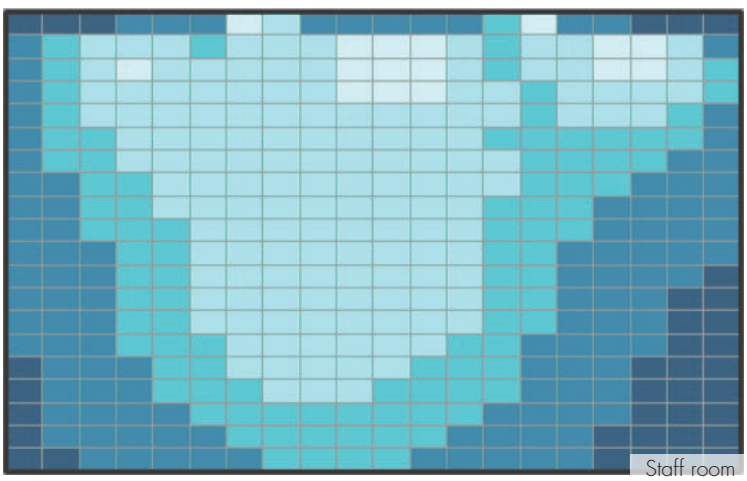


dayroom with
3 windows



dayroom with
2 windows





Staff room

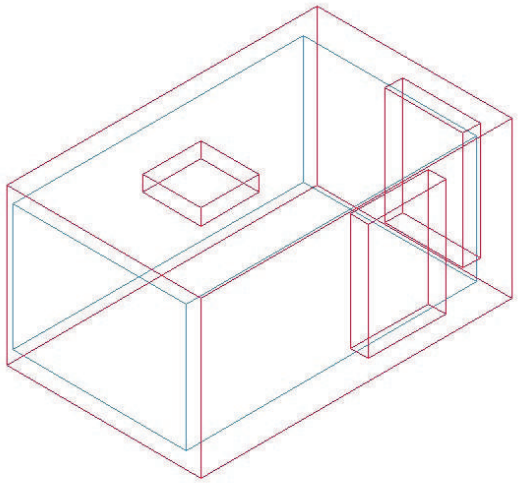
ill.1-3 Light studies

B-sim calculation

To understand the indoor climate quality, a critical room was chosen and built in B-sim. The buildt model consist of one thermal zone.

Assumptions:
People load : the amount of people using the room is sat to be 25 where 20 of them are kids, and the rest is pedagogue. Where the use time is from 7-17
The mechanical ventilation is activated when the indoor temperature exceeds 23 degrees, with a maximal air change rate of 3 h-1. The natural ventilation system is cross ventilation, by using the skylight and the windows.

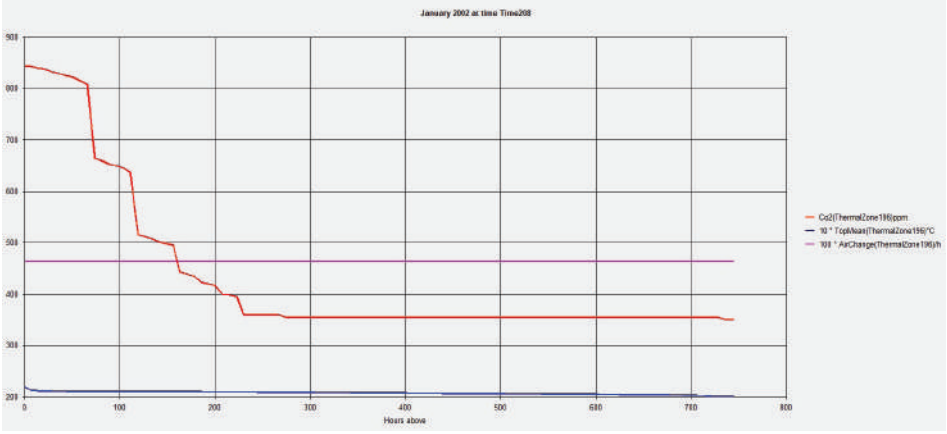
Thermal comfort:
To verify that overheating is avoided, the critical room has been tasted in B-sim with and without shading in 1th. August. According to the building regulation and Danish standard, is the allowed number of hours which the room can be above 26 degree 100 hours pr. Year and above 25 hours for 27 degree pr. Year.
As the results shows is shading a must, if the requirements from Danish standards to thermal comfort has to be fulfilled. There is used hybrid ventilation, but with the oppertunity to use michanical ventilation in the summer periods as well, as the result tell, is the level of CO2 fine, becuase it don't excide 500 ppm over the outdoor which is 350 - 400 ppm. While the top level CO2 when it is worst is 843,6 PPm



ill. 1 Simple B-sim model, with the same area, and number of windows and size.

	No shading	*Shading*
Hours >21	*2768*	*2810*
Hours >26	139	19
Hours>27	*77*	*7*

ill. 2 Overheating tjek , the amount of hours the room is above 21, 26, and 27



Be-10 calculation

Be-10 Calculations:
Energy is affected by many different factors like, placement, design of the building and installation properties. The goal for this building is to reach the BR2020 standard of 20 kWh/y/m2, with use of passive strategies.
when the goal for the 2020 is achieved then can aktive strategies be used to make the building zero energy buliding or near zero energy building.

the Data used in the model are:

Construction: the u-value for the walls are 0,12 W/m^{2}K, which calculated and for the roof is it 0,08 W/m^{2}K. Cold bridges in the windows perimeters are assumed to be small (konforhusene,2010). Windows: The used windows for this construction is Pazans windows with wood frame with U-value 0,66 W/m^{2}K

Shading are assumed to be same for the southen facades with an roof overhang on 1 meter . furthermore are there used external shading which is moveable.

One Pump of 80 W:

The ventilation system are set according to the Danish Standards 12521 p. 37 (DS/EN 12521,2009) 0,42 l/m^2/s which the amount that is reccomended for a class two. Furthermore are the ventilation system set to run both in the sommer and the winter periods.

The pipes are insulated which means that is the loss from the pipe is minimal of 0,045 W/mK

Result:
The energy consumption of the building is now 15,6 kWh/m^2 which fulfills the energyframa for 2020 which is 20 kWh/m^2 below the limit of 2020.

Nøgletal, kWh/m² år

Energiramme BR 2010

Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme
54,1	0,0	54,1
Samlet energibehov		16,4

Energiramme Lavenergibyggeri 2015

Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme
31,0	0,0	31,0
Samlet energibehov		16,4

Energiramme Byggeri 2020

Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme
20,0	0,0	20,0
Samlet energibehov		15,4

Bidrag til energibehovet

Varme	9,8
El til bygningsdrift	1,5
Overtemp. i rum	2,9

Netto behov

Rumopvarmning	9,7
Varmt brugsvand	0,0
Køling	0,0

Udvalgte elbehov

Belysning	0,0
Opvarmning af rum	0,0
Opvarmning af vbv	0,0
Varmepumpe	0,0
Ventilatorer	1,0
Pumper	0,4
Køling	0,0
Totalt elforbrug	32,1

Varmetab fra installationer

Rumopvarmning	0,1
Varmt brugsvand	0,0

Ydelse fra særlige kilder

Solvarme	0,0
Varmepumpe	0,0
Solceller	0,0
Vindmøller	0,0