

# Kindergarten of Tomorrow



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## Abstract

The project is a kindergarten in Karolinelund, Aalborg. It is situated on the site of a former amusement park and focuses on the values of the Italian teaching philosophy Reggio Emilia, which focuses on architecture, along with parents and teachers, as a facilitator of a child's development. The Danish culture is also taken into consideration in the design of the kindergarten. The project is done as a shared space between the regular visitors of the park, and the kindergarten. The kindergarten fulfills the energy requirements for 2020 and is constructed of sustainable materials such as timber and zinc while providing an acceptable indoor climate. This is documented through the use of appropriate software.

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# Analysis



III. 2 rollercoaster

# Introduction

The manner in which small children perceive and explore their surroundings never ceases to amaze and fascinate. A child will use all its senses to acquire knowledge, and this needs to be incorporated in any planning of buildings intended for children, so as to facilitate their learning acquisition as much as possible. Although it is of major importance to keep the children out of harm's way, it is equally important to provide them with inspirational and challenging surroundings. Obviously, this is particularly relevant when considering the design of a kindergarten which this present project deals with.

More people are moving into the cities, even families with small children. This trend increases the need for child-care institutions in the city centres, and with a need for an outdoor environment which is difficult to satisfy. As the city grows industrial areas along the fringe of the city centres are being restructured into functions of higher demands. One of these areas is the former amusement park Karolinelund.

The municipality wants Karolinelund to retain its function as the park it is today while introducing a kindergarten. This presents some challenges to the design, that must be considered in the process. The design will not be able to claim a portion of the park for itself, it will have to coexist with the current users of the park. This leads to some safety concerns for the children, and usability concerns for the current users.

With increasing population and densities in the cities, our environment is becoming more and more strained to sustain us. To counteract this, Denmark has made a plan to achieve 100% green energy in the building sector by 2035, and in the transport system by 2050. [ ] This creates some demands for new buildings to be more efficient and sustainable. So as architects we need to become better at caring for the environment, without compromising the living conditions of the inhabitants.

This leads to the problem definition:

“How do you incorporate the history of Karolinelund and the concept of shared space into a sustainable kindergarten, that facilitates children's learning and development?”

The project explores the possible design of a kindergarten located in Karolinelund, a former amusement park in Aalborg. After a chapter dealing with methodology the site is introduced and analyzed after which inspirational sources are described, the most significant one being the philosophical principles of Reggio Emilia, but also a kindergarten in Fuji and two Danish day care centres have been included here.

Finally, the Kindergarten is described through plans, sections, facades and renderings. With further detailing into the construction, energy consumption and indoor environment.

## Methodology

The chosen guiding method for this project is the Integrated Design Process, developed by Mary-Ann Knudstrup [1]. It focuses on integrating knowledge from engineering and architecture, from early phases of the project, promoting the interaction between each other in order to solve the problems connected to the design of sustainable buildings.

Another aim of this method is to keep a fluid work process, enabling a continuous evaluation of the design, making sure it doesn't deviate from the overall problem and concept. The method is divided into 5 phases: Initiating problem, Analysis, Sketching, Synthesis, and Presentation.

The Initiating problem provides the basis of the project and the questions to be answered, e.g. "How do you maintain security within an open environment?" This can change many times through the project development to incorporate more design criteria against which the design can be measured. This way the process is driven forward while the design becomes more defined.

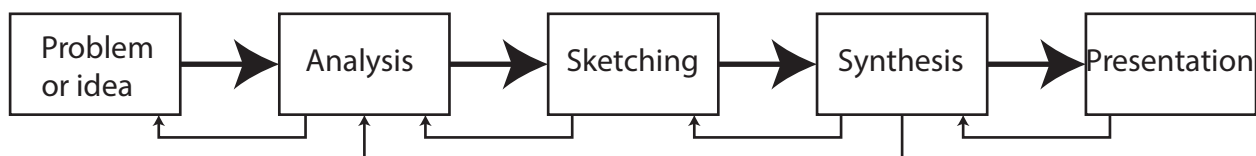
All the information and different analysis are gathered in the Analysis phase where the focus

is on the context of the design, looking at social, urban, architectural, and natural contexts. This is the phase where different analysis methods can be applied such as Kevin Lynch's 'Image of the City' etc.

The focus of the Sketching phase is to expand the idea basis, material research, logistics, structural system etc. from which the design will emerge. During this phase the number of design proposals will broaden. Later the group will analyze the proposals they like the best and use those criteria for further sketching iterations.

The Sketching phase will lead into the Synthesis phase where the design comes together. In this stage, the logistics of the building and site, the construction, the form and materials etc. are going into one unity.

The Presentation phase covers all the material used to present and explain the project. It could be executed in different forms of renderings from hand drawn sketches to computer models.



### Ill. 3 Workflow



## Basis for sustainability

The issue of sustainability is important these days, when climate change is often discussed.

The CO<sub>2</sub> emission is causing an increase in the surface temperature on a global scale. To keep this increase under 2°C the emission cannot exceed 1000 gigatonnes carbon. In 2011 more than half of this has already been emitted (531 gigatonnes). Depending on how this develops, the temperature is estimated to rise 0,3°C - 4,8°C approaching year 2100, while the global sea level will rise between 20 and 98 cm. [2]

These changes may cause (among other things):

- Increased precipitation on a global scale
  - Hurricanes and other storms become stronger
  - Less available fresh water, leaving some societies without water or electricity
  - Floods and draughts will become more frequent
  - Some diseases will spread, such as malaria
- [3]

## Wishes from the Municipality

The municipality of Aalborg has not issued a formal plan for the area, but has verbally communicated some wishes and demands they want to be included in the project.

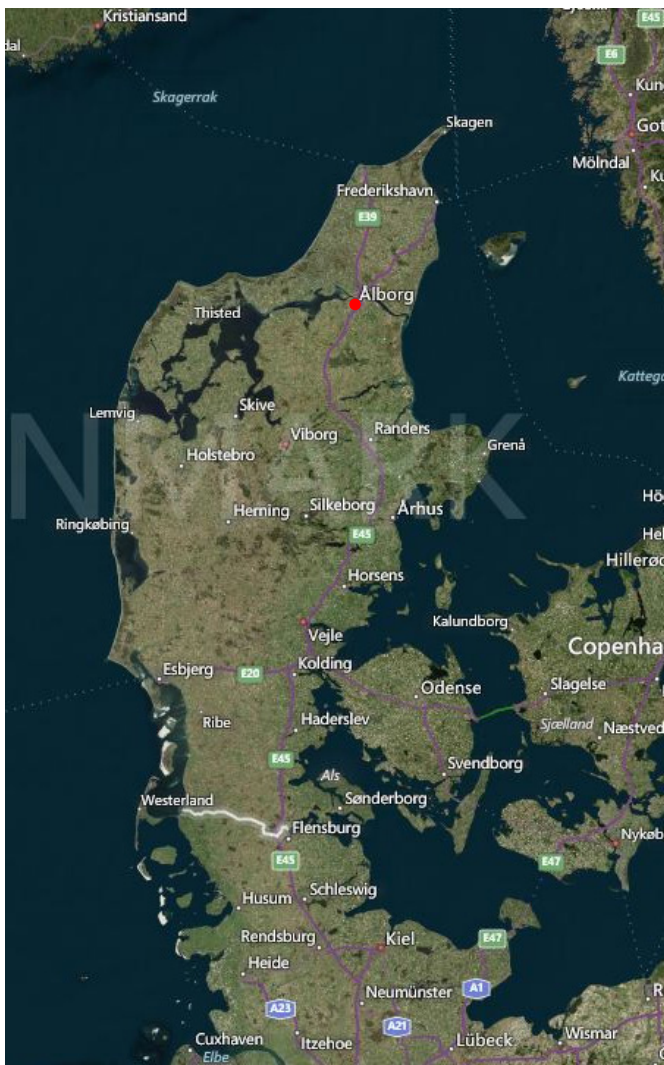
- The kindergarten must house 100 children
- The built area has to be about 700 m<sup>2</sup>
- The outdoor area has to be about 7000 m<sup>2</sup>
- The outdoor area must be accessible for the park's visitors
- Parking must be accessible for the kindergarten
- There should be some distance to the Tulip meat processing plant
- The trees in the area should not be removed

### Location of the site

The site is located in the centre of Aalborg. It was an amusement park before Aalborg municipality repurposed it, to be a green public park.

The site offers a lot of possibilities and challenges. To the east of the site, there is the Tulip factory, which processes meat, and is a parameter when considering the location of a kindergarten. Underneath the site, there is an enclosed stream, which could be reopened

as an asset for the area. The site is close to Limfjorden, Musikkens Hus and Nordkraft, which could offer some activities for the children. A small number of parking spaces are connected to the site on Kjellerupsgade, which is necessary for a kindergarten. There are a lot of preserved trees on the area, which should be left as they are.



III. 4



III. 5



III. 6

# Introducing the Site

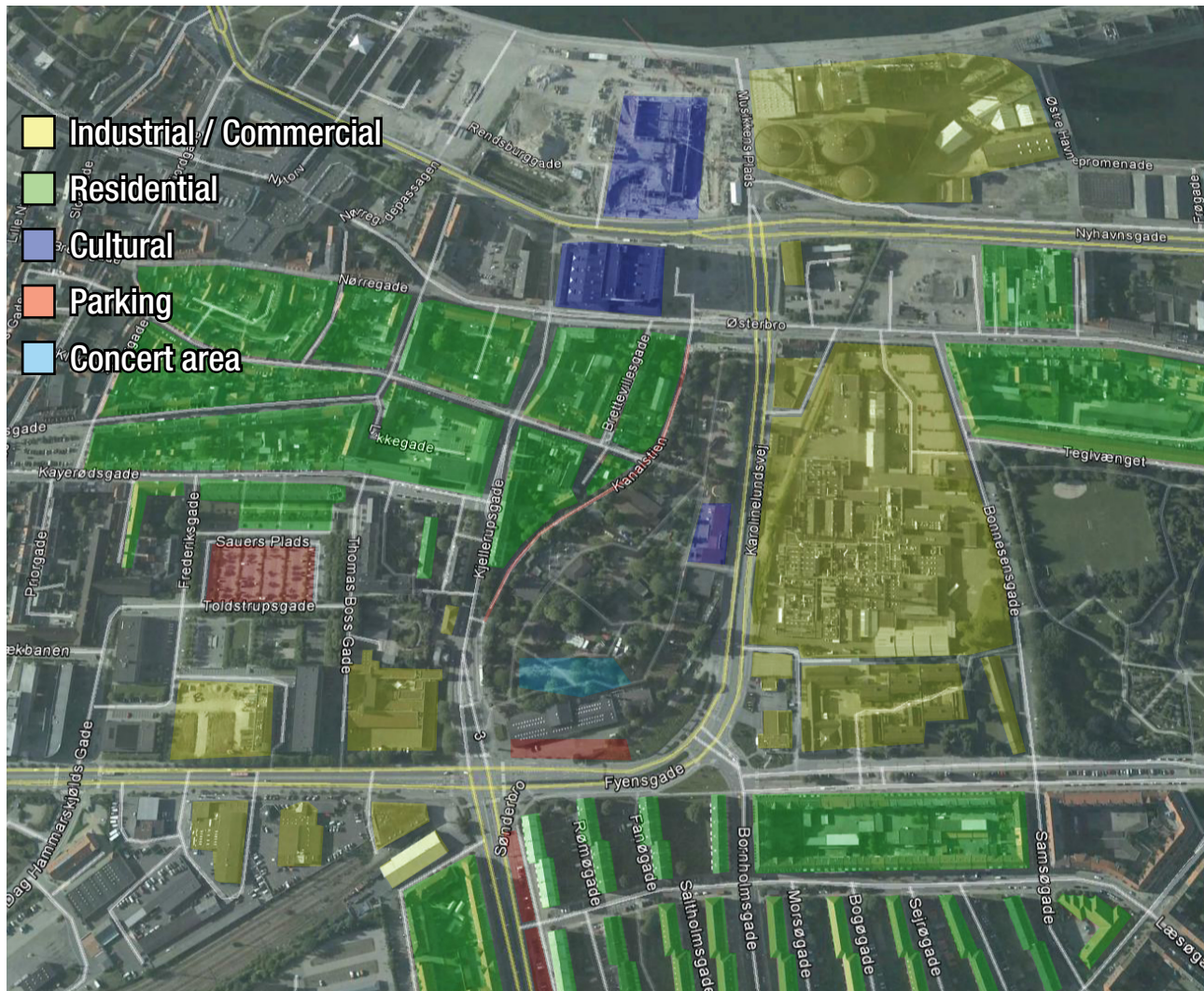
## Context

Karolinelund is situated in the heart of Aalborg, next to the important cultural nodes Nordkraft and Musikkens Hus.

Inside Karolinelund is the alternative stage “Platform 4” which is used for everything from concerts to events for the university.

In the southern end of Karolinelund is the area in which concerts are given on Fridays during the summer.

Tulip has a meat processing plant to the east of Karolinelund.



## History of Karolinelund

In 1946 Karolinelund was owned by the Lind family. First by the brothers Volmer and Carl Lind who established the amusement park and later Franck Bo Lind who in 2006 sold it to Torben “Træsko” Pedersen who owns a number of similar franchises.

After just one season on January 23, 2007, Torben Pedersen sold the park to Aalborg municipality, supposedly for only half the amount he had paid the year before. Aalborg municipality established Karolinelund as a park for the city, a green and recreational area for the city, with a wide selection of rides, restaurants and entertainment.

On 11. May 2012, the park reopened without the rides and restaurants. [4]



Ill. 8



Ill. 9

## Karolinelund now

Today, Karolinelund is the setting of a lot of public activities in Aalborg.

The sense of place is unique in Aalborg, with a wall spanning the area, except to the south that is covered in high quality graffiti. There is a skating area to the north and an adjacent dirt bike track. During the summer period, there are a lot of concerts on Fridays that draw a big crowd. It's possible to get a small garden, in which to grow plants, vegetables and herbs. It is a sanctuary for teenagers and young adults in which to practice their hobbies, while maintaining a secure atmosphere that welcomes and offers something for all ages.

The layout is typical of an amusement park, with nooks and crannies spread throughout the park, which invites to rest and interaction. Aalborg municipality wants to conserve the trees as they are, to cherish this atmosphere.



Ill. 10

This makes Karolinelund a welcome respite in the cityscape, however, the remodelling of the area has left the southern part of the park bare and exposed, with large patches of gravel and missing wall.

# Analyzing the Site

Comparison of areas



On the left there is a diagram of Karolinelund. When choosing the placement of the site there are a lot of things to consider.

First of all, the trees have to be preserved. This automatically eliminates a large part of the area.

The sun conditions are also very important, both for the indoor environment and for the outside playground.

The noise and pollution levels should preferably be as low as possible.

There should be access to parking facilities.

● The patch of gravel at the southern end. This area is unused at the moment, giving a lot of freedom to design and make use of an area that, at the moment, does not contribute to the quality of Karolinelund.

The area has access to parking close by.

It is difficult for a building to open up both towards the parking area, and towards the park at the same time, when designing within the elongated shape.

It is close to heavy traffic, giving both a lot of noise and air pollution.

The building will create shade on the north side which is the most desirable in terms of outdoor activities.

The area is close to the concert area which might cause problems when designing an enclosed outdoor environment.

● The volleyball court.

This area is orientated towards the south, giving a lot of sun on the outdoor areas.

It is placed towards the most quiet part of the context, minimizing noise and air pollution.

The natural orientation towards the south provides a basis for the layout of the building.

The bike area, enclosed by hedges on the other side of the road, is largely unused and can become part of the kindergarten.

The area is already established, making it more difficult to repurpose for the project.

The access to parking is difficult, as the immediate area does not have a big parking area.

Elements in the area



III. 12



III. 13



The area has some useful architectural elements that can be utilized in the project, along with some that might not be living up to their full potential.

Karolinelund has a lot of natural barriers, most prominent among them are the hedges. These can be found throughout the park, and can be simple borders or they can cover smaller areas. This could be used in the project to make natural barriers between the children's area and the rest of the park. Even though the hedges are not taller than the children, they still pose an insurmountable obstacle.

Near the volleyball area, there is a largely unused piece of the park that could be used in the kindergarten.

While the southern end of Karolinelund presents an enticing opportunity to develop an unused piece of the park, the volleyball field is evaluated as the better placement for a kindergarten. It has better placement with regards to sun and pollution, and the lack of parking facilities can be amended through the design.

The volleyball field is also placed next to unused square meters, the use of which would benefit the atmosphere of Karolinelund. The central placement of the kindergarten will also create more activity in the park during the day in a visible location, and not hidden away at the southern end.



III. 14

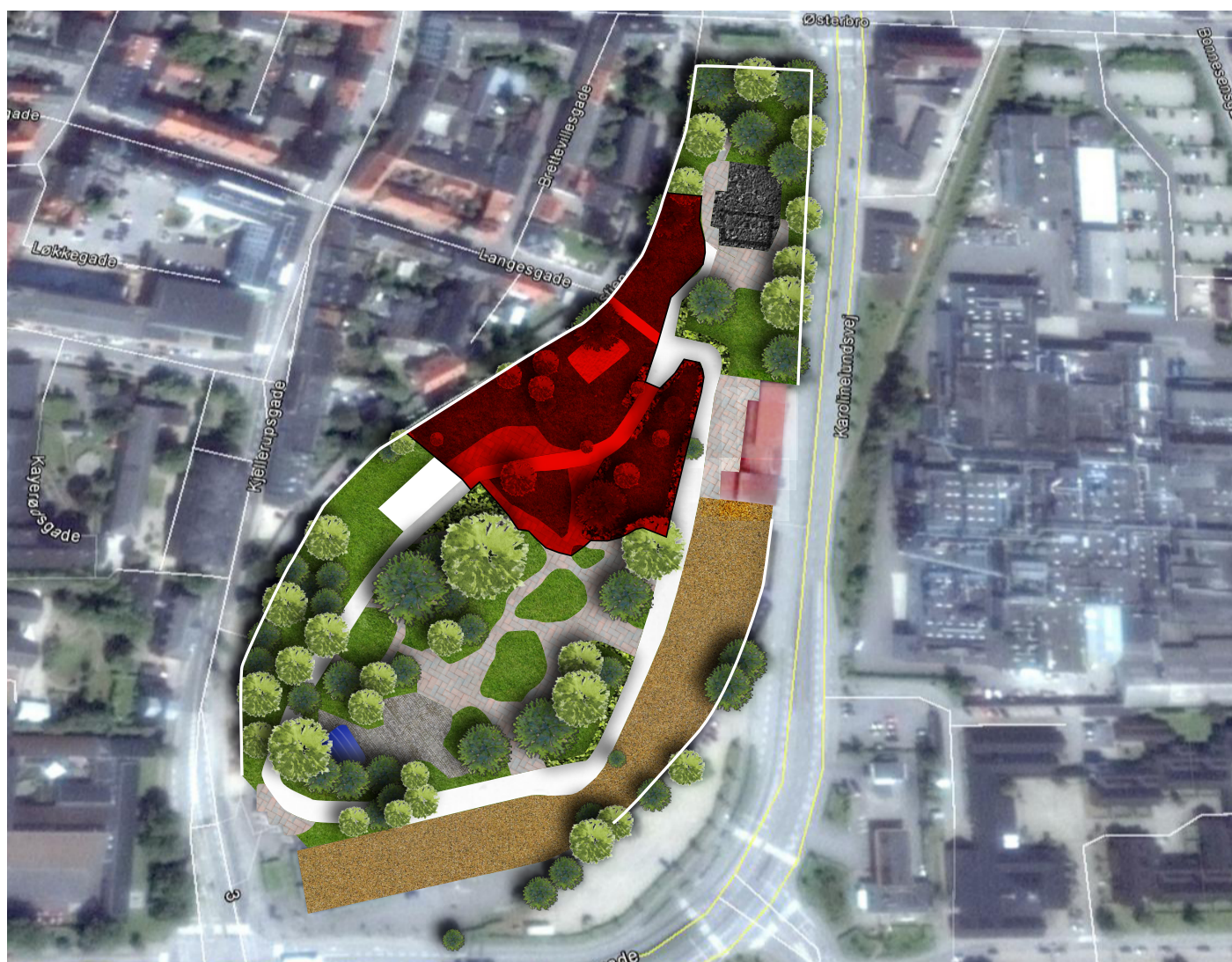
## Potential of the site

The rich history of the site provides a lot of context to work with in the design process. The atmosphere and unique architecture of amusement parks give an interesting point of departure.

The current functions in the park are also one of a kind in Aalborg. This is also an important factor in maintaining the atmosphere.

The location is well suited to a kindergarten, since it can have a large outdoor area attached to it, while still being in the heart of the city which is something most of the kindergartens in the centre of the city cannot provide.

The area marked in red is roughly 7700 m<sup>2</sup> that the municipality wanted the outdoor area to be, including the area for the building. Some of this area is currently unused, because the current function as a small mountain bike course does not see regular activity. Safety is of course important in such an open area, and there will be a need of multiple entrances which have to be as secure as possible within the circumstances. The shape of the area is suited for a kindergarten because an adult will have visual overview of most of the area from any point, because of the flatness of the terrain, and the low barriers.



III. 15

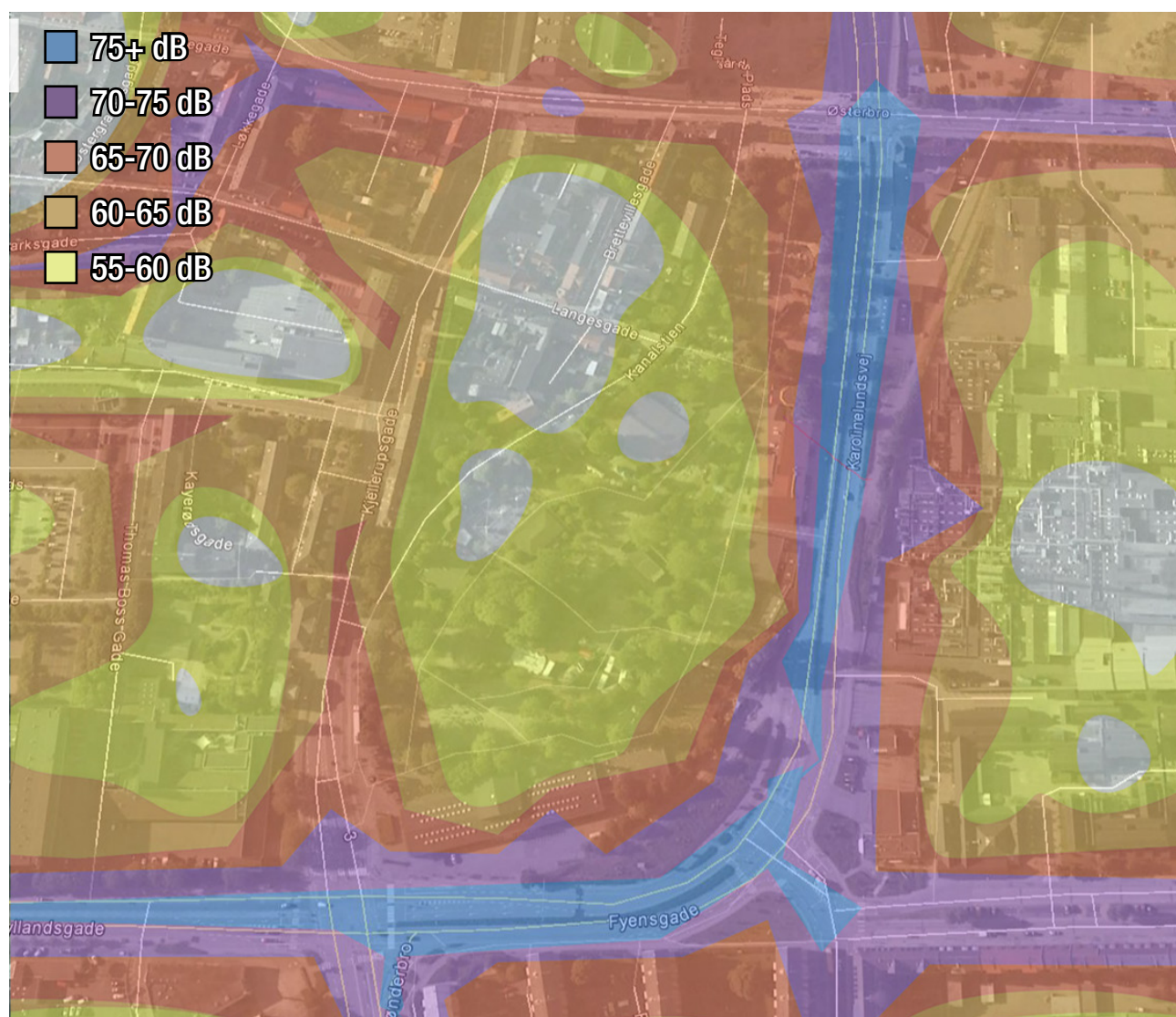
## Noise

As shown in the illustration below the noise pollution is worst along Karolinelundsvej. In most of the park, the level is at 55-60 dB but can reach 70 at the eastern and southern end.

This is a consideration when thinking about the layout of the area, and the importance of completing the wall that runs around the park. Likewise, it might also be relevant to consider this when planning the ventilation strategy and sound absorption in the facade of the building.

The air pollution will also be worst along the big roads which should be considered when placing the outdoor areas for the children to play in.

This will also influence the ventilation strategy inside the building as it is not optimal to bring polluted air in.



Ill. 16

## Kindergarden of tomorrow

The municipality of Aalborg wants the kindergarden to have the vision: "Kindergarten of Tomorrow" This entails having an open design that does not restrict the visitors of the park.

Karolinelund is about 45000 square meters in size, and if a kindergarten for 100 children got 7000 m<sup>2</sup> of it, it would limit the usability of the park.

This poses some security issues for the kindergarten as it will be easier for the children to get out, and for unwanted people to get in contact with the children.

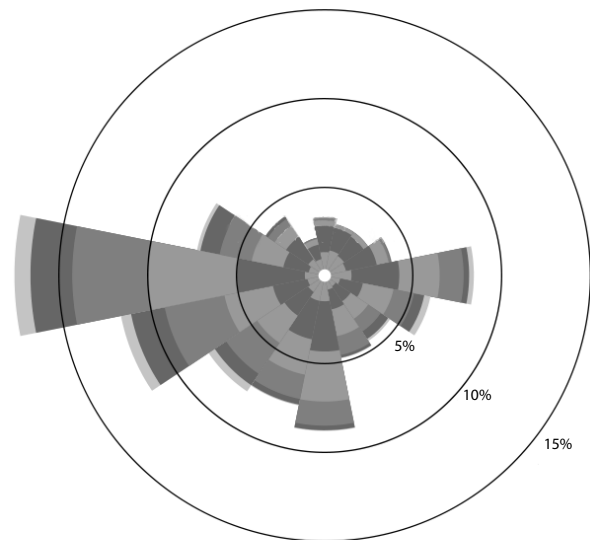
When talking about children and the "Kindergarten of tomorrow" the topic of sustainability is important because the children should be raised in an environment that seeks to preserve the world they are going to grow up in. The kindergarten should be sustainable for the children, both socially and environmentally and present itself that way in the materials it's made of.

## Weather Conditions

When living in a climate with changing seasons, it's important to consider the effects of the weather on a yearly basis, to satisfy indoor climate and reduce energy consumption.

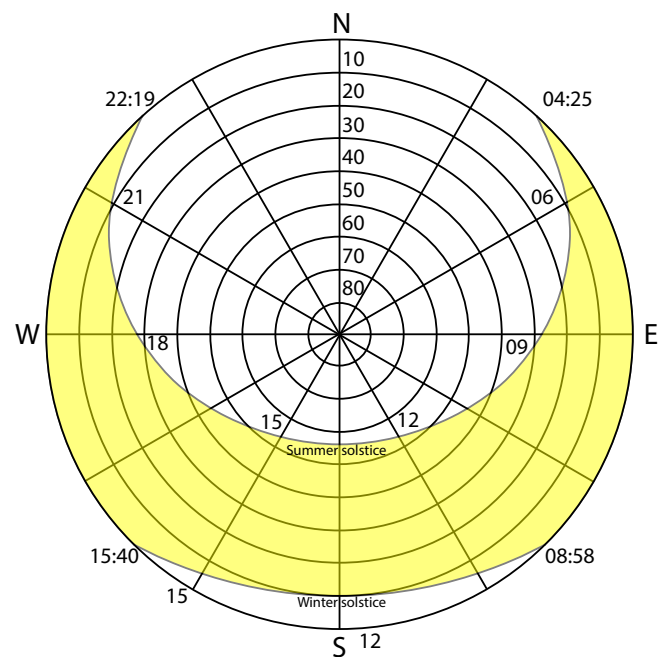
The wind speeds in northern Jutland are high, with it peaking during the winter. This can be important when designing outdoor environments, tall buildings, and when planning the natural ventilation in the building. There is a degree of uncertainty with this data, as it is taken from Aalborg Airport in an unobstructed environment. This could change on the site, because it is closer to the ground and located in the middle of Aalborg, so the other buildings will likely have an effect on the wind.

The sunlight in Denmark varies greatly. This gives Denmark a changing climate with the extreme seasons, summer and winter, presenting very different challenges for the designer. In winter when there is little sun, it becomes important to get a lot of natural light into the buildings, both for the comfort of the user, but also for the passive heat gains it provides. In summer, however, the reverse is true. The intense sunlight coupled with insulated houses can cause discomfort for the users of the buildings. At this time of year, the passive heat gains should be kept to a minimum, and cool air should be used for ventilation.



- > 10 (3.0%)
- 8-10 (8.7%)
- 6-8 (20.2%)
- 4-6 (26.2%)
- 2-4 (28.8%)
- < 2 (13.0%)

III. 17



III. 18

## Technical parameters

As seen in the table, the goal is to reach the energy requirements of 2020 with a low energy building. But to reach that goal, the walls have to be thick and allow little infiltration. This is a concern in regards to the indoor environment, where the thermal comfort can be difficult to achieve, if there is an excess of solar radiation entering the building during the summer. Another matter is the indoor air quality, with little infiltration the CO<sup>2</sup> and pollution from people and furniture might become a nuisance. To make sure this does not happen, it's important to have sufficient ventilation.

Daylight is important when concentrating, that makes it a priority in places where they sit and read or draw, and in the workshops along with the administrative offices and meeting rooms.

Parameter	Goal
Energy Frame	Class 2020
Indoor Air Quality	Class II (CR1752)
Thermal Comfort	Class I
Daylight	Average DF > 2% Preferably DF > 5%
Ventilation	Natural Ventilation

## Room Program

Since there is no official competition, there is not a predefined room programme. This is a simplified version of a similar Reggio Emilia project situated at Arena Nord in Frederikshavn, Denmark.

To compensate for the lack of an official programme, this ensures that the needs of the staff and children are taken into consideration.

Adm. + Staff	Square meters (m <sup>2</sup> )
Offices	30
Staff facilities	30
Meeting rooms	15
Toilets	5
Technical	20
Kitchen	25
Storage	15
Children facilities	
Group rooms	150
Play rooms	90
Changing toilet	30
Childrens toilets	70
Entrances	20
Wardrobe	60
Common Facilities	80
Total	690

# Reggio Emilia

## General overview

The philosophy Reggio Emilia can be used in infant-toddler and pre-schools, and has evolved over the past 40 years into what is widely recognised as the best system in the world. [5]

Reggio Emilia takes its name from the region in Italy where it first emerged. After the destruction of the region in World War II parents wished to establish a democratic and child-centered education to reflect what they believed should be the value that children represent in society. Reggio Emilia is an approach to the education of young children in the pre-school and primary phase. The focus of the philosophy is to incorporate children in the planning of the direction and content of their learning, without a formal curriculum. It believes that children's intellectual curiosity should always be rewarded, and that they should learn through all their senses. It emphasises that the bond between the child and teacher should not be one of unequal power and status, but one where the child is listened to, and respected. There is also a focus on the child's bond with other children and the world.

The approach benefits from consistency which is why it's important that the parents, as the child's initial

teachers, take a large role in the continuation of it in the home and throughout the general upbringing. This continuation is at the heart of the philosophy.

Teachers are provided with a high level of autonomy. Though they are provided with opportunities for professional development, they are encouraged to set their own learning goals without any curriculum or tests but do it on the basis of the children's individual or group needs. The teachers work in teams of two, where one is observing the children through videos, photographs and handwritten notes. This is done to provide a starting point for developing further activities.

One of the leading advocates of Reggio Emilia was Loris Malaguzzi, who was involved with the construction of the first schools and was vital in transferring Reggio Emilia abroad. [6]





## Visit to a Reggio Emilia Kindergarten

On a visit to the Reggio Emilia kindergarten Tiziana in Aalborg, the *pedagoga* made a guided tour of the building where she explained about their experiences with the building, and the Reggio philosophy.

In the common areas there are a lot of indirect light coming into the spaces, both through skylights and through large windows in the facade. The building is constructed with children in mind; the colors are playful, the linoleum floors have paths of different colors inserted which invite the children to make movement through the building into a game. The columns are different colors, which makes the building seem like something a child could have put together out of Lego.

This playfulness permeates the kindergarten, where they do project work based on current events or what season it is. Instead of all the children making the same ashtray, the teachers come up with new topics regularly. In this case, the children had made projects on shelters, where they started with drawings, then models, then small shelters out of blankets and pillows and then large shelters outside, so they follow the process from design to construction. Other projects

include modern day pirates, the sensory experience of leaves, making models out of recycled materials and a study into water. This way, each child gets a unique kindergarten experience that is tailored to what they show interest in.

The teachers follow the children through the kindergarten groups year for year, so the child knows the teachers and vice versa. This means there is no transference of information regarding the child, and, therefore, nothing gets lost in translation, giving the child the best opportunity for tailored growth.

Small windows are placed throughout the building, which allow the children to play with, and observe each other across both physical barriers and age separation. This also allows the teachers to observe the children in all the rooms, even bathrooms, which reduces the risk of bullying, since no room can be completely isolated.

In the play areas of the rooms, there are mirrors that the children can use to observe themselves playing, which the *pedagoga* said were used a lot. They were, however, occasionally broken, and plastic mirrors got scratched too quickly.



III. 20

The teachers are subjected to a teaching curriculum from the state. The teachers, however, are in complete control of how they want to interpret and implement these guidelines.

In the building there are no hallways in the spaces the children move through. The hallway function is transferred to the piazza or the wardrobes.

There is an entrance connected to each group, that functions as a meeting point between teachers, parents and children. This way the social interactions become more relevant, because its the people the child interacts with on a daily basis, and not just a chaotic drop off point.

The visit was inspiring in many ways. It was clear that the building is designed for children, with the big colored beams and columns and windows between rooms being placed in the childrens level. The focus on projects require space, but is an integral part of each child's education



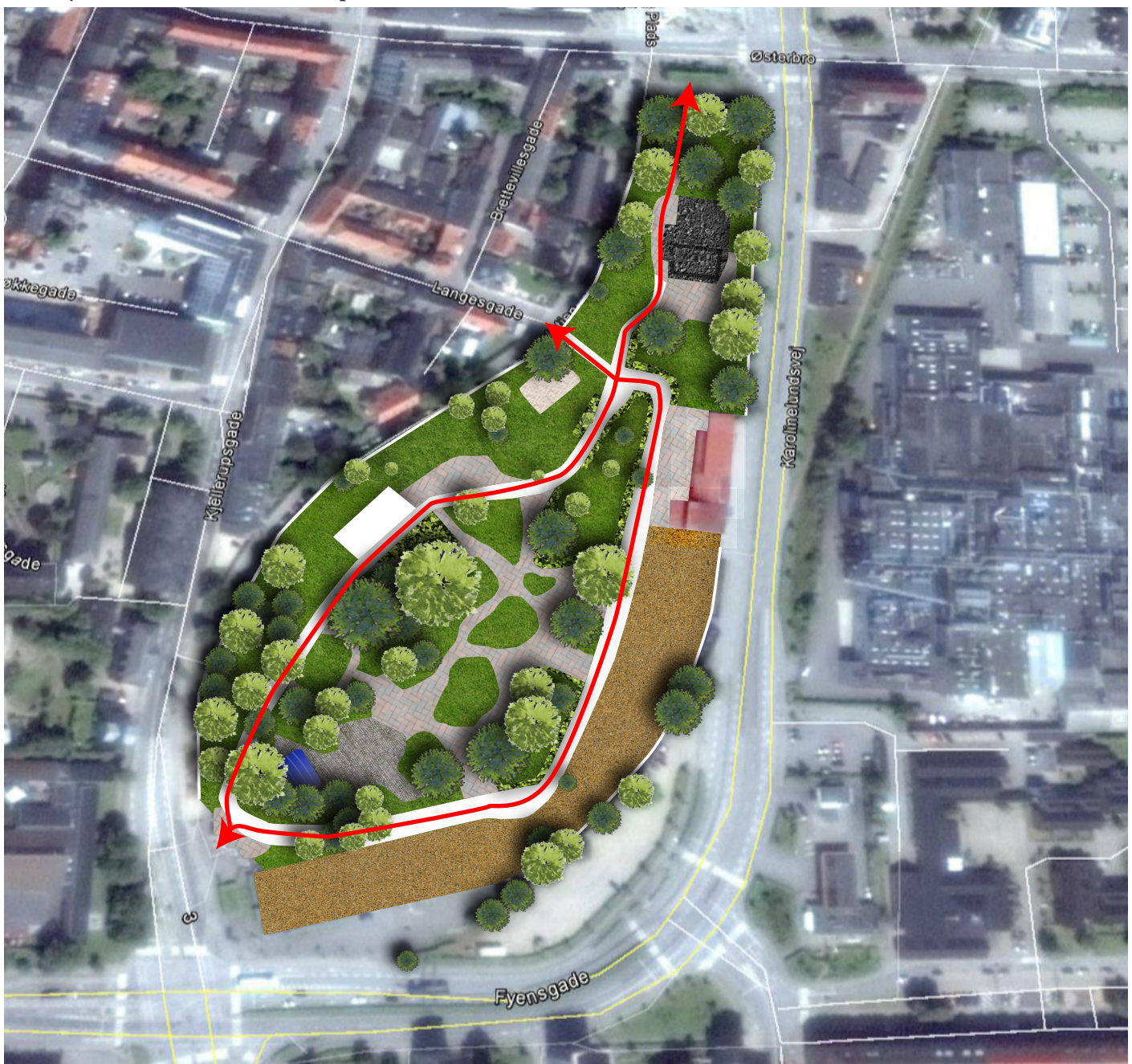
III. 21

# Flow

## Existing Flow

The existing flow is one of the things the municipality wants to preserve in the park. The design will have to take the most important flows into account, no matter where the kindergarten is placed. The flow should not be hindered significantly, but still an acceptable level of security for the children should be provided.

The highlighted paths are the most used in the park, however, there is also some meandering outside the paths, and the grass and volleyball field are used in the summer months.



## Building Flow

Flow is an important factor in a Reggio Emilia kindergarten, because of the unobstructed nature of the design. There can be no unnecessary connecting rooms, such as hallways, in the children's environment.

The flow in the building centres around the piazza, where both staff and children move through and can interact with each other, across groups. In the piazza the children gather for meals, where a few children who helped prepare the food, introduce the meal.

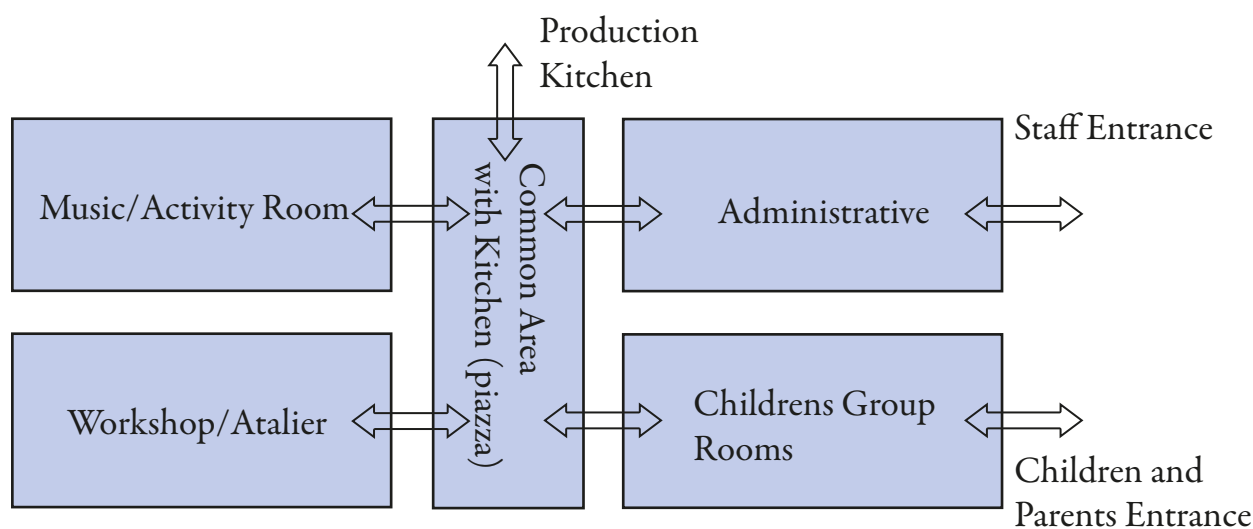
In the big workshop/atelier the children can exhibit their project for the other groups or for the parents. This is also the place where big projects are made, that cannot be carried out in the smaller workshops that are connected to the groups. This is an important practice within Reggio Emilia.

The music/activity room is an area where the children can play instruments or learn new forms of movement under the guidance of a teacher.

The flow in the administrative part of the building is more focused around efficiency. The staff enters through their own entrance. This is done to give them some privacy, and to let them settle in before they go out to the children. It is important to realize that this is a job like any other, and the teachers need to be able to take breaks from it.

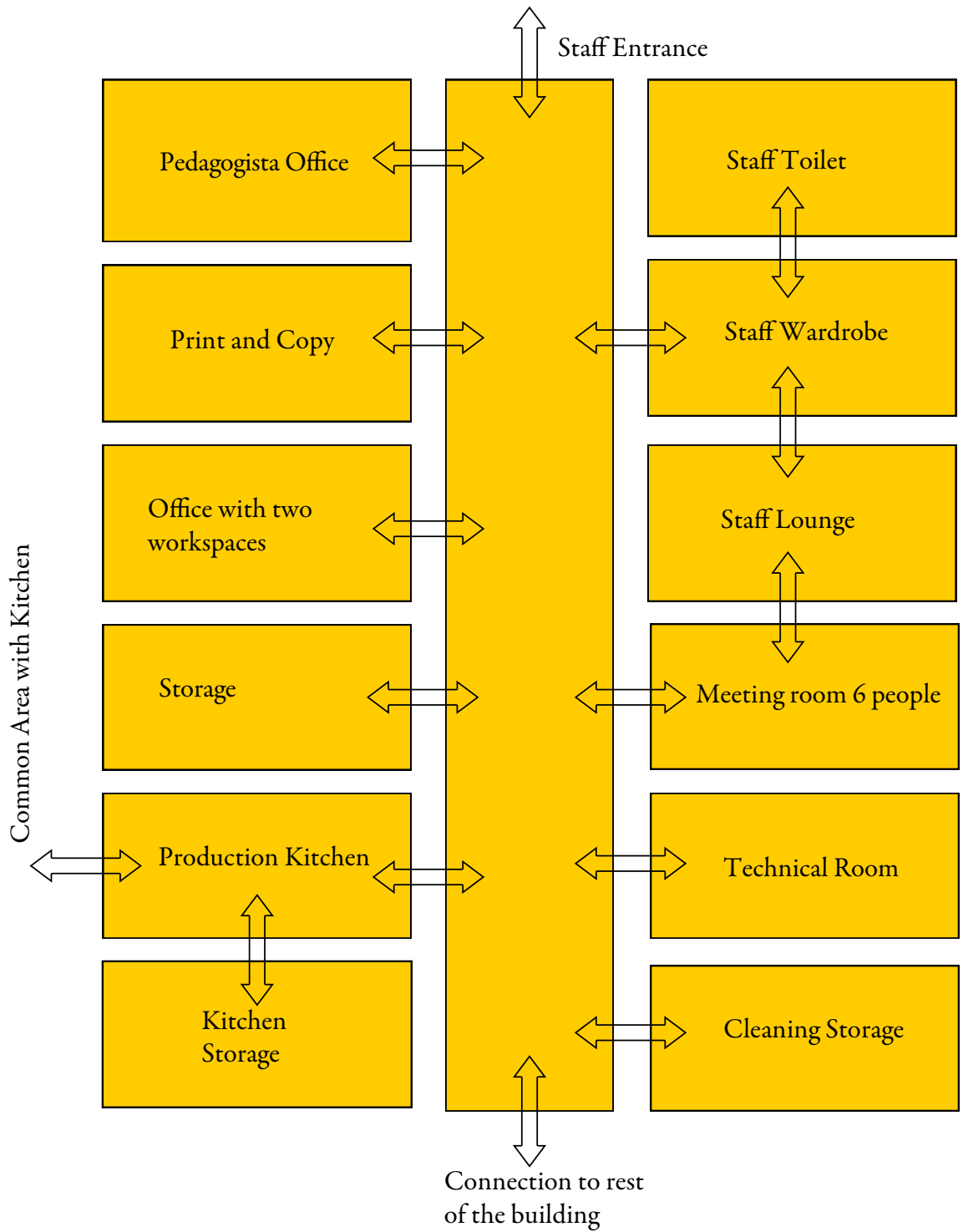
In this part of the building, purely functional rooms, like hallways, are, because it is not meant for the children.

The flow charts are created on the basis of the same project used for the room program.



Ill. 23

Administrative Flow



Ill. 24

## Group Flow

The flow within the groups needs to be good, since this is where the children will spend most of their time when in the kindergarten. The entrance will function as a utility room that is easy to clean, where the children can get dropped off by the parents. A place for social interaction between parents, children and teachers, and a place where the children can take off their dirty shoes before entering the rest of the building.

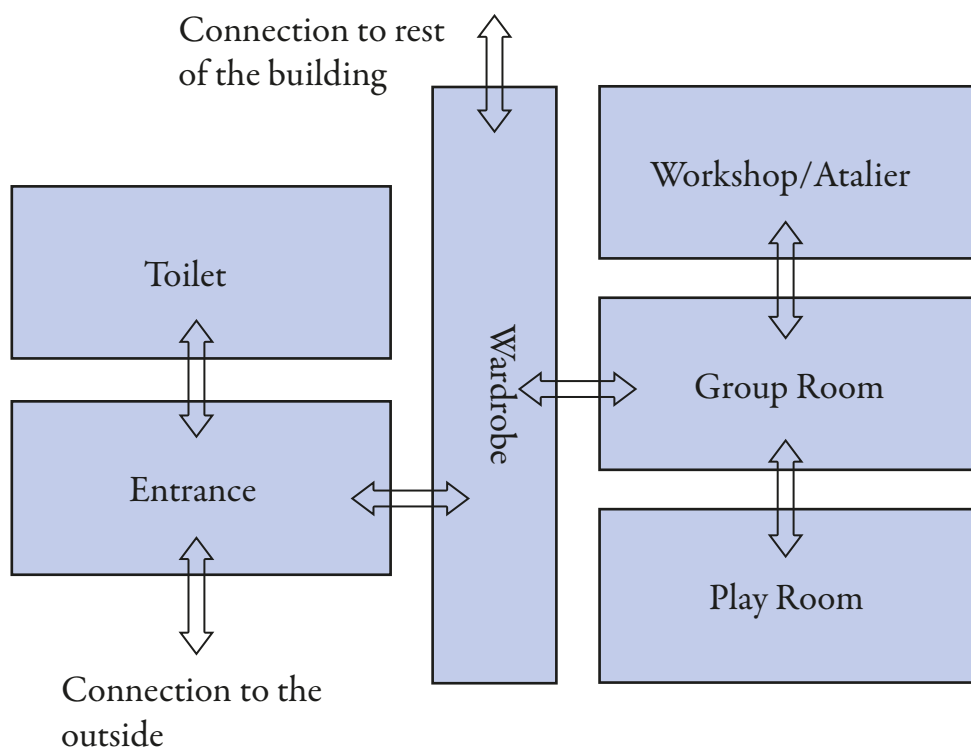
The toilet is connected to the entrance to provide easy access for children coming in from the outside. The toilet also needs to be placed at the edge of the building to ensure that there is enough ventilation.

The wardrobe has a dual function, both as a place for clothing, but also as a connecting area between the other functions and the rest of the building. The wardrobe is chosen because it has a lot of freedom in the shape, while still maintaining its functionality.

The group room is where most of the activities are instigated. This is where the teachers need the transparency to monitor the other functions from, and where the play room and workshop are placed. This is the heart of the group, and must be treated accordingly.

The workshop is small and only meant for minor projects within the group. This is where the teachers of the group can come up with their own ideas for the children without having to involve the rest of the kindergarten.

The playroom is filled with pillows and mirrors to allow the children to play while observing themselves. This is also a room that needs to be transparent to discourage bullying.

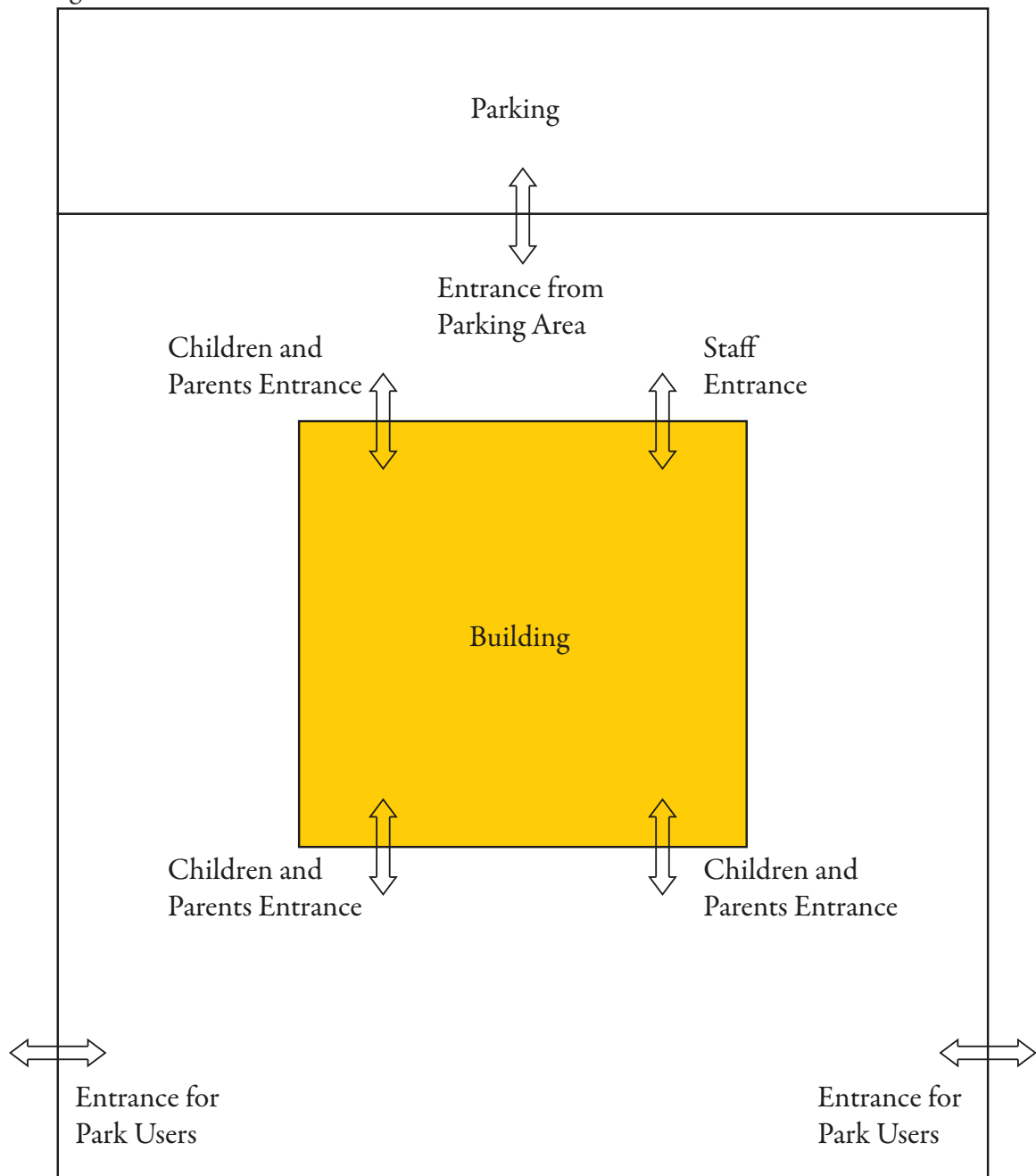


Ill. 25

## Site Flow

The flow on the site is problematic. There must be enough entrances not to hinder the other users of Karolinelund, while still being secure enough so that no children can easily get out, or be taken out without anybody noticing.

Since the building has several entrances that are all equally important, this creates a certain demand for the layout so that it is easy to access them all from the parking area.



Ill. 26

## Case Studies

### Fuji Kindergarten

This kindergarten in Tachikawa city, Japan, is shaped like an oval, with a hollow centre. The kindergarten is built to accommodate 560 children. The roof slopes toward the centre, so any person is always completely visible from the courtyard, and it is pierced by three zelkova trees. A ruling theme is transparency, so there are no hidden places in the building, and the spaces extend into each other. The children can climb the trees or chase each other without being limited by dead ends. The lighting is done with naked bulbs that hang from the ceiling, this teaches the children how light is made and the strings used to turn them on, only work for the lights around the switch. This way it

is necessary to go around and turn them all on. Every switch is connected to a dimmer, so the children can see into the bulbs, and how they function when turned on. [7]

This is an example of how the building itself can define an outdoor area for the children, in contrast to the more typical fenced off area. This solution requires the building to have a large area to work with, in order for the outdoor area to become usable. It also shows how to give children a deeper connection to their environment with the naked bulb lighting.



III. 27



Day care center Skanderborggade  
By Dorte Mandrup Arkitekter

This project is done under a lot of restrictions and regulations. There is a desire to create a balance between the outdoor spaces and the playground on the roof. Even the slope leading to the roof can be used for activities.

The layout is focused around getting enough sunlight and air into all the wards, with the help of two additional courtyards cut into the roof. [8]

This day care centre is designed in a very limited space, and with limited outdoor areas. The amount of outdoor areas are not as important in this case, because the children are not big enough to require a lot of space, but the centre is well optimized and has a very economic use of the square meters.

The play areas are done in a very playful manner, with different textures and colors, which inspire the children to explore and invent.



III. 28

Integrated Day Care Center Saxtorphsvej  
By Henning Larsen Architects

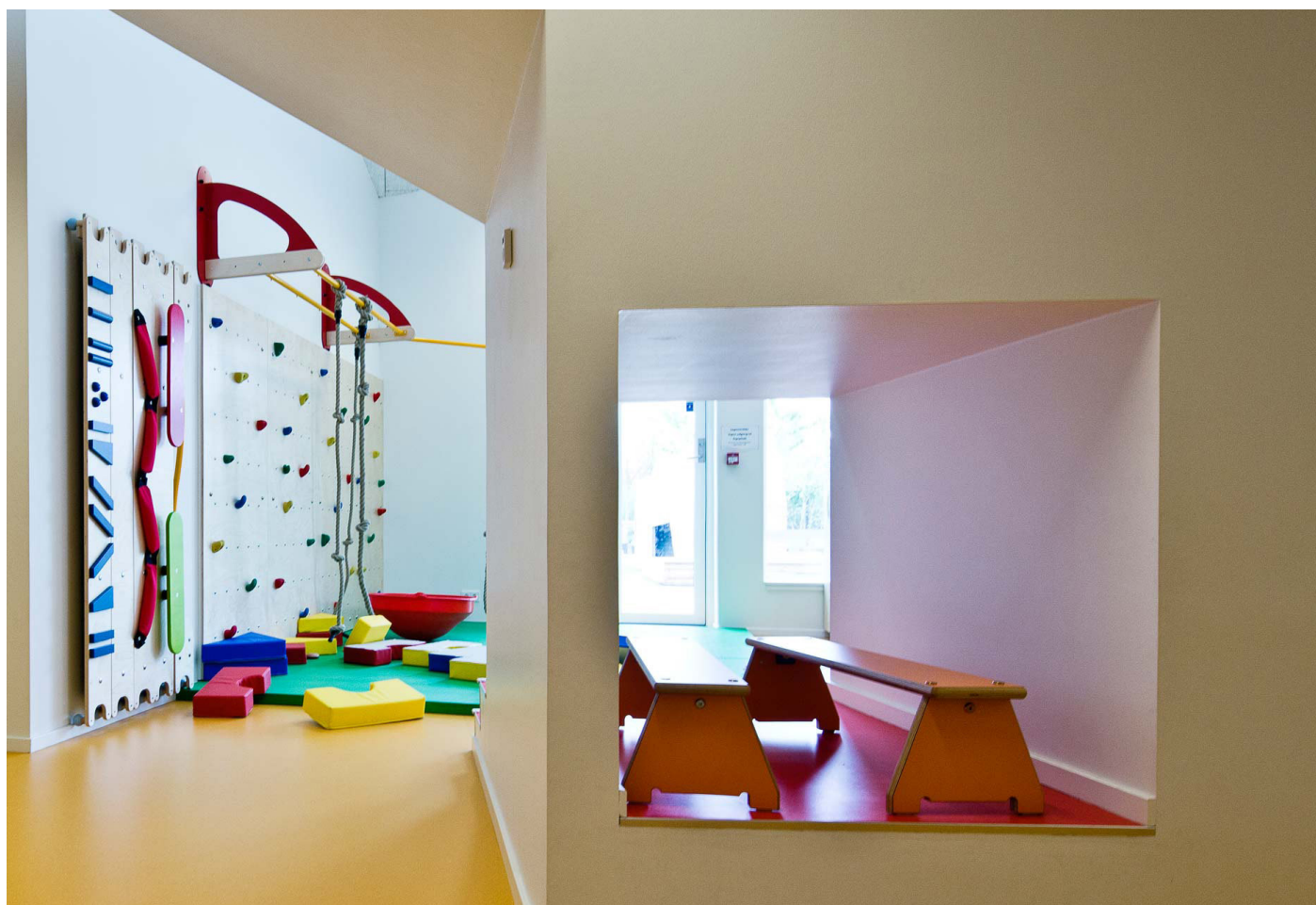
This project is designed from a child's perspective. The central common room functions as the collective street through the building, and workshops, niches and group rooms branch out from it.

The children shall experience the house as safe and recognizable, but at the same time fun and changing. The architecture is imaginative with windows placed randomly in the facade, and rooms with odd angles.

All rooms have a specific characteristic. One room has a big skylight, one a certain shape and one in a special color [9]

The philosophy used in this design is reminiscent of Reggio Emilia, with a central fulcrum from which the other activities sprout.

The building is full of nooks and niches that inspire the children to explore and invent.



III. 29

# Inspiration



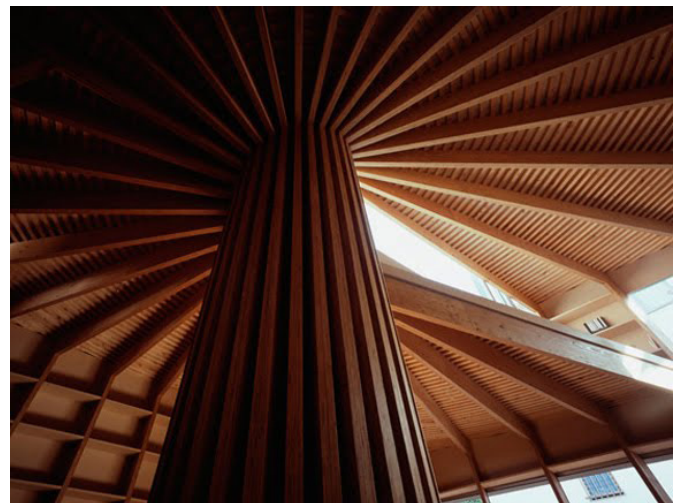
III. 30



III. 33



III. 31



III. 34

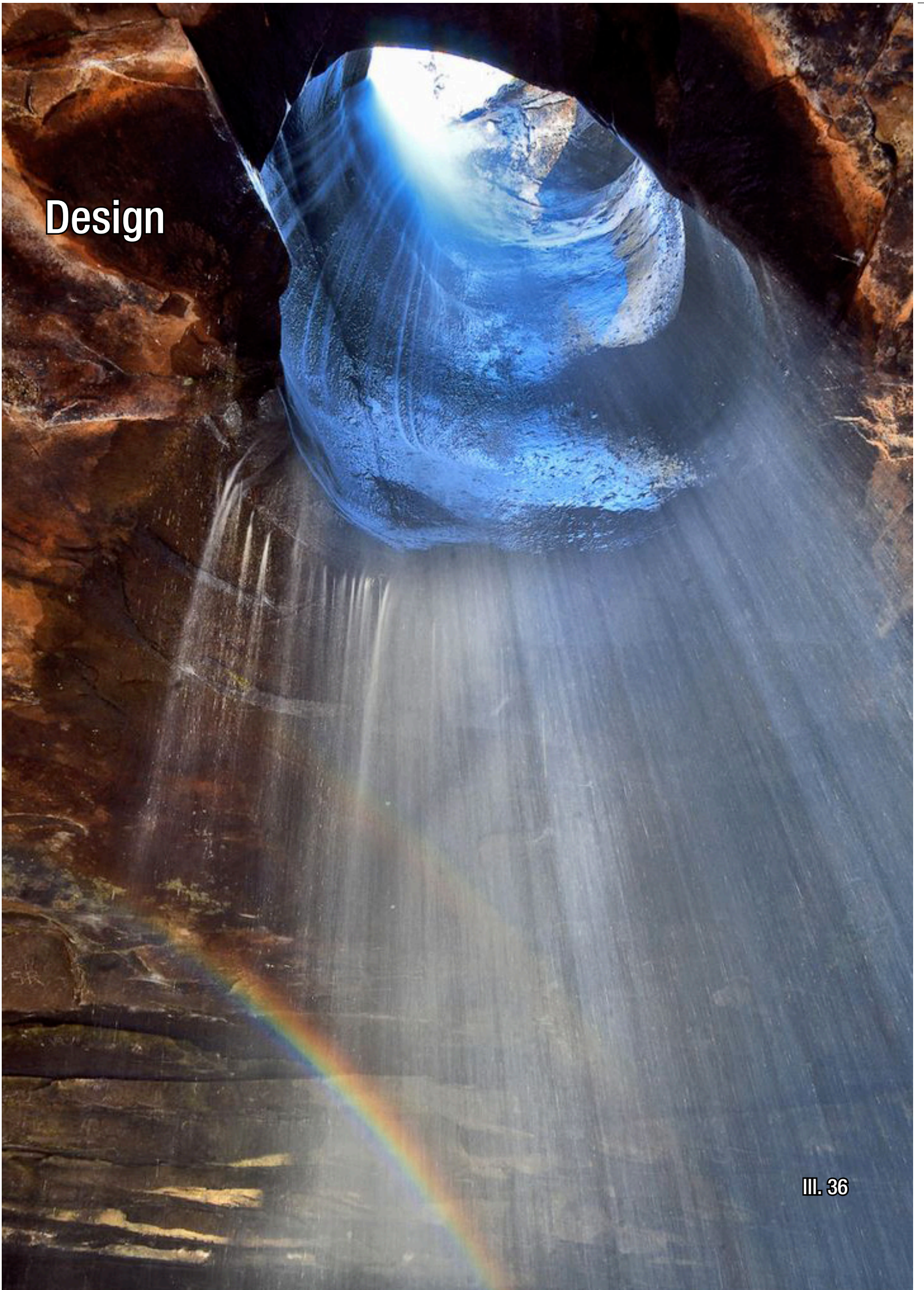


III. 32



III. 35

Design



## Vision

The design aims to create a nurturing environment in which children can be inspired and learn surrounded by sustainable tactile materials. The design must educate the children in how to inhabit the building.

The area around the kindergarten must invite other visitors in, to teach the children and visitors how to behave around each other if this is to become the future of kindergartens in the city.

While the design focuses on Reggio Emilia it must also incorporate the way Danish kindergartens function.

## Design Parameters

The themes explored in the analysis lays the foundation for the design process.

The three educators in the Reggio Emilia philosophy are, according to the founder Loris Malaguzzi, the children, the teacher and the environment. Environments can be seen as both good teachers, with spaces filled with natural light and materials, or they can be seen as bad teachers with impersonal barrack-like steel concrete and glass spaces.

The two most common problems that occur are: Lack of ventilation which limits the children's attention span to 20 minutes. The second issue can be the amount of disturbing noises, because there is not enough sound absorbing materials on the ceiling which makes communication difficult, especially to children with poor language skills.

When the basic necessities are fulfilled, such as light, air and warmth, people have a need for more than just survival. The rooms should communicate to, embrace and stimulate all senses of the users. It should be an individualised learning place, in which aesthetics are not the main focus, but a space with the freedom to create differentiated teaching methods tailored to the children's needs, which reward children who seek knowledge through projects, free learning or group work.

Learning spaces should be in a state of "creative disorder" rather than a rigid composition with straight lines and right angles. A stimulating learning space must help us realise our potential which does not come from the typical box-like classrooms. [10]

As children are considered born with an innate ability to explore and discover the world, Reggio Emilia emphasizes the design to incorporate exploration of the environment. The environment is called the "third teacher", the first being the parents, then the teachers and then the environments that the child experiences. It includes a big workshop/ atelier, and usually with several smaller ones located around the building. The overall layout reflects that of a town or a civic community, with an indoor town square, piazza for activities and socializing with the classrooms and eating area situated around it. There are no hallways in such buildings, because they are reminiscent of institutions. Children are encouraged to participate in cleaning and preparation of meals. Every group room has access to the outside for exploration and play. Likewise, all of them have a welcome area, which marks the transition between the inside, and the outside world, where parents are encouraged to linger and to interact with each others and the teachers. [11]

## Materials

Since a kindergarten is per definition a place that revolves around the future, in most cases the future members of society it also carries an obligation to make sure that the environment is as healthy and nurturing as possible. Because of this, the materials used in the construction should be sustainable, the process should be brief and the materials should be produced locally.

## Reggio Emilia

As described in the analysis the Reggio Emilia philosophy lists a set of qualities for the design. The Reggio Children and Domus Academy Research and Consulting (DARC), the research centre of the Domus Academy in Milan, has been doing research on the soft qualities of children's learning environments together with the designers, architects, teachers and *pedagogistas* (the person in charge of a Reggio facility)

They have made a list of environmental concepts for others to follow, in the decision making of the design. These include:

- Overall Softness: Spaces that are complex, made of many languages, and at the same time plain, liveable, and welcoming.
- Relational Space: Integrated spaces and connections linking other fields of knowledge, identities, and ways of thinking.
- Osmosis: Schools reflecting community and culture, rejecting isolation of school, and allowing real-world learning to permeate the school.
- Multisensoriality: Students using the whole body to explore and investigate, emphasizing perception, interpretation, and synthesis

- Epigenesis: Children acting on and modifying the environment through deploy ability, flexibility, and evolving spaces
- Community: Piazza spaces or collective environments valuing participation and shared values
- Constructiveness: Workshops, studios, and spaces supporting students as they construct knowledge

[12]

Transparency is important to monitor the children's activities and guide them in their social interaction.

The location of a park in the city centre is uncommon and opens up the possibility to work with a nature kindergarten in the middle of the city.

## Masterplan

One of the key aspects in the project is the notion of shared space. The parks visitors must be able to come and go as they please, within reason. This is done by keeping the main road through the kindergarten area open for traffic by separating it with a low gate, that can only be opened from the outside. The gates are placed, so it's easy for a teacher to supervise them.

One of the attractions of the kindergarten area is the volleyball court. By keeping it within the kindergarten area, the visitors who wish to use it are encouraged to interact with the children, and vice versa. This interaction will be a key component if this is to be the way kindergartens are integrated into the cityscape from now on. This communication between the children and visitors will serve to enlighten both parties in how to behave towards each other. The children will gain a lot of knowledge of what to do and what not to do to strangers, which can serve them well both inside and outside the confines of the kindergarten.

The children will be separated from the rest of the park by low, deep hedges that will serve as a natural green barrier which the children can look over but not traverse. This will enforce the notion that the area is not off limits for visitors and encourage communication across the barriers.

The parking lot will be a part of the park. It will be done as a reinforced grass surface, to protect the grass from the cars. This parking lot will only be large enough to accommodate the cars that can not park on Kanalstien. When the kindergarten closes, the parking lot can be used by the visitors for activities or recreation.



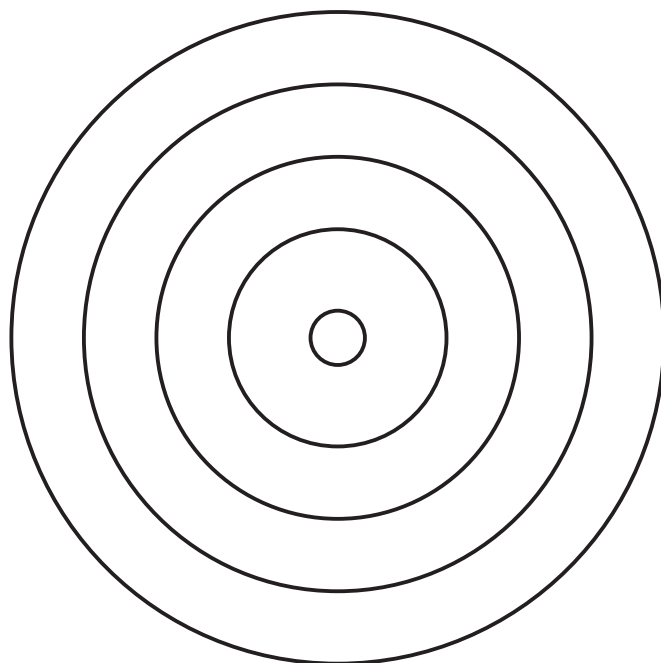


III. 37

# Layout

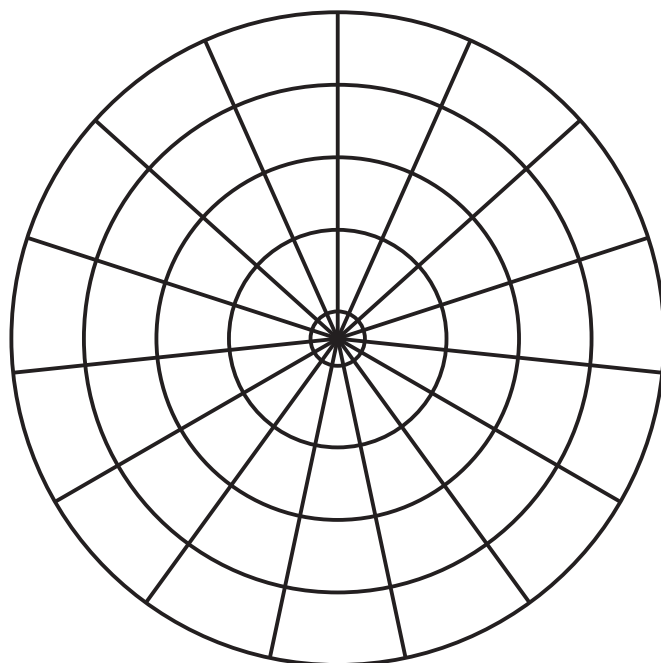
## Form

The circle has much to contribute to this project. It is efficient in terms of area usage, and does not limit the usage of the area around it. It makes it easier for a person in the center to quickly get an overview of the surrounding rooms, which can provide a high degree of transparency that can both be used for safety and communication. The idiom of the circles is reflected everywhere in Karolinelund with the twisted pathways that enclose rounded grass areas.



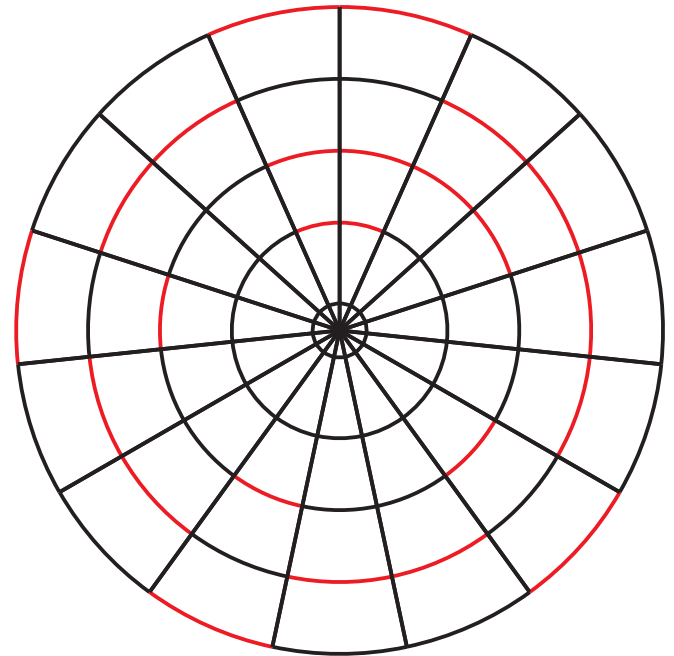
III. 38

The premise for the layout is concentric circles, that when divided by the structural system forms a checkered pattern that will be used in defining room boundaries.



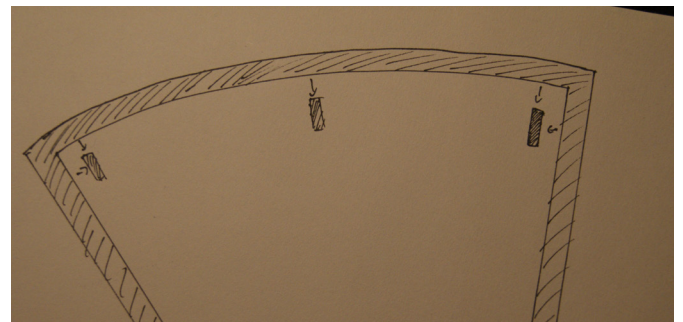
III. 39

By removing parts of the circles it is possible to mark entrances and exits, and decide how big the rooms should be. This makes the resulting shape easy to understand.

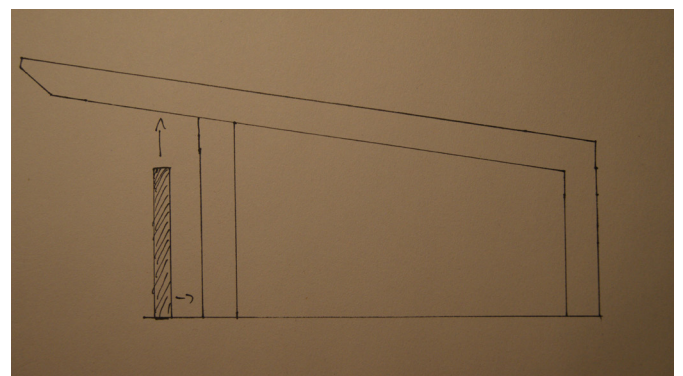


Ill. 40

With the history of Karolinelund as amusement park going to a public green park, the buildings, both past and present, have had a degree of temporality in them. They were not built to last many years and could be classified as pavilions. The design will try to emphasize this aspect by using some of the same principles which also compliment the need for transparency. The roof and structural system is detached from the walls, by tilting it towards the middle of the building and letting the columns stand free of the walls.



Ill. 41



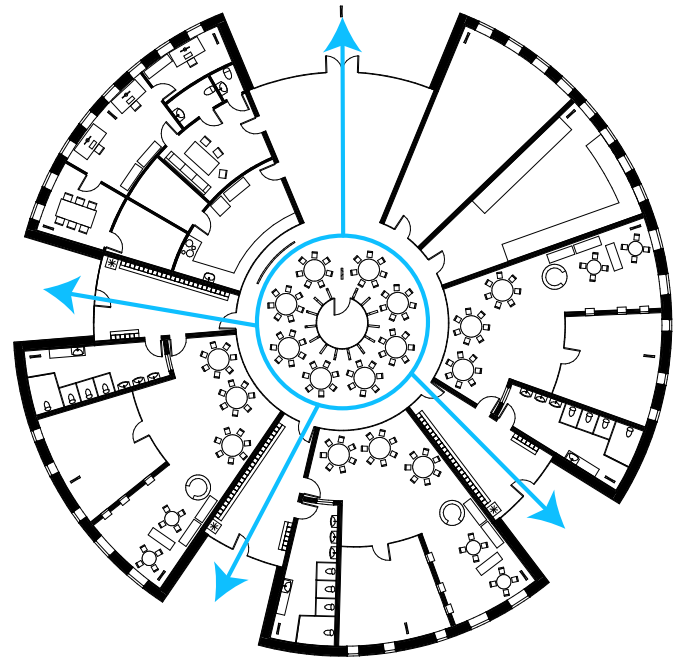
Ill. 42

## Layout

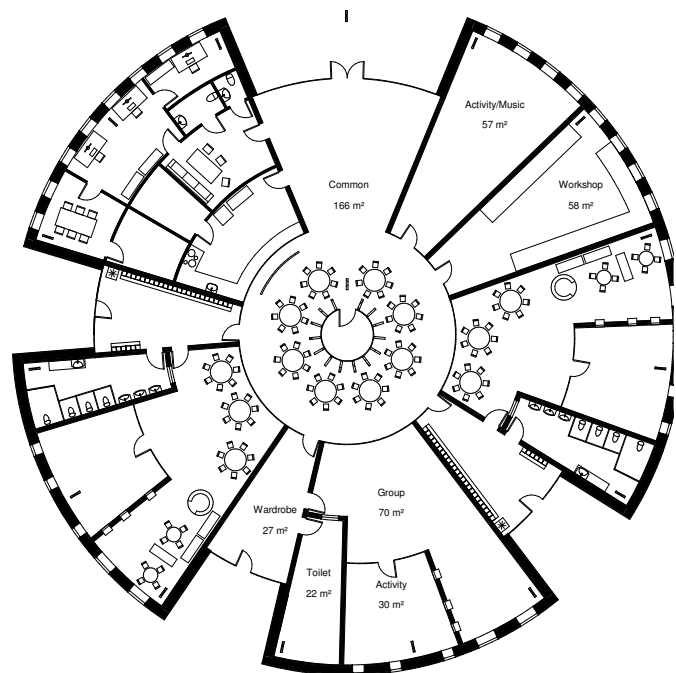
Though there is no main entrance in the Reggio philosophy, it is found in most of the Danish kindergartens and plays a role in the daily routine connected to Danish society. In most Danish kindergartens the children do not arrive at the same time, and there is a transition period where there are only a few members of staff and a mix of children from different groups. To make it easy to keep track of them, the main entrance is important in greeting and informing the children of where they are supposed to gather, until the rest of the staff arrives. The main entrance is emphasized by giving it more space in the facade, and orienting it towards the parking lot.

During the day when the children are out playing or if they arrive at the kindergarten with wet or dirty clothes, they can use the entrance connected with their respective group. Here there will be a dryer for the clothes and tiles that are easy to clean to prevent them from dragging dirt across the building.

The main entrance will function both as a wardrobe for visitors to the kindergarten, but also as an exhibition area for the projects that the children do. This way the entrance becomes an introduction to the Reggio Emilia philosophy, and the place where parents and visitors can stay updated on what is going on at the time. This entrance is also functions as the place where parents can wave goodbye to their children, when they walk back to their cars or where the children can wait for the parents to pick them up.

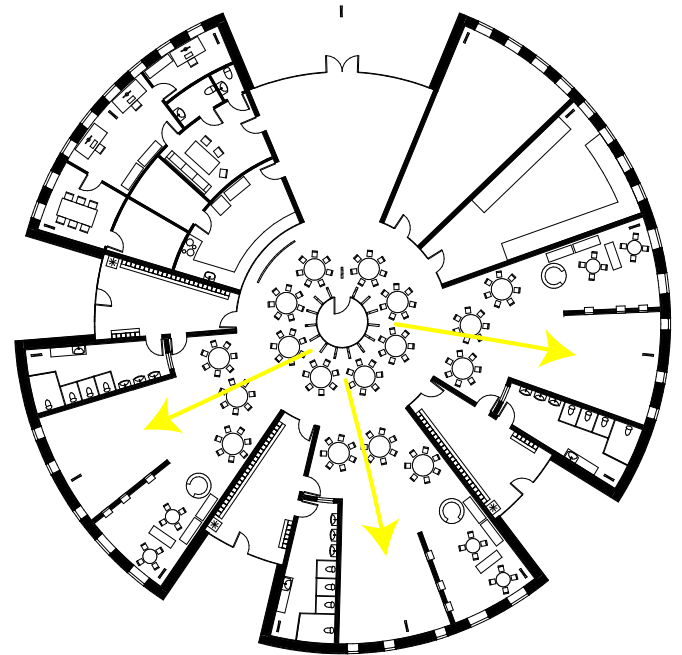


III. 43



III. 44

All the circular interior walls are made of glass, to provide overview and enhance the sense of community in the kindergarten where children in the middle of the building can see their friends in the other groups. The glass walls dividing the activity room from the group rooms and the group rooms from the common room are made of folding panels that can be moved. This makes the building layout flexible. There is room for 56 children around the heart, but if they all need to eat together or if there is an arrangement with the parents in the building, it can be increased by using the group rooms. It also enables the staff to easily make projects that involve several groups.



III. 45

### Accessibility

Since the building only has a ground floor, the whole building is open to people in wheelchairs. Furthermore, there is a handicap toilet in each of the groups and a combined toilet/shower in the staff section of the building

# Materials

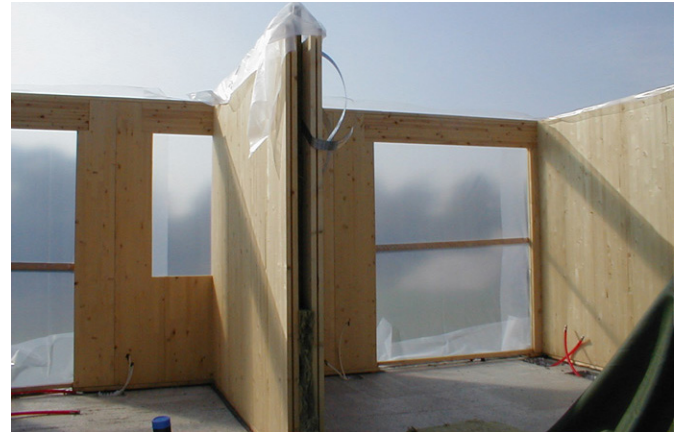
## Types

When considering sustainable materials, the process of making it, transporting it and reusing it are all factors that needs to be addressed.

CLT massive wood elements and glulam beams and columns are made locally in Hirtshals by Lilleheden. The elements can be used for floors, roof, walls or ceilings, and have the potential to replace concrete, gypsum, masonry and structural wood framing. They are produced with the desired openings, and are delivered on site ready to be assembled.

Timber is sustainable if it is regrown and can meet the rising need for this natural resource around the world.

The sliding glass panels that separate the various rooms are designed to allow the users to change the layout to suit their needs. This also gives those barriers a different character, that makes them appear less limiting due to the ability to remove them.



III. 46



III. 47



III. 48

Zinc is a highly sustainable metal, that doesn't cost a lot of energy to produce and is easy to reuse in other projects by only requiring 5% of the primary energy to be reapplied. Its lifespan is more than 75 years, and the patina that it develops protects the material for generations and removes any wear there might be. The scrap price for zinc is up to 60% of the raw material and over 95% of the material can be reused. The residues from the production can be reused in the smelting process without any treatment.



Ill. 49

Floors can be made from reused tires that are melted down and poured into the desired shape. It is a material that is gaining more popularity on places that facilitate physical activities such as sports centres, schools, kindergartens, playgrounds, riding centres and the like.

It can be made in varying colors that can excite to and guide children in play. The material provides a soft surface that protects the playing children, while also providing a high degree of sound absorption to make sure the sounds of children in play stay within the boundaries.



Ill. 50

## Heart

The heart of the building is important in many aspects. It's the focus for all movement through the building. The shape is reminiscent of a tree, which stretches its canopy out over the users and the building, enveloping them and creating a sense of security. The center of the building is open to the sky, enclosing a tiny bit of the outside. This creates a look to the outside, which enhances any bad weather outside, creating a form of "weather well" This is due to the construction, which funnels all rain water into the heart where it turns into an event for the users with water from the 800 m<sup>2</sup> roof cascading down the middle that amplifies the rain exponentially.

In the same manner as the Fuji kindergarten, naked bulbs hang from the ceiling. In this analogy of the tree it is reminiscent of fruits hanging from the branches. The bulbs are controlled in small clusters, with string switches hanging from the ceiling, where the children can access them. This enhances the interaction the children have with their environment and they can experience the building on another level.

The ceiling is clad in perforated plywood with sound absorbing material behind it.



Ill. 51





III. 52

## Niches

These niches have a double function. They denote ownership, by only having space for a child to occupy them and they serve as a sound absorbing surface with fabric which color corresponds to the group color. The windows in the reading corner have a similar function. The green windowsills also denote ownership by showing which group belongs inside.

The niches in the wall are equipped with a lamp connected to each one. This is to give the children further control over the space, and to teach them to turn it off when they are done using it.



III. 53



## Tactility

When designing for children, it's important to understand that they have a sensory approach to their surroundings, they touch, smell, jump on and sometimes even taste the materials in their environment. They notice if the materials are warm, cold, rough or smooth.

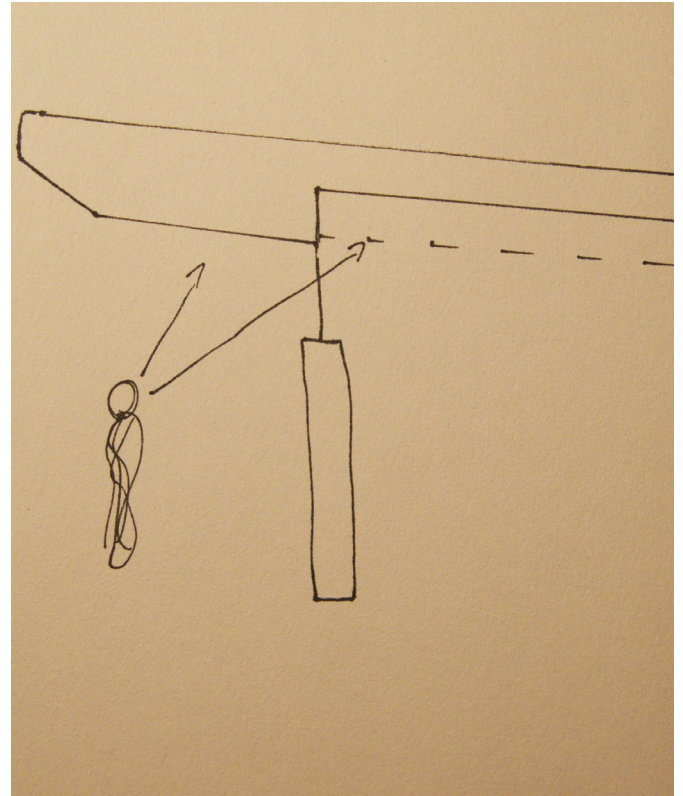
These considerations are of the utmost importance when designing nurturing spaces where the children feel secure and happy. Timber is also an easy material for a child to understand. They can go out into the forest and look at the trees grow, climb on them, interact with it, see all the different kinds of trees, eat the fruits that grow on them, all to gain a better understanding of the material. Concrete and steel are more difficult subjects since they're not materials that can be seen in nature, and the process of making them are a lot more complex, thereby making them harder to relate to for a child.

The soft rubber flooring also suggests what kind of space it is as it is easier for a child to understand that surfaces are meant to jump and run on if they are comfortable to land on, and do not hurt the children when they fall.

## Transitions

The transition from outside to inside should be emphasized, to reinforce the users' perception that they are entering the warm heart of the building. A person standing outside will be able to see the difference between the cold reflecting zinc on the roof, and the golden warm plywood interior. It will be like stepping into a building carved out from a tree.

The exterior of the building is clad in vertical boards that are broken up by the entrances that are constructed in massive timber elements, again showing the transition between outside and inside and the change in warmth of the materials.



III. 55

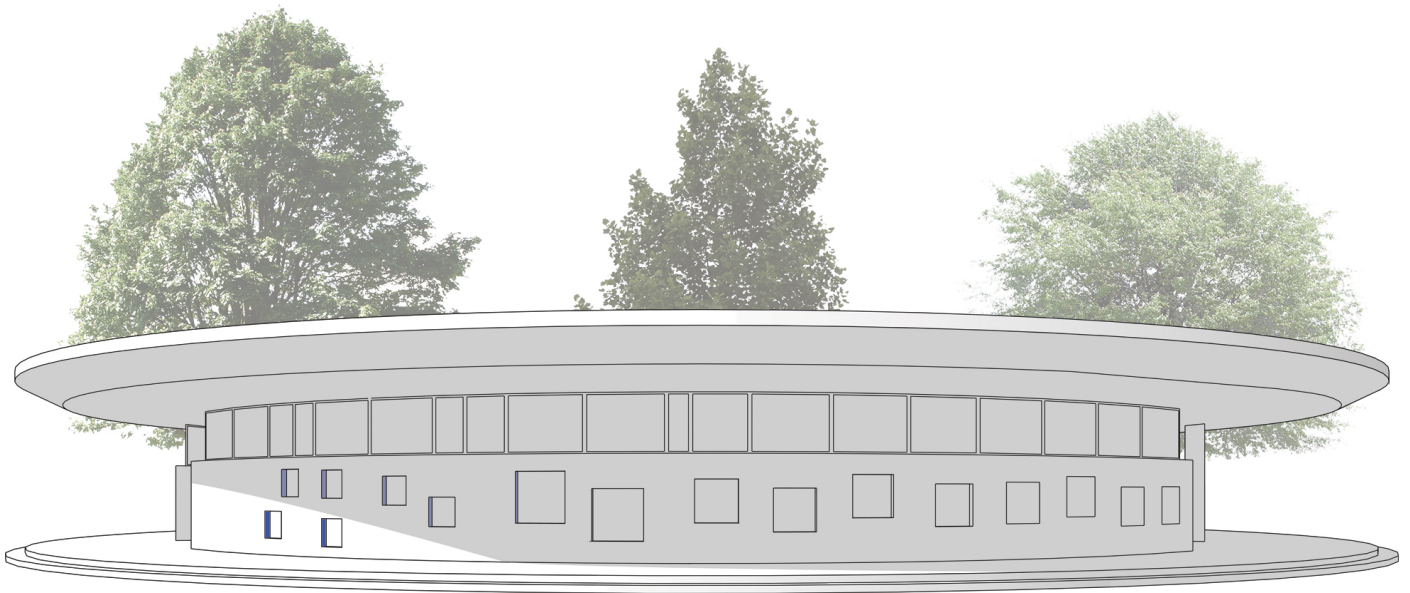
The roof is overhangs the plinth which the building is situated on. This is done to reduce solar radiation during the summer, and cooling the ventilation air and to reduce the number of overheating hours that usually occur in the summer season.

From the east to the north facade there is a transition from the more playful window placement in the workshop and activity/music room to the more regular system on the administrative facade

# Facades & Section



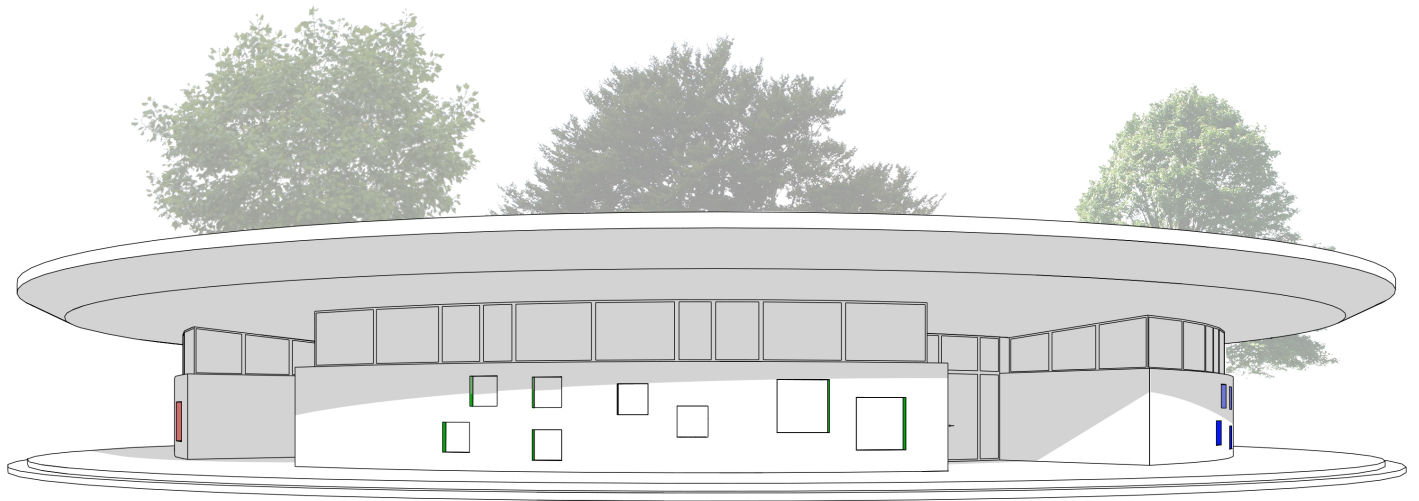
III. 56



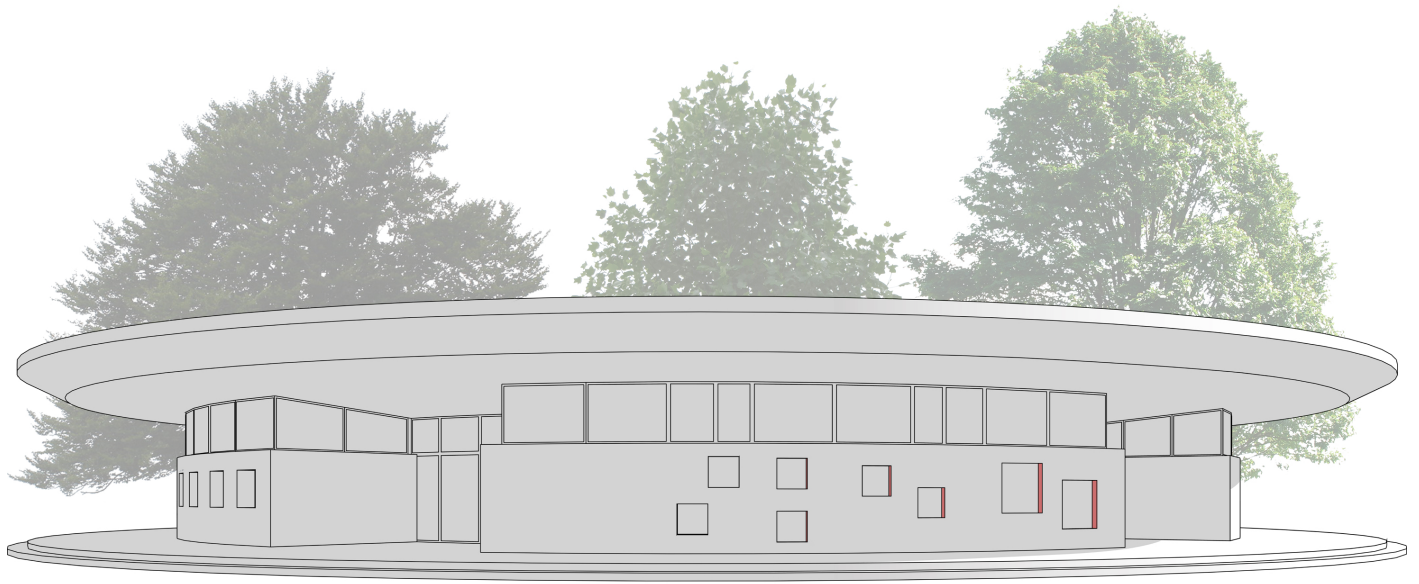
III. 57



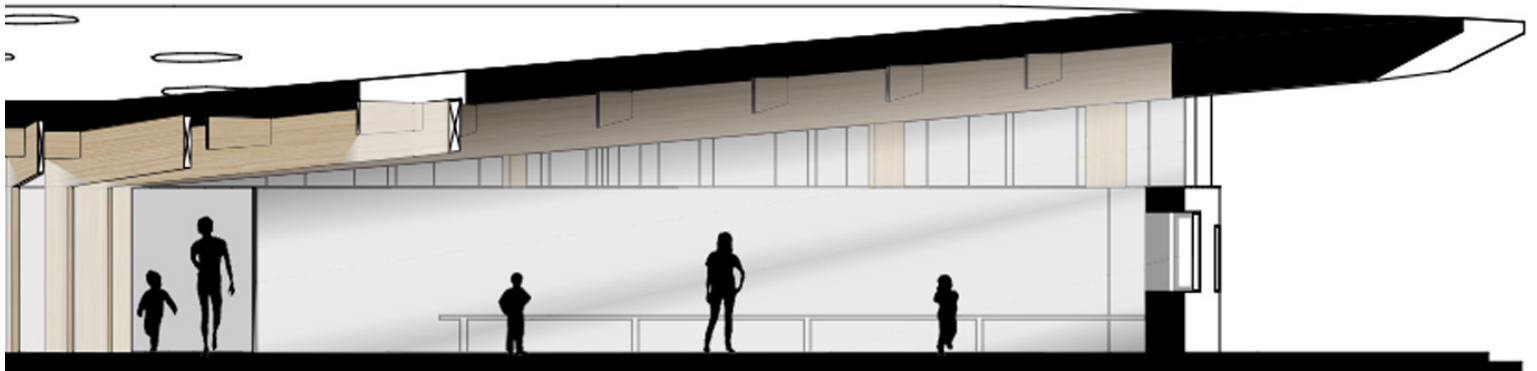
III. 58



III. 59

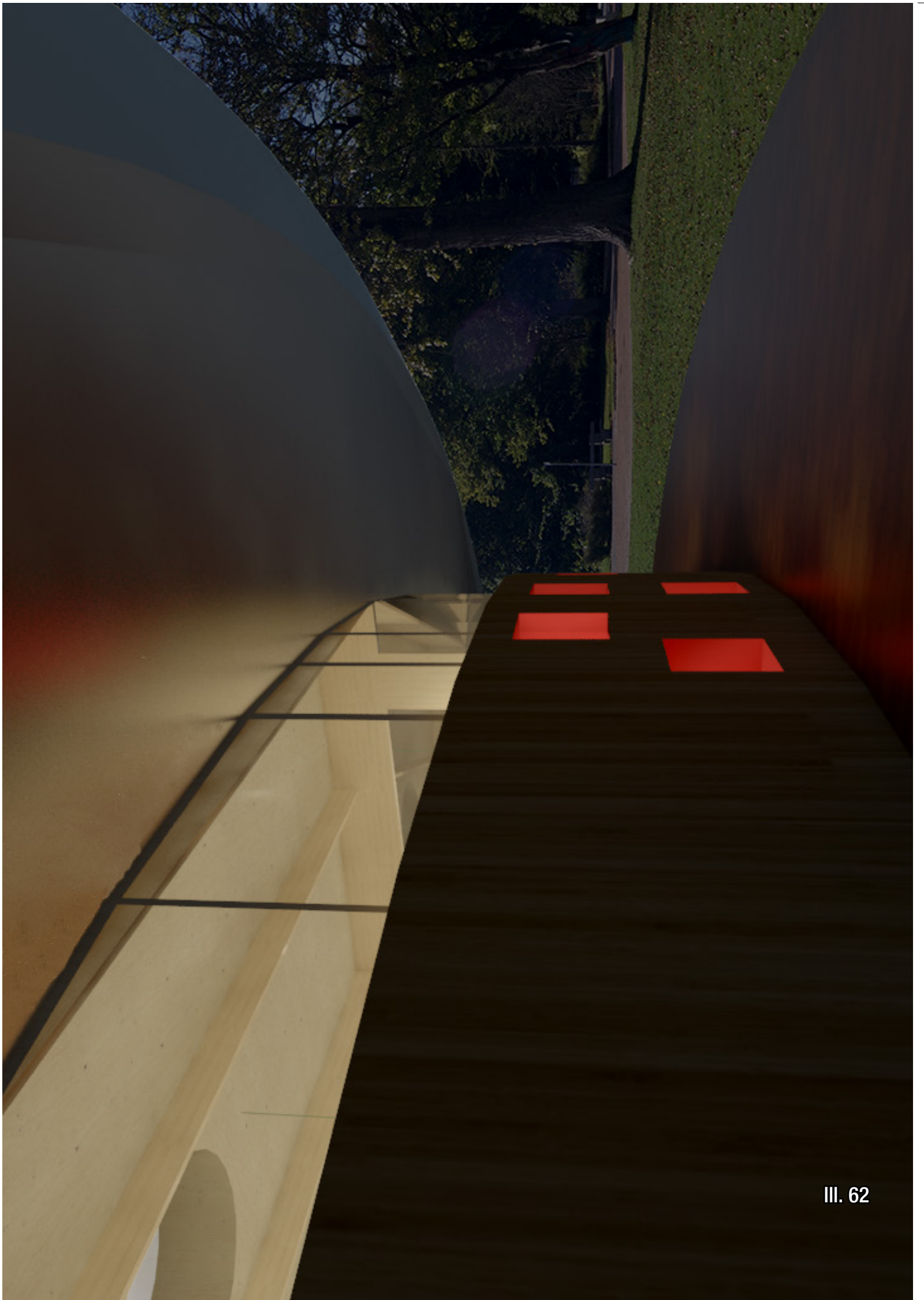


III. 60











III. 63



III. 64

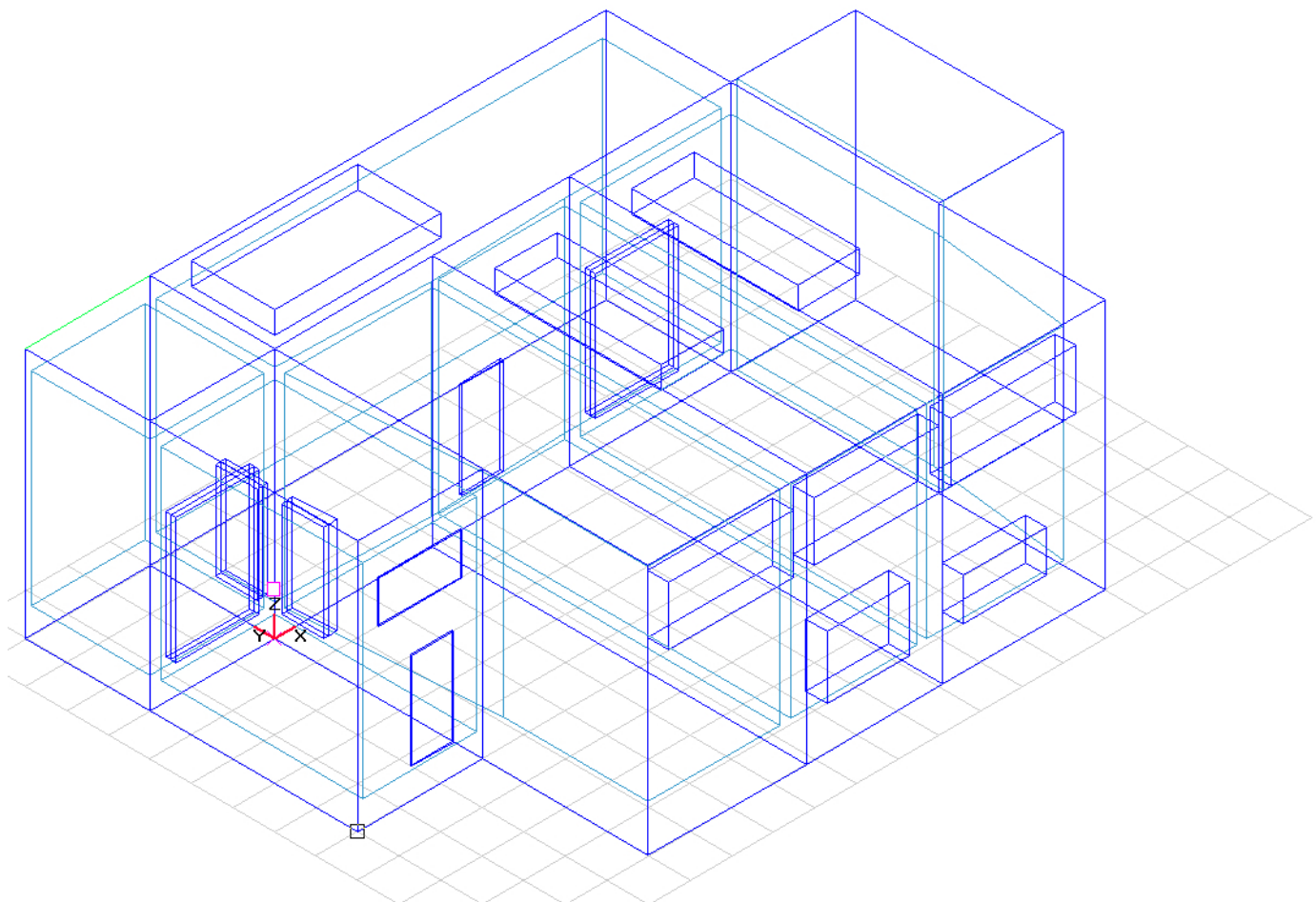
## BSim & Be10

BSim is a program that simulates an environment and gives an estimation of how many overheating hours there are, how much CO<sup>2</sup> there is and how much energy is spent keeping the thermal comfort.

In this project it is used to evaluate the indoor air quality, overheating hours, and how many skylights can be added.

Because the building is deep, there is a need to get natural light far into the rooms and to do this skylights are used. When evaluated in BSim the amount of energy used for heating and the amount of overheating hours can be compared in the process, to get the optimal number of windows.

It's shown in the tables how the initial addition of skylights reduced the energy needed for heating throughout the year. In the first table it is the group area without any skylights where 17570 kWh are spent on heating. With the addition of 20m<sup>2</sup> of skylight windows, the energy consumption is reduced to 16431 kWh. However, the number of overheating hours begin to rise with 10 hours above 26°C and 2 hours above 27°C. In the next table another 6 m<sup>2</sup> of windows are added, and though the energy for heating is reduced a bit, the overheating hours increase to 71 hours above 26°C and 13 hours above 27°C. Based on this information, 20 m<sup>2</sup> of skylights were chosen for the group rooms.



tsbi5 BSim 0 vinduer (Group)		tsbi5 BSim 3 vinduer (Group)		tsbi5 BSim 4 (Group)	
Year 2015, tstep=16, RadModel=P		Year 2015, tstep=16, RadModel=P		Year 2015, tstep=16, RadModel=P	
Month	Sum/Mean	Month	Sum/Mean	Month	Sum/Mean
qHeating	17570,48	qHeating	16431,49	qHeating	16248,46
qCooling	0,00	qCooling	0,00	qCooling	0,00
qInfiltration	-8309,51	qInfiltration	-8782,43	qInfiltration	-8907,22
qVenting	-2092,07	qVenting	-2447,28	qVenting	-2638,54
qSunRad	2147,19	qSunRad	6992,62	qSunRad	8376,17
qPeople	4165,00	qPeople	4165,00	qPeople	4165,00
qEquipment	1066,00	qEquipment	1066,00	qEquipment	1066,00
qLighting	0,00	qLighting	0,00	qLighting	0,00
qTransmission	-14541,17	qTransmission	-17400,53	qTransmission	-18284,61
qMixing	0,00	qMixing	0,00	qMixing	0,00
qVentilation	0,00	qVentilation	0,00	qVentilation	0,00
Sum	5,92	Sum	24,87	Sum	25,25
tOutdoor mean(°C)	7,7	tOutdoor mean(°C)	7,7	tOutdoor mean(°C)	7,7
tOp mean(°C)	18,4	tOp mean(°C)	19,0	tOp mean(°C)	19,2
AirChange(/h)	0,6	AirChange(/h)	0,7	AirChange(/h)	0,7
Rel. Moisture(%)	46,7	Rel. Moisture(%)	44,4	Rel. Moisture(%)	43,8
Co2(ppm)	567,2	Co2(ppm)	556,9	Co2(ppm)	553,1
PAQ(-)	0,5	PAQ(-)	0,5	PAQ(-)	0,5
Hours > 21	469	Hours > 21	1700	Hours > 21	2030
Hours > 26	0	Hours > 26	10	Hours > 26	71
Hours > 27	0	Hours > 27	2	Hours > 27	13
Hours < 20	7406	Hours < 20	6129	Hours < 20	5855

III. 66-68

Key numbers, kWh/m<sup>2</sup> year

Energy frame in BR 2010		
Without supplement	Supplement for special conditions	Total energy frame
54,4	0,0	54,4
Total energy requirement		32,0

Energy frame low energy buildings 2015		
Without supplement	Supplement for special conditions	Total energy frame
31,1	0,0	31,1
Total energy requirement		26,4

Energy frame Buildings 2020		
Without supplement	Supplement for special conditions	Total energy frame
20,0	0,0	20,0
Total energy requirement		19,7

Contribution to energy requirement		Net requirement	
Heat	27,9	Room heating	27,9
El. for operation of bulding	1,6	Domestic hot water	0,0
Excessive in rooms	0,0	Cooling	0,0

Selected electricity requirements		Heat loss from installations	
Lighting	21,2	Room heating	0,0
Heating of rooms	0,0	Domestic hot water	0,0
Heating of DHW	0,0		
Heat pump	0,0		
Ventilators	1,6		
Pumps	0,0		
Cooling	0,0		
Total el. consumption	25,1		

Output from special sources	
Solar heat	0,0
Heat pump	0,0
Solar cells	0,0
Wind mills	0,0

III. 69

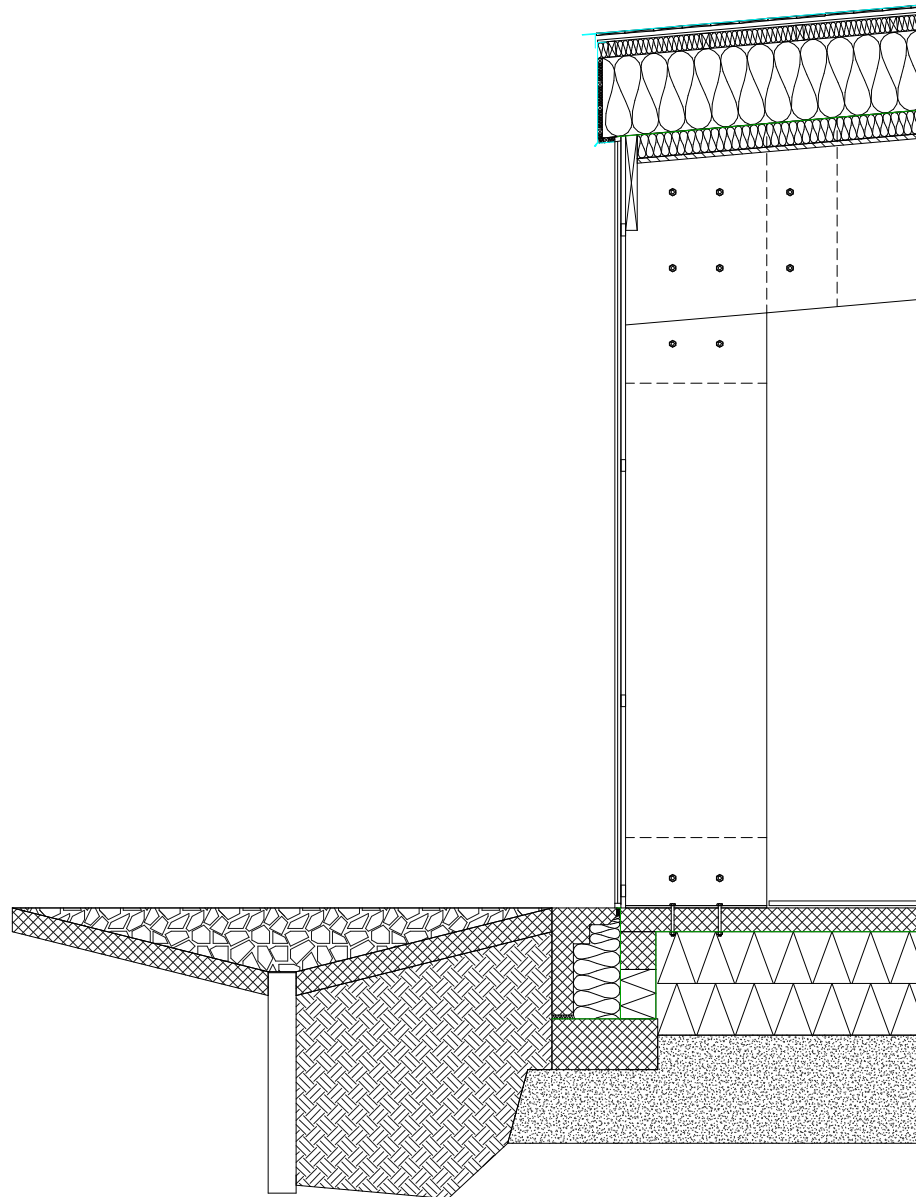
# Construction detail

## Roof

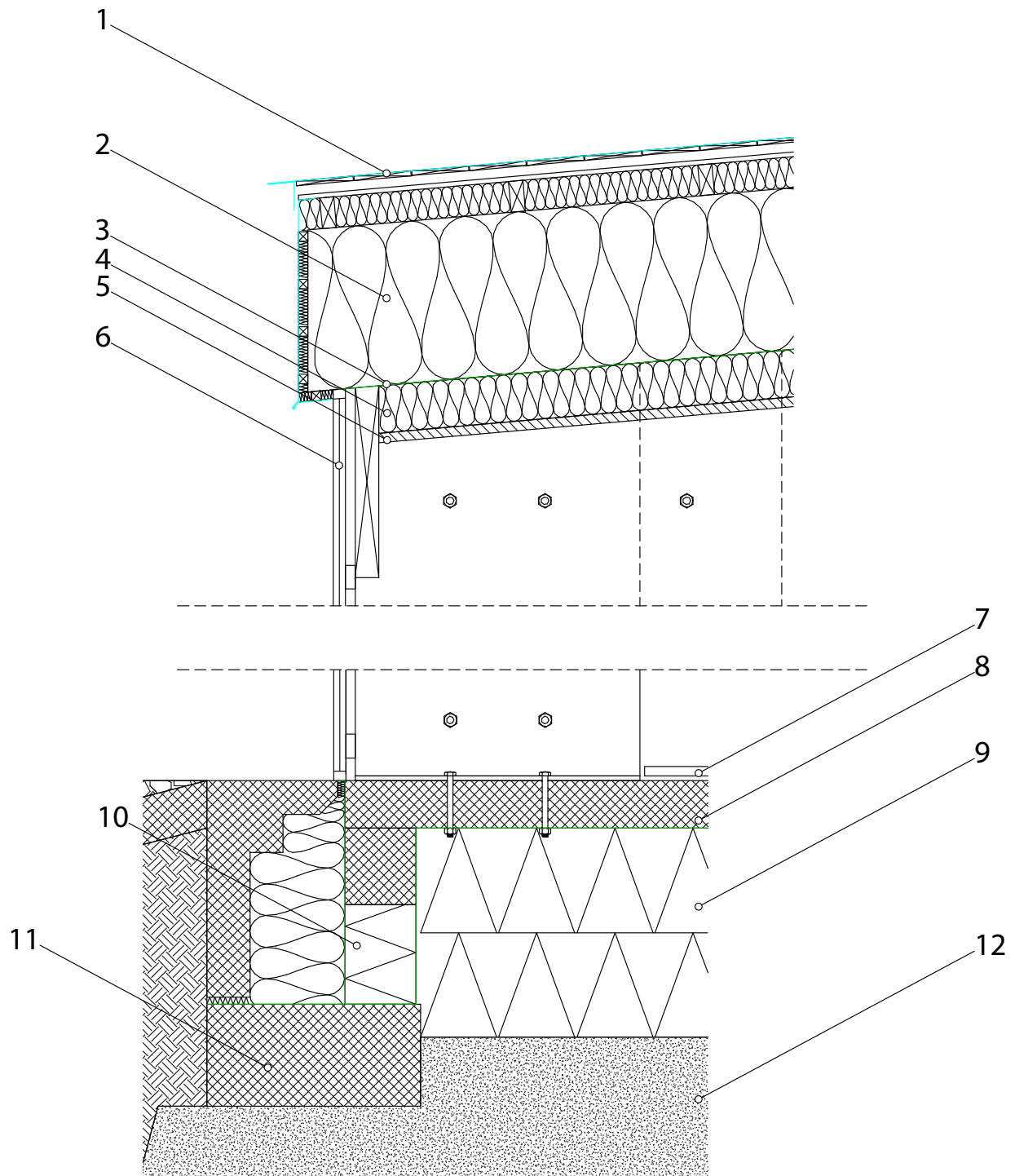
1. Zinc on 120mm boards on top of ventilated gap
2. 405mm insulation
3. Vapor barrier
4. 100mm acoustic insulation
5. 12mm perforated plywood sheats
6. Window

## Foundation

7. 20mm floating floor with backing
8. 100mm concrete floor
9. 440mm insulation
10. Foamglass block 140x190mm
11. Concrete foundation
12. Impermiable layer



III. 70







## Conclusion & Reflection

The analysis phase provided the information needed to choose a site within Karolinlund, away from pollution and traffic noise which is especially important when a lot of children are going to have a high activity level outside for long periods of time.

With the history of Karolinlund as an amusement park, and its current state in which it's made of temporary lightweight structures, it was relevant to draw inspiration from pavilions that by their nature contend with contemporaneity. This is also where the clear difference between the roof and the walls come from; To have the roof floating above the rest of the building, branching out over the users like a big tree.

Reggio Emilia provided insight into the perception of a child claiming that imagination and curiosity can be sparked from the child's surroundings. To have nurturing and warm spaces where the children feel safe and at ease. It is important to have the central piazza, or town square, where the children can meet and interact across groups. In this project the piazza is at the heart of the building, from where slender glulam beams extend across the length of the building and thereby sheltering the users. This is most noticeable when looked at from a child's perspective, as the centre beams begin at 2.5 meters, making less of the structure visible to adults. The centre of the heart is where the rainwater is led to and drained from the building. During rainfall, the 800m<sup>2</sup> roof will make this drain appear as a small waterfall, and since the drained area is so large, the effect is increased exponentially with increased amount of rain. Each children group can be opened up to the piazza with sliding glass walls, to adapt to other needs if, for example, there is a large arrangement with parents or if all the children are going to eat together.

In the children groups there are a set of niches, that can only be used by children which is to show that the adults are just there to guide and motivate them, but they are not the primary users. This can also be seen in the case study by Henning Larsen Architects. It is possible for the children to interact with the naked light bulbs that descend from the ceiling, which is done with inspiration from Fuji Kindergarten, where it is

used to give the children a better understanding of, and influence over their environment.

The circular plan was made both to make it easier for the teachers to supervise the children and because it focuses the square meters around a central point, the piazza.

If the future of Karolinlund, and kindergartens in general, is to be a shared space this change might have to be forced a bit. The notion of going into a kindergarten and interacting with the children is alien to the Danish culture

The materials used for the kindergarten are all considered sustainable, with a lot of timber that can be regrown, and in the process clean the air around it to reduce pollution. The rubber flooring is made with recycled tires that are otherwise difficult to get rid of. The zinc on the roof is similarly sustainable, by requiring little energy for production and is 100% reusable, by only using 5% of the primary energy when repurposed. It also has an expected lifetime of over 75 years.

The program BSim was used to determine how many skylights could be used in the design, while still getting the set goals in Indoor air quality, daylight factor and thermal comfort. Be10 was used to verify that the energy consumption of the building was within the class of 2020.

There were also some things that, if time allowed it, would have been elaborated more e.g. The masterplan lacks polish and locations for playgrounds and other such functions related to the kindergarten. The security surrounding the kindergarten area must be of a high quality without hindering the other users in the park. This aspect is not treated in depth, both because of limited time, but also because it is a new subject and it should be developed further.

The structural system is both an aesthetic and technical element. It might, however, be weak to torsion force around its axis since there is no cross bracing between columns which is also a point that would have to be examined and incorporated into the design.

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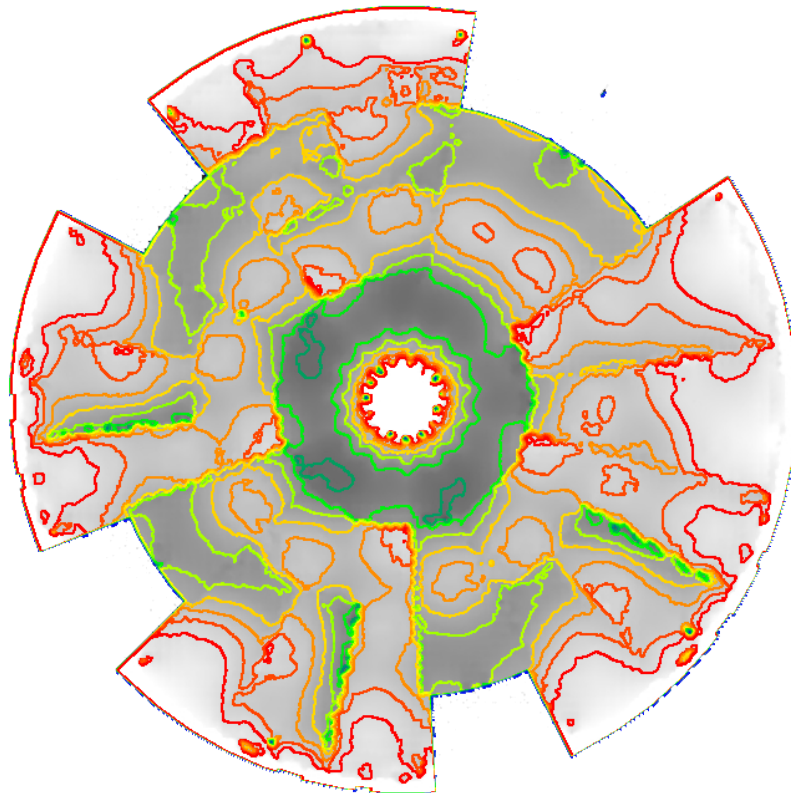
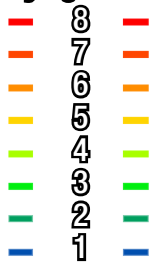
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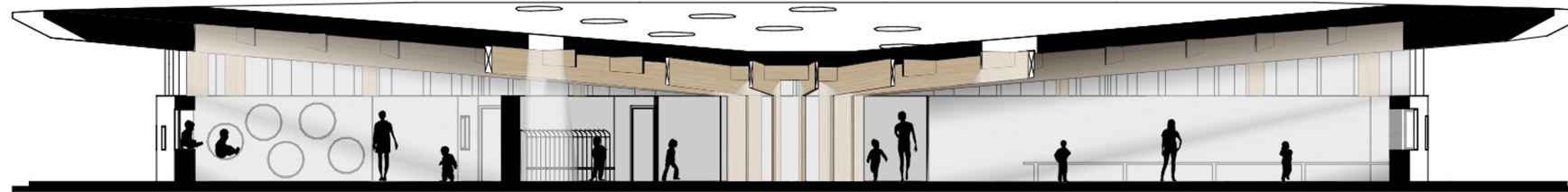
Rest are own Illustrations

# Appendix

Daylight Factor

## Day light factor





Autodesk® Revit®

[www.autodesk.com/revit](http://www.autodesk.com/revit)

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Owner

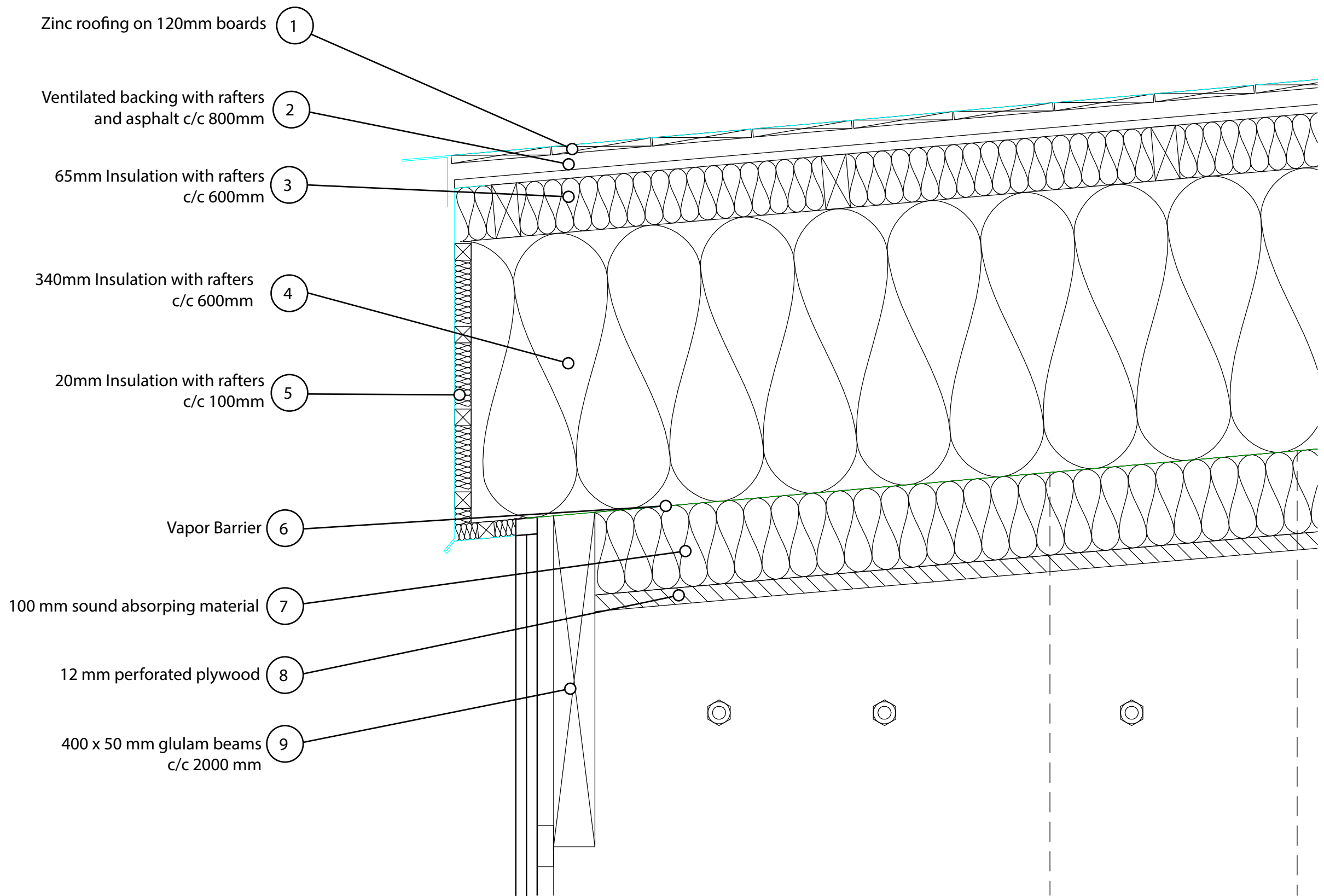
Kindergarten of Tomorrow

Section A-A

Project number	Project Number
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Drawn by	Author
Checked by	Checker

A107

Scale 1 : 200



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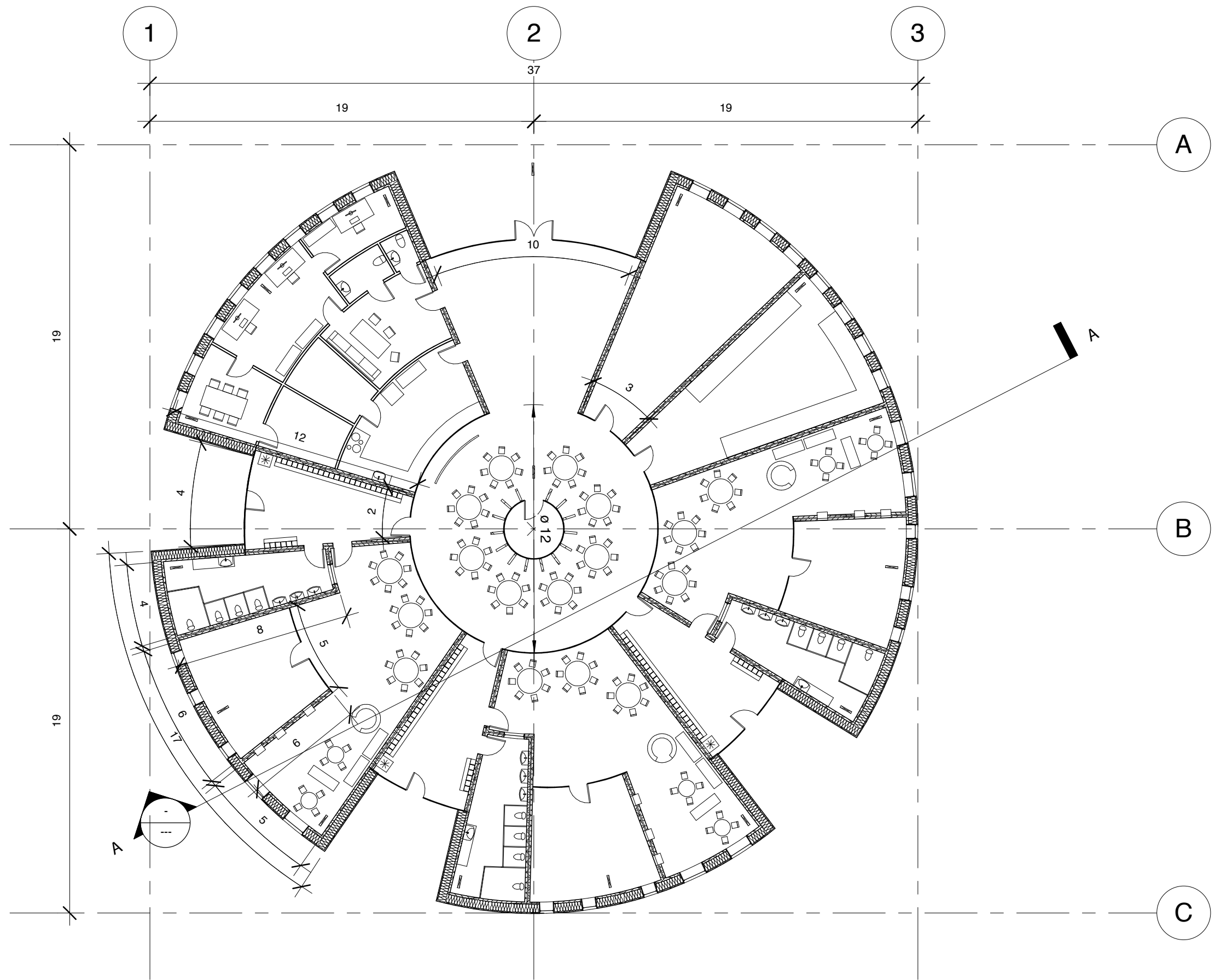
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Owner
Kindergarten of Tomorrow

Roof Detail		
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Checked by	Checker	
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No.	Description	Date

Owner

Kindergarten of Tomorrow

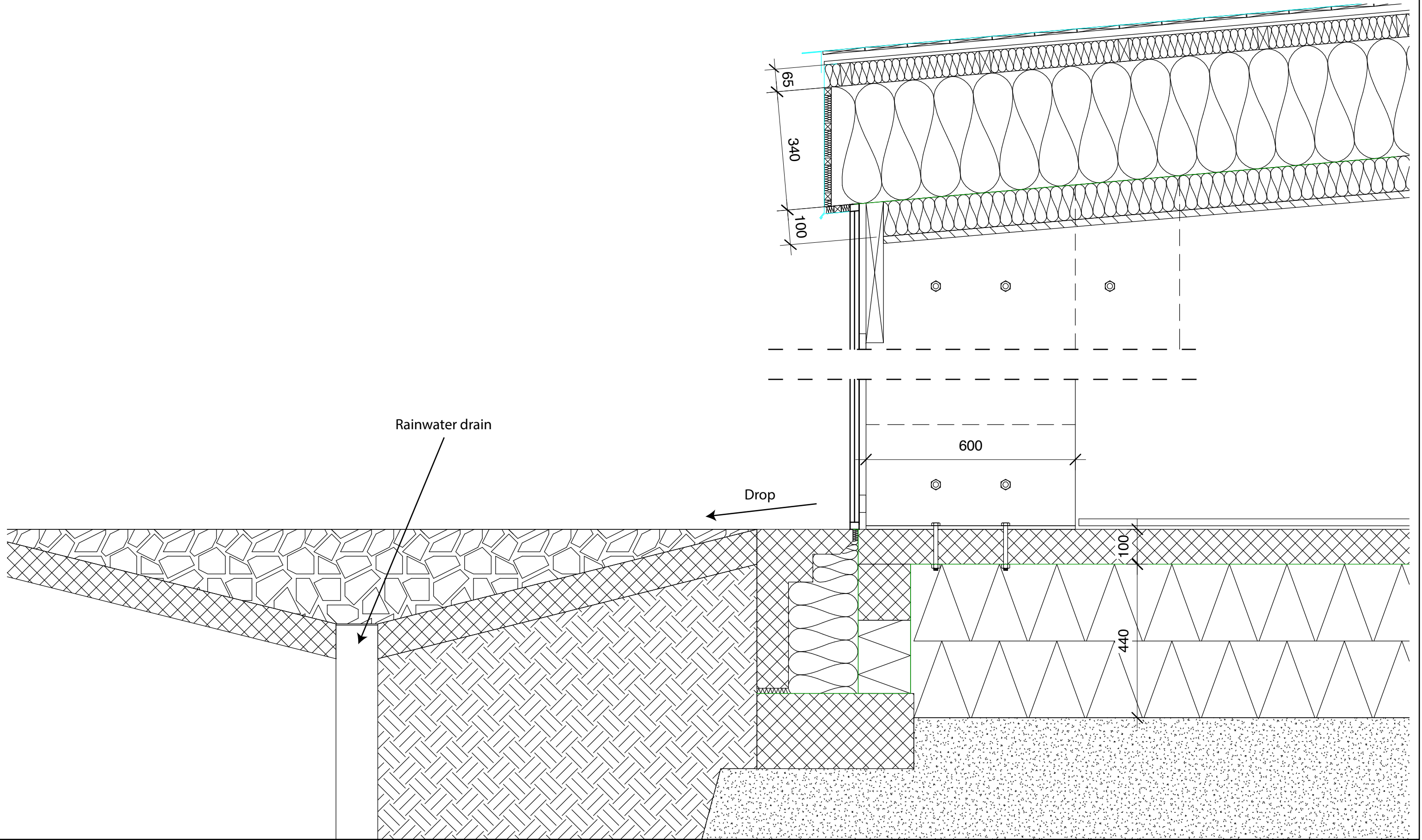
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Date	Issue Date
Drawn by	Author
Checked by	Checker

A106

Scale

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Autodesk® Revit®

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No.	Description	Date

Owner

Kindergarten of Tomorrow

Interior facade detail

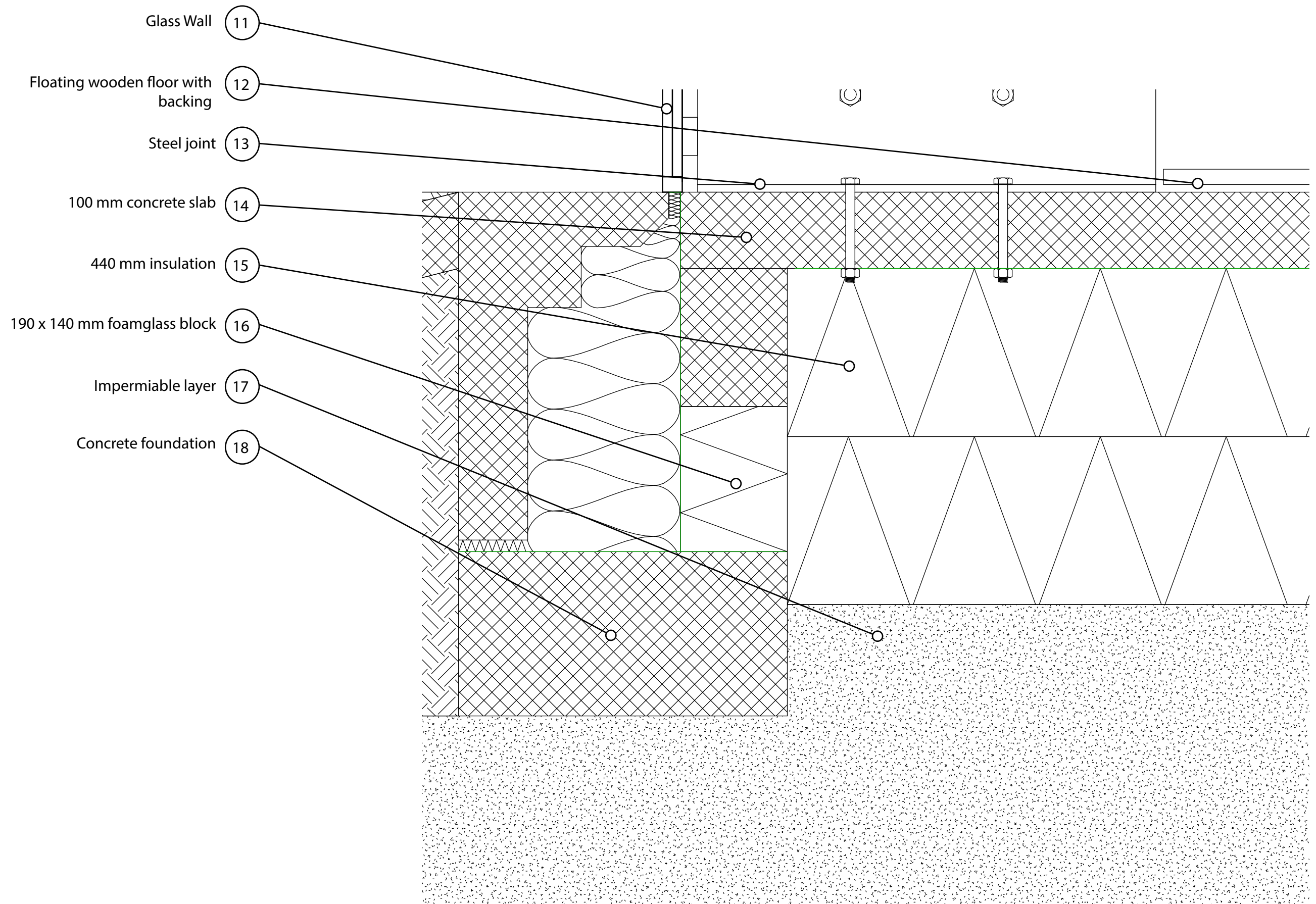
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A101

Scale

1 : 10





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No.	Description	Date

Owner

Kindergarten of Tomorrow

Foundation Detail

Project number	Project Number
Date	Issue Date
Drawn by	Author
Checked by	Checker

A104

Scale

1 : 5