Children's Rehabilitation Camp

A camp for children and families affected by childhood cancer

Glenn M. Collett Poulsen
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Abstract

The master thesis outline a design proposal for an activity based rehabilitation camp for children and families affected by childhood cancer, situated in the scenic landscape of Mols Bjerge National Park. The aim of the camp is to facilitate the process of rehabilitation for children and young adults who have been fighting cancer and need a helping hand back to a normal life. A theoretical framework of the two main themes, healing architecture and sustainability, is established as a basis for project. Through a close relation to the place and the local climate a unique rehabilitation camp is designed that encourage a feeling of community and creates a setting for activity and fun as well as immersion and reflection.

Acknowledgements

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Author: Glenn Munkholm Collett Poulsen

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Supervisors: Lars Brorson Fich
Assistant Professor
Department of Architecture, Design and Media Technology
AAU

Claus Topp
Team Director
NIRAS

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Architecture & Design
Department of Architecture, Design and Media Technology
Aalborg University

Glenn Munkholm Collett Poulsen

Content

Introduction

This master thesis is developed at the Department of Architecture and Design at Aalborg University. It represents my final architectural project, and aim to create an integrated design solution for an activity based rehabilitation camp for children and families affected by childhood cancer. The project is developed in collaboration with Rasmus Thøger Christensen and Heidi Kristine Støve, founders of ExcaliCare Children's Organisation that aims to help children and families back to a normal life after a chaotic period of fighting cancer.

Motivation
Every year 200 children are diagnosed with cancer in Denmark. During the last 20 years the treatment for cancer has improved through an intensive collaboration between the Nordic countries. This means that 80 % of the children diagnosed with cancer survive the illness. The increased survival rate among children with cancer also means that a large group of young people and grownups are living a life affected by late complications of childhood cancer (Carlson and Bøge, 2015).

The late complications for people affected by childhood cancer are not different from the late complications of other cancer patients, however the consequences are. Children diagnosed with cancer are in a place in their lives where they go through physical, mental and social developments. These developments are greatly affected both during and after the treatment and often leaves the child with a great disadvantage when it comes to completing an education, getting a job and an independent financial situation, starting a family, and participating in social activities (Carlson and Bøge, 2015).

A report from Kræftens Bekæmpelse by Carlson (2015) shows that survivors of childhood cancer experience physical, mental and social late complications that to different degrees affect their quality of life after the treatment has ended. The late complications differ from person to person but include conditions such as loss of hair, loss of fertility, fatigue, depressions, anxiety of large social arrangements, and the inability to finish an education.

When a child is diagnosed with cancer the entire family is affected. In a report from Kræftens Bekæmpelse by Carlson and Bøge (2015) a former cancer patient, Jeppe, diagnosed with lymphoma at age 14, tells how his illness has had consequences not just for him but also for his sister. In sympathy with his inability to eat during his treatment, his sister developed an eating disorder that she still struggles with. He tells how she has been admitted to the psychiatric ward and how he feels responsible for her struggles (Carlson and Bøge, 2015, p.56).

Since the late complications of especially childhood cancer can have such great implications for the future of the child and family involved, I hope that my project for a new rehabilitation camp for ExcaliCare can help to promote the focus on the rehabilitation of cancer patients.

Methodology

The project is developed using the methodology of the integrated design process by Mary Ann Knudstrup. The method is developed at Aalborg University as a way to describe the iterative process necessary to reach a design outcome that unites an architectural and engineering approach toward building design. The process is described through the five non-linear phases (Knudstrup, 2004).

Phase 1. Problem/idea
In the first phase, the project is initiated and the problem or idea is defined.

Phase 2. Analysis
In this phase an analysis of relevant aspects are done. The site is studied through cartographical, hermeneutical and phenomenological investigations. Functional demands, theories are analyzed to create a better understanding of the realm of the project. The architectural vision is consequently derived from the accumulated knowledge of the analysis.

Phase 3. Sketching
With the vision as a guideline this phase takes its point of departure in the two previous phases. During the sketching process different design ideas and technical solutions are investigated to narrow down the design parameters towards the final solution.

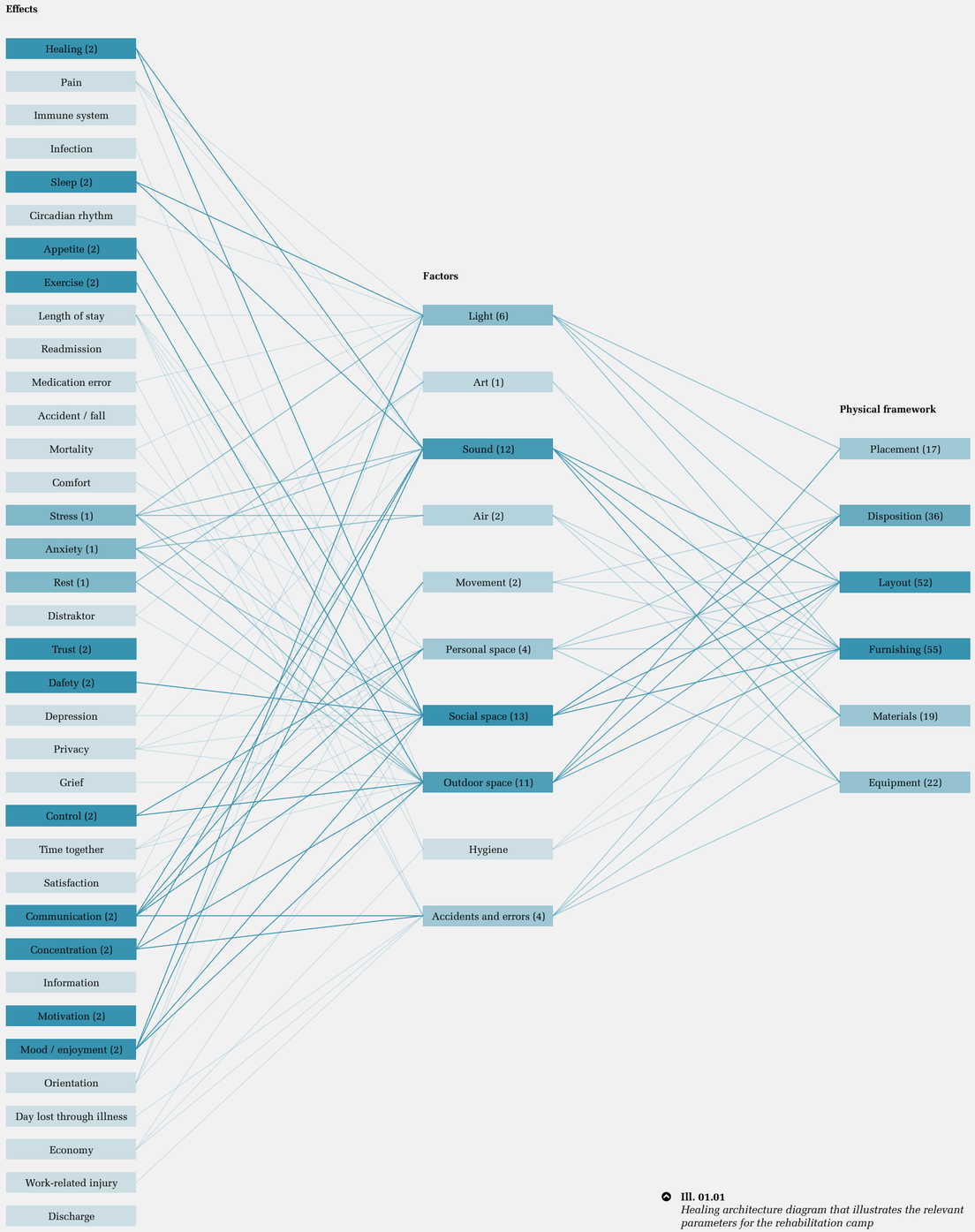
Phase 4. Synthesis
In this phase all the ideas, which derive from the sketching phase, are further developed. The architectural design is specified through a synthesis of form, functionality, construction and climate.

Phase 5. Presentation
The final phase explains and concludes the design, which stems out of all the previous phases. It is expressed and presented in graphical materials, digital renders, physical models, etc.

001

Framework

This chapter introduces the major themes of the project, healing architecture and sustainability, in order to establish a common ground of understanding and a point of departure for the project. At the end of this chapter the points of the potentials worth exploring in the further development of the project are summed up.



Ill. 01.01
Healing architecture diagram that illustrates the relevant parameters for the rehabilitation camp

Healing Architecture

One of the major themes for this thesis is healing architecture. The project is going to create the setting for children and families affected by childhood cancer, thus it is relevant to explore the concept of healing architecture.
Architecture has more than ever become a relevant parameter in the healthcare sector with the notions of healing architecture and evidence-based design. During the last couple of decades research has shown that the built surroundings can have a great impact on the healing process of the individual (Frandsen, et al., 2009).

Healing architecture is a design concept that represents the vision of how architecture affects the well-being of a person and how architecture can contribute to and promote the healing process of the individual. The underlying thought is not that architecture single-handed has the ability to cure, but that architectural elements such as plan layout, the quality of daylight, the atmosphere of a space, colors and materials can support the healing process on both a physical and psychological level (Frandsen, et al., 2009).

The concept of healing architecture is based on evidence-based design (EBD), a method for qualifying decisions on architecture and design based on scientific research to achieve the best possible outcome. EBD has especially been adopted into the healthcare sector due to the significant amount of research within the field. The principles of the design concept can be utilized in various types of buildings, but the primary focus is on healthcare buildings such as nursing homes, rehabilitation, hospices and hospitals (Frandsen, et al., 2009).

The publication 'Helende Arkitektur' by Frandsen, et al. (2009), published by Aalborg University, creates an overview of existing research which is organized in a model with three interrelated categories: physical framework, factors, and effects. The effects cover physiological, psychological, and economical effects and by identifying which are relevant for the in the case of this project, it becomes evident that the relevant factors can be divided into three main categories: Indoor environment, relations and nature.

Healing Architecture

Indoor Environment

The term indoor environment covers several factors such as light, sound, air and temperature, and today it is a focus area in the Danish building regulation with defined standards that new buildings have to meet. The focus of this section is however not on these standards but on how the different factors influence the healing process of the individual.

Light
Light and especially daylight has a positive influence on the well-being of the individual, on the sense of locality, on sleep, depression, pain and stress. Daylight and windows is some of the most important elements for both patients and personnel in relation to their well-being. Research shows that access to daylight helps avoid mental illness and loss of memory, and that there is a relation between the development of delirium and missing access to daylight and view to the outdoor (Frandsen, et al., 2009).

The healing effect of light for patients suffering from depression has been well-known for many years, but research shows that patients in rooms facing east experience fewer symptoms than patients in rooms facing west. The amount of daylight seems to influence their quality of sleep. Research shows that the more daylight a patient is exposed to during a day, the more profound the sleep. Direct daylight also seems to have a healing effect. The length of stay was shorter for patients in rooms facing south than patients in rooms facing north (Frandsen, et al., 2009). The research supports that it is not just the amount of daylight but also the orientation of the daylight that is a critical criteria for success (Volf, 2014).

Sound
The auditory environment is an important element of the indoor environment. Sounds can be both soothing and have a healing effect as well as be a disturbing element for sleep and a factor for stress. Research from an intensive therapy unit shows that a good auditory environment promotes the healing process of the individual patient and reduces the number of re-admissions. The same research shows that a poor auditory environment enhances the feeling of anxiety, nervousness and lack of control. Multiple researches also show that noise affects the sleeping rhythm in a negative way (Frandsen, et al., 2009).

Sound also affects the feeling of privacy. In cases of a poor auditory environment caused by other patients, relevant information can be withheld from the patient because of a lack of privacy (Frandsen, et al., 2009).

Air and temperature
Good air quality and the right temperature are important for the comfort of the individual, but this consideration is applicable for every type of building. In a healthcare environment the air quality is especially important in regards to hygiene as well as individual control of the air flow and temperature since patients often are more sensitive to these factors (REHPA, n.d.).

Healing Architecture

Relations

Relations cover both the need for private and social space. Private space is especially important in many types of healthcare buildings such as hospitals and hospices, but it is however not considered relevant in this thesis. The focus will therefore be on the social space.

Social space
The physical space can promote social interaction between patients, relatives and personnel. Research shows that the establishment of a kitchen on a ward promotes the interaction between patients and relatives, and that it has a positive influence on their experienced well-being and happiness (Frandsen, et al., 2009). The kitchen becomes an important place for spontaneous meetings. Relatives in the same situation benefit greatly from sharing experiences and supporting each other, and the research shows that relatives participate more in the nursing and caring for the patients if the architecture promotes both private and social spaces (Realdania, 2009).

The ability to have a confidential conversation patient to patient has proved to have a positive influence on the healing process. When patients talk and interact with one another, it has a positive influence on the feeling of well-being, stress levels and anxiety (Frandsen, et al., 2009).

The placement of common spaces is also an important factor. Research shows that more people use the common space if it is shielded from areas with a lot of activity. The furnishing of a space can also be an element that promotes social interaction. The most successful furnishing often accommodates both social and private paces (Frandsen, et al., 2009).

Ill. 01.02
Kitchen area of cancer counselling centre in Herning

Ill. 01.03
Nature

Healing Architecture
Nature

Multiple researches point to nature as a crucial factor for relief of stress, pain and depression. In this section there will be a distinction between staying in nature and looking out on nature.

Staying in nature
Staying in a natural environment such as a garden has a positive influence on the mood of patients, relatives and personnel. It has a relaxing and calming effect, and some even feels revived and stronger after staying in a garden (Frandsen, et al., 2009).

Outdoor space can also be a catalyst for different types of interaction. The hierarchy that often is quite evident between patient and personnel is not as clear outdoors as it is indoors, and patients experience the feeling of being a person instead of a patient when they are outdoors. Exercise also becomes more natural outdoors than indoors (Lottrup, 2012). It is however different how people of different ages uses an outdoor area. Grownups often sit by themselves or together with others whereas children are much more active (Frandsen, et al., 2009).

The character of the outdoor space is not irrelevant. Trees, plants and flowers are some of the most compelling elements. The scent of flowers, the sound of birds, the wind blowing in the trees and the sound of running water are all elements that stimulate the senses and have a positive effect on the individual (Frandsen, et al., 2009). Diversity in the flora can also contribute to an interesting outdoor environment throughout the different seasons (Realdania, 2009).

The use of an outdoor environment is closely related to the degree of integration with the architecture. A garden that is not visible or placed far away will not be used to the same extent as a garden placed in connection with a common area (Frandsen, et al., 2009). The outdoor space also has the potential of extending the interior space and adding a lot of quality to the architecture.

View to nature
A view to nature can have a positive impact on a number of circumstances such as stress, concentration, pain and healing for both patients, relatives and personnel. A view to a natural green environment seems to have a calming effect on physiological factors such as heart rhythm and on mental factors such as the mood of the individual and the sense of calmness. Research shows that a view to an urban environment does not have the same effect (Frandsen, et al., 2009).

A view to a natural environment also seems to have a positive influence on pain. Research shows that images of nature can act as a distractor for pain and that the amount of pain medication was significantly lower for patients in a room with a view to nature compared to patients in a room with no view (Frandsen, et al., 2009). Research by Fich et al. (2014) however indicates that the quality of the space might have an impact in itself. Patients in a closed room showed increased stress levels compared to patients in an open room.

There seems to be a relation between the development of delirium and the lack of a view through a window. Both patients and personnel greatly value being able to follow the life outside (Frandsen, et al., 2009).

Sustainability

Another major theme for the project is sustainability, thus it is relevant to clarify what sustainability is. The modern concept of sustainability is based on the holistic idea of sustainability introduced by the World Commission on Environment and Development in the report Our Common Future in 1987 – also known as the Brundtland-report. The report defines sustainable development as (Drexhage and Murphy, 2010):

"(…) development that meets the needs of the present without compromising the ability of future generations to meet their need."

- The Brundtland-report (1987)

A Holistic Approach
Based on the definition of sustainability set forth in the Brundtland-report the Rio Declaration from 1992 introduced the holistic approach to sustainability that defines the term today (Drexhage and Murphy, 2010). It identifies three equally important aspects of sustainable development: environmental, economic and social. The holistic notion of sustainability means that sustainability has to be viewed as a whole. Focusing on only one aspect without including the other two is therefore not a truly sustainable approach. This consideration is based on the realization that our world is made up of mutual depending elements (DAC, 2014).

Sustainable Architecture
Sustainability has gained ground in the building sector, especially since climate change became a political topic (Drexhage and Murphy, 2010). In recent decades there has been an increasing focus on energy consumption and especially on the emission of greenhouse gasses. In Denmark the political goal is to become CO2 neutral by 2050 and with the introduction of increasingly strict building regulations, new buildings in Denmark has become extremely energy efficient (Kleis, 2014). Recent years strong focus on the environmental aspect of sustainable development in the building sector is shifting towards a more holistic approach as seen with sustainable certifications systems such as DGNB.

Sustainability
DGNB

DGNB is a certification system for ranking sustainable buildings. The system is originally developed in Germany and later adapted to fit Danish standards in 2012. Today the system is used for new office buildings and commercial buildings, but it will cover other types of buildings in the future. The system ranks a building with a bronze, silver or gold stamp based on an overall assessment of the building.

The assessment is divided into five categories relating to the building itself and a category for the site. The quality of the site is assessed independently and does therefor not influence the assessment of the building. The five categories relating to the building include environmental, economic and social quality, as the three aspects of sustainability. The remaining two categories include the technical quality and the process, and they become elements that affect the other three.
The DGNB certification is a guarantee for a sustainable building where sustainability is in every aspect of the building. The certification system looks at every stage of the building process including the impact on running the building (DK-GBC, 2013).

A brief review of the five categories of the DGNB system is done to get a better understanding of the individual parameters that make up a sustainable building.

Environmental quality
The environmental quality ensures that the building's impact on both the global and local environment is minimized as much as possible. This includes the environmental effect of running the building and producing the materials, which is calculated through a life cycle assessment (LCA) (DK-GBC, 2013).

Economic quality
The category for economic quality includes a life cycle cost analysis (LCC) of the building. Furthermore, it includes an assessment of the buildings potential for economic development through flexibility and other uses. The LCC is calculated like the LCA for a period of 50 years. It includes the cost for constructing the building and for running and maintaining the building. It is important to look at the life span of the materials and components used in the building, since the cost for replacing these during the buildings life span can greatly influence which materials and components to use (DK-GBC, 2013).

Social quality
The category for social quality includes parameters such as health, comfort, user satisfaction, functionality and esthetics. An efficient and productive work environment with a low absence due to illness is among other things achieved through a good indoor environment. This is assessed through the thermal, atmospheric, acoustic and visual comfort, as well as parameters such as the user influence on the building, the quality of outdoor spaces and the safety and security of the building. Other parameter that is included in the category is accessibility both inside the building itself but also via bicycle paths to and from the building (DK-GBC, 2013).

Technical quality
The technical quality describes the quality of the technical solutions in the building. It concerns both the construction in itself but also how easy the building is to maintain, disassemble and remove after use. The technical quality has an influence on both the environmental, economic and social quality since the choice of technique also affects the result of the other qualities (DK-GBC, 2013).

Process
The quality of the process relates to the process of designing the building. It can be used as a guideline for ensuring that the required level of sustainability is achieved and that the right team is put on the job. This category has a weighted score of 10% in the final assessment whereas the other four categories have a weighted score of 22,5% (DK-GBC, 2013).

Summary and Potentials

Through an exploration of the design concept, healing architecture, it becomes clear that especially three main aspects are interesting in regards to this thesis: indoor environment, relations and nature. The indoor environment includes multiple factors but especially light and sound have a positive influence on stress, anxiety, depression and on the well-being of the individual.

Light is a fundamental quality in architecture, but from the perspective of healing architecture, the direction of daylight becomes very important. The daylight has to support the rhythm of the day. Exposure to daylight from east, where the intensity of the light helps to start the day, is seen to have a more positive influence than daylight from west. This consideration is important to incorporate into the thesis from the very beginning of the design process.

A good auditory environment is equally important. The auditory environment is to a great extent defined by quantitative parameters such as the level of noise (dB) and the reverberation time (s). In this thesis these parameters is especially worth considering for the spaces where large groups of people will gather.

Another interesting aspect of healing architecture in regards to this thesis is the personal relations, and especially the social space. Social interaction is seen to have a positive influence on the feeling of happiness and the well-being of the individual. Introducing an element into the healthcare environment that is typical for a home, such as a kitchen, promotes social interaction. For this thesis there could be a great potential for treating the spaces as something that lies between the typical healthcare building and a home in order to promote the social interaction.

Nature is another interesting aspect, as it is seen to have a positive influence on stress, pain and depression. One thing to consider is the view to nature from the interior spaces and how the combination of interior spaces and outdoor spaces can create a synergy effect. Another thing worth considering is the outdoor space itself as it has a great potential for promoting the healing process. The focus of this thesis should therefore also include the outdoor areas as a relevant parameter.

Through an exploration of sustainability it becomes evident that a holistic approach is essential in creating sustainable architecture. This approach includes a number of factors that need to be taken into account from the very beginning of the design process. Not all of these factors will be addressed in this thesis, but the focus will primarily be on the environmental and social sustainability. This includes the indoor environment, which is also one of the interesting aspects of healing architecture. Working with the indoor environment from both a qualitative and quantitative approach will create a strong foundation for the thesis.

Program

In this chapter ExcaliCare is briefly introduced and the theoretical basis and requirements for the rehabilitation camp is explored and specified in an area chart that will form the basis for further development. At the end of this chapter the points of the potentials worth exploring in the further development of the project is summed up.

ExcaliCare Children's Organisation

ExcaliCare is a children's organisation that focuses on the life after childhood cancer through rehabilitation. The vision of the company is that every child and family affected by childhood cancer should have same opportunities for reaching their full potential as people without sickness. Illness should not be a permanent obstacle for a life full of joy and happiness (ExcaliCare, 2015b).

The company was founded in 2015 by Rasmus Thøger Christensen and Heidi Kristane Støve, both medical students at Aarhus University. The establishment of ExcaliCare became a reality after a generous donation from Børnecancerfonden (ExcaliCare, 2015b). ExcaliCare's goal is to create camps with the aim of creating an integrated rehabilitation program based on well-proven theory as well as a physical and creative challenging environment that generates successful experiences and time for reflection. The rehabilitation camps should serve as a strong foundation for when both the child and family affected by the illness returns to the life after childhood cancer (ExcaliCare, 2015b).

ExcaliCare held their first activity based rehabilitation camp in September 2015 for children with cancer in the age of 11-17. The pilot project, Cool Camp 2015, was a major success and it will form the basis for the company's further development (ExcaliCare, 2015c). When a child is diagnosed with cancer it is the entire family that is affected. The vision of ExcaliCare is to be able to offer camps for the child with cancer, their siblings, their parents, the entire family as well as the ones left behind (ExcaliCare, 2015d). With continuing support from Børnecancerfonden and the four cancer treatment centres for children in Denmark, ExcaliCare will arrange three new camps in 2016; a reunion camp for the campers of Cool Camp 2015, a new Cool Camp 2016 as well as a camp for siblings – the so-called 'shadow kids'.

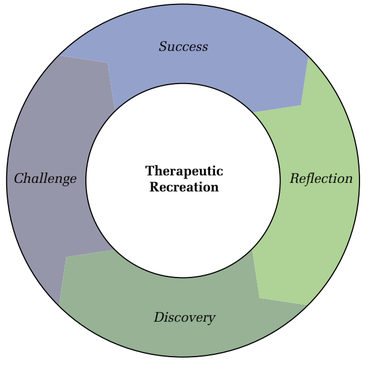
Ill. 02.01
ExcaliCare's Cool Camp 2015

The Camp

ExcaliCare's rehabilitation camps are based on the theoretical model of Therapeutic Recreation (TR). The objective of TR is to improve the child's self-esteem, self-confidence and independence as well as to give the child the tools to handle and reduce stress in the future (ExcaliCare, 2016).

The children participate in a number of activities during the camp that challenge them physically, personally, creatively and socially. The activities on the camp focus on teamwork as a precondition for solving assignments and as a way to promote the feeling of community that supports the individual child. The children experience the feeling of success by overcoming the challenges related to the activity. Through facilitated reflection, the children discover new aspects of themselves that can be used in the future (ExcaliCare, 2016).

The keyword of the TR-program is "empowerment". Letting the child back in control of its life after a long period of illness, makes the child more capable of making informed decision in the future thus promoting the quality of life for the individual child (ExcaliCare, 2016).



Ill. 02.02
The four stages of Therapeutic Recreation

The Camp
Requirements

The requirements for the campus area are based on the project brief (ExcaliCare, 2015a) and on meetings with ExcaliCare. The campus area should initially be able to accommodate 50 people including both campers and volunteers. At a later point it should be possible to expand the camp to accommodate 150 people. The camp should be disabled-friendly, thus the entire area should be accessible for people in wheelchairs, people with reduced eyesight and physically challenged people. The location of the campus area is not specified in the brief but it should preferably be located in Jutland, Denmark, in calm and scenic surroundings with access to a forest and a lake as elements that support the activities of the camp. The campus area should consist of five main areas: A cabin area, a common house, an activity area, a medical house and an administration.

Cabin Area
The cabin area should create a sense of community even though it consists of individual cabins. Each cabin should accommodate between six to eight campers and four volunteers. The campers and volunteers should sleep in separate bedrooms and each cabin should include toilet and bathing facilities. The primary use of the cabins will be for periods of rest and cosines as well as for the facilitated reflection of the TR-program.

Common house
The common house should be able to accommodate all the people on the camp and it will primarily be used for meals and activities during the evening such as shows and small concerts. The common house should therefor include a dining hall with a kitchen and a common space with the possibility for setting up a stage.

Activity area
The activity area should provide the frame for a number of indoor and outdoor activities. It should include 3-4 activity pavilions that can accommodate up to 15 people each. The pavilions should be used for creative activities such as photography, art, glassblowing etc. Further more it should include outdoor spaces for the following activities:

- A robes course
- Archery facilities
- A small lake with the possibility for rowing activities
- A forest with the possibility for campfire and orienteering race
- Green areas with the possibility for other activities

Medical house
The camp is going to be attended day and night by a nurse and a doctor, thus it should be possible for the medical personal to stay overnight. The medical house should contain two examining rooms that make it possible to treat scratches and give medication. It should be placed in close proximity to the rest of the camp but its present should be subtle since the idea of the camps is to point the child away from the course of disease.

Administration
The administration should provide the necessary office space for ExcaliCare. It should be located in connection with the campus area but should not be included as an active part of the camp.

Area Chart

For the scope of this master thesis not all five areas of the camp will be included to the same extend. The main focus of the project will be on the common house and the cabin area. The remaining functions will be included on a planning level without going into the specific details of these. Therefore the area chart only shows the functions of the common house and the cabin area.

	Space	*Quantity*	*Unit area*	*Total area*	*Persons/room*	*Functional demand*
	Common House					
01.01	Entrance	1	15	15		
01.02	Cloak room	1	15	15		*The cloakroom should include 15 m of coat-hanger rod.*
01.03	Common room	1	200	200	*50-150*	*The common room should incorporate a scene. It should be possible block out all daylight in order for the space to function as a black box theater. A good acoustic environment is essential so the space does not become stressful to be in.*
01.04	Dining hall	1	250	250	*50-150*	*A good acoustic environment is essential so the space does not become stressful to be in. The dining hall cannot be placed in direct connection with toilets (BR15 3.4.3, stk .1).*
01.05	Storage room	2	7	14		*The common room and dining hall should have a storage room each.*
01.06	Kitchen	1	60	60	*6-8*	*Should be able to serve 150 people.*
01.07	Cold storage room	1	15	15		
01.08	Waste disposal room	1	7	7		
01.09	Changing room	2	7	14		*For the kitchen staff. Should includes a toilet, bath and lockers.*
01.10	Break room	1	10	10	*6-8*	*For the kitchen staff.*
01.11	Toilet	8	4	32		*1 toilet pr. 15 people (BR15 3.3.4, stk. 2). An anteroom is nessesary if accessible from the common room.*
01.12	Handicap toilet	2	5	10		
01.13	Cleaning equipment room	1	5	5		
01.14	Technical room	1	50	50		
	Total			**697**		

	Cabin					
02.01	Entrance	1	5	5		
02.02	Bedroom (campers)	1	25	25	*6-8*	*Preferably single beds instead of bunk beds due to accessibility.*
02.03	Bedroom (volunteers)	2	10	20	*2*	
02.04	Common room	1	30	30	*10-12*	*A fireplace if possible. A good acoustic environment is essential so the space does not become stressful to be in.*
02.05	Toilet and bath	1	5	5		
02.06	Handicap toilet and bath	1	7	7		
02.07	Technical room	1	15	15		
	Total			**107**		

Summary and Potentials

The implications of childhood cancer are great because the illness affects children in a period of their life where they develop physically, mentally and socially. The cancer treatment that often last for years gives the child a major disadvantage compared to other children. ExcaliCare's rehabilitation camp focuses on this problem. The activity based camp aims to improve the children's self-esteem, self-confidence and independence through teamwork, successful experiences and reflection.

The schedule for the camp is very busy. The entire day is planned with activities, joint eating and time for facilitated reflection. It is in this way the combination of activities and reflection that becomes the driver for the rehabilitation. The architecture should therefore create surroundings that support the rehabilitation process.

The campus area is going to consist of different buildings. The cabin area will form the basis for rest and facilitated reflection. It is therefore important that the architecture supports this part of the TR-program with a calm and reflective atmosphere.

The common house is going to create the setting for many activities. The atmosphere of the space should therefore promote an active and playful space. Another interesting aspect of the common house is the fact that the camp should initially accommodate 50 people but it should be possible to expand the camp to accommodate 150 people. A space that can accommodate 150 people would seem vast and empty if it only accommodates 50 people, so there is a potential conflict that needs to be addressed in the design.

Another topic worth exploring in this project is accessibility. The campus area need to be accessible for people in wheelchairs and physically challenged people. Integrating this into the architecture, so that it feels just as natural to go around the camp in a wheelchair as on foot, will demand a focus on accessibility from the very beginning of the design process.

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Place

In this chapter the site for the rehabilitation camp is introduced and relevant aspects of the site and place are analysed. No specific site is given in the project brief, however, a site in calm and scenic surrounding with access to a forest and a lake is desired (ExcaliCare, 2015a). The site that is going to form the basis for the project is an agricultural property currently on sale that has been chosen based on these qualities. At the end of this chapter the points of the potentials worth exploring in the further development of the project is summed up.

The Site

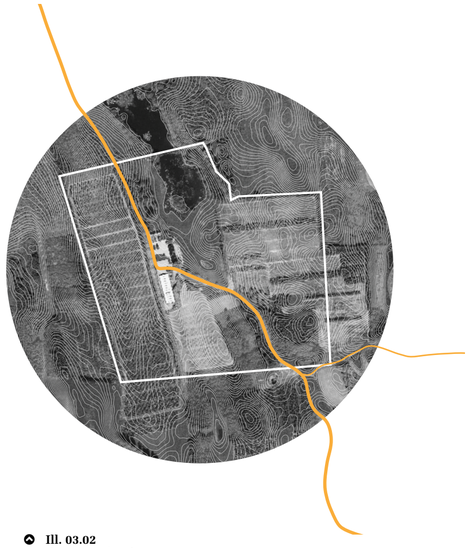
The site is situated in the southern part of Djursland on the east coast of Jutland, Denmark. The landscape on Djursland is quite varied and almost every type of landscape found in Denmark is represented on the peninsula. It is especially hills and valleys, created during the Ice Age that characterizes the landscape but other distinctive types of landscape include moorland plain, coast scenery and dune landscape (Pedersen and Petersen, 1997).

Mols Bjerge
Mols Bjerge is a national park covering a large area of the southern part of Djursland including the area of the site. The national park has a distinctive hilly landscape and an especially varied flora and fauna. Mols Bjerge national park includes areas of natural resort, agriculture, forestry and historic environments. The European Union has specified around 200 types of wild nature that is characteristic for indigenous Europe. Around 60 types are found in Denmark and 40 of these are found in Mols Bjerge national park (Nationalpark Mols Bjerge, n.d.).

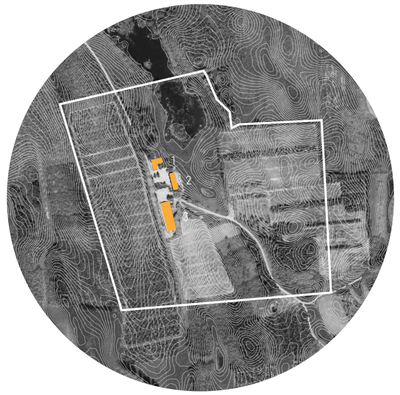
Knudsminde
The site that forms the basis for the project is an agricultural property, Knudsminde. Situated in the calm and scenic surroundings of Mols Bjerge, it is a 40-minute drive to the city of Aarhus and close to the small village of Feldballe. The property is situated in hilly terrain characterized by a mixture of smaller forest areas, small lakes and agricultural fields. The property includes 43 hectare of land and three existing buildings on the site (Landbrugsmæglerne, 2016). The property is spread across nine land registers and a large portion of the land is used for agriculture. For the purpose of this project, the focus of the analysis will be limited to the two land registers that include the existing buildings and the lake next to these.

Ill. 03.01
The site. The contour lines mark an elevation of 0.5 m

Mappings

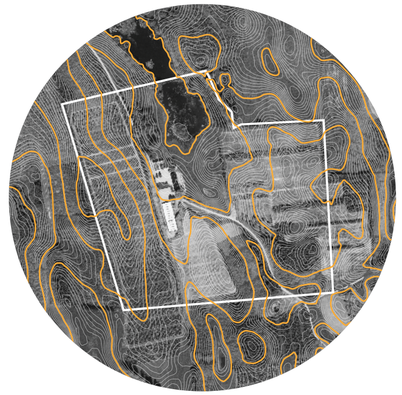


Ill. 03.02
Access to the site



Ill. 03.03
Existing buildings on the site

Ill. 03.04
The lake and ponds of the site



Ill. 03.05
The typography of the site. The highlighted contour lines mark an elevation of 5 m

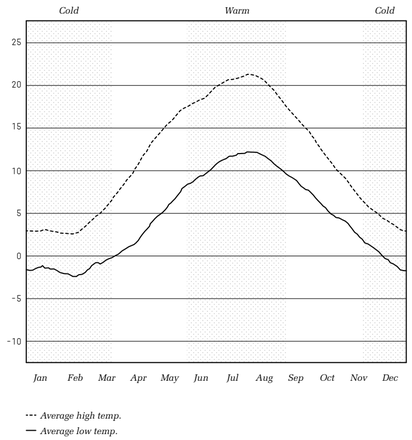
Infrastructure
There is no major infrastructure adjacent to the site except from a small gravel road, Ravnebjergvej, from which you access the site. Ravnebjergvej only leads to a limited number of properties along the road and is a dead-end street, so the impact of traffic is very limited. Two main roads run close to the site making it very accessible. Furthermore, Aarhus Airport is only a 10-minute drive from the site.

Buildings
There are three existing buildings on the site, a main house (1), a former livestock building (2) and a machine hall (3) currently used for storing agricultural machinery. The main building is in two stories with an area of 221 m2. It is built in 1968 with exterior walls of white sandstone and a roof of black fiber cement. The former livestock building is built in 1925 and has an area of 300 m2. The exterior walls are made of white-washed brick stone and the roof is made of black fiber cement. The building currently contains two carports, a boiler room and a dining hall (Landbrugsmæglerne, 2016).

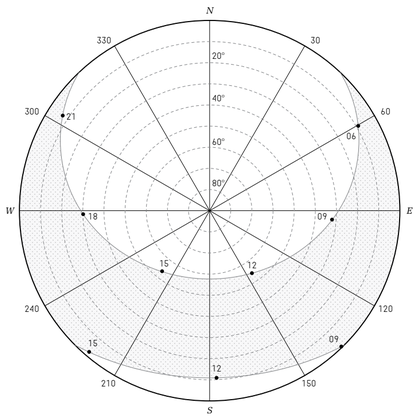
Water
A small lake is one of the most distinctive features of the site. The lake is situated in the northern part of the site and extends beyond the site's boundary. Combined with a number of small ponds spread across the site ensures a rich wildlife on the site.

Typography
The landscape of the site is quite hilly with the only few relatively flat areas around the existing buildings and on the southwester shore of the lake. The flat ground around the lake is very moist and is not suitable for activities in it current state

Climate



Ill. 03.09



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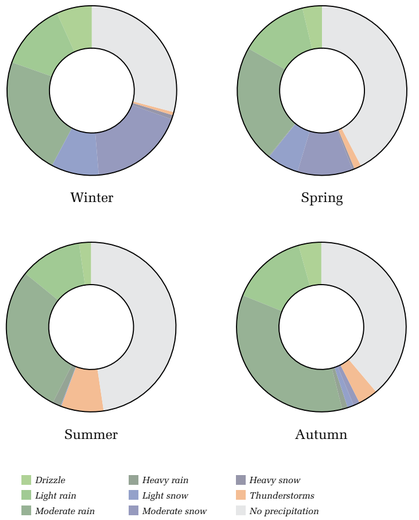

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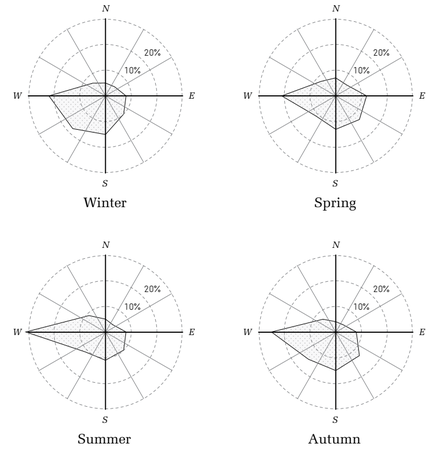


Ill. 03.09

Temperature
The region has a humid continental climate with warm summers and no dry season. The temperature typically varies from -2°C to 21°C over the course of the year and the temperature is rarely below -10°C or above 26°C. The warm season is during the three summer months of June, July and August with and average daily high temperature above 18°C. The cold season typically lasts from the middle of November to the middle of March with an average daily high temperature below 6°C (WeatherSpark, n.d.).

Daylight
The length of the day varies with almost 11 hours over the course of the year. The longest day is June 20 with 17:43 hours of daylight and the shortest day is December 21 with only 6:52 hours of daylight (WeatherSpark, n.d.). During summer s, the sun rises in northeast and sets in northwest with its maximum altitude of 58°. During winter solstice the sun rises in southeast and sets in southwest with a maximum altitude of 11° (Gaisma, n.d.).

Precipitation
The probability of precipitation varies throughout the year with the highest probability (73%) of precipitation in January and the lowest probability (50%) of precipitation in May. During the four seasons, winter has the highest probability of precipitation and summer has the lowest, however the probability is still relatively high. In summer there is a 52% probability of precipitation. The most common form of precipitation throughout the year is moderate rain. In winter there is an almost equal probability of moderate snow, but it is otherwise rain that is the predominant form of precipitation throughout the entire year (WeatherSpark, n.d.).

Wind
The average daily wind speed is quite constant over the course of the year, varying between 4-5 m/s corresponding to a gentle breeze. The average daily minimum and maximum wind speed typically varies from 0 m/s to 7 m/s (moderate breeze) over the course of the year and it rarely exceed speeds above 12 m/s (strong breeze). The predominant wind direction over the course of the year is west, but it changes slightly during the four seasons. In winter the predominant wind direction is still west with 22% but southwest and south are also quite dominant with 18% and 15% respectively. During summer, the picture is more biased with a predominant wind direction from west accounting for 31% (WeatherSpark, n.d.).

A Sense of Place

The Journey
Access to the site happens via Ravnebjergvej. After turning onto the road just outside the small village of Feldballe, the pavement changes from asphalt to gravel. The many impressions from the village are substituted with calm scenery of forest areas and fields. As one approaches the site, the landscape opens up and reveals a lake on the left hand side. Trees on both sides of the road frame the arrival and mark the start of the site. Openings in the treeline frame a view to the lake and the hills rising behind it, which gives a glimpse of the scenic landscape of the site. After passing the main building one arrives at a courtyard defined by the main building and the former livestock building

Ill. 03.10
Arrival to the site

The Lake
The lake is the most influential element of the site. The landscape slopes towards it and creates a natural focus on the lake. The steady water gives the place a calm atmosphere, and the reflections of the surrounding trees in the water surface are only interrupted by ducks and swans paddling around the lake.

Ill. 03.11
The lake

The Hills
The hilly landscape is the second most influential element of the place. It is covered with a green layer of grass, which together with the gentle sloping from hill to valley give the landscape an almost soft texture.

Ill. 03.12
The hilly landscape

The Former Livestock Building
The former livestock building is characteristic for the area with its whitewashed walls, pitched roof and its small vaulted window openings. The white-washed walls make it stand out in the landscape where it becomes a reference to the agriculture of the past that dominated the region.

Ill. 03.13
The former livestock building

Summary and Potentials

The site is placed in the scenic landscape of Mols Bjerge national park on Djurlands. The hilly character of the landscape creates a beautiful backdrop for the camp but it also presents a potential conflict with accessibility on the site. The lake in the northern part of the site is one of the site's most distinctive elements. The scenic landscape and the lake almost suggest that this is a place for settlement, which poses a great potential for utilizing the lake as an integrated part of the campus area.

The arrival to the site happens through a small gravel road, which underlines the natural character of the place. Trees along the sides of the road frame a view to the site and the lake. This could be used to frame the campus area and build up expectations as you arrive to the site.

The site includes three existing buildings: a main house, a former livestock building and a machine hall. The main house and the machine hall do not present any potential in regards to the rehabilitation camp and they will for the purpose of this thesis not be included in the further development of the project. The former livestock building do however present a potential. The scale, shape and materials of the building stand as a cultural reference to the agriculture of the past, and the building is furthermore situated so that it defines a place of arrival.

The climate is also a relevant factor to consider. The probability of precipitation is high throughout the year and the most common type of precipitation is moderate rain. The rehabilitation camp is going to be the setting for a lot of different activities both indoors and outdoors, it is therefore relevant to take the high probability of precipitation into account in the further development of the project. It is also worth noticing that the predominant wind direction is west. This is especially true for the warm season and could potentially be used in the principle for natural ventilation.

Vision

“The new rehabilitation camp for ExcaliCare shall provide a setting that helps to promote the process of rehabilitation for children and families affected by childhood cancer. This should be done by incorporating the principles of healing architecture into the design with a strong focus on the indoor environment, the social space and the nature.
The camp must be inviting and accessible for everyone, including those who are disabled, and it shall encourage a feeling of community. The identity of the place and the local climate should be emphasized and incorporated as potentials for creating a unique campus area.”

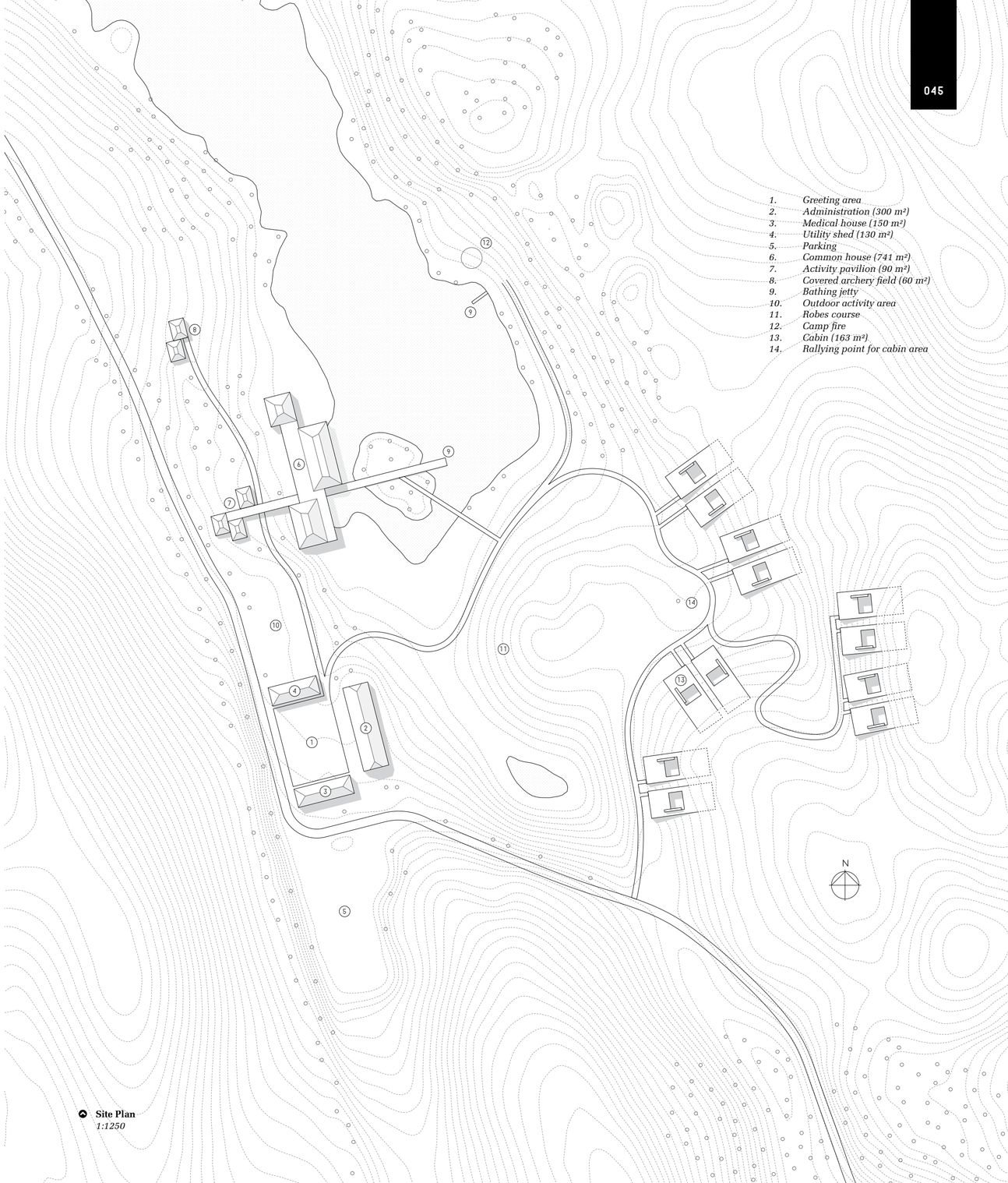
Presentation

In this chapter the design proposal for the new rehabilitation camp is presented. The presentation starts with the site plan in order to establish an overview of the campus area. Afterwards, the common house and the cabin are presented in greater detail.

Site Plan

With its relatively remote location just outside the small village of Feldballe and in the beautiful landscape of Mols Bjerge Nationalpark, the campus area becomes a destination where the experience starts before even arriving to the site. The lake marks the approach to the camp and openings in the tree line along the small gravel road frame a view to the area and helps build up the expectations. The campers then arrive to the greeting area where they are welcomed by the staff. The greeting area is a clearly defined space that provides the campers with a feeling of security and acts as a stepping-stone before the activities of the camp begins.

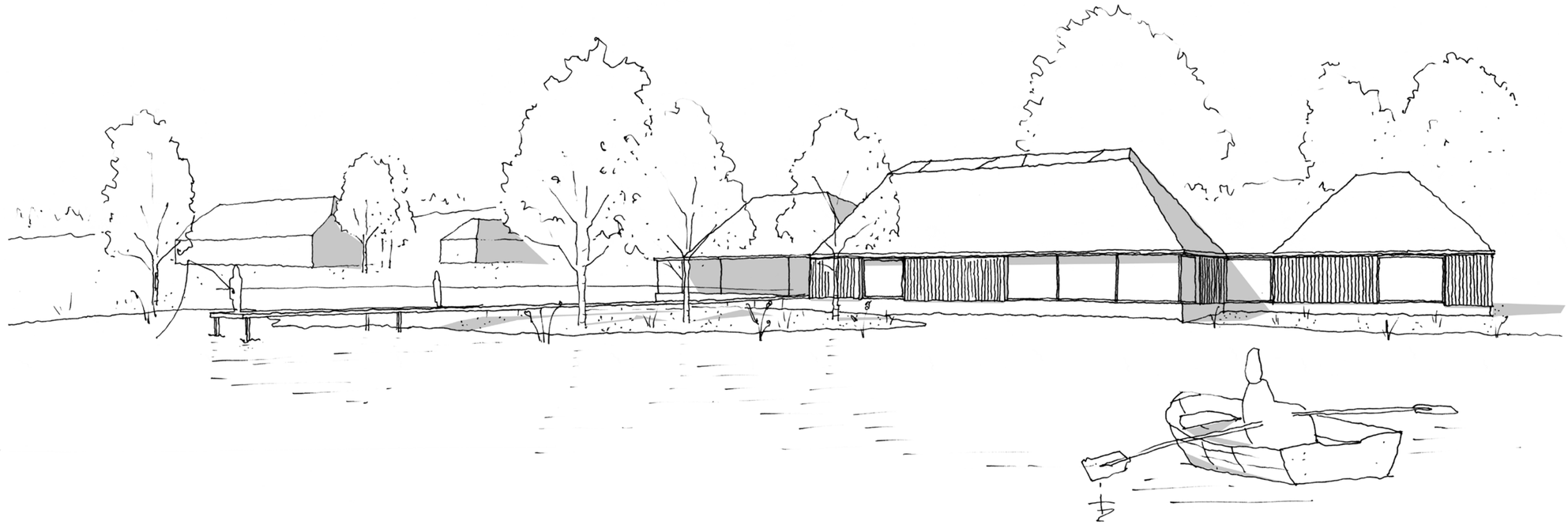
After being welcomed to the campus area, the campers are accompanied to the common house where they will gather for an introduction to the camp. The common house is placed on the edge of the lake and the activity areas center around it to emphasize the idea of the common house being the heart of the camp. After the introduction the campers move on to the cabin area, where they will take up quarters. The cabin area is placed in the hilly landscape and creates a distance between the vibrant atmosphere surrounding the common house to emphasize the calm and reflective nature of the cabins.



Site Plan
1:1250

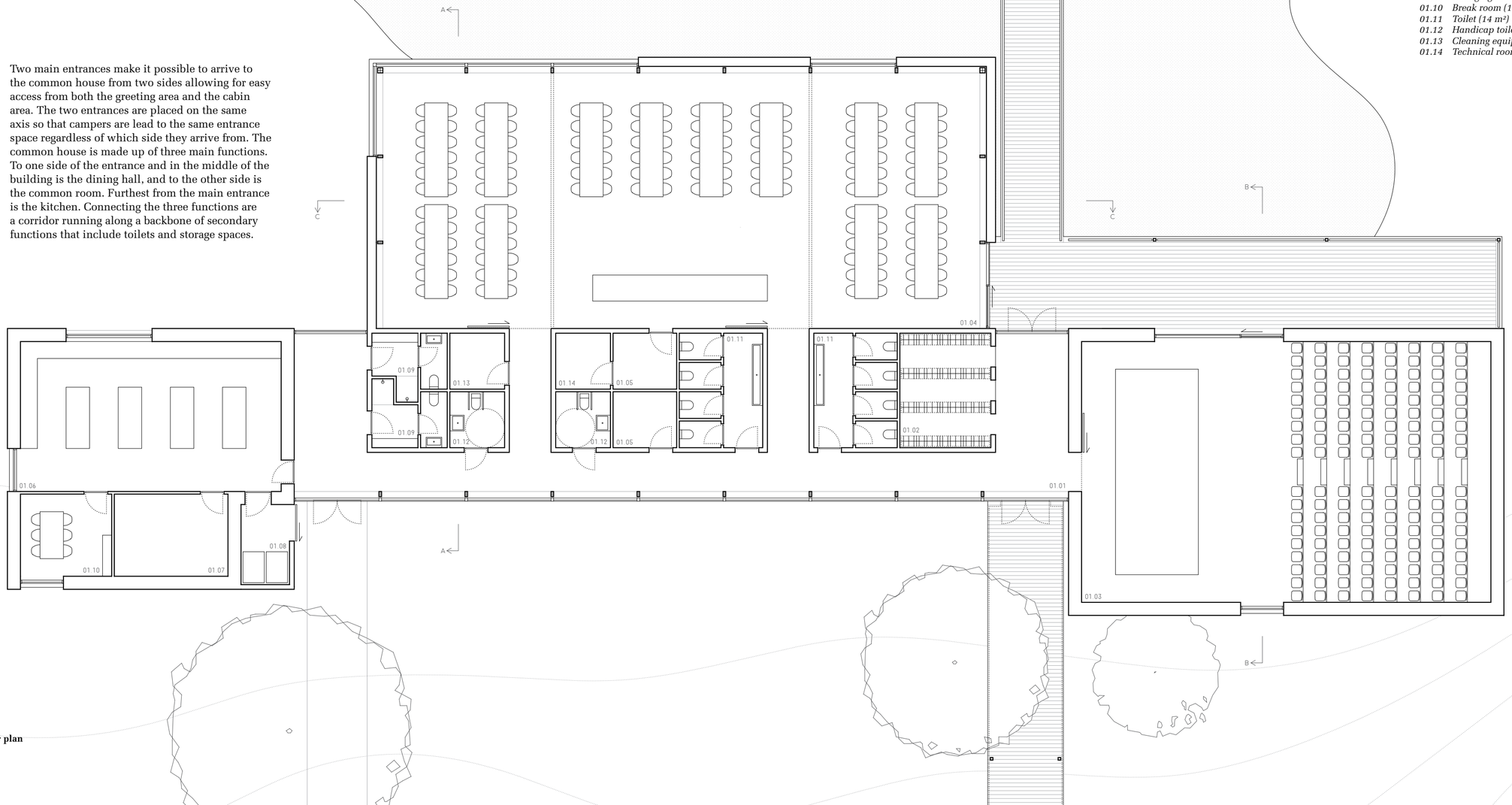
The Common House

The common house is the heart of the camp. It sits right on the edge of the lake gently sticking out into the shallow waters surrounding the small island and adapting to the shore of the lake. This forms a strong relationship between the common house and the lake where the synergy between the two creates a harmony between building and nature.
The roof of the common house is another strong motif. Inspired by the roof structure of the existing building on the site, the roof creates a reference to the scale and shape of the traditional farmhouses characteristic to the area. The three distinct roof structures of the building help to reduce the scale of the common house so that is relates to the scale of its surroundings. The roof, striving towards the sky, together with the lake become the two main instruments for creating a strong atmosphere of the space.



Ill. 05.01
The common house seen form the lake

Two main entrances make it possible to arrive to the common house from two sides allowing for easy access from both the greeting area and the cabin area. The two entrances are placed on the same axis so that campers are lead to the same entrance space regardless of which side they arrive from. The common house is made up of three main functions. To one side of the entrance and in the middle of the building is the dining hall, and to the other side is the common room. Furthest from the main entrance is the kitchen. Connecting the three functions are a corridor running along a backbone of secondary functions that include toilets and storage spaces.



Common House, floor plan
1:125

Common House (741 m² gross area)

01.01 Entrance (18 m²)
01.02 Cloak room (15 m²)
01.03 Common room (157 m²)
01.04 Dining hall (235 m²)
01.05 Storage room (5 m²)
01.06 Kitchen (58 m²)
01.07 Cold storage space (14 m²)
01.08 Waste disposal room (6 m²)
01.09 Changing room (6 m²)
01.10 Break room (11 m²)
01.11 Toilet (14 m²)
01.12 Handicap toilet (5 m²)
01.13 Cleaning equipment room (5 m²)
01.14 Technical room (50 m² including space above kitchen)

The Common House

Arrival

Arriving to the common house happens from one of two sides. From the greeting area you move along a path in the landscape that runs parallel to the building and in-between the existing trees. As you approach the common house a covered pathway greets you and invites you in. The covered pathway becomes an extension of the building and creates a gradual transition between outside and inside, and at the same time provides shelter between the common house and the activity pavilions.

From the cabin area you arrive to the common house from the lake. A footbridge extends across the lake to the little island. The footbridge becomes an extension of the building that greets you before arriving at the destination in the same way as the covered pathway greets you at the other entrance. The covered terrace that meets you right before entering the building further emphasizes the gradual transition from outside to inside.

Ill. 05.02
Arrival to the common house from the cabin area

The Common House

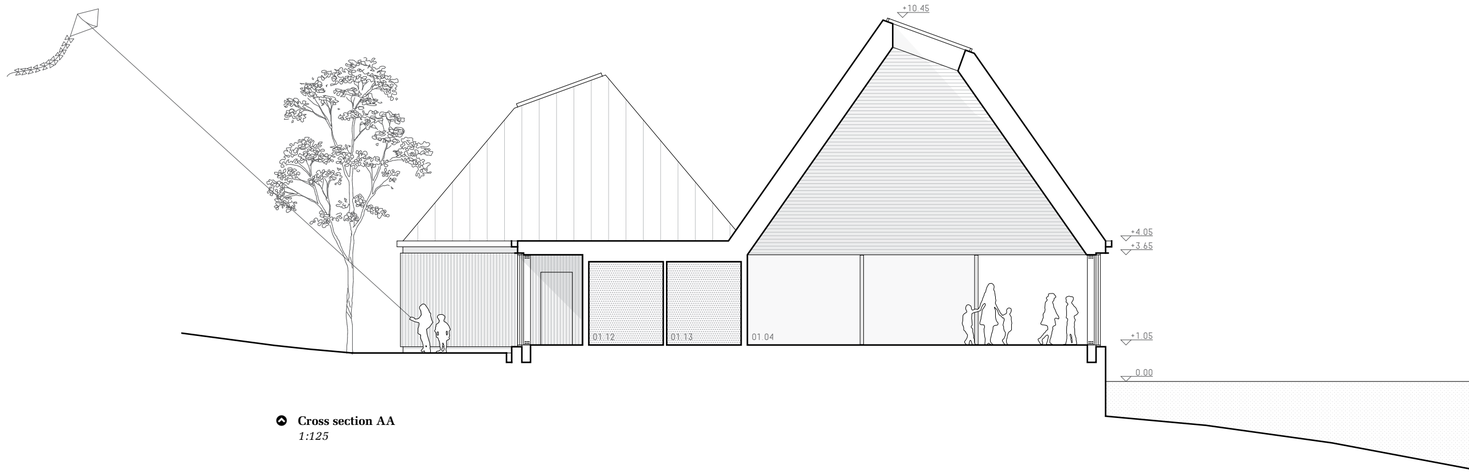
Framing the Nature

The contact to nature is one of the major aspects of healing architecture and one of the main themes throughout the common house. Large floor-to-ceiling openings in the facade ensure a strong presence of nature in the common house that emphasizes the close connection between the building and nature. Each space of the common house frames the nature in a different way to underline the specific atmosphere of the room.

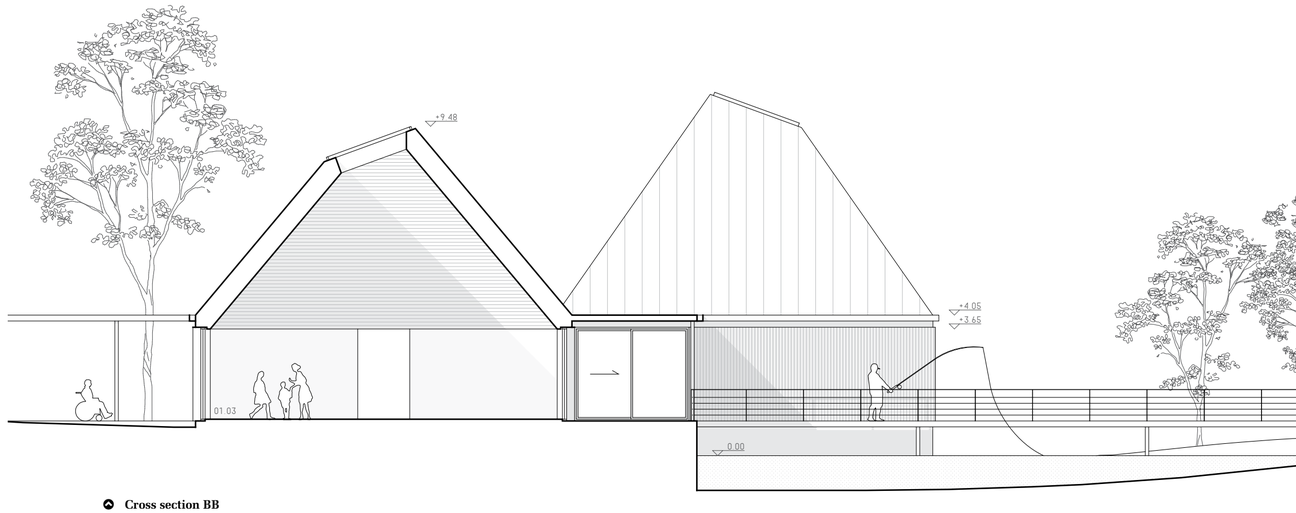
In the dining hall the lake and the sky is used to promote a feeling of openness and space. The pitched roof structure emphasizes the open character of the space and a skylight frames the sky and extends the upward striving motion of the ceiling. The skylight is tilted towards east to give the space more intensity from the morning sun and at the same time reduce sun exposure in the afternoon. Freestanding columns carry the load of the roof and allow for large openings in the facade that frame the view towards the lake. The undisturbed view of the calm lake extends the boundary of the space beyond the physical limits of the room.

The common room is a much more introvert space than the dining hall. The openings in the facade are limited to support the function of the space as a black box theatre. This is further emphasized by the restricted view outside created by the overhang of the covered terrace. The dominating element of the space is the sky. The room has the same pitched roof structure as the dining hall, where the large skylight frames a view to the sky. The skylight is tilted towards west to enhance the exposure of the sun in the afternoon and evening. This gives the space a different atmosphere than the dining hall, which supports the different times of the day where the spaces are active.

Connecting the different functions of the common house is the corridor. The glass facade running along the entire corridor diminishes the boundary between indoor and outdoor and extends the spatial experience of the space. In this way the corridor becomes an interface between the building and nature, which creates a connection between the life inside the common house and the activities outdoor.



Cross section AA
1:125



Cross section BB
1:125

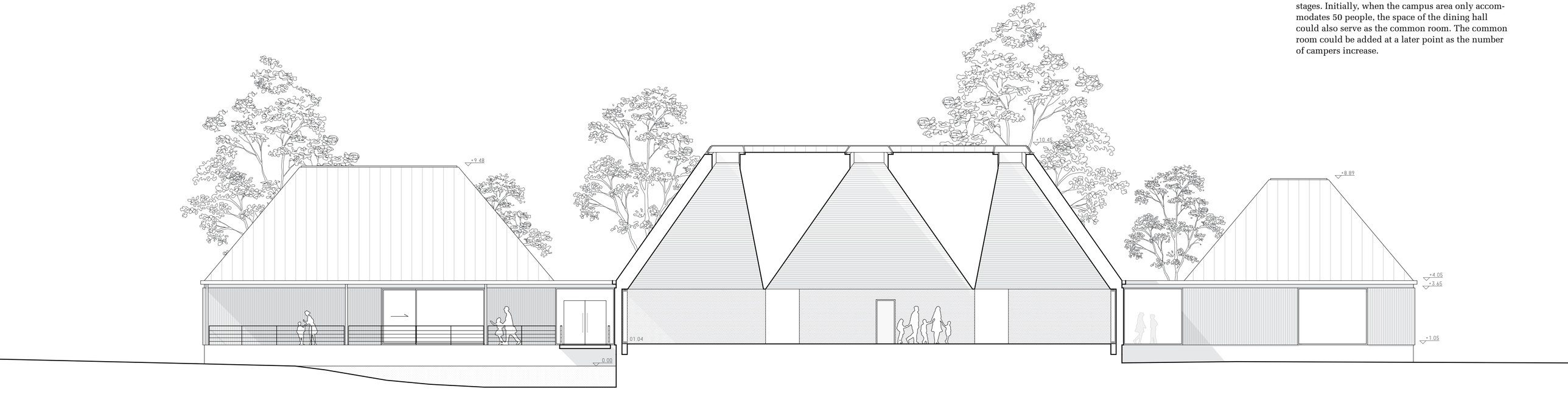
The Common House

Multifunctional Spaces

The common house offers some flexibility in order to accommodate different activities and changing needs. The common room is primarily used during the afternoon and evening for activities such as play and small concerts. For such events it is possible to block out the daylight with movable screens to create the experience of a black box theatre. A telescopic tribune makes it easy to seat everyone for such occasions and still possible to use the space for other activities.

The dining hall is able to accommodate all campers and volunteers of the camps. In plan, the dining hall is one large space, but in section, the ceiling is divided into three parts each with a skylight illuminating the space. This reduces the scale of the space and improves the acoustics of the room, but also makes it possible to divide the space if needed.

In this way the common house could be built in two stages. Initially, when the campus area only accommodates 50 people, the space of the dining hall could also serve as the common room. The common room could be added at a later point as the number of campers increase.

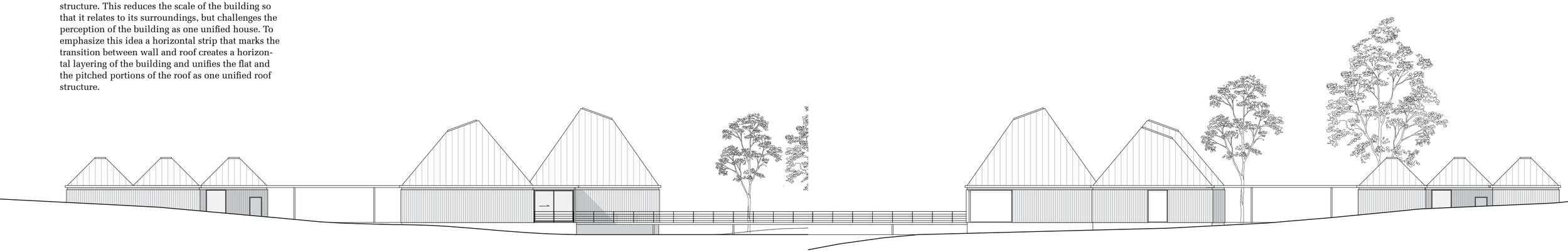


Longitudinal section CC
1:125

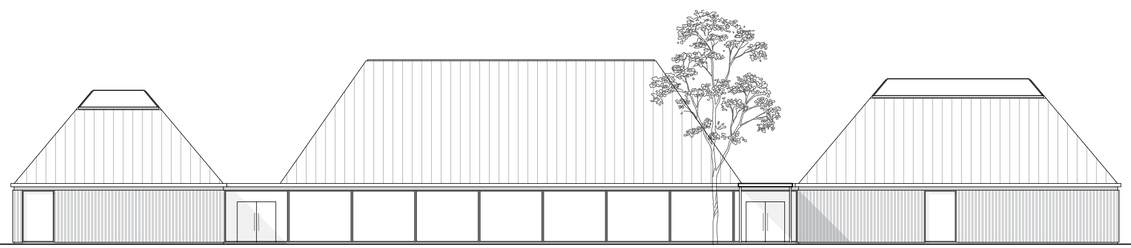
The Common House

One Unified House

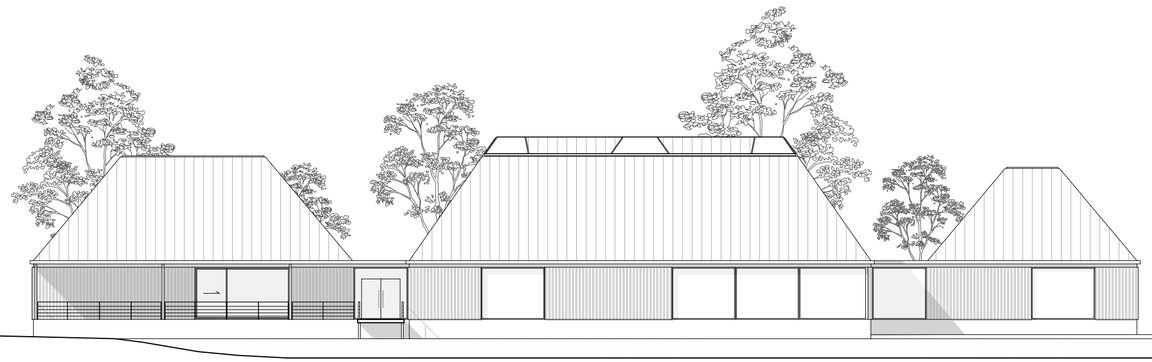
The three main functions of the common house – the dining hall, the common room and the kitchen – are clearly articulated, each with its own roof structure. This reduces the scale of the building so that it relates to its surroundings, but challenges the perception of the building as one unified house. To emphasize this idea a horizontal strip that marks the transition between wall and roof creates a horizontal layering of the building and unifies the flat and the pitched portions of the roof as one unified roof structure.



Elevation, south
1:225



Elevation, west
1:225



Elevation, north
1:225

Elevation, east
1:225

The Common House

Indoor Environment

Ensuring a good indoor environment in the building is important for the wellbeing of the people who occupy the space, and to minimize the energy consumption of the building. It is desired that the indoor environment meets the standards of category B cf. DS 1752.

Daylight
Adequate daylight levels are essential for the quality of the interior space. The large floor-to-ceiling windows ensure a high level of daylight in the common house thereby reducing the need of artificial lighting. Simulations also show how the skylights of the dining hall and common room provide the large spaces with an even distribution of daylight (see appendix 1).

Solar shading
Solar shading in the form of external sunscreens is used to prevent overheating and to provide the users of the building with a high level of control over the indoor environment. Solar shading is used on the skylight and windows of the common room so that it is possible to block out all daylight and use the space as a black box theater. The large windows of the dining hall and the windows along the corridor are important for the connection between the building and nature, but they present a challenge with overheating. The solar shading is automatically controlled but allows for manual override. This ensures an efficient regulation of the indoor environment but still allowing a high level of control for the users of the building.

Ventilation
The building uses a hybrid ventilation strategy where a combination of mechanical and natural ventilation is used to ensure a good indoor environment and to minimize energy consumption.

Mechanical ventilation is used during the heating season where the heat exchanger minimizes heat loss and thereby reduces the energy need of the building. A variable air volume (VAV) system is used due to the changing number of people occupying the space. The ventilation unit is placed on top of the kitchen but hidden under the pitched roof structure so that it is not visible from the outside. The low ceiling height of the toilets and storage rooms makes space for the ventilation ducts, which run to the dining hall and common room (see appendix 2).

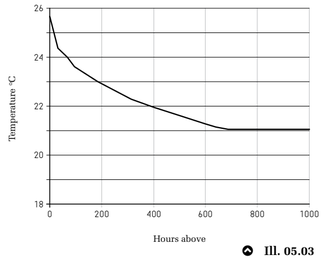
In the summer period where there is no need for preserving heat a combination of natural and mechanical ventilation is used. Few functions such as the toilets and kitchen still needs mechanical ventilation, but natural ventilation is used in the rest of the building in order to reduce the electricity consumption for the ventilation unit. The pitched roof of the dining hall and common room makes it possible to use thermal buoyancy as a principle for natural ventilation. The rising warm air inside the building creates a pressure difference that allows cool air to enter along the base of the building. The skylights further enhance the effect by creating a higher temperature in the top of the room. The cool air enters the building along its perimeter via grills in the floor. This enhances the effect of the thermal buoyancy by creating a higher elevation between inlet and outlet and at the same time eliminating the need for openings in the windows that would obstruct the view. The openings for the natural ventilation are controlled automatically through sensors that measure the temperature and CO2 level of the room.

The Dining Hall
The dining hall presents some potential challenges in regards to the indoor environment of the space. The number of people in the space varies from a handful and up to 150, which affects the internal loads and CO2 levels of the room. The desire to establish a strong connection to the lake and the sky requires large window areas that have the potential to overheat the space. In order to ensure both a good indoor environment and a strong connection to the surrounding nature, the thermal and atmospheric comfort of the dining hall has been optimized through simulations in BSim.

The simulations show that the operative temperature never exceeds 26°C. The graphs illustrate the operative temperature, CO2 concentration and air change shown as a function of the numbers of hours above a given value, and for the period with natural ventilation.

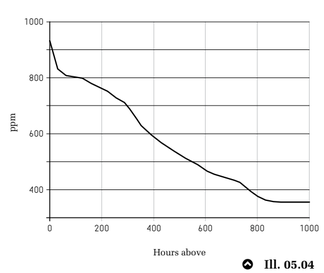
To meet the standard of category B, the allowed concentration of CO2 is 850 ppm. The CO2 concentration never exceeds this level during the period with mechanical ventilation, but it exceeds the level with a small amount of hours (25) during the time of natural ventilation. The maximum CO2 concentration is 934 ppm and it occurs during the hottest months where the driving forces of the thermal buoyancy is low due to the low temperature difference.

Operative temperature



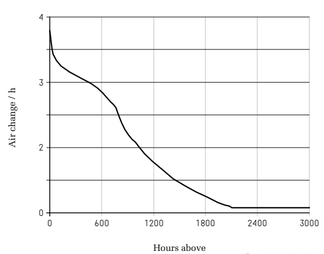
Ill. 05.03

CO2 Concentration



Ill. 05.04

Air Change



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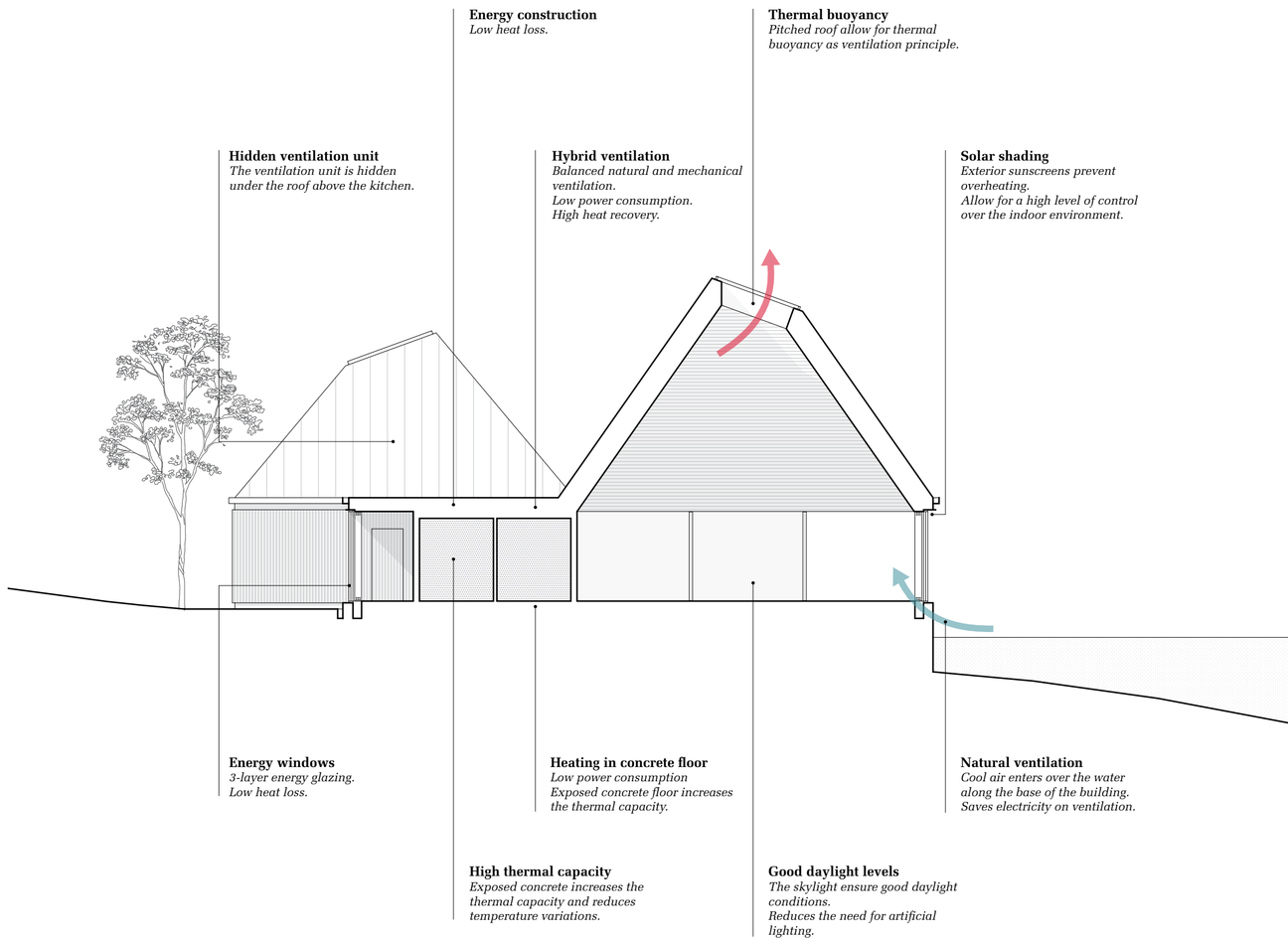


Ill. 05.06
Indoor environment

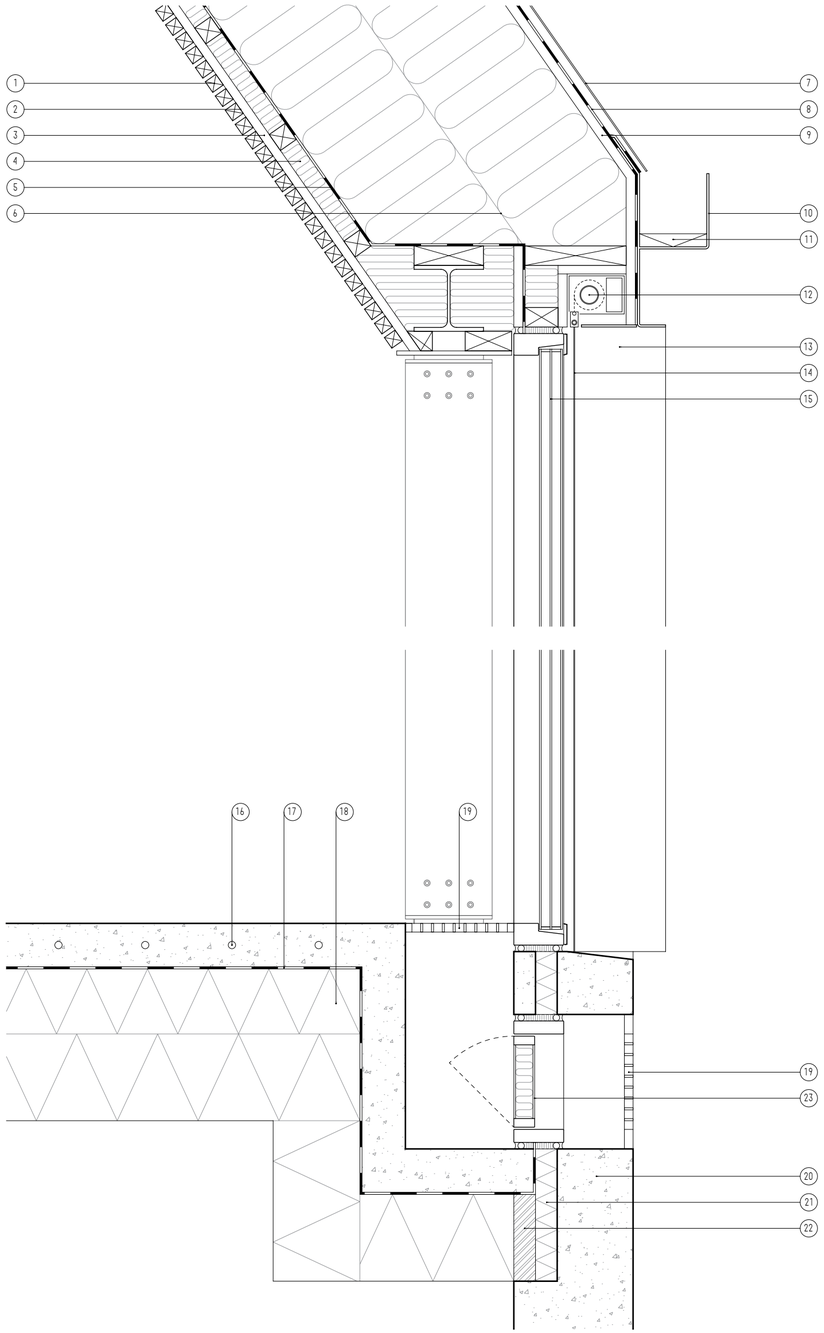
The Common House

Details

The details show parts of the building that are relevant to the experience of the architecture.

A recess in the floor and ceiling hides the top and bottom of the window frame to emphasize the connection between the interior and exterior. To further emphasize this, the sides of the window frame are hidden behind the wooden columns creating an unobstructed view to the outside. The solar shading is integrated into the building so that it is not visible when not in use. The only things indicating its presence are the thin wires that are used to guide the sunscreen. Motorized openings along the base of the building allow for natural ventilation in the summer period. The cool air enters the room via gratings in the floor that are placed in-between the wooden columns.

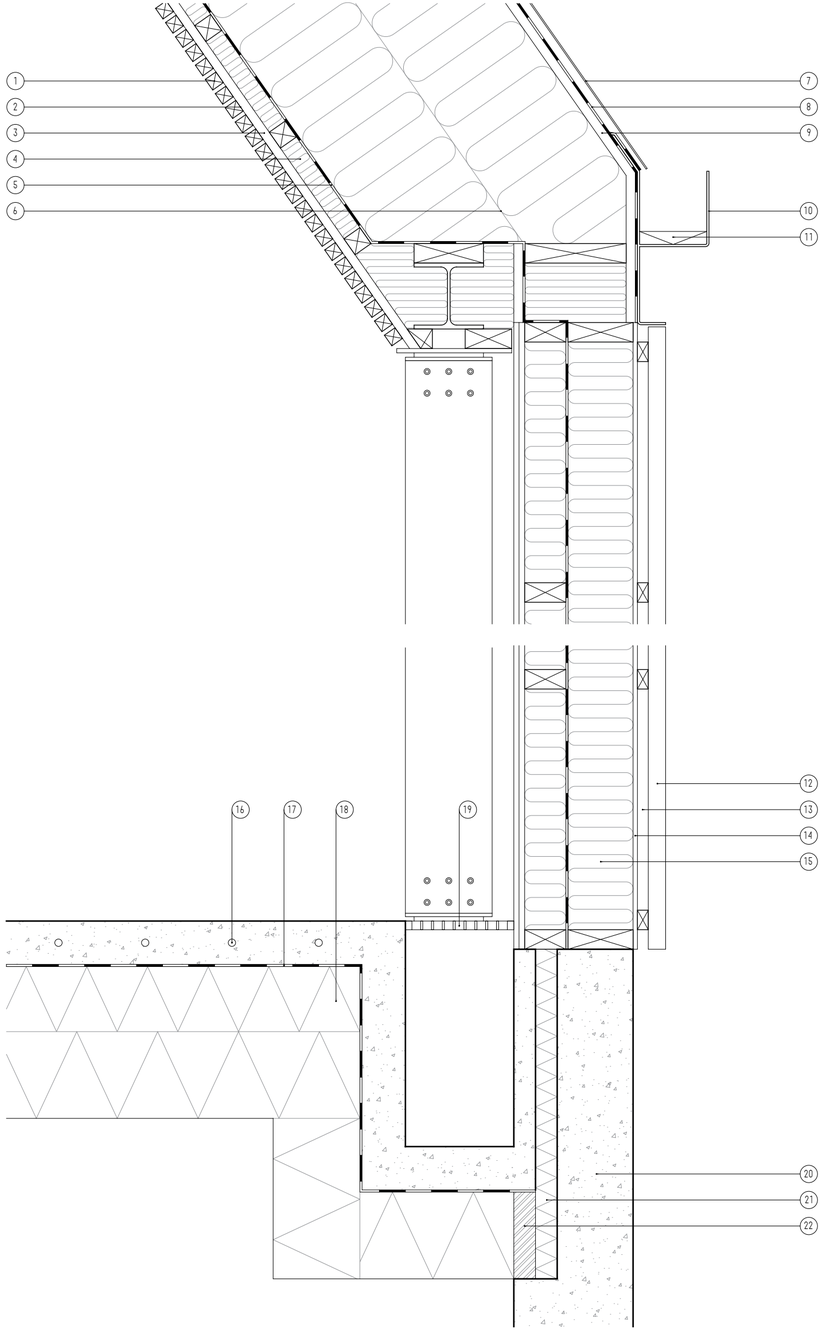
1. *Horizontal wooden lamella (30x30 mm)*
2. *Felt for acoustic regulation*
3. *Lagging (21 mm)*
4. *Insulation (45 mm)*
5. *Damp-proof membrane*
6. *Rafter with insulation (550 mm)*
7. *Zinc roof*
8. *Asphalt board*
9. *Exterior grade plywood (21 mm)*
10. *Gutter profile of zinc*
11. *Integrated fall in gutter*
12. *Motorized exterior sunscreen*
13. *Covering around window of tombac*
14. *Guiding cable for sunscreen*
15. *Window with 3-layer energy glazing*
16. *Polished concrete floor with floor heating*
17. *Moisture barrier*
18. *Rigid insulation (350 mm)*
19. *Air grating*
20. *In situ cast concrete base*
21. *Insulation (50 mm)*
22. *Lightweight concrete*
23. *Motorized opening for natural ventilation*



Detail, window in dining hall
1:10

The freestanding columns in the dining hall add to the total thickness of the outer wall. To reduce the thickness an insulation material with a very low thermal conductivity is used. This makes it possible to create a thin outer wall that still meets the requirements of today's energy efficient buildings. The solution is only used in the dining hall where it serves a purpose, as the cost is greater than using regular insulation material.
The gutter becomes an important architectural element as it combines the different roof structures of the building. In order to keep it horizontal, a base inside the gutter provides the necessary current for the rain to run to the downpipes that are concealed in the outer walls.

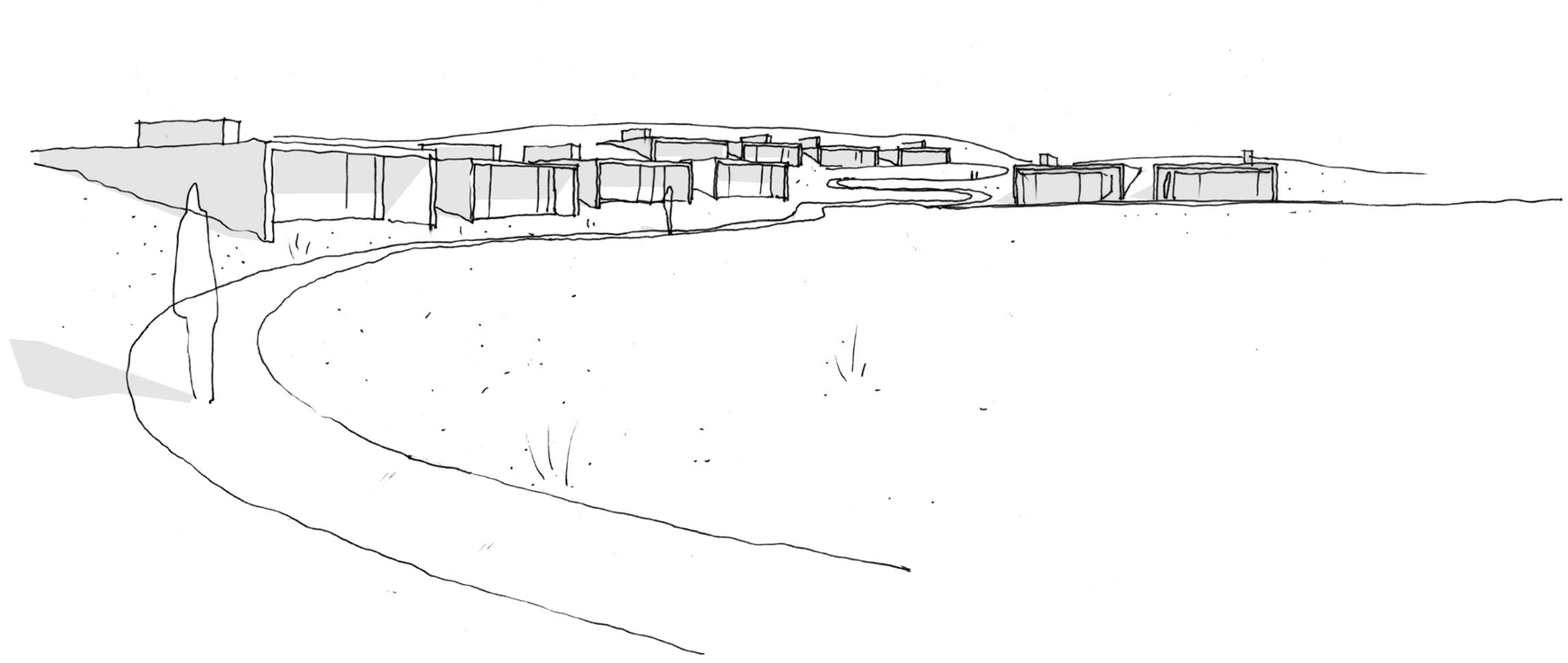
1. *Horizontal wooden lamella (30x30 mm)*
2. *Felt for acoustic regulation*
3. *Lagging (21 mm)*
4. *Insulation (45 mm)*
5. *Damp-proof membrane*
6. *Rafter with insulation (550 mm)*
7. *Zinc roof*
8. *Asphalt board*
9. *Exterior grade plywood (21 mm)*
10. *Gutter profile of zinc*
11. *Integrated fall in gutter*
12. *Vertical wooden lamellas (40x40 mm)*
13. *Ventilated cavity*
14. *Wind barrier*
15. *Insulation (Kingspan Kooltherm K15, 250 mm)*
16. *Polished concrete floor with floor heating*
17. *Moisture barrier*
18. *Rigid insulation (350 mm)*
19. *Air grating*
20. *In situ cast concrete base*
21. *Insulation (50 mm)*
22. *Lightweight concrete*



Detail, wall in dining hall
1:10

A Journey throught the Landscape

The two distinct areas of the camp – the activity area with the common house and the cabins – mark the two ends of the journey from challenge and success to reflection and discovery. Going from one end to the other requires a change in the state of mind. To mark this change, the physical journey through the landscape is used to facilitate this transition. From the common house the campers move via a footbridge that leads them over the little island and to the hilly landscape where the cabin areas are. The cabins are scattered around the landscape and almost seem to extrude from the hills. The path follows the contours of the landscape and slowly ascends allowing for access in a wheelchair and at the same time emphasizing the hilly character of the place.



Ill. 05.07
The journey through the landscape to the cabin area

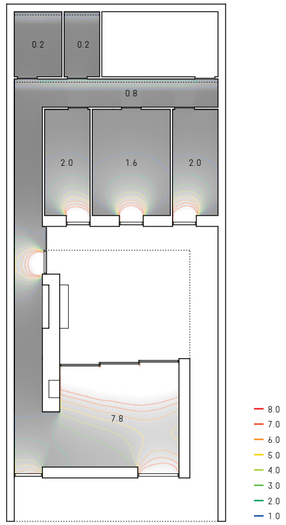
The Cabin

The cabins are scattered around the hills where they seem to extrude from the landscape. The flat roof and horizontal orientation are in contrast to the upward striving roof structure of the common house and immediately indicates a different atmosphere and a strong relation to the landscape. A chimney creates a reference to the home and indicates the function of the cabin as a place to stay.

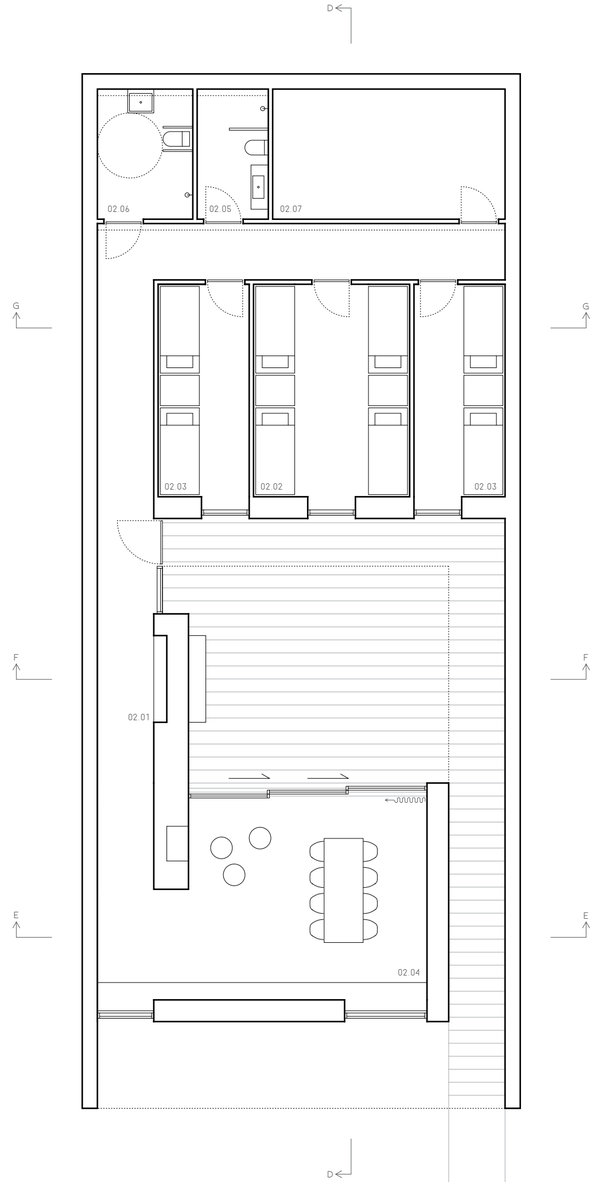
When arriving to the cabin the building greets you and creates a gradual transition from outdoor to indoor. The extruded roof and walls invite you in and at the same time create shelter from the weather. From here a narrow corridor leads to a shielded courtyard from where you enter the cabin. The narrow corridor is in contrast to the open landscape and marks the transition from the outside world to the safe surroundings of the home.

The two main functions of the cabin are the bedrooms and the common room. Both functions are organized around a shielded courtyard that becomes the heart of the cabin. A clear hierarchy between private and social spaces is established through an axis running along the length of the cabin. The baths and bedrooms are the most private spaces and are placed furthest into the landscape to give them a sense of protection. The bedrooms overlook the confined space of the courtyard, which emphasize the private nature of the space. Across from the bedrooms is the common room. It is situated between the protected space of the courtyard and the outside world, which support the more social character of the space but still giving it a strong connection with the rest of the cabin.

The daylight is used to further emphasize the hierarchy between the private and social spaces. The common room is the brightest space with windows on two sides and its glass facade towards the courtyard. The single window of the bedrooms provide them with enough daylight to create a pleasant indoor environment but the contrast to the common room is evident underlining the more private character. The baths and toilets are the most private spaces and are placed deepest into the ground. To emphasize this, a strip of light in the ceiling gently illuminates the room and creates a subtle wall wash effect.



Ill. 05.08
Average daylight factor

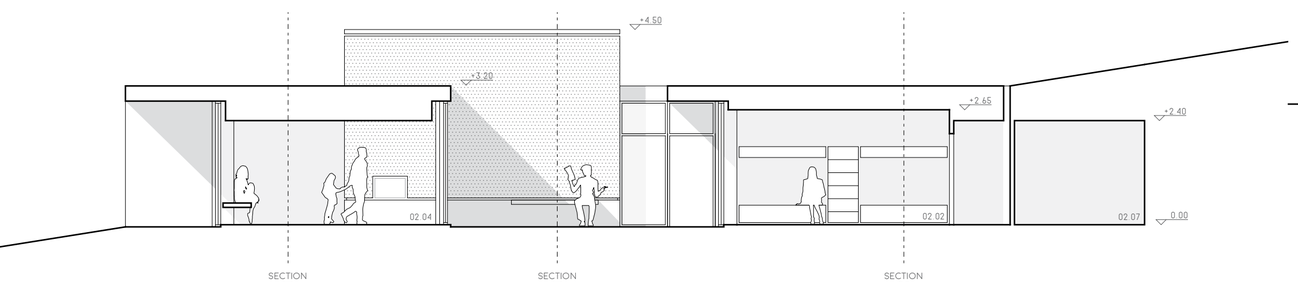


Cabin, floor plan
1:100

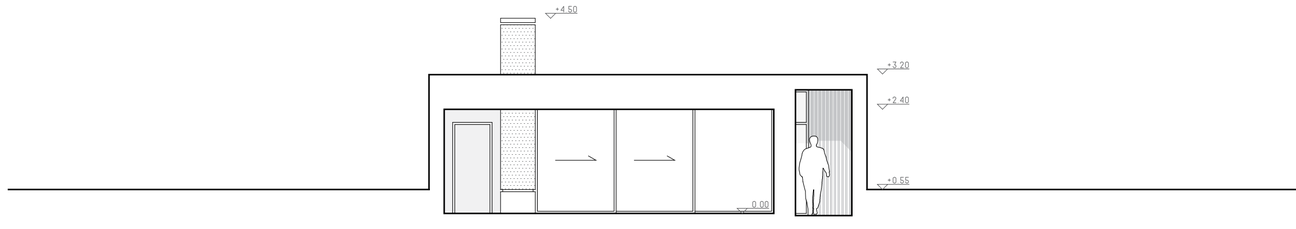
The Cabin

A Space for Reflection

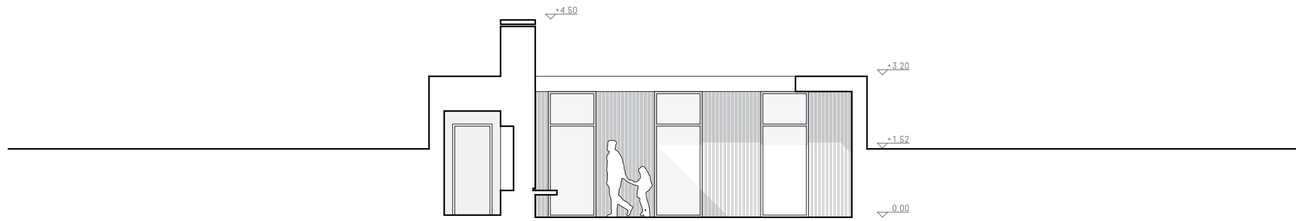
The courtyard is the heart of the building from where the life inside the cabin revolves around. The introvert space of the shielded courtyard gives the cabin a calm atmosphere that stands in contrast to the vibrant atmosphere of the common house. It creates a setting for immersion that helps to promote the facilitated reflection of the TR-program that forms the theoretical basis of the camp.



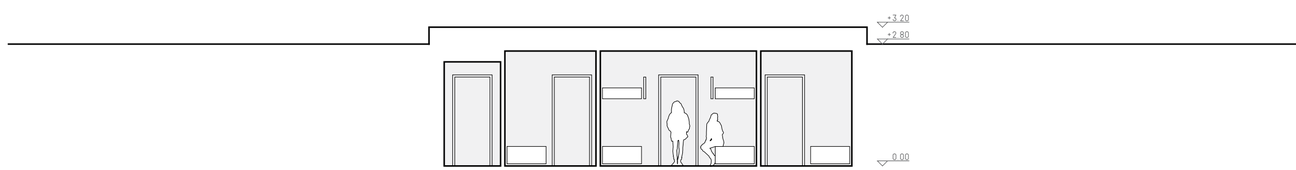
Longitudinal section DD
1:100



Cross section EE
1:100



Cross section FF
1:100



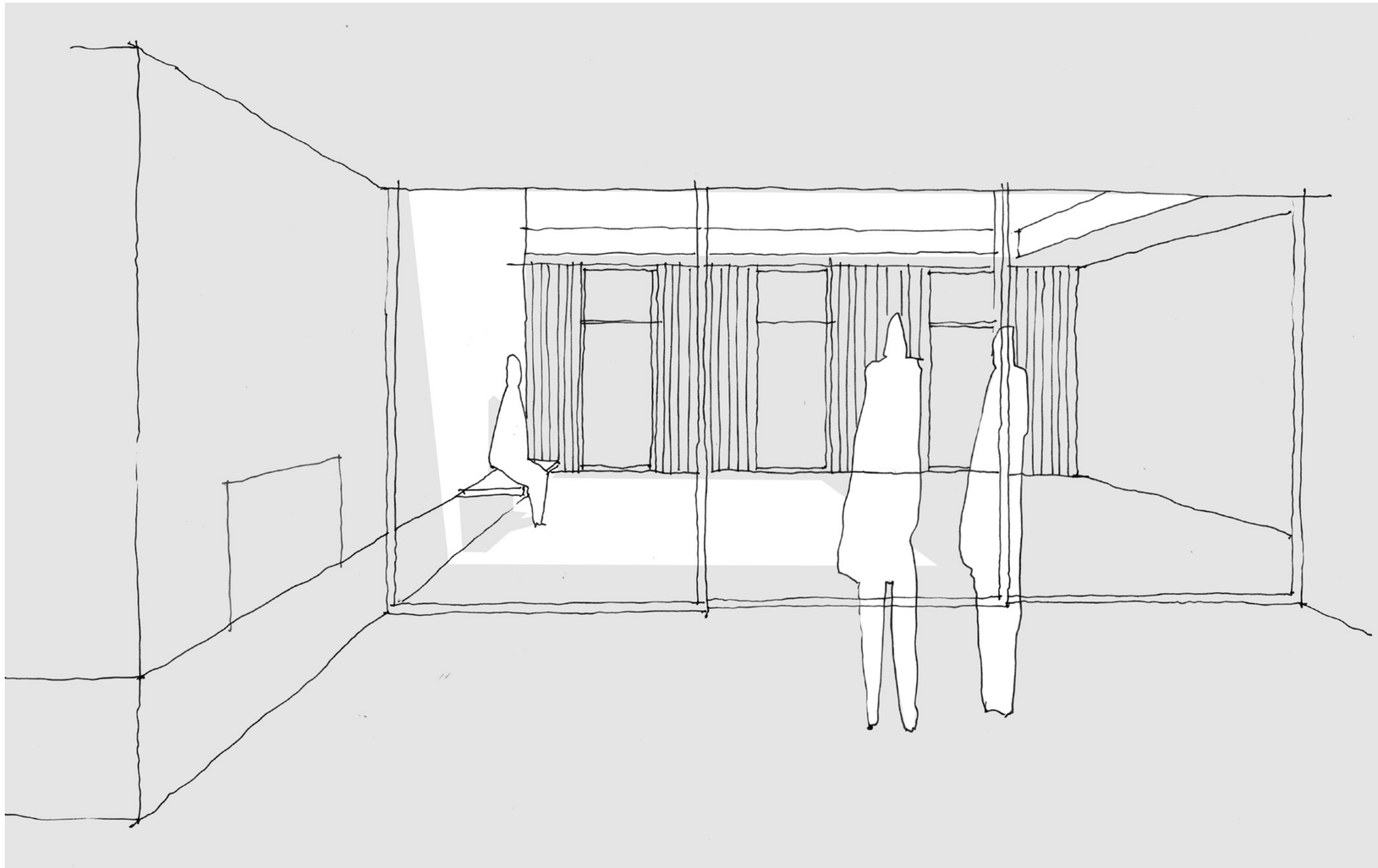
Cross section GG
1:100

The Cabin

The Common Room

The common room serves as a social hub for the campers and volunteers of the cabin. This is emphasized with a fireplace that gives the space a cosy atmosphere and creates a natural place to gather around. The fireplace becomes a strong motif in the architecture of the cabin. It is placed in its own element that extends from the common room into the courtyard and up towards the sky in order to work as a chimney.

Large windows towards the courtyard extend the interior of the space and create a strong connection between the common room and the courtyard. By sliding the windows to one side makes it possible to combine the two spaces whenever the weather allows it. The strong connection to the courtyard gives the common room an introvert character but windows facing out establish a connection to the outside world. The extruded walls and overhang of the roof create a buffer between inside and outside, and a bench in front of the window shields the space an creates a niche for sitting that lets the campers view the world from a distance – from inside the safe surroundings of the cabin.



Ill. 05.09
The view to the courtyard from the common room

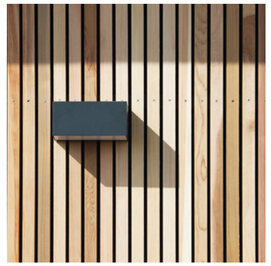
Uniting the Camp through Materials

The architecture of the common house and the cabins are different from one another. The common house is extrovert and the pitched roof structure gives the building a vertical character. The cabins are introvert and their flat roofs give them a horizontal character that relates to the landscape they dig into. The different architectural means give the two spaces their own atmosphere, which emphasizes the different uses of the areas. In order to still make the camp seem as a united area, materials are used to create relation between the common house and cabin area.

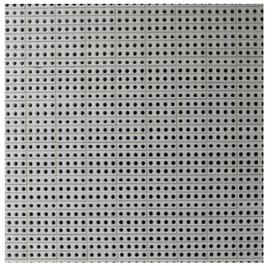
Concrete is used where both buildings meet the ground. In the common house it becomes the raised base on where the building sits and for the cabin it becomes the enclosure that extrudes into the landscape and shields it from the ground. The exterior facade of both buildings is clad with wooden lamellas that gives the building warmth and provide a tactile surface closest to where one meets the building. The lamellas are running vertical to underline the large floor-to-ceiling openings in the facade. The roof of the common house is made of corrugated zinc sheets. The metal roof, characteristic for older rural buildings of the area, creates a relation to the context in where the camp is situated. The roof structure gives the common house its unique character and to emphasize this, the material is only used here. In the same way that the roof is unique for the common house, the fireplace is unique for the cabin. The element with the fireplace is made of natural stone that gives it a tactile surface and emphasizes the importance of the fireplace.

Polished concrete is used for the floor in both buildings. It provides a tough surface that can stand the wear of campers frequently moving between indoor and outdoor. White painted walls and wooden lamellas area used in both buildings to create a bright and warm interior. Wooden lamellas in the ceiling of the dining hall and common room of the common house function as acoustic regulation in order to create a good indoor environment.

Ill. 05.10
In situ cast concrete



Ill. 05.11
Exterior cladding of vertical wooden lamellas



Ill. 05.12
Textured brick for the element with the fireplace

Ill. 05.13
Zinc roofing

Ill. 05.14
Polished concrete floors

Ill. 05.15
White painted walls

Ill. 05.16
Ceiling of horizontal wooden lamellas

Ill. 05.17
Wooden columns

Energy

Because of the remote location of the place, all energy production must happen on site. The large areas with open plains make the site suitable for geothermal heating. Each building has its own heat pump that utilizes the energy stored in the ground. Smaller buildings such as the activity pavilions use air-to-water heat pumps in order to have a greater flexibility with the placement of these.

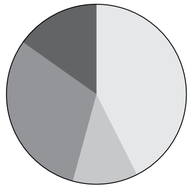
The energy use of the common house and a cabin has been calculated through Be15. The aim of the project has been to reach low-energy class 2015 through careful considerations to the design and without adding energy producing elements such as photovoltaic.

The Common House
The common house stay within the energy frame for low-energy class 2015 of 42.3 kWh/m2 year. As evident from the graphs the heating requirement is biggest from November to March. The increased need for heating also increases the use of electricity for operating the building because of the heat pump. In order to minimize the heat loss the components of the building have a high thermal capacity. To further reduce the need for heating the building's geometry would need to be more compact, but that would compromise the close connection between the building and the lake.

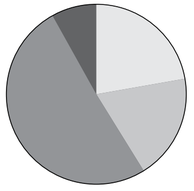
Be15 Key Numbers

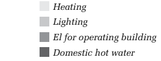
Total energy demand	*42.2 kWh/m2 year*
Contribution to energy requirements	
Heating	*0.0*
El for operation of building	*16.9*
Overheating in rooms	*0.0*
Selected electricity requirements	
Lighting	*4.5*
Heating of room	*2.1*
Heating of DHW	*0.2*
Heat pump	*5.6*
Ventilators	*4.3*
Pumps	*0.2*
Total electricity consumption	*42.6*
Net requirements	
Room heating	*15.0*
Domestic hot water	*6.1*
Cooling	*0.0*
Heat loss from installations	
Room heating	*0.0*
Domestic hot water	*0.8*
Output from special sources	
Heat pump	*20.9*

Energy consumption



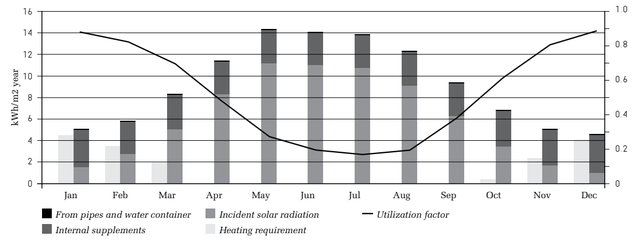
Energy consumption (low-energy class 2015)





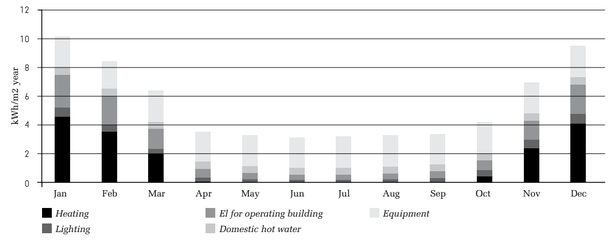
Ill. 05.18

Heating requirement and heat gains



Ill. 05.19

Distribution of energy



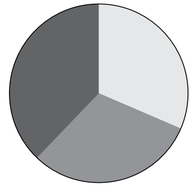
Ill. 05.20

The Cabin
The cabin stay within the energy frame for low-energy class 2015 of 36.1 kWh/m2 year. The graph shows a distribution of energy similar to the common house with an increased need for heating and electricity for building operation in the cold months. Compared to the common house, the cabin uses more energy for domestic hot water. This is expected because of a greater consumption of water for showering.

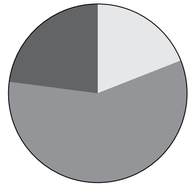
Be15 Key Numbers

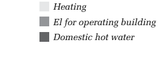
Total energy demand	*34.1 kWh/m2 year*
Contribution to energy requirements	
Heating	*0.0*
El for operation of building	*13.6*
Overheating in rooms	*0.0*
Selected electricity requirements	
Lighting	*0.0*
Heating of room	*1.7*
Heating of DHW	*0.0*
Heat pump	*8.9*
Ventilators	*3.0*
Pumps	*0.0*
Total electricity consumption	*44.3*
Net requirements	
Room heating	*12.4*
Domestic hot water	*16.9*
Cooling	*0.0*
Heat loss from installations	
Room heating	*0.0*
Domestic hot water	*3.8*
Output from special sources	
Heat pump	*29.2*

Energy consumption



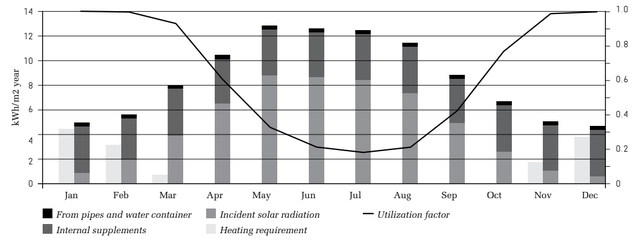
Energy consumption (low-energy class 2015)





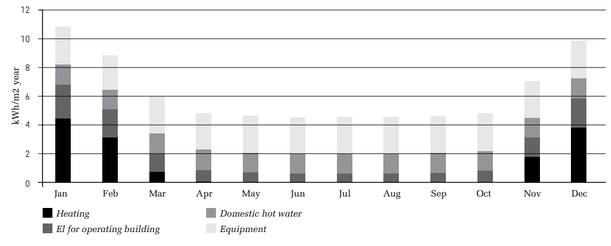
Ill. 05.21

Heating requirement and heat gains



Ill. 05.22

Distribution of energy



Ill. 05.23

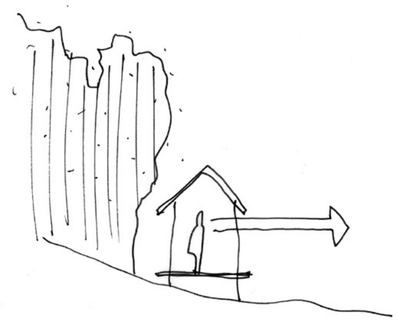
006

Design Prosess

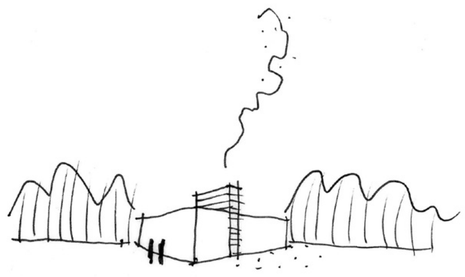
In this chapter a small part of the design process is explained though sketches, models and drawings to give an overview of the important milestones along the process.

Initial Sketches

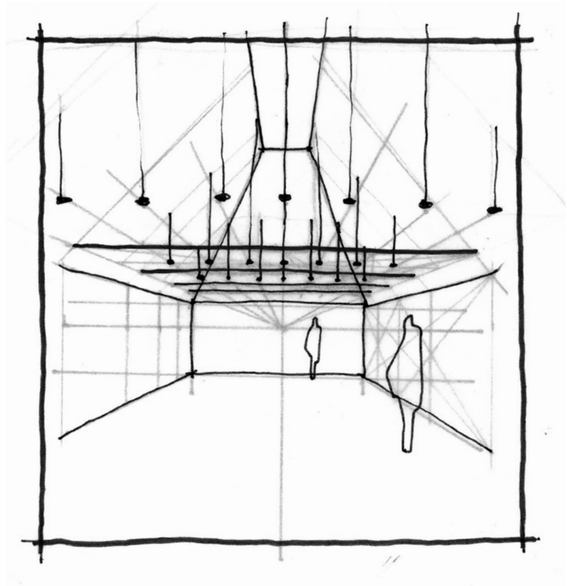
The first round of sketching investigated the potentials that had been discovered through the analysis. The potential conflict between the hilly landscape and accessibility sparked the idea of using two different ways of moving around the landscape that would minimize the elevation by raising the path in some places and digging it into the landscape in others. The two main concepts of the cabin and common house were also developed at this point. The idea of using the chimney as a strong architectural element in the cabin in order to create a reference to the home and the idea of working with the roof as a reference to the existing building on the site. The potentials of the roof were explored further in plan, section and perspective and formed the basis for common house



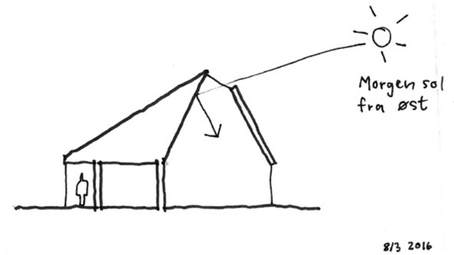
Ill. 06.01
Raised path in landscape



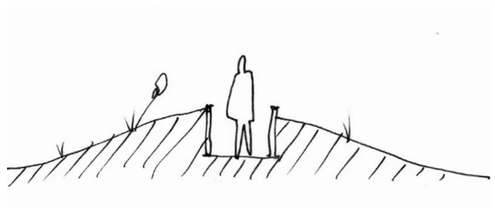
Ill. 06.03
The chimney as a strong architectural element



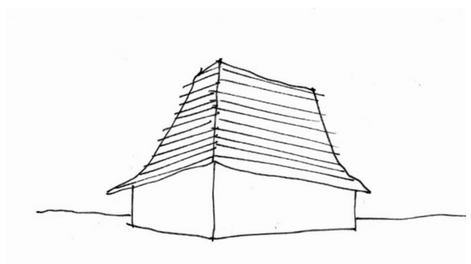
Ill. 06.05
Perspective of dining hall. Tension cables and lamps reduces the perceived scale of the space



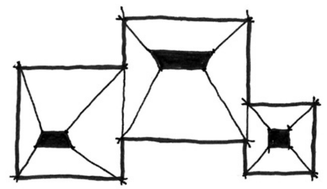
Ill. 06.07
The skylight catches the morning sun



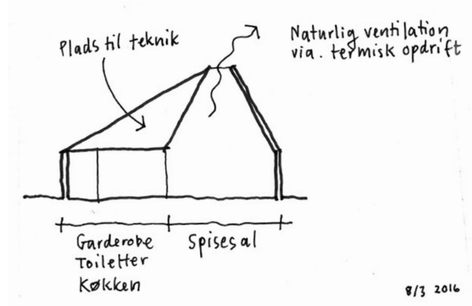
Ill. 06.02
Path recessed into the landscape



Ill. 06.04
The roof as a strong architectural element



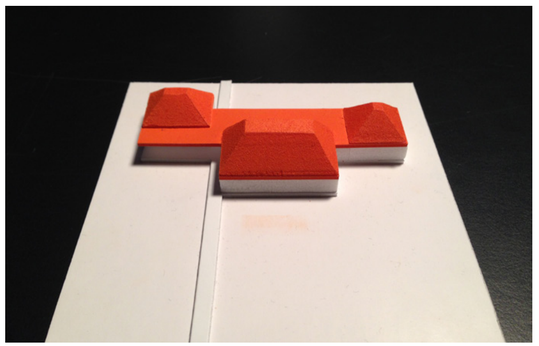
Ill. 06.06
Plan with dominating roof shapes



Ill. 06.08
Layout of functions

Volume Studies

A larger part of the process has been used on investigating how to build in the landscape. The hilly terrain presented a challenge and resulted in multiple volume studies of especially the cabin area. The initial investigations focused on a typology that worked best on a relatively flat surface. As it became evident that the number of cabins and flat areas on the site did not match, the design of a cabin that was made for a sloping terrain began.



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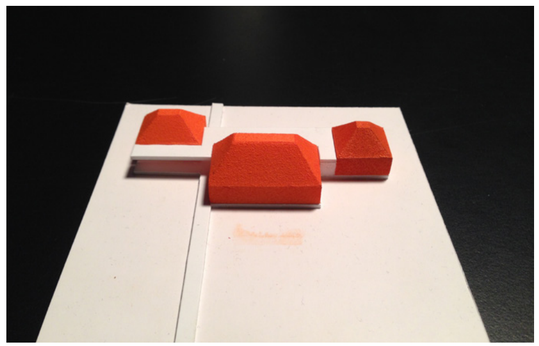

Ill. 06.10

Ill. 06.11

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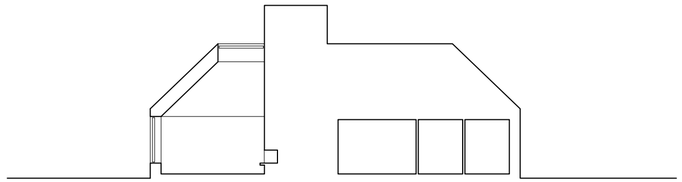
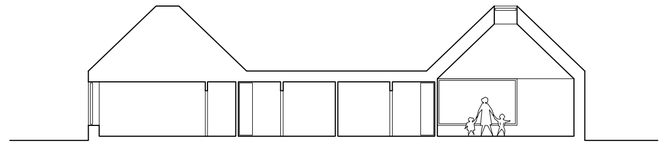
Ill. 06.16

Exploring Plan and Section

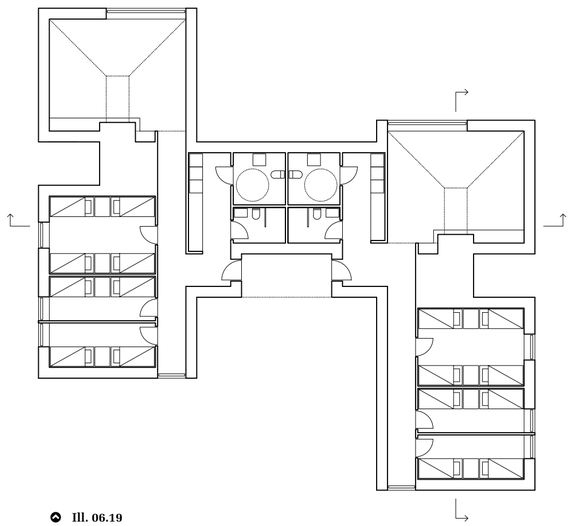
At the same time of the volume studies, the ideas were also explored through plan and section. The volume studies took an outside-in approach to the design, where as the sketching in plan and section took an inside-out approach. Through this stage of the sketching process it became evident that the different nature of the common house and the cabins called for different architectural elements to support this. In the early sketches the cabin was almost a mini version of the common house, both using the skylight and the view to the lake as the main architectural features.



Ill. 06.17



Ill. 06.18



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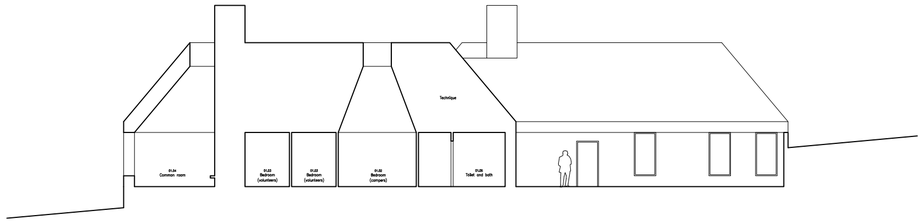
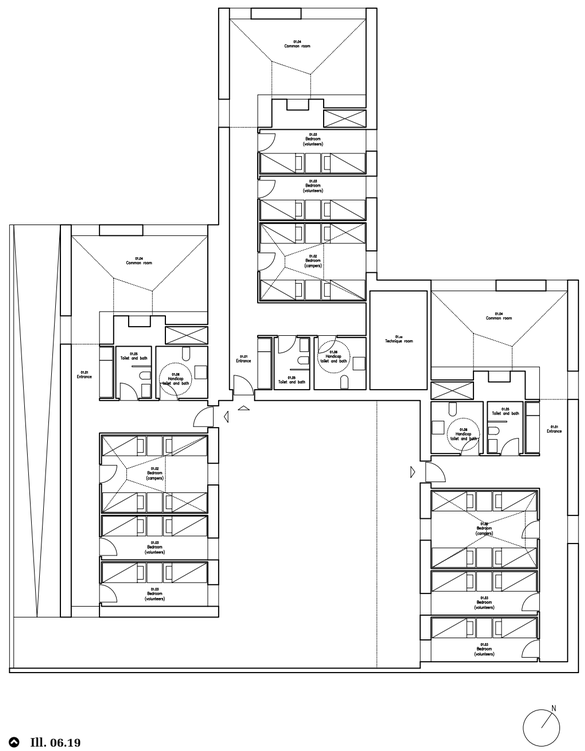


Ill. 06.18



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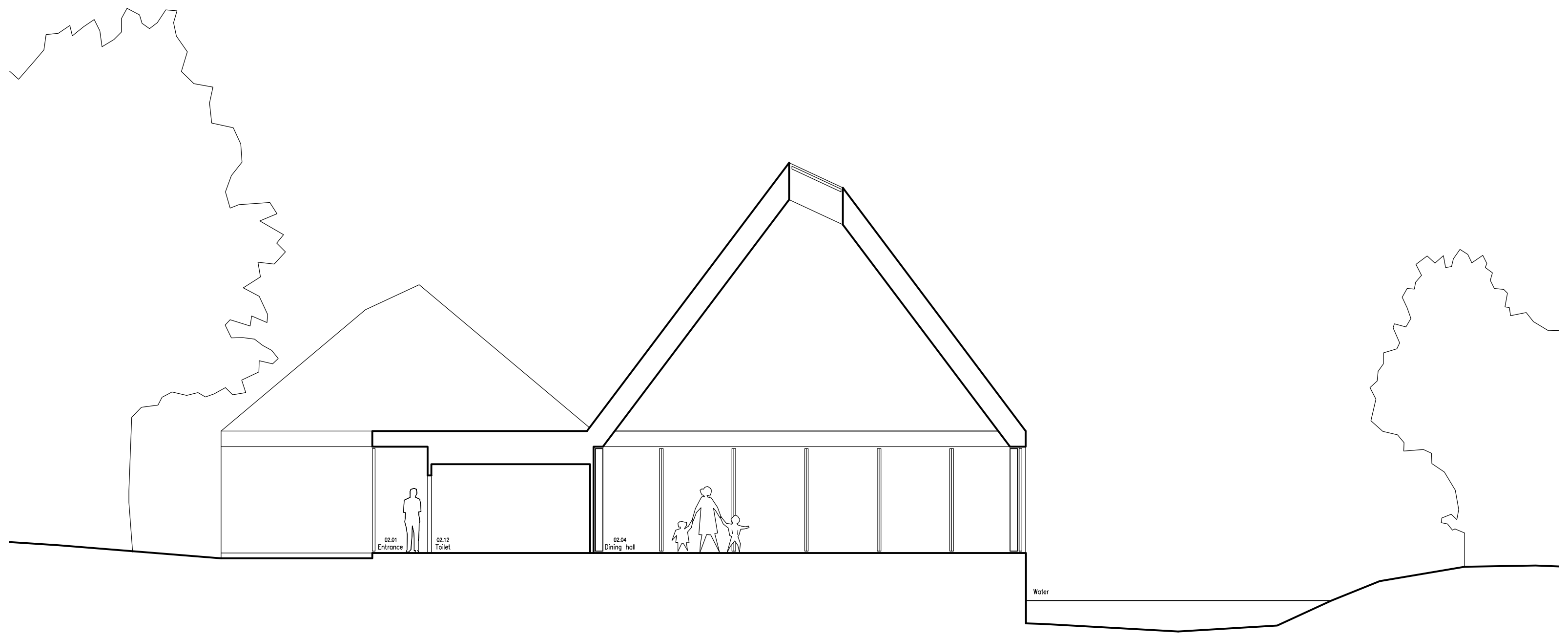

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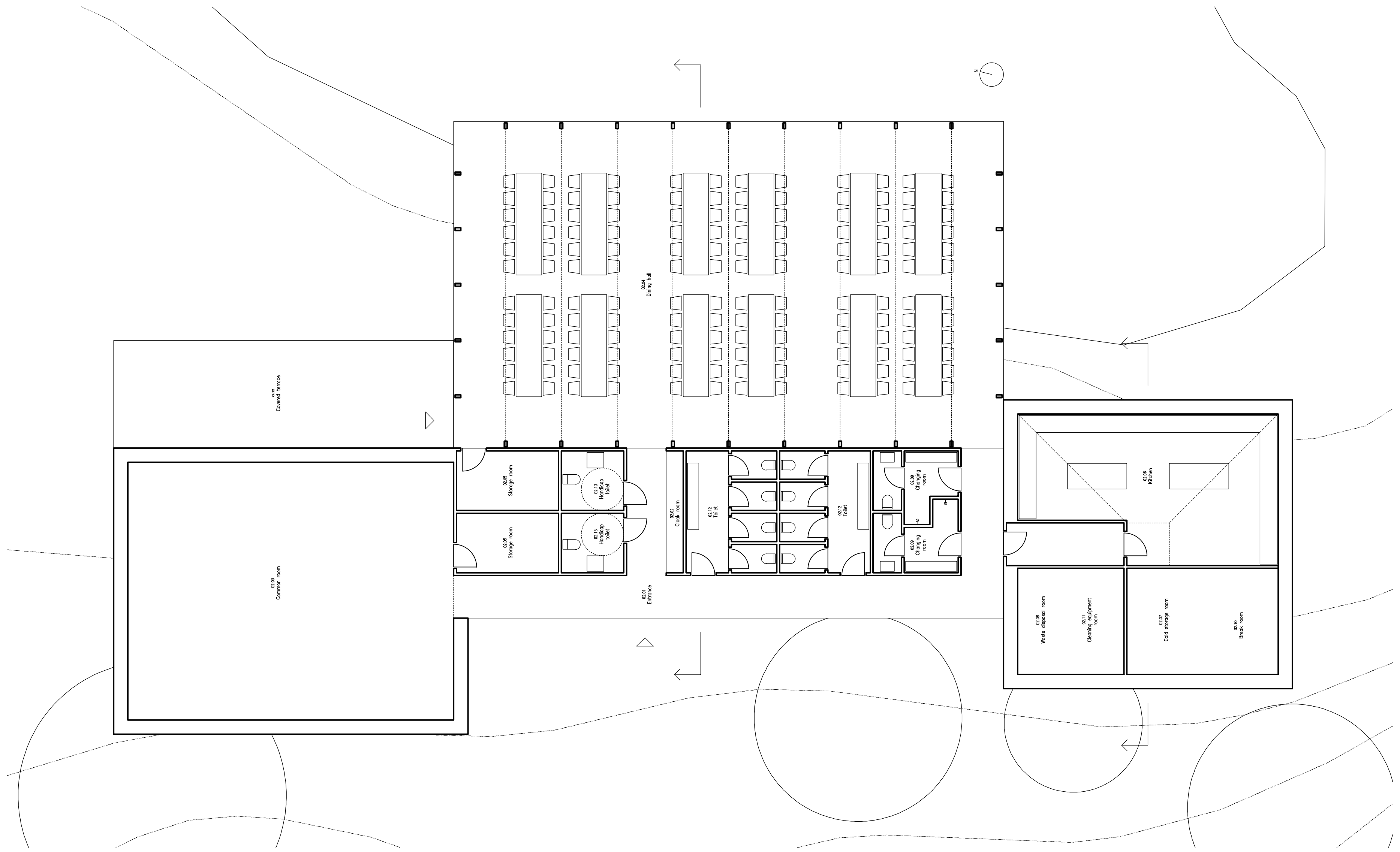

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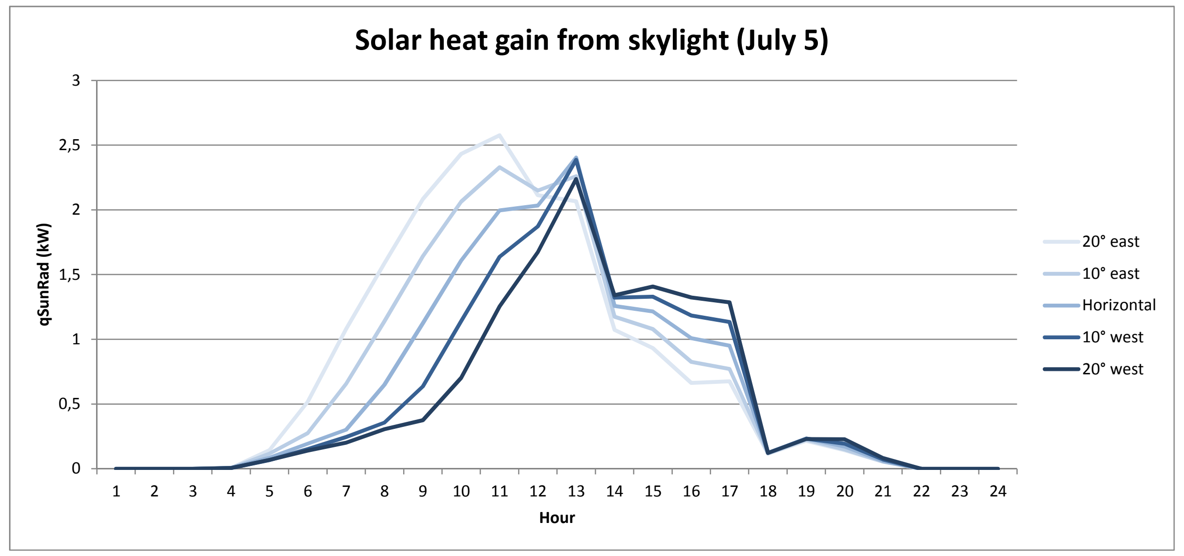
Optimizing the Indoor Environment

The indoor environment of the common house has been optimized through different calculations and simulations. The shape and size of the pitched roof and skylight were informed by a number of simulations that established an understanding of how they affected the indoor environment. The graphs show how a different orientation of the skylight affects the total amount of solar radiance of the dining hall and how it is distributed over the course of a day.



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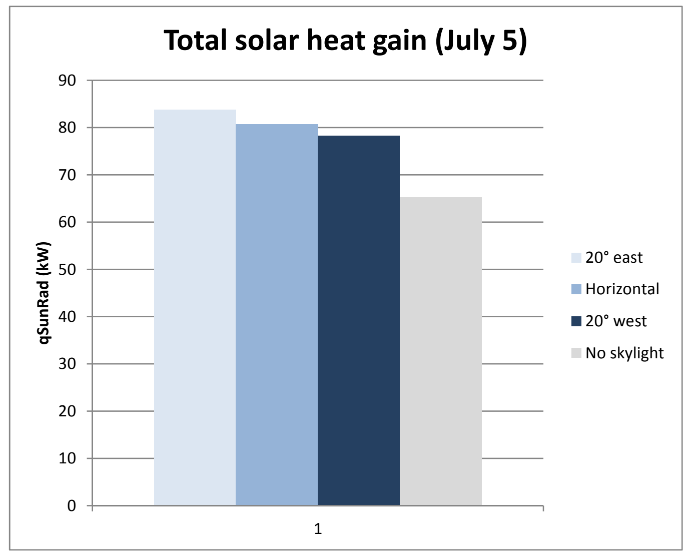

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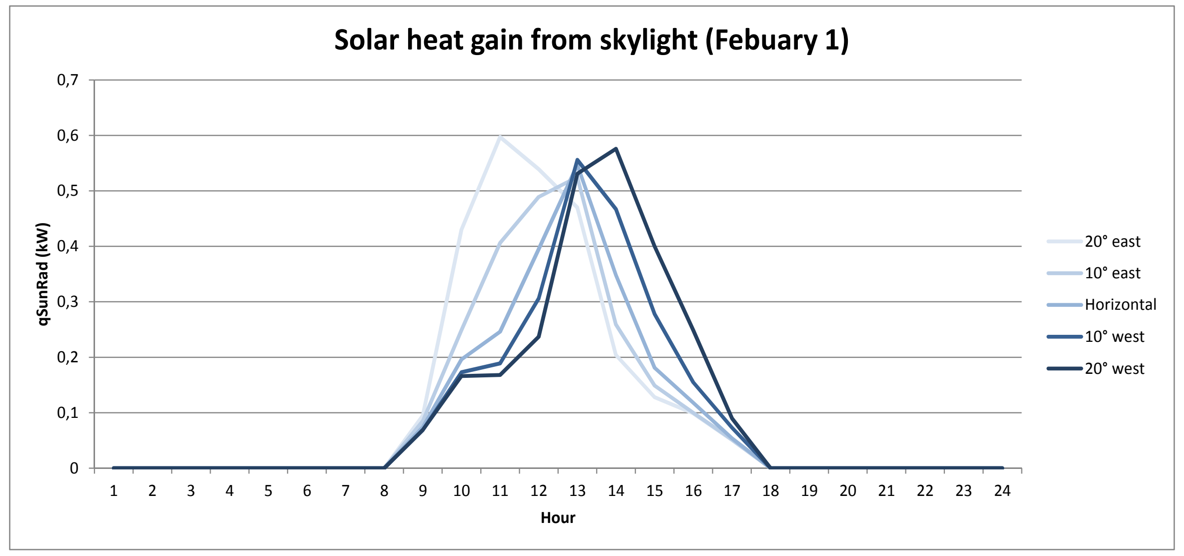

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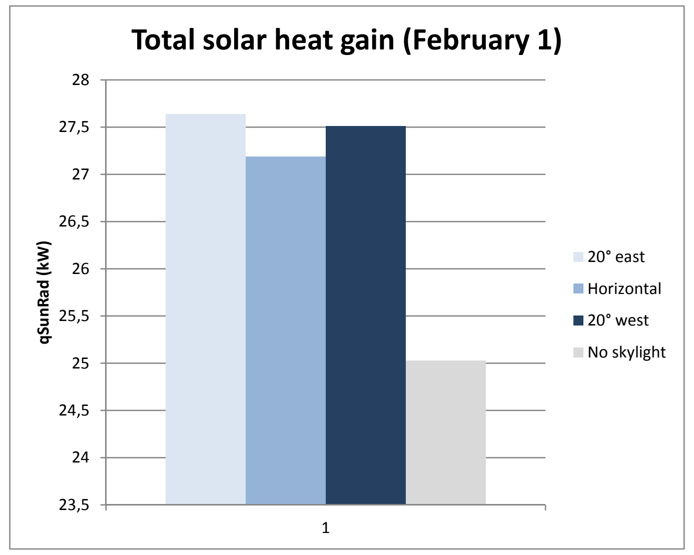

Ill. 06.25

Epilouge

In this chapter the project is summed up through a conclusion where the design proposal is compared to the initial vision for the rehabilitation camp.

Conclusion

The proposal for a new campus area for ExcaliCare is located in the beautiful scenery of Mols Bjerge National Park. The natural scenery creates a setting far away form the hospitals and marks the start of a journey away from the limiting course of illness and back to life. The identity of the place has been incorporated into the design to create a unique campus area. The former livestock building has been preserved and used for the administration. It defines the greeting area and becomes the connection between the site's past as an agricultural property and its present as a new vibrant campus area. The characteristic roof of the common house stands as a reference to the scale and pitched roof structure of the former livestock building and further emphasizes the connection between the old and new.

A strong relation between the theoretical basis of the camp and the proposal ensures that the new campus area helps to facilitate the course of rehabilitation that is key for camp. The four phases for therapeutic recreation (TR) – challenge, success, reflection and discovery – form the basis for the overall structure of the campus area. The greeting area is the stepping-stone that marks the arrival to the camp. The heart of the campus area is the common house. Situated by the lake it becomes the centre from where all activities revolves around, thus creating the frame for the first two phases of the TR-program – challenge and success. The cabins are placed around the hilly landscape and their introvert character creates a space for immersion and reflection that facilitates the last two phases of the TR-program – reflection and discovery. The distance and landscape between the common house and the cabin area are used to create the mental transition from the two stages.

The analysis of the two main themes points to three major areas of interest: indoor environment, social space and nature. A strong focus on the indoor environment of the common house is evident through the architecture. The ceiling of the dining hall is divided into three parts as a way to regulate the acoustic environment and at the same time providing the flexibility to divide the space. A hybrid ventilation strategy is used to minimize the building's energy consumption. In the summer period thermal buoyancy is used as a ventilation strategy where openings along the building's base allow cool air into the building without obstructing the view to nature through the large windows. The presence of nature is quite evident in both the common house and the cabins. Even though the view to nature is more limited from the cabins, the courtyard and the daylight is used to communicate the strong relation to the landscape and the ground that the cabins dig into.

Bibliography

Carlson, L.T., 2015. *Børnekraftoverlevers senfølger.* [pdf] Copenhagen: Kræftens Bekæmpelse. Available at: <http://pdf.cancer.dk/Hjaelp_viden/OmSorg/Brnekrfto-verleveressenflgerhjemmeside/> [Accessed 7 February 2016].

Carlson, L.T., Bøge, P, 2015. *At overleve kræft som barn har konsekvenser for resten af livet.* [pdf] Copenhagen: Kræftens Bekæmpelse. Available at: <https://www.cancer.dk/dyn/resources/File/file/8/5138/1448010192/at_overleve_kraeft_som_barn_rapport_hjemmeside.pdf> [Accessed 7 February 2016].

DAC, 2014. *Hvad er bæredygtighed?* [Online] Available at: <http://www.dac.dk/da/dac-cities/baeredygtige-byer/om-baeredygtige-byer/hvad-er-baeredygtighed/> [Accessed 23 February 2016].

DK-GBC, 2013. *Mini-guide til DGNB.* [pdf] Frederiksberg: Green Building Council Denmark. Available at: < http://www.dk-gbc.dk/media/94949/miniguide_july_2013_screen_singles.pdf> [Accessed 23 February 2016].

Drexhage, J., Murphy, D., 2010. *Sustainable Development: From Brundtland to Rio 2012.* [pdf] New York: International Institute for Sustainable Development (IISD). Available at: <http://www.un.org/wcm/webdav/site/climatechange/shared/gsp/docs/GSP1-6_Background%20on%20Sustainable%20Devt.pdf> [Accessed 23 February 2016].

ExcaliCare, 2015a. *Helende arkitektur – et campus-område for ExcaliCare.* [pdf] ExcaliCare. Available at: <http://www.excalicare.dk/nyheder/helende-arkitektur-et-campus-omraade-for-excalicare?PID=7703&M=NewsV2&Action=1> [Accessed 27 November 2015].

ExcaliCare, 2015b. *Om ExcaliCare Children's Organisation IVS.* [online] Available at: <http://www.excalicare.dk/om-os> [Accessed 7 February 2016].

ExcaliCare, 2015c. *Cool Camp – et vellykket pilotprojekt.* [online] Available at: <http://www.excalicare.dk/camps/pilotprojektet-cool-camp-2015> [Accessed 7 February 2016].

ExcaliCare, 2015d. *Børnecancerfonden mere end fordobler sin donation til ExcaliCare.* [online] Available at: < http://www.excalicare.dk/nyheder/boernecancerfonden-mere-end-fordobler-sin-donation-til-excalicare?PID=7703&M=NewsV2&Action=1> [Accessed 7 February 2016].

ExcaliCare, 2016. *Hvad er Terapeutisk Rekreation?* [online] Available at: <http://www.excalicare.dk/camps/cool-camp-2016-for-kraeftramte-unge/hvad-er-terapeutisk-rekreation> [Accessed 19 February 2016].

Fich, B.L., Jönsson, P., Kirkegaard, P.H., Wallergård, M., Garde, A.H., Hansen, Å., 2014. Can Architectural Desing alter the Physiological reaction to Psychosocial Stress? A virtual TSST experiment. *Physiology & Behavior,* No. 135, p.91-97.

Frandsen, A.K., Mullins, M., Ryhl, C., Folmer, M.B., Fich, L.B., Øien, T.B., Sørensen, N.L., 2009. Helende arkitektur. *Institut for Arkitektur og Design Skriftserie,* No. 29.

Gaisma, n.d. *Århus, Denmark – Sunrise, sunset, dawn and dusk times for the whole year.* [online] Available at: <http://www.gaisma.com/en/location/arhus.html> [Accessed 22 February 2016].

Kleis, B., 2014. *The MiniCO2 houses in Nyborg – valuable lessons.* Copenhagen: Realdania Byg.

Knudstrup, M.A., 2004. Integrated Design Process in Problem-Based Learnig: Integrated Design Process in PBL. I Kolmos, Anette : Fink, Flemming K. : Krogh, Lone (eds.) (red.), The Aalborg PBL Model : Progress, Diversity and Challenges. *Aalborg Universitetsforlag*, Aalborg, s. 221-234.

Landbrugsmæglerne, 2016. *Knudsminde – Deltidsejendom med god jagt samt juletræer.* [pdf] Vejle: Landbrugsmæglerne. Available at: <http://www.landbrugsmaeglerne.dk/sag/39877/Ravnebjergvej-5-8410-Roende> [Accessed 19 February 2016].

Lottrup, L., 2012. Workplace Greenery: Use, preferences, and health benefits of green outdoor environments at workplaces. *Forest & Landscape Research,* No. 50-2012, pp.183.

Nationalpark Mols Bjerge, n.d. *Værd at vide om naturen.* [online] Available at: <http://nationalparkmolsbjerge.dk/oplev-nationalparken/natur/> [Accessed 25 February 2016].

Pedersen, S.A.P., Petersen, K.S., 1997. *Djurslands Geologi.* Copenhagen: Danmarks og Grønlands Geologiske Undersøgelse (GEUS).

Realdania, 2009. *Program for Det Gode Hospice i Danmark.* [pdf] Copenhagen: Realdania. Available at: <https://realdania.dk/samlet-projektliste/det-gode-hospice> [Accessed 24 February 2016].

REHPA, n.d. *Lys – lyd – luft – temparatur.* [online] Available at: <http://arkitektur-lindring.dk/designprincipper/lys-lyd-luft-temperatur/> [Accessed 24 February 2016].

Volf, C., 2014. *En sundere arkitektur basseret på solens asymmetriske lys.* LYS, No. 1, p.18

WeatherSpark, n.d. *Average Weather For Tirstrup near Aarhus, Denmark.* [online] Available at: <https://weatherspark.com/averages/28821/Tirstrup-near-Aarhus-Central-Denmark-Region> [Accessed 20 February 2016].

Illustrations

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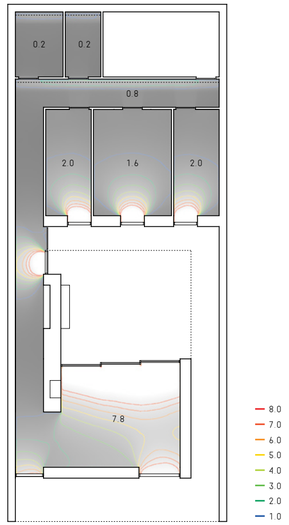
All illustrations which are not listed above, are own illustrations.

Appendix

Appendix 1

Daylight

The illustrations show the distribution of daylight and average daylight factor for the individual rooms.



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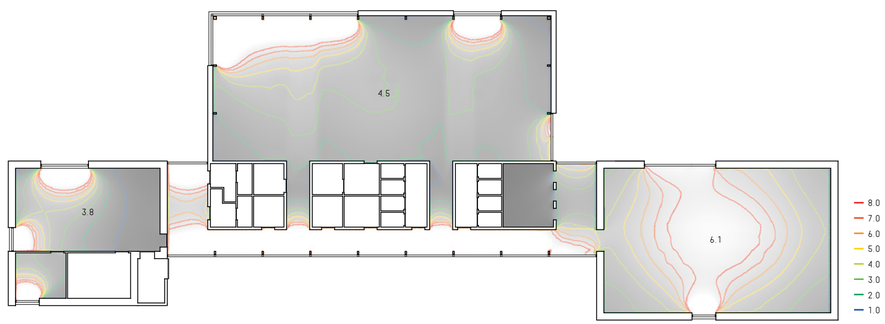

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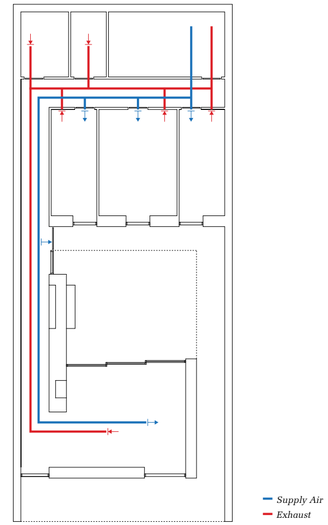
Appendix 2

Ventilation

The illustrations show the principal layout of the ventilation ducts for the mechanical ventilation system.



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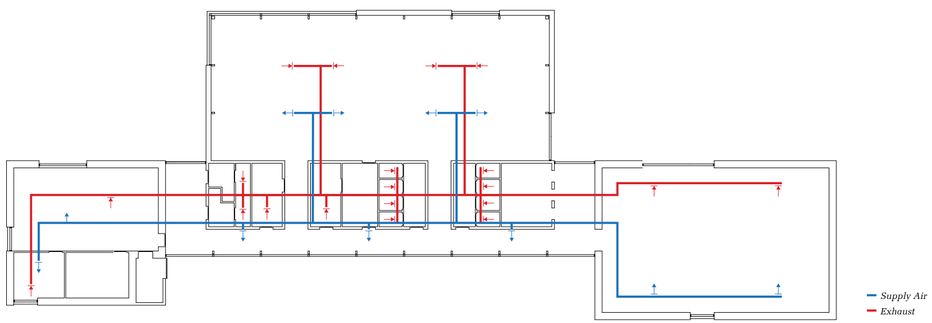

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