REHABILITATION CAMP

FOR CHILDREN WHO SURVIVED CHILDHOOD CANCER

Project Title:	REHABILITATION CAMP FOR CHILDREN WHO SURVIVED CHILDHOOD CANCER
Theme:	Healing Architecture and Sustainability Master Thesis
Group:	MSc04-ARCH11
Pages:	197
Prints:	9

Project Period: 03.02.16 - 25.05.16
Department of Architecture, Design and Media Technology
Aalborg University

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A special thanks to:
Heidi Kristine Støve and Rasmus Thøger Christensen, founder of ExcaliCare Children's Organisation.
Lise Jensen, nurse at childrens department A20, Aarhus University Hospital.
Ramboll Viborg, for plot of drawing folder

AALBORG UNIVERSITY
STUDENT REPORT

EXCALI CARE CHILDREN'S ORGANISATION

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ABSTRACT

This master project takes its point of departure in the fundamental principles of healing architecture, which along with incorporated sustainable solutions, will form the frame for a rehabilitation camp. The camp is placed in calm and scenic surroundings, where the nature has played an essential role in the design, as a view to and inclusion of nature is important parameters for the human well-being.

The rehabilitation camp is for children affected by cancer, which is either at the end of their treatment or have recovered completely from the disease. Many children are affected by cancer every year, but more and more also gets cured. During the course of disease, the treatment has filled up their everyday life. Many have been forced to leave school in an extended period of time, which furthermore have affected their social and individual development. The project is made in cooperation with ExcaliCare Children's Organisation, which is established with the purpose of helping children back to their normal life after treatment of cancer.

Participants at the camp live in houses with space for eight campers and four volunteers. The houses are grouped three and three together, which collectively form a cluster. The majority of the development, which the participants go through at the camp, happen through Therapeutic Recreation. Indoor activities and common functions is gathered centrally at the site, in the main building. An important design parameter has been the feeling of community – nobody should feel left out. Everyone can participate equally in the activities and the entire camp is designed, in a way that is easily accessible for everyone. The camp helps the children by strengthening their confidence and independence and provide them with tools to return to their normal life.

READING GUIDE

This master thesis is developed by group 11, Camilla Nørgaard Frederiksen and Helle Toft, at the 4th semester master program in Architecture at Aalborg University in the spring 2016.
The objective for the project is to create a rehabilitation camp for children which are in the final stage of cancer treatment and children who already have survived childhood cancer.
The focus in this project is Healing Architecture with sustainable solutions incorporated into the design by an integrated design process. As Healing Architecture is mostly used for healthcare design the method will in this project be used as a guideline. The architecture shall for the rehabilitation camp be seen as a healing framework which consolidate the therapeutic recuperation (TR) programme.

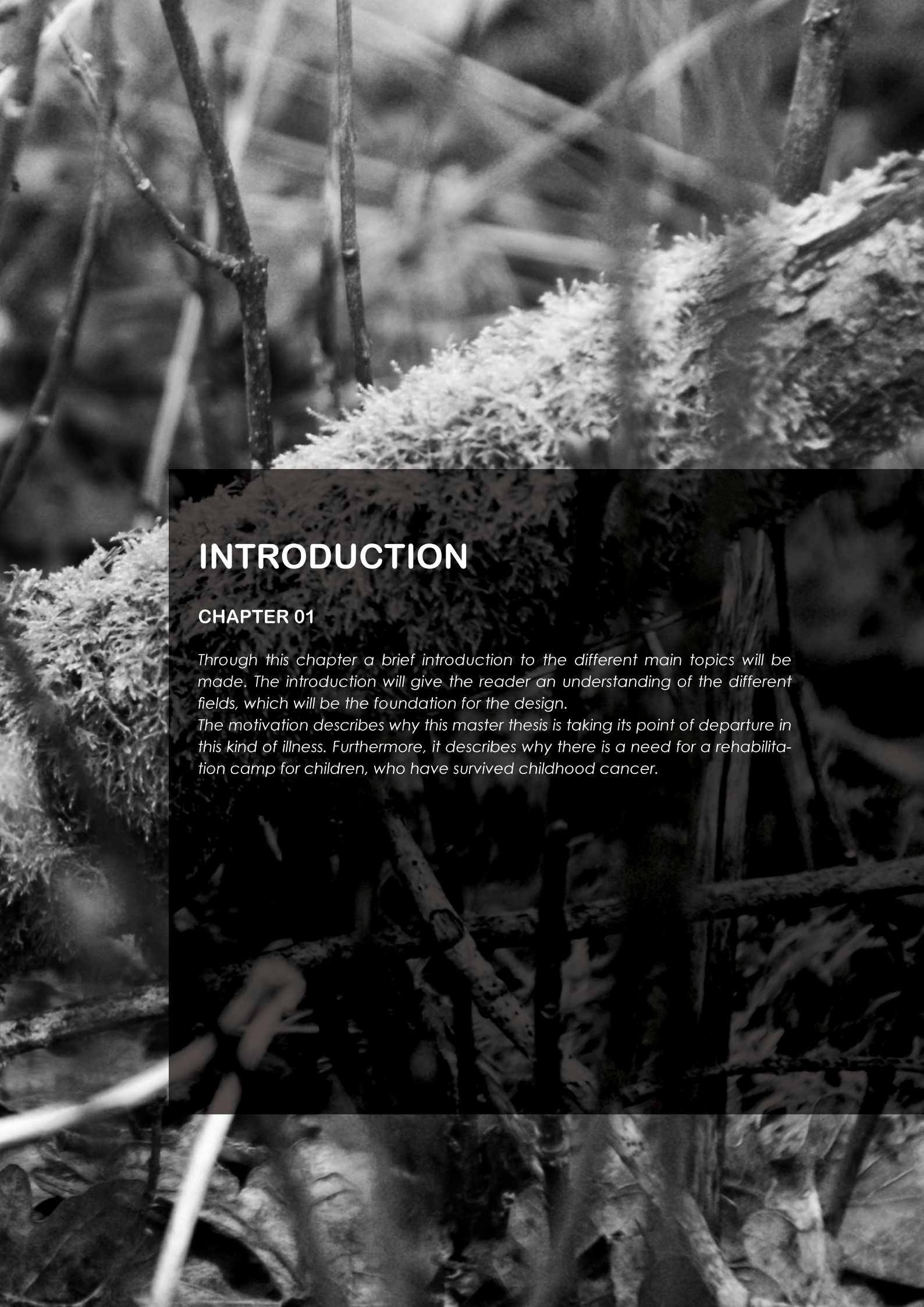
The report contains of different chapters which all begins with a brief introduction. Information about the main focus is carried out to give the reader a better understanding of the design and all the thoughts behind it. From here the final design is presented followed by the design process and analysis which the design is based on. In the epilogue a conclusion and reflection upon the whole project is set.
References used in this report is conducted by the Harvard referencing system. The references in the text is referred as [writer, year of publication]. Illustration is indicated by "illustration (number)". References and illustrations are further clarified in the reference or illustration list.

TABLE OF CONTENTS

05 EPILOGUE

06 APPENDIX

Illustration 11:
Detail at the water from the site



INTRODUCTION

CHAPTER 01

Through this chapter a brief introduction to the different main topics will be made. The introduction will give the reader an understanding of the different fields, which will be the foundation for the design.
The motivation describes why this master thesis is taking its point of departure in this kind of illness. Furthermore, it describes why there is a need for a rehabilitation camp for children, who have survived childhood cancer.

METHODOLOGY

PROBLEM-BASED LEARNING

Problem-Based Learning is to acquire knowledge from different fields in order to answer a given problem. To solve a problem established in the beginning of a project, students must use this learning method which focuses on the student's own ability to learn the useful knowledge. This creates solution-orientated projects where every project is in a constant interaction between theory and practice. Within the academic framework the students creates a formulation of the problem. Then different methods will be used to solve the established problem and in the same time the students will generate new knowledge. Projects which have used Problem-Based Learning has a cross-disciplinary profile and contain a wide variety of academic methods [Askehave et al., 2015].

INTEGRATED DESIGN PROCESS

The Integrated Design Process is often an iterative process where the students must glance over the process several times or just at least at some parts of the project. The process goes through five phases where the project gets more described in-depth as the students works through the phases. Illustration 1.2 is a simplification of the connections between the phases during the integrated design process [Knudstrup, 2005, pp. 13-15].

The first phase in the process begins with a description of the problem which has to be solved. The analysis phase is the next step and incorporate all the necessary analyses needed to proceed to the sketching phase. During the analysis phase different technical principles are used [Knudstrup, 2005, pp. 13-15].

Creative, new ideas and solutions is produced in the sketching phase. Here the academic aspects from the architectural and engineering world is combined and inspires each other to an integrated design approach. In the sketching phase it is also checked whether the design coincides with the experiences

Illustration 1.2:
The five phases in the Integrated Design Process [Knudstrup, 2005, pp. 13-15]

made in the analysis phase. This is one of the phases which must be glanced over several times for retrieving the optimal design solution [Knudstrup, 2005, pp. 13-15].
In the synthesis phase the final design is made and it is ensured that all requirements are met. Different elements (see illustration 1.3) in the project is optimized and technical calculations are documented. The last phase is the presentation. Here the project is presented as well as how every objective have been fulfilled [Knudstrup, 2005, pp. 13-15].
Through iteration the design is continually optimized which creates a complex circular process. The Integrated Design Process works in a broad field where the architectural and technical works together and creates solutions towards a higher unity where they enhance each other [Knudstrup, 2005, pp. 13-15].

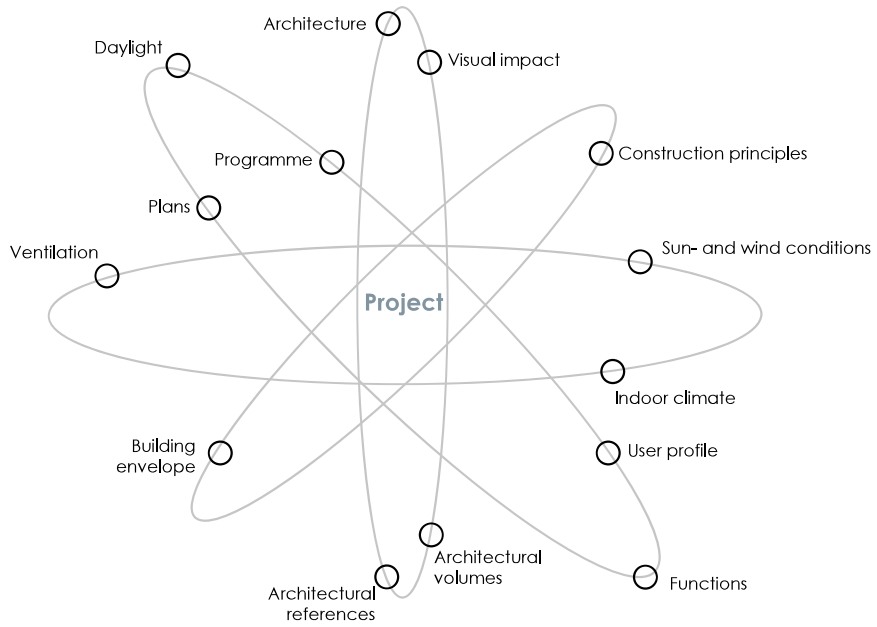


Illustration 1.3:
Integrated parameters in the Integrated Design Process [Knudstrup, 2006]

MOTIVATION

Life is fragile and in a situation where yourself or someone close to you are dealing with a serious disease, life changes. Unfortunately, the rate of cancer diagnosis is high, but more people do survive through an intense treatment of cancer. That leads to an increased demand of rehabilitation opportunites, because more children and families are dealing with long time treatments [Rigshospitalet.dk, 2014].
When children and young people gets cancer they will miss a lot of the social aspects of life. It is in the teenage years we find ourselves, figuring out who we are and test ourselves to be the individuals we want to be. This gets difficult if you have cancer. Often it is hard to get back to a normal life after a disease and for a long time, the children only has focus on recovering. When a child gets cancer, it affects the whole family. To help them recover after a long perioed of treatment, there is a need for a rehabilitation center. Rehabilitation shall help the children and thier families to regain themselves and understand their own ability [Rigshospitalet.dk, 2014].

Barretstown is a camp in Ireland which helps children and their families dealing with the physiological and emotional scars which often are left after months or years of treatment. After a camp the children are going home with increased self-esteem, confidence and the skills to help them on the rest of their journey to recovery [Barretstown, 2016]. A Case about Barretstown i written at page 88.
Barretstown makes good results. And because more and more children survive cancer, there is a need for a camp like Barretstown in Denmark. This master thesis shall be the framework for a camp like the one in Ireland. It is done in cooperation with ExcaliCare, who is the organisation behind Cool Camp for childhood cancer survivors. ExcaliCare Children's Organisation is founded in 2015 and already now it is obvious that there is a need for rehabilitation camps, which generates the desire for creating their own camp. [Christensen, R. T and Støve, H. K. (ExcaliCare), 2016. Introduction meeting].
Focus on some of the fundamental principles from Healing Architecture togehter with sustainable solutions will create the framework of this camp. The project will highlight and make suggestions to, how architecture can provide the setting for children and their families, in a way that the healing process will be shorter and recovery better. The architecture must provide courage and inspiration as the surrounding environment affect people both directly and indirectly.

Illustration 1.4:
Having the courage to jump back to life after childhood cancer.

HEALING ARCHITECTURE

Healing architecture is a concept for designing, mostly acquired for treatment in the hospital sectors, but some of the element can easily be used in rehabilitation as well. Architectures effects humans well being and can therefore be a part of an easier healing process for the individual person [Frandsen et al., 2011]. The basic is not that architecture can heal by itself, but it can create a layout of for example the quality of the daylight, the atmosphere in a room, sounds, color and also the feeling of safety and secureness. This is all part of healing architecture, which underline the process through healing both physical and psychological [Frandsen et al., 2011].

At Healing Architecture there is as mentioned earlier several factors in play, all in different scale. It is both about the structure of the building and also the small details for the human's physiology and psychology. The layout of the architectural effect human psychologically, which for example can be measured by stress and fear. Light, sound and plan arrangement can affect both the overall physical planning, but also the human's physical reaction [Frandsen et al., 2011]. As seen at illustration 1.5 at page 17, there is three primary categories which affect the human physiology. There is "physical frame", "elements" and "the impacts". The basics for Healing Architecture is "the elements". It is the elements where the design can affect both "the physical frame" and "the impacts". Overall there is at the top a vision for the treatment, that tells which impact it is important to affect [Frandsen et al., 2011]. In this project only a few elements is used in relation to relevance for the project.

BODY

Going more into details with the elements, the body have several senses. Light is the sense of sight, sound is the sense of hearing and smelling is the sense of smell [Frandsen et al., 2011].

LIGHT: Light have an influence on both physical and psychological health. In a study done by Professor Bryan Lawson and Doctor Michael Phiri, University of Sheffield, it is mentioned by employees and patients, that they feel discomfort in a room without any windows or daylight. Among the employees worries is expressed about their own health, where workstations is without daylight [Law-

son and Phiri, 2003]. Furthermore, the study show that light and windows have impact on both the patients and the employees well-being and job satisfaction [Lawson and Phiri, 2003]. According to both the power of the medicine for the patients and the admission time, light also have impact. For the patients which ward is facing south the admission time is shorter then the patients which ward do not have any windows. Furthermore, the patients staying on a ward with daylight also get less hard medicin that the patients without any windows at their ward [Frandsen et al., 2011].

SOUND: Sound can both have a calm and healing effect. The sound in a room and the acoustic also have impact on the patient's, sleep, pain, stress and confidence. According to the employees their psychosocial working environment and performance are also affected by sound [Frandsen et al., 2011].

AIR: Air is about temperature and smell. Some patients can be delicate to a special smell if they have been or still is ill. Therefore, it is recommended to have a good working ventilation system or use interior surfaces where the smell is not maintained in the material [Shumaker and Reizenstein, 1982].

TEMPERATURE: Temperature is a big part of the indoor climate. Is it too hot in a room many people will get headache or feel drowsy. Is it on the other site too cold, the body will reach by tighten the muscles more than normale. So too feel comfortable in a surtant room the right temperature is important [Indeklimaportalen.dk, 2016].

RELATION

Relation is the circumstances between the room and the human interaction and relation [Frandsen et al., 2011].

PERSONAL ROOM: All people needs privacy. The choice between being together with others or being alone and control the physical condition is important. As well as space for some personal belongings. If the feeling of privacy is achieved it is also easier to create confidence and openness towards the people around oneself [Frandsen et al., 2011].

SOCIAL ROOM: When designing the social room, there is some different elements that have to be taking into consideration. A room where it is possible to talk to an employee, also have to manage treatment, examination, the possibility to share knowledge and social conversations. Common for all the rooms is the need for private, confidential conversations and care whoever the patients are talking to [Frandsen et al., 2011].

OUTDOOR: For both the employees and the patients it is important to see and be in a green environment with a lot of vegetation, which also have a positive influence on the physical and mental well-being [Frandsen et al., 2011].
A study made by Clare Cooper Marcus and Marni Barnes, University of California at Berkeley, in use of outdoor space at a hospital, one of the questions was "Where do people choose to go when stressed?" [Marcus and Barnes, 1995]. 95 percent felt a positive change in the mood after spending time outside. Specially elements in plant world as for example flowers, trees and all the colors in the nature made a positive change [Marcus and Barnes, 1995].

In the further design Healing Architecture and its concepts for designing will be taken into consideration. However, aspects such as light, view, grren environment and the orientation of the rooms will especially have a larger impact on the design for this rehabilitation camp than the rest of the elements.

VISION OF TREATMENT		
PHYSICAL FRAME	ELEMENTS	IMPACT
Location Disposal Plan Arrangement Interior Arrangement Materials Equipment	BODY Light Sound Air Temperature RELATION Personal Room Social Room Outdoor	PHYSIOLOGICAL Healing Pain Immune system Infection Sleep Circadian Rhythm Appetite Exercise Admission Time Readmission Death Rate PSYCHOLOGICAL Comfort Stress Fear Calm Trust Safety Depression Privacy Sorrow Control Social Contact Satisfaction Communication Concentration Motivation Mood / Happiness ECONOMY Sick day Economy

Illustration 1.5:
Segments arranged in the three different categories. Where the basis at the model is the Elements. By adjusting the Elements both the decision about the overall Physical Frames together with the size and extent of Physiological and Psychological will be affected. The table is adjustet in relation to relevance for this project.

REHABILITATION

Yearly around 35.000 people gets the diagnose of cancer for the first time. 245.500 danish people are already living with cancer today or have had the illness [JChristensen, 2015]. Luckily more and more people get healed from cancer or live longer with the illness. The treatment is for some cancer patients incriminating and comprehensive. The patients therefore need rehabilitation [Jensen and Møller, 2004]. Dependent on the type of cancer, treatment, amount of spread and other things, many patients have problems with late complications after ended treatment. Rehabilitation for cancer and late complication will in this way affect more and more in the coming years [Jensen and Møller, 2004]. This can entail psychical problems as fear and depression or bodily problems in form of pain, sensory disturbances, swelling and a range of other problems related to the individual cancer disease [Jensen and Møller, 2004].

Many researchers are already working with rehabilitation but what is rehabilitation actually? For a long time, there have not been a common definition for what rehabilitation actually is. Rehabilitation International Denmark and MarselisborgCentret decided to do something about this. Thus, based on different knowledge from a committee composed of several different professions such as citizens, theorists, treatment providers, researchers among others a definition for the term rehabilitation is formulated. [Jensen and Møller, 2004].

"Rehabilitering er en målrettet og tidsbestemt samarbejdsproces mellem en borger, pårørende og fagfolk. Formålet er, at borgeren, som har eller er i risiko for at få betydelige begrænsninger i sin fysiske, psykiske og/eller sociale funktionsevne, opnår et selvstændigt og meningsfuldt liv. Rehabilitering baseres på borgerens hele livssituation og beslutninger består af en koordineret, sammenhængende og vidensbaseret indsats."

[Translated to english by the authors of this thesis March 2016: Rehabilitation is a determined and dated collaboration process between a citizen, relatives and professionals. The aim is to give the citizen who have been or still is in risk to get significant limitations in their physical, mental and/or social functionality, to obtain an independent and meaningful life. Rehabilitation based on the citizens whole life situation and decisions consist of a coordinated, coherent and knowledge-based effort]

[Jensen and Møller, 2004].

The matter therefore concerns if the cancer patients can increase or regain the control and disposal of their own life. Thereby, they can by them self create a good life from their own experienced need and preferences [Jensen and Møller, 2004].

Therefore, this rehabilitation camp have to support the actual rehabilitation. In that way the building has to be designed so it supports the needed functions in the different rooms. The architecture is forming the framework for the activities and exercises. And the camp make room for everyone and create the community for the participants.

SUSTAINABILITY

During the 1980s focus came to sustainability and the utilisation of the resources from the nature. To have a common set for global sustainability a report was made called "Our common future, the world commission on environmental and development" [Bu.dk, 2016]. The aim for this report was to give directions for future development [Dac.dk, 2016].

> "Sustainable development is development that meets
> the needs of the present without compromising
> the ability of future generations to meet their own needs"
> [World Commission On Environment and Development, 1987]

Sustainability is divided into three different categories: Social Sustainability - Economic Sustainability - Environmental Sustainability.

SOCIAL SUSTAINABILITY

Social sustainability is focusing on people's well-being. The building should meet the high level of comfort for the people. It should be build in healthy materials, provide the right amount of daylight and have good air quality together with the right indoor temperature. The building should be accessible for everyone, also for the children that walk badly after having a disease. The building also have to measure flexibility [Birgisdottir., 2015], which is also a wish from ExcaliCare. In the future they want to extend the camp from 50 to 150 attendees [Christensen, R. T and Støve, H. K. (ExcaliCare), 2016. Introduction meeting]. Most important is, that the people at the camp feel secure [Dac.dk, 2016].

ECONOMIC SUSTAiNABILITY

Economic sustainability is mostly about the cost of the building. For example the operating cost of the building according to maintenance of materials. If the building is build in materials with less maintenance or even better with no maintenance, there will be less cost on repair [Birgisdottir., 2015].

ENVIRONMENTAL SUSTAINABILITY

Environmental sustainability is focusing on how to keep the ecosystem healthy both global and local. Therefore, it is about the use of renewable resources, how to save resources according to energy and always reduce the carbon footprint

and impacts of biodiversity [Birgisdottir., 2015].

REHABILITATION CAMP

At this stage ExcaliCare have rented a place where the different camps is held. The wish is to have their own camp, that will be built with all the knowledge from Healing Architecture integrated with sustainable solutions. In the future the vision is to extend, so the camp can manage even more campers. It should also be possible to have different types of camps including family camps, the relatives and specially the siblings that often are in the shadow, because all the focus is on the child with cancer [Christensen, R. T and Støve, H. K. (ExcaliCare), 2016. Introduction meeting]. Therefore, the sustainable way of thinking is important from the very start of this project.

Illustration 1.6:
Sustainable thinking

EXCALICARE

ExcaliCare is founded by two medical students from Aarhus University and who both have years of experience of being volunteers at international camps for children who have had cancer. They both wish to shape the framework for the children and their families so every involved can recover their strength within them self and find a way back after a life with cancer [Excalicare.dk, 2016].
The intention is to give danish children with childhood cancer and their families the needed support through well-tested theories. All attendees is going through a four phase Therapeutic Recuperation based on challenges - success - reflection - discovery, see illustration 1.7 [Excalicare.dk, 2016]. All attendees get challenging tasks during the day at the cmp which they shall complete with success by them self or with help from some of the volunteers. A program for a typically day at a camp can be seen in appendix A.
When first the child have completed the task with success there is a basis for a reflection upon how the child solved the task. Afterwards the child may discover that he or she is able to do things even if the child have complications in consequence of their disease. This will not only motivate the child to recover and to explore the world in a new way but also give them strength in case of relapse or disease related stress.

One important keyword for the entire programme at ExcaliCare is empowerment. The Therapeutic Recuperation is first of all meant to increase the child's self-esteem, self-confidence and self-dependence. This will give them control of their own life back and increase their well-being [Excalicare.dk, 2016]. The children is going through a journey of development where ExcaliCare works with the children within their comfort zone but also in their "stretch-zone". Here the children get challenged and learn new things about them self. Moreover, they learn how to find solution and avoid complications later in their life there can be

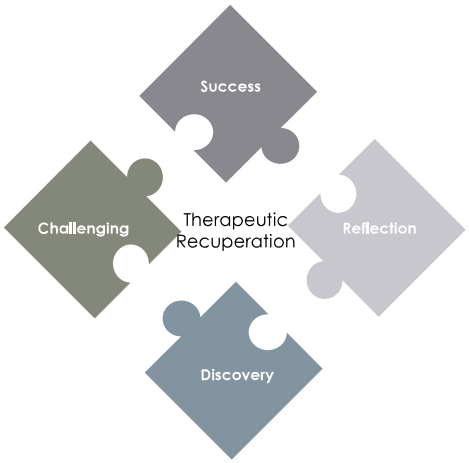


Illustration 1.7:
The four phases of the therapeutic recuperation
[Excalicare.dk, 2016]

related to their disease.

In connection with ExcaliCare's ambitions and stated goals it is in the future important for the organization to have a framework which can form the basis to the project for caring for life after childhood cancer. Therefore ExcaliCare need a place where these children and their families can have an affiliation together with other families who have had cancer in their life.

Illustration 1.8:
Solving a task

Illustration 1.9:
Playing mint golf

Illustration 1.10:
Practise music before they shall perform a play for the rest of the camp.

LIFE AFTER CHILDHOOD CANCER

To gain knowledge about life after childhood cancer and some of the late complications, the disease have been investigated along with qualitative surveys among young people who have been cured from cancer but also from the bereaved who tells the story about their loved ones.
When the treatment period for childhood cancer is over, many families and patients is struggling with emotional issues. The treatment period is a stressful time, and all these emotional feelings are quite normal [childrenscancer.org,2016].

Every year almost 200 children and young people is diagnosed with cancer in Denmark. Four out of five is cured [Boernecancerfonden.dk, 2016]. The type of cancer which hits children and young people differ from cancer among adults. As cancer often is related to the way of living among adults [Boernecancerfonden.dk, 2016] researchers do not know why children get cancer but there is an intense research on the field [Sundhed.dk, 2014]. It is a long struggle through the treatment and the progress of recovery afterwards. Not just a medical recover but also psychologically [Sperling et al., 2015].

> "Det har helt klart sat nogle ting i perspektiv. Jeg sætter mere pris på de små ting og vælger at være optimistisk frem for pessimistisk"
> [Translated to english by the authors of this thesis March 2016: It has definitely put some things in perspective. I put more appreciative of the little things and choose to be optimistic rather than pessimistic]
>
> [Sperling et al., 2015]

It is always critical to get the diagnosis cancer but for young people it could be even more critical. They are standing in front of their lives and the beginning of the creation of their own identity [Cancer.dk, 2015]. It is a critical time in life to be cut off from friends and find oneself left in a hospital bed with a lot of thoughts for the future. When the treatment is over it can be difficult to catch up with the mental and social development [Carlsen and Bøge, n.d.].

There have in many years not been focus on young people with cancer and their late complications such as concentration difficulty, low self-esteem, low self-confidence, being exhausted and that they do not have the energy to socialize with other people or are able to accomplish an education [Carlsen and

Bøge, n.d.]. The young survivors experiences that doctors are more focused and interested in their survival from the cancer than their well-being [Carlsen and Bøge, n.d.].

Late complications, such as depression, impaired hearing and osteoporosis, is what gives the survivors changes in their lives in condition to their treatment of cancer. Side effects can show up a short time after the treatment is over and they will disappear again. But these long-term complications may have impact on the daily life and for many survivors it will be chronically [Carlsen and Bøge, n.d.].

> "Børnekræftoverlevere skal have den nødvendige hjælp
> og støtte til at kunne få et godt liv og en god livskvalitet"
> [Translated to english by the authors of this thesis March 2016: Childhood cancer survivors should have the necessary help and support to get a good life and enhance the quality of life.]
>
> - Line Thoft Carlsen
> [Dreier, 2015]

Life after cancer can be improved if the patient gets a rehabilitation offer already when the disease is diagnosed [Cancer.dk, 2016]. One of the opportunities to recover and return to a comfortable life after cancer and get some tools to handle stress and other consequences could be a rehabilitation camp where the fundamental method used is Therapeutic Recuperation. Here the children will meet like-minded and will create common experiences which may give strength to the future [Christensen, R. T and Støve, H. K. (ExcaliCare), 2016. Introduction meeting]

ACCESSIBILITY

A part of Healing Architecture is the feeling of safety [Frandsen et al., 2011]. After a long course of treatment against cancer people is often exposed to injury both physical and psychological. The physical disorder could be that the accessibility is weakened [Dyg Sperling et al., 2015]. Therefore, it is important the rehabilitation camp takes accessibility into account and put an effort into it [Christensen, R. T and Støve, H. K. (ExcaliCare), 2016. Introduction meeting].

Reduced functionality treat the relation between a person's reduced physical or psychical function according to the options in the society [Godadgang.dk, 2016]. There are many places where the physical environment only takes the average person into account. With a handicap a person experience things, to a higher extent. However, it depend on which proportions the environment is arranged in. The bigger the disproportion is between the individual conditions and the environment's requirements to the function, the more critical the handicap will be [Godadgang.dk, 2016]. The degree of disability is in other words various at different environments. Accessibility is thereby the layout of the environment, in the way that considerations is shown for different conditions, so that the functionality will be increased significant [Godadgang.dk, 2016].

If the environment is well-arranged with a simple layout the safety will be increased. If a person has practical problems, it can lead to social and psychical complications. Persons who cannot go around without an assistant often choose to cut oneself off and avoid the complicated situations. Environment that is planned and designed for disabled people is also always more usable and accessible for everyone else [Godadgang.dk, 2016]. Therefore, it is important the rehabilitation camp is taking accessibility into consideration.
The vision for the camp is to give the attendees the faith back in who they are, give them success back in their life and confidence. If the children who are walking-impaired, sitting in a wheelchair, miss an arm or leg will be limited by their disease, they will not feel the success they camp want them to. Therefore, it is important the camp will be a place with space for everyone, where everyone equally can be a part of the activity and no one feels different in any means. This involve both the life outside and inside the camp [Christensen, R. T and Støve, H. K. (ExcaliCare), 2016. Introduction meeting].

Illustration 1.11:
Accessibility can be a challenge

JAVNGYDE, SKANDERBORG

Introduction to the site

The site for this project is selected from a few criteria - close to nature, potential for a later extension, open spaces and accessibility.
The lakelands is creating the framework for the site, which is located in one of many beautiful countrysides in the municipality of Skanderborg near one of the highest point in Denmark, Himmelbjerget, and only 25 minutes drive from the second largest city in Denmark, Aarhus. Ravnsø is together with trees creating the framework for the ideal site.
The site is a 21.000 m^2 rectangular shaped site where the lake, Ravnsø, is creating an extraordinary vista towards south (see illustration 1.12 and 1.13). Currently the site consists of an almost flat field which makes it accessible for users without changing the existing terrain. Towards north a row of shrubbery is hiding the gravel road which towards west leads to the nearest village, Javngyde. In the east direction there is an existing red painted house, which will become the nearest neighbour to the rehabilitation camp. To the east the gravel road leads to a scout hut which is the last destination at the road. All this makes the surrounding to a quiet place.

Illustration 1.12:
Site Skanderborg, Central Jutland, Denmark.

Illustration 1.13:
View from the site towards the lake.

Illustration 2.1:
Trees at the water's edge.

PRESENTATION

CHAPTER 02

In this chapter the final design of the rehabilitation camp will be presented consisting of plans, section, elevation and technical strategies.
The chapter starts with a vision for the project followed by the concept. The masterplan shows the placement of the different building volumes, after which the presentation will move further into the design. The daily life and the arrival to the site is presented in flow diagrams. Sections and elevations shows the interaction between the building volumes. Finally, relevant technical strategies are presented.

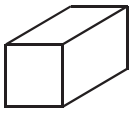
VISION

ExcaliCare's new rehabilitation camp shall adorn the site and become a symbol for the area. It shall be a place that takes care of the users and help them come back to their daily life, after a period with childhood cancer.
The rehabilitation camp shall be designed on some of the fundamental principles of Healing Architecture such as optimal orientation of the rooms, light and views, as these aspects influence human's well-being. Healing Architecture must consolidate and enhance the therapeutic recuperation and create the framework within rehabilitation.
The rehabilitation camp must be accessible for all its users and create desirable indoor and outdoor spaces which invites one to play, challenge and learn.

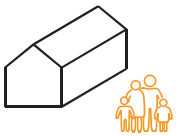
Choices of material must ensure the best possible thermal and atmospheric comfort as well as the acoustic conditions in the building. Moreover, materials shall bring a warm atmosphere to the site and the rooms.
The vision is to design a zero energy building, which fulfills building class 2020 according to the Danish Building Regulations, as well as focus on the social and environmental sustainable aspects.
Through the Integrated Design Process, the architectural and technical solutions are incorporated in order to reduce the buildings energy use, as well as create a well-functioning building without losing its architectural qualities.

CONCEPT

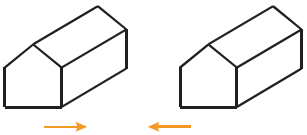
The chosen site is placed in scenic surroundings without any noise, except from the surrounding nature. Standing at the site it is possible to hear ripples by the small waves from the lake, the breeze from the trees and the twittering of different birds. The place is idyllic and there are only a few houses in the area. The request is that the buildings should blend into the beautiful nature and bring as much nature into the buildings as possible. Therefore, the view from the houses have been an important parameter for the design. To get a common expression, both the houses where the campers live and the main building is designed from the same principles. The main building is dimensioned larger compared to its functions, which makes it the "big brother" of the houses. All buildings is designed with a pitched roof, which relate to the typical well-known house shape and therefore a homely feeling. These well-known settings is important in relation to give the campers a sense of security.



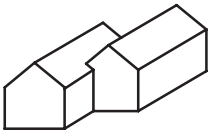
Starting with a box



Creating the typical well-known house, to get a homely feeling

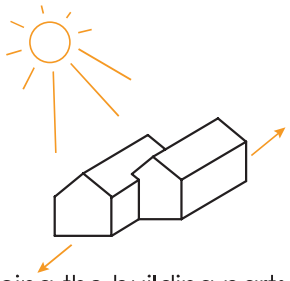


Camper Volunteers

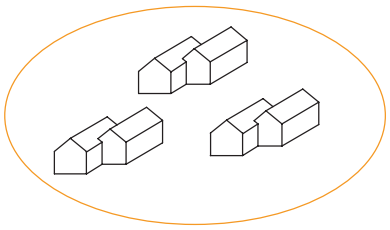


Assembling for community

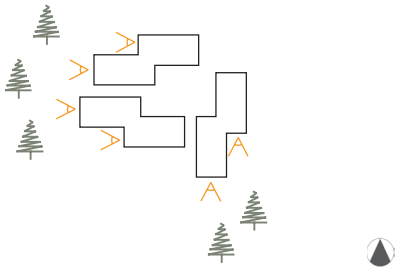
Illustration 2.2:
Concept diagram for the design



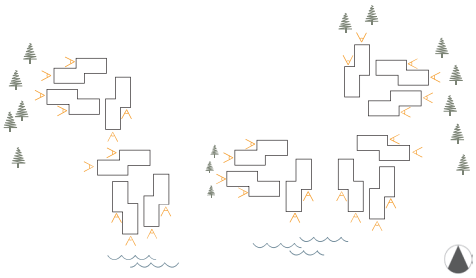
Displacing the building parts to get more sunlight into the entire building



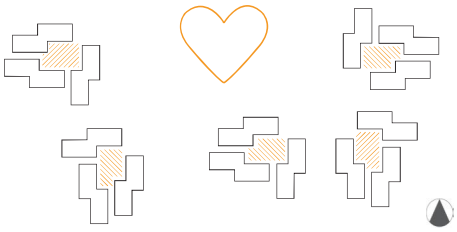
Creating diversity in the level of the campers privacy by making a group of three houses



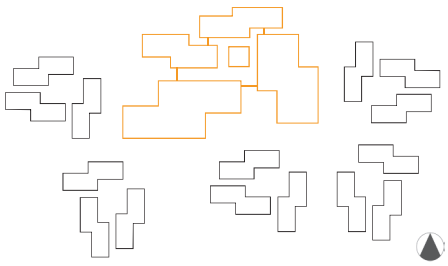
Placing the group of houses so every living room have a view towards nature



Placing every group at the site so every common room have a view towards the nature



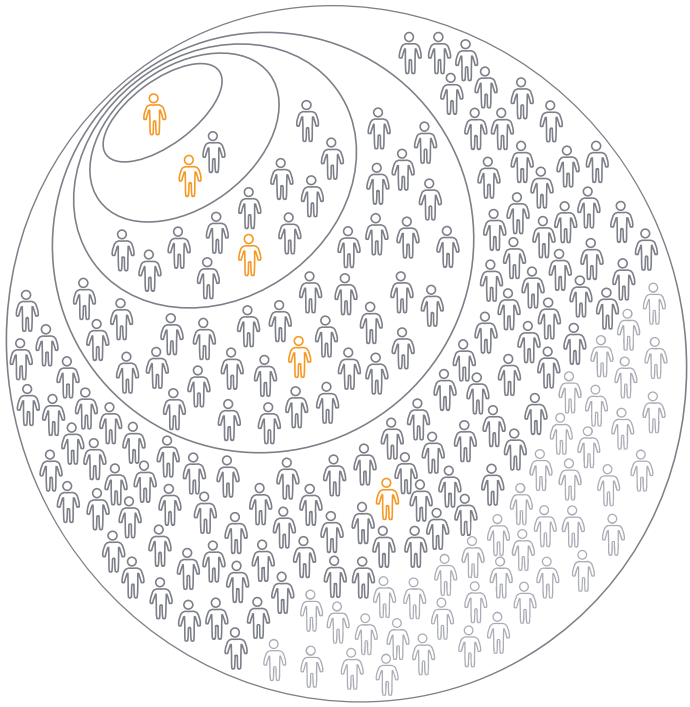
Courtyard is created and the buildings encircle the center of the site



At the center of the site, the main building are placed with all the common functions and the building volumes interacts with each other

LEVELS OF PRIVACY

On a camp fully booked with people and many activities during the day (see appendix A for a typically day at a camp), it is important to have different levels of privacy at the site. This is especially important for the participants on this camp, as some of them has not been used to that many people around for a long time because of their treatment. Some needs a lot of privacy, while others just need a five minutes break to summon energy and some do not need a break at all. Each person is different, but the opportunity for different levels of privacy is important. Illustration 2.3 shows the diversity of privacy for a camper.



One camper

The total amount of people when the first stage of the camp are built

The total amount of people when the last stage of the camp are built

Illustration 2.3:
At the first stage of privacy the campers are just by themselves. At the second stage the camper is together with another camper. Third stage is the house where the campers live. Fourth stage is in the different cluster of houses with a common courtyard. The fifth and last stage is the whole camp together. The exact location of the different stages at the site will be introduced later in the presentation.

MATERIAL

EXTERIOR

The exterior materials are chosen based on the surroundings (see illustrations 2.4 - 2.9). It therefore aims for the best interaction with the surrounding nature, by making the buildings blend into the environment. Furthermore, the maintenance has been taken into consideration, and the materials are therefore chosen in relation to how it will look after many years. The spruce is dry treated so that the pores will close and it will take longer to absorb moisture.

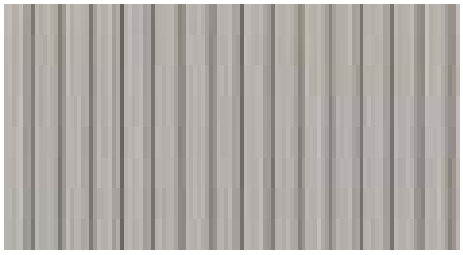


Illustration 2.4:
Zinc used at the roof with angled standing seam

Illustration 2.7:
Grey wetpour used at the ground area for climbing and tabletennis

Illustration 2.5:
Spruce used on the facades. Before commissioning it is dry treated so the pore will close which will create a longer lifetime

Illustration 2.8:
Rubber mats with grass used for the aerial runway, croquet and archery area

Illustration 2.6:
Light grey in situ concrete used for pavement at the path

Illustration 2.9:
Oak used for the jetty

INTERIOR

The materials, which is chosen (see illustration 2.10 - 2.15), makes it possible for the users to leave their own mark on the interior. Therefore, simple and calm materials with a warm atmosphere is used. The same material used in the houses is also chosen for the main building. However, the internal walls in the main building towards the foyer is covered in the same wood cladding as the exterior. This gives a warm atmosphere to the foyer and emphasizes the separation of the different function in the main building.

Illustration 2.10:
Plank floor in rustic oak for the common rooms

Illustration 2.11:
Dark grey oblong tiles for wet areas

Illustration 2.12:
Oak MDF plate for the private niche at the dormitory

Illustration 2.13:
White-painted ash ceiling

Illustration 2.14:
White-painted plaster walls

Illustration 2.15:
Spruce used as interior wood cladding in the main building

SITEPLAN

As seen on illustration 2.16 of the siteplan, the buildings a spread across the site in a way that the buildings interact with each other, while keeping a connection to the surrounding nature. The distance between the different functions is kept at a level, where it is still possible for walking-impaired individuals to take part. The buildings are placed in a very strict way, which creates the opportunity to soften up the path, even though the path by itself is stringent with some variation. Where the bigger flow will be the small paths meets and makes a small square.

The clusters placed in the northwest corner is the administration, while the campers lives in the rest of the clusters. The large building in the center of the site is the main building with all the common facilities. An activity area is placed towards west and interacts with the surrounding nature. Towards the lake, the pavement on the path is changing from concrete to wood. A jetty is placed into the water and will be a place for both relaxation and enjoying the view but also for fishing and canoeing. See inspiration pictures for outdoor facilities in appendix B.

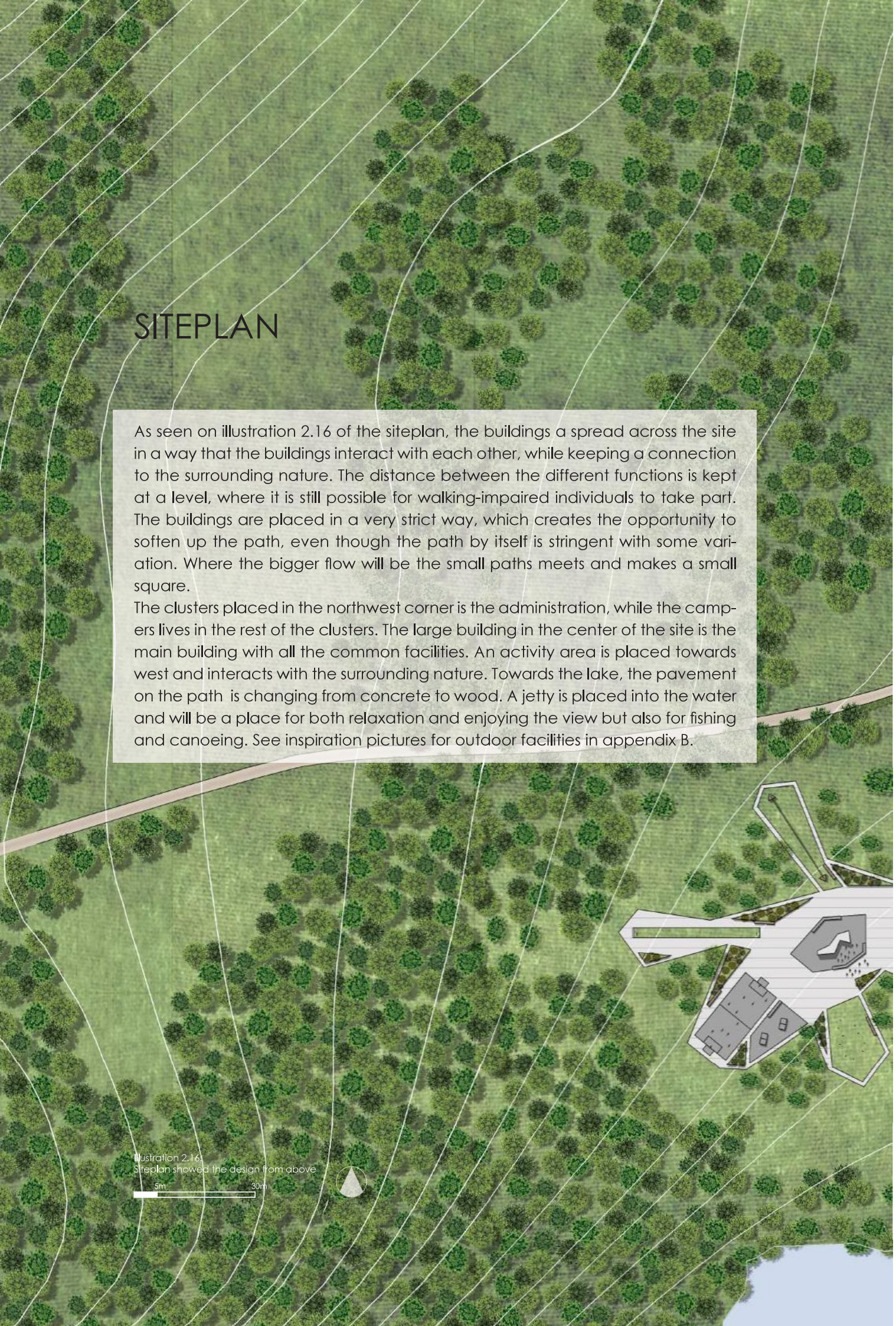


Illustration 2.16
Siteplan showed the design from above

OUTDOOR AREA

ACTIVITY AREA

As mentioned earlier an activity area is placed at the western part of the site. The activities are carefully chosen based on the visit at the Cool Camp Reunion. See appendix C for further information about the visit. The activity area includes an aerial runway, archery, croquet, mini golf, multi-field for football and basketball, table tennis and a climbing wall. The climbing wall also functions as a central meeting point at the activity site, see illustration 2.17. These kind of activities can be used of everyone, with only a little help needed for some campers. Furthermore, most of them do not have to be prepared. Whenever there is a break the campers can enjoy the different activities. This makes it easier for the volunteers and give the campers some freedom. The area is placed towards west to utilize the small gradient in the terrain for the aerial runway and the woods, which creates a division between the different activities.

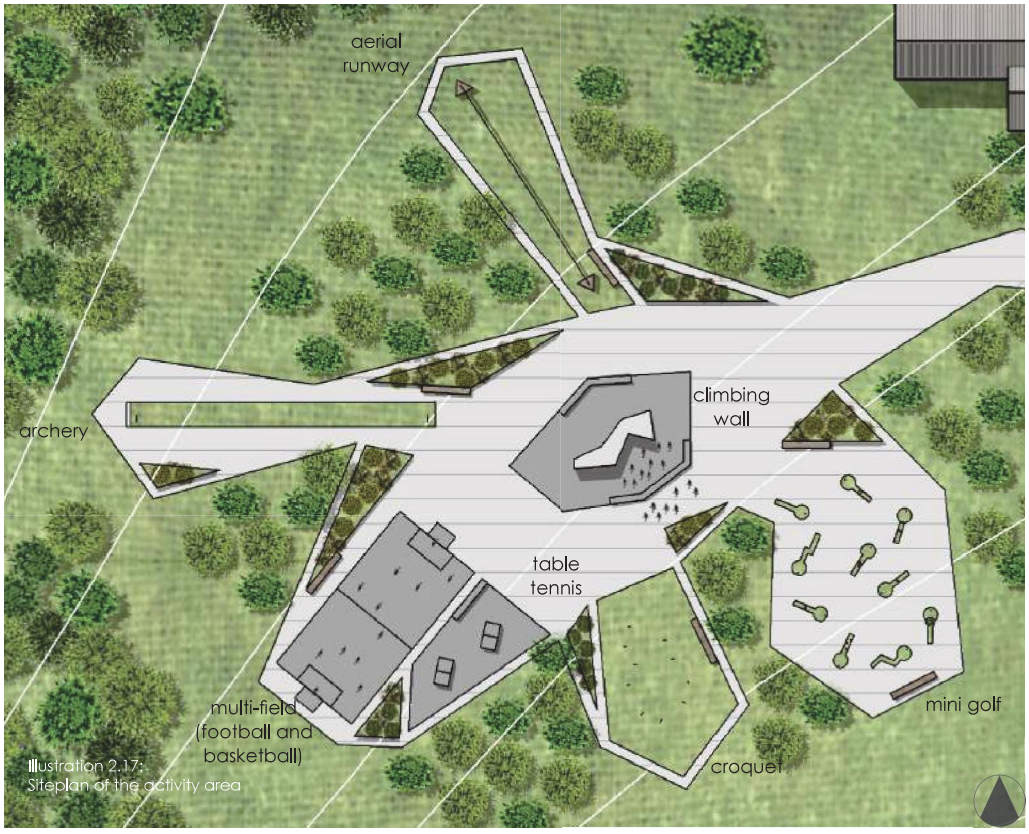


Illustration 2.17:
Siteplan of the activity area

COURTYARD

Approaching the cluster of houses a courtyard opens up. The courtyard is created by the placement of the houses. It is a common courtyard for all three surrounding houses. This is another step in the different stages of diversity in the level of privacy for the campers. The courtyard can be used for a lot of activities. During the day the campers can meet for a meal or the fireplace in the middle can be used during the evening, see illustration 2.18. To drive the campers to meet with campers from other houses, four tables is placed in the courtyard instead of three. It also means they can sit and play a board game or do some other activity without packing it all up, when it is time for dinner. This will ensure that the courtyards is the place where the campers are interacting.

Illustration 2.18:
Tonight a common barbeque will take place in the clusters courtyard and everyone is therefore gathered to get everything ready. Some of the volunteers are planning the last details for the evening activities, with balloons and some jamming on the guitar. Everyone is excited and ready for a great summer night outside.

SHADOW

Most of the year the courtyard in the main building, as well as the terrace in front of the dining hall, will have unobstructed sun conditions (see illustration 2.19 - 2.22). Neither is the activity area covered in shade from the buildings.

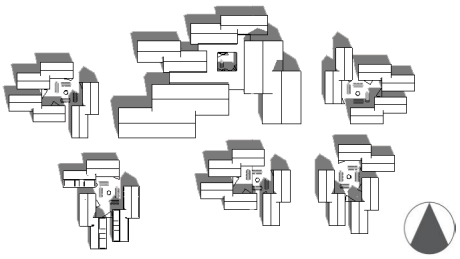


Illustration 2.19:
Equinox 21st of March 12 o'clock

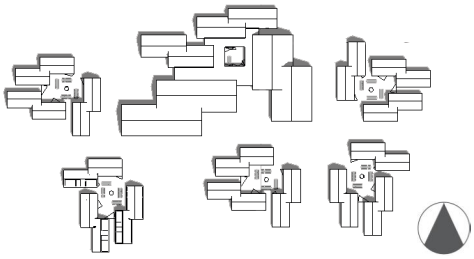


Illustration 2.21:
Solstice 21st of June 12 o'clock

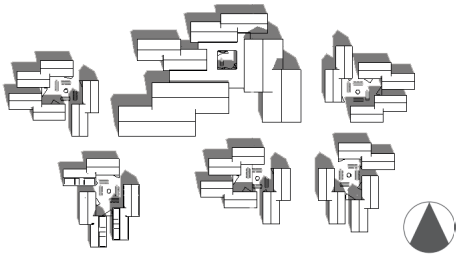


Illustration 2.20:
Equinox 21st of September 12 o'clock

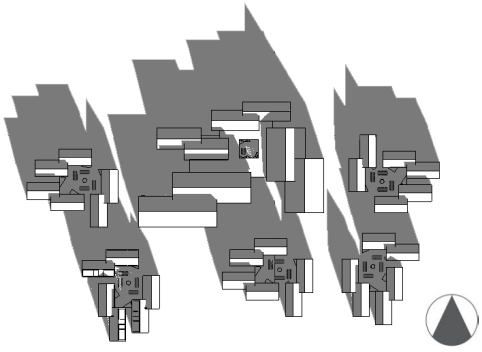


Illustration 2.22:
Solstice 21st of December 12 o'clock

WIND

The wind direction at the site is shown here. In Denmark the wind speed typical is at 5,8 m/s [Dmi.dk, 2016]. This is also the value which have been used in these illustrations. Illustration 2.23 showns that when the wind meets the building, it flows above the building, which makes the courtyard sheltered. On illustration 2.24 the wind direction is showed in plan. When the wind hits the buildings, it can be seen here that the courtyards is sheltered, as well as many other areas on the site.

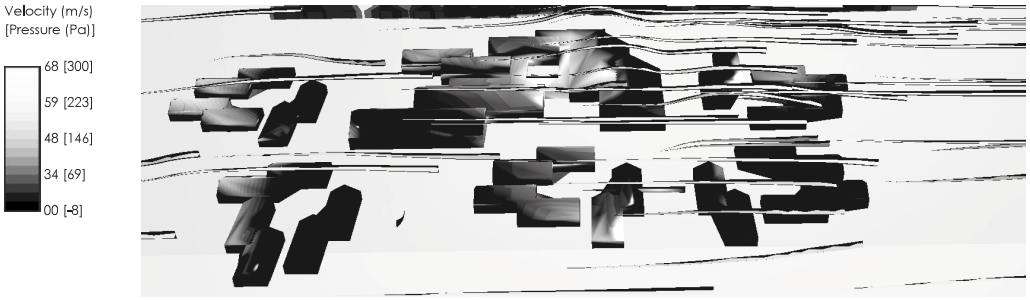


Illustration 2.23:
How the wind meets the buildings and flow above the buildings

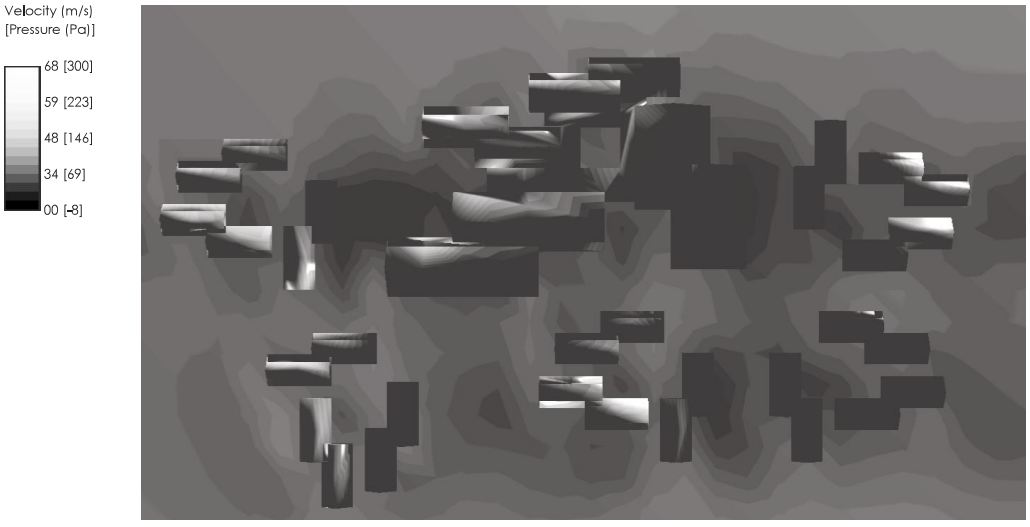


Illustration 2.24:
Shows the velocity on ground.

PLAN

MAIN BUILDING

The main building is divided into different volumes according to their functions as seen at illustration 2.25. Each function is placed in a certain area for a specific reason. First of all the main entrance is placed to the west just near the parking area and the administration. Towards northwest different workshop rooms are placed in a volume. Here space is made available for the creative camper, with room for arts and craft, a photo studio, a music studio and another creative room for different activities.
Orientated towards south the common functions are placed. The common room has a stage for theatre, music and other performances, and everyone can be gathered here. The dining hall is placed with an orientation towards the lake. Large windows are placed towards the lake to capture the view of the water. In the process it is possible to see some of the daylight analysis for the dining hall. Also a smaller common room is part of the common facilities. Here the campers can meet up and play table tennis, pool or board games in between the activities.

The sports activities are placed in the east. It features both wellness, a climbing wall in different levels and a gym with space for three badminton fields. Furthermore, it contains a changing room, that can be used in connection with wellness or if the camp is rented out at some point. The medical house, which is placed towards north, is an impor-

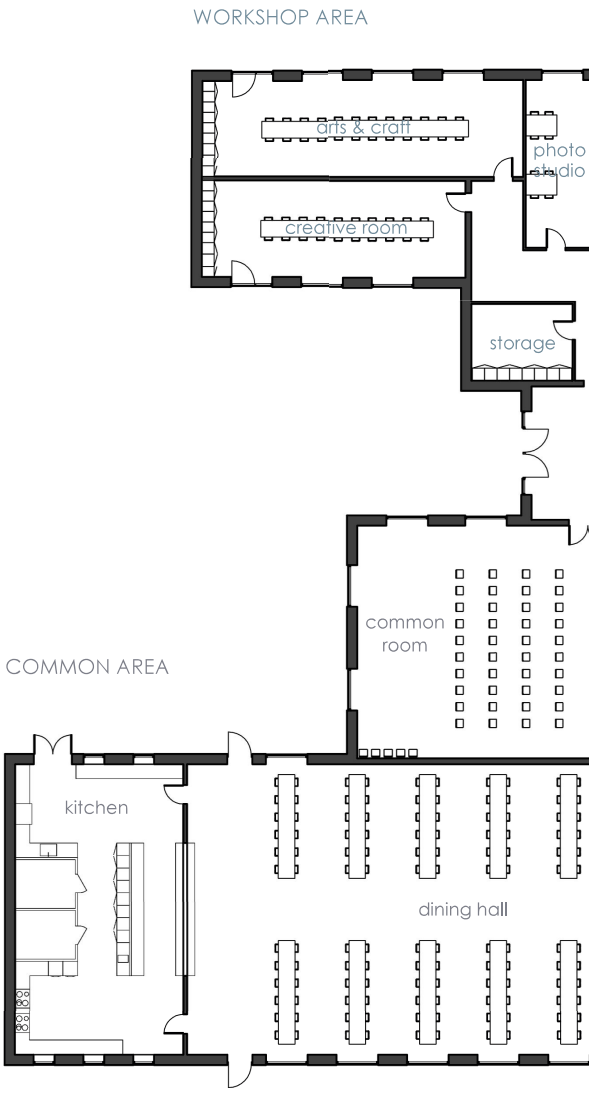


Illustration 2.25:
Plan drawing of the Main Building.
To see the square metre of the different room look at the drawing folder

5m 10m

tant function at the camp. Here the campers medicine is stored and if something unexpected happen the campers will go there to have a nurse to look at it. It have been important for the design, that the medical house is centrally placed, but still not emphasized so the campers will not be reminded of it all the time. The camp is a place which the participants should look forward to, and a place where they will forget their illness for a while. All these different building volumes is connected by a common foyer. In the middle of the foyer, a courtyard is placed, both to get more light into the building, to have a cozy outdoor space just nearby and to drag some of the nature into the building. Next to the courtyard a reflection room is placed, which benefits from the daylight. See illustration 2.26. It is not a closed room, but is defined by lamella placed with different distance between them. It is important for this room that the campers do not have to ask if it is okay to enter. It should be clear who is inside the room but at the same time, the people inside the room should feel comfortable.

Illustration 2.26:
The first buses have just arrived to the camp with expectant campers, ready for a Reunion Camp. They have looked forward to see everyone again, hear how everybody are doing and also tell all about what they have been up to since last time.

ADMINISTRATION

The administration area is composed of a cluster of houses, where each house has its own function as see at illustration 2.27. In the north the office is placed, with meeting rooms and different types of working stations. It is placed closest to the arrival, which is most advantageous in the daily life, due to stock delivery, external meetings or other requests. For the same reason is the camp organizer placed nearby, so they can have an eye on when people arrive to the camp. Furthermore, the organizer also puts a lot of effort into keeping activities interesting for the volunteers, some which is kept as a secret. Therefore, they need their own place to stay.
Normally a camp last around a week, which can be long time even for the volunteers. Therefore, they need a place to take a break without children. One of the houses is therefore designed as a lounge for the volunteers and is placed away from the campers. In some of the activities there is a need for external help. These activities can be late in the evening or last more than one day, which means they also need a place to stay. This function is placed in connection with the organizers building. One of the houses is a large tool shed for outdoor activities and garden tools.

Illustration 2.27:
Plan drawing of the Adminstration Building. To see more specify where the different functions are placed and the square metre of the different room look at the drawing folder

5m 10m

HOUSES

The first room to enter in the houses is the entrances, as seen on illustration 2.28. At the entrance there is space to put shoes and drop a jacket. The entrance has a suspended ceiling and the feeling is increased, when you take a few steps further into the living room, which opens up and embrace you. The living room have a high-ceiling and the windows are large and orientated towards nature. The daylight conditions for the rooms can be seen on illustration 2.29. A long table is placed in the middle of the room, where it is possible to have a common dinner or play different board games at the same time.
A small kitchenette is integrated into the wall with space for making a cup of tea. The tea could be enjoyed in the sofa set, where the windowsill is integrated as a part of the sofa. See illustration 2.30 on page 54. Next to the living room the bedrooms for the volunteers is placed. They sleep together two and two. Each bedroom have their own appertaining bathroom. The bedrooms are placed on the opposite to the camper's dormitory. This is done to maintain the camper's privacy, while still keeping the volunteers nearby, in case the campers need them.
When entering the dormitory you meet a cozy corner with bean bags straight ahead of you. The window is encircled by the nature and the windowsill is integrated for sitting. Furthermore, the dormitory is divided into smaller niches by half walls. The half wall is accurate tall enough for the campers to be able to lean their back against it and still command the room. This is chosen because it is important that each camper still is a part of the community, even though the camper is in the niche. The campers share their niches two and two, but each camper also has a private space, which they can decorate as they want. It could be a picture of their family or pictures from earlier camps they have attended. At the foot of each bed a chest is placed, which has several functions. It can contain private things, clothes or things the camper need to have nearby. It can also be used as a place to sit, but first of all it keeps the camper's things private. The windowsill continuous to a desk, which is shared between the two campers in the niche. This desk is used for activities during the day, for example drawing. See illustration 2.31 at page 56. In the future the camp should accommodate children and their families. In this case the volunteers bedroom will become bedrooms for the parents and the dormitory will be used by the children and their siblings. When a family camp is running, one of the clusters will then be the new place where the volunteers will then be accommodated.

Illustration 2.28:
Plan drawing of the the House. Every House in designed out from the same principles. To see the square metre of the different room look at the drawing folder

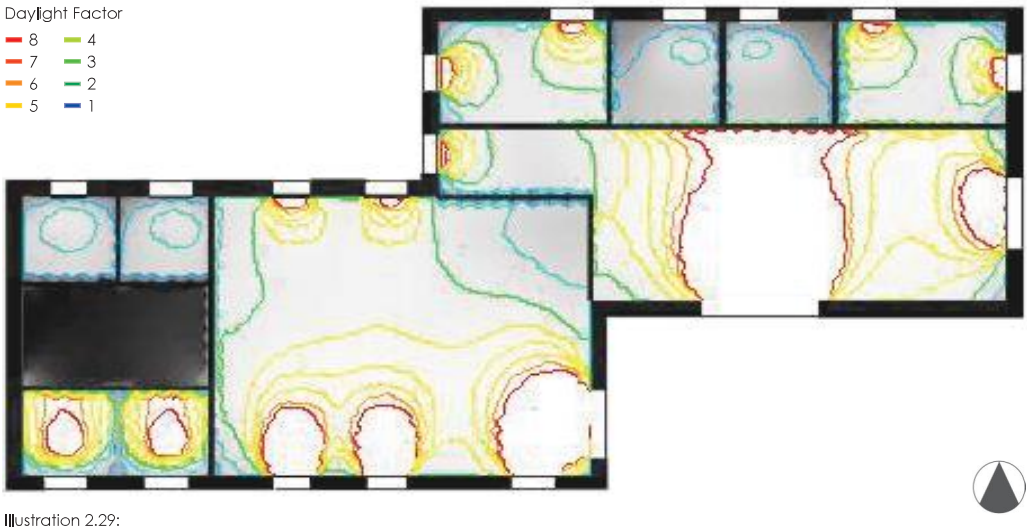


Illustration 2.29:
Daylight condition in relation to the plan arrangement

Illustration 2.30:
The volunteers from one of the guys' houses are preparing a snack, for when the campers will come back from the afternoon activities. Board games and drawings is still on the table from an earlier break during the day, and it is ready to be continued on, when the boys get back.

Illustration 2.31:
The girls just arrived to the house, after they have been out doing activities the entire day. They are talking about their experiences and starts to get ready, for the banquet at the dining hall. Afterwards some of the attendants from the camp, are entertaining with a show in the common room.


EXCALI
CAR
HOUSE 5

FLOW

ARRIVAL

1. The campers will often arrive to the camp by bus. **2.** Then the organisers of the camp and the volunteers will welcome campers with banners and cheers, and the campers will be lead into the common room. **3.** In the common room a welcome will be given, as well as some formal and practical information. The campers will be told which house to stay in and which volunteers that is associated with their house. **4.** After the introduction the campers which need it, will have their medicine delivered to the nurse in the medical house 5. The campers will find their cluster of houses 6. and afterwards their own house and finally which bed they have to sleep in.

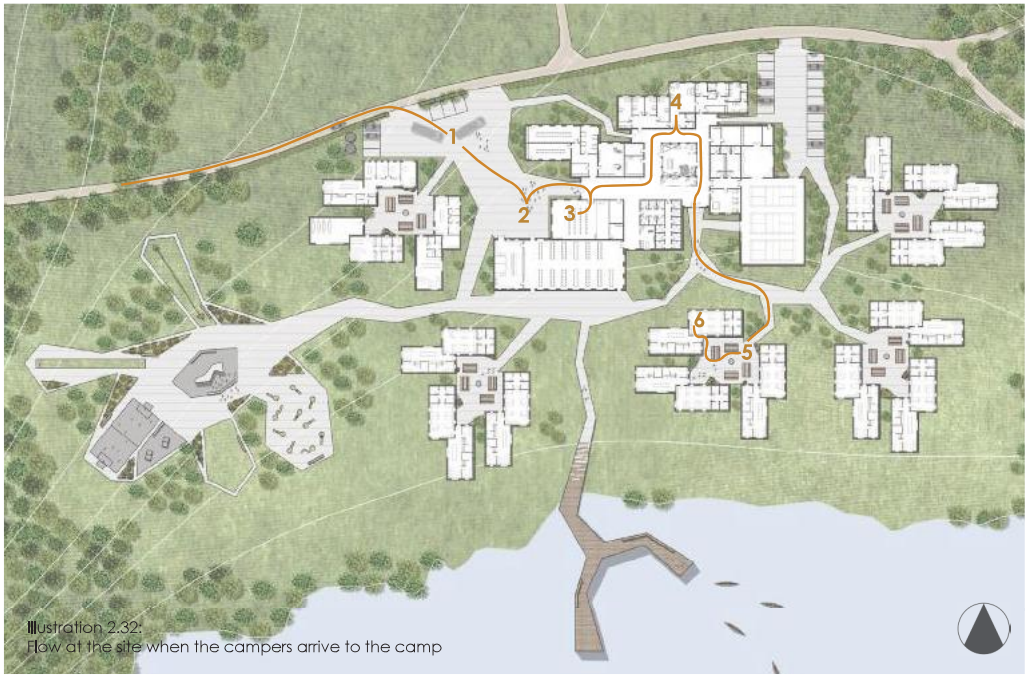


Illustration 2.32:
Flow at the site when the campers arrive to the camp

PARKING

1. When arriving at the site it will either be by car or bus **2.** The bus or **3.** car will park and drop of the camper **4.** take a turn and drive the same way back as they came from. Along the sport activities, **5.** a parking space for persons working in the administration is placed. This means that the flow from traffic will only placed in the northern part of the site as shown at the illustration.

Illustration 2.33:
Traffic flow regarding to parking at the site

DURING A CAMP DAY

1. A given day at the camp starts in the houses. The campers wake up and take a shower **2.** Afterwards the campers are ready for breakfast in the common dining hall in the main building. Here the overall program for the day will be presented. **3.** After breakfast activities are held in some of the common workshop rooms in the main building. **4.** Before lunch it is time for outdoor activities at the activity area, which is placed at the western part of the site. **5.** There is several options for where to have lunch, but the most used one is the dining hall. **6.** After lunch it is time for relaxing in the different houses, to gain energy. **7.** After a short break the activities will continue with sport activities **8.** followed by afternoon coffee at either the dining hall, the courtyards by the houses or the common terrace in front of the dining hall. **9.** Afterwards it is possible to go fishing or canoeing at the lake before **10.** dinner. **11.** After the meal the campers has time to relax in the reflection room. **12.** The day will be concluded by a theatre play, which the campers have practised the day before. **13.** After a long day it is time to say goodnight and go to sleep in the houses.

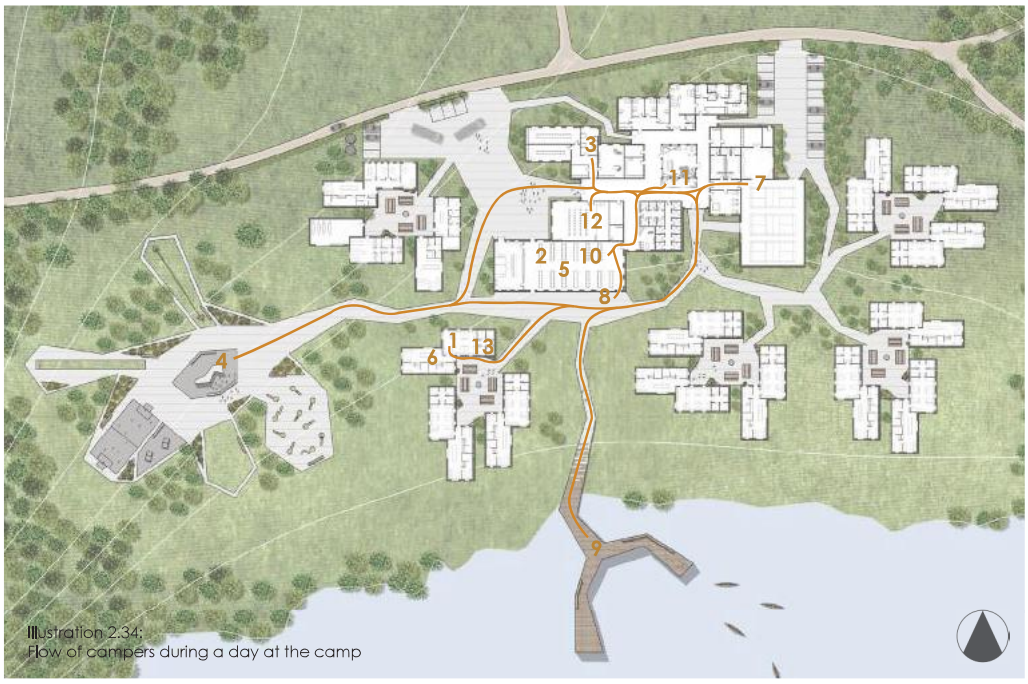


Illustration 2.34:
Flow of campers during a day at the camp

DAILY LIFE

1. During daily life people visiting the site arrives at the camp the same way as anyone else. **2.** They park the car or van and **3.** address the administration, which is placed just next to the guest parking. **4.** As an example it could be an external person attending a meeting or delivery of goods for the kitchen, 5. before leaving the camp. In this way the traffic, during daily life, will also only be situated at the northern part of the site, which makes more space for green areas.

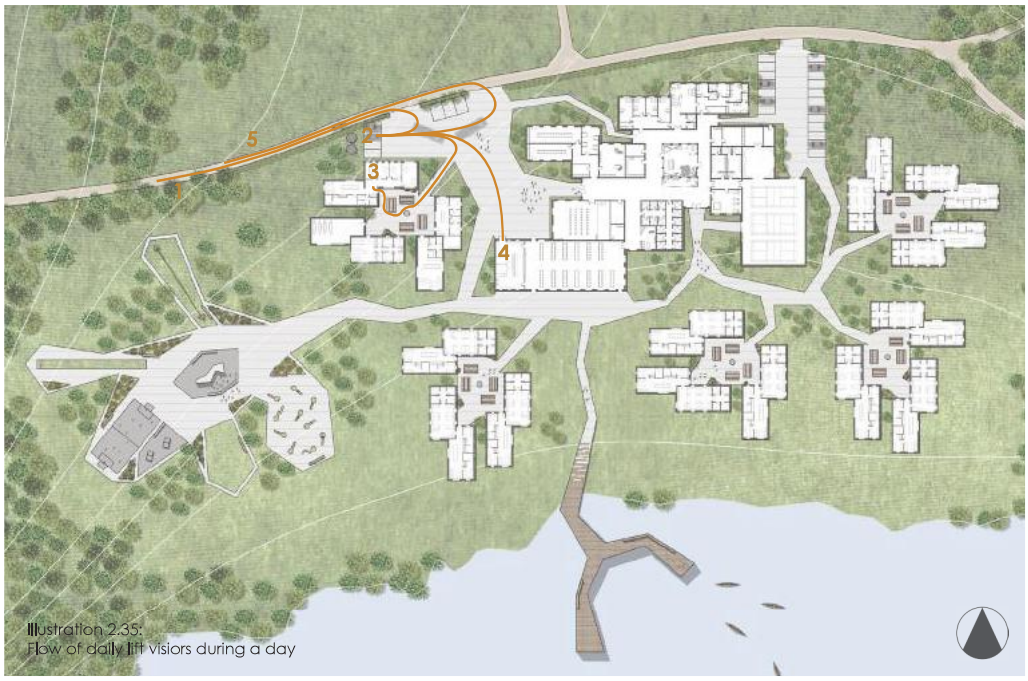


Illustration 2.35:
Flow of daily life visiors during a day

SECTION

SITE - FROM NORTH TO SOUTH

The section goes from north to south (see illustration 2.36). From the left the waiting room is placed, then the courtyard and finally the reflection room. The sports facilities can be seen in the background. On the right, the section goes through a cluster of houses. In the first house the section cuts through the living room and one of the volunteer's bathrooms. The sections continue through the volunteer's bedroom, the entrance and the camper's dormitory in the last building.
In this section the volumes of the different buildings are seen together with the very flat terrain, which only decreases with two meters in total from the road to the lake.

Illustration 2.36:
Section North - South

Illustration 2.37:
Illustration shows where the section is from

SITE - FROM WEST TO EAST

The section goes from west to east (see illustration 2.38). From the left the section cuts through the administration cluster. First the externals house and then the volunteers lounge. The cut also goes through the main building where the kitchen and the dining hall is seen, followed by the sports activity. On the right the section cuts through another cluster of houses. First the camper's bathrooms and then their dormitory.
This section also shows space in between the building volumes and the height difference from the main building to the house. The terrain decreases with four meters in total from west to east.

Illustration 2.38:
Section West - East

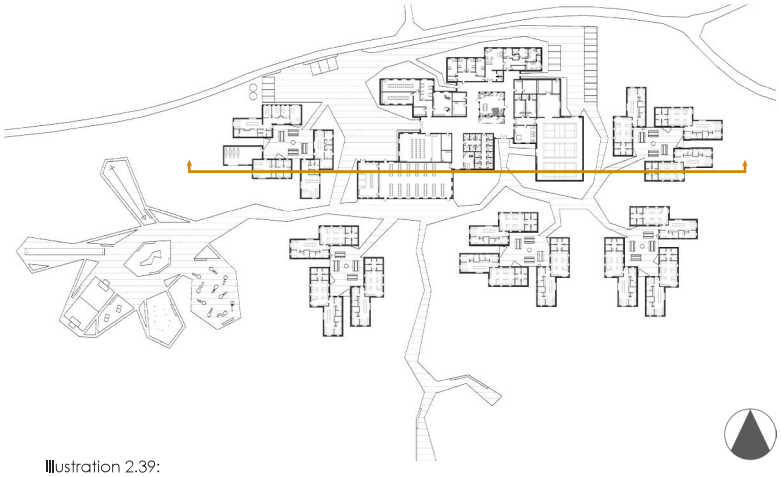


Illustration 2.39:
Illustration shows where the section is from

HOUSE - FROM NORTH TO SOUTH

This section cuts through a cluster of houses from north to south (see illustration 2.40). The first room the section cuts through is the camper's dormitory. Here a part of the private niche can be seen. The other building cuts through the volunteer's bedrooms and their private bathrooms. In between the buildings, the courtyard is shown with the third house in the background.

Illustration 2.40:
Section North - South

Illustration 2.41:
Illustration shows where the section is from

HOUSE - FROM WEST TO EAST

This section cut is made from east to west, with direction towards the lake (see illustration 2.42). From the left the section cuts through the living room and one of the volunteer's bedrooms. The other building is cut through one of the volunteer's bathrooms and the living room.
This section also shows the room between the two building volumes.

Illustration 2.42:
Section West - East

Illustration 2.43:
Illustration shows where the section is from

CONSTRUCTION

DETAIL: SECTION OF THE FUSED BUILDING VOLUMES

The buildings consists of two building volumes which is fused and pose the frame for the campers stay. Illustration 2.44 is a detailed section through the campers bedroom, the entrance and one of the volunteers bedroom.
The roof is built up with a combination of a scissors and fink truss. The scissors truss give a high ceiling and a feeling of spatiality to the room. The fink truss is added to the scissors truss and is used for a lower ceiling height.
Since the sloped ceiling in the campers bedroom and in the living room has a negative influence on the acoustic environment, the ceiling in the campers bedroom and the living room is made with acoustic regulation materials which among others ensures that the reveberation time is obeys with DS 490:2007 and do not exceed 0,6 Seconds. In appendix D a reveberation calculation for the campers bedroom and living room can be found. See also illustration 2.63 page 84 of hidden gutter for a more specific description of the ceiling construction.

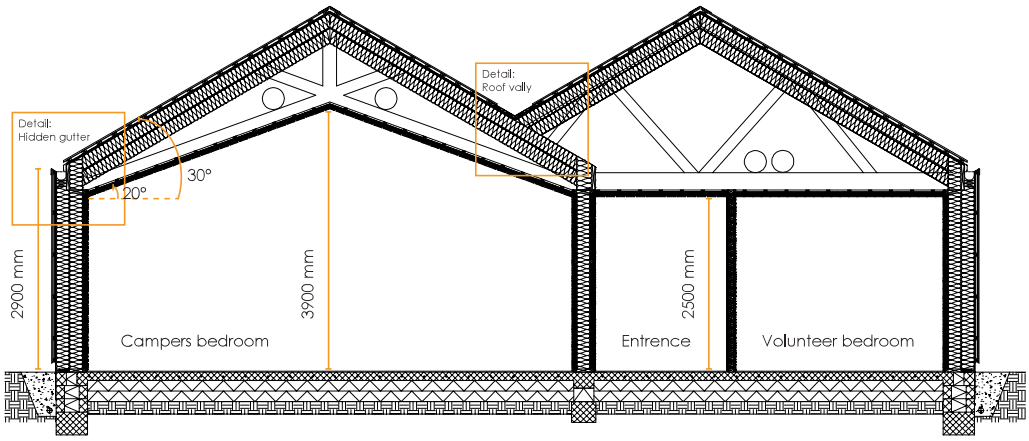


Illustration 2.44:
Section detail through building volumes. For more specifications see drawing folder.

DETAIL: LIVING ROOM AND VOLUNTEERS BEDROOM

A spatiality is wanted for every room. However, a high ceiling gives another spartial feeling than a horizontal ceiling does. A walk through the house or the main building will give different experiences due to the high ceiling. Rooms with high ceilings also has a larger volume which can be one af the parameters to abate the risk of overheating. In the volunteers bedroom and the appertaining bath rooms, as well as the entrance, there is a lower ceiling height (see illustration 2.45). Because of the rooms floor area and the use of the room, a high ceiling is not suitable due to the rooms proportions. Above the lowered ceiling the ventilation ducts can be placed.

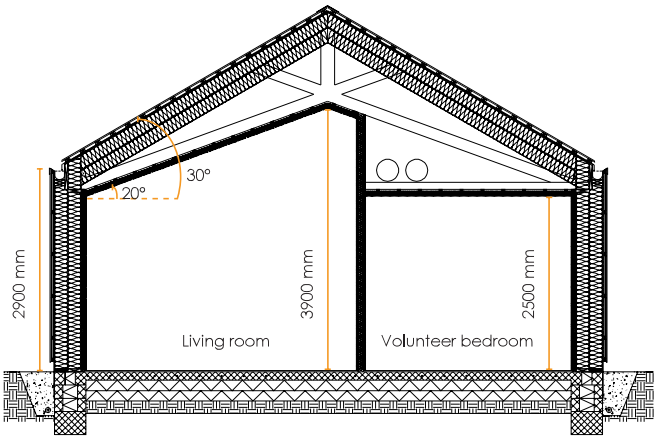


Illustration 2.45:
Section detail through living room and volunteers bedroom. For more specifications see drawing folder.

ELEVATION

NORTH

Illustration 2.47:
Shows where the elevation is taken from

In this elevation the facade towards north can be seen at illustration 2.46. It is the north façade the campers meet when walking to and from the activity area. The windows at the facade is, from the left, the camper's bathroom and dormitory and then one of the big windows in the living room.

Illustration 2.46:
North Elevation

SOUTH

Illustration 2.49:
Shows where the elevation is taken from

The elevation at illustration 2.48 is seen from the south. The right part of this elevation can be seen when standing in the courtyard. The windows are, from the left, the volunteers' bedrooms and baths and then windows into the campers' dormitory. This elevation also shows the different opportunities for flowers in the flower bed.

Illustration 2.48:
South Elevation

WEST

Illustration 2.51:
Shows where the elevation is taken from

This elevation at illustration 2.50 shows the west gables. The big windows in the façade shows that these rooms have prioritized a view towards nature. The two biggest windows are made as a sitting place in the camper's dormitory and the living room. The room behind the last window is a bedroom for the volunteers. Above the small window, the facade is perforated for inlet to the ventilation unit.

Illustration 2.50:
West Elevation

5m 10m

EAST

Illustration 2.53:
Shows where the elevation is taken from

The east elevation at illustration 2.52 shows the entrance door and a window to the volunteer's bedroom. The closed gable is what the campers meet when approaching the cluster of houses. The gable is closed to indicate, that when entering into the courtyard it becomes more private. However, everyone is welcome in the courtyard. The left side of the elevation can be seen when standing inside the courtyard, which is also indicated by the flower bed. Above the window to the volunteer, the facade is perforated for inlet to the ventilation unit.

Illustration 2.52:
East Elevation

MAIN BUILDING

This elevation is the south elevation of the main building (see illustration 2.54). Here it is shown that the main building is designed on the basis of the same parameters as the houses. This elevation is the one that meet the campers when they have been at the jetty for either fishing, have been on a canoe trip or just have had a break at the water front. From the left it is first the windows to the kitchen, afterwards the many windows to the dining hall. Followed by the relaxing room and then the entrance to the main building. This entrance will be the main entrance when the campers are on the camp. After the entrance the wellness and sports hall is seen.

Illustration 2.54:
South elevation of the main building

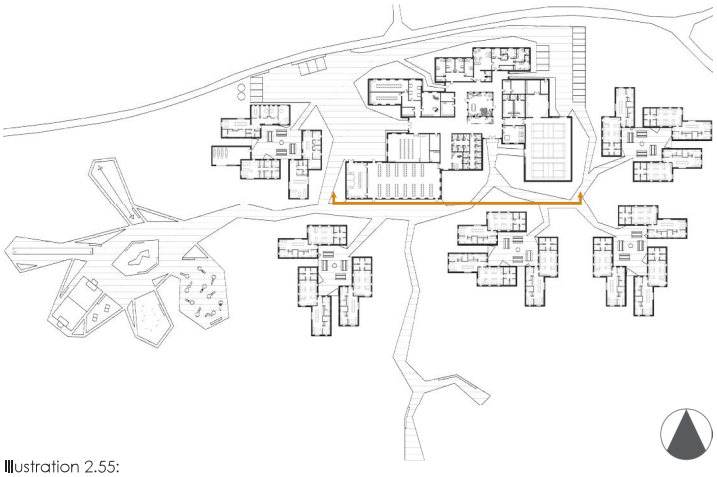


Illustration 2.55:
Shows where the elevation is taken from

ENERGY CONCEPT

BE15

To reach the Building Class 2020 with an energy use which does not exceed 25 kWh/m^2 - year a Be15 calculation is made. Due to the indoor climate where category 1 corresponding to DS/EN 15251:2007 have to be fulfilled and a period of use there differ from the building regulations (BR15 chapter 7.2.3 subsection 3) and SBi 213 p. 15 it is allowed to add a subsidy. The subsidy varies from building to building regarding to the orientation on the site. The orientation of the building have influence on the windows conditions.
By looking at the energy contribution to the building it can be decided which renewable energy technologies theres is most efficient to use to fulfill the requirements for a zero energy building. To cover the energy used for heating a brine to water heat pump is installed in every building. It also means that the site do not need to be connected to the district heating. Due to the fact that a heat pump needs electricity, solar cells are implemented as an other active strategy. The solar cells is covering the buildings total electricity demand. Due to Excalicares *no mobilephone and other electric appliance policy* for campers, it means that the solar cells in the houses only have to cover lighting, heat pump and mechanical ventilation units. Calculation for solar cells can be found in appendix E and specific numbers from Be15 can be found in appendix F.

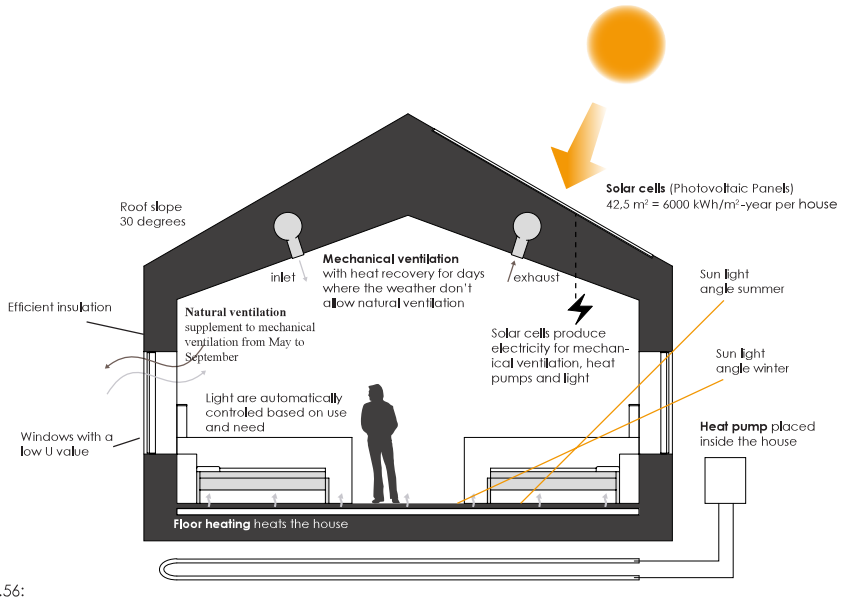


Illustration 2.56:
Energy concept for the houses.

INDOOR ENVIRONMENT

BSim have been done to find the right size of the windows, so overheating hours can be prevented and to fulfill category 1 CO_2 requriements corresponding to DS/EN 15215:2007. BSim is also used to find the ventilation rate in the different rooms as the indoor environment is an important parameter for this building so the campers will feel comfortable.
The illustration below shows the amount of hours with temperatures above 26°C and 27°C and the CO_2 level for each bedroom and living room in one of the houses. Corresponding to category 1 the CO_2 is recommended not to exceed 350 ppm above the outdoor level [Dansk Standard, 2007], which for this project is estimated to be 400 ppm [Teknologisk.dk, 2016]. In interaction with the houses orientation some of the windows must have a lower g-value to maintain the reqirements and other windows can have a higher transmittance and let the solar heat gain into the room.
For more specific datas and other BSim results see appendix G.

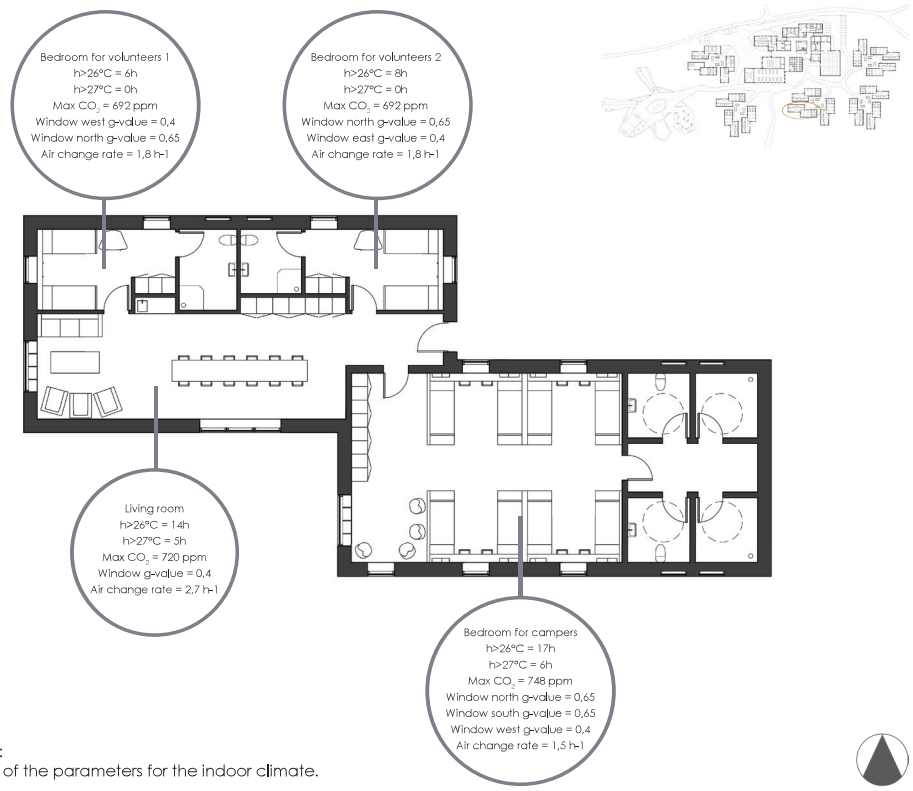


Illustration 2.57:
Result of some of the parameters for the indoor climate.

TECHNICAL STRATEGY

VENTILATION

For the buildings a hybrid ventilation system is used. This means a combination between mechanical ventilation and natural ventilation. Mechanical ventilation is used throughout the year and has a heat recovery system which, saves energy for heating up the inlet air in winter time. Mechanical ventilation is also used to ensure a good indoor environment. The operation principle with a constant air volume (CAV) is used in the bedrooms for the volunteers where the ventilation rate is under 72 m^3/h and the variation of the required level of ventilation is almost the same during a day. The bedroom for the campers and the living room is used more diverse and is therefore controlled by a variable air volume (VAV). The ventilation system in the houses is balanced which mean that the total inlet and exhaust is equivalent. For the bathrooms and lavatories there is only exhaust at 15 l/s and 10 l/s respectively corresponding to the Danish Building Regulations. Due to the small ventilation rate in the volunteers bedrooms only inlet occurs. Because not all the air will be exhaust through the appertaining bathroom the total exhaust from the living room will be equivalent to the inlet in the living room and the rest of the air from the volunteers bedrooms. At illustration 2.58 the principle of the ventilation can be seen.

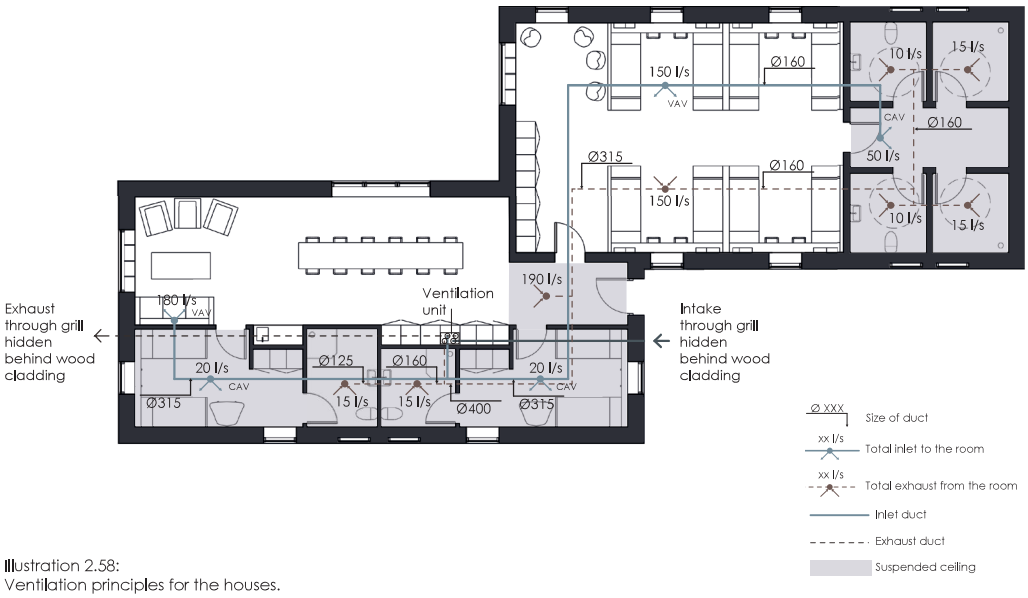


Illustration 2.58:
Ventilation principles for the houses.

For a good thermal indoor environment in summertime (from May to September) cross- and single-sided natural ventilation is used as a supplement to the mechanical ventilation in the buildings.
In the houses the chosen ventilation system is a central ventilation unit which can be installed in one of the cabinets in the entrance. A central ventilation unit for mechanical ventilation is also chosen for the main building due to a larger amount of air volume. The building is divided into five ventilation zones where the units is located above suspended ceilings (see appendix H for illustration for both the administration cluster and the main building).
Both in the houses and the main building the exhaust and inlet for the mechanical ventilation system is placed in the buildings gables. To make it seems that the facade is continuous from bottom to top the vent valve is placed behind the facade material (see illustration 2.59 and 2.60). This means that the facade material is perforated those places where the vent valve is placed.

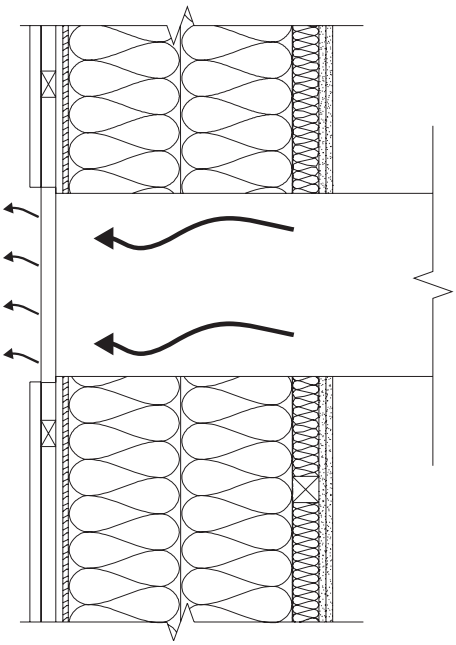


Illustration 2.59:
Princip for exhoust through external gabel wall.

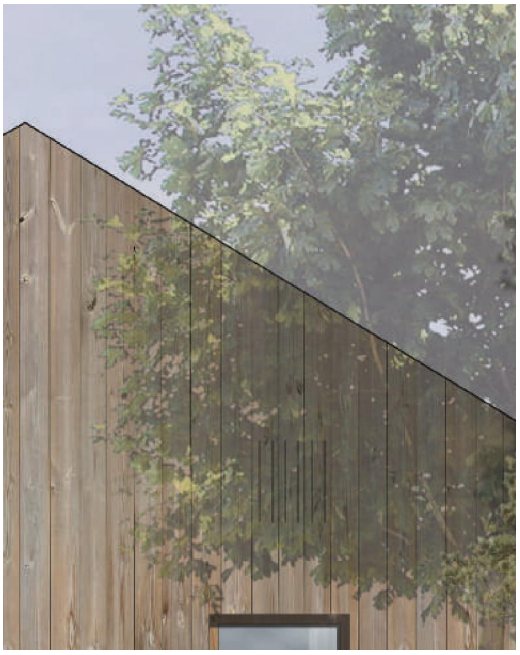


Illustration 2.60:
Princip for perforated cladding

FIRE PLAN

The buildings is designed for usage category 6 according to the Danish Building Regulation chapter 5.1.1 subsection 1. Most of the campers is, in the case of fire, capable of bring themselves to a safe place, but some of them might have a disability and is therefore not able to bring themselves to a safe place. [Bygningsreglementet.dk, 2016]. At illustration 2.61 the escape routes in the houses are shown as well as the rescue openings in the different rooms. In appendix I escape routes can be seen for the administration cluster and the main building. In case of fire, the living room will function as an escape route. Therefore, as seen on illustration 2.61, the houses is divided into four fire compartments, campers dormitory, living room and volunteers bedrooms respectively.
Corresponding to SBi 230 the maximum distance to a fire exit must not exceed 25 meters. In the main building escape routes is arranged so they lead to the nearest fire exit without exceeding the 25 meters.

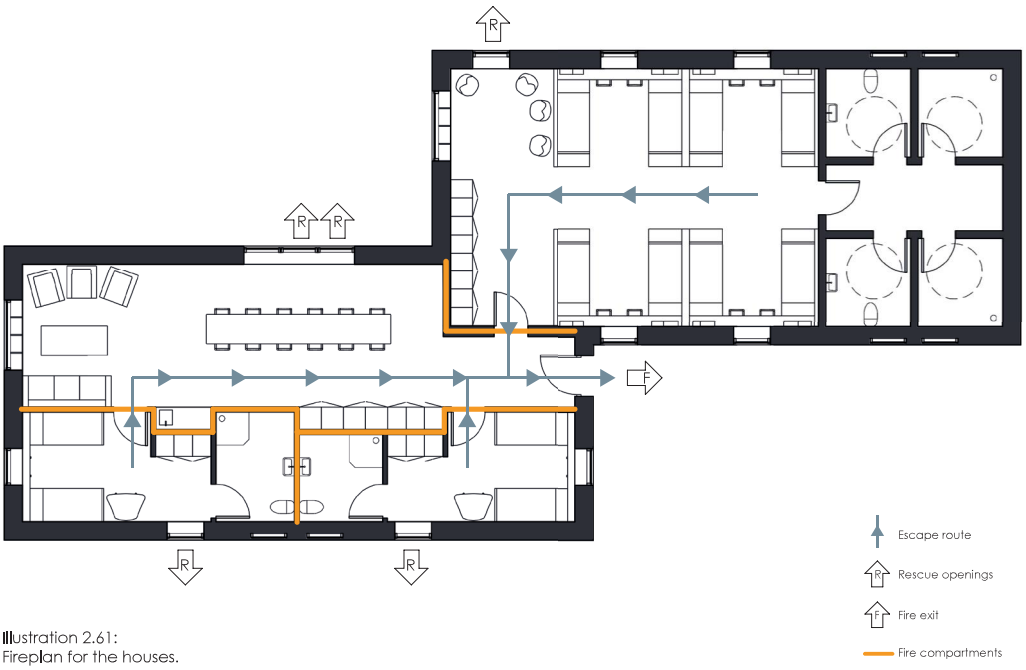


Illustration 2.61:
Fireplan for the houses.

DETAIL: FOYER ROOF ATTACHED TO BUILDING VOLUME

At the main building the foyer has a flat roof which is binding the four building volumes together. The detail (see illustration 2.62) shows how the flat roof is attached to one of the building volumes. The asphalt roofing is chosen to give a contrast but also to emphasize the other volumes.

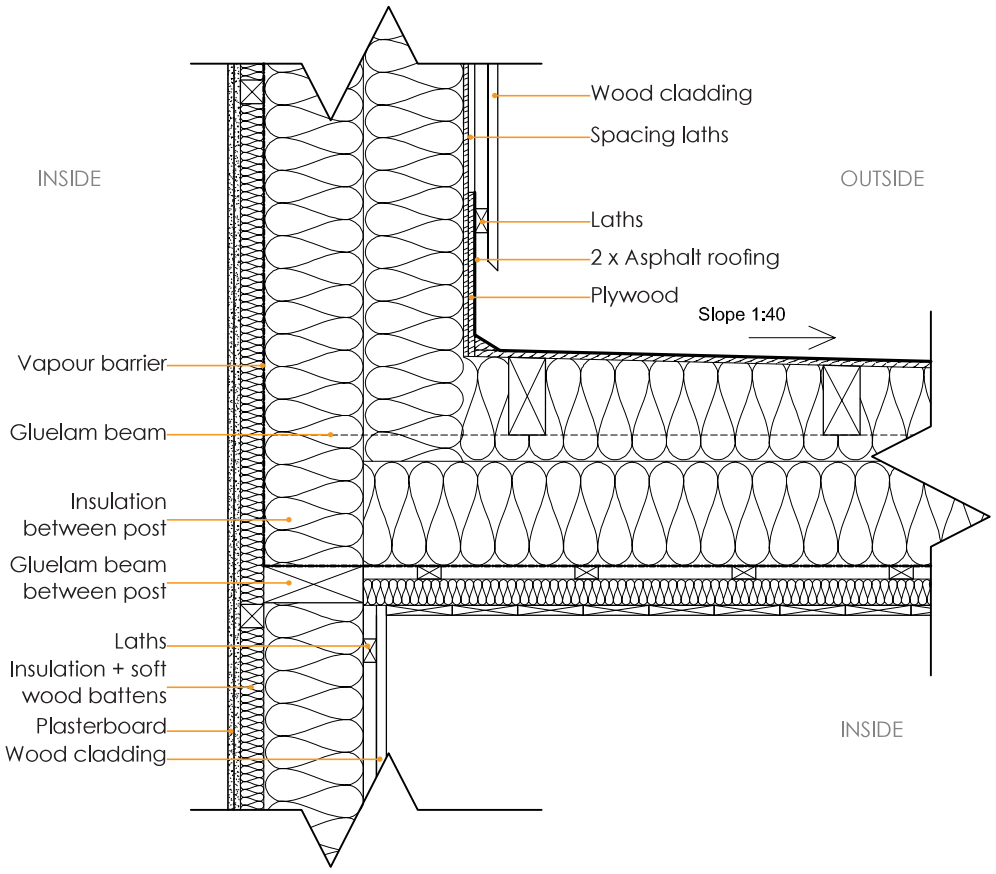


Illustration 2.62:
Detail of the meeting between wall and flat roof. For more specifications see drawing folder.

DETAIL: HIDDEN GUTTER

To maintain a strict building volume and to keep a simple expression of the houses the gutter is hidden behind the wood cladding as see in illustration 2.63. To prevent leaf and other organic materials to block the gutter a fine meshed gutter net is applied at the top of the gutter. This will also do the maintenance more simple.

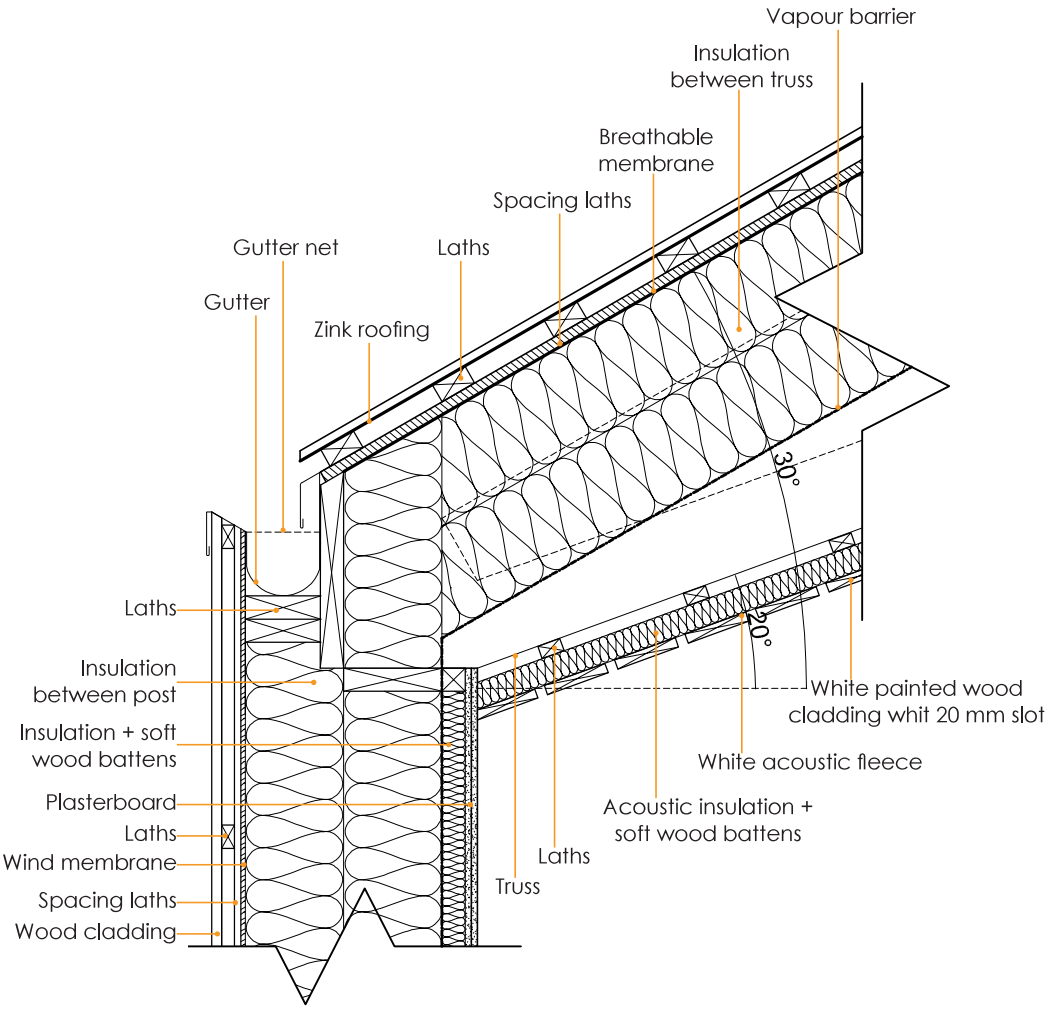


Illustration 2.63:
Detail of hidden gutter. For more specifications see drawing folder.

DETAIL: ROOF VALLEY

The building volumes are fused. Where the roofs meets eachother there is a need for a valley to collect the rain water so it can be directed to one of the hidden gutters as see at illustration 2.64.

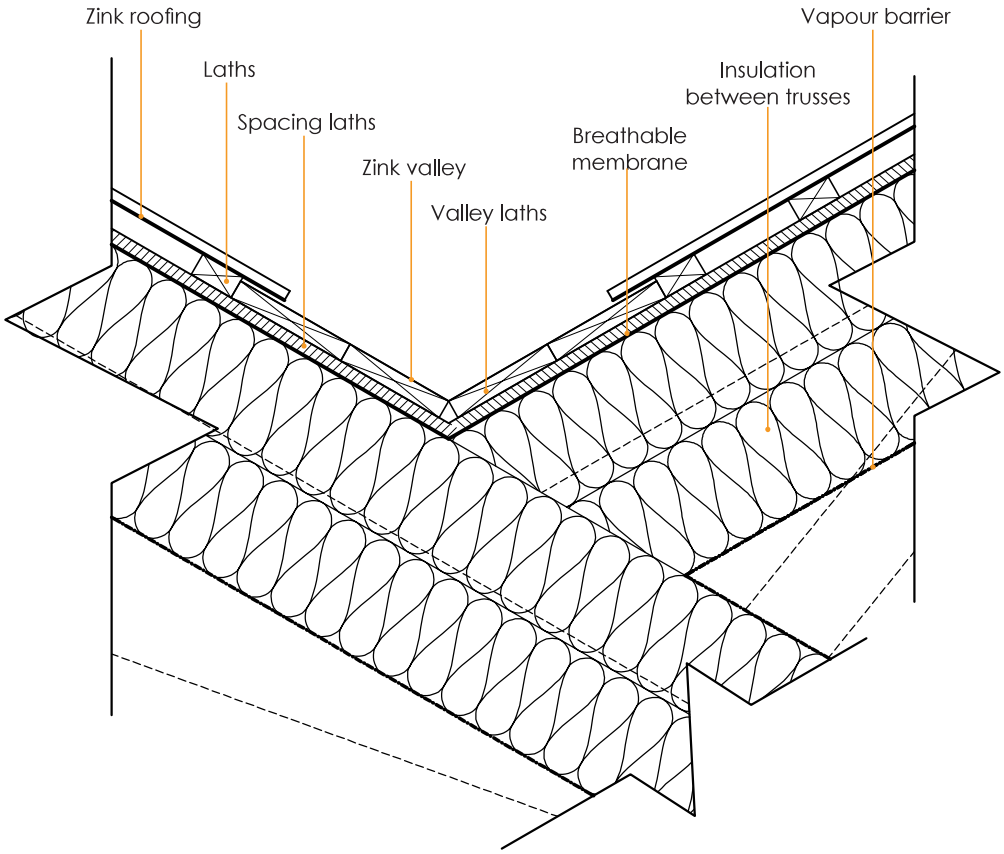
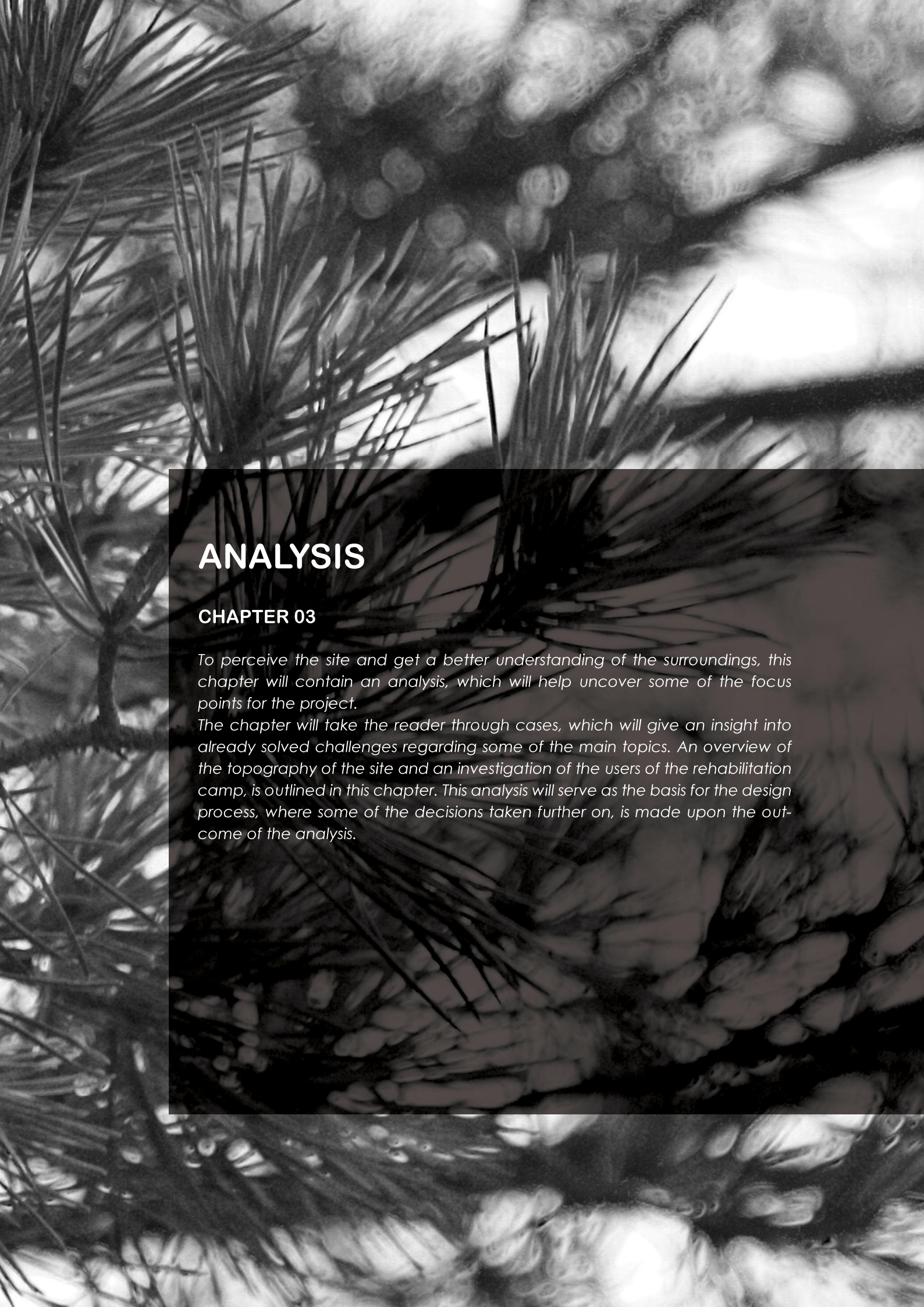


Illustration 2.64:
Detail of the meeting between the two roofs. For more specifications see drawing folder.

Illustration 3.1:
Closeup of a tree in the surroundings.



ANALYSIS

CHAPTER 03

To perceive the site and get a better understanding of the surroundings, this chapter will contain an analysis, which will help uncover some of the focus points for the project.
The chapter will take the reader through cases, which will give an insight into already solved challenges regarding some of the main topics. An overview of the topography of the site and an investigation of the users of the rehabilitation camp, is outlined in this chapter. This analysis will serve as the basis for the design process, where some of the decisions taken further on, is made upon the outcome of the analysis.

CASE: BARRETSTOWN, IRELAND

Rebuilding lives affected by childhood illness

Barretstown is a registered charity in Ireland, England and Spain. It is a camp for children and their families who lives with a serious disease. The charity was founded in 1994 by Paul Newman. He had a vision for how incredible it could be if a child living with a serious disease had the chance to simply be a child. The opportunity to just have fun. Therefore, he started a camp where children could be children [Barretstown, 2016].

"Hospitals treat the illness, Barretstown treats the child"
[Barretstown, 2016]

The camp is charge free for the participants. Barretstown is recognized as a center of excellence in childhood cancer care together with other disease. Their mission is to regenerate the life for children together with their families [Barretstown, 2016].

THERAPEUTIC RECREATION

Barretstown have their own model of Therapeutic Recreation. The model is inspired by elements from many different aspects, for example Recreational Therapy, Psychology, Occupational Therapy, Adventure Based Counselling and Education. Basically Therapeutic Recreation is to give the campers the control of their life back [Barretstown, 2016]. The program is designed individually for every children and their family. The aim is to ensure that the campers achieve or regain the understanding of their own ability. Furthermore, the aim is to make informed choices of other aspects of their lives, which many of them have experienced because of a disease. The lost control could for example be in relation to diminish self-esteem, body image, confidence and coping skills [Barretstown, 2016].

By using Therapeutic Recreation, the campers will be empowered and encouraged individually. By stepping out of the comfort zone the campers rebuild their confidence, self-esteem and trust and discover something new about themselves and their ability (see illustration 3.2). They learn to try something new, to challenge themselves in a fun, safe and supportive environment. These challenges are met with success, as Therapeutic Recreation is learning through fun [Barretstown, 2016].

Illustration 3.2:
The different zones the campers are going through.

CHALLENGE: In Barretstown there are three different zones to help understand the range of challenges for an individual. Comfort Zone is the comfortable activity. Stretch Zone is where the campers are comfortable enough to try the activity and also learn something new about themselves. Panic Zone is where the campers are very stressed and panicked by the activity, this is a zone no one should be in [Barretstown, 2016].
SUCCESS: At Barretstown every challenge is met with success. The activities are made in a way that everyone can be a part of it, even though at different stages. The most important part is that everyone experience success and are able to put a positive label on the activity [Barretstown, 2016].
REFLECTION: Reflection makes a success into a positive experience in a child's mind. This zone is the key to self-discovery and increased self-confidence. At the camp, they discuss the success with the campers to show them, that it is themselves which have succeeded [Barretstown, 2016].
DISCOVERY: Discovery is the only zone the campers will not see at the camp. First when the campers are home, they will tell friends and family how brave they were or what they have learned about themselves. Basically the campers will reflect upon the activities and the experiments. Hopefully the campers self-esteem will grow and there will bee a change in the confidence after the campers have participated in the camp [Barretstown, 2016].
FUN: Fun is the driver in a camp like this. At Barretstown every activity is centralized around fun. Fun also ensure that the campers are involved and engaged in the activities [Barretstown, 2016].

ZERO ENERGY BUILDING

When a building is designed with a low energy demand and the energy used for running the building (including building operation, user related behaviour, construction and maintenance of the building) is covered by renewable energy sources the building can be categorized as a Zero Energy Building (ZEB) [Brand et al., 2014].

"Zero energy buildings, ZEB, are buildings designed for a very low energy demand, and are using zero fossil energy based on an optimal combination of energy savings and supply of renewable energy from electrical and thermal network or from on site."

[Brand et al., 2014]

To create a ZEB in Denmark, there are some measurements which has to be taken into consideration. First of all, the building has to be firmly insulated in order to reduce the heating hours [Bejder et al., 2014]. Furthermore, when reaching for a ZEB the building will also fulfill the 2020 requirements according to building regulation.
Since the building is highly insulated with a low infiltration, the internal heat gains and the radiation through the glazing facades will heat up the building which might cause overheating hours. This can be solved with passive solutions, active solutions or a combination of both [Bejder et al., 2014].

PASSIVE SOLUTIONS

- Passive solar heating
- Shading integrated in windows
- Exposed thermal mass to store heat
- External solar shading
- Natural ventilation

ACTIVE SOLUTIONS

- Solar collectors
- Solar cells (Photovoltaics)
- Heat pumps
- Mechanical ventilation
- External mechanical shading

[Bejder et al., 2014]

In this project it is therefore necessary to install passive solutions sush as natural ventilation and passiv solar heating. The site beyond reach for district heating. Heat pumps shall be installed in the buildings to cover the heat losses. To cover

the energy demand for electricity solar cells (photovoltaics) have to be integrated in the building design.

A ZEB must also be designed with a good indoor environment where temperature, air quality, daylight and acoustics is in focus in respect for the user [Brand et al., 2014]. Here mechanical ventilation will be used to control the indoor atmospheric and thermal comfort. When designing a building for children who have had cancer or maybe still is in the final stage of their treatment, those parameters for the indoor environment is important. This also leaves high expectations for the building which means the design shall be qualified by category 1 corresponding to DS/EN 15251:2007 standards.
The residential buildings will be designed to fulfill an operative temperature in wintertime of minimum 21°C and in summertime a maximum temperature of 25,5°C [Dansk Standard, 2007]. According to requirements in the Danish building regulations it is not allowed in the period of use to exceed 100 hours per year with a indoor temperature above 26°C and 25 hours per year with a indoor temperature above 27°C [Bygningsreglementet.dk, 2016].

Daylight is also an essential element according to a good indoor environment. Therefore, the daylight factor (DF) at the camp is set to 5% in the houses. The total area requirements of a DF at 5% 850 mm above the floor is specified in the room program.

According to ventilation is it important to ensure the right air speed and temperature so the campers not feel discomfort due to example draft. At a rehabilitation camp noise plays a big role. If the noise is too loud the campers will be more exhausted. Interior acoustics should not be the reason why the campers loses energy and gets tired. [Christensen, R. T and Støve, H. K. (ExcaliCare), 2016. Introduction meeting]. Therefore, focus is on using good acustic materials in the rooms there is most critical exposed for noise, such as the living rooms, dormitoryies and dining hall.

HANDICAP STANDARD

At the first Cool Camp EcxaliCare had in 2015, there was only a few children using a wheelchair. To make space for everyone, where everybody can be a part of the camp equally, it is important that the few children that is walking-impaired feel as much a part of the camp than everyone else [Christensen, R. T and Støve, H. K.(ExcaliCare), 2016. Introduction meeting].
To get a better understanding of which conditions the design have to be aware of, a study have been made according to the standard measures for accessibility.

To ensure that a person sitting in a wheelchair is able to get around the building the design have to include space for the wheelchair to turn. The space needed for a wheelchair to turn 90 degrees is minimum 1,4 x 1,4 meters and 1,5 x 1,5 meters for a turn on 180 degrees (see illustration 3.3) [Sigbrandt and Jensen, 2008]. A wheelchair by it self with the user is 0,75 x 1,20 meters (see illustration 3.4) [Danish Standard, 2001].

The width of the door has to be designed a bit bigger than normal to ensure enough space for walking-impaired people. It is recommended that at least one door to each room have a free opening on minimum 0,9 meter (see illustration 3.5). This will be enough space for a person in wheelchair to pass through without any problems [Sigbrandt and Jensen, 2008].

A bathroom for people with disability have to be design a bit bigger than a normal bathroom because there have to be space for a wheelchair to get around [Hfb.dk, 2016]. It have therefore been an important knowledge for the further design to know the minimum value for a handicap bathroom (see illustration 3.6).

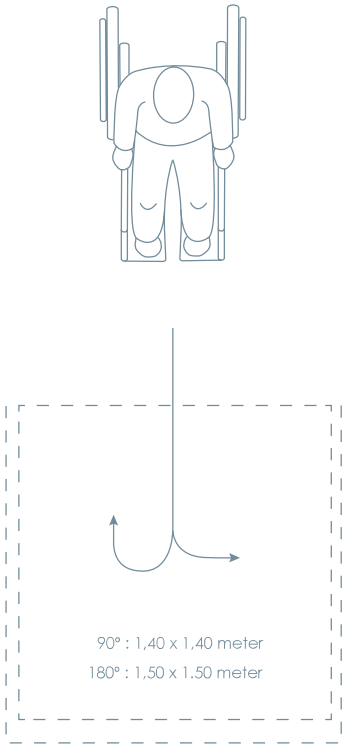


Illustration 3.3:
Turning point for a person in wheelchair

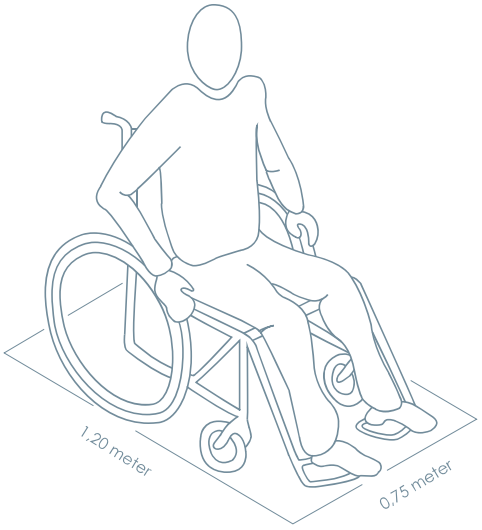


Illustration 3.4:
The space a wheelchair with a person take up

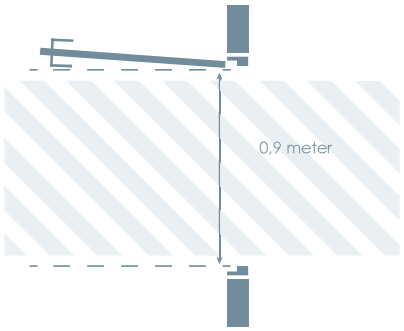


Illustration 3.5:
Needed space with a hinge door

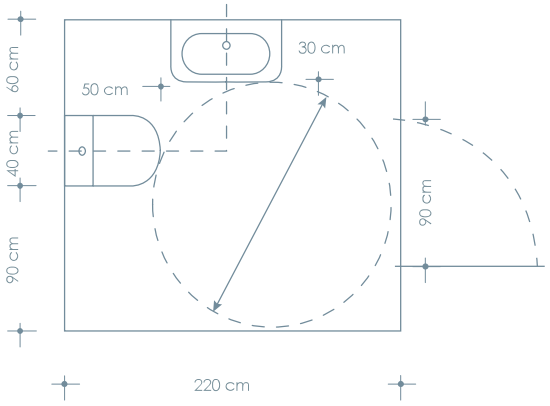


Illustration 3.6:
The needed space at a bathroom

USER PROFILE

As the architecture is playing a larger role for the users it is essential to have a look at the profile of the users. The rehabilitation camp is mainly for young people who have had cancer, but also their siblings. In the future the rehabilitation camp shall also provide room for the whole family and children with other childhood illnesses [Christensen and Støve, 2015]. As the focus is on the children the profile description will be about them.

YOUNG PEOPLE WHO HAVE HAD CHILDHOOD CANCER

The young people experiences a time of change when they have cancer and is in treatment. Often the self-esteem and self-confidence is adversely affected and it can be difficult for the young to return to the life they had before cancer [Jensen, 2016].

The illness leaves its imprint on body and soul. Some young people have physical changes when they have lost a leg or an arm. And some is also having invisible changes when they suffer from fatigue or constant pain. These young people have to accept the changes that cancer leaves them. They are suddenly in a new situation where it will be difficult to rebuilt the life after childhood cancer [Jensen, 2016]. For a more comprehensive correspondence with nurse Lise Jensen see appendix J.

SIBLINGS TO YOUNG PEOPLE WHO HAVE HAD CHILDHOOD CANCER

When a child get cancer it also affects the siblings. In periodes the siblings need to be without their sister or brother and one of their parent. These children is often worried for their sibling who have cancer and can feel the insecurity both from the parents but also from the surroundings [Cancer.dk., 2015]. Therefore, the rehabilitation camp must make it possible for the siblings to gain knowledge and receive relevant tools to deal and live with a brother or sister with cancer [Excalicare.dk, 2016].

The two different user groups have the same need of recovering to get the same life as before cancer. In this project, the architecture shall set the framework for the opportunity to accomplish activities in reflection to Therapeutic Recuperation. Thereby, the young people may recover their self-esteem and confidence. The design for the rehabilitation camp must therefore reflect spaces which encourage to reflection, safety and healing.

Illustration 3.7:
Group picture of campers from Cool Camp'15

SITE

TOPOGRAPHY

The site near Javngyde, Skanderborg, is relatively flat as mentioned earlier (see also illustration 3.8). This is important for the accessibility to the site and therefore also to the final design proposal.
Due to the flat site, there are no need for further terrain regulations, which supports the nature as it is today. The layout of the site also makes it possible to use the qualities of living close to water, such as the exciting reflections just as there often will be a lot of light and it will be possible to have a spacious scenery. The site also brings a lot of qualities into the design according to light and the view towards nature (see an inspirational case at appendix K). For information about other avtivities in the area, a structural analysis is made, see appendix L.

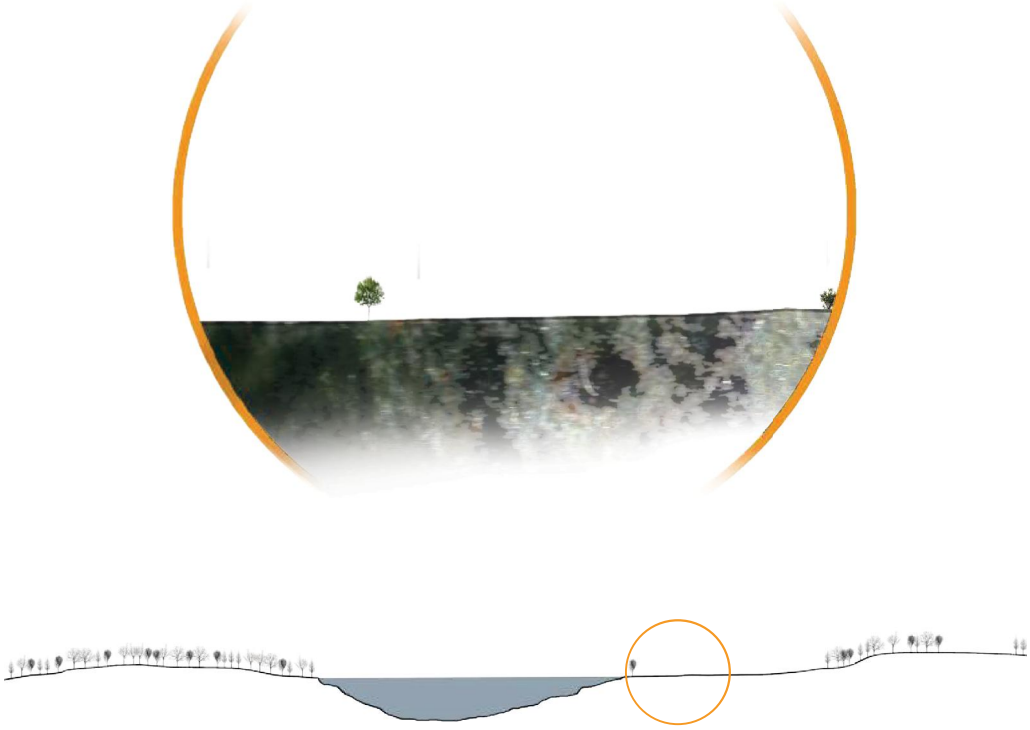


Illustration 3.8:
North-south section of the terrain and the site

CLIMATE

Wind conditions and sunlight is some of the climate conditions which may have the biggest impact on a design when thinking of indoor climate and energy. For the project it is further intended to design engaging outdoor areas which makes it important to be aware of the climate aspects for the site.

SUN

Throughout the year the sun varies in both path and power. It goes from summer days where the sun shines in 18 hours till winter solstice where the sun only shines for seven hours (see appendix M). In winter the sun stands low in the sky which provides long shadows on the ground. This fact is important to keep in mind when designing outdoor spaces.

WIND

The wind directions needs to be taken into consideration, also when placing the entrances and exits to the building.
In appendix M a wind rose from Javngyde indicates wind directions and intensities. The wind diagram shall also be used to get an insight whether it is possible to utilize natural ventilation and thereby take part in a comfortable indoor climate.

Based on the sun path and wind rose illustration 3.9 indicates that the dominating wind directions comes from a south to a westerly direction. Likewise, the solar radiation to the site The site is located in a small valley which may have impact on the movement pattern and intensity especially when the wind meets the hilly terrain [Bjerg, 2012]. The site is open from the southern side with only a few trees and some shrubbery to take some of the wind. In the western direction a small forest provides some lee to the site.

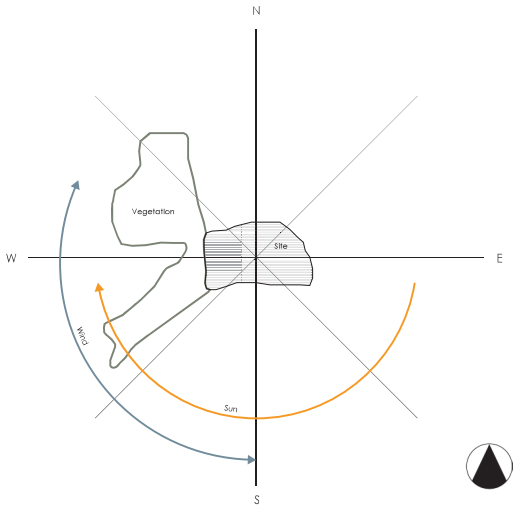


Illustration 3.9:
Compass rose for the site with dominating wind direction, sun path and local vegetation.

PHENOMENOLOGY

In Pallasmaa's "The eyes of the skin" it is express how all senses modalities when going through a forest. Nature has an invigorating and healing effect on humans. To get a perception of the room, the eye needs to collaborate with the body and the other senses [Pallasmaa, 2005].

A subjective analysis of the site is made to perceive the spirit, the character and the atmosphere at the chosen site. It is carried out through a phenomenological experience which will help the further design to utilize the qualities of the site. By making the analysis it will be possible to create a design which may be in synergy with nature.

Taking a turn off the highway to drive towards Javngyde is trip into the unsure and unexpected. The drive to the village is a drive through a hilly countryside encircled of trees, where the roads becomes smaller and smaller and the villages one passes only consists of a few houses. Making another turn and driving away from the village, trees are popping up all around in the horisont. Suddenly the road changes to a bumpy gravel road and the landscape once again becomes hilly. On the top of a low hill only 800 meters from the center of the village, Ransø a lake, appears between some trees to the right. An unexpected view as seen on illustration 3.13.
The field are ending directly into a still lake where ducks flutter their wings and fly away when hearing the sound of a buzzing car. A place where crowns of the old trees has grown beyond the shore of the lake and do now have the lengths to see their own reflection in the water. A small place of inner peace where some of the trees has granted their life to the lake and is now growing half on the site and half in the water (see illustration 3.10 and 3.12). A small blaring from the returning ducks makes the eye wander and follow them to a small pond on the other side of the road. A flock of pheasants is uninterrupted trundling over the field and disappears into a shrubbery.

A small row of shrubs separates the site from the gravel road (see illustration 3.11). It appeals to go beyond to explore the area and to find out what this place consists of and to find its many qualities and possibilities. Contrary to the surroundings the site is almost flat which makes it easy to access for almost all persons which is one of the most significant demands to the site. Standing at the

middle of the field there is plenty of space and room for differences. The sun can bury its rays into the field without getting interrupted from high trees and give energy to the different kind of life at the site.

This place which appears to be in the middle of nowhere, is actually not far from everything and will make the breeding ground for a future rehabilitation camp. The site fulfills the requirements there needs to be fulfilled due to the criteria mentioned in the intro - close to nature, potential for a later extension, open spaces and accessibility.

Illustration 3.10:
Site going directly into the water.

Illustration 3.11:
Shrubbery along the road.

Illustration 3.12:
Trees in the water.

Illustration 3.13:
View from the site towards a forest on the other side of the lake.

ROOM PROGRAM

The purpose of the room program is to secure the different areas have the right amount of rooms and facilities (see illustration 3.15 at page 102), some rooms needs to be in close connection, see illustration 3.14 page 101 and illustration 3.15 page 102. In dialogue with ExcaliCare some of the rooms is described to get an idea of what there is expected and which demands there is.

DORMITORY FOR CAMPERS: In the houses 6-8 campers must have their own bedroom and access to two lavatories as well as two bathrooms.

BEDROOM FOR VOLUNTEERS: In the houses there must be two seperate rooms to the volunteers. It is in this way possible to seperate males and females. Moreover, it is also a demand that each of the volunteers bedroom has its own bathroom, which is separated from the campers.

DINING HALL: The dining hall shall be able to contain all attendants at the camp. Meals are taken in the same groups as they lives in the houses. Acoustics has a great importance.

COMMON ROOM: The room will mainly be used for evening activities such as shows and smaller music acts. Therefore, it must be possible to integrate a scene in the room. The room must have the possibility to be black outed.

REFLECTION AND RELAXATION ROOM: The atmosphere is essential for the room as there shall be opportunity for reflection and relaxation. Materiality, colors, light, view and furniture have to be considered in the layout of the room. It shall be a room where everybody is welcome and no one has to ask for permission to enter.

TREATMENT- AND EXAMINATION ROOM: Some of the campers is still in treatment for their disease. Therefore, it shall be possible for nurses or doctors to give medicine to the campers. Likewise, it shall be possible to treat small scratches.

MEDICINE ROOM: The room must be placed near the treatment rooms in the medical house. The room will be used for storage of different medical aids and dosage of medicine. There must be space for refrigerators and sinks.

WAITING ROOM: The room will be used as a type of a waiting room. This is one of the first rooms the campers will see when they are checked in to the camp and needs to hand in their medicine to one of the nurses. Therefore, it shall be possible to sit down before the nurse or doctor picks one up. The atmosphere is essential for the room and must on request appear calm and comfortable.

ADMISSION/OVERNIGHT STAY: In the future the rehabilitation camp shall also be for international campers. In this connection there will be a need for a room where a camper can overnight if he or she gets ill. Danish attendants will in this case be taken to the nearest hospital. Another scenario can be if a camper suffer from homesickness and needs to have an overnight stay near an adult.

ACTIVITIES: On rainy days it must be possible to have indoor activities such as badminton, archery, climbing and wellness among others. Creative activity areas with space for 15 campers and volunteers. One of the rooms shall be used for a photo activity, which means that the room must have a possibility for black out. Another room will be used for music and must therefore be soundproof.

VOLUNTEER LOUNGE: It might be necessary for the volunteers to pull out and rest, or just have the opportunity to watch the news or have a break with some of the other volunteers. The volunteers lounge must therefore appear comfortable and cozy, but still have room for a common meeting.

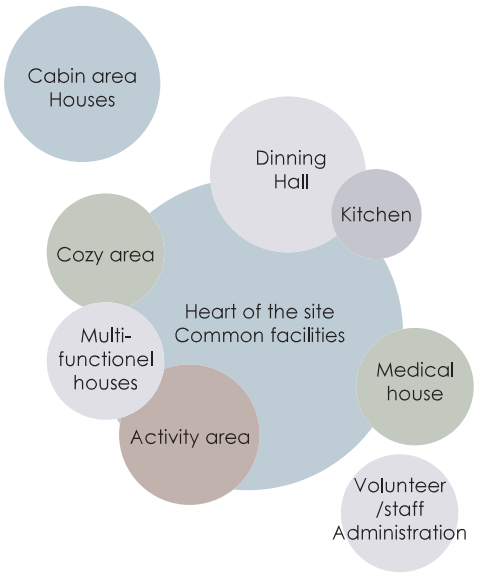


Illustration 3.14:
Connection between the rooms

Function	Units	Unit area min. [m²]	Total area [m²]	Capacity [pers/room]	Min. Ceiling Height [m]	Atmosphere	Importance of external view
HOUSES							
Entrance	1	10	20	-	2,5	Welcoming	Less
Living room	1	30	30	12	3,5	Cosy	Very
Campers dormitory	1	70	70	8	3,5	Calm	Very
Bedroom for volunteers	2	12	24	2	2,5	Calm	Less
Kitchenette	1	3	3	-	2,5	-	Less
Disabled lavatories/bath	4	5[2]	20	3	2,5	-	Less
Lavatories/bath	2	6[2]	12	1	2,5	-	Less
COMMON HOUSE							
Dining hall	1	300	300	150	3,5	Calm	Very
Kitchen	1	100	100	5	3	-	Less
Common room	1	200	200	150	3	Calm	Less
Reflection room	2	25	50	15	2,5	Cozy	Less
Disabled lavatories	12	5[2]	60	3	2,5	-	Less
Cleaning/Depot	1	10	10	-	2,5	Robust	Less
MEDICAL HOUSE							
Treatment room	2	12	24	3	3	Informel	Very
Examination room	2	12	24	3	3	Informel	Very
Medicine room	1	10	10	-	2,5	Robust	Less
Waiting room	1	60	60	20	3,5	Calm	Very
Room/Bedroom	2	9	18	1	2,5	Calm	Less
Admission/Overnight stay	2	9	18	1	2,5	Calm	Very
Disabled lavatories/bath	2	5[2]	10	3	2,5	-	Less
Lavatories/bath	3	6[2]	18	1	2,5	-	Less
Cleaning/Depot	1	5	5	-	2,5	Robust	Less
ACTIVITY AREAS							
Sport activities	1	600	600	150	7[2]	-	Less
Wellness	1	70	70	25	3,5	-	Less
Creative rooms	4	35	140	15	3	-	Less
Changing room	2	25	50	12	2,5	-	Less
ADMINISTRATION							
Open office	1	30	30	4	2,5	Calm	Very
Closed office	2	15	30	2	2,5	Calm	Very
Copy/ archive room	1	8	8	-	2,5	-	Less
Volunteer lounge	1	90	90	30	3,5	Cozy	Very
Bedroom for external helpers	4	9	36	1	2,5	Calm	Less
Lavatories/bath	2	4	8	1	2,5	-	Less
Cleaning/Depot	2	10	20	-	2,5	Robust	Less
Laundry room	1	10	10	-	2,5	Robust	Less
Kitchenette	3	3	9	-	2,5	-	Less

Illustration 3.15:
Room program.

[1] hfb.dk, 2012 [2] Loa-fonden.dk, n.d. [3] Dansk Standard, 2011 [4] DS/EN_15251:2007

Room area above 5% daylight	Light[3] [Lux]	Temperature[4] [°C]	Max. noise[4] level [dB]	Revebera-tion time[5] [S]	Min. air flow[4] rate [l/s]	Comments
-	50	21 - 25,5	-	-	-	-
50 %	200	21 - 25,5	32	0,6	120	-
30 %	200	21 - 25,5	26	0,6	80	-
30 %	200	21 - 25,5	26	0,6	20	-
-	-	21 - 25,5	-	-	-	In connection with living room
-	200	21 - 25,5	45	-	15	-
-	200	21 - 25,5	45	-	15	-
30 %	200	21 - 25,5	40	0,6	1500	-
50 %	500	21 - 25,5	55	-	900	In connection with dining hall
15 %	300	21 - 25,5	40	0,6	1500	-
-	100	21 - 25,5	30	0,6	-	Transparent areas
-	200	21 - 25,5	45	-	15	-
-	200	-	-	-	-	-
30 %	500	21 - 25,5	40	0,6	30	-
30 %	500	21 - 25,5	40	0,6	30	-
-	200	21 - 25,5	-	-	50	-
50 %	200	21 - 25,5	40	0,6	200	-
-	200	21 - 25,5	26	0,6	10	-
30 %	200	21 - 25,5	26	0,6	10	Close to the nurses bedroom
-	200	21 - 25,5	45	-	15	-
-	200	21 - 25,5	45	-	15	-
-	200	-	-	-	-	-
-	300	21 - 25,5	45	1,8	1500	-
-	200	21 - 25,5	45	1,2	250	-
-	200 - 500	21 - 25,5	45	0,6 - 1,1	150	-
-	-	-	40	0,6	120	Close to sports activity and wellness
30 %	500	21 - 25,5	40	0,6	60	-
30 %	500	21 - 25,5	35	0,6	20	-
-	200	21 - 25,5	-	-	-	-
50 %	200	21 - 25,5	30	0,6	300	-
30 %	200	21 - 25,5	26	0,6	10	-
-	200	21 - 25,5	45	-	15	-
-	200	21 - 25,5	-	-	-	-
-	200	21 - 25,5	-	-	-	-
-	-	21 - 25,5	-	-	-	Staff room and offices

[5] DS 490:2007

SUB CONCLUSION

In the analysis different observations is achieved. The chosen site is located in a relatively flat topography surrounded by a forest and placed just down to a lake. The site gives opportunities for outdoor activities at the site and in the water. The site also gives a variety of possibilities to bring the extraordinary surroundings into the building. Because the site is located outside the city it is a peaceful area with no disturbing traffic, only the chirping from birds is filling the air. Still there is only a few kilometers drive to the nearest village with some shops and a small train station. The city also have some activities which could be possible for the camp to use, and likewise the camp could encompass activities, which the citizens could use. In this way the camp may give something back to the area.

To ensure good accessibility for walking-impaired people the aim is to ensure that the building is designed in one level. The flat site also help obtain this demand. It is important that every child have access to the main facilities within the building and do not feel limited by their disability.

The site makes it possible to create a rehabilitation camp with light and open spaces where the users can expand and challenge themselves. This project will create the framework for the rehabilitation camp where Therapeutic Recuperation is the actually rehabilitation for the children through play and learning. This makes them able to learn more about the possibilities to renew life after a recovery from childhood cancer. The wish from ExcaliCare for an opportunity to extend the camp in the future is possible due to the location of the site. The extension is a wish, because ExcaliCare want to create a camp for children with other serious disease. In the long term there will be camps for siblings and the whole family as well.

Sun and wind analysis give the needed knowledge to integrate technical solutions into the building and design a Zero Energy Building. Social and environmental sustainable principles will have the largest impact according to the further design.

DESIGN PARAMETERS

QUALITATIVE

- View to nature from living spaces
- Accessibility for everyone no matter the level of walking-impairment
- Step free access to the building
- Step free access to outdoor open spaces
- Fulfill requirements for handicap standards and walking-impaired

QUANTITATIVE

- Fulfill guidelines for acoustics
- Fulfill Building Class 2020 and make the building a Zero Energy Building
- Integrate passive solutions to the building
- Renewable technology to produce energy on site
- Minimum 30 % of the room area in living spaces must have a daylight factor at 5 %
- Class 1 indoor environment for CO_2 pollution and temperature

DESIGN CRITERIA

MAIN BUILDING

- The entrances may not compete against each other. It has to be clear which entrance is the main entrance
- The administration has to be placed close to the arrival place
- The nature has to be drawn into the building
- The reflection and relaxation room should be designed as an open and accommodating room
- The dining hall should have a view towards the lake
- The kitchen and dining hall should be placed nearby each other
- The kitchen need direct access to the outside
- The sports hall and climbing wall have to be placed in connection to each other to create community
- The medical house should be placed nearby, but still in the background

HOUSES

- The entrance should have the opportunity for storage
- The entrance may not be in the living room, but have to be in connection with it
- The living room may not be a distribution wall
- The living room has to be placed with the opportunity for a nice view towards nature, when every house has been placed on the site
- The volumes create the rooms both indoors and outdoors
- The dormitory may have a big window towards nature
- The bathrooms for the campers have to be placed near the dormitory and need a hall. In this way it is not directly connected to another room
- The bathrooms for the volunteers have to be placed in connection to the bedrooms

Illustration 4.1:
Views of the lake

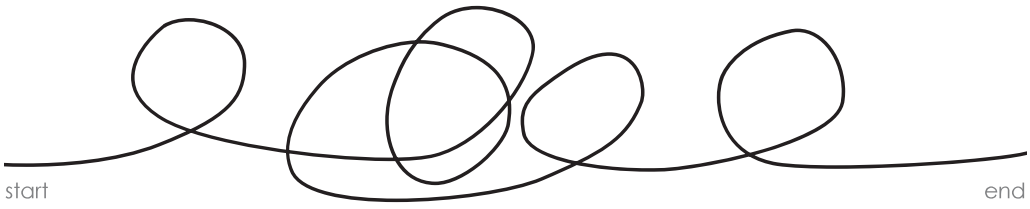
PROCESS

CHAPTER 04

Through this chapter, parts of the design process will be uncovered from the very first ideas to the final design. The project has been created on the basis of an integrated design process, where both technical and architectural solutions melts together to create a whole.

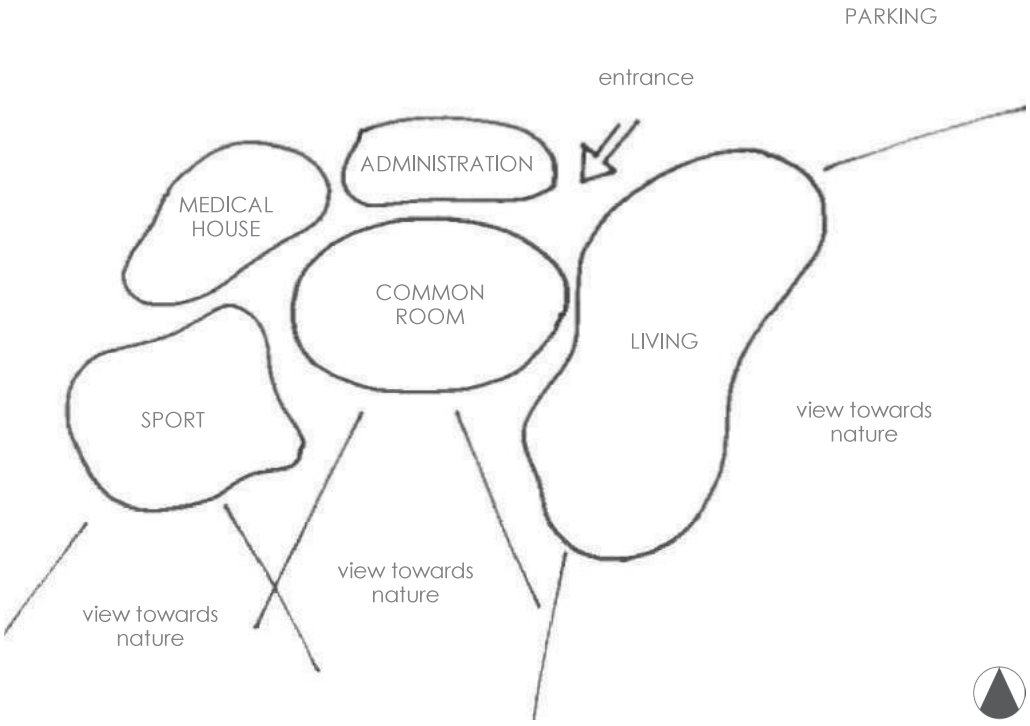
INTRODUCTION

The final design has gone through a comprehensive design process where different throughs and ideas is tested. There have been loops at the process, through the whole progress as seen in the illustration, because many of the areas that have been on the drawing board have influence on each other and therefore also have been design simultaneous. The design process both contain technical and architectural solutions that together create the integrated design process. All illustrations used through the design process is made by the authors of this master thesis.



CONCEPT

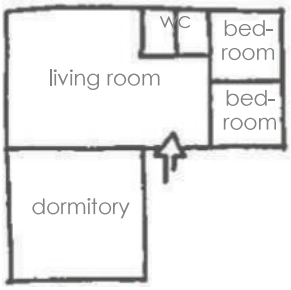
On basis of the program the very first drawing of the design was made. It was from the beginning clear that the common facilities should be the heat of the complex, with space for everyone to gather. Because of the beautiful surroundings it was very essential both for the healing architecture and the design to bring the nature into the complex and work with views towards the nature from different functions, see illustration below. The administration should be some of the first functions to meet at the site, and the medical house should be placed in the back to not remind the campers of their illness. Therefore these two functions is placed towards the road.



PRELIMINARY FORM STUDIES

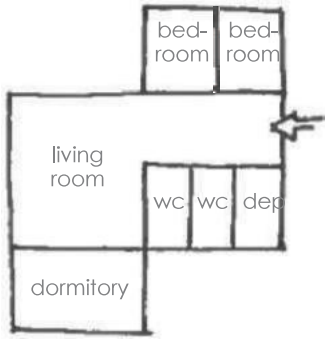
HOUSE

The process started from the very beginning by working from inside and out to place the function at the houses in the best possible way. At the same time it was a wish to have individual houses with 6-8 campers. These forms was chosen for further detailing after a longer process with different forms.



192 m^2

+ No need for an entrance
+ The living room is not a distribution hall
+ Dormitory is placed separated from the volunteers bedrooms



224 m^2

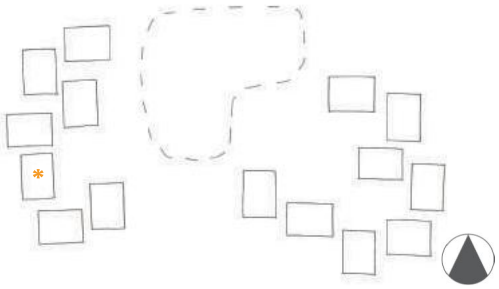
+ The living room is not a distribution hall
+ Dormitory is placed separated from the volunteers bedrooms

198 m^2

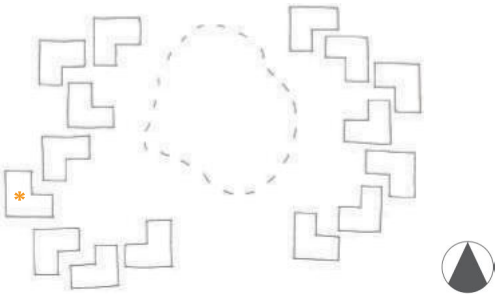
+ Living room and dormitory is placed in each direction of the house which will divide the flow in the building

CONTEXT

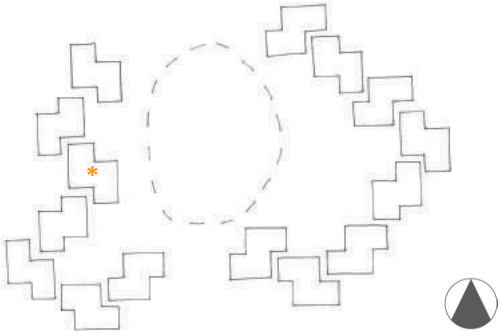
Based on the different forms chosen for further detailing, a study is made to figure out how apartable the different forms are, because it is a wish that the houses should be adaptable for the whole complex in a way so they interacts with each other and the nature at the same time. The buildings marked with a *, have been chosen to be analysed in Velux. See the results in appendix N.



+ The courtyards is mostly defined at this layout
- The houses is not that easy to integrate with each other
- The houses in the middle will not get the view towards the nature



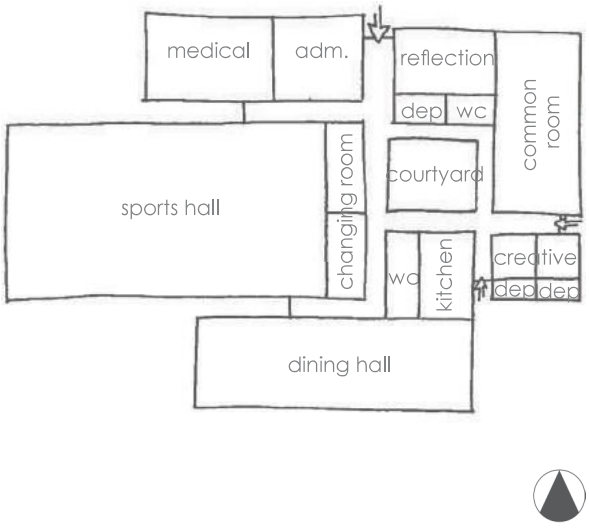
+ The siteplan look calm in the way the buildings interact with each other
+ Every buildings have view towards the nature
+ The courtyards is more divided at this layout
- The complex is not interacting enough with the nature



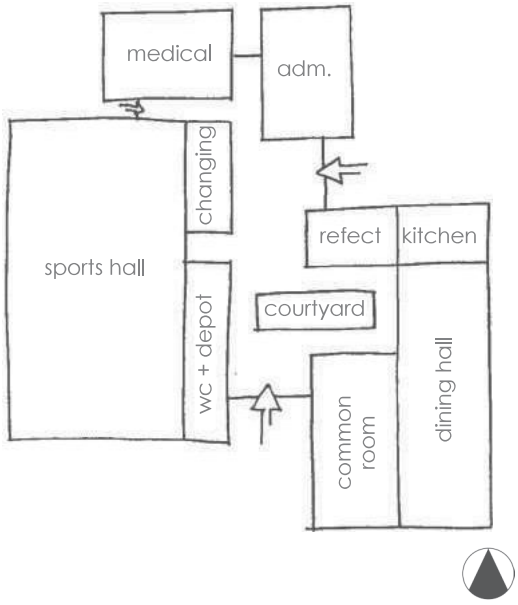
+ The complex interact with the nature
+ There is hierarchy between the courtyards
+ Every house have view towards the nature
- Two houses have view towards the road

MAIN BUILDING

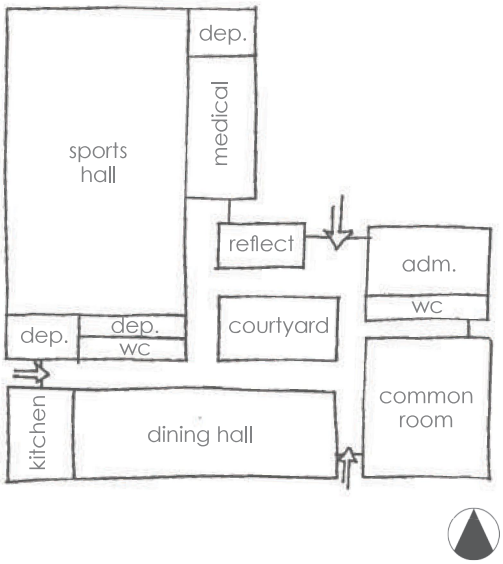
To integrate the main building and let it interact with the houses the form principles for the main building runs simultaneous with the design of the houses. It is constantly important to ensure that the way the houses is placed at the site also create an interacting with the main building. Therefore a study have been made, to ensure that the functions at the main building can be placed so the main building interact with the houses. There have both been studies where it is the buildings total volume that is related to the shape of the houses and the fact that it is the composition of the functions that relate and create a connection.



+ The administration is pla-ced as the first thing you meet, when you arrive at the main entrance in the north.
+ The courtyard area gives transparency, clarity and light into the building
+ The medical house is placed in the background from the other functions
+ Every function is place under the same roof
- The dining hall is the only function, which has a view of the lake



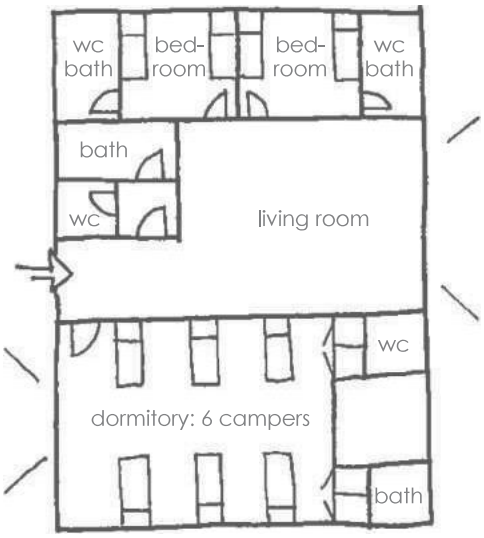
+ The dining hall and common room can be merged via the folding door
+ The medical house is placed away from the common functions
- There has not been made space for the creative rooms in the buildings
- There is to large entrances which compete with each other
- The corridor takes up a lot of wasted space



+ Every function is place under the same roof
+ The courtyard area gives transparency between the functions
+ The medical house is placed away from the other functions

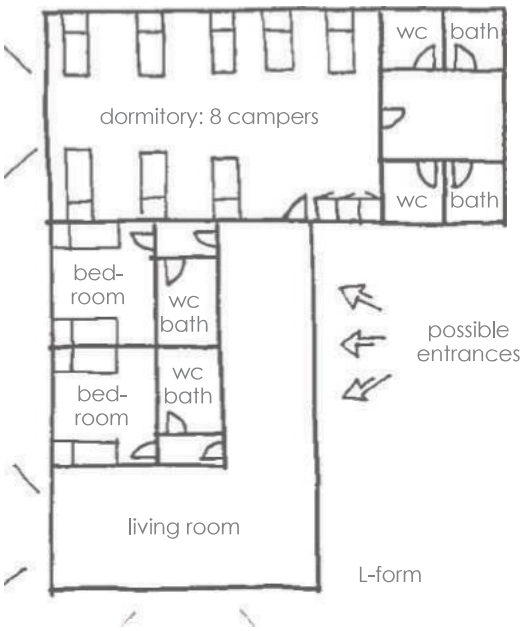
HOUSES

To be able to place both the main building and the houses correctly on the site, it was necessary to go into more depth with the interior decoration of the houses. It was therefore important to take a step back in proportion to the design of the houses. This was done to secure the optimal interior decoration and form, on the basis of which the concept could be designed now that the thoughts of the house being integrated with each other and the surrounding nature has been confirmed. From a long process with a lot of different site plans, a number of design criteria where formulated, which helped the selection of chosen plans.
Below is the plans, which was chosen for further work in correlation with the design criteria. See design criteria of the house on page 107.
Among other things, the design works with the campers having their own section in the house with a bathroom and a toilet. This enable the campers to be more private, while still keeping the volunteers nearby. In the long term, it is the intention that the types of camps should be extended to, among other things, a family camp. Because of this each of the volunteers have a bedroom with their own toilet and bath, which is intended as a room for parents at a later point in time

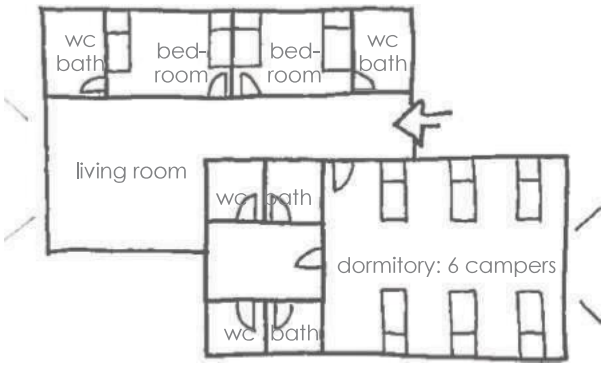


+ The living room open up for you, when you enter the house
+ The placement of the bed in the dormitory gives a greater sense of community
- The living room becomes to large
- The living room becomes a distribution corridor
- The bathroom in the middle is not as Integrated, as it could be

Rectangle-form



+ The dormitory become its own separate section
+ View to nature from both dormitory and living room
- In a way it becomes a corridor in a corridor until the volunteers' bedroom
- The volunteers' bedroom does not have the opportunity for windows
- The living room is far away from the campers

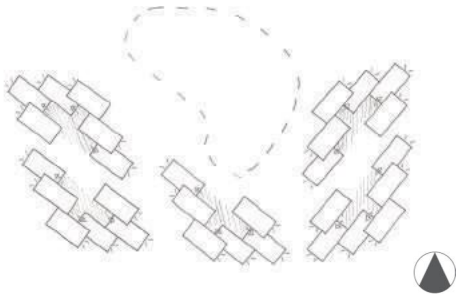


Z-form

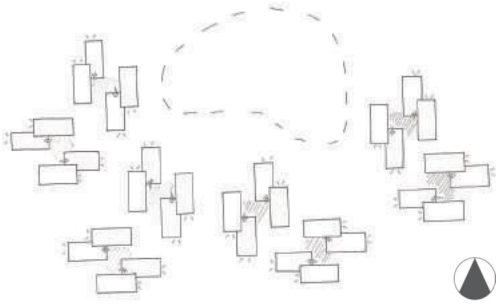
+ The dormitory becomes its own separate section
+ The living room opens up for you, when you enter the house
+ The placement of the bed in the dormitory gives a greater sense of community
+ View to nature from both rooms (dormitory and living room)
+ The volunteers' bathroom has a window
- One of the camper's bath and toilets, does not have the opportunity for windows

CLUSTERS

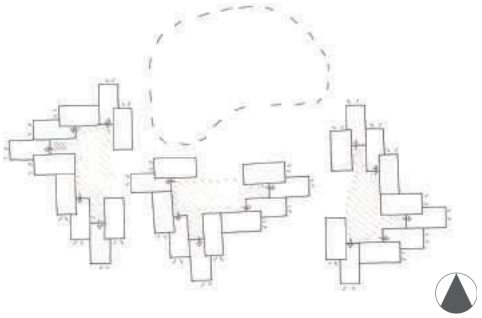
Diversity of privacy in the complex was a priority. Ttherefore an investigation of the composition of the houses was made to find out how many houses there needed to be put together for giving the effect of a cluster.
On basis of the studies of the houses composition, Z-form was chosen for further work in the making of clusters, as seen above.



- The separation of the clusters makes the cluster in the middle stand out as its own entity
- The way the houses is placed, does not mesh in with the surroundings to a large enough extent and furthermore it has its back against the area where the main building is placed.



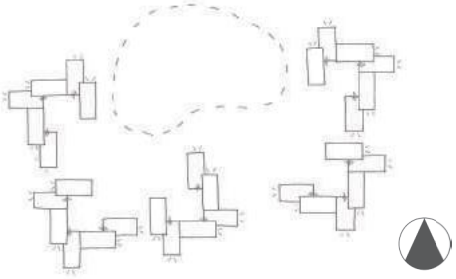
+ The placement of the buildings creates a fine room around itself
+ The site is utilized well
+ The buildings have the possibility to mesh in with the main building
- The courtyard areas are not well defined



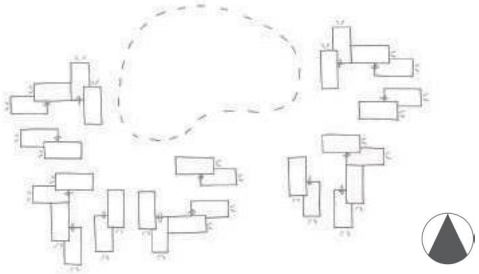
+ The courtyard areas for each of the clusters has the same size
+ The clusters mesh in with the surrounding nature and makes space for the main building
+ Creates a good room around itself
+ The placement ensures that their is no 'back' of the site
- The clusters become to large, in relation to the desire for diversity in privacy

COURTYARD

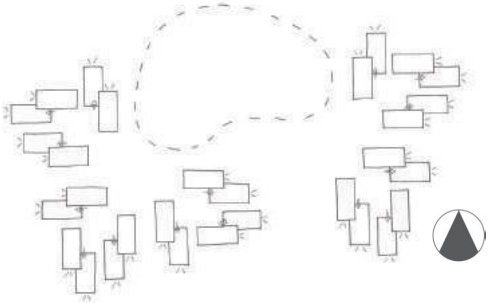
On the basis of the earlier studies on clusters, the lst figure at page118 is chosen for further development. This form was chosen because it gave the most opportunities and created the greatest rooms, both within the cluster and around the cluster. At the same time the created rooms meshed dynamically into each other.
From the placement of the houses in clusters, it was investigated how much openness the courtyard area between the houses should have. It was explored when the 'entrance' was to large or small, when the courtyard was to large and what it does for the courtyard if the buildings is placed against each other, compared to give the volumes a bit of space between them.



The houses is placed up against each other which gives a closed courtyard. This leaves only one view and no special view towards nature.



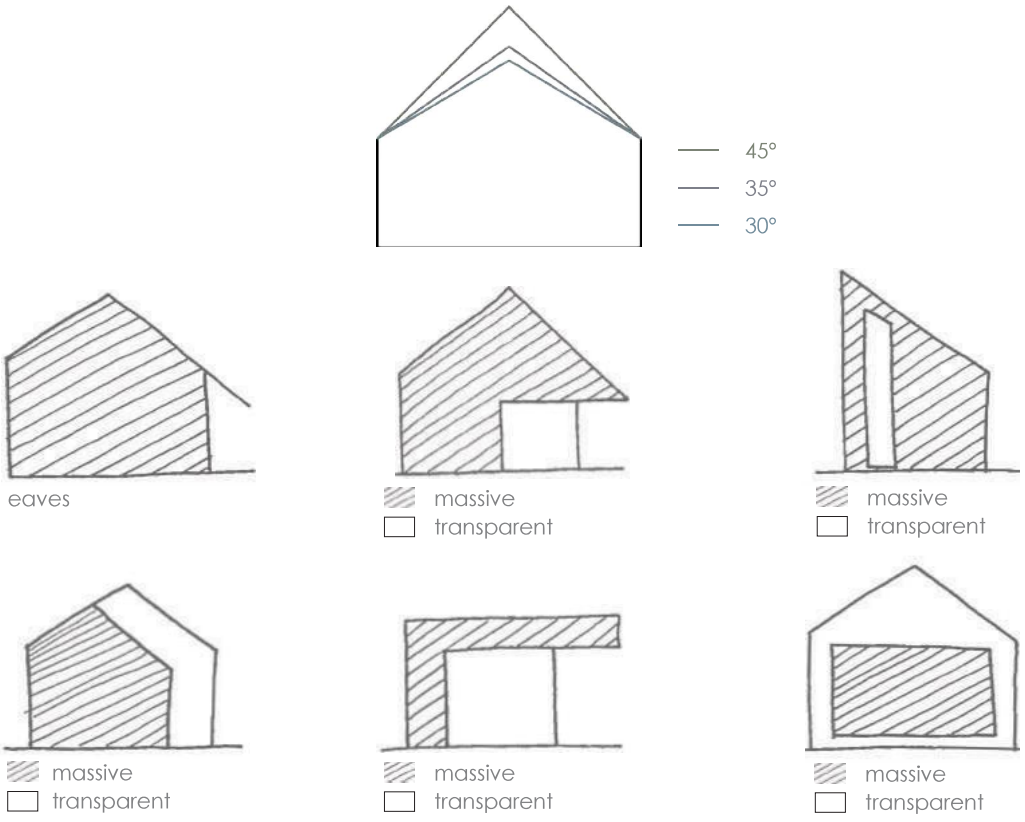
Here the form splits up the courtyard a bit, which creates an opportunity to 'pull' the nature into the courtyard area and have a view towards nature.



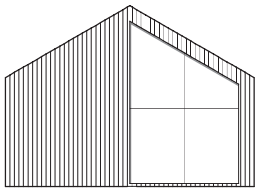
The fixed form is more divided. This makes each of the houses appear as individual units, while the shape still defines the courtyard area. This creates a greater connection to the surrounding nature.

VOLUME

At the point where the site plan is more or less done, studies on how the volumes should be shaped is made. This is a study, like many others, have done in parallel with the development of the site plans.
The solar cells is incorporated into the design from the beginning, in order to produce the electricity which the building will use. Even though the optimal pitch of the roof for solar cells is 45°, 30° was chosen because it expresses a fusion of the aesthetic and the functional (see illustration below).
The design aims for a simple and strict expression. The campers attend the camp to take charge of the elementary things in life, in order to live a life as close to normal as possible after a deadly disease. This often means life is back to basic and that is the expression the volumes of the houses aim for. In connection to this, work have been done on the design of the sizes of the windows, in relation to both expression and overheating in the rooms, as seen on the next page.



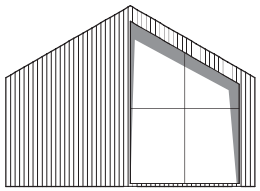
During the design process BSim has been used as a tool to define some of those parameters which have influence on the indoor climate. In different tests mechanical and natural ventilation is used to avoid overheating as well as passive solutions such as the windows placement in the wall and the size. The investigation is also made to see if solar shading is necessary and therefore needs to be integrated in the design of the houses. However, from the living room it shuold be possible to have a view to the nature. Therefore it will be preferable if no solar shading is needed at all. The following illustrations is an investigation of the shape and size of the living room window in the gable of the houses.



Without solar shading:
h>26: 294h
h>27: 140h

With solar shading:
h>26: 176h
h>27: 72h

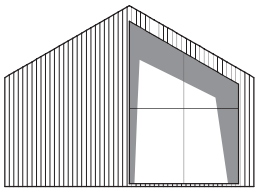
TEST 1: The window is placed in the facade and has an area corresponding to 30% of the heated floor area. In this case the room is exposed for a large amount of hours with temperatures above 26°C and 27°C.



Without solar shading:
h>26: 266h
h>27: 125h

With solar shading:
h>26: 141h
h>27: 55h

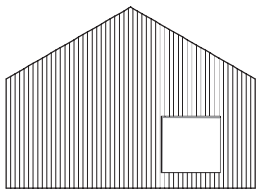
TEST 2: By an extension of the wall the window has an overhang of 1 meter and a 1 meter left and right side-fin. The room is even though still exposed to overheating hours.



Without solar shading:
h>26: 237h
h>27: 113h

With solar shading:
h>26: 162h
h>27: 63h

TEST 3: By a further extension of the wall the window has an overhang of 2 meter and a 2 meter left and right side-fin. The room is still exposed to overheating hours.

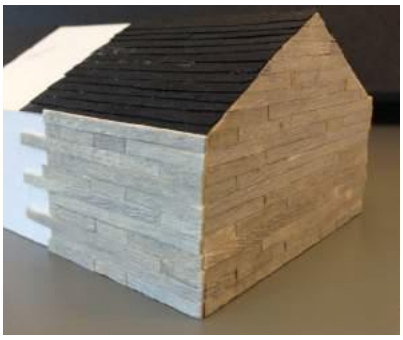


TEST 4: Without solar shading
A decision of simplicity where taken and the windows automatically became smaller. This meant that the living room as well as the other rooms in the house not exceeds the requirements for overheating and CO_2. See illustration 2.57 for specific data.

MATERIAL

When the volumes have been found, material studies is made in concern to expression and the choice of materials. In the design a lot of work have been done with wood, as it has a calm and comfortable expression. This fits well with the atmosphere of the camp and its surroundings.
Subsequently, work have been done concerning how the wood should be integrated with, among others, the horizontal and vertical orientation. Also studies on window design has been touched upon during this study.
To integrate the solar cells with the strict expression of the design, nuances of the roof material, which makes the solar cells less prominent has been explored.

Horizontal wood cladding in a light nuance with a flat black roof

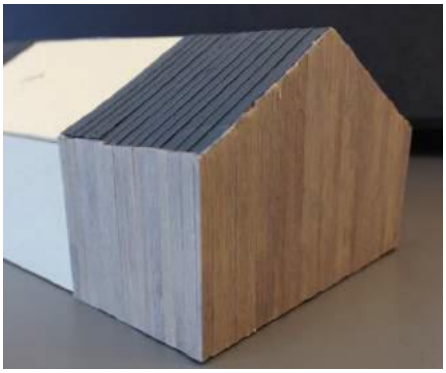


Horizontal wood cladding in a grey-colored nuance with horizontal black slate roof

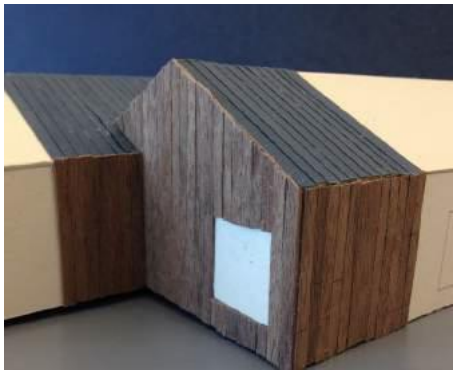
Horizontal wood cladding in a dark nuance with a flat dark roof

Horizontal wood cladding in a grey-colored nuance with horizontal black slate separated into smaller sections

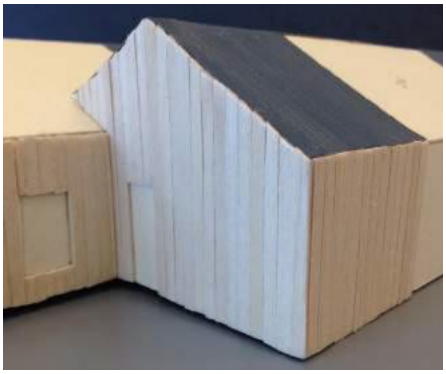
Vertical wood cladding in a grey-colored nuance with a flat grey roof



Vertical wood cladding in a grey-colored nuance with a low seam in grey



Vertical wood cladding in a dark nuance with low seam in grey

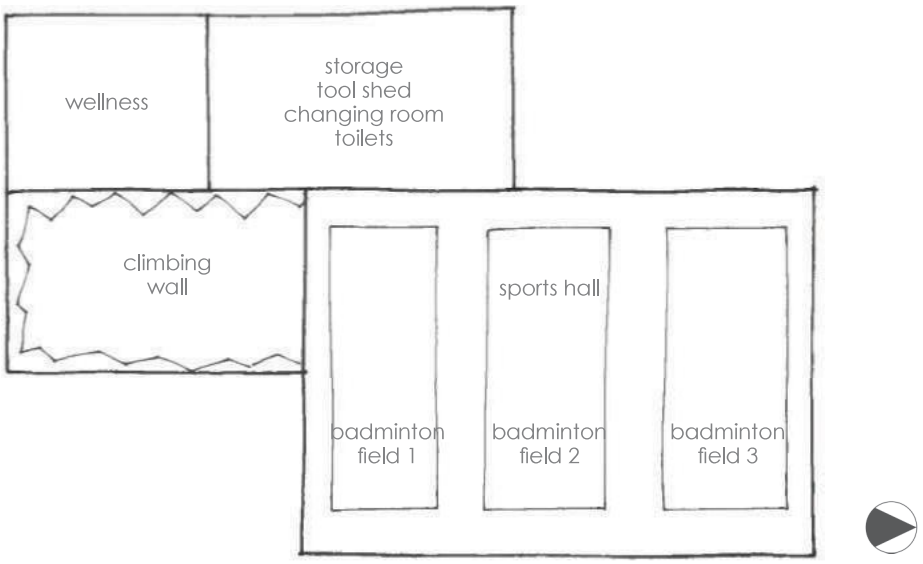


Vertical wood cladding in a light nuance with a low seam in grey

MAIN BUILDING

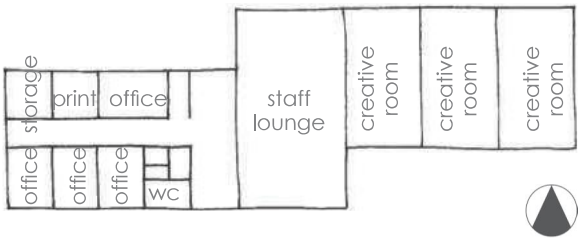
SPORT ACTIVITY

The design aims for the main building to be integrated as a 'big brother' for all the houses, as it is in the main building everybody is gathered. Therefore, the main building works of the same design critea as the houses. To be able to design the complete main building, it is above all important to handle the different functions. The functions in the main building is divided into different categories, which relates to each other. The design aims for each area of functions to relate to the shape of the houses.
In the design of the sports hall, the design takes its departure in the size of three badminton courts, as the campers often make activities where the participants are separated into different teams and then switched around between the different activities. By having a hall, which holds three badminton courts, several campers can play at the same time, and the space can also be used for other activities. Furthermore, the placement of the climbing wall in continuation of the hall, is due to the possibility to use both activities at the same time, but keeping the feeling of being part of the whole.

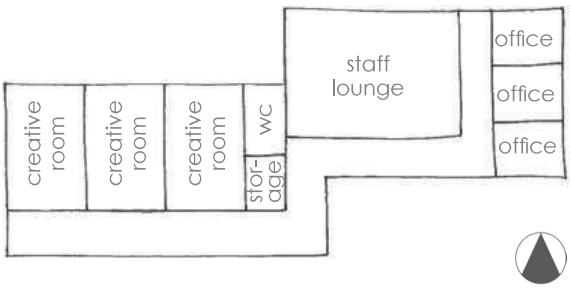


CREATIVE ROOMS AND STAFF LOUNGE

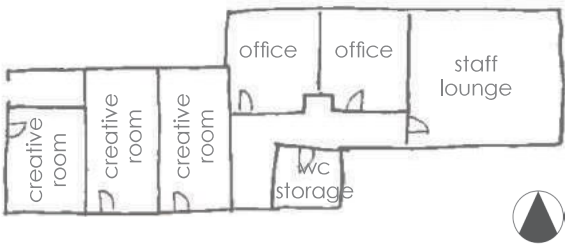
The design investigates a creative room and staff lounge in one volume. One section for offices and administration, and another section for the creative activities has been explored.



The offices and the creative room is separated by the staff lounge



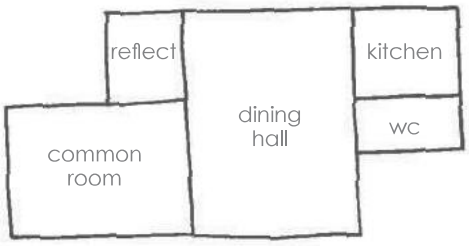
A long corridor creates a connection and access to the different functions



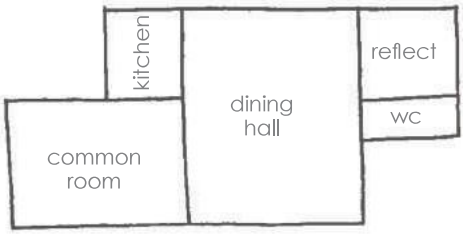
The volunteers have to walk through the office area to reach the staff lounge, which can be a distraction for the office staff.

COMMON ROOMS

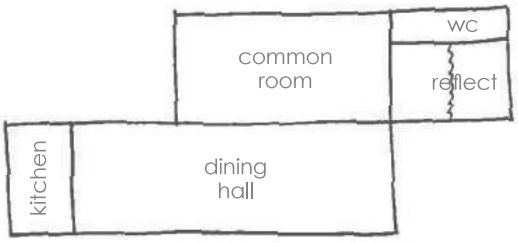
The common activities are placed in the same volume. The only thing, which have been determined in the design of the common rooms, is that the placement of the kitchen should be situated in connection with the dining hall. In addition, it is beneficial if the kitchen is placed outermost in the volume, due to delivery of goods. The design explores how a hatch between the kitchen and the dining hall could be integrated, as this would create the opportunity for a buffet for all the participants. Furthermore, due the process there have been made acoustical calculations for the dining hall (see appendix O).



Here the dining hall is the central place for the common room. This makes the view from the dining hall towards nature, available to only a few of the campers, which is a shame.

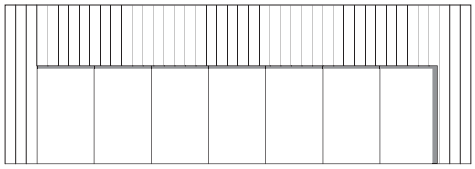


Here the kitchen is placed near the common room, which can be an advantage when events a held in the common room.

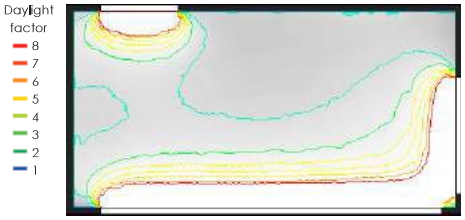


Here the dining hall is placed such that, as many as possible gets the view of the lake, when they stay in the dining hall.

BSim is also used to find the right amount and size of the windows in the dining hall to ensure that the room does not overheat. The room is orientated towards south and the lake. These studies has been a process with many studies in the daylight factor as well.

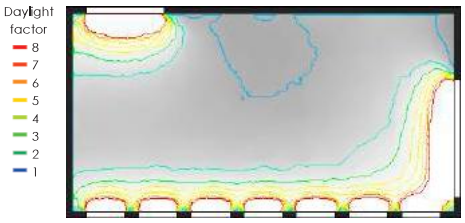


Test 1:
A long row of windows cover the most of the south facade, but this means that the room is exposed to a large amount of overheating hours.

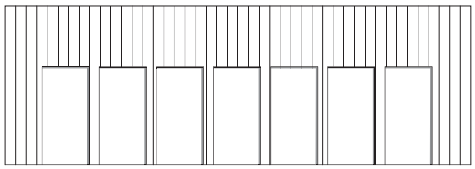


Test 1:
The daylight conditions in the room is better than required, but due to overheating hours the window areas is too big.

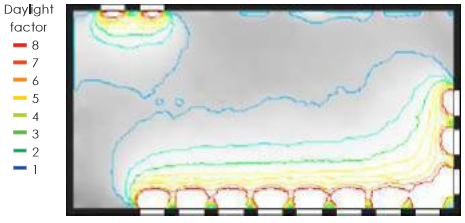
Test 2:
When separate the row of windows with columns the window width now become 3 meters. The room is even though still exposed to overheating hours.



Test 2:
The daylight condition still recive the requirements but there is at the same time still to many hours of overheating.



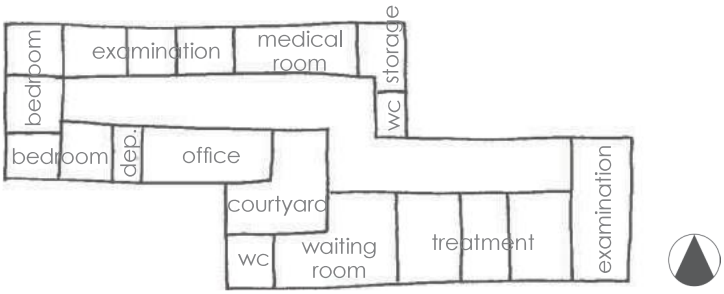
Iteration 3:
From the dining hall the view towards the lake has a high priority. This mean it should not be necessary with solar shading. A principle of one window per table made the windows even smaller. The width of the window became 2 meters and do then obey atmospheric and thermal requirements as well as design criteria.



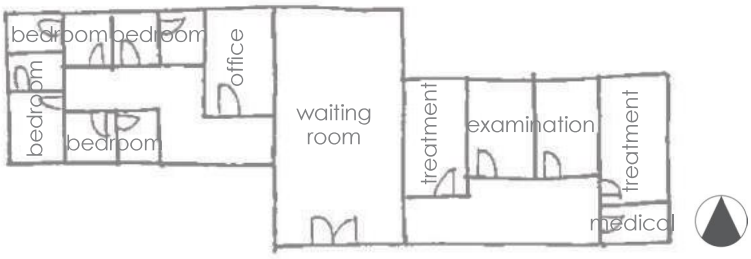
Test 3:
The windows is maked smaller and the daylight consition is still gode nok samtidig med at camperne har god udsigt til søren

MEDICAL HOUSE

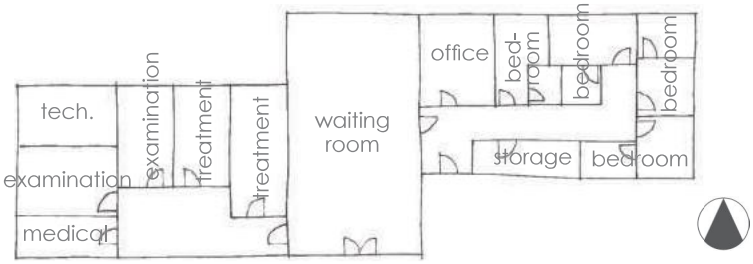
A lot of functions have been placed in the medical house. It contains both functions for treatment and bedrooms for the nurses. Therefore, it has been a challenge to make it both a workplace, while still keeping it a place with a homelier feeling, as the nurses have to spend the night there. The medical house should also be able to accommodate, if some of the campers gets homesick or needs a quiet moment, and therefore needs to sleep close to an adult.



A courtyard brings light into the volume, where the functions is placed along a corridor.



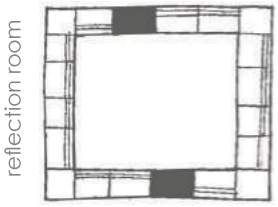
The waiting room is the heart of the volume, where the workplace is situated to the right and the common rooms are situated on the left.



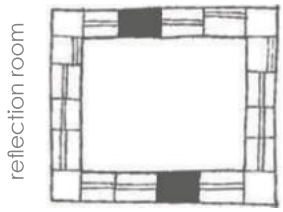
On the basis of the arrangement above some adjustments have been made, in concern to the division of the workplace and the common rooms.

COURTYARD

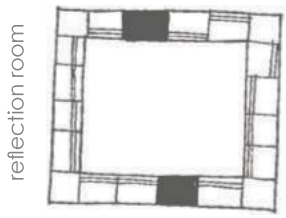
In the courtyard at the main building, different solutions for placement of the windows in the façade, has been tested (see illustration at the left). The design aims for the possibility to use the windows in the corners of the courtyard as furniture, which you can sit on. The same thing applies to the windows which face the reflection room. Furthermore, different arrangement has been tried out.



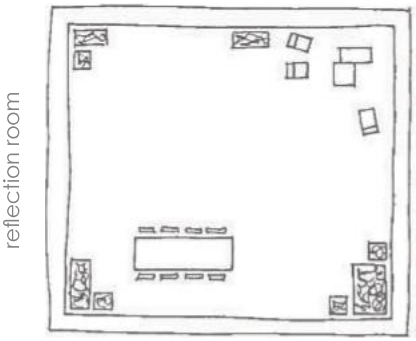
Here the placement of the windows changes by the doors (the black fields).



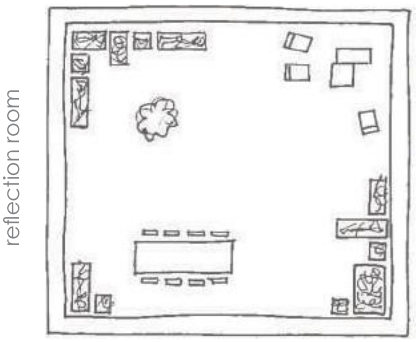
Every window is placed in the middle, except the windows, which is used as furniture.



Here every window is placed on the basis of the desired function.



The courtyard features different functions, a lengthy table and a small cozy niche.



Green areas get a greater importance and take up more space in the courtyard.

REFLECTION ROOM

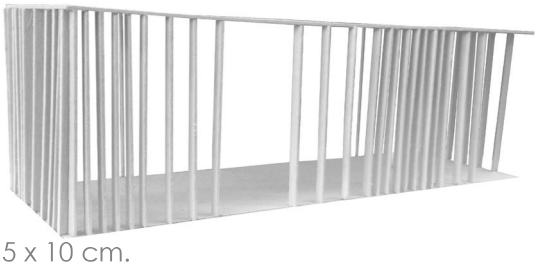
It is important that the reflection room is not a room, which you have to request access to enter. The design therefore aims for a more transparent room, where the sunshine from the courtyards can reach the room. At the same time, it has to be a place, where you can stay without getting the feeling of being watched. Therefore, the design explores different sizes of lamella and the space between them to reach the right amount of openness and atmosphere in the room.

15 x 15 cm.

Here lamellas with a thickness of 15x15 centimeters is used. This gave the the expression of the lamellas being over dimensioned and to thick, and therefore did not provide the intended atmosphere in the room.

10 x 15 cm.

Here lamellas with a rectangular cross section and dimensions of 10x15 centimeter is used. This gives a depth, when you see through the lamellas. Furthermore, it creates a good atmosphere and the feeling of separation from the walking area. This type of lamellas is chosen for further work.

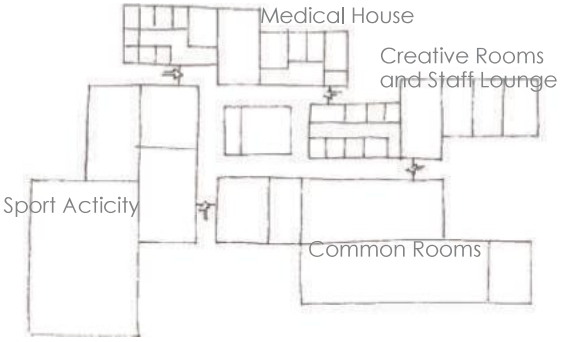


5 x 10 cm.

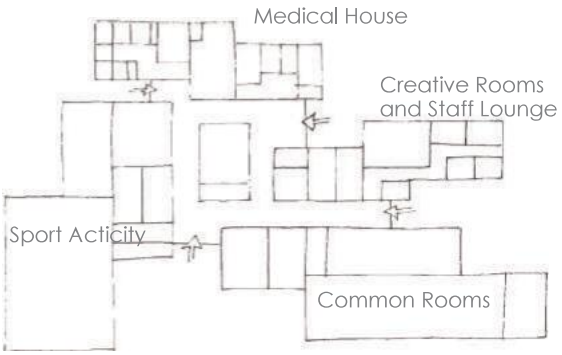
Here lamellas with the size of 5x10 centimeters have been explored. This gives the opposite effect than the lamellas with a thickness of 15x10 centimeters. Here the lamellas feel to slim and more lamellas are needed to give the same expression, which cause the room to feel more closed.

COMPOSITION OF FUNCTIONS

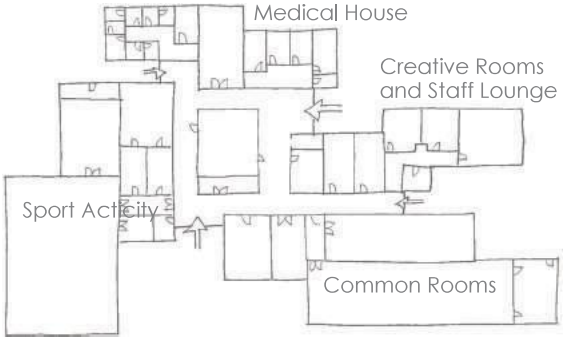
The different zones in the main building is composed into the complete main building, which is bound together by the foyer. Some of the rooms in the different zones is moved a bit around, for among other things, to give the correct access to the rooms and the right experience in relation to where the rooms is placed in proportion to each other.



Here several entrances to the main building towards west and east has been explored. In addition, the reflection room is placed west of the courtyard.



Here a larger entrance towards east has been explored. This is done to avoid that the entrances compete against each other. Furthermore, this makes the flow of people easier to control.

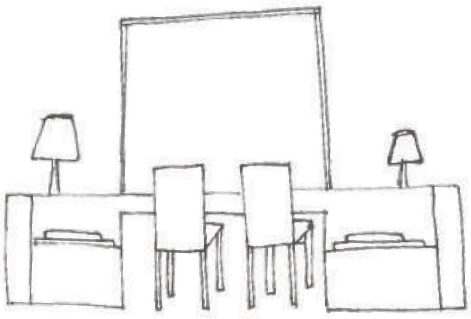


Here another placement of the rooms has been explored. Among other things, this has been done in proportion to the creative rum and staff lounge, to reduce the walking area.

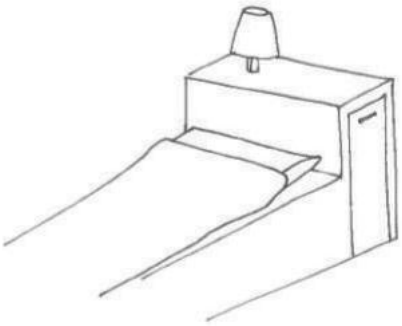
ATMOSPHERE

DORMITORY

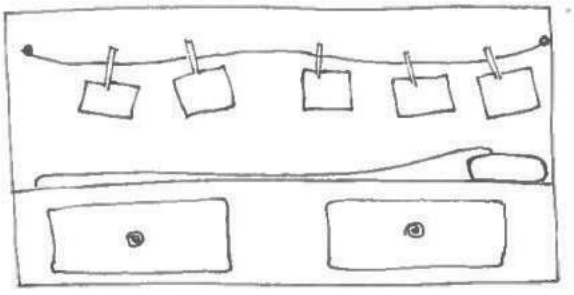
The design aims for a warm and cozy atmosphere in the dormitory. This should be a place where you feel comfortable as a camper. Furthermore, it is important to make space for the campers, to put their own mark on their side of the niche. This should make the dormitory feel homelier.



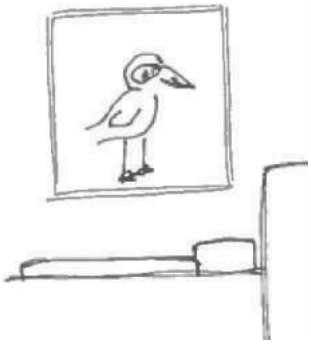
The niche, where the desk and the two beds can be seen.



The bed with the integrated drawer for personal things placed next to the camper's head.



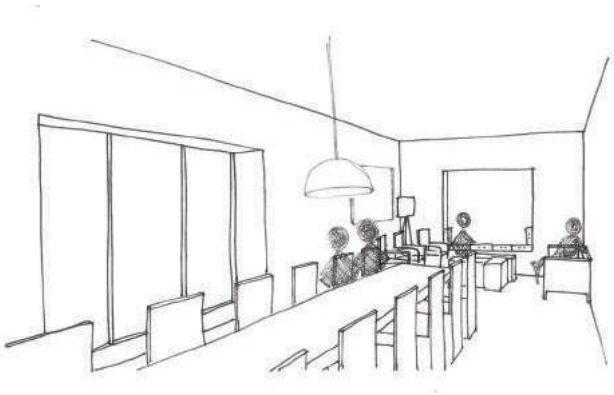
Above the bed, space is made available to decorate with the camper's personal things. For instance, pictures or drawings which mean a lot to the camper, can be hung here.



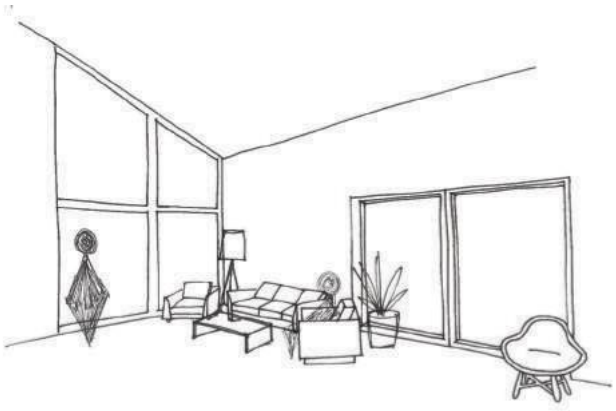
It is also possible to hang a painting above the bed.

LIVING ROOM

The atmosphere in the living room should encourage all the residents in the house to hang out and meet up. It should be cozy. It should have space to lounge in the sofa or sit at the long table a play a game of cards. Most importantly it should invite residents to stay there and be a part of the community.



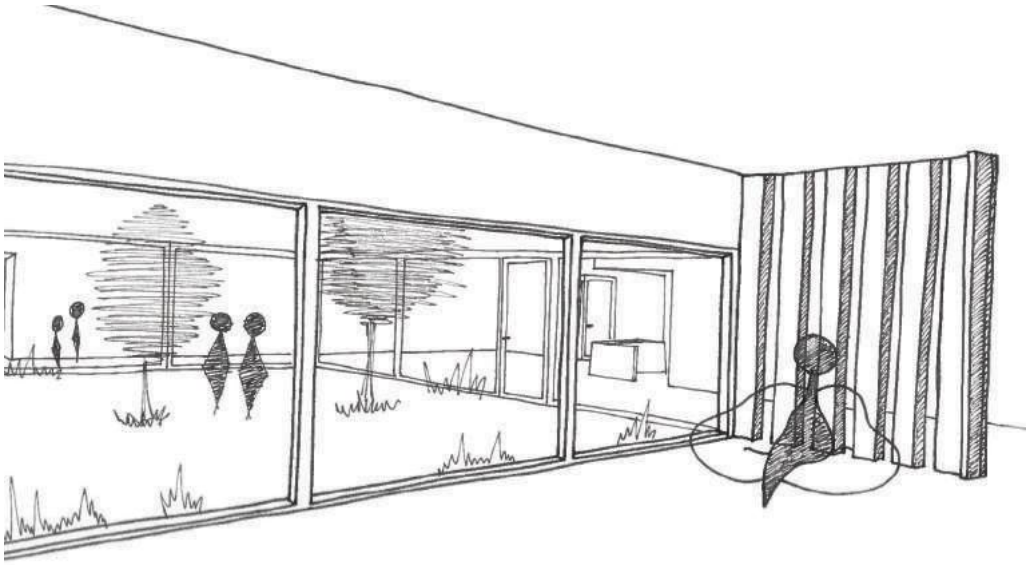
Here the long table can be seen, where you are able to play, while still being a part of what is happening in the sofa.



Here the sofa set in the living room can be seen. This makes it possible to relax, possibly with a cup of coffee made in the kitchenette.

REFLECTION ROOM

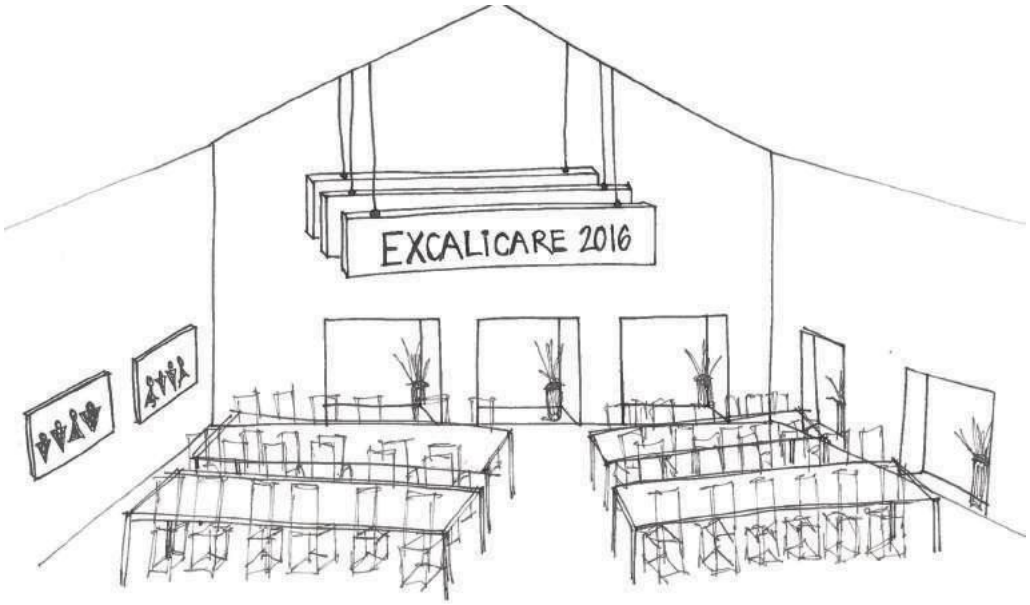
The atmosphere in the reflection room should be cozy. There should be a place to hang out in bean bags, to sit and talk a couple of people together or just sit alone and reflect on the experiences and challenges, which has happened at the camp. It should be quiet, relaxing and meditating to stay in the reflection room, while looking out at the courtyard, the green surroundings and large trees. This is a place where you can relax and gather energy for the rest of the day.



Here the reflection room can be seen, where you can sit and enjoy the nature, which is being 'pulled' into the courtyard.

DINING HALL

The dining hall should accommodate a lot of people at the same time. The campers will stay there many times during the day, because this is the primary place to consume meals. The atmosphere aims to be calm, and the community is allowed to set its mark. A lot of effort has been put into the view towards nature.

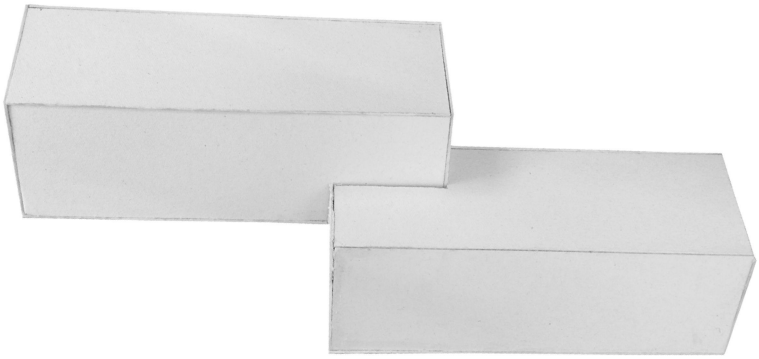


The illustration shows the dining hall where the tables is orientated towards the windows for a better view of the nature.

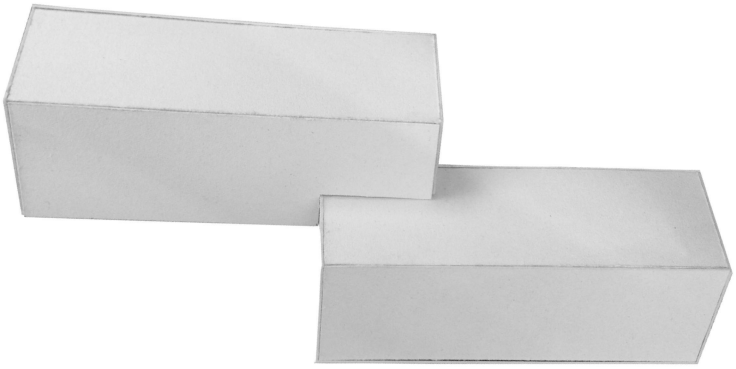
FUSION

HOUSES

The two volumes is sqeezed into each other. It is the volumes which is creating the rooms and on the basis of the wanted atmosphere in the houses, it was necessary to make some minor adjustments to the plan arrangement. This opened up for a preliminary study on how much the volumes of the houses could be pulled apart, to accommodate for the right interior and atmosphere and it still is the volumes which is shaping the rooms.
The volumes is pulled apart in both the long and the narrow direction to make more space in the living room, to give every niche in the dormitory a window and to make a shorter but wider entrance.



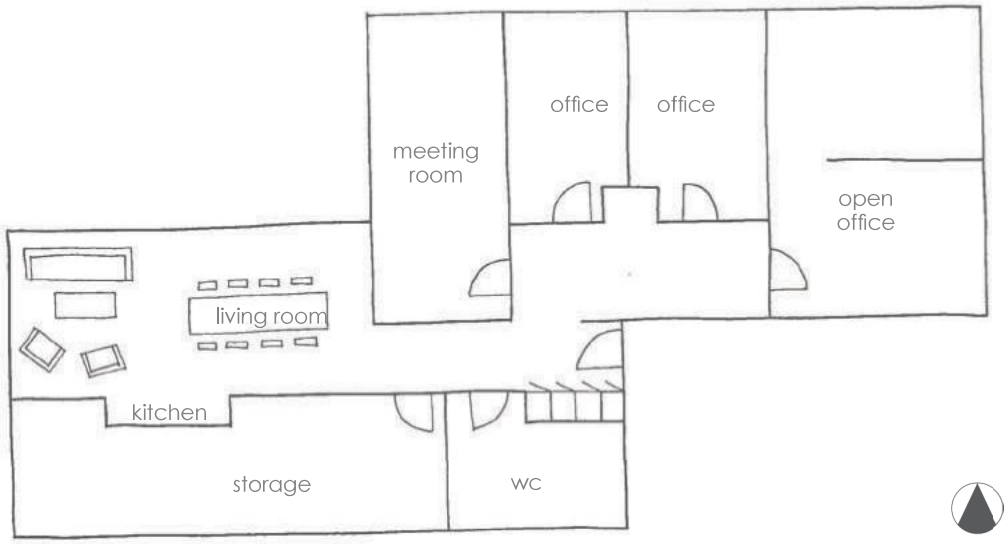
The building is seen from above and the volumes is moved 3 meters into each other, which does not make enough space at the entrance.



The building is seen from above and volumes is moved 2.5 meters into each other, which promote the interior design, as well as the form still expresses community.

ADMINISTRATION

Later in the process it became apparent how much traffic would exist in connection with the administration and that it would function at bit more as a external element. The administration was therefore moved to its own cluster. This proved to be beneficial for multiple things. Before this came to our attention, sleeping arrangements for the camp organiser and external people, which needed overnight stay, was missing. Furthermore, there was a desire for the staff lounge to be situated away from the children. Additionally, the number of sleeping arrangements was a bit extensive. This was solved by using one of the clusters as administration and residence for volunteers at the camp.
In connection with this, studies of the arrangement of the administration cluster have been conducted.

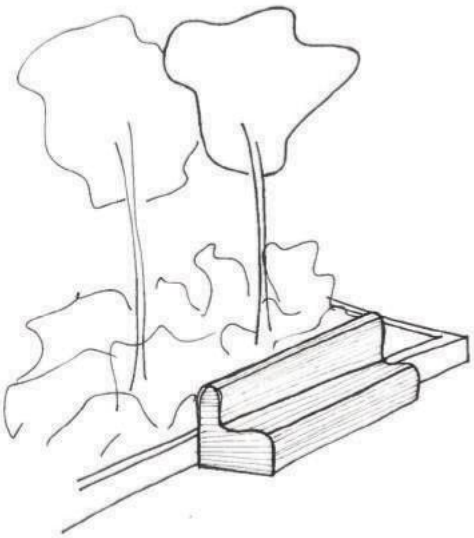


Here the placement of all the office facilities in one end and common area and kitchen in the other end of the building, has been explored. This is done to ensure that you are not disturbed, if others are taking a break.

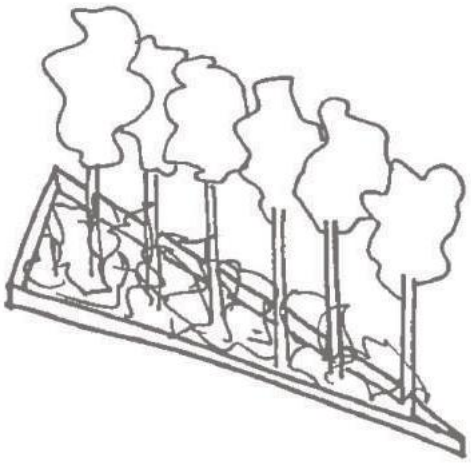
OUTDOOR

ACTIVITY AREA

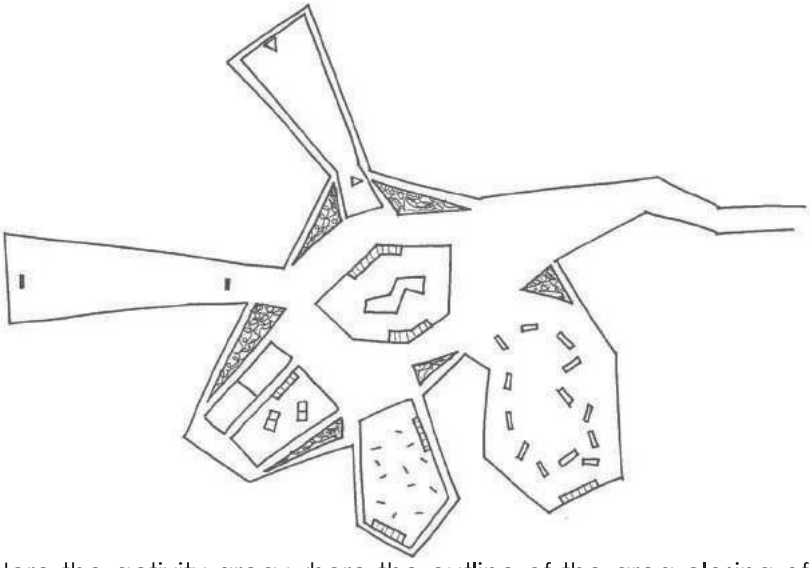
In the design of the activity area it has been an important parameter that all the participants at the camp can participate in each of the activities. From an extensive brainstorm the most relevant activities have been chosen, and integrated into its own area. It has been ExcaliCare's wish (see appendix C from the visit at the Cool Camp Reunion) that there where activities which the campers could use themselves, without the volunteers needing to set them up. Furthermore, it has been ExcaliCare's wish, that the campers not necessarily could see each other if more activities were occurring at the same time, but they should be able to hear each other. This has been explored by pulling the green surroundings into the activity area. Furthermore, benches are integrated for campers who are watching as see at the illustratio below. The climbing wall is a sculptural element, which functions as a central meeting spot on the site. To create a coherency from the path system, which is carried on into the activity area, different solutions of the outline of the area has been explored as see on the next page.



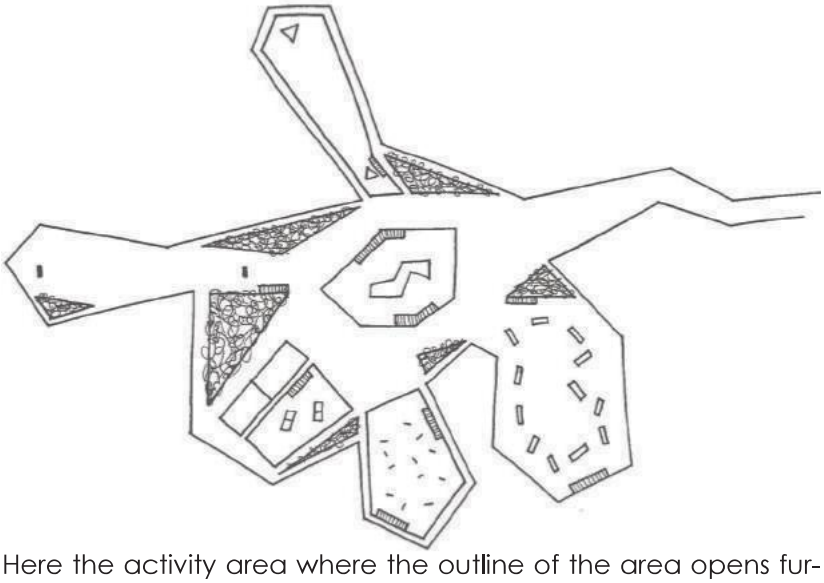
Here the meeting of the benches and the green surroundings and how it creates seating for the campers which does not participate in the activities, can be seen.



Here is the greenery dragged into the activity area in the shape of beds for flowers and trees.



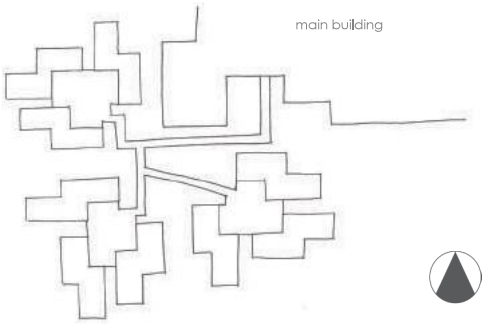
Here the activity area where the outline of the area closing of the surroundings, can be seen.



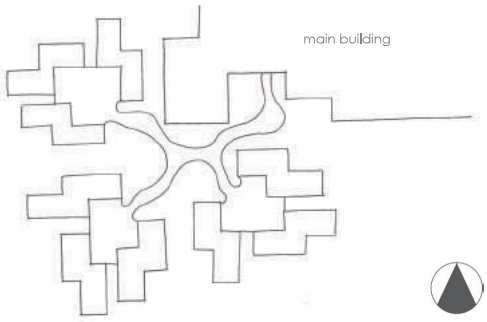
Here the activity area where the outline of the area opens further up for the surroundings, can be seen. This one is chosen for further work.

PATH SYSTEM

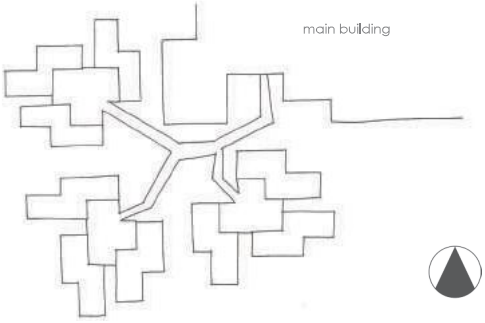
The buildings are strictly placed on the site. To soften it up and create contraction, different suggested solutions of the path system on the site, has been explored. The path system should enable access to all functions, as it should be easily accessible for walking-impaired moving around the site.



First and foremost, the direct access to the different functions from a very strict expression, has been explored.



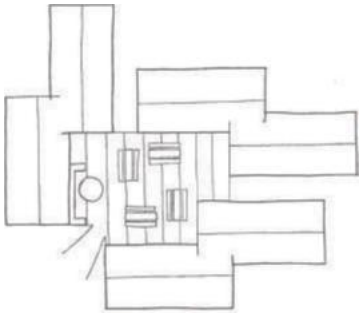
To create a broader diversity and contradiction for the strict buildings, an oval-shaped path system with variations in the thickness, has been explored. Where most people meet the path is broadest.



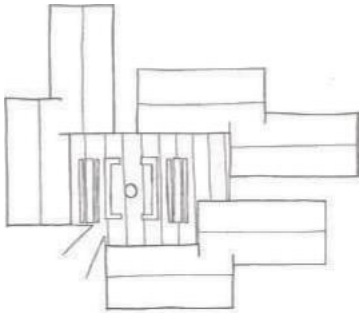
From a mix of the two aforementioned designs, this is the solution which has been further developed. Here the path is strict as an underlying basis, but has variations and opens up, where the flow of people is at its greatest.

CLUSTERS COURTYARD

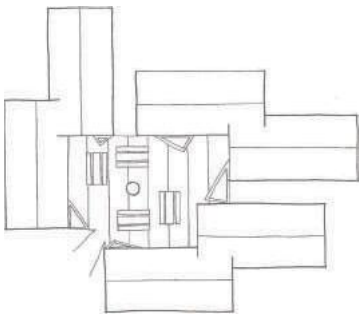
The courtyard of the clusters should form a frame around the community of the cluster, because this is where everybody gathers. Two and four tables in the courtyard has been explored, because it is the intention, that you should mix across the houses, when staying in the courtyard. Had there been three tables, the chance that you sat down at the table with the people you share a house with, had been greater. Different arrangements in proportion to the fireplace and placement of tables and green beds has been explored.



Here the placement of the fireplace placed in one end of the courtyard and the tables gathered in the middle, has been explored.



Here the fireplace as a central part of the courtyard and two long tables on each side of the fireplace, has been explored. This however results in the two tables sitting far away from each other.



Here the fireplace is integrated in the middle of the courtyard, where the tables surrounds it. At the tables there is smaller benches, which can be easily gathered around the fireplace for the bright nights with bread on a stick and marshmallows over the fireplace.

Illustration 5.1:
Forest edges near the site.

EPILOGUE

CHAPTER 05

Through this chapter, the complete project and process will be concluded and reflected upon. All used references and illustrations used in the project will be listed.

CONCLUSION

With basis in healing architecture and sustainability, the frame for a rehabilitation camp for children, who have survived childhood cancer, is developed in this master thesis.
The complex emphasise the importance of accessibility. The outcome is a camp where everybody is equal and where it is important that no one feels left out or different. At the same time, the level of privacy is essential when many people are gathered, at the same place for a longer period of time.
The chosen site is placed in beautiful surroundings, which has had a big influence on the design. The choice of materials makes the buildings blend in with the nature. Big sections of windows and a courtyard in the main building, drags nature into the building. Thereby, the attendants are always surrounded by nature and the peaceful healing it brings, even though they might stay inside most of the day.

The different positions of the buildings create an experience, when moving around the site. The buildings are orientated for optimal daylight conditions, in living spaces and rooms where the attendants stay for a longer time, during the day. The clusters open up towards nature, and simultaneously encloses their own courtyards, to create a safe feeling for people who belongs to one of the three houses within the cluster.
The houses are designed with focus on the camps ExcaliCare arranges at the moment - Cool camps, for childhood cancer survivors. However, a flexibility is incorporated into the design, for future camp for the whole family and camps for siblings. The design layout is also prepared for future camps, where children with other childhood diseases will have the chance to visit the camp and experience the cohesiveness and a quiet contemplation, when they try to find their way back to life.

The many different activities inside the buildings and outside at the activity area, are easily accessible for everyone. Campers have the opportunity to use the activities by themselves, but also in a more controlled form, where the aim is to challenge the campers and strengthen their own empowerment.

Through the project social sustainability has been explored, where the building embraces and creates the best possible framework, to make sure its users

feel comfortable. By integration of renewable technologies, the building complex reaches building class 2020 and becomes a Zero Energy Building. Through the integrated design process, loops back and forth have been made. This has been done to find the best solutions, in order to fulfil the technical requirements, set in the beginning of the project, without losing the architectural concept.

The building and the impressive nature encourages play, challenging of the mind and reflective perspectives. The architecture expresses the fundamental basis of a building and emphasise the power of life. The design is simple and provides space for the buildings users to reflect upon life.
This master thesis project therefore, serves as a suggestion of how ExcaliCare's future rehabilitation camp could be designed, to create the necessary framework to help children get back to a daily life, after treatment and survival of childhood cancer.

REFLECTION

When viewing the project in a larger perspective, the camp might have influence on a series of parameters in Denmark. As mentioned earlier 200 Danish children are diagnosed with cancer every year. Luckily four out of five get cured. This mean that approximately 160 children might need help to get back on track, after their illness. Some of these children is in a vulnerable age, because they are in the teenage years, where they are dealing with their personality and which kind of person they might become. Children who gets affected by cancer, has more important things in life to deal with. When those children get cured, they have fallen behind their peers, trying to figuring all these questions and uncertainties. The children often get a low self-esteem and low self-confidence, and often suffer from concentration problems. This affect both their social life and their ability to get an education.

This project creates the frame for a camp which helps these children. At the camp they work with Therapeutic Recreation, which shows good results. This is evident through other comparable camps, looking at an international level. Currently no camp exists in Denmark for children who have gone through a rough time of treatment and illness, but the need for one is obvious. Before ExcaliCare began their work in Denmark, the children went to Barretstown in Ireland, where they could recover their own empowerment.

The camp might give the children a better life after childhood cancer, as it might bring them back to life faster. This will result in that the children can get an education, and give something back to society, instead of requiring help, maybe for the rest of their life.

Starting out this camp will only be for Danish children, but when the entire complex is built, it is meant to be for European children as well. This means that different children, from different countries and cultures will meet at this camp and experience a cohesiveness and together create a community. Some of them will be roomies and some of them will be friends for life, but most importantly they will all be a part of each other's healing process, to get back to a normal life after childhood illness.

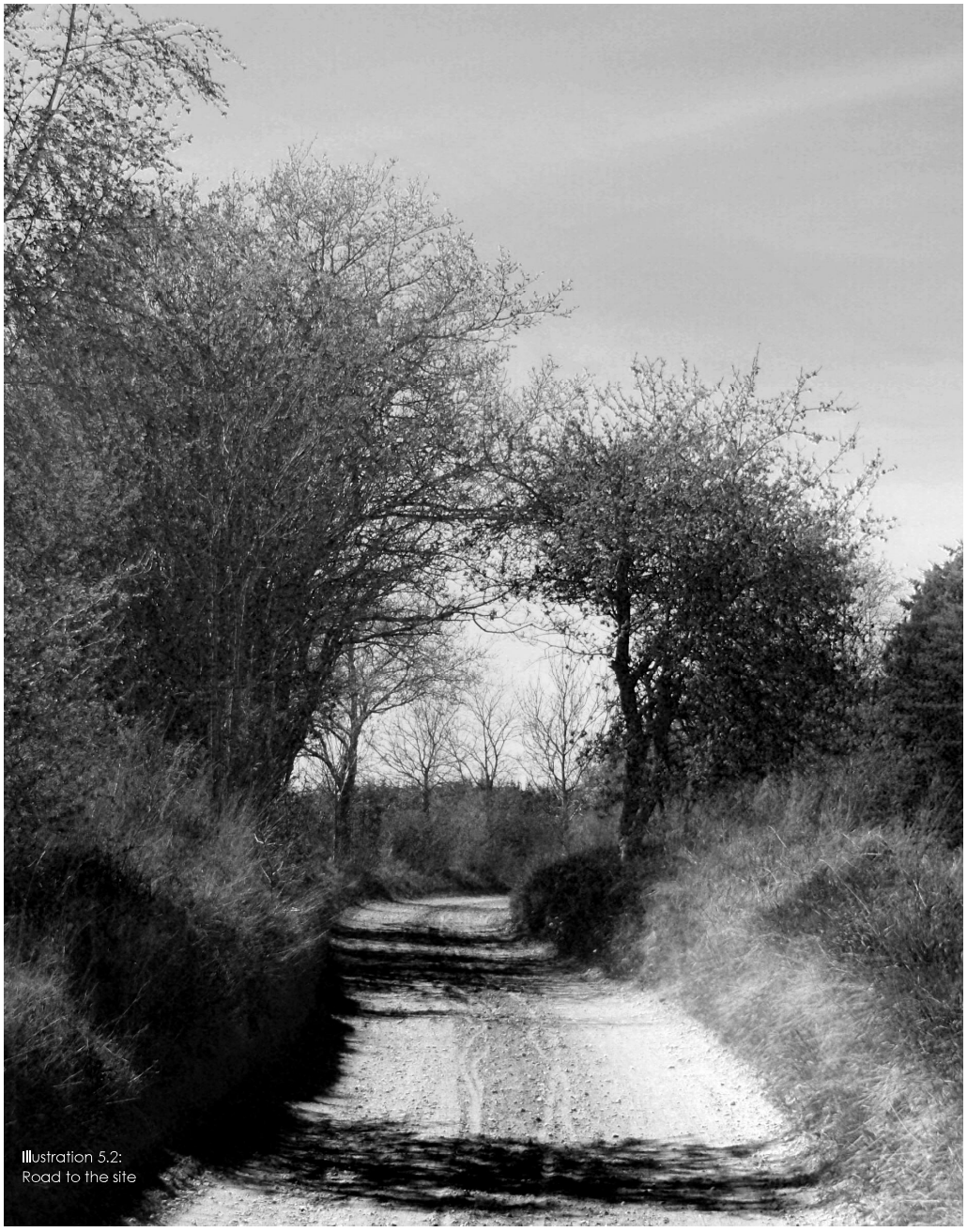


Illustration 5.2:
Road to the site

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Front page	Own illustration
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ExcaliCare Logo	Excalicare.dk. (2016). ExcaliCare Children's Organisation. [online] Available at: http://www.excalicare.dk/ [Accessed 19 May 2016].

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illustration 1.1	Own
illustration 1.2	Knudstrup, M. 2005. Arkitektur som integreret design. In: Botin, L. and Pihl, O. eds. 2005. Pandoras boks: metode antologi.. Aalborg: Aalborg Universitetsforlag, pp. 13-15.
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illustration 1.13	Own

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04 PROCESS

4.1 Own

05 EPILOGUE

5.1 - 5.2 Own

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6.64 - 6.68 Own

Illustration 6.1:
Stream through edge of a forest

APPENDIX

CHAPTER 06

All material which has been referred to throughout the rapport, can be found in this chapter. Among other thing, different types of calculations and relevant summaries from meetings held, during the project is presented.

APPENDIX A

A TYPICAL DAY AT A CAMP

To understand a typical day at a camp, it has been necessary to look at the program, during a typical day. The time schedule is also used in BSim.

Tid	En typisk dag
09:00	Morgenmad
10:00	Hytterengøring
10:30	Aktiviteter
11:40	Skift aktivitet
11:50	Aktiviteter
13:00	Frokost
14:00	Hvilepause
15:00	Aktiviteter
16:10	Skift aktivitet
16:20	Aktivitet
17:30	Teen talk
18:00	Aftensmad
19:00	Hyttetid
19:30	Aftenprogram
21:00	Chill out
22:00	Hyttesnak
23:00	Sovetid

Illustration 6.2:
Program for the camp activities at a typical day

APPENDIX B

INSPIRATION PICTURES

DORMITORY


Illustration 6.3


Illustration 6.4


Illustration 6.5


Illustration 6.6


Illustration 6.7

LIVING ROOM


Illustration 6.8


Illustration 6.9


Illustration 6.10


Illustration 6.11

DINING HALL


Illustration 6.12

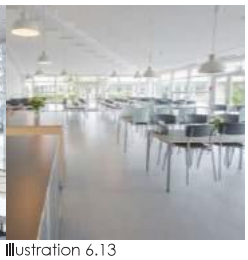
Illustration 6.13

RELAXATION AREA


Illustration 6.14


Illustration 6.15

AT THE LAKE


Illustration 6.16


Illustration 6.17


Illustration 6.18


Illustration 6.19

COURTYARD - MAIN BUILDING

Illustration 6.20 Illustration 6.21

COURTYARD - HOUSES

Illustration 6.22 Illustration 6.23

WINDOWS

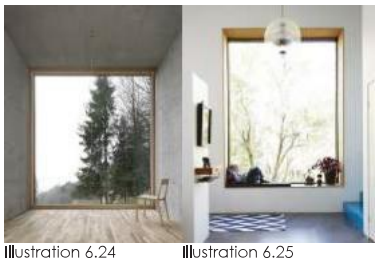

Illustration 6.24 Illustration 6.25

DETAIL

Illustration 6.26

EXTERIOR MATERIAL

Illustration 6.27 Illustration 6.28

EXTERIOR

Illustration 6.29

PAVEMENT

Illustration 6.30 Illustration 6.31 Illustration 6.32 Illustration 6.33

APPENDIX C

VISIT AT COOL CAMP REUNION

After the first Cool Camp by ExcaliCare in 2015 a reunion was planned. We had the chance to be a fly on the wall at the reunion and asked in context both campers, volunteers and the founders of ExcaliCare if they had any wishes for ExcaliCare's future camp. The participants could wish for anything, without considering costs. Some of the wishes recur in the different categories of participants.

WISHES FROM THE CAMPERS

Houses

- Toilets where they sleep. At the moment they have to go outside and into the main building to go to the toilet. This is not very pleasant during night time, especially if it rains.
- They do not like to sleep in bunk beds because it is not possible for some of the campers to climb into the upper bed.
- A place in the houses for social activity.

Main Building

- A multi sport arena
- Pool table
- Table tennis

Outdoor

- Huge slide, maybe the biggest in Denmark
- A zip wire
- A climbing wall or a clamber system with different levels of difficulty.

WISHES FROM THE VOLUNTEERS

Houses

- More toilets and showers are requested. At the moment there are only four showers lady showers, for both campers and the volunteers and they have to share toilets and showers which is not optimal. It could be great if the showers are divided into boxes, so there is a bit of privacy. The campers have an age where some of them do not want to shower if there is

other girls around.

- No bunk beds in the sleeping area. Some of the campers can not climb up into the upper bed.
- A common room in the houses so they don not have to sit in each other's beds
- Space for the volunteers to sleep in the houses together with the campers
- A place in the houses where the volunteers can gather and talk about the day while the campers fall asleep
- The volunteers do not have to sleep just next to the campers, so the campers feel that the volunteers can hear everything the talk about
- Keep a calm atmosphere in the houses
- A place in the house where the campers can be themselves with total privacy
- The way the campers currently live in the small houses is working pretty well
- Possibility for roof between the houses to the main building if it rains

Main Building

- Common 'cozy' room with space for everyone
- Common room with space for discotheque and a lot of other social activities
- A common room with possibility for creating a theater with seats where the campers can perform for each others.
- A dining hall that is only used as a dining hall, so you don not have to move stuff back and forth all the time
- ExcaliCare are putting a lot of effort into having a calm atmosphere - maintain that in the future design
- A calm atmosphere in the main building - actually in the whole complex in every room. The main building may not be too major and clinically, more the atmosphere of an old manor house with visible beams in the roof.
- A place the volunteer can be by themselves. In the Cool Camp program sparetime for the volunteers is scheduled, therefore it could be great with a room that is only for them - a no kids zone, with the possibility to

watch television, play a game, maybe with a pool table and a small kitchen where they could have a bit of food. A place with space to relax and talk about the day
- Storing of clothes and private stuff in a "chest" that also could be just for sitting, because it is great that the campers should not sit in each other's bed
- A multi sports arena as a backup if the weather is bad. With possibility to shoot with bow and arrow

Outdoor
- Accessibility for outdoor activities for walking-impaired and people sitting in a wheelchair
- The possibility to have outdoor activities even though it is raining maybe by a pent roof.
- Fishing is a activities where everyone can participate on the same terms
- A outdoor zip wire or a obstacle course
- Outdoor activities that do not have to be prepared
- A outdoor playground for young people in this age
- Outdoor climbing wall
- Good outdoor activities
- Possibility for outdoor shooting with bow and arrow
- Outdoor wellness

Medical House
- Homely feeling. If a camper is homesick there should also be space for a camper to stay overnight. Therefore it would be practical if there was one room for a volunteer and another room with space for both a volunteer and a camper.
- Often the volunteers do not know each other therefore it would be great if they could have separate bedrooms
- With 100 campers there is a need for two treatment rooms and space for 2-3 nurses to sleep
- The treatment room is at the moment 30 square meters and that is all too much space. 15 square meters is enough
- If the camp should house international campers as well there should be

space enough for two campers to stay overnight
- The medical house is the place where the nurses are most of the time, therefore it would be great with a small kitchen to make a cup of coffee and have some food

WISHES FROM THE FOUNDER

Houses

- Toilets and showers in the houses where the campers are sleep
- Some of the campers need a bit privacy doing a long camp, so a place in the house where they could be just themselves would be essential

Main Building

- Now there is a kitchen with the size of 520 x 520 centimeter where they make breakfast and lunch by themselves. The dinner is delivered but in the future they want to make all food by themselves and have some people hired to do it.

Outdoor

- Accessibility for outdoor activities for walking-impaired and people sitting in a wheelchair
- Outdoor space inspired by "Gorilla Park" in Vejle
- If the outdoor space was sheltered it could be used even more
- If there is a forest at the site, it could be great if that could be integrated so there was space for some outdoor activities as for example archery

APPENDIX D

ACOUSTICS FOR THE FINAL DESIGN

The three tables shows the acoustics for the final design. It is desirable for each frequency to have the same reverberation time at a maximum of 0,6 sec. However, a small deviation in one of the frequencies will not have a major impact.

LIVING ROOM

Reveberation time																	
Equivalent absorption area	**Material**	**Areal** S(m^2)	**125 Hz** a	Sa	**250 Hz** a	Sa	**500Hz** a	Sa	**1000Hz** a	Sa	**2000Hz** a	Sa	**4000 Hz** a	Sa			
Living room																	
Floor	Wood flooring	44,46	0,15	6,67	0,11	4,89	0,10	4,45	0,07	3,11	0,06	2,67	0,07	3,11			
Ceiling	Suspended ceiling (wood planks)	47,31	0,44	20,82	0,73	34,54	0,83	39,27	0,90	42,58	0,90	42,58	0,80	37,85			
Walls	Plasterboard 2x12.5 mm	69,72	0,15	10,46	0,10	6,97	0,06	4,18	0,04	2,79	0,04	2,79	0,05	3,49			
Windows	energy efficient windows	7,52	0,10	0,75	0,07	0,53	0,05	0,38	0,05	0,38	0,02	0,15	0,02	0,15			
Doors	Wooden door	4,20	0,14	0,59	0,10	0,42	0,06	0,25	0,08	0,34	0,10	0,42	0,10	0,42			
Absorption from persons		**Antal**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**			
Persons		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00			
chairs		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00			
Absorption in air																	
v/ 50% RF		**Volumen** [m3]	**125 Hz** m	mV	**250 Hz** m	mV	**500Hz** m	mV	**1000Hz** m	mV	**2000Hz** m	mV	**4000 Hz** m	mV			
		135,50					0,00	0,05	0,00	0,14	0,00	0,33	0,01	0,83			
Total absorption				39,28	1,11	47,34	1,10	48,52	1,14	49,19	1,12	48,61	1,04	45,02			
Reveberation time	T=(0,16*V)/((Sa*s)+(Sn*A)+(4*m*V))			0,6		0,5		0,4		0,4		0,4		0,5			

Illustration 6.34:
Reveberation time for the Living Room

DORMITORY

Reveberation time																	
Equivalent absorption area	**Material**	**Areal** S(m^2)	**125 Hz** a	Sa	**250 Hz** a	Sa	**500Hz** a	Sa	**1000Hz** a	Sa	**2000Hz** a	Sa	**4000 Hz** a	Sa			
Camper bedroom																	
Floor	Wood flooring	70,00	0,15	10,50	0,11	7,70	0,10	7,00	0,07	4,90	0,06	4,20	0,07	4,90			
Ceiling	Suspended ceiling (wood planks)	80,00	0,44	35,20	0,73	58,40	0,83	66,40	0,90	72,00	0,90	72,00	0,80	64,00			
Walls	Plasterboard 2x12.5 mm	77,08	0,15	11,56	0,10	7,71	0,06	4,62	0,04	3,08	0,04	3,08	0,05	3,85			
Windows	energy efficient windows	11,42	0,10	1,14	0,07	0,80	0,05	0,57	0,05	0,57	0,02	0,23	0,02	0,23			
Doors	Wooden door	4,20	0,14	0,59	0,10	0,42	0,06	0,25	0,08	0,34	0,10	0,42	0,10	0,42			
Absorption from persons		**Antal**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**			
Persons		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00			
chairs		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00			
Absorption in air																	
v/ 50% RF		**Volumen** [m3]	**125 Hz** m	mV	**250 Hz** m	mV	**500Hz** m	mV	**1000Hz** m	mV	**2000Hz** m	mV	**4000 Hz** m	mV			
		213,50					0,00	0,09	0,00	0,21	0,00	0,51	0,01	1,30			
Total absorption				58,99	1,11	75,03	1,10	78,85	1,14	80,89	1,12	79,93	1,04	73,40			
Reveberation time	T=(0,16*V)/((Sa*s)+(Sn*A)+(4*m*V))			0,6		0,5		0,4		0,4		0,4		0,5			

Illustration 6.35:
Reveberation time for the Dormitory

DINING HALL

Reveberation time																	
Equivalent absorption area	**Material**	**Areal** S(m^2)	**125 Hz** a	Sa	**250 Hz** a	Sa	**500Hz** a	Sa	**1000Hz** a	Sa	**2000Hz** a	Sa	**4000 Hz** a	Sa			
Dining hal																	
Floor	Wood flooring	401,80	0,15	60,27	0,11	44,20	0,10	40,18	0,07	28,13	0,06	24,11	0,07	28,13			
Ceiling	Suspended ceiling (wood planks)	436,24	0,44	191,95	0,73	318,46	0,83	362,08	0,90	392,62	0,90	392,62	0,80	348,99			
Walls	Plasterboard 2x12.5 mm	187,40	0,15	28,11	0,10	18,74	0,06	11,24	0,04	7,50	0,04	7,50	0,05	9,37			
Acoustic walls	like suspended ceiling	136,64	0,44	60,12	0,73	99,75	0,83	113,41	0,90	122,98	0,90	122,98	0,80	109,31			
Windows	energy efficient windows	62,50	0,10	6,25	0,07	4,38	0,05	3,13	0,05	3,13	0,02	1,25	0,02	1,25			
Doors	Wooden door	8,40	0,14	1,18	0,10	0,84	0,06	0,50	0,08	0,67	0,10	0,84	0,10	0,84			
Wall sticked canvas		50,00	0,35	17,50	0,65	32,50	0,95	47,50	1,00	50,00	1,00	50,00	1,00	50,00			
Absorption from persons		**Antal**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**			
Sitting person on chair		150,00	0,20	30,00	0,40	60,00	0,55	82,50	0,60	90,00	0,60	90,00	0,50	75,00			
chairs		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00			
Absorption in air																	
v/ 50% RF		**Volumen** [m3]	**125 Hz** m	mV	**250 Hz** m	mV	**500Hz** m	mV	**1000Hz** m	mV	**2000Hz** m	mV	**4000 Hz** m	mV			
		2290,26					0,00	0,92	0,00	2,29	0,00	5,50	0,01	13,97			
Total absorption				395,37	2,89	578,86	3,43	660,54	3,64	695,01	3,62	689,29	3,34	622,89			
Reveberation time	T=(0,16*V)/((Sa*s)+(Sn*A)+(4*m*V))			0,9		0,6		0,6		0,5		0,5		0,6			

Illustration 6.36:
Reveberation time for the Dining Hall

APPENDIX E

SOLAR CELLS RESULTS

For making an overall estimation of how many m^2 solar cells the buildings need a BE15 is made. The total energy demand for every building is including lighting, appliences, electricity for heat pumps and mechanical ventilation. The illustration below illustrate which houses the estimated calculation is based on. The table shows different results from Be15. Furthermore, the table at the next page is used for the calculation for the solar cells.
The estimation gives a quick overview off the overall needs for solarcells for the houses. In the administration cluster the area of solar cells will vary more because of the different use of the buildings.

Illustration 6.37:
Orange circles shows which houses there is calculated on

	Energy frame 2020	Subsidy to energy frame	Electricity for running the building [kWh/m²/year]	Total energy demand [kWh]	Orientation of solar cells	Solar cells [m²]
Main building	25	15,3	16,3	154511	S, W, E	S: 310,5 W: 373,5 E: 377,7
House 1a	25	23,7	26,9	6561	S	39,6
House 1b	25	23,7	27,1	6613	V	48,5
House 1c	25	23,6	27	6584	S	39,7
House 2a	25	23,6	27	6593	E	47,8
House 2b	25	23,8	26,5	6465	S	39
House 2c	25	23,6	27,1	6609	S	39,9

Illustration 6.38:
Table showing different results from Be15 and the final area of solar cells for each calculated building

SOLAR CELLS CALCULATION

To calculate the needed area of solar cells on the buildings the table below is used.

A. Samlet areal af moduler		m²
Kendes den installerede effekt, gå direkte til C		

B. Vurdering af modulvirkningsgrad (%)	Standard	Højeffektiv
(kun moduler med siliciumsolceller)		
Monokrystallinsk, tætpakket	15	18
Polykrystallinsk, tætpakket	12	15
Amorft / tyndfilm	6	10

C. Installeret effekt = AxB/100	kW_{peak}

Solcellernes ydelse i fuld sol (Antal moduler gange den nominelle ydelse)

D. Vurdering af systemfaktor	Fritstående	Bygningsintegreret
Optimalt anlæg med højeffektiv vekselretter	0,85	0,8
Gennemsnitsanlæg med standardvekselretter	0,75	0,7
Mindre optimalt anlæg, f.eks. let skygge	0,65	0,6

Systemfaktoren tager hensyn til temperaturindflydelse, forskelle i de enkelte modulers ydelse, tab i kabler og vekselretter med videre. For amorfe moduler regnes altid som fritstående.

E. Indstråling kWh/m²

		Øst			Sydøst		Syd		Sydvest			Vest
		-90	-75	-60	-45	-30	0	30	45	60	75	90
Vandret	0°	999	999	999	999	999	999	999	999	999	999	999
	15°	988	1017	1044	1067	1084	1097	1080	1062	1038	1011	981
	30°	958	1012	1060	1100	1130	1152	1124	1092	1050	1001	947
	45°	914	983	1045	1096	1134	1163	1128	1087	1033	971	901
	60°	853	928	997	1052	1092	1124	1087	1042	983	916	839
	75°	772	845	912	967	1005	1033	998	957	901	833	759
Lodret	90°	671	738	795	841	873	892	867	833	785	726	662

Årlig solenergi på en skrå flade i Danmark. Værdierne kan variere geografisk og fra år til år.

$$A = \frac{C * 100}{B}$$

$$C = \frac{Årlig\ ydelse}{D * E}$$

Illustration 6.39:
Dimensioning of solar cells [PVdimensioneringsguide-nomogram.pdf, n.d.]

APPENDIX F

BE15: INPUT PARAMETERS, HOUSES

BUILDING: HOUSE 1A (see page 170 for location of house)

Heated floor area	244,12 m²
Heat capacity	80 Wh/K x m²
Time of use	168 h/week
Rotation	0 deg.
Addition to energy frame	23,7 kWh/m²/year

Building envelope

	Area (m²)	U (W/m²K)	b	Ht (W/K)	Dim.In (C)	Dim.out (C)	Loss (W)
	775,03		CtrlClick	61,5757			1677,48
External wall	247,95	0,07	1,00	17,3565			555,408
Roof	282,96	0,07	1,00	19,8072			633,83
Floor	244,12	0,1	1,00	24,412	30	10	488,24

FOUNDATIONS

	l (m)	Loss (W/mK)	b	Ht (W/K)	Loss (W)
	188,5		CtrlClick	13,026	416,832
External wall	81,8	0,12	1,00	9,816	314,112
Windows and doors DS418 tabel 6.12.2	101,1	0,03	1,00	3,033	97,056
Partion going through foundation DS418 tabel6.7.3	4,5	0,01	1,00	0,045	1,44
Doors and foundation DS418 tabel 6.13.6a	1,1	0,12	1,00	0,132	4,224

Windows

	Area (m²)	U (W/m²K)	Ht (W/K)	Ff (-)	g (-)	Fc (-)	Loss (W)
	35,57		28,456				910,592
East	4,08	0,8	3,26	0,85	0,7	1	103,68
South	10,2	0,8	8,16	0,85	0,4	1	261,12
West	8,39	0,8	6,712	0,85	0,4	1	214,79
North	12,9	0,8	10,32	0,85	0,7	1	330,24

VENTILATION

	Area (m²)	Fo, -	qm (l/s m²)	n vgv (-)	ti (°C)	qn (l/s m²)	qi,n (l/s m²)	SEL (kJ/m³)	qm,s (l/s m²)	qn,s (l/s m²)
Zone	244,12		Winter			Winter	Winter		Summer	Summer
Entrence	7,12	0,5	0	0	0	0,3	0,03	0	0	1,2
Bath/lavatories	61	0,5	1,33	0,88	18	0,07	0,03	1,5	1,33	1,2
Volunteers bedroom	40	0,5	1	0,88	18	0,07	0,03	1,5	1	1,2
Dormitory	82	0,21	1,46	0,88	18	0,07	0,03	1,5	1,83	1,2
Living room	54	0,11	2,22	0,88	18	0,07	0,03	1,5	3,33	1,2
Volunteers bedr. outs. use	82	0,29	0,3	0,88	18	0,07	0,03	1,5	0,3	1,2
Living room outside use	54	0,39	0,3	0,88	18	0,07	0,03	1,5	0,3	1,2
Rest outside use	244,12	0,5	0,3	0,88	18	0,07	0,03	1,5	0,3	1,2

Internal heat gain

	Area (m²)	Persons (W/m²)	App. (W/m²)
Zone	244,1	366,2 W	0,0 W
House	244,12	1,5	0

LIGTHING

	Area (m²)	Almen (W/m²)	Belys. (lux)	DF (%)	Styring	Fo (-)
Zone	244,12	Inst.			U,M,A,K	
Entrance and bath	68,12	6	50	2	A	0,1
Volunteers bedroom	40	8	200	2	A	0,2
Living room and dormitoty	136	8	200	5	A	0,2

Heat pump, brine to water

Type	Combined Space heating	VBV
Nominel effect	5,5	5,5
Nominel COP	3,36	3,36
Rel. COP	0,9	0

BE15: INPUT PARAMETERS, MAIN BUILDING

BUILDING: MAIN BUILDING

Heated floor area	3291,7 m²
Heat capacity	80 Wh/K x m²
Time of use	168 h/week
Rotation	0 deg.
Addition to energy frame	15,3 kWh/m²/year

Building envelope

	Area (m²)	U (W/m²K)	b	Ht (W/K)	Dim.In (C)	Dim.out (C)	Loss (W)
	8197,7		CtrlClick	683,54			18613,2
External wall	1483	0,07	1,00	103,81			3321,92
Roof	3408	0,07	1,00	238,56			7633,92
Floor	2716,7	0,1	1,00	271,67	30	10	5433,4
Floor sport activities	575	0,1	1,00	57,5			1840
Gates	15	0,8	1,00	12			384

FOUNDATIONS

	l (m)	Tab (W/mK)	b	Ht (W/K)	Dim.Inde (C)	Dim.Ude (C)	Tab (W)
	4782,04		CtrlClick	510,608			16339.4
External wall	4014,65	0,12	1,00	481,758			15416,3
Windows and doors DS418 tabel 6.12.2	530,3	0,03	1,00	15,909			509,088
Partion going through foundation DS418 tabel6.7.3	141	0,01	1,00	1,41			45,12
Doors and foundation DS418 tabel 6.13.6a	96,09	0,12	1,00	11,5308			368,986

Windows

	Orient	Areal (m²)	U (W/m²K)	Ht (W/K)	Ff (-)	g (-)	Fc (-)	Tab (W)
		107,35		85,88				2748,16
Door	n	5,5	0,8	4,4	0,85	0,5	1	140,8
Window kitchen	n	1,55	0,8	2,48	0,85	0,5	1	79,36
Door	n	2,75	0,8	2,2	0,85	0,5	1	70,4
Windoor dining hall	n	5	0,8	4	0,85	0,3	1	128
Window common room	v	5	0,8	8	0,85	0,3	1	256
Window common room	n	5	0,8	8	0,85	0,5	1	256
Window and door	v	10,5	0,8	8,4	0,85	0,3	1	268,8
Activity	s	5	0,8	12	0,85	0,3	1	384
Activity	n	5	0,8	20	0,85	0,5	1	640
Photo	ø	5	0,8	4	0,85	0,3	1	128
Music	n	5	0,8	8	0,85	0,5	1	256
Door	v	2,75	0,8	2,2	0,85	0,3	1	70,4
Door sprinkler room	n	2,75	0,8	2,2	0,1	0,1	1	70,4
Medicin house	n	3,42	0,8	10,944	0,85	0,5	1	350,208
Waiting room	v	3,42	0,8	2,736	0,85	0,3	1	87,552
Medicin house	n	3,42	0,8	13,68	0,85	0,5	1	437,76
Bath	ø	4,97	0,8	3,976	0,85	0,3	1	127,232
Door	ø	2,75	0,8	2,2	0,85	0,3	1	70,4
Sport activity	ø	6,6	0,8	5,28	0,85	0,3	1	168,96
Wellness	s	3,42	0,8	5,472	0,85	0,3	1	175,104
Window and door	s	15,5	0,8	12,4	0,85	0,3	1	396,8
Cozy room	s	8,42	0,8	6,736	0,85	0,3	1	215,552
Windoor dining hall	ø	5	0,8	12	0,85	0,3	1	384
Door	s	2,75	0,8	4,4	0,85	0,3	1	140,8
Windoor dining hall	s	5	0,8	28	0,85	0,3	1	896
Window kitchen	s	1,55	0,8	3,72	0,85	0,3	1	119,04
Courtyard area	ø	18,75	0,8	15	0,85	0,5	1	480
Courtyard area	n	18,05	0,8	14,44	0,85	0,5	1	462,08
Courtyard area	v	19,85	0,8	15,88	0,85	0,5	1	508,16
Courtyard area	s	18,05	0,8	14,44	0,85	0,5	1	462,08

VENTILATION

	Area (m²)	Fo, -	qm (l/s m²)	n vgv (-)	ti (°C)	qn (l/s m²)	qi,n (l/s m²)	SEL (kJ/m³)	qm,s (l/s m²)	qn,s (l/s m²)
Zone	3291,72		Vinter			Vinter	Vinter		Sommer	Sommer
Kitchen	132	0,17	6,8	0,8	18	0,07	0,03	1,5	0	1,2
Dining hall	428,45	0,1	5,14	0,85	18	0,07	0,03	1,5	5,14	1,2
Common room	200	0,09	7,5	0,85	18	0,07	0,03	1,5	7,5	1,2
Bath and lavatories	206	0,5	1,3	0,85	0	0,07	0,03	1,5	1,3	1,2
Depot/tech.	278,5	0,5	0,6	0,85	18	0,07	0,03	1,5	0,6	1,2
Foyer	790,35	0,5	0,3	0,85	18	0,07	0,03	1,5	0,3	1,2
Activity 1+2	155	0,09	3,1	0,85	18	0,07	0,03	1,5	3,1	1,2
Photo + Music	125	0,09	2,4	0,85	18	0,07	0,03	1,5	2,4	1,2
Medine treatment	102	0,25	1,2	0,85	18	0,07	0,03	1,5	1,2	1,2
Waiting room	88,4	0,25	1,7	0,85	18	0,07	0,03	1,5	1,7	1,2
Rooms	77	0,2	0,8	0,85	18	0,07	0,03	1,5	0,8	1,2
Changing room	63,2	0,09	1,6	0,85	18	0,07	0,03	1,5	1,6	1,2
Sports activity	575,4	0,09	2,6	0,85	18	0,07	0,03	1,5	2,6	1,2
Wellness	70,4	0,09	3,2	0,85	18	0,07	0,03	1,5	3,2	1,2
Building outside use	4838	0,5	0,3	0,85	18	0,07	0,03	1,5	0,3	1,2

Internal heat gain

	Area (m²)	Persons (W/m²)	App. (W/m²)
Zone	3291,7	4937,5 W	11520,9 W
Main building	3291,7	1,5	3,5

LIGTHING

	Area (m²)	Almen (W/m²)	Belys. (lux)	DF (%)	Styring	Fo (-)	Arb. (W/m²)
zone	1700.52	Inst.			U,M,A,K		
Foyer, bath ect.	68,12	6	100	2	A	0,5	0
Kitchen	40	8	500	5	A	0,17	2
Dining hall	136	8	200	5	A	0,1	0
Common room	200	8	300	3	A	0,09	0
Activities	280	8	300	2	A	0,09	0
Medicine treatment	102	8	500	5	A	0,25	0
Waiting room	88,4	8	200	5	A	0,25	0
Rooms	77	8	200	3	A	0,2	0
Changing rooms	63,2	8	200	2	A	0,09	0
Sports activity	575,4	8	300	2	A	0,09	0
Wellness	70,4	8	200	2	A	0,09	0

Heat pump, brine to water

Type	Combined Space heating	VBV
Nominel effect	49,4	24,7
Nominel COP	6,6	3,3
Rel. COP	1	0

Illustration 6.40:
Table shown values used in Be15

ENERGY USE

The graph shows the energy use for the calculated buildings. When a subsidy is added to the energy frame for Building Class 2020, nearly every house fulfills the energy frame. First, when solar cells are added to the buildings, it becomes a Zero Energy Building. For results of the solar cells and calculation, see appendix E.

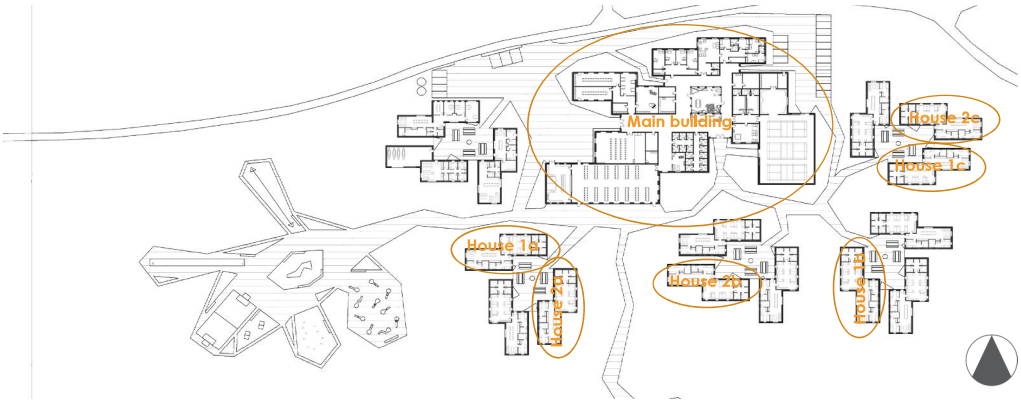

Illustration 6.41:
It is here seen which buildings there is calculated on

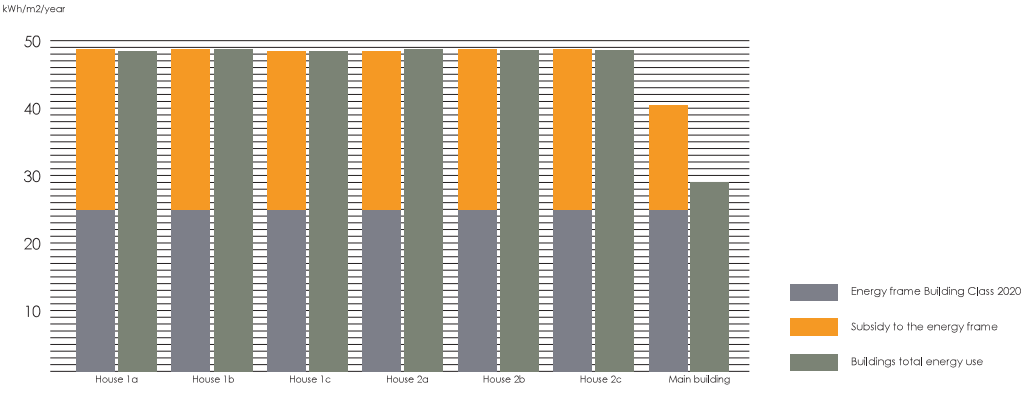

Illustration 6.42:
Energy use can be seen at the graph for the different buildings

APPENDIX G

BSIM: INPUT DATA AND RESULTS

Below the input for the BSim database is shown.

Konstruktionsdel	Materialer	λ	Cp Specifik varmekapicitet	U:
Ydervæg (træ) 448 mm	300 mm isolering kl. 34 2 x 12,5 mm gipsplade DS418	0,034 W/mK 0,2 W/mK	800 J/kg K 1000 J/kg K	0,08 W/(m²K)
Indervæg 120 mm	2 x 12,5 mm gipsplade 70 mm stålskelet m. isolering kl 45 2 x 12,5 mm gipsplade	0,2 W/mK 0,045 W/mK 0,2 W/mK	1000 J/kg K 800 J/kg K 1000 J/kg K	0,45 W/(m²K)
Gulv 420 mm	20 mm gulvbelægning – Paket gulv 100 mm btonplade armeret 300 mm trykfast isolering kl. 45	0,14 W/mK 2,1 W/mK 0,044 W/mK	1800 J/kg K 800 J/kg K 750 J/kg K	0,096 W/(m²K)
Tag 450 mm	450 mm isolering kl. 36 2 x 12,5 mm gipsplade	0,036 W/mK 0,012 W/mK	800 J/kg K 1000 J/kg K	0,08 W/(m²K)

SYSTEMS FOR THE LIVING ROOM

12 persons (8 campers and 4 voluenteers) Living Room

		Tidsplaner	
System Personlast	Beskrivelse 12 Standart 100 W/pers	Regulering 0 % kl. 01 – 07 25 % kl. 08 -09 0 % kl. 10 50 % kl. 11 16 % kl. 12 – 16 100 % kl. 17 50 % kl. 18 0 % kl. 19 16 % kl. 20 - 22 0 % kl. 23 25 % kl. 24	Tidsangivelse Hver anden uge
Belysning	Særlys 0 kW Almen belysning 0,354 kW svarende til 8 W/m² Gen. Light level: 200 lux Type: glødepære Solar Limit 2 kW Til udsugning 0	LightCtrl-reg Factor (-) 1 Lower limit 2 (kw) Temp max (□c) 25 Solar limit (kw) 0,2	Brugstid hver anden uge
Infiltration	Grundskifte 0,021 l/s m² i brugstiden 0,0203 l/s m² udenfor brugstiden TmpFactor 0 TmpPover 0 WindFactor 0	97% kl. 01 – 07 97% kl. 10 97% kl. 19 97% kl. 23 100 % kl. 08 – 9 100 % kl. 11 - 18 100 % kl. 20 – 22 100 % kl. 24	Altid
Udluftning (Naturlig ventilation)	Basic air change: 3 h^{-1} TmpFactor: 0,1 Tmp Power: 0,5 WindFactor: 0,2 Max AirChange: 5 Max Wind: 0	Venting Ctrl SetPoint 24°C SetP CO_2: 0 Factor 1	Brugstid Maj – Sep.

Opvarmning	MaxPow 45 kW Fixed Part 0,05 Part to Air 0,5	HeatCtrl Factor 1 Set Point 21 °C Design Temp -12 MinPow 0,5 kW Te min 17°C	Altid
Ventilation Indblæsnings-styring	Input Supply 0,18 m³/s (2,36 h⁻¹) ✻ Pressure Rise 200 Pa Total Eff. 0,7 Part to Air 1 Output Return 0,18 m³/s Pressure Rise 200 Pa Total Eff. 0,7 Part to air 0 Recovery Unit Max Heat Rec 0,85 Min Heat Rec 0 Max Cool Rec 0,7 Max Moist Rec 0 Heating Coil Max Power 1 kW	ZonetmpCtrl Part of nom.flow (-) 1 Min inlet temp (°C) 18 Max inlet temp (°C) 30 Heating set pnt (°C) 21 Cooling set pnt (°C) 24 Air Hum: 0,07 kg/kg	Altid

✻ Page 181 and 182 is used to estimate the Air Change Rate in the Living Room

SYSTEMS FOR THE DORMITORY

12 persons (8 campers and 4 voluenteers) Dormitory

		Tidsplaner	
System Personlast	Beskrivelse 12 Standart 100 W/pers	Regulering 55 % kl. 24 – 07 58 % kl. 08 -09 0 % kl. 10 50 % kl. 11 16 % kl. 12 – 16 0 % kl. 17 50 % kl. 18 0 % kl. 19 16 % kl. 20 - 22 100 % kl. 23	Tidsangivelse Hver anden uge
Belysning	Særlys 0 kW Almen belysning 0,544 kW svarende til 8 W/m² Gen. Light level: 200 lux Type: glødepære Solar Limit 2 kW Til udsugning 0	LightCtrl-reg Factor (-) 1 Lower limit 2 (kw) Temp max (□c) 25 Solar limit (kw) 0,2	Brugstid hver anden uge
Infiltration	Grundskifte 0,021 l/s m² i brugstiden TmpFactor 0 TmpPover 0 WindFactor 0	95% kl. 10 95% kl. 19 100 % kl. 20 – 09 100 % kl. 11 - 18	Altid
Udluftning (Naturlig ventilation)	Basic air change: 2 h⁻¹ TmpFactor: 0,1 Tmp Power: 0,5 WindFactor: 0,2 Max AirChange: 5 Max Wind: 0	Venting Ctrl SetPoint 24°C SetP CO_2: 0 Factor 1	Brugstid Maj – Sep.

Opvarmning	MaxPow 45 kW Fixed Part 0,05 Part to Air 0,5	HeatCtrl Factor 1 Set Point 21 ˚C Design Temp -12 MinPow 0,5 kW Te min 17˚C	Altid
Ventilation Indblæsnings- styring	Input Supply 0,15 m³/s Pressure Rise 200 Pa Total Eff. 0,7 Part to Air 1 Output Return 0,15 m³/s Pressure Rise 200 Pa Total Eff. 0,7 Part to air 0 Recovery Unit Max Heat Rec 0,85 Min Heat Rec 0 Max Cool Rec 0,7 Max Moist Rec 0 Heating Coil Max Power 1 kW	ZonetmpCtrl Part of nom.flow (-) 1 Min inlet temp (˚C) 18 Max inlet temp (˚C) 30 Heating set pnt (˚C) 21 Cooling set pnt (˚C) 24 Air Hum: 0,07 kg/kg	Altid

SYSTEMS FOR THE VOLUNTEERS BEDROOM

2 persons (2 voluenteers) Volunteers Bedroom

System Personlast	Beskrivelse 2 Standart 100 W/pers	Tidsplaner Regulering 60 % kl. 24 – 07 50 % kl. 08 -09 0 % kl. 10 50 % kl. 11 0 % kl. 12 – 19 50 % kl. 20 0 % kl. 22-23	Tidsangivelse Hver anden uge
Belysning	Særlys 0 kW Almen belysning 0,112 kW svarende til 8 W/m² Gen. Light level: 200 lux Type: glødepære Solar Limit 2 kW Til udsugning 0	LightCtrl-reg Factor (-) 1 Lower limit 2 (kw) Temp max (□c) 25 Solar limit (kw) 0,2	Brugstid hver anden uge
Infiltration	Grundskifte 0,028 l/s m² i brugstiden TmpFactor 0 TmpPover 0 WindFactor 0	93% kl. 10 93% kl. 12 - 19 93% kl. 21 - 23 100 % kl. 24 – 9 100 % kl. 11 100 % kl. 20	Altid
Udluftning (Naturlig ventilation)	Basic air change: 3 h⁻¹ TmpFactor: 0,1 Tmp Power: 0,5 WindFactor: 0,2 Max AirChange: 5 Max Wind: 0	Venting Ctrl SetPoint 24˚C SetP CO_2: 0 Factor 1	Brugstid Maj – Sep.

Opvarmning	MaxPow 45 kW Fixed Part 0,05 Part to Air 0,5	HeatCtrl Factor 1 Set Point 21 ˚C Design Temp -12 MinPow 0,5 kW Te min 17˚C	Altid
Ventilation Indblæsnings-styring	Input Supply 0,02 m³/s Pressure Rise 200 Pa Total Eff. 0,7 Part to Air 1 Output Return 0,02 m³/s Pressure Rise 200 Pa Total Eff. 0,7 Part to air 0 Recovery Unit Max Heat Rec 0,85 Min Heat Rec 0 Max Cool Rec 0,7 Max Moist Rec 0 Heating Coil Max Power 1 kW	ZonetmpCtrl Part of nom.flow (-) 1 Min inlet temp (˚C) 18 Max inlet temp (˚C) 30 Heating set pnt (˚C) 21 Cooling set pnt (˚C) 24 Air Hum: 0,07 kg/kg	Altid

Illustration 6.43:
Values and results from BSim

INDOOR TEMPERATURE

The graph shows the indoor temperature during a year

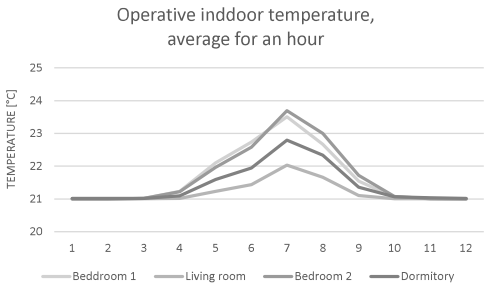

Illustration 6.44:
Operative indoor temperature, average for an hour

The graph shows the minimum and maximum indoor temperature in the different rooms

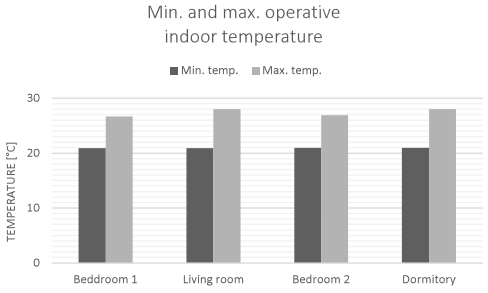

Illustration 6.45:
Min. and max. operative indoor temperature

CO_2 RESULT IN THE DIFFERENT ROOMS

The three graphs show how the CO_2 concentration behave on an hourly basis over a year.

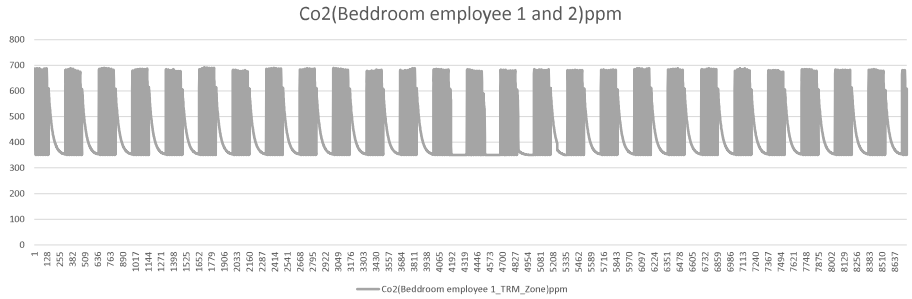

Illustration 6.46:
Here the CO_2 concentration for the volunteer's bedrooms is shown. Every second week, when the camp is not in use, the CO_2 concentration decreases.

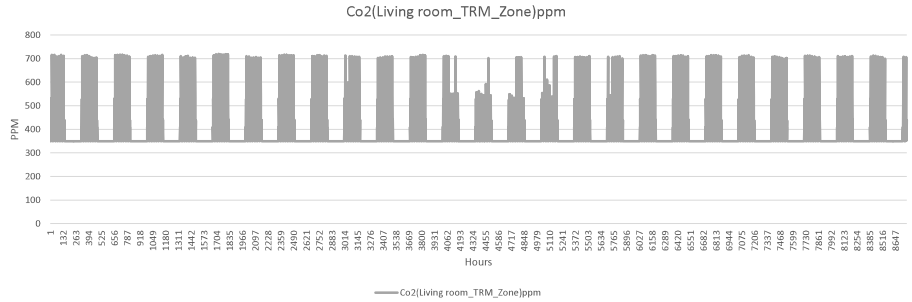

Illustration 6.47:
In the summer period when the temperature gets above 24 degrees, the windows open and the CO_2 concentration decreases.

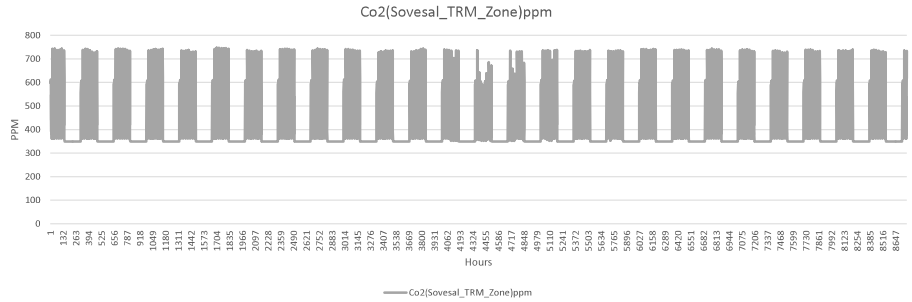

Illustration 6.48:
The CO_2 concentration in the camper's dormitory is steady throughout the year. There is only a deviation during summer time, when it gets to warm inside and the windows automatically opens

BSIM RESULT FOR HOUSE 2

The house is simulated in Bsim to the find sizes of windows and the placement in the wall. As CO_2 have a significant role of the atmospheric comfort, this is also investigated and regulated to fulfill requirements corresponding to category 1, DS/EN 15251:2007.
This house is rotated -90 degres compared to the house presented in the presentation.

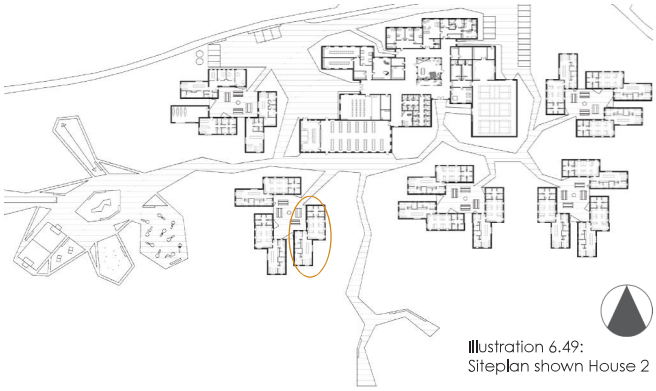

Illustration 6.49:
Siteplan shown House 2

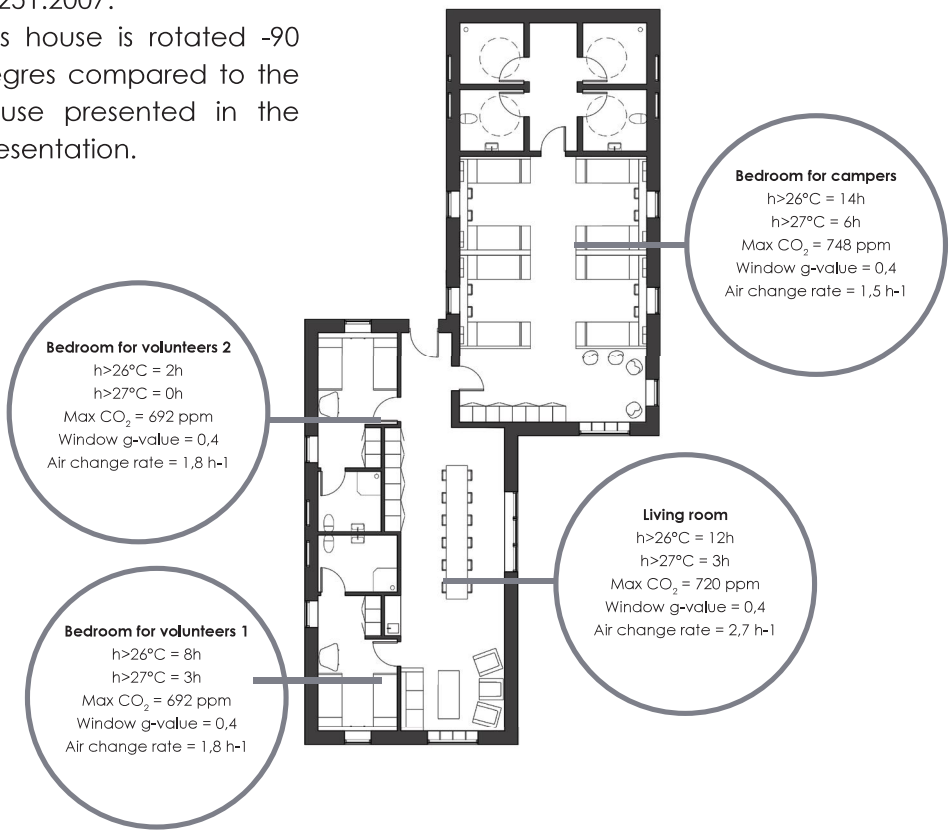

Illustration 6.50:
Plan shown the results from the different room at the house

AIR CHANGE RATE ON BASIS OF EXPERIENCED AIR POLLUTION

This calculation of the air change rate is based on a sensory calculation for the living room.

Category	Perceived air quality		Required ventilation rate[1)]
	dissatisfied %	dp	l/s × olf
A	15	1,0	10
B	20	1,4	7
C	30	2,5	4

[1)] The ventilation rates given are examples referring exclusively to perceived air quality. They apply only to clean outdoor air and a ventilation effectiveness of one.

Illustration 6.51:
Tree categories for percieved air quality
[Dansk Standard, 2001]

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

C = 1,0 dp [perceived air quality - 15 % dissatisfied persons]
q = 12 olf + (0,1 olf/m2 * 45,2 m^2) = 16,55 olf [added air pollution]
• Number pers. 12 olf
• Pollution from building = 0.1 olf/m^2 ; floor area, living room = 45,2 m^2
Ci = 0,05 dp [perceived air quality in outdoor air]
Vl = the introduced outdoor air flow
V = 275 m^3

$$1{,}0\ dp = 10 * \frac{16{,}55}{V_l} + 0{,}05\ dp$$

Vl=174,2 l/s = 627,12 m^3/h

Air change:

$$n = \frac{V_l}{V}$$

$$n = \frac{627{,}12\ m^3/h}{275\ m^3}$$

n = 2,2 h-1
This means the air flow should be 14,5 l/s per person in the living room.

AIR CHANGE RATE ON BASIS OF THE CO_2 POLLUTION

Outdoor CO_2 concentration are estimated to be 400 ppm. For not exceeding the requirements of CO_2 concentration corresponding to DS/EN 15251:2007. The following formula is used to calculate the air change rate in the living room:

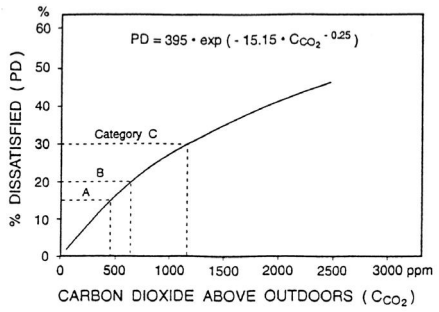

Illustration 6.52:
Percieved air quality (% dissatified)
[Dansk Standard, 2001]

$$C = \frac{q}{n * V} + C_i$$

C = 750 ppm [pollution concentration in the room]
q = 17 x M = (17 x 12)/1000 = 0,204 m^3/h [the CO_2 concentration]
V = 275 m^3
Ci = 350 ppm [concentration of pollution in the air insufflation]
n = h-1 [air change rate]

The air change rate is:

$$750\ ppm = \frac{0{,}204 m^3/h}{n * 275 m^3} + 350\ ppm$$

n = 1,85 h-1 = 141,4 l/s

This means the air flow should be 11,78 l/s per person in the living room.

APPENDIX H

VENTILATION PRINSIPLES: ADMINISTRATION CLUSTER

Here the ventilation principles for the administration cluster is shown.

Illustration 6.53:
Ventilation principles in administration cluster

VENTILATION PRINSIPLES: MAIN BUILDING

Here the ventilation principles for the main building is shown.

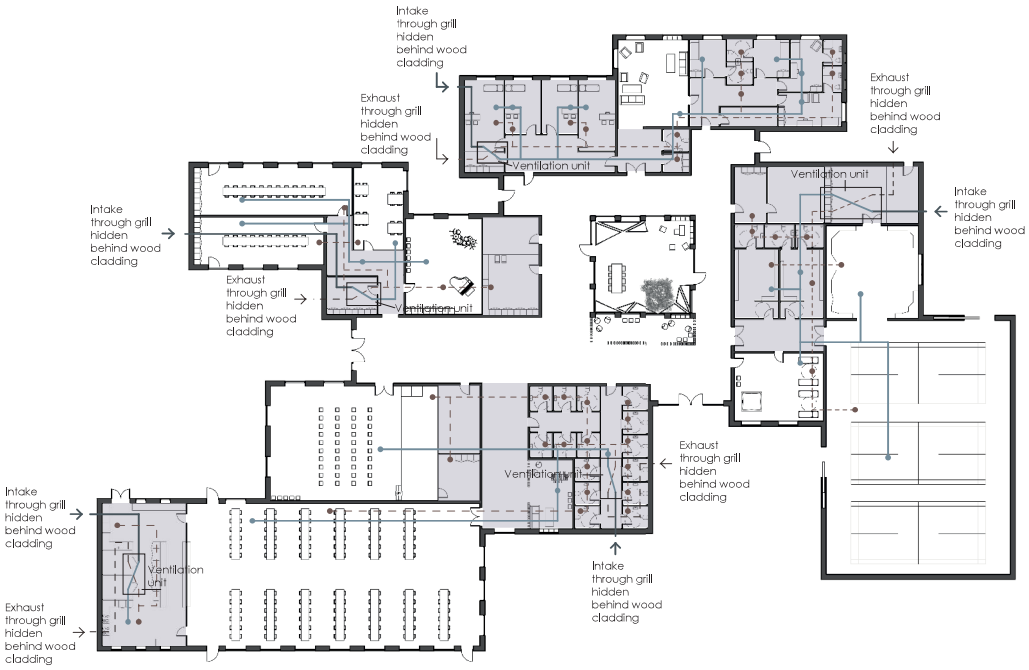

Illustration 6.54:
Ventilation principles in the main building

APPENDIX I

FIRE PRINCIPLES: ADMINISTRATION CLUSTER

Here the fire plan strategy for the administration cluster is shown.

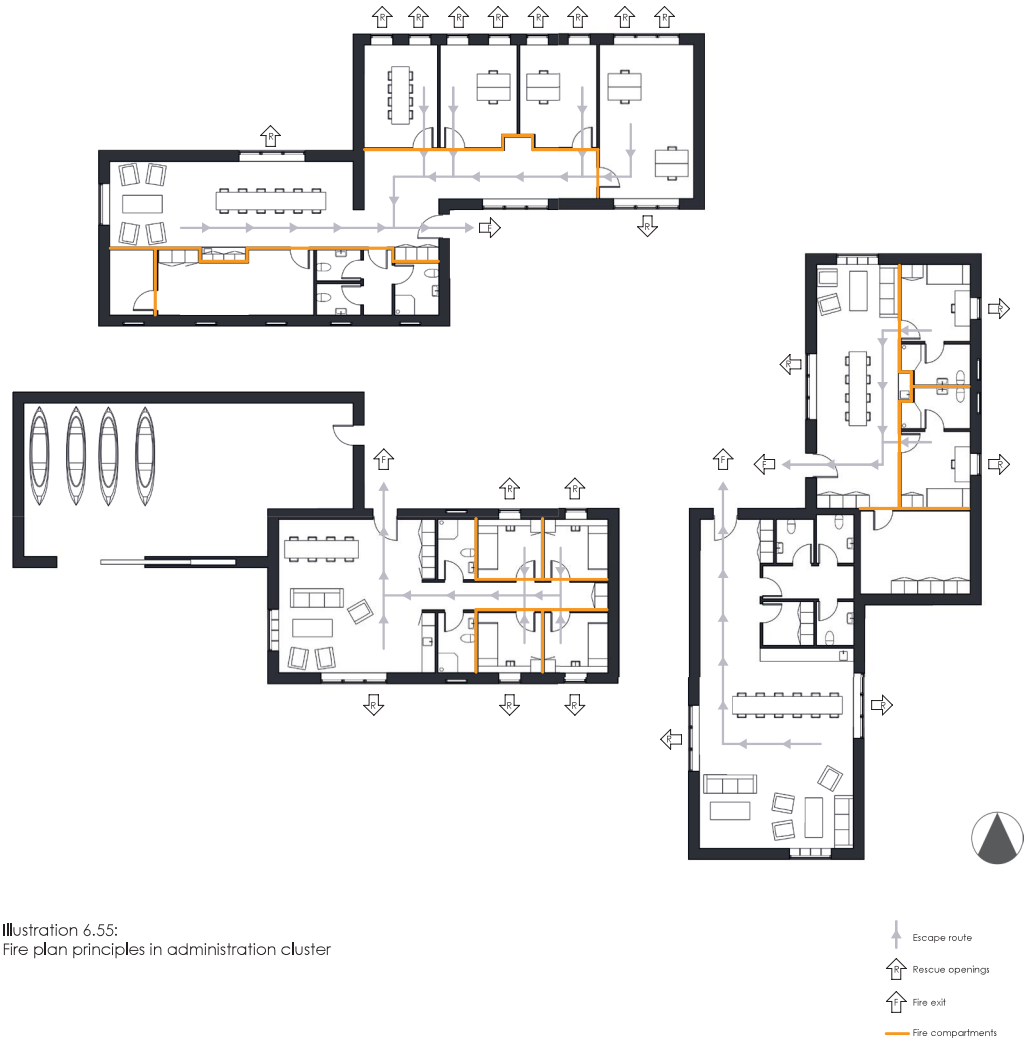

Illustration 6.55:
Fire plan principles in administration cluster

FIRE PRINCIPLES: MAIN BUILDING

Here the fire plan strategy for the main building is shown.

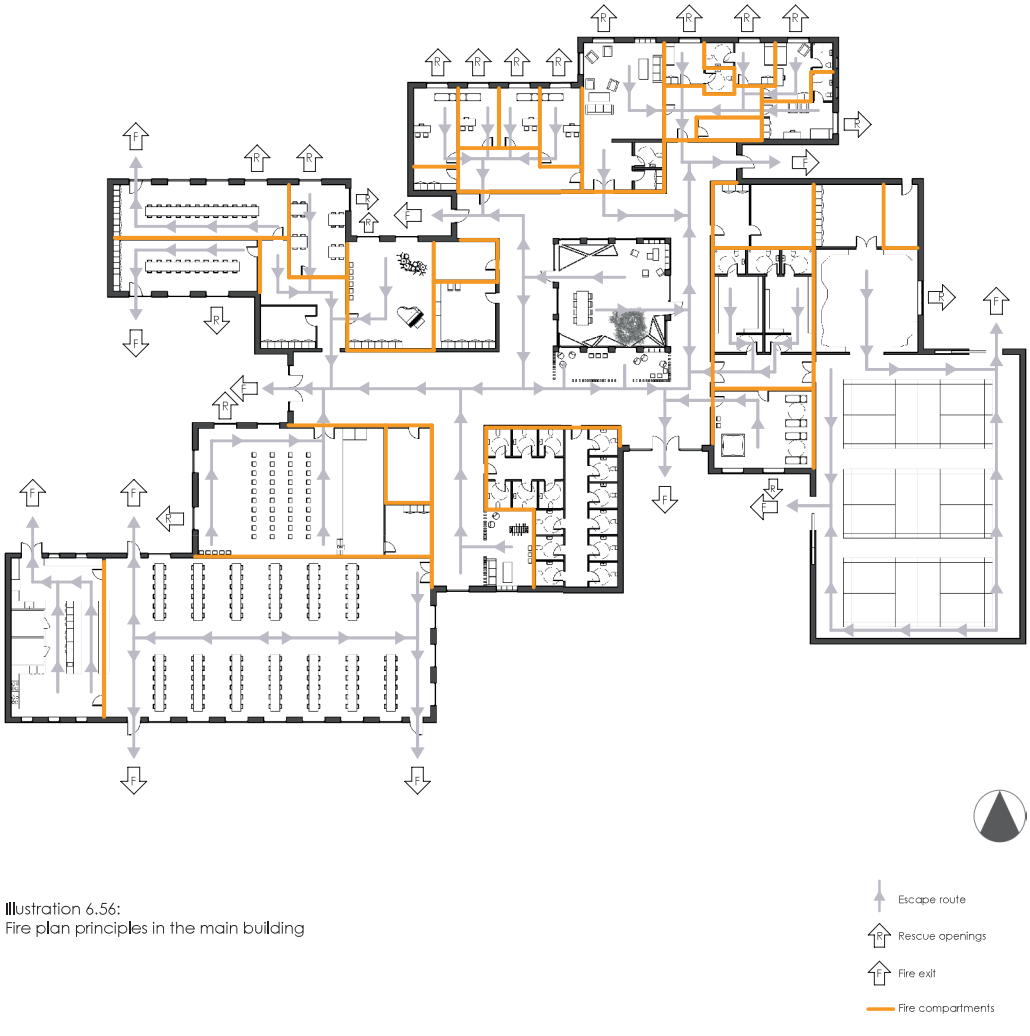

Illustration 6.56:
Fire plan principles in the main building

APPENDIX J

E-MAIL CORRESPONDENCE WITH NURSE LISE JENSEN

Hej Lise

Vi har fået din mail fra Heidi og Rasmus fra ExcaliCare.
Vi er to speciale studerende fra Arkitektur og Design, Aalborg Universitet, som i samarbejde med ExcaliCare er ved at udvikle et udkast til et campområde kun for ExcaliCare.
Vi kan forstå at det er dig, der er med til at udvælge nogle af de børn, som kan deltage i Cool Camp. Vi er meget interesseret i af få en forståelse af denne proces og især høre lidt om, hvordan du kan føle en forskel på børnene, når de har været på campen. Vi har i denne forbindelse udarbejdet nogle spørgsmål, som vi håber du har tid og lyst til at knytte et par ord til.

Er det nogle bestemte børn der bliver en del af campen?
Hvordan foregår udvælgelsen af børnene?
Hvordan kan du mærke forskel på børnene når de har været afsted?
Hvorfor tror du, at der ikke allerede findes et lignende tilbud i Danmark som ExcaliCare?

Venlig hilsen
Helle og Camilla

Hej Camilla og Helle

Tak for jeres mail - prøver at svar så godt jeg kan.

Udvælgelse af unge til Campen beror altid på et skøn og en faglig vurdering, ud fra kendskabet til den unge patient.

Vi er i tæt kontakt med den unge patient og dens familie både under hele behandlingsforløbet, men også bagefter til kontroller i ambulatoriet. Her bliver vi ofte opmærksomme på, om den unge patient har udfordringer med rehabiliteringen og om der er noget vi som fagpersoner kan gøre for at hjælpe på dette. Både mine kollegaer i ambulatoriet og i sengeafsnittet diskuterer patientforløbende løbende og på den måde gør det udvælgelsen nemmere. Mange unge har det svært efter endt behandling og det at genoptage det tidligere liv kan være udfordrende. Samtidig kan sygdommen have efterladt forandringer på krop og sjæl, der gør det svære for de unge at vende tilbage. Den unge patient kan have ændret udseende, fået skrækmærker, mistet et ben eller på anden måde fået synlig bevis for sygdommens magt. Usynlige ændringer som konstante smerter,

smagsændringer, nedtrykthed og træthed kan også fylde. De unge patienter skal finde ud af at leve et liv efter sygdommen, og de unge skal til at acceptere, at de ikke nødvendigvis kommer tilbage til 'sit gamle jeg', som før sygdommen. Den unge er i en ny situation, og det bliver ikke som før.

De unge er forandret og mange har behov for hjælp, da både selvværdet og selvtilliden kan være ændret negativt - noget vi ofte blover gjort opmærksomme på ved hjælp af forældrene eller under ungesamtalerne alene med den unge. Mobning er et problem der fylder hos mange og ved at lade den unge, med mobning tæt inde på livet, deltage i campen er der mulighed for den unge, at møde ligesindede - ikke fordi sygdommen skal fylde, men blandt de unge oplever jeg en anden accept og forståelse for hinanden, end de måske møder blandt deres tidligere venner. Ved hjælp af Terapeutisk reakreation kan den unge få et øget selvværd og bedre selvtillid, som kan hjælpe hende på vej tilbage til livet.

De senere år er fokusset på rehabilitering vokset - og det samme er behovet også for de unge patienter. Der forskes meget på området, vi har et stærkt lægefelt og en stærk patientforening, der yder økonomisk støtte. Efterhånden er prognoserne blevet bedre, og så er der et behov for at hjælpe bagefter. Men der skulle nogen til at gribe bolden og fokusere på rehabilitering af unge kræftpatienter, nogen med ressourcer, kompetencer, erfaring og ideer - hvilket Heidi og Rasmus havde og skabte dette fantastiske univers, som jeg er heldig at måtte være en del af .
I efteråret efter campen oplevede jeg flere forældre opsøge mig, både telefonisk og når de var til kontrol, for at fortælle om hvilken stor ændring de har oplevet hos deres barn i positiv retning efter campen. Det giver lyst og drive til at kunne hjælpe endnu flere - for behovet er stort.

Jeg håber ovenstående var svar på mange af jeres spørgsmål - i er meget velkommen til at kontakte mig igen

Med venlig hilsen
Lise Jensen

Sygeplejerske
A20 Børneafsnit for gigt, kræft og blodsygdomme
Aarhus universitetshospital
Palle Juul-Jensens Boulevard 99
8200 Århus N
Tlf. 7845 1676

APPENDIX K

CASE: THE HEALING POWER OF NATURE AND LIGHT

For humans light is a basic need. It is also an important factor to understand that light has a positive effect on people's well-being, since the light gives quality to the surroundings and to the indoor room [Lamm and Kural, 2007]. But as important light is, the view throughout the window is at least just as important [Lamm and Kural, 2007]. The positive effect that views to natural scenes can have has been established for a long time [Fich et al., 2014]. In a paper by Roger S. Ulrich it has been investigated how the view influences the recovery from surgery. View towards vegetation and water elicit positive feelings and reduces stressful thoughts [Ulrich, 1984]. The paper also states that the view especially is important for patients and people who spends many hours in the same room. Finally the records proves that patients with a view towards trees recovers faster than those who had a view towards a brick wall [Ulrich, 1984].

"Igennem forebyggelse og planlægning kan lys virke som ikke-medicinsk behandlingsform mod en række forskellige lidelser"

[Translated to english by the authors of this thesis March 2016: Through prevent and planning light can work as a non-medical treatment against several different disease]

- Carlo Volf, Arkitekt MAA, ph.d.
[Arkitektforeningen.dk, 2014]

Illustration 6.57:
From the courtyard

APPENDIX L

STRUCTURAL ANALYSIS AND MAPPING

To get an overview of the location for the rehabilitation camp, a structure analysis and mapping is made. The most important element is chosen to map to get the best insight into the site. Furthermore, the study also show what the area can give to the camp. There is a possibility that the camp can benefit from some of the activities, which already exists in the area and in the same way the camp can contribute in new ways to the area.

BUILDINGS

The site is located outside the city where most of the surrounding buildings are smaller country houses. Therefore, it is a quiet place to be and the camp will not get disturbed.

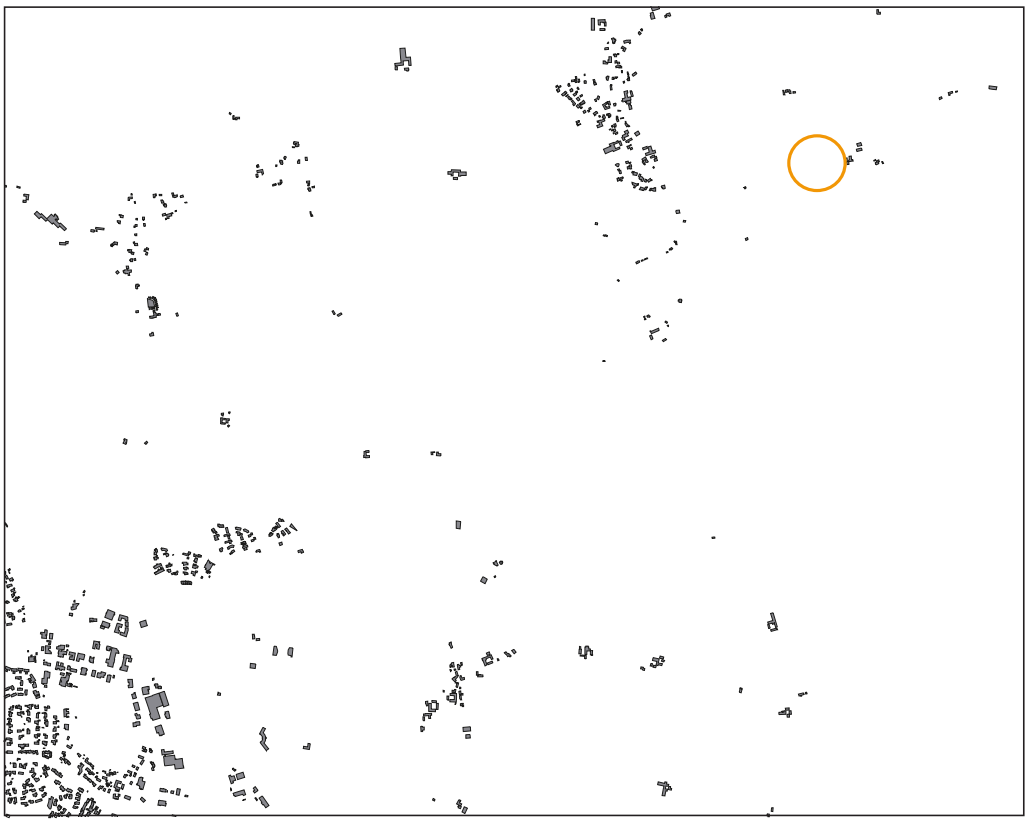

Illustration 6.58:
Buildings

INFRASTRUCTURE

The road to the site is a dead-end road which also mean, that only few will pass the site. It is easy to get to Ry from both Herning and Aarhus with train as seen on the illustration

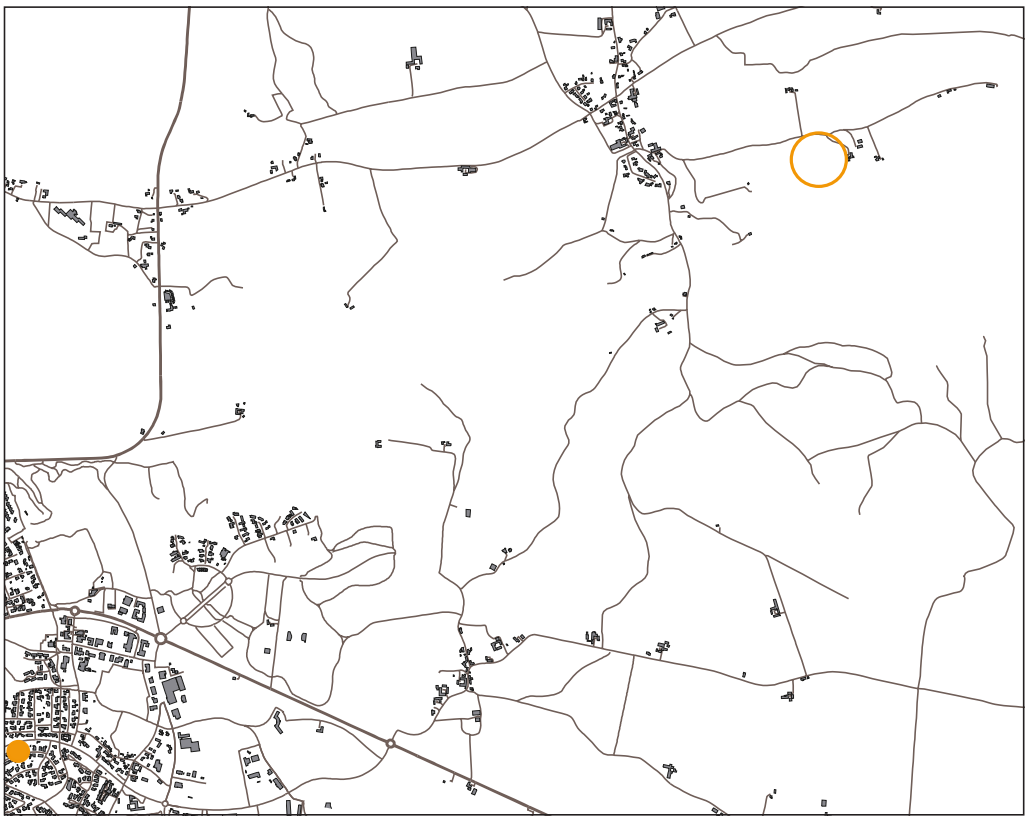

Illustration 6.59:
Infrastructure with a mark at the Train Station

NATURE

There is a lot of nature in the area. The site is surrounded by nature both forest, fields and lakes. The site ends at a sea where it is allowed to swim, which make activities at the lake much easier and add qualities to the site.

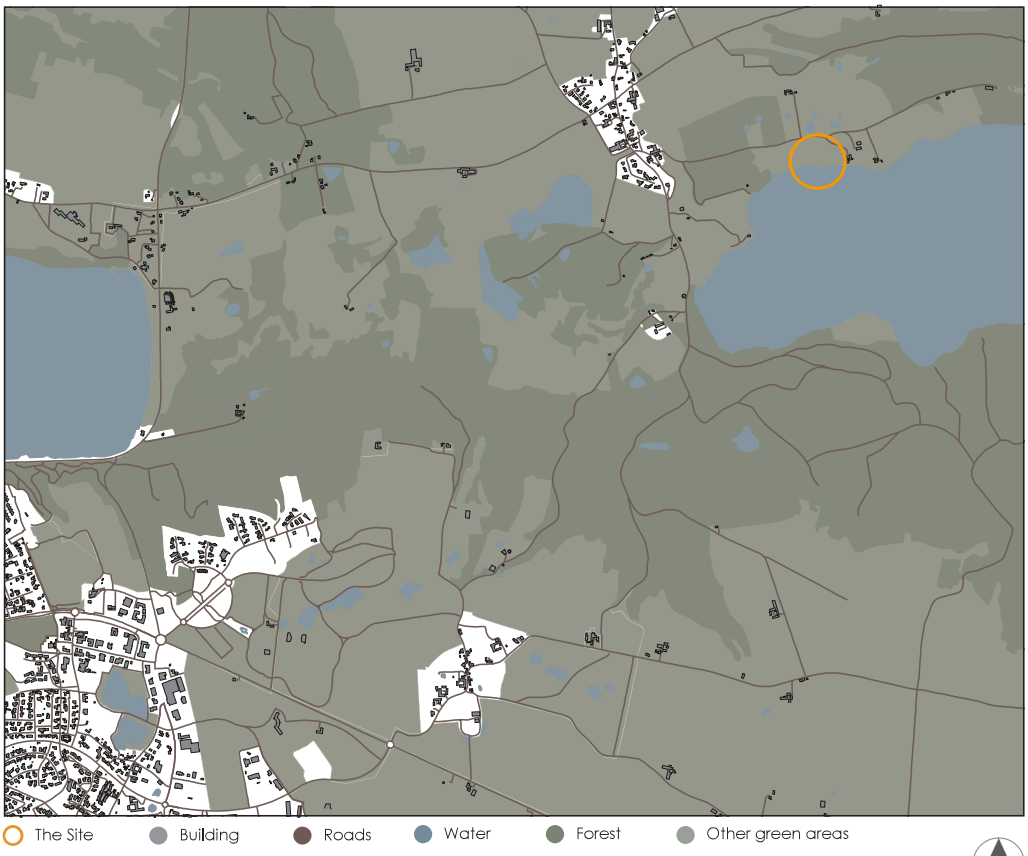

Illustration 6.60:
Nature: water, forrest and other green areas as fields

ATTRACTION

Ry have some attraction which the camp have the possibility to use. This includes a golf field, rowing, canoe, yacht club, horseback riding, a cinema and a few shops and grocery.

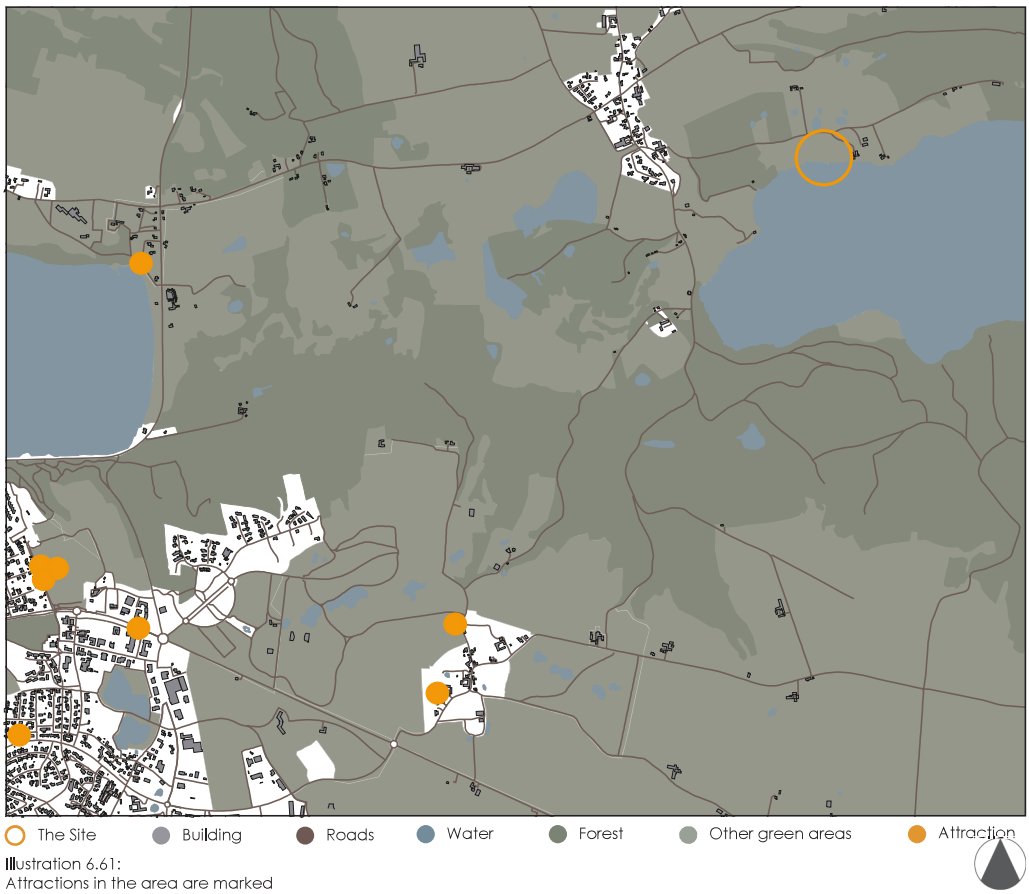

Illustration 6.61:
Attractions in the area are marked

APPENDIX M

CLIMATE

Sun path diagram and wind rose is used for site analysis and is the basis for the compass rose.

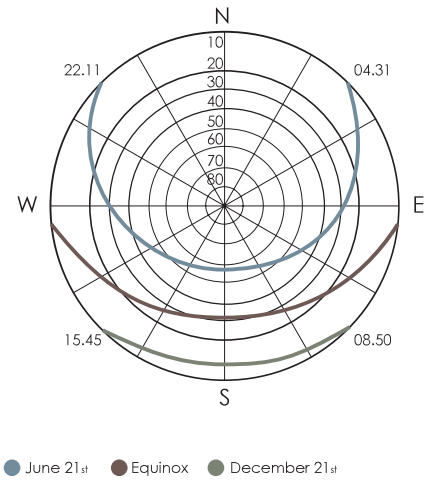

Illustration 6.62:
Sun path diagram for Silkeborg, Denmark

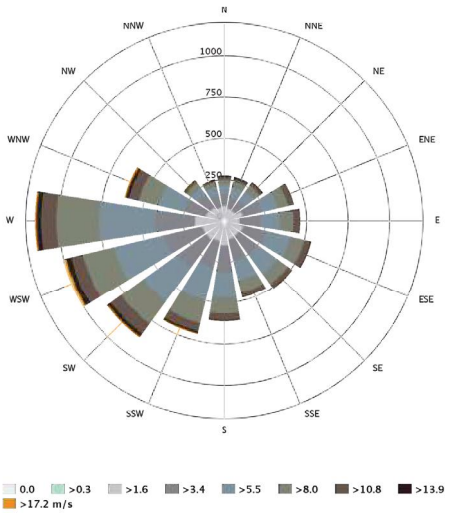

Illustration 6.63:
Wind direction distribution in m/s over a year for Javngyde, Denmark

APPENDIX N

DAYLIGHT ANALYSIS: CONTEXT

Here the different forms, which has been worked with in the context, is seen modelling in Velux. This is done to get an idea of the daylight factor, in the different rooms. Work have not been done concerning the size and placement of the windows, at this point in time.

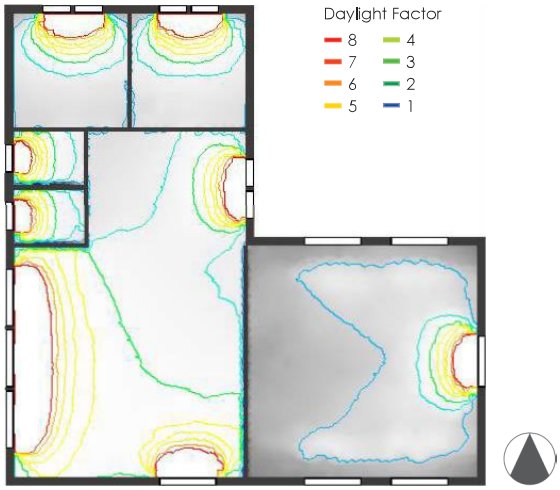

Illustration 6.64:
Velux analysis for the L form

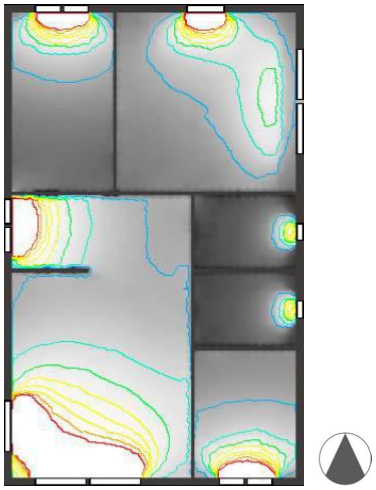

Illustration 6.65:
Velux analysis for the rectangle form

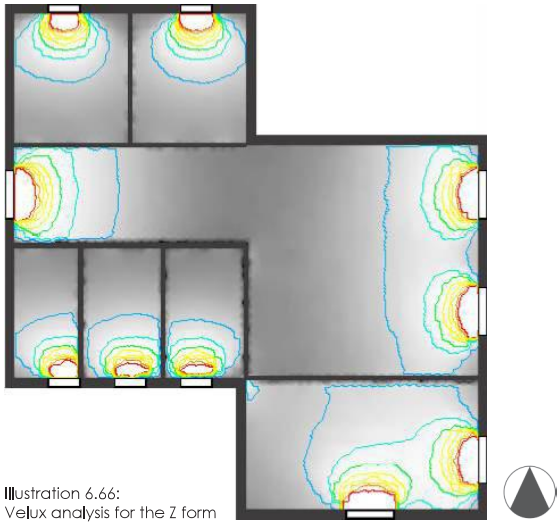

Illustration 6.66:
Velux analysis for the Z form

APPENDIX O

ACOUSTICS CALCULATION FOR DINING HALL, PROCESS

The tables below shows an investigation in the reverberation time for the dining hall. The tests are made with persons sitting on a padded chair. As the final result in appendix D shows, some of the walls need to be decorate with sound absorbing pictures.

Reveberation time

Equivalent absorption area	**Material**	**Areal** S(m^2)	**125 Hz** a	Sa	**250 Hz** a	Sa	**500Hz** a	Sa	**1000Hz** a	Sa	**2000Hz** a	Sa	**4000 Hz** a	Sa
Dining hall														
Floor	Wood flooring	401,80	0,15	60,27	0,11	44,20	0,10	40,18	0,07	28,13	0,06	24,11	0,07	28,13
Ceiling	Suspended ceiling (wood planks)	436,24	0,44	191,95	0,73	318,46	0,83	362,08	0,90	392,62	0,90	392,62	0,80	348,99
Walls	Plasterboard 2x12,5 mm	324,04	0,15	48,61	0,10	32,40	0,06	19,44	0,04	12,96	0,04	12,96	0,05	16,20
Windows	energy efficient windows	62,50	0,10	6,25	0,07	4,38	0,05	3,13	0,05	3,13	0,02	1,25	0,02	1,25
Doors	Wooden door	8,40	0,14	1,18	0,10	0,84	0,06	0,50	0,08	0,67	0,10	0,84	0,10	0,84
Absorption from persons		**Antal**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**
Sitting persons on a chair		150,00	0,20	30,00	0,40	60,00	0,55	82,50	0,60	90,00	0,60	90,00	0,55	82,50
chairs		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Absorption in air														
v/ 50% RF		**Volumen** [m3]	m	mV	m	mV	m	mV	m	mV	m	mV	m	mV
		2290,26					0,00	0,92	0,00	2,29	0,00	5,50	0,01	13,97
Total absorption				338,25	1,51	460,27	1,65	507,83	1,74	527,50	1,72	521,78	1,59	477,91
Reveberation time	T=(0,16*V)/((Sa*s)+(Sn*A)+(4*m*V))			1,1		0,8		0,7		0,7		0,7		0,8

Illustration 6.67:
Materiality is the same as in the houses

Reveberation time

Equivalent absorption area	**Material**	**Areal** S(m^2)	**125 Hz** a	Sa	**250 Hz** a	Sa	**500Hz** a	Sa	**1000Hz** a	Sa	**2000Hz** a	Sa	**4000 Hz** a	Sa
Dining hall														
Floor	Wood flooring	401,80	0,15	60,27	0,11	44,20	0,10	40,18	0,07	28,13	0,06	24,11	0,07	28,13
Ceiling	Suspended ceiling (wood planks)	436,24	0,44	191,95	0,73	318,46	0,83	362,08	0,90	392,62	0,90	392,62	0,80	348,99
Walls	Plasterboard 2x12,5 mm	187,40	0,15	28,11	0,10	18,74	0,06	11,24	0,04	7,50	0,04	7,50	0,05	9,37
Acoustic walls	*wood wool board till height 2,5 m*	136,64	0,20	27,33	0,15	20,50	0,25	34,16	0,50	68,32	0,85	116,14	0,65	88,82
Windows	energy efficient windows	62,50	0,10	6,25	0,07	4,38	0,05	3,13	0,05	3,13	0,02	1,25	0,02	1,25
Doors	Wooden door	8,40	0,14	1,18	0,10	0,84	0,06	0,50	0,08	0,67	0,10	0,84	0,10	0,84
Absorption from persons		**Antal**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**	**Sa/stk**	**Sa**
Sitting persons on a chair		150,00	0,20	30,00	0,40	60,00	0,55	82,50	0,60	90,00	0,60	90,00	0,60	90,00
chairs		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Absorption in air														
v/ 50% RF		**Volumen** [m3]	m	mV	m	mV	m	mV	m	mV	m	mV	m	mV
		2290,26					0,00	0,92	0,00	2,29	0,00	5,50	0,01	13,97
Total absorption				345,08	1,66	467,10	1,90	533,79	2,24	590,36	2,57	632,45	2,29	567,39
Reveberation time	T=(0,16*V)/((Sa*s)+(Sn*A)+(4*m*V))			1,1		0,8		0,7		0,6		0,6		0,6

Illustration 6.68:
Materials for floor, ceiling and walls is the same as for the houses. For this calculation there is added some wood wool boards on wall surfaces above 2,5 meter

APPENDIX P

SUMMARY OF INTRO MEETING WITH EXCALICARE

Date: 3. February 2016
Participants: Heidi Kristine Støve, Rasmus Thøger Christensen, Helle Toft and Camilla Frederiksen
Place: Møllevangs Allé 142, 8200 Aarhus N

The target group for the camp is children affected by cancer, which is either in the last part of their treatment or have completed their treatment. The patients have had a course of treatment from month to several years, with a risk of relapse. The chemo treatments, cause bad immune system, isolation and the patients is taken away from their social life, which is very difficult during the teen-age years.
The overarching vision for the rehabilitation camp, is for it to function as a fixed course when children and young people is done with their treatment at the hospital. At the starting point the camp is only an offer for children who just survived cancer, but in the long term, the course should be an offer for people with other diseases as well. ExcaliCare wants their own camp area, in order to make it possible for them, to organize a lot more camps, both for children affected by cancer, but also their siblings and parents.
Therapeutic Recreation is the model, which the camp is structured around. The model has 4 phases, namely challenge, success, reflection and discovery. You work within the campers comfort zone and strength zone. The strength zone is where the camper gets challenged.
After treatment some children has handicaps or other injuries, as a consequence of the disease. As an example they can be in a wheelchair, have a bad balance, bad sight or the child gets drained for energy quickly. Because of this one of the most important factors with a new camp area, is that it is handicap-friendly and accessible to everyone.
During activities it is important that the children create relations with the other participants and the volunteers. Because of this they are always with their house group. The children will also have to solve tasks with other children, they don't know as well. This feeling of safety while still meeting new people is important. Activities include drama, art, climbing, music etc.
Concerning the design, the camp should have the opportunity to extend with even more houses in the future and it should speak to both large and small children and their parents. Furthermore, it should have individual toilets and baths for the houses. It should not have bunk beds, as some of the children have a physical handicap. The houses should have max 8 people, sleeping in the common dormitory and there should be space for 4 volunteers per house.
The camp should be the place where the organization works from and they want the camp for themselves. In the beginning it will only be used for camps in the spring and during summer, and it can therefore be rented out for teambuilding or continuation school.