# Rehabilitation Center for Refugees Aalborg

Michael Hans Sørup & Mads Birk Petersen Master Thesis June 2016 // MSc.4-arc29 //Aalborg University



TITLE PAGE

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and Peter, which has provided helpful supervision and guidance throughout the project.



Mads Birk Petersen

This report contains the development of a design for a Rehabilitation Center for Refugees located in Aalborg-Lindholm. The report present the framework of the project containing research, analysis, case studies, the presentation and process of the project, and an epilogue covering the conclusion and reflections of the project.

The main topic concerns the designing of an optimal setting for rehabilitation of refugees with Post Traumatic Stress Disorder (PTSD). The treatment centers for refugees is providing a holistic treatment between psychological, social and physical professions. This holistic treatment is provided in a setting far from the contemporary standard in the health care system. This observation fosters a question of how a contemporary design for a rehabilitation center for refugees can be designed to accommodate the needs of the current holistic treatment.

The aim of the project is to use healing architecture and knowledge of refugees with PTSD to develop a sustainable design with focus in the unique Nordic atmosphere.

The concept of the design is using the path to be empowered as central spine. Empowerment is the ability to be a self-controlling and independent human being. The term is thus a central element to occupy working with PTSD.

A division in levels of intimacy and a foreseeable design in a homelike setting provides the basis for a design that accommodate an optimal course of treatment. A social spectrum is implemented to provide a gradual transition between being PTSD patients and be able to live in the surrounding society.

The project considered it has succeeded by creating an optimal setting for the treatment of patients with PTSD. This in an environmental sustainable building developed for social interactions in a simple Nordic atmosphere.

This report inspects the development of a rehabilitation centre for refugees using healing architecture in a sustainable Nordic setting.

Through eight sections in this report is the design of the rehabilitation centre documented with an academic architectural and technical point of departure.

## PHASE 1\_PROLOGUE

The first section is a walkthrough of the formalities, the presentation of the chosen subject and the related motivation and introduction to approach this project. Further, the prologue explains the used methods within the integrated approach to design.

## PHASE 2 \_RESEARCH

The second section covers the research made to inform the project. Thorough investigations in project related subjects is developed containing motivation, analysis and conclusion on each section to comply to the project relevance. The research is used as a point of departure for the design process.

## PHASE 3\_SITE ANALYSIS

The site analysis is investigating the conditions, the perception and general information about the site and context.

### PHASE 4\_CASE STUDIES

Case studies is implemented in the project to inform and inspire the process with real life architecture relevant to the subject.

## PHASE 5\_DESIGN MANUAL

The design manual collects the information from section 2-3 and 4, which is used to inform the design process.

## PHASE 6\_DESIGN PRESENTATION

The design presentation exposits the final design product. A combination of text and graphic materials is presenting the result of the rehabilitation center for refugee's using the integrated design process.

## PHASE 7\_DESIGN PROCESS

The process contains the main steps of the journey to the final design, in a combination of a chronological course of events and theme studies through various phases of the process. The process can after interest be read before the presentation.

## PHASE 8\_EPILOGUE

The epilogue contains a conclusion and critical reflection of the project, followed by a reference overview of all literature and illustration references.

The appendix of the report contains additional important documentation relating to the project. A drawing folder and a USB stick with further documentation of technical calculations, and explanations of strategies and secondary project elements are accompanying the report. The USB stick contains further explanation of the design process to give a better overview of the design solutions. Motivation Introduction Methodolog

## RESEARCH

Rehabilitati Healing Arc Sustainabili Nordic tecto Atmoshpere

## SITE ANALYSIS

The site The district Sensory pe Site mappir Microclimat

## CASE STUDY

Slagelse F Livsrum

## DESIGN MANUAL

Foundation Architectura User group Energy and Room Prog Design para Vision

	0	DESIGN FRESENTATION - CONCEPT		1
n	7	User concept	56	I
ду	8	Building concept	58	-
		PRESENTATION		1
tion of refugees	12	Grasping the context	62	1
chitecture	16	Approaching the building	64	
lity	20	Ground floor	66	
tonics	22	First floor	68	EPILOGU
res	24	Light conditions	70	(
		Cross-laminated-timber	72	(
		The energy frame	74	I
	30	Façades	76	I
t plan	31	Section	80	I
erception	32	The entrance	82	
ing	34	Entering the treatment	84	APPENDIX
ate	36	Treatment waiting	86	
		Waiting niches	88	
		Office	90	
Psykiatri	38	Indoor comfort	92	
	40	Ventilation	94	
		Social common area	96	
		The social outdoor area	100	
n for design	44			
ral approach	45	PROCESS		/
C	46	Designing for PTSD	104	/
d ndoor environment	48	Initial design - Form	106	/
gram and Function Diagram	50	Technical focus	108	
rameters	52	Design inspiration	110	
	53	Design workshop 1	112	
		Detailing the concept	114	

DESIGN DESENTATION CONCEPT

	Detailing the concept	116
	Reviewing the context	118
	Technical optimization 1	120
	Technical optimization 2	122
	Room - inside out	124
	Room outside - in	126
	Spatial room detailing	128
EPILOG	UE	
	Conclusion	132
	Conclusion	132
	Reflection	133
	Literature references	134
	Illustration references	136
APPEN	DIX	
	Appendix A - Ventilation	138
	Appendix B - Atmospheric comfort	139
	Appendix C - Thermal comfort	140
	Appendix D- Acoustic approach	141
	Appendix E - Window presentation	142
	Appendix f - Window process	145
	Appendix G - Facade process	147
	Appendix H - Fire plans	148
	Appendix I - Structural principle	149
	Appendix J - U-values	150
	Appendix J - Final room program	152

440

## MOTIVATION

## INTRODUCTION

## **HEALING ARCHITECTURE**

Human beings are affected by their surroundings. In an architectural context; the overwhelming atmosphere in the majestic Pantheon in Rome and the socially inviting roof of the Oslo Opera House in Norway, shapes the mind and behavior of the humans in and around it. We believe that architecture is designed for the individual as well as for the community. As architects, it is our role to ensure that design is made to be moving and inspiring, but also usable and functional at the same time. In recent history this relationship between human and building has formed the foundation for research on how architecture relates to the healing process of humans affected by cognitive and somatic diseases. This has resulted in the concept of healing architecture, which has been used in various settings: Cancer counseling centers, hospices and the new super hospitals being built throughout Denmark. It is used to architecturally support the environment in which humans have the possibility to rehabilitate.

### NORDIC SUSTAINABLE RESPONSIBILITY

In the Nordic countries, we are known for our humanism; the democratic consciousness and social responsibility forms a society with a distinct and pleasurable character. This also characterizes our approach to architecture, which furthermore is known for its strong focus on daylight, nature, materiality, atmospheres and holistic approach to design. These gualities have evolved through time and continue to evolve into the 21th century, where sustainability is the natural next step for the conscientious architect. Sustainability is a crucial element in current and future buildings, without the implementation of sustainability the future need for buildings

is possibly non-existent. The field of sustainability is for this reason an unavoidable subject that should be appreciated instead of rejected.

## TRAUMATIZED REFUGEES

We live in a world in conflict. Around the globe people are fleeing from war and terror. Many of these people flee towards the western world, brining scars of war with them along the way. Scars showed in the form of physical traumas and even more often as mental traumas. It is our responsibility as a wealthy society to support the refugees who arrive with genuine problems and is in need of help. This has already been acknowledged, as rehabilitation centers have existed in Denmark since the late 1980s. Since then, the theory of healing architecture has changed the way we build in the health care sector, thus making the existing centers outdated when compared to modern standards. Therefore, this master thesis concerns the use of the concept of healing architecture as a point of departure for developing a sustainable rehabilitation center for refugees with a holistic Nordic approach of designing.

WHY REHABILITATION OF REFUGEES?

In 2014, 60 million people were forcible displaced worldwide. 20 million of these live as refugees in other countries, waiting for an asylum or to return to their respective home countries (United Nations High Commissioner for Refugees, 2015). In Denmark 21,000 refugees got an asylum in 2015, which made us the fifth largest recipient of refugee's pr. inhabitant in 2015 (Tal på udlændingeområdet, 2016). Today, over 100.000 people lives as refugees in Denmark and it is estimated that up to 45,000 is living with traumas (Uibm.dk, 2015). If traumas are left untreated it can prevent refugees from getting integrated into the Danish society; especially the children of traumatized refugees can be affected by this. Up to 50% more children of refugees with traumas, than of refugees without traumas, can end up in crime or in general social problems (Flygtninge med traumer i Danmark, 2009. Today, traumatized refugees are being offered to participate in rehabilitation programs at regional centers throughout Denmark. The treatment is done in a professional and medical manor with the illness as the main focus. Contrary to this, recent research indicates that a holistic approach to the patient as a human individual rather than "just" a medical patient provides a more efficient treatment (Stigsdotter, 2012).

Beside the negative impact in the life of the individual patient, it is evident that refugees with traumas are a burden for society. By investigating and optimizing the treatment this burden can be minimized or parts of it even eliminated, with positive consequences for the individual, for their relatives and eventually for society.

## THE THEMES

In order to adapt this into an architectural context, this project has its point of departure in investigating a series of themes related to the subjects presented in the motivation. From initial investigations of refugee rehabilitation and how the treatment is done today, healing architecture is used as a driver for optimizing the treatment.

Healing architecture is based on the relationship between human and architecture, and it provides an evidence-based and factual input for developing a holistic rehabilitation center. While the theory of healing architecture derives from evidence-based research, it is important to remember that architecture is more than the measurable and the obvious. It also has spiritual, sensual and experiential qualities. especially in a Nordic context. In order to balance this, the term atmosphere is investigated as a separate theme. The humanism and social responsibility within the Nordic countries suit the concept of healing architecture in the context of using the human as the point of departure when designing. Another strong focus point in Scandinavia, is sustainability and the lowering of the use of energy.

In order to integrate healing architecture and sustainability into a holistic design, a master builder approach is used. This is tectonic; as when all parts of a building, from detail to spatial gualities, are combined within a sense of poetry.

The collective aim is to produce a visionary and holistic solution in the sense of rehabilitant treatment of refugees and in the sense of holistic healing architectural design.

## METHODOLOGY

## METHODOLOGY

This section is describing the used methods to develop and design a new rehabilitation center for refugees in Aalborg in a holistic and integrated way.

The method used in this project is framing and organizing an academic approach to ensure a detailed and thorough process. In this concern, the integrated design process developed by Mary-Ann Knudstrup at Aalborg University is used to frame approach (III 1,1) (Knudstrup, 2004). The integrated design approach is developed to consolidate an iterative process where architectural and engineering gualities encounter in a synergetic holistic design. The approach evolve from the problem-based accession developed at Aalborg university, which secure a problem oriented approach to design (III 1,3).

The process is divided into five phases that in continuous iterative loops are developed to implement architectural theoretic, sustainable strategies and engineering qualities.

## THE INTEGRATED DESIGN PROCESS

## **PROBLEM PHASE/IDEA**

The initial stage of the project evolve from a current standstill of the advance concerning rehabilitation centers for refugees, and generally an interest of evolving this concept implementing healing architecture being sustainable and Nordic responsible.

## ANALYSIS PHASE

The analyses evolve from empiric collection of data made to procure the best possible development of a rehabilitation center for refugees. The relevant subjects investigated is the rehabilitation of refugees and their traumas, healing architecture, sustainable design and Nordi- design and atmospheres. The subject of rehabilitation of refugees is examined supported by a gualitative interview with the constituting superior of rehabilitation center for refugees Northern Jutland to gain broader knowledge of the patient group and general needs.

The optimal site is identified by combining the knowledge of the initial research. The phenomenological qualities, microclimate and context is further elaborated in the considerations of the site choice.



III.1.2 Kevin Lynch - Image of the City (Lynch, 1960)

Information about the site and the related district development plan is procured. The chosen site approached with phenomenology with base in Christian Norberg-Schultz's Genius Loci (Norberg-Schulz, 1980). Mappings are used to clarify the significant features of the site presented in simple graphic illustrations. The final analysis of the site consists of the investigations of the microclimate and other physical attributes to the site, visualized by diagrams.

The method of Kevin Lynch is focused on how pedestrians travels and is orienting in the city scape (Lynch, 1960). According to Kevin Lynch pedestrians uses five different approaches to orient; Paths, Edges, Districts, Nodes and Landmarks. These orientations are used to make a legible image of the coherence of recognizable patterns, which is mentally modelled to an image of the city. (Koseoglu and Onder, 2011)

The five parameters in the method is further described in the Kevin Lynch analysis of the context of the site.

The knowledge of the analysis is continuously processed hermeneutically to further develop the knowledge continuously with designing in the sketch phase.

## SKETCH PHASE

The sketch phase departures from the gathered knowledge of the analysis. A mixture of various approaches is workedthrough to accomplish the development of the concept. Simple plans and spatial investigations is made with analogue as well as digital tools. The decision making is made through an abductive process, implementing the knowledge from the analysis phase, evidence-based parameters, aesthetic qualities and energy - and indoor climate calculations. Technical initiatives are included early in the process to integrate important design changing parameters. This will contribute to inform the design concluding in an integrated design.

The sketch phase evolves using various studies - from details to context concepts - executed to extract new knowledge of complex problem issues. Digital drawing tools is here

### III.1.3 Problem based learning (AAU)

contributing to a more holistic experience of the sketching. relation to the Nordic and sustainable approach will unfold its gualities to the design. The human presumed interaction B-Sim, Be10, plugin to Rhino-Grasshopper "Diva, Ladybug and Bumblebee" is used to calculate daylight, energy and to the building is optimized in relation to the informed and indoor climate to continuously perform an informed process. evidence-based parameters. Calculations to increase the The physical interaction between designer and design is of building performance are finally performed and verified. primary concern. Physical modelling and investigations are in this relation important to get a better understanding of PRESENTAION special qualities and materials. The final work for communicating the design is created.

Throughout the process Evidence-based design (Heling Architecture) is used to implement the best knowledge in the field of health care architecture. This method to design is a field of study, which emphasize to inform and influence design with documented evidence (III 1,3).. With EBD both designer and client has the opportunity to be informed by evidence (Kopec, Sinclair and Matthes, 2012). EBD is mainly used in health care buildings, but the concept is further used in the development of schools, restaurants, prisons ect.

## SYNTHESIS

Through the synthesis the final healing principles in strong







III.1.4\_Evidence-based Design (Health At Every Size® Blog, 2016)

The developed design are presented, moving through the project from the overall concept to the small detail. This is completed by the use of sketches, 3d-visualisations, physical models and text, communicated by a project report, a project presentations and posters.





# RESEARCH

In this chapter, relevant literature is examined to support the threshold of the design. The subject of the project is to develop and design a new strategy and frame for the rehabilitation for refugees program. In this concern is the contemporary organization, the target group of PTSD patients and the treatment examined. To deal with this subject, theme studies within Healing Architecture and Nordic Architecture is used to support a new design approach, combining healing evidence-based strategies with the compassionate and social Nordic design approach. In the quest of designing to rehabilitate, the theme, sustainability, is used to frame the project in an environmental and social responsible way.

# **REHABILITATION OF REFUGEES**

TRAUMAS AND TREATMENT

Worldwide many refugees are in need of help, both in their respective countries, but also in the places where they move to constitute a safe platform for both long- and short-term stays. Many refugees is establishing their stay beginning with severe mental damage and psychosocial challenges This mental and social disorder does that many refugees has a setback being integrated in a new environment and culture (Irct.org, 2014). This project concerns the creation of a basis for rehabilitation of refugees with PTSD, thus making the organization and existing treatment important to investigate. The knowledge of the trauma disorder is equally important to implement into the design. In this way, the design can be focused directly on the patients in need. The foundation for this chapter is a visit and interview with the existing rehabilitation center for refugees in Northern Jutland (RCF), represented by T. Bertelsen, and research from various literature.

### TRAUMAS

In order to understand the rehabilitating treatment of refugees, a natural start is to understand their disorder, traumas and PTSD, and the origin of it. Everybody can experience a trauma. Being involved in a natural disaster, a traffic accident, being raped or taken hostage can cause a trauma. For refugees, traumas are often connected to experiences from their home country and the escape from it. Experiences such as being in a warzone, being persecuted and imprisoned and being exposed to violence and rape can cause severe traumas (Traume.dk, 2016). Furthermore, being forced to leave their family, their property and their culture can further be traumatizing. This is coursed by the uprooting of cultural and social relations and being forced into an unknown society with different unwritten rules for human interactions (Lykke Sørensen, 2004).

A trauma courses the body to go into a state of emergency. where the body is ready to either fight or to escape the danger (Ptsdidanmark.dk, 2016). This is normal reaction to an extraordinary situation and the reaction and symptoms having a lack of appetite and being in a state of tension and



III. 2.3 PTSD - Occourance and development (Lund et al., 2008)

usually disappears after a while. For some, especially if they experience a heavy trauma, the reaction develops into a permanent illness. This is diagnosed as Post-Traumatic-Stress-Disorder, PTSD (Traume.dk, 2016).

### POST-TRAUMATIC-STRESS-DISORDER

PTSD occurs when the state of emergency coursed by the trauma becomes permanent. The body cannot identify the trauma as something of the past, and instead it experiences the trauma as something that is happening over and over again (Oasis-rehab.dk, 2016). It can course a strong emotional reaction when re-experiencing the trauma (Rehabiliteringscenter for Flygtninge, 2016). Suddenly, even minor everyday events such as a random sound, somebody yelling or casual physical contact can trigger a panic attack. The type of events can be endless and the reaction is usually hard to predict (Oasis-rehab.dk, 2016). Beside the panic attacks PTSD can course flashbacks to the trauma. nightmares of the trauma, dyssomnia, memory disorders, concentration problems, feeling anxiety, having headaches,

stress (Rehabiliteringscenter for Flygtninge, 2016).

In general, when dealing with the human mind, emotions and individual reactions towards various situations, it is difficult to create a one-size-fits-all solution. As an example, the four basic types of human anxiety concerns some completely opposite set of feelings (Stokkebæk, 2002): The first two is the antagonism between feeling anxiety when being alone, versus feeling anxiety when being in a social relation (Stokkebæk, 2002). The last two is the antagonism between feeling anxiety when being safe, versus feeling anxiety when being unsafe (Stokkebæk, 2002). The latter refers to a fear of stagnation (safe) and a fear of the unknown (unsafe).

Being triggered by the basic human instincts, the reactions towards PTSD is common for most refugees. The major difference is the cultural and social context and how we as humans behave according to this (Lykke Sørensen, 2004). Even though a trauma is experienced as an individual person, it is experienced in a cultural context. This is also highlighted by the strong reaction to uprooting.





### REHABILITATION FOR REFUGEES

The rehabilitation of refugees in Denmark is managed by a combination of private- and public health care trauma centers. The treatment of refugees was internationally developed through the 1980's by the Rehabilitation Council for Torture Victims (IRCT), and was quickly adapted in Denmark. The concept of trauma centers is to provide a restituting surrounding for individuals or families after war, traumas or persecution (Skaarhoj, 2015).

The trauma centers in Denmark are divided in different organizations, though with the same goal; to secure a better life for traumatized refugees. The rehabilitation center for refugees in Northern Jutland (RCF), placed in Aalborg, is a part of the Rehabilitation program for refugees mapped by the regions in Denmark (2.6 trauma centers in Denmark). The center is a self-owned organization beneath the special sector of region Northern Jutland (Bertelsen, 2016). As a selfowned organization, RCF has the opportunity to influence and organize the rehabilitation by themselves, and can thus be a part of moving the boundaries of what is possible in the

## III. 2.5 Map of trauma centers in Denmark

## treatment of refugees.

### THE TREATMENT

Investigations point out that it is inadequate to only talk about the traumas: a more holistic course of treatment is needed. The current rehabilitation concept is implementing consultations with psychologists, physiologists and social consultants. The patients are often partly psychologically, physically or socially disabled, which requires an interdisciplinary course of treatment. In relation to this, the rehabilitation centers distinguished task is to give the patients a highly professional and holistic treatment (Bertelsen, 2016) (2.5 Current holistic treatment). This approach is supported by the fact that a successful rehabilitation and integration is highly depending of a fast track treatment of the patients, allowing them to return to a more normal life as fast as possible (LG Insight, 2013).

The rehabilitation center for refugees in Northern Jutland is treating 220 refugees every year, 100 at a time. The patients are connected to the rehabilitation center in 3-12 month.

In this period the patients are consulting the psychologists and physiologists every week and the social consultant every second week. The rehabilitation center is a day center and does not include patients staying overnight. The initial treatment is often done in groups with 4-10 patients depending on the course of treatment and the social mental state of the individual patient. Further on, individual consultancies are used as the primary method of treatment. It is important to establish a sense of trust and privacy between the patient and the consultant (Lykke Sørensen, 2004). The three consultancy professions are working with the patients in different surroundings with different tools. This requires their offices to be customized according to the specific type of treatment. The general treatment require; good working facilities for the employees, well-lit rooms, avoidance of cognitive trauma related influences and a well-structured course of treatment, just to mention some parameters.

The needed functions and conditions for the patients and employees are further elaborated in the user group chapter.



III. 2.6 PTSD - Symptoms (Harry Croft, 2015)

## CONCLUSION

into the Danish society.

When designing for PTSD patients it is important to avoid the possibility for uncontrolled stress situations, thus ensuring that the patient has the feeling of being able to escape a situation and being able to have an overall view of a room and/or situation. Avoiding sudden sounds and other surprises is also an important factor in relation to this. Beside stress situations, it is also important to design in order to avoid provoking anxiety, thus providing the needs of various types of patients, ranging from introvert to extrovert.

Regarding the treatment, the design should provide the optimal conditions for the course of a holistic treatment, both in the sense of patient experience but also in relation to the working conditions for the employees. Furthermore, creating a social and cultural establishment with fellow patients can act as a calming factor in a very unfamiliar situation, and can eventually influence a better approach to being integrated



III. 2.7 Children with PTSD (Anon, 2013)



## HEALING ARCHITECTURE THE BODY AND RELATION CONDITIONS

Architecture in itself is not believed to be healing. The concept of healing architecture is that the built environment that surrounds us has a direct and measurable impact on us. physically as well as psychologically. Thereby, by designing in the right way, a building can support the healing process initiated by other means, thus creating a more holistic treatment of the human being.

The foundation of this chapter is the research project Supplementary sources are included in the text. "Helende Arkitektur" (Frandsen et al., 2009) from Aalborg University. Published in 2009, its purpose is to clarify the existing knowledge of the relationship between architecture and treatment results. It collects and systemizes existing research, and sorts this into overall categories and factors to be used when designing. The first category, body, concerns the factors that effects the human body, its senses and

wellbeing. These are light, art, sound, air and movement. The second category, relations, concerns the interaction between patients, relatives and staff on a private and social level. It is divided into the factors personal space and social space. Furthermore, the relation to the outdoor space is also an important factor. The relevant knowledge of a third category, safety, has been included in the other two categories.



III. 2.8 Body conditions

## LIGHT

BODY

patients as well as for the staff.

our emotional stability." (Hobday, 2006, p. 10)

The human body reacts differently to diffuse daylight and direct sunlight. When exposed to light the brain signals the body to stay awake and ready, while lowering the production of melatonin. As a reaction, it encourages the brain to regularly produce it while asleep. Melatonin makes you tired, and is also called "the hormone of sleep". It also acts as an antioxidant that helps the body to repair itself (Hobday, 2006). This is why sleep is crucial when fighting diseases and the like. This melatonin action-reaction is called the circadian clock. It is often referred to as the human body clock. The exposure to direct sunlight makes the brain produce serotonin and further lowers the production of melatonin. Furthermore,

Direct light Diffuse light Awakeness

Visuality

Acoustics Transmission

Overview

One of the most important factors for the wellbeing and health of humans is the access to daylight. This goes for

"Light has a profound effect both on our immune system and

it also produces D-vitamin, which is important for the human immune system. Serotonin is a neurotransmitter that enables the brain cells to cooperate. A lack of serotonin plays a part in depressions, anxiety, pain perceptions and aggressions (Hobday, 2006). The brain also needs serotonin in order to produce melatonin, highlighting the importance of it, and thereby of direct sunlight (Hobday, 2006).

In relation to patients with PTSD and the like, daylight and sunlight has a reducing effect on stress and on the perception of physical pain. It also has a positive effect on patients with depressions. The amount of daylight during the day also affects the quality of sleep at night; the higher the amount of light during the day, the deeper the sleep during night. This is caused by the melatonin reaction to light. This is relevant for patients with sleeping problems, which is often a part of PTSD. Related to the staff, people working in an environment with a high amount of daylight make fewer mistakes, e.g. in the medical record keeping or when medicating the patients. This makes for a more efficient treatment.

## ART

The visual, tactile and audial integration of art has a stimulating effect on the human senses. In the sterile environment often seen at a hospital, art can act as a distracting element. This has a calming effect on the patient, on a mental as well as on a psychical level. Especially art that resembles nature has this effect.

## SOUND

Sound can have a healing effect when used as an active part of the treatment. It can act as a distraction to pain and as calming element, when being introduced as e.g. sound of nature and music. On the other hand, a high level of sound and noise, which is defined as unwanted sound, can course stress, anxiety and lack of privacy if one has a feeling of being overheard. The working environment of the staff is also effected by the sound quality.

## AIR

A major part of the human comfort and wellbeing in a building relates to the air guality and its temperature and smells. Bad air quality can be distracting while being uncomfortable for a longer period of time can course a stress reaction. In relation to smell, studies suggest that the smell of exotic oils and certain fruits can have a calming effect.

## MOVEMENT

Not being able to locate your destination within a building can cause a stress reaction, especially if people are not feeling well to begin with. The human mind remembers locations by how they are connected to each other. In a simple plan, the amount of necessary connections between locations are smaller, thus making it easier for the human mind to comprehend.

## RELATIONS



III. 2.9 Relations conditions

### PERSONAL SPACE

The feeling of intimacy and privacy is important for the patient in order to achieve a sense of confidentiality and trust in his or her relation to the staff, relatives and other patients. If the patient have a feeling of being watched or being overheard he or she is likely to keep information to themselves. This may course a loss of important information, which can be critical to the treatment of psychological traumas. Thus, it is important to include this knowledge into the design.

## SOCIAL SPACE

The active support of relatives during the treatment often has a positive effect on the patient. This is caused by the care of the relatives, their mental support and their mere presence. Space for informal and everyday activities helps increase the interaction between the patient, the relatives and the staff. The social relations between patients with the same diagnosis have a major impact on the healing process. Informal activities, knowledge sharing and private conversations reduce the amount of anxiety, fear and stress. The social relations between the patient and the staff have

its foundation in the treatment of the patient. The feeling of accessibility to the staff and the involvement from these has a significant impact on the patient and his or her sense of safety and support throughout the treatment.

The social interactions and communication between the patient, his or her relatives, other patients and the staff demands different levels of privacy depending on the situation. These range from informal socialization to private is key factors in the relationship between the patients, their relatives and the staff. Beside the influences previously mentioned, strong social relations in general also affect the overall mood of the patients in a positive way.

## OUTDOOR SPACE

Nature is an important factor in the treatment of stress (Pavi, 2016). Being able to look at, or interact with, natural elements has a reducing and preventive effect on stress. The perception of wild nature is emphasized as being the most relaxing as opposed to controlled nature often seen in an

urban context (Guenther and Vittori, 2008 and Weibel and Svarrer, 2015). The effect of seeing, hearing or smelling natural elements, such as trees, plants, flowers and water, provide a significant mental pause for patients as well as for relatives and staff. It provides a personal space for relaxation and reflection. Furthermore, it also seems to have a relieving effect on psychical pain. This strong human relation to nature is suggested to be coursed by the fact that our point of origin and evolution as a specie derives from a natural setting conversations. Visual connections and open space planning (Guenther and Vittori, 2008). This causes the human mind to connect with the nature.



## **CONCLUSION**

## **BODY / LIGHT**

Regarding the building design, it is very important to ensure a sufficient quantity of daylight. The access to and quality of direct sunlight is an important factor to consider. Light can also be used to create or support an atmosphere in room (Pavi, 2016). Furthermore, the position of a window has an impact on the perception of daylight while the possibility for a view to the distant context and to the sky also adds significant qualities to a room.

## **BODY / ART**

Art can be integrated as separate elements or as colors in the building. Either way, it can act as significant parts of a way finding-system beside the calming qualities.

### **BODY / SOUND**

The sound level and the reverberation time should not be too high in a building. Elements such as sound absorbing materials, room planning and the location of technical

equipment affects this.

When designing, it is important to consider the ventilation and solar shading in order to maintain a good overall air guality.

### **BODY / MOVEMENT**

Guidance by signs can help in a case with a complex plan design, but a simple plan design is by far the most efficient solution. Furthermore, wayfinding can be integrated into the design.

## **RELATIONS / PERSONAL SPACE**

There are no direct guidelines on how to design this architecturally, the important element is to ensure the sense of privacy for the patient.

## **RELATIONS / SOCIAL SPACE**

The design and planning of a building can help stage the social interactions. It is important to create spaces for

informal as well as for private conversations. The latter can be done by distancing the social areas from the transit zones of the building. The most efficient way to establish a visual connection, and the related gualities, is by using a circular plan with the staff located in the middle. This causes the patient and his or her relatives to maintain the visual connection at all times. Regarding the room design of the building, it is important that the areas for the social functions resemble the everyday life outside of the treatment center. Most patients are unaccustomed to the clinical feel of a hospital, causing further stress.

## **RELATIONS / OUTDOOR SPACE**

When designing, it is important to include the ability to look out to the surroundings in order to maintain a sense of time during the day. Beside the effects mentioned above, it creates an access to daylight. If a garden or similar outdoor space is part of the design, a connection to the central parts of the building is important in order to ensure an active use of the area.

## **BODY / AIR**

# SUSTAINABILITY

## A REVIEW OF ENVIRONMENTAL AND SOCIAL SUSTAINABILITY

This chapter will enlighten the term sustainability and relevant initiatives in order to design sustainable. This is done through literature studies based on Arkitektur & Energi (Marsh et al., 2011) and the International Energy Agency's Transition to sustainable buildings (Transition to Sustainable Buildings, 2013). The relevant initiatives are used to sharpen the sustainable focus when designing for rehabilitation of refugees in a Nordic context.

The focus on sustainability is continuously increasing. The general comprehension of the human responds to the fact that the climate changes are becoming more and more visible. Warmer climate, increasing water levels, changing bio diversity and extreme weather is physical results of the inadvertent ravage on the nature and climate of the Earth. Sustainability is defined as the ability to sustain (Sustainability. com, 2010). In 1987 The Brundtland Commission published the report "Our Common Future" emphasizing the focus on sustaining the present condition of the Earth.

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 2016, P.5).

The Brundtland report is clarifying what the long-term goal of sustainability is; to secure our and future generations. The limitations for a global sustainable development are the current level of technological capabilities, the lack of economic benefits and the challenges within the social organization of society. This is why the society on the Earth has to collectively stick together and focus on the environmental, social and economic challenges (Brundtland, 2016).

The term sustainability is embracing three important parameters; environmental sustainability, social sustainability and economic sustainability (diagram 2.11). These areas are covering the background for a sustainable future. The environmental sustainability concerns delivering and evolving natural resources to future generation in a proper way. Social sustainability is focusing on developing and supplying the future generation with an efficient and wellfounded social organization. The last, economic sustainability is the process of securing the present and future socioeconomics (Andersen and Larsen, 2001). The focus will be



III. 2.11 Sustainability diagram - The unity of environmental, social and economic sustainability.

on environmental and social sustainability because of the project relevance to healing architecture.

## ENVIRONMENTAL SUSTAINABILITY

Environmental sustainability covers many aspects and is for this reason a complex topic to address. The general goal of an environmental sustainable design is to minimize the energy consumption and thereby the CO2 emission. With more than 40% of the primary energy requirements worldwide used by the building sector (Michael Bauer, 2009), the field of architecture has the potential to make significant changes for the environment (diagram 2.12). Regarding the individual building, 40-50% of its energy requirement is determined by the design (Kongebro, 2012), making it vital to integrate sustainable strategies into this. Therefore, the primary focus of this project is limited to lowering the energy requirement through passive design strategies.

This can be done in many ways throughout the building process: The location and orientation of the site, the building materials, building layout and the way passive strategies

III. 2.12 The use of energy in the building sector (Architecture2030. org, 2015).

are implemented is all important parameters. Passive strategies should be implemented early in the process to be an integrated part of a holistic design. Initiatives could be windows strategically oriented to secure solar gains and integrated solar shading to avoid over-heating. The building envelope should be minimized, and the heat demands and use of raw materials kept to a minimum. Furthermore, natural ventilation or hybrid ventilation with heat recovery needs to be integrated in order to avoid energy demanding mechanical ventilation for heating and cooling.

It is important to consider the life cycle from cradle to cradle of a buildings energy use, with the architect and engineers playing a powerful role in changing the design from status quo to the better. Moving on from this, strategies should be implemented in the final building to secure a responsible use of energy. Low energy appliances and an understanding of energy-demanding resources are required to keep the energy use in the building at a minimum. The indoor climate should adapt to the needs of the users to avoid unnecessary heating, cooling or ventilation.



III. 2.13 Social sustainable community (Dac.dk, 2012)

SOCIAL SUSTAINABILITY

2 Research

Social sustainability is important to review because of its relation to how a society in and around a building is planned. The interaction between the building and its users are important to sustain through a forward-looking planning of the surroundings. Furthermore, the interaction between humans in and around the buildings is an important part of future proofing a district (Hackett and Caistor-Arendar, 2011). The following review of social sustainability will map the important aspects relating to the subject.

How a building reacts towards its context and surroundings is crucial for the long-term social sustainability. If an area is built only with introvert buildings, declining any social relationship to each other, the long-term consequences will be major in relation to the settlement. Without the right opportunities for social interaction among the users of the buildings, communities will quickly derive into decline (Hackett and Caistor-Arendar, 2011). The building itself should encourage its users to intuitive and scheduled social activities, while also connecting to the outdoor areas and the surrounding society.



The indoor climate should be adapted to the individual needs of the building in order to secure an optimal setting for social activities. Social sustainability is also about encouraging a society to live sustainable and thereby developing a sense of solidarity. Social congregations with a sustainable mindset can expand the focus and importance of lowering the emission of CO2.

## CONCLUSION

The implementation of environmental and social sustainable parameters is crucial in order to reach a design that is not only rehabilitating for the users, but also a rehabilitating part of securing the future of planet Earth, with a focus on energy use. The environmental initiatives should be found in integrating passive strategies into the building design, considerations about the building envelope, about passive heating and cooling strategies and also about the indoor climate.

The social initiatives should be accomplished through inviting and accommodating social spaces. The building should constitute a social platform to sustain the present and future need of flexible social assembling related to the rehabilitation, promoting a feeling of equality among the users of the building, allowing for informal social interactions as well as areas with a sense of trust and confidentiality.

## NORDIC TECTONICS SUSTAINABLE NORDIC ARCHITECTURE

The Nordic building tradition is characterized by building for the humans with the basis in culture, tradition and social congregation. The following chapter will map the Nordic tradition and its close relation to general visions of the tectonic notion. In this project the tectonic approach will be used to ensure a holistic design with an intensively coherence between the function of the building and the atmosphere. In relation to this a review is made of different thinkers of tectonics, presenting different focal points in the tectonic building mind.

## THE NORDIC TRADITION

The diversity in the cultural self-image and geographical location is providing a vernacular architectural tradition to regions worldwide. New ways of living and technological influences is continuously shaping regional styles as it has done with the Nordic tradition through the 20th century.

The northern modernist architecture was evolving through the 1930s with Alvar Alto and Gunnar Asplund as pioneers. The new architecture was pragmatic, social deliberate and regional focused to create architecture to the common user. Focus on this new architecture was on creating holistic honest buildings, where the interaction between atmosphere and construction reached new heights (Lund, 2008).

This relationship between the atmosphere and building structure has evolved through the Nordic architectural tradition. One of the most influencing architects in Denmark, Kay Fisker, has stated that we in the north avoid the spectacular to strive for the worked through and harmonic (Lund, 2008). The subtle in Nordic architecture is often found in the gentle use of building materials and an consistent understanding of light. In particular, Key Fisker and Jørn Utzon was part of the Danish school of architects working with the structure of local building materials and color registers (Lund, 1991). Another architect highly distinguished for his work of light is Henning Larsen (Lund, 1991). The individual and social assembling around light is an important approach used in the Harpa (picture 2.14).

In many ways Jørn Utzon is one of the masters of Nordic architecture. Kenneth Frampton enhance him as a thinker and master of handling tectonic elements (Frampton, 1996). Utzons ability to adjust architecture to the concerned region



III. 2.14 Harpa - Revkiavik Concert Hall and Conference Centre(Henning A/S. 2016).

he is building in is subtle and articulated. Niels-Ole Lund also appreciates Utzons approach to architectonics; the approach to design with an individual variation and in the same time standardized, with focus on clear and simple solutions. (Lund, 2008, p. 5) This close related description of a Nordic architect, who masters the tectonic notion, provides an occasion to review the tectonic term.

## THE TECTONIC NOTION

The notion of "tectonics" derives from the Greek "tecton" which means carpenter or masterbuilder (Frampton, 1995). In the ancient Greece referring to a person that in a holistic way joins well performed craftsmanship with art. In the 1830s Karl Müller and Gottried Semper developed the tectonic term we use today, which Kenneth Frampton framed in his book "Studies in Tectonic Culture". The term in a modern context has several definitions, depending on the user of the tectonic language. Gottfried Semper think of tectonics as the product of artistic human skills that reveals a conscious attempt by the craftsman to express a well conducted coherence when molding materials (Beim, 1999 p. 53).

This thinking is in close connection of the believes of Anne Beim and a research group from The Royal Danish Academy of Fine Arts (The Royal Danish Academy of Fine Arts, 2012). They believe that tectonic design evolve from a creative idea, which conducts the structural principle. This results in a holistic approach for creating meaningful architecture (The Roval Danish Academy of Fine Arts. 2012).

Even the approach is not directly focusing on the constructive principles, the overall design should still function in the large overview as well as in the evaluation of the small details, which Marco Frascari is occupying. Marco Frascari is working more into detail with the tectonic field (Frascari, 1984). The tail of the detail is one of the most important parts of designing tectonic, and is also present in the material focus of Nordic architecture. Both the physical connection between elements and the visual satisfaction of the joint should be clear and tell a story. The aim of the tectonic process is to join the artistic idea and the construction into one history (Frascari, 1984).

The tectonic approach is moving towards being more than a



holistic coherence between atmosphere and constructional principle, adapting parameters such as sustainable strategies. Working in a region where sustainability and a strong focus on lowering the use of energy is present, can the combination of sustainability and the holistic Nordic and tectonic approach, be a part of increasing the standard of holistic designs.

## SUSTAINABLE TECTONICS

2 Research

The development of tectonics is entering a new era. It is no longer enough to make a well-conducted coherence between architectural atmosphere and structural principles. As mentioned earlier; if a project is not sustainable, it is rarely tectonic. The missing sustainable link to the national and worldwide environmental progress is working against the basic principle of building holistic.

Through new initiatives, current research deals with issues concerning sustainability, especially resource consumption, and the development of technology and contemporary identity of our building culture, which is ending with a new set

of guidelines for tectonic responsible sustainable buildings (The Royal Danish Academy of Fine Arts, 2012). As of 2016, this research is still ongoing, causing these guidelines to be a part of the future. Nevertheless, it emphasizes the relevance of thinking sustainability in a holistic context.

The aspects that matters in architecture are slowly moving to become more sustainable, e.g. building price, construction embodiment and social comfort. "The good life" evolves to be not just a guestion of social correlations and individual relish, but also about your contribution to securing the future of planet earth. Currently, sustainable issues concerns reduction of the energy consumption and CO2-emission. This creates demands to the way buildings are designed. The search for sustainable responsible tectonic design can contribute to projects by aesthetically integrating sustainable strategies in the architecture. Integration of sustainable initiatives should be sensible and holistic in order to sustain the architectural aesthetic gualities already possible without sustainability.

## CONCLUSION

The Nordic architectural tradition and the tectonic culture are very closely related, having evolved through the 20th century, resulting in a holistic integration of sustainable strategies into an aesthetically pleasing design. This is done in a harmonic, subtle and articulated way, with a focus on clear and simple solutions with the aesthetic and tactile gualities of materials and daylight. These qualities are implemented from overall design to the detail of joins and materials.

The new knowledge about the current tectonic movement is leaving an awareness of various parameters that has to be considered reaching a holistic design. This knowledge will be used though the designing.

Furthermore, there is a strong focus on the human as the center of architectural attention. The interaction between human and architecture created within a tectonic design is further elaborated in the chapter "Atmospheres".



## ATMOSHPERES A REVIEW OF PETER ZUMTHORS ATMOSPHERS

This project aims to create a building that contributes to a holistic healing process. An important part of this is to create a building that does not resemble the clinical environment often seen within healthcare facilities. A building that has a more "homely" feel to it - that has an atmosphere. Atmospheres move something inside of us. Within a split second we feel if we have been spiritually moved. Initially we might not know why – And we might never find out.

Peter Zumthor is famous for his work of architecture, in which he explores the sensory and poetic qualities of space. His book Atmospheres, (Zumthor, 2006) is based on a lecture in which he highlights the nine key points he consider when designing. This chapter shorty explains these nine points.



## THE BODY OF ARCHITECTURE

Peter Zumthor compares a building with the human body. It has different elements, some visible as the human skin and others invisible like the human skeleton. Architecture is a frame around the human space. A frame covered with a fabric. A fabric to be touched by the human and which can touch the human. Architectural atmosphere is when these elements meet and interacts:

"..(architecture) collects different things in the world, different materials, and combines them to create a space.." (Zumthor, 2006, p. 23)



## MATERIAL COMPATIBILITY

The variety of materials is endless. Even of a single material: Every room has a sound of its own. We associate different The quantitative presence of the material, the qualitative sounds with different rooms; this can be based on childhood finish of the material and the interplay between light and memories or something similar. Even in guiet room there is material all play a part in the overall expression. Thus, the still something to hear. Maybe not a sound, maybe just a tone relationship and reaction between different materials is coursed by the shape of a room and the use of materials: important. If two materials are too similar or too different they will fail to react with one another. Therefore, it is important to "Interiors are like large instruments, collecting sound, balance the presence and spatial weight of materials: amplifying it, transmitting it elsewhere." (Zumthor, 2006, p. 29)

"Materials react with one another and have their radiance. so that the material composition gives rise to something unique." (Zumthor, 2006, p. 25)



I. 2.19 Acoustic elements plays a part in the sense of sound.

## THE SOUND OF A SPACE



## THE TEMPERATURE OF A SPACE

Like all rooms have a sound, they have a temperature too. Materials can affect the sensorial, the visual and the emotional temperature of a space. As an example, steel as often considered as a cold material while wood is considered as a warm. Psychically as well as metaphorically:

"..temperature in this sense is physical, but presumably psychological too. It is in what I see, what I feel, what I touch.." (Zumthor, 2006, p. 35)



## SURROUNDING OBJECTS

The use of a building, by people and by the objects they surround them with, affects the architecture. When people occupy a space, it creates a connection between the architecture and the use of the architecture. It transforms the building from "anything" to "something":

"..you could probably describe it as a sense of home." (Zumthor, 2006, p. 39)



## **BETWEEN COMPOSURE AND SEDUCTION**

Architecture is a spatial experience – But also a temporal experience. When people move, so does time. This affects the perception of the building and how it should be designed. Should it urge the user into a sense of composure or should it be trying to seduce the user into exploration and and exterior. This transition and how the exterior of buildings investigation? No matter what its purpose is, a building can act as a natural guide to itself by being inviting, stimulating or surprising. It is important that these sequences of gestures support the users and the function of the building:

"So that it appeals to you, too, and more especially, so that it supports the uses of the building." (Zumthor, 2006, p. 45)



## TENSION BETWEEN INTERIOR AND EXTERIOR

By putting a box on the ground you automatically create an inside and an outside of it. This contrast between in and out, between enclosure and exposure, between private and public, creates a tension and a transition between interior react to their surroundings highly affect how they respond to the context:

"I am really glad to be situated on this square. Or they could say, I am the most beautiful building here - You lot all look ugly. I am a diva." (Zumthor, 2006, p. 49)



## LEVELS OF INTIMACY

The effect of light and shadows adds another depth of It is important to consider the sensorial and spiritual elements The perception of intimacy is related to the hierarchy between the human body and the mass of the building. The materiality to the surfaces in a room or on a building. This of architecture when designing for a holistically healing and entire building is naturally bigger than the human body, while addition of materiality can be described as the "feeling of atmospheric environment. In order to ensure a coherence light". This relationship between materials and light, or the between human and building, Peter Zumthors nine points elements of the building are often smaller than the human body. The experience of a space is closely related to the lack of it, can either enhance or spoil the potential experience of atmospheres acts as an inspiration in order to frame and proximity to it and to the distance between the human and of architecture. The fact that light is an enormous part of the categorize the spirituality and soul of architecture. the building - Exterior as well as interior. An example is spirituality of nature adds an almost supernatural quality to the intimidating feeling of being smaller than a building or a daylight: In relation to Healing Architecture, atmosphere is interpreted room, another is the opposite: into the levels of intimacy as a part of the relations between

describe it actually.." (Zumthor, 2006, p. 53)

".. these are surroundings that somehow make me feel *larger, allow me to breathe more freely – I don't know how to* (Zumthor, 2006, p. 61)



## THE LIGHT ON THINGS

"It gives me the felling there's something beyond me, something beyond all understanding."

## SUMMARY

patients and staff, the transition between interior and exterior as a part of the healing potential of nature, the use of materials and surrounding objects as part of obtaining a non-institutional atmosphere and the use of light in relation to this as well as a healing factor.



# SITE ANALYSIS

The following section will address the investigations regarding the site. The optimal site for the rehabilitation center is identified, to meet the conditions from both the current rehabilitation center and healing architecture theory. Further is the district plan and its content reviewed to identify what the area can do for the building, and what the building can do for the area. Sensory and physical descriptions of the surroundings of the site is executed with a phenomenological approach, mappings and an Image of the city analysis by Kevin Lynch.





- Posible oudoor areas

- Visibility from access road.

Healing architecture related desire

- Close to green nature
- Close to water
- Calm area

Other - Part of a new developing area

III. 3.2 *Site choise parameters* 



III. 3.3 Map - Denmark

SITE CHOICE

In the process of choosing a site several parameters has to be taken into consideration. The site choice is based on the interview with RCF Northern Jutland and extracted from important parameters in relation to healing architecture.

For RCF, being a regional center, the most important parameter is to be close to public transport, which means close to the railway and busses moving in a northern, southern, eastern and western direction. This allows for easy access from the entire region of Northern Jutland. Furthermore, the elements of relaxing surroundings and calm outdoor areas are extracted to create a peaceful base for treating patients with PTSD.

Important parameters in relation to healing architecture are that the site should be located in calm surroundings with the possibility for plenty of daylight and sunlight. A location close to maritime elements and green areas is to prefer in order to consolidate the healing impacts.

The last key element in choosing the best possible site is an aim of developing a building that can affect the area where it is places and where the area is simultaneously contributing to the building. A rehabilitation center will contribute with activity between 8 in the morning and 22 in the evening, increasing the level of activity in an urban context. Furthermore, building with a strong sustainable focus can make the building a landmark acting as a parameter in influencing the surrounding city development to be more sustainable.



III. 3.6\_Map - Lindholm brygge

## THE SITE

The site is selected from the above-mentioned parameters. The optimal conditions are found on a site on Lindholm Brygge in Nørresundby, which is part of a newly approved district plan. The site has green nature on the east part of the site and is located 200m from the fiord. The site is a part of the old DAC factory area, which is a part of the Danish industrial heritage (Bender and Pedersen, 2006). The area is a mecca of polished new build apartment houses, which is dismissing the industrial heritage of the area.

III. 3.4 View south-north on the current area of the new development plan

## THE DISTRICT PLAN

## III. 3.5\_New District plan 1-112 Lindholm Brygge

The chosen site on Lindholm Brygge is part of new site development area, mainly considering apartment blocks and row housing. In this context a rehabilitation center will supplement the area by adding activity in the daylight hours. the nature. The development plan is suggesting high dens apartment blocks towards east and lower scattered settlement towards the Lindholm Fjordpark. The park is planned to be implemented into the new area, likewise having the area oriented towards the park. The district plan is divided in two areas; A and B. The area A towards the park can be built in two stories with a maximum height of 8.5 meters while the buildings in area B can be built in 3 stories with a maximum of 11 meters.

The settlement is creating extrovert and introvert functions

between the buildings. Parking lots are placed in the north site and green areas are placed along the south side. The area against the park is opening up to allow interaction with

The district plan is securing that green initiatives are being made. The district plan is applauding sustainable initiatives such as green roofs and increased greenery; also green facades are welcome. The district plan invites to use LRDsolution, Local drainage of rainwater, or other initiatives, which can delay the rainwater for reaching the groundwater and the fiord. 25% of the area has to be green areas with local trees and bushes to increase the biodiversity and recreational values.

## SENSORY PERCEPTION

The sensory perception of a space is important to clarify its genius loci – The spirit of the place. The theorist Christian Nordberg-Schultz has had a major influence in how we in the Nordic countries think and work with the spirit of the place and how to perceive it and its relation to the architecture through the use of phenomenology (Norberg-Schulz, 1980). In the Nordic region we have the opinion that if we repeal the place, we simultaneously repeal the architecture (Lund, 2008, p. 288). This is caused by the acceptance of nature being something bigger than us as human beings (Kjeldsen et al., 2012).

The spirit of the place is existential for the behavior of the architecture. In the following section, a description of the genius loci of the place is made.

Approaching the site from Thistedvej, at the north of the site, a feeling of countryside and calmer surroundings is perceived. The road at the roundabout is leading either to the station or down Lindholm Brygge. In both directions green and calm surroundings is the first that is meeting your sight. If you walk closer to the site, the old DAC factories buildings are inevitable to overlook. The old preserved factory is providing the area with a sense of old industrial area; suppling roughness and heritage to the area.

When walking further down on Lindholm Brygge, the area is changing character. New apartment houses on the left and eight stories apartment blocks on the right are rising, creating a diversity in the housing typology in the area which are containing single family houses, student housing, apartments for a diverse social demography and row housing. This diversity in the social target group is creating a varied environment with buildings in different heights, with different purposes and with different architectural themes. Despite this, the lack of people in the area is striking.

In the end of Lindholm Brygge; Høje Brygge is raising 16 storeys into the air. This building is defining the area from a distance, standing as a landmark, which symbolizes the development of the area from old industry area to modern residential area.

The entrance towards the site from Lindholm Brygge is feeling cold and unpleasant, caused by the high buildings



III. 3.7 View from fjordparken with Lindholm Brygge in the background.

which are creating a wind tunnel effect, increasing the wind impact. The eye grabs the site in its existing form. An eight meter high square building is dominating the view and blocking off the chosen site. Behind the building, on its left, an old administration building and factory warehouse is placed, which are currently is in use by Aalborg Technical School. When the site is reached a pleasant feeling of the human body meeting nature is dominating. The tree line to the Lindholm Fjordpark is suddenly dominating. Without the old buildings beside the barrier to the park the area indeed has the potential to be integrated in the wild nature besides.

The area that forms the direct connection from the site to the fiord is dominated by a five storey high building. Further south from the apartment building four newer building is built with a small footprint placing them gently on the sensible site. Compared to the other buildings the apartment houses are placed with respect to the concerned site, but still miles from how a Nordic building should be expected to capture the site.

The next meeting is with the wild nature of Lindhom

Fjordpark. The area is generally a wilderness, only disturbed by a planned path curving through the area. This area is peaceful and pleasant to be in and around. When walking through the area, one senses activities and smaller buildings applicant to nature life on the western side of the Lindholm stream. Smaller areas with grass are provided to stay in the wild area. This area is in its current condition an ideal place to encourage rehabilitating initiatives. Birdsong, the sound of water and the wind in the trees are creating a perfect background for absorption and reflection.



















## SITE MAPPING





III. 3.18 Building hights

1-2 Storevs 3-4 Storevs +5 Storevs



III. 3.19 Infrastructure

Mapping is the way of representing important geographical and contextual features in a simple overview. In the following four mappings this will be displayed; Building functions, building heights, infrastructure and a Kevin Lynch Image of the City-analysis, in order to give an overview of the outer impacts of the context of the site.

## **BUILDING FUNCTIONS**

III. 3.17 Building functions

The area is an old industrial area developed around the old Danish Cement Sharing Factory DAC. The factory closed in the 1978 and has since been translated to a city development area where new blocks and luxury apartments has been built. Towards north Lindholm city and station is located. The area around the station is mainly single-family housing dating back to the 1940s.

In 2002 Siemens Mobile built a very dominating office building stretching out on the pier were also Høje Brygge is on the tip of the pier and is functioning as the image of the area. Along the years, the Siemens building has been used for offices and educational purposes. Today it is for sale, to be used only for offices.

### BUILDING HEIGHTS

The building heights in the area is differentiating, going from one storey up to 16 storeys. The buildings around the site is tall ranging from five to eight storeys. This induces a focus on the shading of the site. Straight south of the chosen site, a five storey apartment building rises into the air. This building is not built as related to the context, but is placed to get the best possible conditions for the apartments. In the winter this building is shading for parts of the site, and should thus be taken into consideration when designing

## INFRASTRUCTURE

The roads around the area are very calm. The road connecting the area of Lindholm Brygge is a dead-endroad. The Thisted Landevej 300m north of the site is a heavy

traffic road connecting Aalborg with the northwestern part of Jutland. During the rush hours, the heavy traffic can be heard on the site, but is normally not disturbing.

The bus and train are leaving from Lindholm station 400m from the site. The choice of site has been heavily influenced by the access to transportation around the region of Northern Jutland. Lindholm station is connected up to Skagen with train covering the largest cities in Northern Jutland; Frederikshavn, Hjørring and Brønderslev. The train is connected in southern direction with Aalborg and Hobro. The bus route is covering the whole northwestern part of Northern Jutland. If the site is accessed from south of Aalborg a bus change has to be made at Aalborg bus terminal.

**KEVIN LYNCH** site has edges on all four sites of it. Towards east and The method of Kevin Lynch's mental map provides the south tall building rises, these buildings are affecting the opportunity to map the pedestrian's image of the city. This is perception of open landscape, but are also functioning as done in order to clarify the points of impact that have to be safety screens both in terms of shielding walls and eyes on made, to give the pedestrians, e.g. refugees arriving by train the street according to the theory of Jane Jacobs (Jacobs, or bus, the best possible image of the city. 1993). Towards the west and north vegetation is functioning as a barrier to respectively Thistedvej and Fjordparken. The paths around the area are adequately numerous, as Around the area – Thistedvej - the railway and the edge to the new development area have connections planned as the Limfjorden is working as main edges.

crisscrossing paths through the area. On the other hand, the area at Fjordparken is only connected with one path. This area should be connected with more paths to be an integrated part of the new Lindholm Brygge area.

Lindholm Brygge is filled with edges. The chosen building



III. 3.20 Kevin Lynch - The Image of the City

In relation to the paths, Lindholm Brygge contains a lot of nodes. The nodes makes the area easy readable and is an important parameter in the future new settlement to maintain the clarity of the area.

The area has Lindholm Brygge 30 - Høje Brygge as main landmark. Furthermore, the apartment and office buildings stretching on the south-north axis, from the fiord to Thistedvei, is characteristic of the area. The station is working as a landmark in terms of function. It acts as heart of the city area and all public traffic and pedestrian routes disperse from here.

The current area in Lindholm is a diverse area of districts with functions from single family houses to industrial areas. This is creating a wide range of different districts that is characterizing a multifunctional area. With the future implementation of the new development plan, the industry will be replaced by housing, thus creating a more homogenous collection of districts.



## MICROCLIMATE



III. 3.22 Temperature and Precipitation



III. 3.24\_Sun Hours

Throughout the project, being an integrated design process, this process is operating by continuously informing the design in order to reach an integrated design solution in the end. This is also influenced by the information available of the microclimate. Wind, sun and precipitation have a significant influence one the design, especially in a Danish context where the seasonal microclimate is highly differentiating.

The location in Lindholm close to the Limfjorden, can increase certain microclimate impacts. In this case wind is of primary concern (Weatherspark.com, 2015). Furthermore, a focus on flooding and raised groundwater needs to be included in the design process, to avoid inexpedient climate influences on the future design.

In the process of building sustainable several elements is important to extract from the climate investigations. The sun hours has an effect on the possibility for passive heat gain and the need for passive cooling. Also the buildings capability of accumulate heat is varying with the amount of sun hours.

III. 3.23 Wind speed



much wind produces a higher risk of draft and calm wind reduces the ventilation. These parameters are all important when developing an integrated building design.

The following data are extracted from Weatherspark.com and the Danish Metrological Institute. The data is covering norms in Denmark and Northern Jutland.

## TEMPERATURE

The temperature in Northern Jutland is varying during the course of the year. The average temperature is 7.5 degrees Celsius. The average day time temperature in the summer is 20.1 degrees Celsius and 0.4 degrees Celsius in the winter. The general maximum temperature is 28 degrees Celsius in the summer and -10 degrees Celsius in the winter time.

The climate in Northern Jutland is categorized as a humid climate. 30% of the days in Northern Jutland is days with precipitation. A precipitation day is categorized as a day where there is dropping more then 0.1 mm precipitation. The wind influences primarily the natural ventilation. Too December is the general month with the most precipitation,



III. 3.26 Wind - December



III. 3.28 Wind - June

with 75% of December being precipitation days. The months with the maximum and minimum precipitation are November and February with respectively 79mm and 38 mm of precipitation.

## SUN

The amount of sun hours are, like the temperature and precipitation, varying over year. The summer is often sunny and the winter more overcast. The length of the day has a great effect on the amount of sun hours. The months with the most sun hours are May, June and July while the less sunny months are December, January and February. The length of the day is varying from 6 hours and 50 minutes the 21th of December to 17 hours at the 21th of June.

The typical overall solar radiation over a year is around 1000 kWh/m2 varying throughout the year because of the intensity of the sun and the various lengths of the days. The chosen site has shading context elements that have to be taken into consideration. If the building is poorly placed, the solar contribution to the energy frame in the winter



III. 3.27 Wind - March



III. 3.29\_Wind - September

period will be insufficient. Therefore, shading elements is an important parameter when designing.

### WIND

In a Danish context the western wind will be an important parameter to investigate. The influence of the wind will be differentiating according to the placement of the building. If the building is placed in a city context the influence of the wind will not be as big compared to if the building is placed on the countryside. When building along the Limfjorden the wind should always be taken into consideration because of the open landscape. Around the site large buildings are placed that can work as wind tunnels.

The western and southwestern wind will typically reach speeds of around 5 to 11 meters pr. second. In the first months of the year a significant amount of the wind is above 11 meters pr. second.



I. 3.30\_Lindholm høje has an effect of the climate both in terms of wind and sun



## CASE STUDY - SLAGELSE PSYKIATRI HEALING ARCHITECTURE IN A CURRENT SETTING

This newly built psychical hospital is directly influenced by the theories of healing architecture, especially the use of nature, daylight and social relations (Karlsson Arkitekter, 2016). Furthermore, the project has a strong focus on the scale of the building and how it is experienced by the patients. Being a newly built project of 44.000 m2, it is interesting to investigate how these qualities are achieved.

Data Project: Location: *Year of completion: Architect:* 

Nyt Psykiatrisygehus Slagelse, Denmark 2015 Karlsson Arkitekter & Vilhelm Lauritzen Arkitekter A major feature of the hospital is the downscaled size of the patient sections and the integration of nature within a close proximity the patient areas. The main treatment functions are divided into small clusters consisting of 15-18 patients, centered around an outdoor courtyard garden flanked by the patients common areas. By doing this, the patient areas are scaled down to fit the conditions of psychological patients, who often prefer the feeling of safety and clarity caused by the sense of proximity within a small area. Beside the accessible common courtyard garden, all patient quarters are visually connected to an inaccessible quiet garden allowing for fresh air and access to see and hear the qualities of nature. By having an inaccessible garden, it is ensured that nobody is suddenly looking into the private living-quarters of the patients.

The relationship between private and social is adaptable to the wishes of the patient. The doors into the living-quarters can be fully opened, acting as an invitation to possible visits from the staff and other patients. Throughout the corridors, small areas for seating are installed next to the windows. This allows for informal interactions between the patients and the staff. The last level of sociality is the use of transparent glass walls in the common areas. It allows for easier interactions between patient-to-patient and patient-to-staff. Furthermore, the felling of constant presence by the staff makes for a safer feeling for the patients. This hierarchy allows the patient to maintain a social overview depending on the level of their illness and their social capabilities.

Building integrated art is used to create a unique color scheme for every segment of the hospital, thereby creating an element of recognizability for the patients. Colors area used to mark the elements intended for interaction, e.g. doors into common functions such as a gymnasium or a fitness area. In the common areas of the hospital, a continuous poem is written on the walls. In a positive and friendly manner, it reminds the reader about the positive aspects of being at the hospital. It is intended as a stimulus to the patient, creating either food for thought for the individual, or creating something to talk about with others.

Throughout the hospital, designing for daylight access has been an important parameter (Godtsygehusbyggeri.dk, 2016). Windows and skylights are used to allow daylight into



4.2\_Overview of Stagelse Psychiatric Hospital agion Sjælland, 2015)



II. 4.4\_ Suppelmentet daylight (Region Sjælland, 2015)

all areas of the building mass. This ensures an experience of well-lit rooms, causing better conditions for the healing process. As a support, the artificial light is designed in order to mimic the outdoor daylight, by changing the color and the brightness according to the seasonal light conditions in nature. This allows the patients to sense the time of the day, and also adds a sense of changing atmosphere to the rooms.



III. 4.3\_Courtyeard Slagelse Psychiatric Hospital (Region Sjælland, 2015)



I. 4.5\_ Transparant common room area (Region Sjælland, 2015)

### SUMMARY

Dividing and downscaling the patient areas into a size where a sense of proximity is possible to achieve, will allow for a less stress full experience for the patients.

By integrating nature directly into the building mass, it allows for a close and easy access from all over the building – Visually as well as physically.

Creating a hierarchy between private and social, allows for the patient to socially evolve in his or her own pace. It can help ensuring a social development throughout the treatment. The use of integrated art can act as a support in the hierarchy within the building. Furthermore, the use of colors can act as a way-finding system or as mental stimulus for the readers. The access to daylight can be integrated into a building in several ways, e.g. skylights. Furthermore, artificial light can act as a support of the natural conditions of daylight.



## CASE STUDY - LIVSRUM AALBORG THE SOCIAL CONTRIBUTION IN TREATMENT

The Livsrum Cancer Counseling Centers is a series of centers throughout Denmark. Initiated by the Danish Cancer Society and Realdania, and inspired by the British Maggie Centers. Their purpose is to create a haven from the stressful cancer treatment, for both cancer patients and relatives, and allow for positive and life enhancing experiences - hence the name Livsrum, directly translated into room of life (Kræftens Bekæmpelse, 2016). The focus on creating a place for positive experiences for people in a difficult state of mind makes the centers interesting to investigate.

The general concept throughout the centers is the common room, called the livsrum, and the attention to the feeling of safety, of homeliness, and of openness and presence among like-minded persons (Kræftens Bekæmpelse, 2016). In this case it is exemplified by the centers in Aalborg and Herning, providing two different takes on the concept, with the center in Aalborg being a newly constructed building while the center in Herning is a renovation and addition to an existing building.

Data Proiect:

Location: Year of completion: Architect: Livsrum Cancer Counseling Centers Aalborg & Herning, Denmark 2013 (Aalborg) & 2014 (Herning) Polyform (Aalborg) & Claus Pryds (Herning) In all Livsrum centers, the common room is the main room of the buildings. In the center in Aalborg the common room is acting as the center main room with the functions of the building scattered as volumes around it. Skylights are used to highlight the main areas in the room. Besides adding a significant amount of daylight to the central areas, it has a strong spatial impact in the room by emphasizing the main functions. This main room has a strong hierarchy in the spatial overview. Upon arrival, the visitor stands in the common room with a view directly to the kitchen, being the hearth of the center. When walking towards it, the visitor is presented with the interior of the volumes of functions one at the time. This provides an easy overview of the functions while maintaining a low amount of impressions at a time, making the experience suitable for people with stressful things on their mind. Regarding an easy overview, when arriving to the center in Herning the entrance area has glazed walls towards the interior, allowing for an easy overview of the nearby rooms and a visual connection to the office area. This allows the staff to respond when people visit for the first time.

In both centers the location of niches close to the common areas creates invitations to more or less spontaneous and informal conversations in a more intimate setting than in the remaining center. Furthermore, they provide areas for relaxation and reflection. In the center in Aalborg, the niches are located between the volumes of functions. They are made as areas for seating facing the outside, creating a quiet zone while utilizing the healing impact of daylight and to some degree, the relation to nature. In the center in Herning the niches are incorporated into the walls in the corridors throughout the building.

Both centers work with creating a non-institutionalized atmosphere. In the center in Aalborg, the levels of intimacy throughout the center are marked and emphasized using the scale of the various rooms. This is done by lowering the ceilings in the consulting rooms while maintaining a larger room height in the common areas. In the center in Herning, especially the materials are used to create a calm and inviting mood (Clauspryds.dk, 2016).The renovated part of the center is an old family house were the exiting materials and surrounding objects are used to emphasize the homely feel already there. In the new part of the center, wood is used as the main material, with plywood on the walls and lamellas



III. 4.11\_Activity room in Livsrum Herning (Clauspryds.dk, 2015)

on the ceilings. It creates a warm, calm and tactile feeling while allowing for an integrated acoustic regulation. Concrete is used on the floors, creating a contrast to the wood while symbolizing the robust foundation throughout the center (Clauspryds.dk, 2016). In addition to the building materials, the fabric of the furniture is made in various subtle colors to contrast the materials.

In the center in Aalborg, the windows are used to actively support the functions of the rooms. They have various sizes and are placed according to the specific functions of the rooms. Two examples: In the consulting rooms, they are mainly placed at low height facing away from the urban context, allowing for a sense of intimacy when sitting down. In the fitness room, they are mainly placed high in the room allowing for a sufficient amount of daylight while avoiding any interference from the outside e.g. strangers looking in from the urban context.

### SUMMARY

Creating a spatial hierarchy in the building allows for an easy overview of the functions while maintaining a low amount of impressions at a time. The use of light can emphasize the main functions and allow visitors to focus in these areas.

Locating the point of arrival of the center close to other functions, e.g. offices or common areas, allows the staff to respond when people arrive, thereby avoiding unnecessary stress for the visitor.

Niches in close relation to the commonly used areas create invitations for informal conversations in a more intimate setting than in the remaining center.

The selection of materials, scale of the building and furnishing is a major part of creating a non-institutional atmosphere.

By adjusting the size and placement of the windows according to the function of the rooms and the context, it is possible to support the level of intimacy and privacy.



# DESIGN MANUAL

The design manual collects the reviewed themes into a manual that underlines the main focus in relation to users and design. It contains an elaborated definition of the user group with the purpose of giving an overview of the collected knowledge about the users with PTSD and the initiatives that should be made to reach a contemporary proficiency within the field of interdisciplinary holistic treatment. Furthermore, the architectural approach for the design, also founded in the research, is underlined.

An evaluation of the research, the site investigations, the case studies and the user group, will subtract a series of design parameters to form the foundation of the design process. With a base in the collected knowledge, a room program and function diagram is made to ensure an optimal infrastructure and functionality in the building.

### **REFUGEE REHABILITATION AND USER GROUP**

The current treatment for traumatized refugees is in a medical and psychological manner creating a holistic course of treatment. This holistic treatment covers consultations with a social consultant, a physiotherapist and a psychologist and is compounded to eventually empower refugees into being able to participate in a well-functioning society. The notion empowerment derives from the health care sector and means "to be able to control and be responsible for your own life and situation". On this path of personal transformation is it important to consider the psychosocial elements in the treatment (Lykke Sørensen, 2004).

The current rehabilitation program is not including social activities which can contribute to a better understanding and integration into the Danish society. The implementation of healing architecture in a Nordic social responsible context can create an interdisciplinary holistic treatment, which considers both the medical treatment and the social aspect, creating a contemporary path of empowerment. The implementation of the social aspect in this project is an important part in

order to achieve an overall interdisciplinary holistic treatment combining treatment and social activities.

With the foundation in the above this project will; create an optimal frame for the course of treatment and social activities by implementing a language school for traumatized refugees. It has been suggested by RCF Northern Jutland that this will provide the possibility to engage in common activities beside the treatment (Bertelsen, 2016). This frame should be designed with an outermost concern for the syndrome of the patients. The theory of healing architecture is an important element in this design because of its evidencebased approach to designing for humans.

### HEALING ARCHITECTURE

Healing architecture concerns a wide range of empirical approaches in creating an optimal course of treatment for the patients and working conditions for the staff. Both the attributes regarding the wellbeing of the body and the benefits of areas for relations will be used in the project to create an optimized course of treatment. Furthermore, an additional

focus on homelike elements is important in order to avoid an institutional feeling. Daylight and nature is important subjects in a healing project, and will therefore be further emphasized in the guest of an optimal design.

### ABOUT THE SITE

In relation with building Nordic the building should reflect the gualities and spirit in the area in which it is built. The new development plan invites to a sustainable approach, providing a well-founded starting point for the refugee center for rehabilitation. The combination of the green context and the old factory area provides the opportunity to investigate contrasts in materials.

While the current building typology is very high and determined, the new development is open for a more scattered plan, interacting with the nature. This is to be used in the design to create not only a holistic building design integrating natural elements, but also a holistic area where the introduction of functions in the daylight hours contributes the diversity in the district.

### SUSTAINABILITY

The approach of designing with an environmental and social sustainable awareness affect the way the design is informed. The sustainable strategies are to be integrated throughout the The holistic approach to design covers both the treatment, but design process. In this way the project has the opportunity for also the responsibility for designing sustainable. Considering a holistic development containing sustainable parameters. the impact by the building design, passive strategies are an important element in sustainable design in order to achieve a NORDIC TECTONICS responsible energy use and a pleasant indoor environment. Nordic tectonics outlines the connection between thinking The specific technical demands are elaborated in the chapter Nordic and tectonic into a holistic entity implementing "energy and indoor environment". sustainability. Atmosphere and the psychical frame are

Social sustainability is considered as making areas and spaces within the building that provides a social platform to sustain the present and future need of flexible social assembling. Furthermore, the design should encourage to social interactions where relevant, developing better possibilities for social interaction and integration of the patients. In relation to the context, the functions of the building are to compliment the existing functions in the area, thus creating a more diverse city district. Furthermore, the building is to be open and inviting towards its context in order

## ARCHITECTURAL APPROACH

to promote an ease of access.

central elements in creating good architecture, with the detailed use of materials done in an elegant way with significant aesthetic and tactile gualities. Furthermore, the integrated use of daylight is a key element.

The social deliberate architecture in the Nordic region is to be reflected in the design, providing the basis for social gatherings as well as more intimate niches for personal reflection.

### ABOUT ATMOSPHERE

It is important to consider the sensorial and spiritual elements

of architecture when designing for a holistic healing and atmospheric environment. In order to ensure a coherence between human and building, Peter Zumthor's nine points of atmospheres acts as an inspiration in order to frame and categorize the spirituality and soul of architecture.

## USER GROUP



### III. 5.2\_ Design focus for PTSD

PATIENTS

The patients using the center are refugees with a residence permit and suffering from PTSD. To be able to attend the treatment a doctor referral is needed. The supplementing activities at the center are intended to be used by the current patients and the former patients, who still have problems creating a coherent everyday life. It also provides the possibility for informal knowledge sharing between them.

Patients suffering of PTSD are to some degree mentally, functionally and socially disabled. This presupposes that the design can handle the issue that goes with this disability. Calm surroundings planned to contemplation and reflection is essential for the rehabilitation of the patients. The patients is in need of a building which is not institutional, thus including initiatives to avoid this will be contributing the rehabilitation of of patients. the patients. Easy readable design and intuitive way finding is crucial for the clarity for the patients. Initiatives that help in avoiding pangs of anxiety and confusion should be integrated into the design, thereby contributing to the well-being of the patients. An integrated and intuitive wayfinding system

is essential to avoid stressed situations for the patients the functions should be carefully divided to differentiate between the functions. Long straight corridors leads to an increased feeling of institution, but short corridors and open environments with multifunctional can lead to un-clarity and confusion. This is a dilemma that should be carefully integrated in the design process.

Patients with PTSD have anxiety showing in many different ways (Stokkebæk, 2002). What seems de-stressing for one patient can cause a panic attack for others. This demands the design to provide differentiated areas for the patients. Contrast between open and closed - between small niches and congregation areas and between sound and no sound has to be provided to accommodate the needs for all types

According to the evidence of healing architecture, a strong connection to nature has a decisive and positive influence on the healing process (Frandsen et al., 2009). In a Nordic context the close relation to nature is in our origins. In an interdisciplinary cultural context the close relation is more where refugees currently origins.

Daylight is another key parameter when designing for patients with PTSD. Both treatment offices and common areas should be perceived as bright. However, closed and darker areas can create a peace of mind for some patients. The daylight in the needed areas should be well-integrated and well-considered to achieve the wanted atmosphere according to the specific function.

The users of the building are divided in two main groups. The patients and the earlier patients using the facilities of the center, grouped as "patients" and then the employees. The current rehabilitation center has 220 patients a year; this number will increase to 250-300, which also leads to increased staff. This is due to the increased amount of refugees fleeing to Europe in these years.

The following section is reviewing the needs for the patients and the employees with a background in the chapter "refugee rehabilitation" and the interview with the constituent manager at RCF Northern Jutland.



III. 5.3 Refugees Rehabilitation center

EMPLOYEES

The daily functions at the rehabilitation center are maintained by the employees. Currently, four physiologists, four physiotherapists, three social consultants, one permanent interpreter and four people associated with the administrative operation of the center are employed. Furthermore, numerous translators and medical staff is affiliated the organization. One extra staff member per category will be considered when increasing the patient strain.

The new center is to provide ideal working conditions for the employees, allowing them to focus on providing the best possible treatment. This calls for well-lit and comfortable working areas, as this minimizes the risk of treatment errors.

The implementation of healing architecture in the treatment can make the process of rehabilitation more effective. The social cohesion between employees is important for creating a good working environment resulting is a good course of treatment for the patients. Knowledge sharing is an important element in providing a better treatment. Spaces for such

activities should be planned and integrated. Not as separated areas, but as areas interacting with the patients in order to provide the foundation for informal meetings, providing a feeling of non-stressing accessibility to the employees.

obliterate. The direct connection, can for this reason, not necessarily be translated into - for instance - a middleeastern target group. However, an assumption for this project is that a majority of the patients across cultures and living standards experiences a positive effect by nature. After all, nature and greenery exists in all the parts of the world from



## ENERGY AND INDOOR ENVIRONMENT

Energy use:	Max. 25 kWh/m2/yr
Energy grants:	No less than 0 kWh/m2/yr (windows and glass walls) No less than 10 kWh/m2/yr (roof top windows and glass roof)
Max. transmission loss: Max. U-values:	Ext. walls: 3,7 W/m2 (1 story), 4,7 W/m2 (2 stories), 5,7 W/m2 (3+ stories) Ext. doors: 0,80 W/m2K (no glass), 1,00 W/m2K (glass)
Air tightness:	Max. infiltration: 0,5 l/s pr. m2 heated floor area (at 50 Pa)

# Air – Thermal gualit Air – Perceived qua Acoustic: Daylight:

III. 5.5\_ Energy demnags (\*Specific to BR15 energy class 2020)

To build environmental sustainable and healing architecture demands a deliberate approach, which implements energy and indoor environment. Without an informed and integrated implementation of technical elements, an optimal design for rehabilitation of refugees will be difficult.

## ENERGY

The most ambitious building energy class in the current version of the Danish Building Regulation, BR15, is building energy class 2020. It allows for a yearly energy consumption of no more than 25 kWh/m2 for office buildings and institutions. Furthermore, it has certain requirements for U-values and air tightness. This is to be achieved through the use of passive strategies and hybrid ventilation with heat recovery.

## BUILDING ENVELOPE

The building envelope should be built considering the climate in Denmark. The thickness and execution of the envelope has great influence on both the air tightness and the transmission loss of the building. The amount of daylight entering the A hybrid ventilation is to prefer to have a ventilation system

rooms is another important parameter to consider when increasing the thickness of the facade.

## HEAT DEMAND

Up to 50% of the energy used by buildings can be saved with a sensible use of integrated passive strategies (Kongebro, S., 2012). The energy demand for heating is the most energyconsuming element in a Danish context. For this reason, the use of passive heating is not to be ignored. Solar heat gain, heat recovery and minimizing of the transmission loss are some of the methods to decrease the heat demand.

## COOLING DEMAND

The demand for cooling is not as rapid as the need of heating. The process of cooling down with ventilation is extremely energy consuming and should for this reason be avoided. Ventilation and thermal mass should be actively used to avoid overheating in the summer time.

## VENTILATION

that can ventilate for the air quality in the winter month without draft, simultaneously having the effect of natural ventilation in the summer months. Both the natural and mechanical systems can be integrated in many ways, but especially the natural ventilation is important to implement in the process.

## ACTIVE STRATEGIES

The active strategies will in this project be down prioritized to focus on reaching 2020 with only passive strategies.

## INDOOR ENVIRONMENT

As specified in the chapter regarding healing architecture, an important part of the human wellbeing relates to the indoor environment. Therefore, the requirements of The Danish Building Regulations 2015 are to be met. Beside the improved demands for energy consumption, the BR15 building class 2020 also has higher demands for the perceived air quality and the quantity of daylight on workstations.

/ (Cat.II):	Wintertime (1,0 clo): 20°C-24°C Summertime (0,5 clo): 23°C-26°C Max. 100 hours/yr above 26°C, max. 25 hours/yr above 27 °C
ity:	CO2: Max. 900 ppm*
	-
	Min. 3% daylight factor or min. 15% glass-to-floor-ratio*

III. 5.6\_Indoor Environment (\*Specific to BR15 energy class 2020)

The following specifications are based on The Danish Building Regulations 2015 (Bygningsreglementet.dk, 2016).

## **AIR QUALITY**

The demands for the air quality is reached by implementing hybrid ventilation. A symbiosis between the ventilation strategies is important to obtain without compromising draft and thermal comfort. The mechanical system should be used less possible to succeed the energy requirements.

### THERMAL QUALITY

The thermal comfort should be obtained by using the connected district heating as less as possible. An optimal solar gain in the winter and effective solar shading in the summer, should contribute to a comfortable thermal environment concurrent with a low energy consumption.

### ACOUSTICS

The acoustics in the design is important to shield from loud and sudden sounds. A humming emotion is whished in the common areas to constitute a feeling of life. The acoustics should in general support the functions, e.g. private conversation or social events. The building acoustic should be well-performed to prevent the sound traveling from room

to room.

## DAYLIGHT

The daylight is a key parameter in the project. 3% of daylight should be reached in the areas where work or treatment activity occurs. The daylight is important in the process rehabilitating the patients for their traumas, therefore is an optimization process acquired to investigate the best amount and quality of light compared with the heat loss and gain of the windows.

The following specifications are based on The Danish Building Regulations 2015 (Bygningsreglementet.dk, 2016) and DS474: Code for Indoor Thermal Climate (Danish Standard, 1993).

## ROOM PROGRAM

	Function	Size (m2)	Qua ntity	Total size (m2)	Daylight	Nature	Relation	Atmoshpere	Acoustics	Ventilation rate	Comments
Treament	Office									l/s	
	Office psycologist	20	6	120	High	High	Private	Homely	Calming	10	Space for desk and treatment
	Office social consultants	20	5	100	High	Medium	Private	Homely	Calming	10	-
	Office, physical therapist	25	6	150	High	High	Private	Homely	Calming	15	-
	Group therapy room	50	2	100	High	High	Private	Homely	Calming	30	Add. space for psysical therapy
	Waiting										
	Waiting	100	1	100	Medium	Medium	Social	Relaxing	Buzzing	40	
	Hallways	200	1	200	nign	nign		Relaxing	Buzzing	20 i/s pr.zone	
	Drossing room	7	0	1/	Low	Low	Drivoto	Eurotional	Mufflod	20	
	Technical room	20	1	20		Low	Flivale	Functional	Muffled	20	Depends of type of ventilation
		20	1	20		Low	- Privoto	not storilo	Muffled	10	51,100 usors - Min 2 HC toils
	Toilote patiente	6	л О	10		Low	Private	not storilo	Muffled	10	45 usors - Min. 2 toilots
	Toilets, patients	6	2	12		Low	Private	not storilo	Muffled	10	45  users = Min. $5  toilets$
	Print/copy	10	1	10		Low	Social	not sterne	Muffled	10	
	Relayation Boom	10	1	10	Medium	High	Privato	Calming	Calming	10	To be used by patients
	Storage	10	4	10	Low	Low	-	Canning	Muffled	10	To be used by patients
	Stairoacoc	120	1	120	High	LOW			Buzzing	0	
	StallCases	120		985	Tilgit	1000			Duzzing	U	
				305							
Social	Common area										
	Dining	75	1	75	Hiah	Hiah	Social	Homely	Buzzina	80	
	Hall/CommonRoom							,			
	- Kitchen	20	1	20	Medium	Medium	Social	Homely	Muffled	20	
	Consulting areas	10	6	60	High	Medium	Social/private	Homely	Calming	0	
	Workshop	25	1	25	High	Medium	Social	Functional	Calming	20	
			-						· · · · · · · · · · · · · · · · ·		
	Classroom	25	3	75	High	Medium	Social	Inspiring	Muffled	30	Divided by folding wall
	Fitness	40	1	40	Medium	Medium	Social	Inspiring	Muffled	100	For patients and staff
	- Locker room	10	2	20	Low	Low	Private	not sterile	Muffled	20	
	- Shower	2	2	4	Low	Low	Private	not sterile	Muffled	20	
	Language school										
	Office interpreter	30	1	30	High	Medium	Private	Homely	Calming	15	-
	Language school office	35	1	35	High	Medium	Ptivate	Homely	Calming	15	-
	Service functions	10	4	10	Low	Low	Casial		Colming	10	
	Polovation Room	10	1	10	Modium	LUW	Brivoto	Homoly	Calming	10	To be used by patients
	Mosting room	12		24	Medium	Modium	Social	Homely	Mufflod	10	For stoff
	Toilote staff	30	1	10	Low	Low	Brivato	not storilo	Muffled	10	17 usors - Min 2 toilots
	Tollets, Stall	6	2	12	LOW	LOW	Private	not sterile	Muffled	10	$17 \text{ users} = \text{Min} \cdot 2 \text{ toilets}$
		5	4	24		Low	Private	not sterile	Muffled	10	45  users = 100  mm. $5  tollets$
	Storago	10	л О	20		Low	Flivate	not sterne	Muffled	15	51-100 users – Will. 2 110 tolle
	Cloaning	10	1	20	LOW	LOW	-		Muffled	0	
	Hallwave	200	1	50	bigh	bigh		Poloving	Buzzing	20 1/c pr zopo	
	Tialiways	200		579	nign	nign		пеналіну	Duzzing	. 20 1/5 pl.2011e	
	Other			515							
	Becention	10	1	10	High	Medium	Private	Homely	Buzzina	10	
	Administration	30	1	30	High	Medium	Private	Homely	Buzzing	15	
		00		40		modiam			Buzzing	10	
	Net area			1604							
	Gross area			2085.2							III 5.7 Room program

patients.

environment.

main room.

relations. (5.9)

Social relations The social relations contains the common areas of the building. It is where patients, users and staff is moving around to socialize and in general search for contact. It consists of the social common room, the entrance area, and the common treatment waiting area

Semi private relations The semi-private relations is the places where the opportunity for retreatment, introvert stay and smaller areas of social contact is provided. It consist of the smaller common areas

5\_Design manual

## ROOM PROGRAM AND FUNCTION DIAGRAM

The preliminary room program, to be used for the design phase, is based on the existing facilities at RCF in Aalborg. It has been updated according to the needs and wishes for the project. The importance of access to daylight and relation to nature is included in the program, and is ranked on a scale going; Low, medium and high importance. Furthermore, the wanted level of relations in the room, either private intimacy or social interaction, is noted. The wished atmosphere and acoustics is applied to be able to plan the rooms to fit the

The functions are divided into two different groups. The treatment containing the actual physical, social, and psychological treatment of patients with PTSD, and the social functions containing activities for the patients, and other users to learn to handle the PTSD in a secure

The main functions diagram (5.8) is showing the relation between the main rooms of treatment and additional functions. The diagram is split in nine different functions; the treatment with treatment offices, waiting areas and service functions; the entrance containing the reception and administration; and the social area with the common room, language school, office functions, fitness and service functions. The colour of the function diagram reflects the colours of the room program to show the sub rooms of every

The functions in the design is divided in three level of intimacy. Private relations, semi-private relations and social



III. 5.8\_ Function diagram

as fitness, workshop and classrooms in the social part, and in the treatment part of smaller waiting niches and areas.

## THE PRIVATE RELATIONS

The private relations are the functions that is introvert and closed. It is the areas of cautiousness, relaxation and reflection. The private areas is mainly in the treatment area where the offices is the largest part of the private areas. Additional is all the service functions as toilets, copy room, storage etc. planned as private relations.

The final room program is provided in Appendix K.



### III. 5.9 Levels of initimicy

## DESIGN PARAMETERS

VISION

Ensure an easy overview and intuitive wayfinding in and around the building.

Enable the design to accommodate the various types of PTSDpatients.

Integrate the wild nature from the nearby Fjordpark.

Ensure an average daylight factor of 3 %.

Use the idiom from the new development area to make a coherent connection between the rehabilitation center and context.

Create a non-institutional atmosphere.

Create spaces for private and social relations.

Provide social initiatives for interaction and promotion of social sustainability.

Provide good working conditions for the staff.

Comply with the BR15 2020 energy demands using passive strategies.

Comply with the BR15 2020 indoor environment demands using hybrid ventilation.



The theme of this thesis project is to use contemporary Nordic architecture as a support to the healing process of traumatized refugees, by incorporating the principles of healing architecture into a holistic and sustainable design. The aim is to create a rehabilitation center where the refugees can be helped to overcome their wounds and get the best possible start to a new life.

# DESIGN PRESENTATION CONCEPT

The concept has derived with background in the analysis and the design process. The concept is divided into two parts. The first part, containing the needs for the PTSD patients, summarize the needs and initiatives in focus when designing for this distinct sensitive group of people. This concept derives from the analysis of PTSD and Healing Architecture. The second part is the overall building concept. It has it departure in the sustainable approach with a Nordic responsible touch and atmosphere.

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## USER CONCEPT

Within the prospect of securing better cognitive living conditions for refugees settling in Denmark as citizens, a concept is designed to provide a frame for a holistic course of treatment, in order to support the psychological, social and physiological disabilities connected to Post-Traumatic-Stress-Disorder.

People with PTSD is living an vulnerable life with constant anxiety. This anxiety will show in externalizing or internalizing behaviour. The design will provide places for diverse human behaviour, specifically designed to be capable of meeting people with PTSD in the best possible way. The mind of PTSD-patients are very sensitive. In depth analyses of the reactions, needs and avoidance of the disorder, is crucial to succeed in creating an optimized course of treatment.

The concept for the users takes it departure from the notion empowerment that describes the state of mind in where people are able to be responsible and self-determined for their own actions. The building is symbolizing the journey from being a recently treated patient with PTSD to be able to empower and thereby to be an equal part of the Danish society. The transition to be empowered is divided into two sections: The treatment and the social. The treatment area is providing what in present-day is called the holistic treatment, handling physical, psychological and social aspects. The social area is the new implemented area where the patients learn to use their increased physics and psychosocial abilities (6.1). The contact and interaction between patients themselves and staff is the first step of empowerment. The transition between treatment and social activities is a continuous spiral until the day, where the patients is no longer in need of the rehabilitation center (6.2-6.3-6.5).

Nature and light is central elements in the design, do to its importance for the healing process of the patients. The treatment and social area have, for this reason, a close connection to nature and light.

The treatment area is centered around wild nature in order to provide a natural break in the course of treatment, and provide a look to nature from all of the area. The social area is centered around the main common room to provide a congregation area that unify the users of the building with distance from the treatment area (6.4).

## PTSD FOCUS

III. 6.1 *Concept diagram showing, first the contemporary* 

use their acquired treatment in a protected environment.

understanding of what is seen as an holistic treatment , within

where the "practice of using the treatment" is implemented to

create a holistic treatment where the patients further learn to

the field of rehabilitation of traumas. To the future development



in diagram 6.1



ered individual in the society.



importance of nature in both cognitive and somatic treatment. The social activity part is located around a common room to congregated the functions and users around the heart of the fellowship.

57

## **BUILDING CONCEPT**

The ambition of the building design is to create an optimal frame for the treatment of PTSD while creating a subtle situated building relating to both the wild nature and the city. The Nordic building tradition provide the knowledge and inspiration for this approach. The interplay between materials and atmosphere is essential in creating a homelike setting.

The focal point of the building is the two main areas, the treatment and the social area. The two areas are creating a field of tension looping from treatment to the social area. This relationship is adapted as symbol of the ongoing interplay between the treatment and social activities.

The associated functions of the respective main areas are located around a central area, in order to create an easy overview and easy access. The intuitiveness of the these areas are essential in order to keep the level of way-finding on the terms of the patients.

The building is opening op towards the nature to provide a lookout to the nature for the central areas, while the central areas is the spine towards the city and the entrance. The entrance of the building is located in the middle of the building to create the easiest possible access to both the treatment and social areas.

The building is optimized with passive strategies to ensure the goal of complying to BR2020. The shape of the building has found its final shape thought this optimization.





Functions oriented around common room

Open to nature -Dense to the city





Connecting the functions with the path of empowerment

Pull back the treatment area to provide an intuitive entrance

Optimize the building volume towards BR2020



# PRESENTATION

This chapter presents the design of the Rehabilitation Center. It starts from the big-scale planning, and how the building is located in relation to the site and the context.

Afterwards, it moves on to presenting the overall building design. Finally, the detailed design for the primary functions along the path of empowerment is presented. Technical elements are an integrated part of the presentation.

## GRASPING THE CONTEXT

The new development plan of Lindholm Brygge is filled with plans for forward looking and sustainable initiatives. The plan works with local materials and vegetation while encouraging to built with both environmental, social and economic sustainable solutions in mind. The extrovert and introvert building organization allow the green Fjordparken to scatter into the new settlement. This concept is adapted in the Refugee Rehabilitation Center in order to interact with the wild nature. A connecting spine runs thought the area encouraging to social interactions throughout the area. This spine is used to emphasize the path to the Rehabilitation Center, by using the materials and idiom of the area. Furthermore, the design is interacting with the surrounding buildings by using the same scale and shape to underline a holistic developed area.

With base in the new development plan, the Rehabilitation Center is a promoter for future green and sustainable solutions in the area. Green roofs, responsible material use and an energy friendly building makes the building a sustainable landmark of the area.

The building design is raised one meter to adapt to future high tides and possible flooding. The level difference increase the appeal of the entrance of the building while gently shielding from views from outside the site area. The design is a part of the gradually downscaling from Lindholm Brygge to Fjordparken. It meets the north part of the area in two floors and graduates down to one floor towards south.



III. 6.7\_The design is closing for views through the building

III. 6.8 Wild nature is used in the treatment and entrance area while there in the social area is planed nature providing space for activities.

III. 6.9 Context plan of the new development area located on Lind-holm Brygge (plan in 1:200 is provided in the drawing folder.

Planned nature



## APPROACHING THE BUILDING

The users of the Rehabilitation Center can approach the entrance from two directions to the north and to the east of the site. The north road is the direct connection from Lindholm Station and is for this reason the most obvious. The spine of the new development is showing the most intuitive way to the Rehabilitation Center, and is utilized to avoid stressed situations with difficult wayfinding upon arrival. The spine ends in the entrance where a ramp from the north and a stair from east directs straight into the building.

To the south east of the entrance the parking space is located. Here are parking for the employees, visitors and patients provided.

The building separates itself from the surrounding buildings with its wooden cladding and green roof. Bushes is placed strategically around the site to prevent outsiders to look into the building, but glimpses of the activity in parts of the building invites the users to feel welcome.

Towards the street the building is downscaled into smaller volumes, to be perceived as more homelike. The divided volumes also ensures an easy location of the building volume. Only one entrance is provided, in this way, the users of the building cannot get lost.



III. 6.10\_The entrance is emphasized by pushing the building back from the context, thus providing entrance from two directions.

III. 6.11\_View to the entrance, showing the ramp and stair leading to the entrance. The building is downscaled into smaller volumes in order to create a more human scaled design.



## GROUND FLOOR

(For annotated drawing, see drawing folder) The building is entered in the middle of it. From the entrance, a direct and undisturbed view is provided to the wild nature (8). To the right side, a view to the reception makes for a quick overview, in where it is only the reception and the wild nature that has to be considered. The administration is located together with the reception (7). This office area is in direct connection to the main waiting area of the treatment (4). The open space makes a constant sound of life, which avoid the feeling of aloneness. From the waiting area there is direct contact to nature and a view to the different office areas. On the ground floor is the six physiotherapy and the five social consultancy offices.

The treatment part towards the north is centred around a nature area, creating a path of nature which is connecting the waiting area and the offices. In front of every office area, consisting of two or three offices to provide clear overview, is a niche separating the path of nature with the entrance to the offices (1,2,3,5,6). In this area space for planned activities, small niches and open consultancy areas is provided. The users of the building can decide themselves if they want to be a part of the social common treatment area close to the reception or sit in the smaller semi-private niches around at the offices, allowing them to chose their own level of intimacy.

The common treatment waiting (4) is a part of the path of empowerment in the building. It is consisting of the common treatment waiting and the path of nature, the entrance (8) and the social common room (13). The path of empowerment is where the distribution to all functions happens and is where the users slowly moves to become more and more empowered.

In the northern building part a second floor is integrated, this will be further described in the next section.

The social part of the building is located to the left of the entrance. From the entrance the first thing that meets the sight is the kitchen, which are an essential part in many homes. The kitchen is part of the common room from where all social activities originates. Around the common room there is a staff area (9), a multi-area and fitness (10), the language school with classrooms (11) and a workshop area with a room for volunteers (12).



III. 6.12\_The building is divided into the three levels of intimacy. The common functions, the entrance and the waiting areas the first level of intimacy, social. The path of nature and the areas for stay are the second, semi private. The offices are the third level of intimacy, private.

III. 6.13\_Ground floor in context.

1) Psychology treatment area 1 (2) Group therapy area 3 Social consultant area 1 Treatment common waiting area Psychology treatment area 2 Social consultant area 2 Reception and administration 8 Entrance (9) Staff office and service functions (10) Multi-room / Fitness (11) Classrooms (12) Workshop and volunteer room (13) Social common room (14) Kitchen

Parking

## FIRST FLOOR

The exceeded qualities of the first floor arise from multiple parameters. The volume is placed in the north of the site to avoid increased shadow on the side. Furthermore, the double-high room in the north volume is creating a sun space ventilated with the roof windows. This is providing improved heat gains to the offices facing northeast, through natural ventilation.

The first floor is closely connected to the ground floor by the double-high area (5) and the stairs. They are creating both visual and audible contact. For many PTSD patients, this is increasing the feeling of safety because of the assurance that they are not alone. A relaxation area is located in the north-western part of the volume (1). This area is for patients that are in need of brake from the more crowded ground floor. The staff can also use the area to do small meetings and quick brakes.

The physiotherapy offices are located on the first floor (2-3). These offices has a particular need to avoid look from outside the building, because of the intimate nature of the treatment.

The connection to the ground floor by stairs and elevator is essential to avoid places that is ending in blind spots. Many PTSD-patients are in a constant fear of not being able to escape. This fear is considered throughout the building design, as the possibility to escape is provided from all main areas.

On the first floor, a roof top terrace is provided (4). The main quality of the terrace is the close connection to the outdoor area from the first floor, including the ability to stay in sunlit area. Furthermore, it provides a view to the fiord and over the Fjordpark, which produces increased absorption and comfort. The roof top terrace has a stair down to the garden of senses. This connection is further contributing to the union of the ground- and first floor.

The fireplan of the building is visualized in Appendix H



III. 6.15\_Levels of intimacy in the first floor.

III. 6.14\_First floor in context.

(2) Physiotherapy office area 1 (3) Physiotherapy office area 2 (4) Roof top terrace 5 Double-heigh with stairs and elevator

## (1) Relaxation area

## LIGHT CONDITIONS

An important parameter within healing architecture is light, daylight as well as sunlight. Furthermore, the latter has a major sustainable impact due to the possibility of passive solar heat gain.

## SUNLIGHT

The orientation of the building has been determined through an optimization of the passive solar heat gain (diagram 6.16). The main use of the building is divided in two zones; the treatment area and the social area. The treatment is mainly in use from 8 to 16 o'clock while the social area mainly is scheduled from 12 o'clock. The goal of the optimization process has been to reach at least one hour of sunlight in the half year of summer, in order to provide a qualitative use of sunlight for all offices.

Diagram X is showing that the sun on the may 1st is providing a minimum of two hours of all concerned façades. This means that there will be a minimum of two hours daylight in the office rooms from the 1st of May to the 1st of August.

## DAYLIGHT

The daylight in the building is an important parameter in order to perform a satisfactory treatment and to give pleasant areas of stay with motivating moods. The daylight factor is of a minimum of 3% on workstations and is in average 2% in the rest of the building. Skylights is used in the areas of the building where the daylight factor goes below 1%. The main areas; the treatment waiting and the path of nature, the entrance and the social common room is achieving average daylight factors of above 5%, which is very lit.



III. 6.16 Diagram showing the sun light hours on the façades. The area of the treatment is calculated between 8 and 16 while the social area is calculated between 12 and 20. III. 6.17 *The daylight calculation for the ground floor is especially showing the quality of using skylights.* 



III. 6.18\_Daylight calculation for the first floor.
#### CROSS-LAMINATED-TIMBER

With a non-institutionalized atmosphere as an important element of the design, the warm and tactile materiality of wood supports this, as oppose to the white and clinical feel often seen at healthcare institutions. This is achieved by the use of cross-laminated-timber. CLT, as an exposed structural system. CLT is made with layers of timber strips which are glued together perpendicular on each other, allowing the strength and flexibility of the fibers in wood to be utilized in all directions. This form a panel in which openings for e.g. windows and installations are cut. It is also possible to hide ducts for electrical cables by making cutouts in the mid-layers of the CLT-panel (KLH Component Catalogue, 2012). In this case, the inner layer of the CLT panel is left exposed in order to highlight the grains of the wood and the direction of the lamellas. Furthermore, is it leached in order to achieve a light feel and to allow for a high reflection of daylight.

#### SUSTAINABILITY

Wood is often considered as a sustainable material. especially when compared to heavier materials such as concrete and the like. When looking into the Life-Cycle-Assessment of CLT, it actually is a more sustainable material. Wood has 50% less CO2-emission and 40% less embodied energy when compared to concrete (Jp. europeanwood.org, 2016). Embodied energy is the total sum of energy used for producing, using and disposing the material.

Regarding the indoor climate. CLT-constructions are considered as a medium-heavy construction type (KLH Passivhaus, 2012), as opposed to standard wood constructions which are a light construction type. This allows for the use of CLTs thermal mass for modulating the indoor climate. It does so by absorbing the heat during the day and delivering it back to the room during the night. This allows for a more even distribution of the heat during the winter season, and makes it possible to night-ventilate the heat out through natural ventilation during the summer season. The latter has a big impact on the energy used for ventilation. Beside absorbing heat, wood also absorbs moist from the air, thereby further contributing to an improved indoor climate (Bejder, 2012). Beside the aesthetic gualities of having exposed CLT, it is also the optimal conditions for utilizing its thermal capabilities.







#### **GREEN ROOF**

When building a green roof it is important ensure that the water, moist and dirt from the greenery cannot get into the roof construction. The bottom layer is a waterproof root barrier which ensures that no parts of the plants get into the construction. The next layer is a drain mat, allowing excess water to escape into the roof drain. On top of this, a geotextile fabric will stop earth from the growing medium above from getting into the drain. The green roof detail is based on solutions from the vendor Byggros (Byggros.com, 2016).

The capping of the wall is focused on protecting the exposed end parts of the façade cladding timber boards and allowing water to drain off into the roof drain. The roofing asphalt continues over the top in order to water proof the capping. Inside the construction, joint tape is used at the connection between the CLT-panels to compensate for the possible irregularities of the wood. The panels are joined by an angle bracket.

The drawing shows how the green roof throughout the building is integrated into the roof.

#### TERRACE

are made of plastic.

terrace is made.



An important parameter in relation to accessibility is to have a level-free transition between the interior floor and the exterior roof terrace, allowing physically weakened persons to use it on equal terms with everybody else. The terrace is built on top of the roof, which are sloping underneath in order to drain water away from the surface. This is done in order to avoid moist and the like as this will damage the construction of the wooden terrace. For the same reason, the floor supporters

The drawing shows how an level-free transition to the rooftop





#### Green roof

- 1: Water proofing membrane/root barrier. 5mm.
- 2: Drainage laver, 30mm.
- 3: Geotextile fabric, 5mm.
- 4: Growing medium, 100mm.
- 5: Greenery.

Roof (U-value: 0.065 W/m2\*K) 6: Lowered ceiling with timber lamellas, 50mm. 7: Gap for lights and installations. 100mm. 8: CLT panel (5 layers), 300mm. 9: Hard insulation, 450mm. 10: Plywood, 20mm. 11: Roofing asphalt.

#### Wall capping

- 12: Drain, sealed with roofing asphalt.
- 13: Top element of wood, 20mm.
- 14: Fascia board of wood. 20mm.

Exterior wall (U-value: 0.094 W/m2\*K)

- 15: Two layer exterior cladding of larch tree, 2x30mm.
- 16: Ventilation gap with horizontal cladding rafter, 30mm.
- 17: Ventilation gap with vertical cladding rafter, 30mm.
- 18: Wind barrier of impregnated wood, 15mm.
- 19: Insulation with timber mullions. 320mm.
- 20: Vapor barrier.
- 21: CLT panel (3 lavers), 95mm.

Rooftop terrace

- 1: Timber boards. 30mm.
- 2: Floor rafter, 30mm.
- 3: Drain.
- 4: Floor supports of plastic.
- 5: Avoidance of thermal bridge.
- 6: Door with three lavers of glazing.

Deck

7: CLT panel (3 lavers), 95mm, 8: Concrete floor with heating, 70mm. 9: Hard insulation, 30mm.

10: CLT panel (5 layers).

11: Gap for lights and installations. 910mm.

12: Lowered ceiling with timber lamellas, 50mm.

Roof (U-value: 0.065 W/m2\*K)

13: Plywood with roofing asphalt, 15mm.

- 14: Hard insulation, 450mm.
- 15: Vapor barrier.
- 16: Beam of glulam, 300mm.
- 17: Gap for lights and installations, 100mm.
- 18: Lowered ceiling of fiber cement, 20mm.

#### THE ENERGY FRAME

The energy requirement for complying with the BR2020 demand for an office building is to use no more than 25 kWh/ m2/year, including the energy used by artificial lighting. The overall principle for reaching this goal has been to reduce the energy consumption through passive strategies and then to optimize the reuse of the energy already present in the building by the use of heat recovery. The latter is not categorized as an active strategy as it does not produce energy, but rather reuses energy already present.

The overall energy strategy has been to initially reduce the energy consumption by the use of passive strategies. The building is optimized for solar heat gain through strategies such as orientation and a high amount of windows. The latter also allows for a lot of daylight, resulting in a low use of energy for artificial lighting. The building has an efficient envelope with low U-values for the walls and windows (calculations are included in appendix H), resulting in a small amount of heat-loss through the construction. An example of how this is done can be seen at the detail drawing in relation to this chapter. The integrated utilization of the thermal mass of CLT and concrete allows the building to absorb the solar heat during the day. In the winter season it is used to heat the building throughout the day, while in the summer season it allows night ventilation to remove some of the excessive heat. In general, the integrated use of natural ventilation is an important factor for lowering the energy requirement. Additionally, integrated passive solar shading has a big part in avoiding overheating during the summer. Overheating causes a heavy use of energy for mechanical cooling.

Beside the directly design related strategies, optimizing the reuse of energy are a key factor for reaching a low total energy requirement. This is mainly done by using a mechanical ventilation system with heat recovery, in this case one of 85 %. The use of decentralized ventilation also allows for a low use of energy for running the system. Furthermore, a hot water heat recovery system allows for a reduction of 41 % of the energy used for heating the domestic hot water. The data sheets of the ventilation system and the domestic hot water heat recovery system are included on the attached USB.

The result is a total energy frame of 23.7 kWh/m2/year - The key numbers can be seen on this page and the BE15-file is included on the attached USB.

Key numbers, kWh/m <sup>2</sup> year											
Renovation class 2											
Without supplement Si 136,4 Total energy requirement	Nithout supplement Supplement for special conditions   .36,4 0,0   Fotal energy requirement										
Renovation class 1											
Without supplement Si 72,0 Total energy requirement	Without supplementSupplement for special conditions72,00,0Total energy requirement										
Energy frame BR 2015											
Without supplement S 41,4 Total energy requirement	upplement for s 0,0	special conditions	Total energy fram 41,4 32,3	ne I							
Energy frame Buildings 2020											
Without supplement Si 25,0 Total energy requirement	upplement for s 0,0	special conditions	Total energy fram 25,0 23,7	ne N							
Contribution to energy requ	Contribution to energy requirement										
Heat El. for operation of buldin Excessive in rooms	18,5 g 7,0 0,0	Room heating Domestic hot v Cooling	13,0 vater 3,9 0,0	)							
Selected electricity require	ments	Heat loss from in	stallations								
Lighting Heating of rooms Heating of DHW	6,7 0,0 0,0	Room heating Domestic hot v	1,5 vater 0,8	i I							
Heat pump	0,0	Output from spe	cial sources								
Ventilators	0,1	Solar heat	0,0	)							
Pumps	0,2	Heat pump	0,0	1							
Cooling Total el. consumption	0,0 21,1	Solar cells Wind mills	0,0 0,0	)							

III. 6.24\_BE15 key numbers.

#### FOUNDATION

An air-tight and efficient building envelope is important in relation to the use of energy. Insulation towards the exterior is important, especially in the areas where two or more building parts connect, as these areas are prone to insufficient airtightness. The foundation of a building is a typical area of concern regarding this, because of the need for connecting to the ground. At the connection between the CLT-panel and the concrete foundation, joint tape is used to compensate for the possible irregularities of the wood. The panel and the foundation are joined by an angle bracket. The foundation detail is based on the Comfort Houses which are built according to the passive house standards (Komforthusene.dk, 2015).

building is made.

THE		
x 71 1	No.	1

III. 6.25 Location of detail.

Foundation Ground deck (U-value: 0.081 W/m2\*K) 1: Fine aggregate (sand), 110mm. 2: Hard insulation, 400mm. 3: Damp- and radon-proofing. 4: Floor heating on heat distribution plates, 40mm. 5: Timber floor, 35mm, on subfloor. 6: Timber base moulding. 7: Avoidance of thermal bridge.

Exterior wall (U-value: 0.094 W/m2\*K) 8: Two laver exterior cladding of larch tree. 2x30mm. 9: Ventilation gap with horizontal cladding rafter, 30mm. 10: Ventilation gap with vertical cladding rafter, 30mm. 11: Wind barrier of impregnated wood, 15mm. 12: Insulation with timber mullions. 320mm. 13: Vapor barrier. 14: CLT panel (3 layers), 95mm.

Foundation 15: Plinth renderina, 15mm. 16: Water drip. 17: Strap and angle bracket for CLT mount. 18: Concrete foundation, 255mm, 19: Exterior insulation with geo-textile fabric, 150mm.

The drawing shows how the foundation throughout the





III. 6.26 Detail 3: Foundation.

## FAÇADES

The façade is developed with focus on sustainable material choices, the need for view related to the interior functions and general functional needs. This has resulted with a wooden façade with one on two larch wood cladding. Between the wood volumes is the entrance, the common room and treatment waiting. These functions are highlighted with the use of glass and fiber cement panels. The wooden panels are meeting the battlement, which is also wooden. The roof is constructed by CLT slaps in the wooden volumes and by laminated glulam in the middle parts (façade SE). The wooden volumes has growing medium on top.

The window solution is reflecting the needs for the interior rooms. The facade is avoiding repetitions, this is due to the users perception of the building. A repetitive façade has an tendency to be institutional and impersonal. The windows are square with a size of 800mm and 1200mm. The windows is made small to avoid unwanted views from outside the building (façade NE). Furthermore, they have integrated solar shading because of the size (see appendix E for window presentation).

Larger windows is provided in the ends of the middle buildings. This is due to daylight and natural ventilation (p. 73 and 96). These windows has implemented passive solar shading, which is vertical 100x500mm mullions cladded with fiber cement (façade SE).

Larger windows is used in the area around the treatment towards the garden of senses (façade NW). This is to utilize the daylight and to enhance the connection to nature. The windows is for this reason either pulled back from the façade or has the exterior part of the two on one cladding continuing in front of the window. This is creating small seating niches inside which invites to stay by partly covering the back of it.





III. 6.27\_Window sills White aluminium in the window sills allow for a high amount of diffuse daylight to be relected into the building. They also highlight the windows on the façade (architonic.com, 2012).



III. 6.28\_Green roof The roof acts as the fifth façade of the building. Not only when seen from the roof terrace but also when seen from the surrounding buildings. Furthermore, it allows for local handling of rainwater by absorbing the water and allowing it to evaporate afterwards (Vegetalid.us, 2016).







## III. 6.31\_*Room height glazing As part of the contrast between the wood cladded volumes and*

# the concrete, room height glazing is used to allow the concrete to "hover" between the volumes. It also creates a strong connection between interior and exterior (Cutlasercut.com, 2016).

III. 6.32\_Concrete As a contrast to the wood façade cladding on the volumes, concrete Fiber cement panels are used for cladding this part of the building (CG-Source, 2016a). is used as the main material for the areas in between the volumes.



III. 6.33\_Wood on façade The façade is cladded with two layers of larch wood, done with a one-on-two cladding. This creates a three dimensional expression. highlighted by depth and shadows. It is treated in order to withstand the weather while maintaining its natural appearance (bolius.dk,





III. 6.35\_Southeast facade

#### SECTION

The section is showing the interior of the rooms along the path of empowerment. Between the wood volumes the direct contact to nature is in focus. From left to right: Through the common room, entrance and treatment waiting. These functions are the first level of intimacy, social relations. The room height in these rooms are higher than in the rest of the building, 3.1 m, allowing for an open feeling of space.

The main rooms is connected to the next level of intimacy, which exists of the secondary waiting function and niches as well as the front rooms and corridors of the social area. These areas are made so the users of the building have the possibility to retreat to more safe and enclosed areas compared to the main areas. These areas are also used as distributors to the third level of intimacy.

The third level of intimacy is mainly the offices. Here, the possibility to be completely secluded from the surroundings is provided. The third level of intimacy is the most private rooms of the building. Here is a reassuring mood essential to create contact and reliance between the staff and the patients. The room height in this area is lowered to 2,7m to create a more enclosed and homelike feeling.

In the main rooms additional skylights is installed to secure well-lit rooms. The skylights further provides a separation between the wood volumes and the in between concrete volumes. The contrast between the rooms is important in order to differentiate between the rooms with social relations and the spaces with more private relations.

To achieve a better understading of the relation between interior and construction, the constructional principle is visualized in Appendix I



III. 6.37 Section arrow.



III. 6.39 Window sills White timber in the window sills allow for a high amount of diffuse daylight to be reflected into the building (CG-Source, 2016c).



III. 6.40\_Concrete

As a contrast to the CLT, concrete is used on the floor throughout the building and on the ceiling in between the volumes. It is used as solid material tying the building together across the different zones and functions (CG-Source, 2016a).





III. 6.41\_*Room height glazing As part of the contrast between the wood cladded volumes and* the concrete, room height glazing is used to allow the concrete to "hover" between the volumes. It also creates a strong connection between interior and exterior (Cutlasercut.com, 2016).





III. 6.42\_*Cross Laminated Timber, CLT The main interior material is the exposed CLT panels. The inner layer* of CLT is high quality larch, relating to the façade cladding. In the offices the inner layer is horizontal in order to emphasize the intimate scale of the room. In the remaining of the building the inner layer is vertical in order to different the two (CG-Source, 2016c).

III. 6.43 Wood floor The offices have wooden floors, differencing them from the concrete floors in the remaining of the building. Furthermore, it supports the more intimate character of the office (CG-Source, 2016b).

#### THE ENTRANCE

The entrance is where the first impression is made of the interior of the design. The entrance is made with an extended and undisturbed view to nature. The design is implementing nature as a main element, to create a homelike and subtle atmosphere around the treatment. The entrance is taking the overview and relation down to a level where every visitor of the building feels as being a part of the design. After entering the weather porch, a direct view to the reception is provided. This view is essential to avoid confusion and anxiety of not being able to know where to go.

The entrance is splitting between the treatment to the right and the social area to the left. A first time visitor will go directly to the reception area where the remaining treatment area opens with the path of nature as central element.

The entrance is the central part of the path of empowerment, here are the users of the building deciding, where to go on the path. All users of the building will get a fast and easy overview of the two directions to attend.

When going out of the treatment area the patients are invited to move along the path of empowerment to the social area, where the kitchen is visible as the central element in the room.



III. 6.46\_Section of the entrance area.



III. 6.44\_The path of empowerment. The path goes through the entrance through the reception and common treatment area. It follows the path of nature around in the treatment area hereafter is it continuing to the social area. The circulation is ongoing until the day where the treatment is no longer necessary.



III. 6.47\_Plan of the entrance area.



#### ENTERING THE TREATMENT

The treatment area is where the patients is undergoing psychological, physiological and social consultancy treatment. The space is a reflection of the already existing rehabilitation center for refugees, regarding the needed functions. The implementation of healing architecture has entailed an increased focus on nature and daylight. Large open window façades is dissolving the area between interior and exterior, with a corridor leading around the nature. This path of nature is a part of the path to empowerment. Walking, sitting or staying in this area provides a calmness and absorption into oneself which is important in the treatment when implementing healing architecture (ill. 6.42).

In the middle of the path of nature is the garden of senses. The garden is creating a relaxing and de-stressing atmosphere with time and space for reflection. The treatment is functioning across two floors. The connection is open, with a double height area and two stairs. The access is intuitive and provides an easy overview. Two stairs is located to provide a circulation between the two floors. In this way there will be no dead end in the areas.

The ceiling material is changing between the areas of the treatment. In the common treatment waiting area the ceiling is of fiber cement, while the ceiling in the more intimate areas is wooden lamellas which provides a more intimate atmosphere.

Functions as storage, toilets and additional treatment related rooms is scattered around the treatment area to create the easiest and most intuitive access to the rooms for users and employees.



III. 6.48\_The path of nature dissolving transition between inside and outside III. 6.49\_*Visualization of the common treatment* waiting area, looking along the path of nature.



#### TREATMENT WAITING

The common treatment waiting is the first room that meets the user's sight after going thought the reception. The treatment waiting is provided for the PTSD-patients that is in need of a sense of social security. The area is open planned with a direct contact to the administration. The patients using the treatment waiting will always feel that they, to some degree is being looked after, and being able to see staff. This sense of security appeals to the PTSD-patients that is afraid of being left alone.

The acoustics is in this area are buzzing due to the concrete floor and acoustic sealing. This interplay creates an acoustic that is heard by noise, but not by words. This makes a feeling of being part of a place without being overheard when speaking. The treatment area consists of small couch areas and a common table where social interactions between patients, volunteers and staff occurs. The waiting is furnished in a simple way to maintain for an easy overview in order to avoid unexpected surprises for the patients.

The area is provided with natural ventilation from the double façade placed in each side of the room. The ventilation is using cross ventilation and thermal buoyancy to ventilate the area effectively in the summer season or in case of high internal loads. The ventilation is elaborated on page X.





#### WAITING NICHES

Around the treatment there is six areas which main function is to be secondary waiting areas. These areas is appurtenant to the second level of intimacy, the semi-private areas. These areas are provided both to accommodate small areas, where the patients can sit for themselves and have a personal moment without interruptions, and small social areas where small activities occurs, before and after they go to the treatment office. The patients using these areas should slowly get an increased self-confidence to start interacting with other patients.

The areas are multi programmed to contain different functions that can support the path to socializing and empowerment. Computer area, children's area, library, relaxation area, game area is some of the programming applied to these areas, that can help the patients to interact with each other. The building is layouted and programmed so that families, friends, acquaintances etc. can be a part of the treatment, learn about their relative's syndrome. This approach allows the patients be more open and more extrovert in order to move the status gou of the PTSD.

The niches in the building is connected with the path of nature going around the wild nature in the center of the treatment area. The path of nature is the first step of the empowerment route. By continuously exploring the path and functions on it, the patients can slowly learn to use their treatment in a safe and secure environment.



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Sitting niche in wall Computer area Waiting niche Library



III. 6.52\_Location of the waiting niches in the treatment area.

III. 6.53\_Section of the southwestern waiting niche.

III. 6.54\_Plan of the southwestern waiting niche.

## OFFICE

The office is the most important part of the treatment. It is here the actual treatment takes place. Without a good and relaxing space for the core of the treatment, the optimal holistic course of treatment is impossible to achieve. The interior is exposed walls with CLT. CLT is a sustainable building material and a material, which contributes to a relaxing and warm mood. This mood is essential to create a homelike atmosphere where the patients can feel safe and expose their traumas.

The office areas are divided in two areas. The actual office is where the employees have their personal objects, professional material and office equipment (right part of the visualization). The other part is where the treatment is accomplished. This area is planned to have flexible furnishing depending on the individual needs of the employees (left part of visualization). Some like to use a high table, some likes couches and some like lounge furniture. The employees decide themselves which furnishing fits best for their approach.

In the design there is three different kind of offices; the psychology, physiology and social consultancy treatment. These three areas of specialization is producing the course of treatment, which in the profession is called a holistic treatment. In the category of psychology office, there is two group therapy rooms that is used in the beginning of the course of treatment.

The rooms has a proportion of 20 m2 and is 2,7m height. This size is developed through investigations of the furnishing and spatial qualities of the room. The room should not be too large, then the homelike feeling will be lost, or to small, so the functionality of the room will be disregarded.

For further furnishing of the rooms, see drawing folder ground floor.

## Criston who gent who



III. 6.55\_Section of the treatment office (section arrow, see page 95)



#### INDOOR COMFORT

The rooms are developed to provide the best possible indoor comfort related to their functions. A point of impact for this are in the offices. The offices are the heart of the treatment, and should perform as well as possible in relation to comfort, in order to be able to handle the best possible treatment. Being in a comfortable environment can contribute to a better treatment where the patients feel an increased freedom to open their mind.

#### ATMOSPHERIC COMFORT

The atmospheric comfort in the offices are developed through B-Sim and studies in ventilation. A good atmospheric comfort that obtain a free breathing and avoid unwelcome and unpredicted smells. This is calculated, by the CO2 pollution in B-Sim, to reach an acceptable quality of the air of the offices. The CO2 level in the rooms are not passing 600ppm, which is 300ppm below the maximum of the BR2020. However, the rooms with a higher person load has an increased need of ventilation due to the increased CO2 level (see appendix B for further information).

#### THERMAL COMFORT

The thermal comfort is another key element of the treatment in the offices. Through B-Sim an optimal thermal comfort is achieved by floor heating, ventilation with heat recovery and a heat coil. The amount of radiation let in through the windows is adjusted to the internal loads, this means that there will be few times doing the year where the temperature rises above 26 and 27 degrees. Only when extreme solar radiation or high internal loads is experienced the temperature will be to high for the comfort (see appendix C for further information).

#### ACOUSTIC COMFORT

Panic attacks or extreme discomfort can be activated by loud or continuous sounds. The designed acoustic solutions are constructed to accommodate these needs. The acoustics in the office is a clear acoustic with a low reverberation time. It should be easy to have a conversation without having trouble being heard. The building acoustics between rooms is made as low as possible with sound absorbing materials and avoidance of sound transmitting assemblies (see D appendix for further information).



III. 6.56 *B-Sim* data of an extreme hot summer day in July showing that thermal mass and integrated solar shading prevents the room to overhead by an extended value.



III. 6.57\_*B-Sim data of a sunny spring day, showing a high solar gain.* 



#### VENTILATION

The building is hybrid ventilated which means it uses a combination of natural and mechanical ventilation. It is a necessity to implement the hybrid ventilation in the building design to achieve architectural, constructional and installation technical holistic solutions.

The building is using natural ventilation throughout the entire building design. The offices is mainly single sided ventilated, but has the opportunity to open a window towards the waiting niches to cross ventilate at the peak loads.

The main open areas has the opportunity for cross ventilation through a double glazing façade. An inlet is provided in the bottom of the window, which leads cold air into the center of the window. The facade is using the heat from the sun through the façade to enforce thermal buoyancy in the center of the window. Thereby is temperate air displaced into the room, so main draft inconveniences are avoided. In case of peak loads in the main rooms, a cross-ventilation opportunity is provided through the natural ventilation system. A double façade in each end of the social area, the entrance and treatment waiting area is providing a sufficient air transport.

The north building is using the double height room as distributer of heat. The room with large windows is turning towards Southwest. Thereby a descent amount of solar heat will enter the room. The area uses thermal buoyancy through the skylights to ventilate the warm air by peak loads. In the winter season is the room used as main provider of heat to the surrounding rooms.

The mechanical ventilation is provided through decentralized units placed over the windows in the office, main areas and adjacent rooms. The unit is an Inventilate decentralized component, which brands themselves as being sustainable ventilation. The ventilation is decomposed in small units in op to eight small fans. These are providing the room with between 5-10 l/s. In this case a minimum of four compounded units is needed in the office area. The units has a low energy consumption, silent sound level and a heat recovery between 78-92% (For more information, see the attached USB).

The general hybrid ventilation plan is provided in Appendix A



III. 6.59 Section of the natural ventilation principle of the main rooms.





INTEGRATED VENTILATION

The decentralized ventilation is integrated into the wall above the window. On the interior, a removable air grate conceals the ventilator while allowing for easy maintenance. On the exterior, the outer facade cladding extends down in front of the intake/exhaust thereby covering it while allowing for undisturbed air-flow between the wood boards. The installation of the decentralized ventilation is done in accordance with the guidelines from the manufacturer Inventilate (Inventilate.dk, 2014).

When building with wood, it is important to allow water and moist to escape from the construction. Therefore, all horizontal edge slopes outwards allowing for water to escape and an air-gab behind the façade allows for ventilation of the wood. In order to ensure a low line-loss around the window, the frame is insulated on the interior side. This simultaneously hides the part of the window frame not used for opening the window, making a more undisturbed view to the outside.



III. 6.64 Location of detail.

Ventilation unit

ventilation.

6 Design presentation

1: Interior intake/exhaust of ventilation. 2: Ventilation fan. 3: Heat recovery unit. 4: Exterior intake/exhaust of ventilation. 5: Inner layer of facade cladding open for intake/exhaust of

III. 6.63\_Heat recovery from decentralized aggregate



III. 6.61\_Single sided ventilation in the office.



III. 6.62\_Floor heating in office.

III. 6.60\_Double sided ventilation in the office





III. 6.65 Detail 4: Ventilation above window

Window (U-value: 0.78 W/m2\*K)

7: Window with three layers of glazing.

6: Insulated window frame.

of the window.

Exterior wall (U-value: 0.094 W/m2\*K) 9: Two layer exterior cladding of larch tree, 2x30mm. 10: Ventilation gap with horizontal cladding rafter, 30mm. 8: Exterior frame of aluminium. Wall-mounted on the sides 11: Ventilation gap with vertical cladding rafter, 30mm. 12: Wind barrier of impregnated wood, 15mm. 13: Insulation with timber mullions, 320mm. 14: Vapour barrier. 15: CLT panel (3 layers), 95mm.

## SOCIAL -COMMON AREA

(For drawing of social area, see drawing folder)

The social area is the final point on the path of empowerment. It is an extension of the current treatment program and functions as the place where the patients can start socializing in a safe and predictable environment. The socialization outside the rehabilitation center is more unpredictable and transgressive and acquire more self-determines and rushing than patients with PTSD is capable of obtaining.

The social part is consisting of four key elements. The common room with a kitchen is placed as the heart of the area. Located around it is the language school with three classrooms, a multi-room/fitness and a workshop area. Furthermore, a staff area and a volunteer office is connected with the common space to provide a close connection between the staff and the users.

When attending the social area the patients is no longer seen as patients, but as users. The social offer is voluntarily and is run mainly by volunteers. The volunteers can be old patients of the rehabilitation center, family to former patients, but also ordinary Danish citizens wanting to make a difference.

The language school is an offer applied by the rehabilitation center. Three levels of classes is provided to current and former PTSD-patients, who has problems attending Danish classes on same terms as other refugees, immigrants and newcomers. The classes is reduces to 8-10 students to keep a steady and calm class with few new faces to accommodate the psychological fragile students.

The multi-room/fitness is a combination of a room used for fitness activities related to the physiotherapy treatment, and a flexible room provided for the social area, which could be used to physical activities or play. The room has a dressing room connected, which can be used of all users also connected to the treatment.

The social area is the place to test the ability to empower the PTSD. Small steps of success is supporting the mind to be capable of controlling anxiety and stress. The common room provide small sitting niches as well as larger areas for stay. Immaterial to the placement in the room is the essential feeling of being a part of the community of the rehabilitation center.

III. 6.66\_Visualization of the common room of the social area watching the kitchen, the social main space and out the planned nature.







III. 6.67\_Section of the main common room.

## THE SOCIAL OUTDOOR AREA

The outdoor space in front of the social area is a multifunctional area for various activities. The outdoor activity space is an extension of the common room, which continue into the open field of Fjordparken. The area immediately in front of the common room is a terrace. The terrace can be used the whole year and is especially in the summer months intended as being fussed with the common room.

In the garden different functions can make it interact with the interior activities. A kitchen garden, a green house, a tea pavilion and a flower beds can provide space for small groups of users to do activities together. In the center of the garden there is a green space for activities. Here can children play or it can be used to open consultancies in the green environment.

The garden is a resemblance to a standard garden in a single family housing area, and is scaled to be as intimate and have the same sense of security.

The garden is continuing towards south west against the fiord. The planned green is slowly merging with the wild Fjordparken and is providing a path into the wilderness. This path is a gravel path that is adjusted to the wild setting.

The users of the building can use the path to go on adventure on their own, with their family or in therapy groups. Following the path, Lindholm Å will be reached, which leads to the fiord. The close connection to the maritime environment, can provide additional areas for reflection and can be used as a part of the program to enhance small informal meetings within the area of Lindholm Brygge.



# PROCESS

The goal of the process is to use the integrated design process to develop a holistic design for the Rehabiliation Center for Refugess. The interplay between aesthetic and technical challenges from the beginning of the process induce well-considered solutions. The process will examine the ideation from the sketch phase to the final presentation material examined in previous chapter.

The design of the new development for a rehabilitation center for refugees in Northern Jutland will take the departure in the needs of the PTSD affected users of the building. The design will evolve implementing context parameters, additional user needs, detailing and confirmation of the sustainable initiatives. Healing architecture is used throughout the process to inform the design with evidence-and experiencebased design initiatives. The implementation of nature and use of daylight is throughout the process key elements of the design. The general technical focus in the process is on the optimization of the building energy performance to reach BR2020 only using passive strategies. The optimization of passive heating and cooling, orientation, building envelope and ventilation is the key parameters to reach the goal.

#### DESIGNING FOR PTSD



Design focus:

- Enable the design to accommodate the various types of PTSD-patients.
- Create spaces for private and social relations.
- Create a non-institutional atmosphere.

The needs for patients with PTSD are a very complex issue to address. The PTSD is wide-ranging so a design fitting perfectly to all users cannot succeed. The general anxious triggering elements is though easier to handle. Loud sounds, small closed rooms and opaque areas are some of the parameters easier to implement in the design. The more diverse the parameters is, the harder is it to design for; some patients are scared for open rooms, some for closed; some is anxious with people contact and some is afraid of being alone. The contradictions is uncountable.

The approach is in this project to create varied spaces and niches where the patients themselves can decide what space they want to be a part of. Thus, a differentiated design is important to reach this aim.

The feeling of being in a safe space is crucial in the development of the best possible cause of treatment. A safe space can be many things, but a place where many feel safe is in their own home. Therefore, the safe feeling of home is central to help, and make the patients open up for the cause of treatment.

The following spread will elaborate on the initial approach to deal with PTSD patients.





III. 7.1\_ The needs in the building in an early stage.

Building

PTSD

patients

Employees

Former PTSD

PTSD patients

patients

Family Volunteers



#### III. 7.2 Hierarchic in the approach.



#### FUNCTIONS SOCIAL VS. TREATMENT



7 Process

Use





III. 7.5\_The common room and offices illustrated as a circular building.



III. 7.7 Sketch from the common room



III. 7.10\_Section showing the levels of intimacy between a court yards, smaller social rooms and treatment offices.

# Entering the PTSD course of treatment Path of empowerment Be able to empower

#### III. 7.9\_*Illustrated path of empowerment*

EMPOWERMENT

The empowerment notion is a relatively new term within medical science. The term is directly translated to "being capable of", but in the medical world the term is described as the process where the human is being capable of counteract powerlessness and addiction. The goal is to be an independent and self-controlling human being. The notion is used in this project to describe the transition between being PTSD patient with severe mental damage and to be able to control the mental disorder; or being able to empower.

#### 105

III.7.8\_Functions start to divide the circlar volume to create an atrium.

## INITIAL DESIGN - FORM



Design focus:

- Create spaces for private and social relations.
- Enable the design to accommodate the various types of PTSD-patients.
- Comply with the BR15 2020 energy demands using passive strategies.

The purpose of the volume studies is to gather background knowledge in the size, organization and placement of the building on the site. Different tests from simple forms containing the wished square meters to more conceptual sketches, is giving a better understanding of the approach to the form concept. The initial test further implement the new knowledge from the PTSD investigations made in the program and initial sketches.

The general form concept derives from the centered common room with the offices located around. This concept cause an intuitive way finding in the building, but are missing spaces and niches for differentiated use. Challenges with the orientation is already faced in this phase. The wish of having offices towards the nature and still have solar heat gain in the are problematic because of the northwest placement of the nature.



III. 7.12\_The centred common function with offices around it.





















III. 7.13\_Extract of the performed initial studies

## TECHNICAL FOCUS



Design focus:

- Comply with the BR15 2020 energy demands using passive strategies.
- Comply with the BR15 2020 indoor environment demands using hybrid ventilation.
- Ensure an average daylight factor of 3 %.

The technical focus is important to implement from the beginning. The early implementation leads to the possibility of an ending holistic design where the technical theme – sustainability – can be an integrated part of the project.

The initial technical studies is investigating different methods to implement passive and active strategies in the building design. This leads to an increased understanding of the future technical challenges, and the approach to solve them.

The studies also leads to design focus areas, which is important to implement in the design process. The orientation and solar heat gain is from this study the most rewarding. The orientation study shows in B-sim the importance of having the right orientation to provide solar gains.

Elaboration on the buildings energy performance is made to get a basic understanding of the parameters that influence the performance. The essential to extract from the calculation is the need of passive heat gain and possibility for ventilation. Further, the building volume should strive to be as dense as possible.

#### PASSVIE STRATEGIES





III. 7.15 Initial orientation considerations









III. 7.18 Natural ventilation considerations



III. 7.19 Passive cooling







III. 7.21\_Hybrid and mechanical ventilation

#### **ORIENTATION AND ENERGY TEST B-SIM & BE15**



III. 7.22\_Orientation diagram showing cold and warm surfaces



III. 7.23\_ Building heat gain orientation North-south



III. 7.24\_ Building heat gain northwest - southeast



III. 7.25\_ Square one storey building used for the energy frame

Renoveringsklasse 2			
Uden tillæg	Tillæg for særlig	e betingelser	Samlet energiramme
136,9	0,0		136,9
Samlet energibehov			48,3
Renoveringsklasse 1			
Uden tillæg	Tillaeg for særlig	e betingelser	Samlet energiramme
72,3	0,0		72,3
Samlet energibehov			48,3
Energiramme BR 2015			
Uden tillæg	Tillaeg for særlig	e betingelser	Samlet energiramme
41,6	0,0		41,6
Samlet energibehov			44,7
Energiramme Byggeri 2	020		
Uden tilæg	Tillæg for særlig	e betingelser	Samlet energiramme
25,0	0,0		25,0
Samlet energibehov			35,9
Bidrag til energibehovet	÷	Netto behov	
Varme	18,1	Rumopvarm	ning 9,6
El til bygningsdrift	7,3	Varmt brugs	vand 6,3
Overtemp. i rum	11,9	Køling	0,0
Udvalgte elbehov		Varmetab fra	installationer
Relysning	6.7	Rumonyarm	2.0
Opvarmning af rum	0.0	Varmt brugs	vand 1.1
Opvarmning af vbv	0.0	0.0000000000000000000000000000000000000	000000
Varmepumpe	0,0	Ydelse fra sæ	rlige kilder
Ventilatorer	0,3	Solvarme	0,0
Pumper	0,2	Varmepump	e 0,0
Køling	0,0	Solceller	0,0
Totalt elforbrug	21,4	Vindmøller	0,0

III. 7.26\_Energy frame for one storey building - used for initial under-standing of the need of densifying the building.

#### DESIGN INSPIRATION



Design focus:

- Integrate the wild nature from the nearby Fjordpark.
- Create a non-institutional atmosphere.
- Provide social initiatives for interaction and promotion of social sustainability.
- Provide good working conditions for the staff.

The rehabilitation of refugees is a relative new notion. Therefore, not much has been done to optimize on the buildings where the cause of treatment happens to be. In this relation, not much inspiration regarding the field of expertise is left to investigate. Fresh methods has to be taken into account.

Slagelse new psychiatry is used to investigate the needs of psychiatric troubled individuals. Slagelse psychiatry involves, among other, patients with PTSD. Further, they are the first Danish health care building to use the initiatives from healing architecture. In addition, Livsrum cancer consulting is investigated. Livsrum distinguish from a strong common area, the heart, which compiles the users of the house. Livsrum further deals with zones of intimacy, which is important in the search for differentiated spaces.

Other project has been less influencing, but is still worth to mention. Herzog de Meuron's Childrens hospital in Zürich, which is able to combine an institution in a homelike and safe frame. CREO and WE architecture's psychiatry in Ballerup who downscale the building mass to small easy readable volumes, and Friis&Moltke and PLH's Bispebjerg psychiatry, which in an excellent manor is able to combine in-and exterior.



showing one of the private niches out-



III. 7.28 The garden of Livsrum Herning creating a simple and homelike garden.



III. 7.29 Livsrum in Aalborg with its common room that distributes the functions around it.



III. 7.30\_Nord architects Cancer consulting centre creating niche and green private areas in a city context (Nord architects, 2012).



III. 7.31\_Bispebjerg psychiatric hospital shows the close connection between interior and exterior (Plh.dk, 2016).



III. 7.32 The Psyciatric Hosital in Ballerup creates small niches and a homelike setting within the architecture(ArchDaily, 2014).







7.33\_Herzog& de Meurons childrens Hospital in Zürich uses vood and nature in an exemplarv manor. (ArchDailv.

III. 7.34 El Salvador Beach House emphasises nature in the building (Dwell, 2012).

III. 7.35 Ballerup Psychiatric Hospital shows how downscaling of the building bass contributes to a pleasant room (ArchDaily, 2014).

III. 7.36\_Aabenraa Hospital creates a coherence betwee space on first and second floor (Friis-moltke.dk, 2014).



7.37\_Psychiatric Hospital in Slagelse creates a translucent build ing to create easy overview(Ka-vla.dk, 2015).



Ka-vla.dk. 20



III. 7.39\_Bispebjerg Psychiatric Hospital implements private niches in the corridors and apply small private outdoor areas (Plh.dk, 2016).

#### **DESIGN WORKSHOP 1**

#### INVESTIGATING FORMS



Design focus:

- Enable the design to accommodate the various types of PTSD-patients.
- Create a non-institutional atmosphere.
- Integrate the wild nature from the nearby Fjordpark.
- Comply with the BR15 2020 energy demands using passive strategies.
- Create spaces for private and social relations.

In the progress developing the concept, two intensive design days is performed to investigate different ways to shape the concept of treatment and social interaction. The social common room should function as an extension of the current rehabilitation program.

Different parameters are defined to rate the developments in comparison to each other. The important factors was aesthetical, functional and technical oriented.

The main parameters to review was optimized surface area towards nature - intuitive access to nature - common room centered in the building - the building should create intuitive niches, both inside and outside - the building should provide daylight in the whole building - entrance should be emphasized - and the building should be downscaled to be more homelike.

Four of the best ideas was worked through to investigate its potential. The four proposals was rated with a PV-Diagram.















# DETAILING THE CONCEPT

#### **MIDTERM REVIEW - THE BOXES**



Design focus:

- Use the idiom from the new development area.
- Ensure an average daylight factor of 3 %.
- Ensure an easy overview and intuitive wayfinding in and around the building.
- Create spaces for private and social relations.
- Create a non-institutional atmosphere.
- Comply with the BR15 2020 indoor environment demands using hybrid ventilation.

From previous investigations of form finding, the concept is further developed through a combination of aesthetic, functional and technical investigations. The plan are developed through abstractive classification of main elements also seen in the earlier process. The functionality, flow and accessibility is implemented in the plan development.

Spatial investigations increase the understanding of the human scale in the different spaces. Further, volume studies are made to partially compare with the context, and use to investigate radiation on the building surface and daylight factor in the common areas.

General considerations addresses the most effective placement of the building on the site, compared to the amount of radiation. Initial studies is developed for the windows solution, view from the office and office daylight factor. In addition, ventilation and possible ways to apply solar gain to Northwest facing rooms is tested.

#### FUNCTIONAL PLANING





**AESTHETIC AND SPATIAL INVESTIGATIONS** 



III. 7.43 The plan of the building is evolving to implement the needs of PTSD patients, functional and aesthetic qualities.



III. 7.44 The spatial investigations is important to use in the transi-tion between zones of intimacy and use of materials.

#### VOLUME INVESTIGATION









#### **TECHNICAL CONSIDERATIONS**



III. 7.46\_Radiation study on the site. The difference between the sun in the northern and southern part of the site is notable.





## DETAILING THE CONCEPT

#### MIDTERM REVIEW



Design focus:

- Ensure an easy overview and intuitive wayfinding in and around the building.
- Enable the design to accommodate the various types of PTSD-patient
- Create a non-institutional atmosphere.
- Create spaces for private and social relations.
- Provide good working conditions for the staff.
- BR 2020 strategies.

In connection to the midterm review, located in the middle of the project, the chance is given to detail the current design. The concept is clarified to primary meet the needs of the users. The concept is in this phase adjusted to be able to fit any given site with the inside out concept developed. This means that the focus on the relation to the concept is juxtaposed.

Plans, facades, section and sketch visualizations are presented to give a picture of the building situated on the site, and give an overview of the spatial and material qualities in the design. The important areas of the plan is furnished to give the possibility to identify the areas that does not meet the wished expression and experience.

Daylight calculations is made in the offices and common areas to keep track of the wished daylight needs. Radiation on the façades gives the possibility to further develop the solar heat gain. The roofs are one sided pitched to provide the possibility for thermal buoyancy, increased solar heat gain with skylights and additional PV´s.

The energy frame in BE 15 shows that a more dense building with better control of the over temperatures is desired to achieve BR2020.

#### MIDTERM CONCEPT











III. 7.49 Concept development focusing on the needs for patients with PTSD. An easy readable plan solutions, clarity and overview.

#### SITE PLAN AND TREATMENT AREA



III. 7.50 The plan situated in the context showing challenges in relation between building and context



III. 7.51\_The main area for treatment is easy readable, but uses many m<sup>2</sup> on corridor space. The plan strive to be institutional.



III. 7.52\_Sketch visualisation from the entrance in the north of site showing the building in a low scale and divided volumes.

#### DAYLIGHT ANALYSIS











#### ENERGY CALCULATIONS



III. 7.54\_Radiation on the façades showing many radiance insuffi-cient surfaces oriented towards north west.

Renoveringsklasse 2							
Uden tillæg	Tillæg for særli	Tillæg for særlige betingelser					
136,3	0,0		136,3				
Samlet energibehov			48,4				
Renoveringsklasse 1							
Uden tillæg	Tillæg for særli	ge betingelser	Samlet energiramme				
72,0	0,0		72,0				
Samlet energibehov			48,4				
Energiramme BR 2015							
Uden tillæg	Tillæg for særli	ge betingelser	Samlet energiramme				
41,4	0,0		41,4				
Samlet energibehov			42,7				
Energiramme Byggeri 2	020						
Uden tillæg	Tillæg for særli	ge betingelser	Samlet energiramme				
25,0	0,0		25,0				
Samlet energibehov			32,7				
Bidrag til energibehovet	:	Netto behov					
Varme	28,4	Rumopvarm	ning 20,8				
El til bygningsdrift	6,2	Varmt brugs	svand 6,0				
Overtemp. i rum	4,4	Køling	0,0				
Udvalgte elbehov		Varmetab fra	installationer				
Belvsning	5.6	Rumopvarm	ning 1.4				
Opvarmning af rum	0,0	Varmt brugs	avand 0,8				
Opvarmning af vbv	0,0						
Varmepumpe	0,0	Ydelse fra sæ	rlige kilder				
Ventilatorer	0,4	Solvarme	0,0				
Pumper	0,2	Varmepump	e 0,0				
Køling	0,0	Solceller	0,0				
Totalt elforbrug	20,3	Vindmøller	0,0				

III. 7.55\_Energy calculation from the previous proposal showing issues with surface area and over temperatures.

111.7.56\_Longitudinal section with common social area towards south and the treatment area with nature as centre in the north part The roofs are sloping to let in daylight and solar radiation from south. The building is terracing towards the south to emphasize the flow from treatment to social area.

## **REVIEWING THE CONTEXT**

#### FORM FINDING



Design focus:

- Use the idiom from the new development area to make a coherent connection between the rehabilitation center and context.

- Ensure an easy overview and intuitive wayfinding in and around the building.

- Provide social initiatives for interaction and promotion of social sustainability.

- Integrate the wild nature from the nearby Fjordpark.

The focus until midterm has been on investigating the possibilities of creating a concept emphasizing the focus on the PTSD patients. Overview, simple plan solutions and a symmetric interior has for this reason been essential to conform to. The approach has been" The building needs to work for the users". The function and the aesthetics of the frame should be the essential, the coherence to the surroundings is then secondary.

Having a clear idea of how the path of empowerment connects treatment and social functions around nature and a common room, the time has come to investigate the coherence to the context.

The investigations of the context implement the differentiation between nature and city. The building should open to the nature and be denser towards the city. The building should use the same idiom as the context buildings to be an integrated part of the new development. With base in Nordic architectural knowledge, the building must fuse into the idiom of the nature and simultaneously fuse into the cityscape.



III.7.57 The modification of the concept implements a strong connection to the concept of the typology and openness to nature in the new development plan.



III. 7.58\_The modification still works with the important futures developed earlier in the process. Additional layers has to be implemented to meet both the needs of the users and the context.





III. 7.60\_The entrance has changed location to the middle of the building for several reasons. The path of empowerment should be a spiral shifting between treatment and social activities. With the middle entrance a choice is provided to strive for the treatment or social area.

III. 7.62 The technical considerations and calculations has been brought to the new form, that opens for more optimization studies.

## **TECHNICAL OPTIMIZATION**

#### STEP ONE



Design focus:

- Ensure an average daylight factor of 3 %.
- Comply with the BR15 2020 energy demands using passive strategies.

To be able to conform to the energy demands of BR2020 the building most undergo technical optimization within the parameters that is insufficient compared to the demands. This project strive to achieve BR2020 without active strategies, this leads to increased focus on the passive strategies.

Technical investigations has been implemented earlier in the process both in a conceptual level, but also by verifying calculations.

The aim of the technical implementation is to inform the design contemporary with creating a functional and aesthetic satisfactory frame for the users of the design. By using the technical optimization in the process, the design has the possibility to integrate the technical solutions in the design.

In the first part of the optimization daylight studies, orientation and density is considered. The daylight effects the depth of the building volumes and the organization of rooms. The orientation concerns the passive heat gain and heat loss. Finally, the density of the building effects the surface to volume ratio, which have a major impact on the energy frame. The density also effects the buildings footprint, which should be as small as possible related to sustainable considerations.

#### DAYLIGHT STUDY



III. 7.63 Daylight studies space between boxes and large windows in the end



III. 7.64\_Daylight studies space between boxes and no large windows in the end.



II. 7.65\_Daylight study where the upper builing part is shiftet towards north east to provide sun to the waiting area.



III. 7.66\_Work with an open coridor to the nature is desmised, because of increased surface area and deep rooms



III. 7.67\_A study where the design is made more to meet the needs of the energy demand, it leeds to smaller rooms with better daylight.

#### DAYLIGHT

The daylight investigations has continuously been a part of securing pleasant and illuminated areas inside the building. Daylight is an important parameter within healing architecture, and has a documented effect on the healing process. Illuminated areas gives a better overview and clarity inside the building. The areas for retraction should still be provided for users that have the needs.

#### **ORIENTATION - HEAT GAIN**



Throughout the process, a continuous desire has been to create offices with heat gain contemporary with creating view to nature. This wish has been a challenge, but in the optimization phase, a new goal has to be set not to compromise the aesthetic and functional parts of the design. The offices should be provided with sunlight at least one hour a day in the summer months. The offices turning away from the morning and midday sun should then have a view to nature. In this way, the missing sunlight is meet with increased nature.

#### DENSITY

Renoveringsklasse 2											
Nerroveningskidsse z											
Uden tillæg	Tillæg for særl	ige betingelser	Samlet energiramme								
136,2	0,0		136,2								
Samlet energibehov			46,6								
enoveringsklasse 1											
Uden tillæg	Tillæg for særl	ige betingelser	Samlet energiramme								
71,9	0,0		71,9								
Samlet energibehov			46,6								
Energiramme BR 2015											
Uden tillæg	Tillæg for særl	ige betingelser	Samlet energiramme								
41,4	0,0		41,4								
Samlet energibehov			42,0								
Energiramme Byggeri 2	020										
Uden tillæg	Tillæg for særl	ige betingelser	Samlet energiramme								
25,0	0,0		25,0								
Samlet energibehov			33,7								
Bidrag til energibehove	t	Netto behov									
Varme	22,9	Rumopvarm	ning 15,6								
El til bygningsdrift	5,3	Varmt brugs	avand 5,9								
Overtemp. i rum	10,4	Køling	0,0								
Jdvalgte elbehov		Varmetab fra	installationer								
Belvsning	4,8	Rumopvarm	nina 1.3								
Opvarmning af rum	0,0	Varmt brugs	avand 0,7								
Opvarmning af vbv	0,0										
Varmepumpe	0,0	Ydelse fra sæ	rlige kilder								
Ventilatorer	0,4	Solvarme	0,0								
Pumper	0,2	Varmepump	e 0,0								
Køling	0,0	Solceller	0,0								
Totalt elforbrug	19.4	Vindmøller	0.0								

III. 7.69\_Energy frame from BE15 on the building mass developed of the time in the process.

#### DENSITY

The building is continuously undergoing a transformation compared to the density. The building should be as dense as possible while providing the desired functions and flows in the building. An ingoing optimization is performed between the spatial qualities of the interior spaces and the energy frame. Both elements is of major priority, thus other initiatives has to be implemented to fulfil the energy frame, if it fails to accomplish.

#### TECHNICAL OPTIMIZATION

#### STEP 2



Design focus:

- Ensure an average daylight factor of 3 %.
- Comply with the BR15 2020 energy demands using passive strategies.
- Create a non-institutional atmosphere.

The second part of the optimization implements the elements that has less influence on the overall shape of the building. The elements are though still important to implement to achieve the energy demands with integrated holistic solutions.

The ventilation system influence specifically the room height, the distance between functions and the thickness of the floor deck. With a worked through ventilation system many details in the design can be well executed. Different ventilation types is considered to meet functional and aesthetic need of the building and its users. A wish of creating zones of intimacy with the height of the ceiling opens for investigations for the best possible ventilation solution.

Natural ventilation is an important factor in achieving the energy frame. The natural ventilation should be implemented in a way where the users avoid draft. The natural ventilation should further be so effective that overheating is avoided. A design for double-sided ventilation in the offices is investigated to achieve the best possible ventilation in the office and common areas. To achieve a good indoor environment the acoustics is carefully considered. The acoustics shall fit to the purpose of the rooms and shall contribute to the differentiated experience of the interior spaces.

A point of impact has been made in the technical investigations in the social common room where solar shading and heat gain is optimized.

#### VENTILATION



III. 7.72\_An overall decentralised solution does that the ceiling height is more flexible, the desired room height can with this proposal succeed.



#### ACOUSTICS





ACOUSTICS

Acoustics is an important part of the perception of the spaces in the building. The design manual differentiates between buzzing, muffled and calm acoustics. Buzzing acoustics is when the sound of others is heard as unclear sounds, acoustics with medium reverberation time and low clarity. this should occur in the common areas. Muffled acoustics is acoustic with low reverberation and medium clarity, used in areas where reverberation time is not needed. The calm acoustics is made in offices, here the clarity should be clear with a medium reverberation time.

#### SOCIAL COMMON ROOM





III. 7.75\_A point of impact between the ratio of daylight, solar radiation and transmission loss has been made in the social common room.



III. 7.76\_With an open roof with lammelae the room has sufficient daylight, but failed to keep a pleasant indoor thermal climate.



III. 7.77\_To lower the amount of radiation skylights is tested in the top of the roof with different orientations.



III. 7.78 The daylight shows with this solution a satisfactory daylight factor in the area where it is needed.



III. 7.79 *Towards west lamellae are tested to keep out the heat of the* evening sun.



III. 7.80\_Towards East the lammelae are used to shield from unwant-ed glimpse from the parking space.

#### ROOM - INSIDE OUT



- Enable the design to accommodate the various types of PTSD-patients.
- Provide good working conditions for the staff.
- Create a non-institutional atmosphere.
- Create spaces for private relations.

The room inside out departures from the needs of the patients and the employees in the office area. The employees have their own office where they perform the treatment. A small office area and furniture's for treatment should be provided. The needs for the various rooms are differing. The physiotherapist needs an examination couch, while the psychologist only needs chairs, tables and storage space.

The rooms are developed through the process while designing the outer frame. The room size is adjusted to the needs through various iterations. The room depth is further elaborated. Square rooms are easier to furnish, but have troubles getting daylight far into the rooms. Rectangular rooms with the longest surface towards the exterior provides sufficient daylight factors and can further increase the solar gains.

The materials in the rooms are important. A homelike perception of the room are desired. This can be reached in many ways, it opens for investigations in interior materials, furnishing and exclusion of institutional like elements.







III. 7.81\_The design of the offices has been through an ongoing process from the beginning of the project. The impacts of the process is shown in the above diagrams.























1.7.82\_Studies in the room design is investigated to reach the desired view and aesthetics from inside the room, and the desired block of view from ouside the rooms.

#### ROOM OUTSIDE - IN



- Create a non-institutional atmosphere. - Comply with the BR15 2020 energy demands using passive strategies.
- Comply with the BR15 2020 indoor environment demands using hybrid ventilation.

Through investigations of the ratio between daylight and radiation, it shows that the need of solar shading is necessary towards east, south and west. Different design is investigated with basics in the smaller windows developed earlier in the process. The small windows makes it possible to focus the view from the inside while scattering the glimpse into the room.

Investigations of the window placement is accomplished. The investigations shows that by changing the depth of the windows in the façade it is possible to make and adequate screen from the sun. The method is calculated and optimized to fit two different window sizes. The rule of thumb for this solution is, that the window should be placed 1/6 of the height of the window within the facade. With this calculation a window with the square of 1\*1m should be placed 16.6 centimetres from the outer point of the façade. Appendix (F)

Different investigation of the materials on the façade is further elaborated. The material on the outer façade is chosen with background in the LCA of the materials, considerations about thermal mass, homeliness and the coherence between the material and the general idea of the design.













III. 7.83 The window solution is tested with focus on the aesthetic perception, daylight and solar radiation. Shown is the different tests with related daylight studies. The studies is covering square, horizontal and vertical windows.



III. 7.85 Facade proposal light shingles.



III. 7.86 Design proposal bricks and wood.



#### SPATIAL ROOM DETAILING



- Create a non-institutional atmosphere.

- Create spaces for private and social relations.
- Integrate the wild nature from the nearby Fjordpark.
- Provide social initiatives for interaction and promotion of social sustainability.

The last phase of the synthesis is the confirmation of the used initiatives in and around the building complex. The aesthetic perception of details and flow around in the spaces is completed to meet the needs of the users. The spatial visualizations gives the possibility to visualize the design solutions in a nearly finish settings. Change of materials, distances, windows placement, furnishing and programming, can move the design into a more holistic project for the users of the building.

The use of spatial investigations in the treatment - and social area has led to change in materials, room depths and change in furnishing.

The outside areas are further detailed. Both the treatment connection to the nature and the entrance area has changed by visualizing the zones.

In the detailing phase, overheating was detected in the treatment common zone. Solar shading in the exterior façade has evolved through an aesthetic evaluation of the possible solar shading possibilities. The desired aesthetic experience is confirmed by the spatial visualizations.

#### TREATMENT AREA



III. 7.87\_Visualization from first floor of the north building with plas-terboard walls.



II. 7.88\_Visualization from first floor of the north building with lamel-lae on walls



III. 7.89\_Visualization from common waiting area towards the garden of senses.

#### SOCIAL AREA



III. 7.90 Visualization from social common room with differentiating materials on the floor.



III. 7.91\_Visualization from social common room with concrete floor.



III. 7.92\_Visualization from social common room with furnishing.

#### ROOMS









#### SOLAR SHADING



7.93\_Visualization from office with wooden floor and CLT walls



III. 7.94 The visualizations gives an insight of to many wooden mate-rials joined in one space.



III. 7.95\_Test where the wooden materials are more alike.



II. 7.96\_Visualization of the southern facade on the northern building III. 7.99\_Facade iteration Elaborating on the passive solar shading solution.



III. 7.97\_Interior visualization from the waiting area showing the double height rooms and need of solar shading.



III. 7.98\_The niches of the corridors and solar shading.

#### ENTRANCE





III. 7.100\_Empathising the entrance



III. 7.101\_Empathising the entrance with detailing.

# EPILOGUE

CONCLUSION

## REFLECTION

elaborated.

#### PROJECT

The field of rehabilitation of refugees combined with purpose-designed architecture is a completely new field of work. Throughout the Danish society is a major focus on new somatic and psychiatric hospitals, which addressed Danish citizens. Many of the centers for rehabilitation in Denmark is a part of the special sector of the psychiatry system, but is not provided with space in the hospitals. An increased focus on the needs of the rehabilitation centers should be taken into account on the same terms as treatment of Danish patients. The refugees joining the Danish society is, properly in many cases, more in need of increased evidence-based treatment, and an optimal frame for this, than many Danes.

Healing architecture is the result of research-based information from hospitals and the like in the western world. New hospitals are integrating this evidence-based design, which is developed in a western context, and with a western background of the collection of data and experiences. Thus, it provides no direct guarantees for an effect for patients from another context, even though it is used in Denmark. Furthermore, healing architecture derives from the medical world and does as so, not guarantee that it actually works in this specific context of PTSD-patients. The assumption, that healing architecture have an effect on refugees with PTSD, has though provided the project with initiatives that seams logic in the sense of dealing with rehabilitating of psychologically, physically and socially deteriorating patients. The amount of initiatives with healing potential is wide ranging. As such, this project is based on a selected part of this, covering mainly nature and daylight. The other initiatives could have informed the design in various different ways.

An important parameter of working with healing architecture is the feeling of home. The concept of healing architecture is best used in a setting where the patients feel comfortable and safe enough to open their minds and accept the provided treatment. The target group for the rehabilitation center has their own vernacular culture and their own feeling

Founded in a thorough analysis of healing architecture and the current program for rehabilitation of refugees for Post-Traumatic-Stress-Disorder, PTSD, the development of this project has through and integrated process, resulted in a state-of-the-art holistic rehabilitation center for refugees. With a strong focus on the healing potential of in particular nature, daylight and pleasant indoor climate, the center is combining the existing treatment with a social approach to the rehabilitation, creating a visionary holistic rehabilitation center, which prepare the users to be empowered, and thereby being ready to join the society on equal psychological, physical and social terms.

To accommodate as many needs of the PTSD patients as possible the functions is clearly divided to achieve an intuitive organization. The treatment is centered around a relaxing and sensual garden of wild nature while the social area is centered around the common room of the rehabilitation center. The two areas are connected by a central path of empowerment, symbolizing the transition from being treated for PTSD to living with PTSD. This organization of tension between treatment and social aspects can move the rehabilitation to be more then just a treatment, but a social rendezvous for refugees who has a hard time being settled in Denmark.

With PTSD being an extremely stressful suffering, an important part of the rehabilitation is to feel relaxed, safe and calm. A homelike atmosphere is setting the mood to be able to complete the rehabilitation in the best possible way.

A major part of the social element in the design is the informal meetings. These are made possible throughout the building by having various spaces and niches allowing for different types of stay, ranging from private to social, depending on the wish of the individual patient. The range from private to social is categorized in level of intimacy. The level of intimacy is contributing to make clear divided zones to meet the very different and sometimes unpredictable needs characterizing PTSD-patients

Nature is a main element throughout the building; the treatment part is centered around a relaxing sensual element of wild nature and the common part includes outdoor areas with various activities, while at the same time being directly connected to the wild nature of the context. The latter allows for experiencing the wild and undisturbed nature of Lindholm Fjordpark.

The building is situated with a clear connection to the surrounding development. The holistic expression in the area is underlining the sustainable approach, by together implementing green and social initiatives. The design welcomes the wild nature of the Fjordparken. The connection enables the implementation of wild nature as an important healing element, while the wild bio climate of the Fiordpark is being provided with new opportunities to extend by being partly drawn into the new development area.

The design comply with the BR2020 and is with various passive strategies extending to be environmental sustainable. The orientation and the program layout of the

building is optimized for passive solar heat gain, e.g. having the functions with a low internal heat gain located at the most sunny areas of the site during winter. Furthermore, aesthetically integrated solar shading prevents overheating during the summer period, while allowing for a strong visual connection to the outside nature. The integrated solar shading allows for large amount of windows, which are important in order to provide the building with a high amount of healing daylight.

The building is with its focus on an optimal indoor climate, good acoustics, daylight and provision of social assembling establishing a sustainable social community. The building is not only creating an introvert sustainable wellbeing, but is inviting the surrounding society to join the community on the terms of the PTSD patients. Volunteers that would like to be a part of social activities in the building is more than welcome to join the small community to be a part of the rehabilitation of refugees.

The concept of using the path of empowerment is developed to be a possible way to deal with future rehabilitation centers. The approach of combining treatment in a social setting is a sustaining initiative, which through this project has shown to contain qualities that will move the understanding of a holistic course of treatment. The sustainable approach provide a thorough concept, which consider both the rehabilitation of refugees and the earth, to comply with an overall holistic sustainable rehabilitation center for refugees.

The aim of the reflection is to bring the initial and essential guestions of the introduction and design parameters to a broader perspective, where reflections about the general approach and the choices made in the making will be

of what a home is. The feeling of home is for sure not the same in Denmark as in Syria, Ethiopia or Pakistan. The basis of providing Danish initiatives for a home can work contradictory to the patient's origin, and thereby dismiss the homely feeling. The standpoint of using the Danish homeliness is though intentional, with focus on the future integration of the PTSD-patients into the Danish society. By using the Danish approach to homeliness the refugees can learn about Danish cultural traditions in an early state of the integration.

#### PROCESS

The coherence between rehabilitating humans and building sustainable is close. Sustainability is implemented in the project in order to provide the best setting for the rehabilitation; a sustainable design is a healthy design. Through the project. the environmental and social sustainability is an essential part of the design development. The last element in the trio, the economic sustainability, is left out though. The economics is an equal important part as the environmental and social sustainability whit in the sustainable design. Economic considerations of material choices, details- and general solutions have though been topics for discussion through the project. A full implementation of economic sustainability would supplement the project with considerations of building solutions, detailing and project organization that exceed the authors' current knowledge of economic sustainability.

An integrated process is a balance between the guantitative technical and the gualitative aesthetical input, treating both as equals. With the technical input often being more straight forward, coursed by the ability to answer "yes" or "no" to whether a result are satisfactory or not, subjective discussions regarding atmosphere and aesthetics sometimes unwittingly becomes a secondary parameter. Throughout the process. there has been a strong focus on how these two elements intersect and inform each other, and with the well-researched foundation for the project, several additional layers were added to this balance.

The integrated design process is throughout the project used to conform to a holistic and worked through design. Nordic architecture and tectonics is in many ways doing the same. The authors' approach to deal with holistic solutions has for this reason evolved through a Nordic thinking. The Nordic

approach is an approach that is wide ranging and hard to be specific about. Through the process the Nordic approach has been more of a method of creating the desired atmospheres. then a regular design tool. A better framing of the term "Nordic architecture" could increase the awareness of Nordic design solutions, and lead to a project more conforming to the Nordic building culture, going beyond the spirit of the place.

#### PERSPECTIVE

By designing a rehabilitation center for refugees, a new focus has been created to accommodate refugees with PTSD. The new concept of designing for refugees with PTSD can be a part of evolving a field of profession where little money and a down prioritized social relation to refugees makes the agenda. In our opinion, an increased focus on refugees with PTSD can create a more socially sustainable Danish society. The course of treatment for the refugees is essential in order to provide a strong foundation for the integration, both for the patients, but also for the children of the patients and the future generations. The ability to be able to empower is alpha omega in order to provide support and give a surplus of mental resources. Without a mental surplus, the foundation for constituting a new life in a foreign country is not present. The path of empowerment provides a room for treatment connected to a strong social context. This is moving the concept of LIVSRUM a step further, from being a room for consulting and social contact, to be a space for treatment. consultancy and social engagement. This method is providing a, so far, untested environment, which theoretically could work in a real life setting. Thus, the outcome of this thesis is a worked through design proposal for how rehabilitation of refugees can occur on the most optimal terms.

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# APPENDIX

#### CONTENT

.

A: Ventilation B: Atmospheric comfort C: Thermal comfort D: Acoustic approach E: Window presentation F: Window process G: Facade process H: Fire plans I: Structural principles J: U-values K: Final room program

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#### **APPENDIX A: VENTILATION**



2016)

The sensory pollution is calculated by using Fangers calc. of olf. The calculation occupy with an amount of dissatisfied, who perceive the air quality. The amount of dissatisfied can not exceed 20% that equals 1,4 decipol in a category B building, which the rehabilitation center conform to. The unit olf is the amount of sensed pollution from different pollution sources. A sitting person is polluting with one olf with an activity level on 1 met. The building is further polluting with an amount of 0,1 olf pr. sqm.

causes made in a stationary environment.

In the diagram below are the different methods worked through. It shows a high amount of sensory pollution that is important to realize and know about. The Olf calculation is not the dimensioning calculation because of the large deviation from the standard BR2020 calculation. Where the CO2 level is higher than the BR2020 regulations, the CO2 is the dimensioning load because of its high influence on the physical comfort for occupants.

Roon

Psychologist Grp. Therapy Physioterapist Common Room

9\_Appendix

#### APPENDIX B: ATMOSPHERIC COMFORT

The atmospheric comfort is calculated both by sensory pollution, CO2 pollution and by the BR 2020 regulations. The regulations request a 0,35 l/s pr. m2 ventilation, added 5l/s pr. adult and 3 l/ pr. child. The BR2015 conform to a max pollution of 900 PPM, which should be achieved with mechanical or natural ventilation. (Bygningsreglementet.dk,

The last calculation method is the CO2 calculation that measures the amount of human bio effluent in a room. The calculation is combined of the amount of CO2 pollution from the people in the room, the air velocity, and the allowable amount of CO2 PPM. The calculation is for calculation

ms	Area m²	Volume m <sup>3</sup>	Persons	Aktivity level	Total Olf	CO2 I/s	m3/h	Olf I/s	m3/h	Regula 2020 I/s	tion BR m3/h	Air change	Inventilate units	Pipes diameter in mm (if central
				MET										ventilation
6	22	66	2,0	1,2	4,6	20,86	75,093333	62,1	223,6	17,7	63,72	1,1	2	100
2	49	147	10,0	1,2	16,9	100,31	361,11515	228,2	821,3	67,2	241,74	2,5	11	200,0
6	25	75	2,0	1,5	5,5	25,42	91,515152	74,3	267,3	18,8	67,5	1,2	3	160,0
1	150	450	20,0	1,2	39	513,13	1847,2727	526,5	1895,4	152,5	549	4,1	57	315

### APPENDIX C: THERMAL COMFORT

The thermal analyses of the indoor temperature has evolved through Bsim. The solar radiation and ventilation has great effect on the result of the thermal comfort of the rooms. Through the process, the focus has been on creating the optimal thermal conditions in the offices for treatment. The temperature can, referring to BR2020, not exceed 260 more than 100 hours-, and 270 more than 25 a year.

The optimization of the thermal indoor climate has been on allowing as much daylight on the workstation, while keeping an acceptable solar radiation. The changes done to the BSim, has in first round, been to optimize on the window placement in the façade. The change had a significant differece in the over temperatures, which allowed for more windows.

The second part of providing optimal thermal conditions is to adjust the ventilation. The ventilation rate is used from the atmospheric comfort calculation. The ventilation rate is though deficient to avoid over temperature in the summer season. Natural ventilation is for this reason necessary. Double-sided ventilation is used to increase the ventilation rate.

On hot summer days the ventilation is though still unsatisfactory. The treatment area is seldom in use from 16-8, night ventilation is for this reason a possible solution for the hot summer days. Night ventilation is applied in the night in the summer period, and from 6-7 in the winter period if the temperature is inadequate.

The construction is helping by absorbing heat in the summer period. CLT is not the optimal thermal mass, but is compared to a lightweight wall a sturdy thermal conductor.



Not optimized window solution Over 26º: 320 hours Over 27º:130 hours



Optimized ventilation Over 26°: 90 hours



Optimized window solution Over 26º: 160 hours Over 27°: 75 hours



Night ventilation Over 26º: 71 hours Over 27°: 19 hours



III. 9.3 Window and ventilation

developmen

## APPENDIX D: ACOUSTIC APPROACH

The acoustic comfort has evolved through the process based on conceptual thoughts and general knowledge about acoustic solutions. The PTSD patients are very sensitive and is thus in need of a controlled acoustic environment.

Acoustic materials is often a part of institutionalizing buildings. This institutional composition is, for PTSD patients, an obstacle for creating a safe and comfortable environment. Materials known for institutions as acoustic ceilings troldtekt or linoleum flooring is not desirable.

Of acoustical initiatives is used wooden lamellae as ceiling, CLT walls and in the office, wooden floor. Wood is an effective absorbent for sound and is reducing the reverberation time and increasing the clarity.

sound waves.



III. 9.4\_Ray-tracing diagrams

In the scheme is made a ray trace analysis, which gives an insight of the increased scattering and fewer bounces of the

Ray-tracing with ceiling lammelas

#### Ray-tracing with flat ceiling



## APPENDIX E: WINDOW PRESENTATION







III. 9.10\_Solar shading in front of main area window with additional building and roof shading
### APPENDIX F: WINDOW PROCESS

In order to use the view of nature as a calming element when staying in the offices, it is desired to integrate shading into the windows without disrupting the view to the outside. Furthermore, it is wished to avoid disturbance from outsiders being able to look in as this can break the feeling of privacy. An average daylight factor of 3 % is desired. With deep exterior walls, it is desired to enable the window sill to be used as integrated shelves or the like. The maximum allowed solar heat gain is defined with BSim.

Test parameters: Daylight factor, shading effect and window depth.

Test time: Extreme summer week, oriented against south.

Window area: Approx. 20% of floor area.



III. 9.11 Vertical windows

III. 9.1 L vertical Windows In order to provide sufficient shading the windows have to be placed fairly deep in the wall, causing a loss of useable sill space. Due to the height of the window the daylight is focused in front of it, rather than throughout the room. Being narrow, the disturbance from out-siders looking in is minimal.







III. 9.13 Square windows is minimal.



The low height of the window allows for it to be placed close to the facade, while maintaining its shading abilities. The even distribution of the windows allows for an equally even distribution of daylight in the room. Being narrow, the disturbance from outsiders looking in

#### III. 9.12 Horizontal windows

III. 9.12 – HORZONIAI WINDOWS The low height of the window allows for it to be placed fairly close to the facade, while maintaining its shading abilities. The even distribu-tion of the windows allows for an equally even distribution of daylight in the room. The width of the window causes a problem as outsiders are able look in for a long amount of time when passing by.

### **APPENDIX G: FACADE PROCESS**

### **FACADE DESIGN**

As part of the parameter to obtain a non-institutionalized expression of the building, the facade design is desired to break down the perceived size of the building. Furthermore, it is to relate itself to the fragile user group and the natural context.

### WINDOWS

Starting from the inside-out, the division of the offices into three zones forms the foundation for the placement of the windows: A window for each zone. The earlier test regarding integrated solar shading decides the shape: Square windows.

#### CONCLUSION

In order to avoid a repetitive façade two types of windows are used: A large window in each end of the office, and two smaller windows in between. The large windows remains in the same height all over the façade, but is mirrored randomly throughout the facade. By randomly changing the location of the smaller windows, the repetitive placements of the offices are broken down. Especially the randomizing of the heights of the small windows has an effect, as doing this avoids horizontal lines from emerging.



# 

#### MATERIALS

expression are being taken into account.

#### Conclusion

into the theme of the development plan.







III. 9.17\_Testing of brick facades.

III. 9.16\_Testing of randomizing all windows.

Random windows according to room functions.

III. 9.14\_Testing of randomizing the small windows.

From the notion of warm and welcoming materials as something that takes the users into account, this type of material is the starting point. Furthermore, relation to the context is also an important element. Elements such as orientation of the facade material and the type of tactile

As part of down-scaling the perception of the horizontal façade, vertical timber cladding in a natural color is the material of choice. The window frames, having a bright color, extends beyond the façade cladding in order to emphasize the varying expression of the facade. The warm and tactile expression of natural wood relates to the fragile user as well as to the natural context. Furthermore, wood of often characterized as a material with a sustainable profile, fitting



Testing of facade with material combinations.



III. 9.18\_Testing of shingles façades.

III. 9.19\_Testing of timber façades.

### APPENDIX H: FIRE PLANS



III. 9.20\_Fire plan ground floor.



III. 9.21\_Fire plan first floor.

principle.

Between the wood volumes are glulam beams spanning. Glulam is chosen to allow skylights in the middle segment. The structural principle is visualized with focus on exteriorand interior sheer walls, the mullion curtain system between the volumes, the glulam and roof slaps.



III. 9.22\_Constructional principle.

9\_Appendix

### APPENDIX I: STRUCTURAL PRINCIPLE

The constructional principle in the building is developed with focus in a tectonic connection between atmosphere and

The constructional system is divided in two systems, the system in the wood volumes, which consists a general constructive system of sheer walls and a roof slap in CLT. The span of CLT is limitet. Some parts of the inner walls is for this reason made as additional sheer walls.



## APPENDIX J: U-VALUES

<u>U-value: Roof</u>					
Laver	<u>Thickness</u>	Lan	<u>nbda</u>	<u>R U</u>	l
Interior air		0,130	1,000	0,130	7,692
CLT, 5 layers		0,300	0,130	2,308	0,433
Vapour barrier		0,000	1,000		
Hard insulation		0,450	0,035	12,857	0,078
Plywood		0,015	0,130		
Roofing asphalt		0,035	0,500	0,070	14,286
Exterior air		0,040	1,000	0,040	25,000
Total thickness		0,800	Total R	15,405	<b>0,065</b> W/m2*K

Laver	<u>Thickness</u>	Lan	nbda_	<u>R</u>	<u>u</u>	<u>l</u>
Interior air		0,130	1,000		0,130	7,692
CLT, 3 layers		0,095	0,130		0,731	1,368
Hard insulation		0,320	0,035		9,143	0,109
Windbarrier		0,015	0,140		0,107	9,333
Air gap		0,110	1,000		0,110	9,091
Cladding, 2 boards		0,060	0,130		0,462	2,167
Exterior air		0,040	1,000		0,040	25,000

Layer	Thickness	La	mbda	<u>R</u>	<u>u</u>
Interior air		0,130	1,000	0,130	7,692
Timber floor		0,035	0,170	0,206	4,857
Subfloor		0,040	2,100	0,019	52,500
Plywood		0,015	0,140	0,107	9,333
Hard insulation		0,400	0,035	11,429	0,088
Fine aggregate (sand)		0,110	0,350	0,314	3,182
Exterior air		0.130	1.000	0,130	7,692

## APPENDIX K: FINAL ROOM PROGRAM

	Function	Size (m2)	Quantity	Total size (m2)	Daylight	Nature	Relation
Treament	GROUND FLOOR	()		()			
	Office psychologist	21	6	126	High	High	Private
	Office social consultants	21	5	105	High	Medium	Private
	Group therapy room	50	2	100	High	Medium	Private
	Main waiting	40	1	40	High	High	Social
	Path of nature	126	1	126	High	High	Social
	Open consultancy/Waiting niches	156	5	156	Medium	Medium	Semi Social
	Treatment entrance	26	1	26	Low	Low	Social
	Wardrobe	5	1	5	Low	Low	Semi Social
	Staircase/Lift	65	1	65	High	Medium	Semi Social
	Reception/administration	76	1	76	High	Nature	Semi Social
	Toilets, Patients/staff	5	5	25	Low	Low	Private
	HC toilet	1	1	1	Low	Low	Private
	Print/copy	7	1	7	Low	Low	Private
	Technical room	7	1	7	Low	Low	Private
	Storage	9	2	18	Low	Low	Private
	FIRST FLOOR						
	Office, physical therapist	24	6	144	High	Low	Private
	Open consultancy	20	2	40	High	Medium	Semi-Social
	Toilet	5	3	15	Low	Low	Private
	Storage	12	2	24	Low	Low	Private
	Rlaxation room	13	2	26	Medium	Medium	Private
	Relaxation area	40	1	40			
	Waiting niche	30	1	30	Medium	Low	Semi-Private

	Size		Total size			
Function	(m2)	Quantity	(m2)	Daylight	Nature	Relation
Common Area						
Common Room	114	1	114	High	High	Social
- Kitchen	27	1	27	Medium	Medium	Social
Workshop	29	1	30	High	Medium	Social
Volunteer Office	23	1	23	High	Medium	Private
Classrooms	36	3	108	High	High	Social
Fitness/Multiroom	79	1	79	Medium	Low	Social
- Locker room/ Shower	30	2	60	Low	Low	Private
Office interpreter	26	1	26	High	High	Private
Language school Office	27	1	27	High	High	Ptivate
						Semi-
Consulting areas	15	3	45	Medium	Medium	private
	17	1	17	Medium	Low	Social
loilets, staff	13	1	13	Low	Low	Private
l ollets, patients	3	4	12	LOW	LOW	Private
	0	1	0	Low	LOW	Private
Storage	11	1	11	Low	Low	Private
Lalwaye	23	1	23	Low	Low	Privale Somi privato
Social optrance	27	1		low	Modium	Serial
Social wardrobe	6	1	6	Low	Low	Private
Net area			1918			
Gross area			2493.4			