Nørresundby Residence & Community Center for the Aged

2011

Ma4 - ark32

Rosa Graham

Motivation

There is no hiding the fact that I take this subject to heart. The motivation behind this project comes from my personal experiences in the New Zealand way of leaving the design and building of old persons nursing homes to private corporations, which in my view allows for many disadvantages in the care for old people. What I have endeavoured to do throughout this project is to incorporate, paramount knowledge from cases in Denmark and around the world, including knowledge of evidence based design, to aid in the conception of a project that illustrates improvements that New Zealand could consider for future designs in this field.

Architecture means more than just the art of architecture itself. As an architect it is important to take on innovative solutions in relation to envolving global society needs, where urgent tasks, need to be addressed with different forms of living requirements for the young, families and older people.

Old age is a global issue. This is indicated in some countries by the growing life expectancy of the older people due to happiness, good health, social and environment. In other countries the number of older people outnumbers the young, thus giving way to problems for the requirement of additional care and housing for the older people.

An retired man in his 80's sits on a chair in the corner of his room looking back towards the door. Behind him is a large bay window that looks out onto a rose garden. Within the room are a bedside table, bed, built-in wardrobe and some drawers. The room is so small and cramped that he can not turn to look out the window and there is little room to have an extra chair for a guest.

This man is my father. Once a tall, strong farmer, he now has trouble walking due to multiple strokes and arthritis in his joints from many years of hard work and a deformed, old broken shoulder. He comes out of his room only to read the newspaper and to be fed. Other times it is the big screen TV that draws him out of his room to watch a rugby game.

I see it through his eyes are hear it in his voice, the hatred of growing old in a 'rest home'.

The room is small and stuffy, because my dad can't reach to open the window. The surrounding seems impersonal. There is a small ensuite without any shelving, so my father's things just sit on the floor.

"The term old age can convey positive as well as negative notions – wisdom and respect or frailty and dependence." [B. Schwarz & R. Brent. 1999]

Why is he there?

Within a 10 minute walk with the dog and a 5 minute drive, is my mother's house. The idea was to have him close by so my mother could visit without a lot of driving. My mother still helps with my father, by taking him to appointments and dinner every Sunday evening but they have been separated for many years.

My father enjoys these outings. He loves to go to the pub for a glass of wine, to browse the supermarket selves for specials, and use love going for walks, to be in the garden clearing leaves etc. He is an ex farmer so it would be hard to become a stationary person that lives in a 'rest home' where the carpark is half the size of the building complex and three times as large as the outdoor garden. No wonder the homes gossip is full of stories about elderly people refusing to get out of bed, walking away or trying to climb aboard the local bus to escape reality. Yes, they do offer many actives of flower arranging, sewing and shopping outing to the local mall, but this is run by women for the elderly women where the men seem to be left out. The area where the home is situated in amongst residential housing, it is quiet area but there are no amenities close by that give the people the freedom to go and bye some chocolate or go for a walk.

It would seem to be selfish to say that I would not wish my own retirement to be set out as a degrading, forgotten part of society, but more of a celebration of life and as I see it now with the psychological changes of my father, I would not wish this upon myself.

As this world moves forward there are more changes brought about with the stress of work and life, the environment and sickness etc. Why can't the idea of retirement create hope? We live in an ever changing society that fights more for social justice as a human than in the histories past, thus leading to the changes in the rights of older persons to lead independent lives and as full contributors to the contemporary culture. [Feddersen & Lüdtke. 2009].

So why can't architecture move towards, social matters and not just architecture for the sake of architecture? We all grow old in the end.

Synopsis

This project focuses on an integrated design process, in the development of elderly homes in relation to healing architecture.

Through investigations of existing elderly homes all over the world and research of evidence base design, an elderly residential area will be proposed in Nørresundby, Aalborg, Denmark. Aspects of the research will be combined to create a home that provides essential experiences from the architectural surroundings that gives a positive effect on the emotional physical and physiological wellbeing of the elderly users and staff.

Preface

This Masters Thesis project is completed by Rosa Graham as part of the 4th semester, Masters Program at the Department of Architecture at the Institute of Architecture and Design, or Aalborg University. This project was prepared during the period of 1st February 2010 till 31st June 2010.

The focus on this project is to look at evidence-based design and ongoing studies of elderly care and how they can be integrated into the design process of elderly homes. The aim is to create an atmosphere of assisted living that meets the customer's needs, promote independence and dignity, to allow all residents to age in a home-like environment.

This project looks at creating a sustainable building with healing qualities through the use of evidence based design and highlighting the lighting conditions, in creating an pleasurable environment for the well-being of the users and staff.

The outcome to gain an understanding of elderly care and the effects of the architectural surroundings on the physical and physiological effects of the user and staff, that can then be adapted to a New Zealand context.

Reader's Guide

This report is divided up into three main parts, the analysis, process and presentation phase. In regards to the referencing the Harvard method has been used. Illustrations are referred to as (ill XX). Information regarding sources will be referenced at the back of the report in the illustration and literature list.

Additional information can be found in the appendix and on a CD at the back of the report. A CD containing additional information is found at the back on the report.

Contents

Motivation 2

Synopsis 4

Preface 5

Contents 6

Methology 8

INVESTIGATION PHASE 11

Healing Environment of Architecture 12

Healing Architecture 14

Evidence Based Design 15
- Connections to Nature 16
- Options and Choices 17
- Environment Stressors 20
- Access to Social Support 20
- Connections of Nature 20
- Postive Distractions 20
- Options & Choices 20

Social and Health Care for Older People 21

Effects of Aging 27
- Factors of Wellbeing 31
- Summary 31

Homely - Conceptual Thoughts 35

Users 38

Technical Investigation 40
- Light 40
- Sustainability 43

Deliberation 44

Overview of Case Studies 45

PROJECT PHASE 61

Context 62

Room Program 76
- Total Room Program 76
- Context Organization 81
- Room Organization 83

Design Criteria 84

Vision 85

DESIGN PROCESS 87

Process Overview 88

Sketching Phase 1 90
- Morphology 90
- Volume Typology Studies 91
- Inital Ideas and Princlipes 94
- Site 96
- Building 98
- Height & Scale 100
- Nursing Home Units 102

Concept 104

Sketching Phase 2 106
- Overview of the Design 107
- Functions and Plan Layouts 108
- Modifications 111
- Connections to Other Functions 112
- Building Form & Structural Expression 114
- Nursing Home, Units in Detail 116
- Building Expression 120

Master Plan 124
Overview of Sketching Phases 126

Intergration Phase 1 128
Overview of the Design 129
Fire 130
Construction Strategies 132
Ventilation Strategies 134
Daylight Simulations 136
Window Expression 139
Shading Systems 140
Materials 142

Intergration Phase 2 146
Overview of Design 147
Indoor Climate 148

Room Program 150

PRESENTATION 153

Conclusion 172

Concluding Perspective 174

Bibliography 176

Illustration List 179

Appendix 180
Indoor Climate 180
Carparking Requirements 182

Methology

Introduction

In this chapter a brief description of the methods of the project structure for the completion of this project will be discussed. The method utilised in the report will be the integrated design process (IDP) which will be represent in the following phases:

- Investigation Phase
- Project Phase
- Design Process
  - Sketching Phase
  - Conceptual Development Phase
  - Synthesis
- Presentation Phase

Investigation Phase

The investigation phase sets out to give an overview of research to understand the subject. This will include various studies of related material for the final project concept. The investigation phase will lead to a summary of requirements and design criteria's for the project, which will be incorporated into the development of the project.

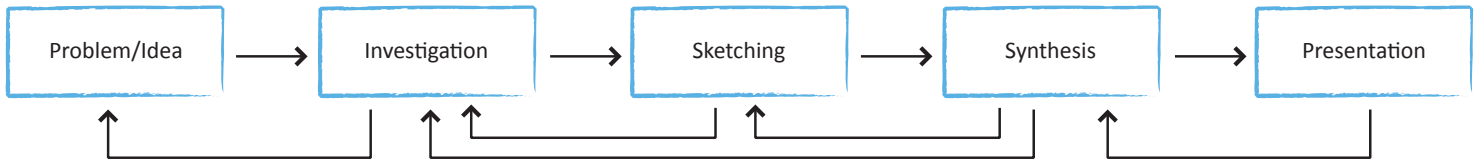
During the investigation phase aspects of elderly care throughout the world, healing architecture, users, case studies of existing elderly nursing homes, will help form the aim and vision for the project.

Project Phase

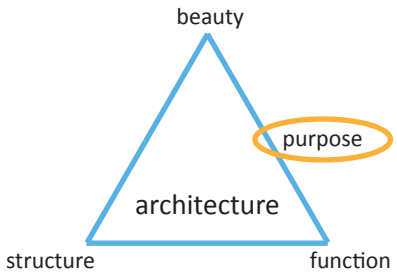
Within the project phase an overview of conclusions will create design criteria that will help form a building brief for the project.
The second part will introduce the context to determine the specific location of the proposed building but also the relationship to the area and surroundings.

Design Process

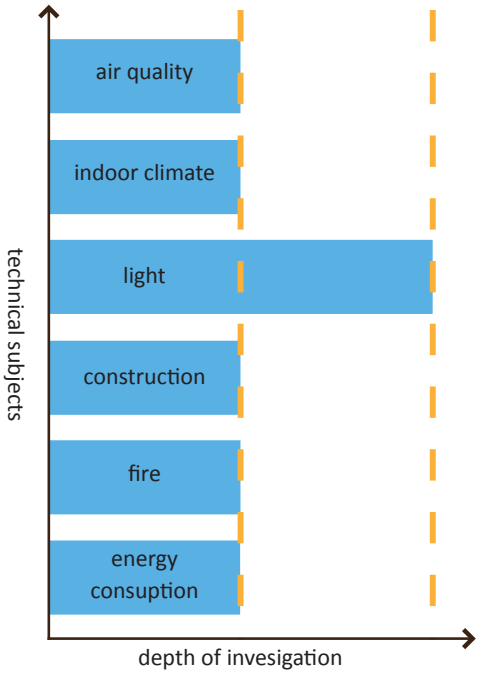
The design process consists of multiple phases that are integrated design together to create sketches, concept and an analysis of the concept in a synthesis.



ill.8.1 Integrated Design Process [Knudstrup 2005]



ill.9.1 Focus of architecture. Healing architecture looks more at the purpose.



ill.9.2 Different techincal subjects & the depth of invesigation throughout the project

Sketching

After the investigation phase has been established, different parameters for the project will be used in the sketching phase. This will help develop a physical shape and concepts through a range of different tools, and methods, such as physical models, 3d models, and hand drawing. Within the sketching phase different design considerations will be integrated then evolve and redefined in order to end up with a project concept that has all the major elements in one design.

During the sketching process both architectural qualities and the technical performance is taken into account. With these in mind a range of form studies will be performed in relation to solar positioning, wind and light to make sure the proposed building design meets the technical requirements. The final outcome is to have an established conceptual idea for an elderly home.

Concept Development

From the sketching phase a specific design parameter of interest will be established and investigated in more depth. This process would incorporate and related to the conceptual idea for the elderly home. In addition to this more investigations will take place to fine tune the conjectural design of the proposed building. Finally a acceptable design will then be taken into a deep investigation in the synthesis phase.

Synthesis

In the synthesis phase a deep investigation of the proposed conceptual ideas of the room and functions, the plan and the parameters are considered. Through this the building finds its form and expression, through the development of the plans, facades, section and detailing. In this phase, 3d and physical models will be used in order to get a better overview of the complex problems.
A continuation of this investigation finalizes the dimensions and detailing, but also the assessment of light properties. The final internal and external expression of the elderly home is concluded, which leads to the presentation phase of the building design concept.

Presentation

The final conclusion of the project is presented in drawings, renders and diagrams. This phase consists of drawings of; context plans, floor plans, cross sections, elevations and perspectives. In addition to the presentation phase a reflection of the project will conclude on the fulfilment of the original brief and vision of the project.

Additional Research Method

Additional research method used is Evidence Based Design. This will be incorporated into the research, analysis phase that looks at scientific research that will help form a background in the impacts of architecture on the health and well-being of patients and staff in a hospital setting. This will be then integrated within the investigation of elderly nursing homes and in the final design of the proposed building.

Tools Used

Hand Sketching
Physical model making
CAD

INVESTIGATION PHASE

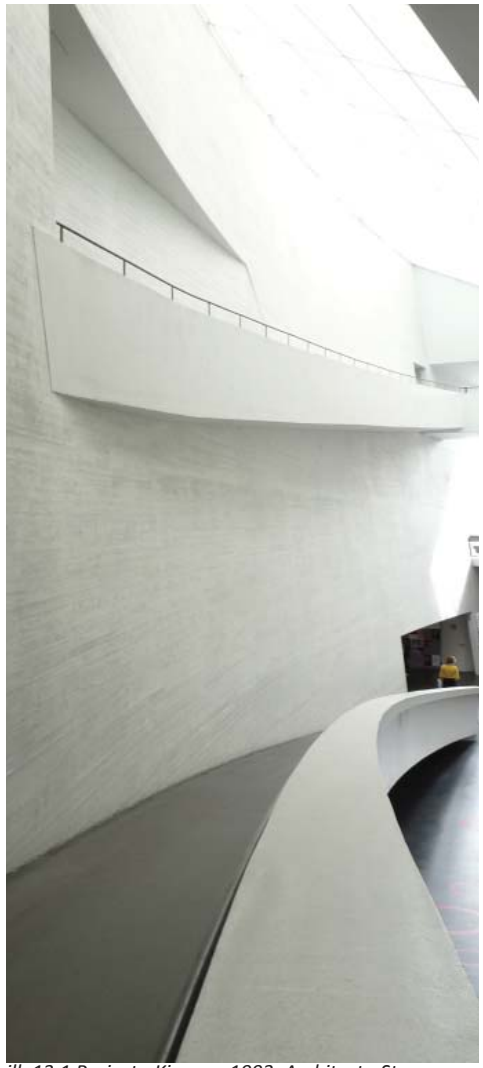
Healing Environment of Architecture

ill. 12.1

Introduction

There are many challenges throughout the world that relate to the ageing population. Meeting these challenges will require innovative planning and policy reforms in developed countries. This includes good nursing/retirement design which integrates functional requirements with the human needs of its users that is the staff and residents. In order to establish an understanding of this phenomenon, different characteristics of care to the old will be critiqued. This investigation focuses on the aged and the affects of ageing, which in turn will provide the basis for an extended study on the relationship between the environment and the person living within an old people's home. The purpose of the investigation is to establish design criteria which will help influence the form finding process.

Healing Environment of Architecture



ill. 13.1 Project - Kiasma, 1993. Architect - Steven Holl. Internal view of a ramp with the soft daylight, naturally aluminating the space

As we look of architecture in the healthcare sector we see many changes in the way the human is perceived. It is not only the medical side of healthcare that is important but also the patient's well-being and healing process. Through scientific studies of human behavior in a healthcare situation shows that manipulating architectural space and shapes can alter the humans healing process.

Within the past ideals from the Enlightenment era of architecture supported the idea of a natural setting and clean air which were considered essential to the well-being of the patient in a hospital setting. As technology changed the face of the medical world, science dominates the healthcare furthermore machines could do everything and the patient was merely an object. [Weller & Nickl. 2007].

Today we are seeing more challenges in the public health care sector as the average lifespan of a person doubled, depression, increase of asthma, developmental disabilities, diabetes, obesity, reduced fertility, and cancer which have significant connections to changes of the technological and environment.

The following chapter looks at factors that incorporate ideas of architecture and how they contributing to the healing process of patients in hospital setting through the use of healing architecture and the research method of evidence based design. Architectural qualities will be discussed and related back to the proposed older people's nursing home.

Healing Architecture

ill.14.1 Paimio Sanatorium, 1929-33, Alvar Aalto. External area for TB patients used through the year.

ill.14.2 Danish old people, sitting in the sun outside their nursing home.

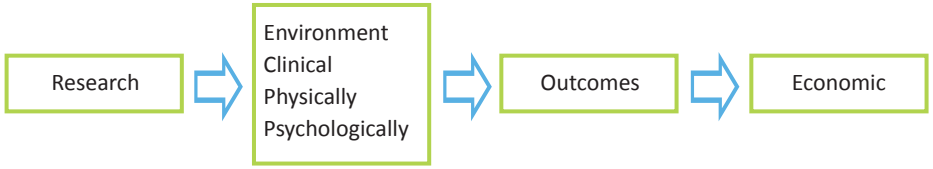
Within architecture in a healthcare setting, healing architecture refers to the design factors that make up the surroundings and the impact it has on patients healing, stress reduction and the improvement in wellbeing of the patients, relatives and staff. By utilizing architecture and its surrounding environment, of daylight qualities, room ambience, colours and sound and the capabilities of creating private and secure spaces to assist the healing process and wellbeing for people.

But can the idea of healing architecture work within an older persons (nursing) home?

When the focus is turned onto older persons nursing homes, healing architecture can give reason to change the design and setting of the spaces and layouts. As discussed at the beginning, the struggles the older people and how they find it hard physically and mentally to get active. Within healing architecture aspects of the environment can facilitate calming and relaxing atmosphere but also the areas around the aged homes can take on a positive social atmosphere.

Within the older persons nursing home setting pose the problems of creating a depended identity of both privacy and freedom for the users. Aspects of healing architecture can be incorporated into the design to stimulate a stress free environment that generates positive emotions.

One of the methods in which healing architecture can be looked at is through the use of Evidence Based Design (EBD).



ill.14.3 Evidence based design as a scientific method of research

Evidence Based Design

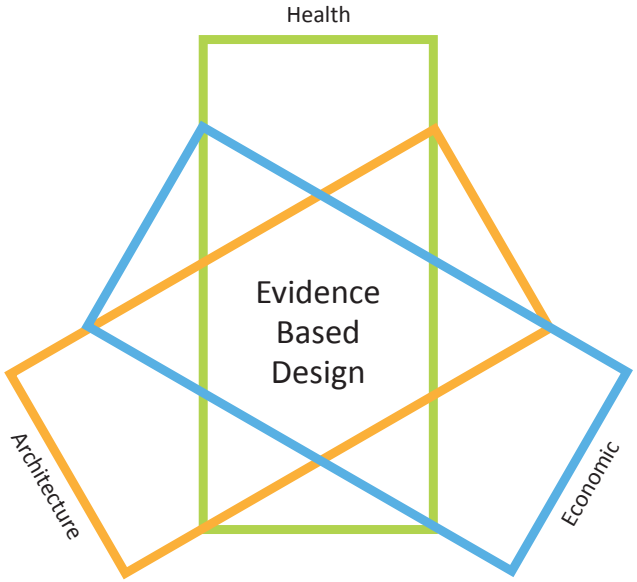
Evidence based design (EBD) looks at the effects of the environment on the people who are exposed to it. Evidence based design as a method that characterises outcomes of scientific research; predominantly EBD solely focuses on healthcare facilities though the outcomes of the studies could be facilitated on to other building types. When analysing the outcomes and research of evidence based design allows new opportunities to be think the design of hospitals in the consideration of how it affects staff and patients. General types of outcomes considered are;

- to reduce staff stress,
- to increase the effectiveness and the delivery of care,
- improve patient safety,
- reduce patient and family stress,
- improve outcomes (cost),
- and to improve the overall health care quality. [Ulrich. 2008]

Within healing environments research in relation to older persons homes five options explained by Jain Malkin, report stand out as the foundation for design factor to be considered:

- Connections to nature
- Options and choices
- Positive distractions
- Access to social support
- Environmental stressors (noise, glare, poor air quality) [Wagenaar. p 259. 2006]

Though it is important to look at the staff's wellbeing during this investigation much of the research for this project is based on the older person's wellbeing, as a positive older person would try and be more independent, so it would be easier for the staff when needed.



ill.15.1 Relationship of evidence based design

"Evidence-based design appeals to the scientific minds of physicians and other clinicians who are trying to practice on the basis of medical evidence. It offers the prospect of improving clinical outcomes, and it gives patients and families the prospect of a higher-quality experience in their healthcare encounter. The public, consumer groups, and payers are pleased with anything leading to more effective and lower-cost healthcare." [Hamilton. 2003]

ill. 16.1 The psychological & physiological benefits of nature.

ill. 16.2 Natural view from inside provides a positive distraction

Connections to Nature

Many strong studies argue the potential of having a natural view and gardens around a hospital setting. Through the connections to nature, patients have been found to take less medication for pain and there was a positive emotional, psychological and physiological change in the patient.

From a study done by Roger Ulrich's Theory of Supportive Garden Design four factors create a bases for a garden to help to mitigate stress to the extent that they:

- Create opportunities for physical movement and exercise
- Provide opportunities to make choices, seek privacy and experience a sense of control
- Provide settings which encourage people to gather together and experience social support
- Provide access to nature and other positive distractions. [Wagenaar. p 315. 2006]

A study by Ulrich (1984) compared patients that were recovering from gall bladder surgery. One of the wards had a natural setting of trees and grass where the other ward had a brick wall. The outcomes of the study showed that the patients who had the natural view recovered faster and took less pain medication that the patients who had the brick wall. Though there are no studies defining what kind of landscape to use, most people prefer the natural setting to a built landscape.

Another natural connection that is vital to the wellbeing of every human on earth is daylight. Daylight is important for the influence of the physical and psychological health and wellbeing. Light affects human health and routine throughout the day and night by allowing us to see that task at hand, control the body's circadian system, affecting mood and perception, and by facilitating critical chemical reactions in the (melatonin levels). [Joseph. 2006]. Exposure to sunlight is also important for the vitamin D chemical response in the human body and promotes calcium absorption. [Lewy et al. 1998].

Within the setting of an older persons nursing home daylight plays an important part in the wellbeing of the old through the circadian rhythm and sleep, to help with depression, and in the reduction of stress and pain.

Studies in relation to circadian rhythm found that light played an important part in the maintenance of sleep. It showed that having a bright light during the morning showed older people with dementia were more activate during the day and had a deeper sleep with fewer movements. [Frandsen. 2009]

Another studies looking upon daylight as a good antidepressant by reduction the effects of depression among patients with bipolar disorder or seasonal affective disorder (SAD). Studies showed that morning light affected the depressive mood and shortened the time it took before antidepressants began to work. [Frandsen. 2009]

Within studies of sunlight in a hospital setting found that patients with a room exposed to 46% more sunlight than other patients that had undergone the same surgery took 22% less pain medication. [Frandsen. 2009].

Thus it is important to consider the benefits of natural sunlight and daylight for the older people within their units, common social areas and to have access outside throughout the day.

ill. 17.1 Wayfinding can become stressful & confusing for people

ill. 17.2 Quality signage can help with the options ahead

Options and Choices

The options and choices found in architecture can also facilitate different environments of private and social interaction. Through studies of people's search patterns and objective measures of spatial characteristic found that they tended to move along more "integrated" routes that were more assessable to different spaces and had less turns. [Peponis. 1990]. Whyfinding and familiarity in the flow of a building can help alleviate stress and disorientation of the older people and visitors. This is important in both the inside and outside where studies have shown the importance of having a main pathway that leads to an identifiable entrance that directed the person to a main corridor through a hospital to create less confusion.

Private and personal space is about making a space that can be private for the older people, relatives and staff. Not only does these spaces have to be enclosed areas but also other areas that are more open but still feel less threatening. Studies showed that within private areas patients felt less anxious, more relaxed and to facilitate communication during a medical examination. [Ulrich, Zimring. 2004].

Positive Distractions

Art can be used as a positive distraction of pain, a visual stimulant and a gratification to the eyes. Though art comes in many forms studies showed that patients preferred natural scenes than abstract art. [Carpman & Grant. 1993; Ulrich. 1991, Ulrich & Gilpin. 2003]. Not only does art stay indoors but the ideas of facilitating art into the surrounding gardens can also help in distraction and stimulate other thoughts other than pain and depression.

What can be a positive distraction within a building is the connection to home. Everyone has their perception of what home is but taking the small aspects can change the environment that seems sterile and institutionalised by subsisting it for elements that relate more to people. As discussed above in regards to having a homely environment to allow people to relax and interactive with others is a positive effect.

ill. 17.3 Nature can help with pain & stress relieve. People experience nature as a positive distraction

ill. 17.4 Using homely furnishing can help the patient connect to the space, while relaxing them

ill. 18.1 Social support of a nursing home where new friend can be made.

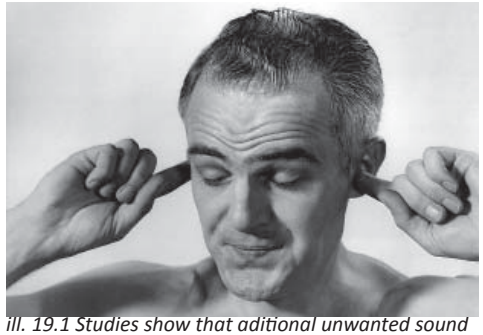
ill. 18.2 Social support from the family that can also create a postive distraction.

Access to Social Support

Social support for patients in evidence-based design shows a strong impact on stress. Studies have shown that patients had a strong social support during hospital stay survived longer than those who did not have support. What changes the face of hospital design in regards to this is the idea to the design spaces around the patient and to consider the environment in which visitors are accommodated within the patient rooms and also to provide appropriate family support spaces nearby. [Wagenaar. Hamilton. 2006]

Within a social space human interaction can be achieved. Within the different types of interaction between groups, requires different spaces. Studies on social spaces recommended additional rooms such as a sitting room, daytime rooms etc be used in a hospital setting with movable furniture that would be flexible in creating small groups for social interaction.

Why a social space in important studies have shown that aspects of being healthy is to have an extended network of social support. It is important for the staff to also communicate to the older people and their family as studies showed that the more patients and relatives in a hospital setting communicated to the staff helped improve the family involvement in the care of the patient. [Ulrich. 2008]. Other studies looked at the social interaction between different patients about found that the kitchen and living rooms were an important in creating a space that had a considerable amount of social interaction and activates that reflected their own home life outside of the hospital. Through joint actives such as cooking or eating could promote social interaction which is a quality that can make the patients more comfortable in the surrounds and reduce stress and anxiety. [Frandsen. 2009].



ill. 19.1 Studies show that aditional unwanted sound can create stress.

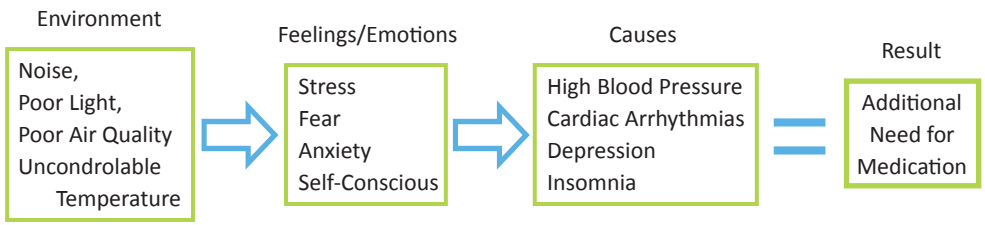
ill. 19.2 An American nursing home uses a mixture of animals & birds to create a postive distraction for patients in pain.

Environmental Stressors

Internal environments that are linked to a stressful atmosphere consist of factors of noise, poor ambient condition of light, air quality, and temperature which are not controllable. Through Evidence Based Design research of noise studies showed that large sounds can be distractive and an interruption to some people. When a physical atmosphere contains stressful factor like sound exposure that cause problems can occur from noise interference where misunderstanding, problems with concentration, fatigue, and uncertainty with lack of self-confidence can result in a stressful reaction to the situation. [Berglund, Lindvall, Schwela. 1999]. Other studies show in regards to acoustic privacy when one wants it sounds which include involuntary listening to other people's conversations or unwanted information can cause thinking of stress, fear, and anxiety at the lack of privacy for them. [Frandsen. 2009].

Within the studies of evidence base design research many factors that studies show that natural daylight as a positive factor in the well-being of humans. But when looking at natural daylight of bright there can have an opposite effect causing discomfort and stress. When looking at light that is important to have the opportunity to control the lighting levels in the air and also ventilation of any overheating that occurs due to natural sunlight.

When looking at inflation evidence base design research looks upon a hospital ventilation system is a reduction of airborne diseases does not consider this as a physiological health benefit for the patients and staff. When looking at a hospital setting or an older persons home many visitors find that there is a distinctive smell that can have a negative mental effect to those who visit relatives and friends.



ill. 19.3 The effects of a stressful environment of a patient in a hospital setting.

Creating a Healing Environment Requires Systemic Change

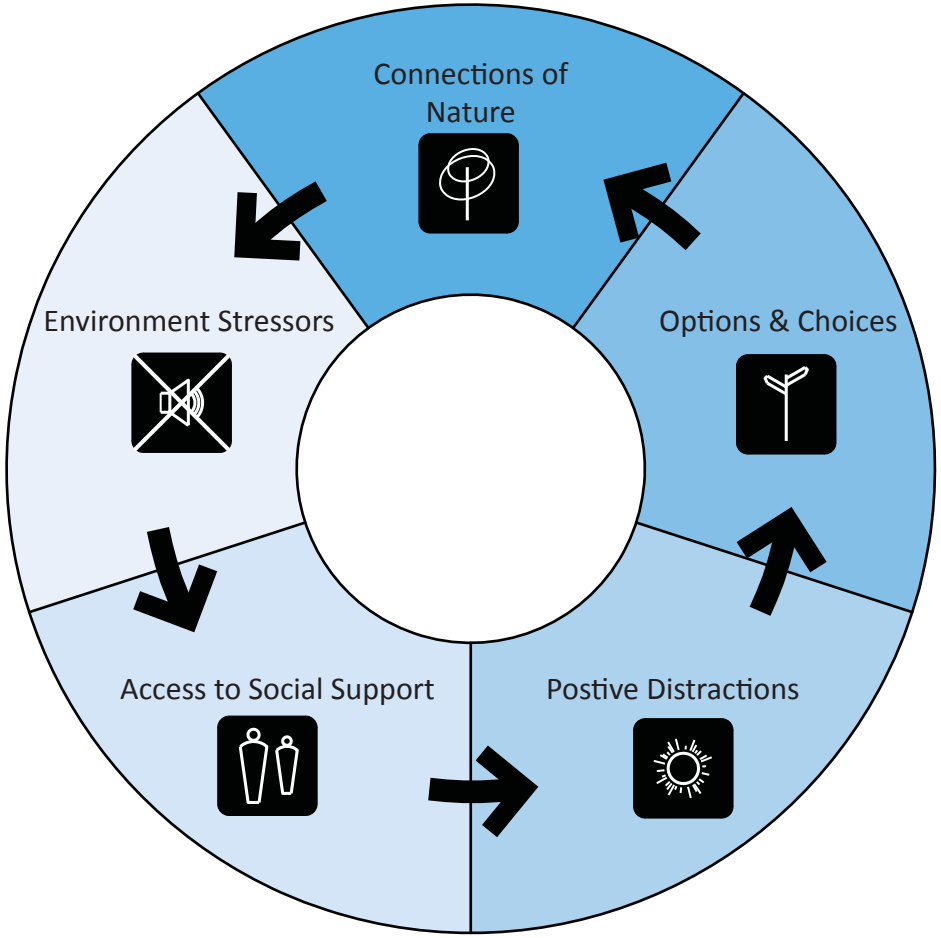
Though it is more common to have studies and research done on the term 'healing environment' not many of the facilities achieve this goal due the budget constraints. Within the older people nursing homes much of the restraints of design requirements are based around the staff thus when cost cutting occurs the older person misses out. But as more studies come into hand regarding a healing environment we see that the benefits of spending more money at the initial design and construction the long term cost benefits can be huge.

One way healing environment becomes cost efficient is through the means of reducing stress. When stressed the muscles tighten and all forms of pain is exacerbated because of the release hormones which lowers the threshold for pain. Blood pressure and respiration increases and in the long term the over-production of stress hormones can affect the immune system thus causing cardiac arrhythmias, depression, and insomnia. Another point regarding stress that the negative effects of stress can still be measured hours after the stressful event has occurred which concludes the importance of design an environment that helps reduce stress. [Wagenaar. p 259. 2006].

Summary

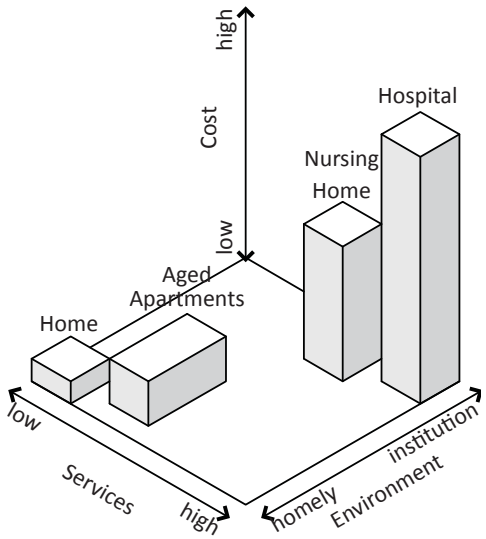
As we see through evidence base design implications of architecture not only the surrounding environment is also the sight, sound, touch and smell. The outcomes of the studies conclude scientific outcomes shows the benefits of changing the way in which hospital works but also the cost factor of how the environment can enhance the quality of health care.

The studies show from evidence-based design is how the building to facilitate a healing and positive environment for patients family and staff. One of the important factors from the studies is important the first stages of designing hospitals or older persons nursing homes to make sure the building can achieve an optimal experience that in the long run can be cost efficient and it's running but also within the use of natural means of helping with the physical and physiological welfare of people.



ill. 20.1 A diagram showing the important factors of healing architecture & evidence based design research

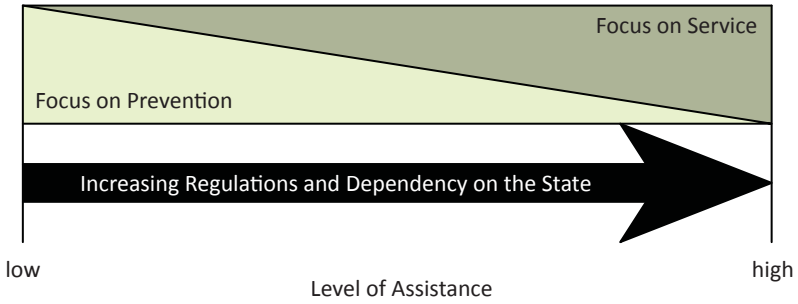
Social and Health Care for Older People



ill. 21.1 Aged building types and cost factors of care.

For every person living, no one can anticipate what the future will hold with regard to health and welfare. Everyone grows old in different ways and as an architect it is important to consider different factors of atmosphere and community that creates a positive effect in the wellbeing of an ageing population.

As we enter the 21st century population ageing is a global, national and local phenomenon permeating economical and social spheres demands of all countries. With this increase comes many problems to support the older people's need, keeping the old people independent and active. Now in the future people are living longer but how can we improve the quality of life in old age? [WHO, 2001] For the purposes of this investigation, 60 years of age and older has been used as the general definition of an older person. This is because the age of 60 or 65, roughly equivalent to retirement ages in most developed countries, is said to be the beginning of old age. [WHO, 2001].



ill. 21.2 Level of assistance and how the cost of care changes as the dependency becomes high.

Through the course of aging people face multiple changes and challenges. There are difference scale of challenges faced in a country, society and community, family to the single person.

When considering a country's healthcare system challenges include:

- An increase of social and economic demands on the country that could become a problem for the existing health care system and social security.

- People are living longer after the retirement age (65+). The longer people age the more health problems and disabilities can occur (dementia and Alzheimer's etc), which require additional help and care.

- Due to changes in people's lifestyle has seen a rapid increase in non-communiable disease such as cancer, obesity, heart disease and depression are becoming the leading causes of death and disability in developing countries. This 'double burden of disease" strains already scare resources to the limit. [WHO, 2001].

- International peer reviewed research continues to demonstrate that the socio-economic status and health are inter-related. The socio-economically deprived suffer from more disabilities and premature deaths than the less deprived. The more funding is made available the longer and healthier people's lives will be . With the global rise in the cost of everyday items such as food, electricity, fuel etc many people do not have the income to save for retirement, but also the cost factor in the healthcare budgets of governments.

Society and within the community:

- It is difficult for young people to imagine that they will ever be old with old age retaining many negative connotations between different generations.

- In some circumstances older people in the workforce may be forced to voluntarily retire resulting in loss of potential experience in favour of a younger person due to stereotypes about older workers, such as lack of adaptability, slowness, and possessing obsolete and unwanted skills. This is despite research demonstrating that most older workers are healthy, competent, able to learn new skills, conscientious and loyal Age, including assumptions based on stereotypes about age, should not be a factor in decisions about lay-off or termination.

- The demographic transition, when rapid population is followed by stablization due to a sharp decline in birth rate, as has happened in many countries, creates another problem, often accentuated by an increase in life expectancy. Most social welfare systems depend on revenues from the working population to support older people, for

ill. 22.1 American nursing home which provides the older community with weekly concerts.

ill. 22.2 Nanto City, Japan. Residents engage in exercise within a nursing home.

ill. 22.3 Nanto City, Japan. Mixed community of young & old engaging in exercise.

whom social services and medical expenses can be very high. If, because of changing birthrates and reduced mortality, the number of aged increases while a smaller work force is left to support them, then a crisis in social welfare will result.

- Lack of safe accessible areas for physical activity such as walking or cycling and social activities that are inclusive for older people.

Within the family challenges can be:

- Dramatic changes in family structures and roles, as well as in labour patterns and migration. Urbanization, the migration of young people to cities in search of jobs, smaller families and more women entering the formal workforce means that fewer people are available to care for older family members.

Personal challenges:

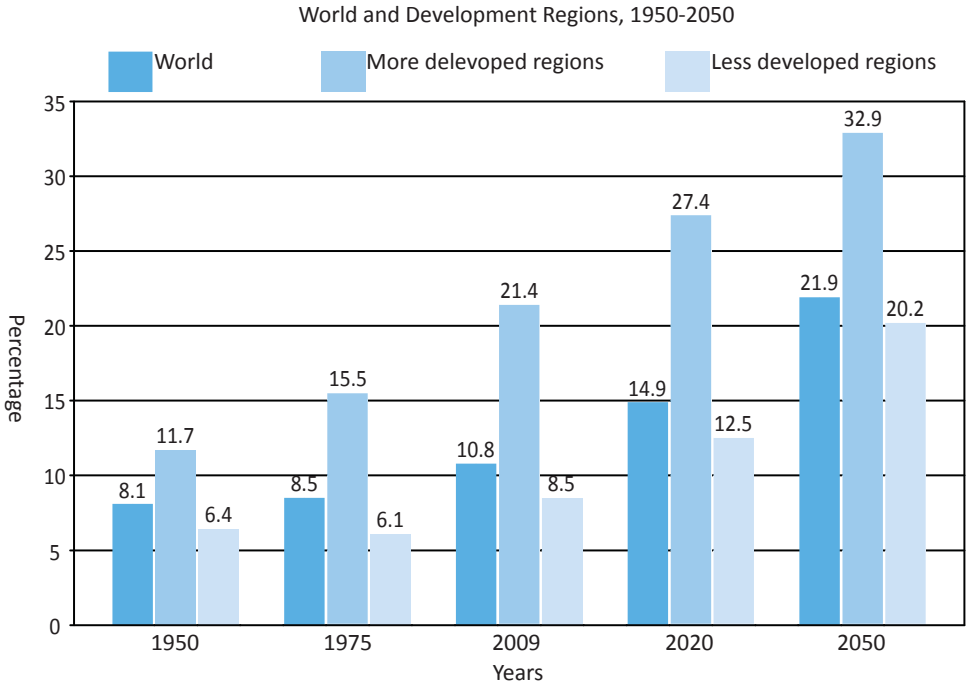
- Dependency on other people, and being in a place of isolation that can create additional adverse health outcomes such as depression or for some even suicide.

- Globally, women are living longer than men. Research shows that in some circumstances while women have the advantage of living long lives they are more likely than men to experience domestic violence and discrimination in access to education, income, food, meaningful work, healthcare, social security measure and political power. These cumulative disadvantages mean that women are more likely than mean to suffer poverty and disabilities in older age .

- An older person can experience physical and mental disabilities that can make basic "activities if daily living" (such as eating, dressing, walking etc) and "instrumental activities of daily living" (such as shopping etc) difficult.

- When aging some of the intellectual ability such as memory, reaction time etc, naturally decline. These can be due to the situation of the person by disuse and psychosocial factors such as isolation and depression etc. [WHO, 2001].

- Malnutrition due to being under-nourished or consuming excessive amounts of calories.

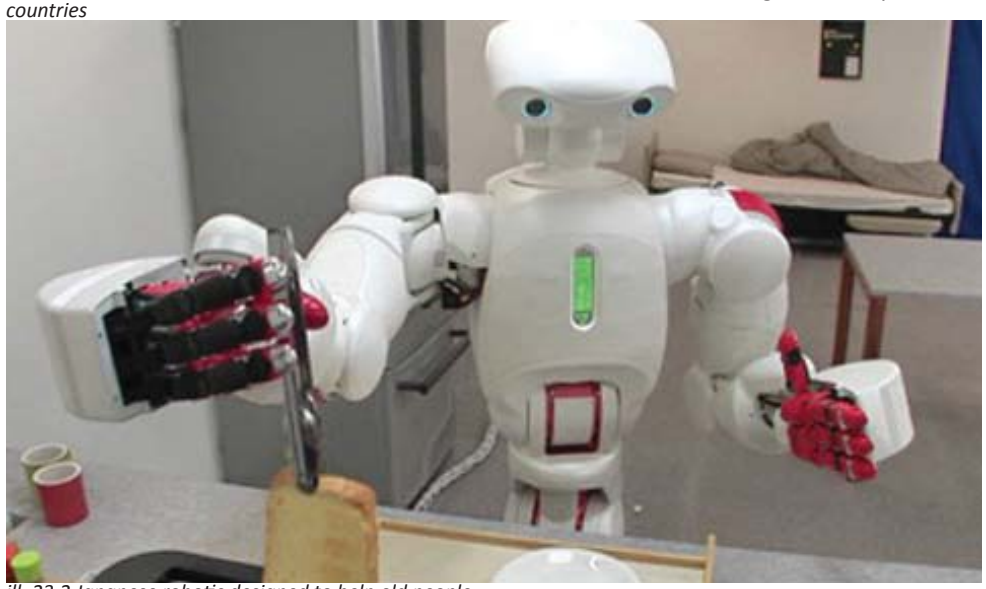


ill. 22.4 Percentage of population aged 60 or over - [UN. 2009]

ill. 23.1 Old Zacatecas woman. Family plays a huge part in the care of the older family members, compared to the social changes in the developed countries

Overview of Global Issues

Global population statistics published by United Nation's Department of Economic and Social Affairs in 2007, showed Germany, closely followed by Sweden, Greece and Austria, to have the highest proportion of older people (80+). However, in Italy and Japan the highest proportion of older people were over 60 years old. In Japan there has been an increase in life expectancy with the level of population older than 100 years, compared to other developed countries worldwide. The Japanese government's response to the growing number of old people has been to build more nursing homes, daycare centres and develop a 'care at home' programme. Some of these healthcare facilities promote a luxurious character equipped with ultra modern hotel-like attirbutes. With this demand comes problem of staffing the necessary care for older people. What Japan doesn't have compared to other European countries is the use of immigrant workers, which Japan has made up for this shortfall in skilled healthcare labour through the use of technology such as robots.



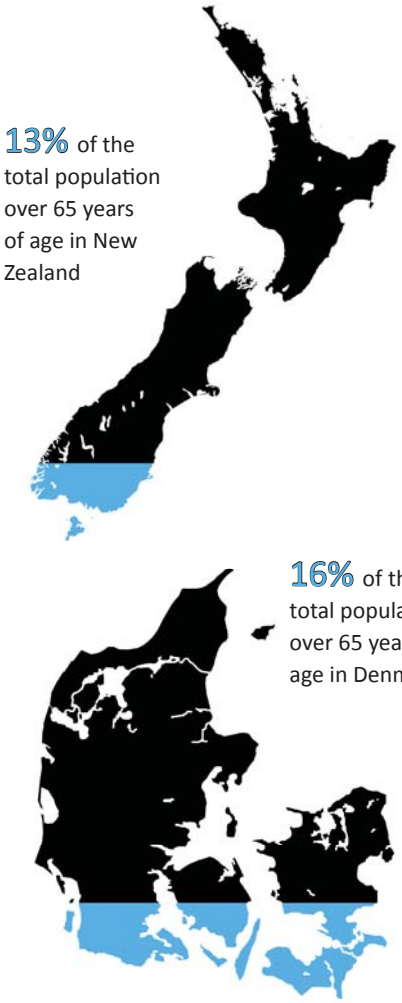
ill. 23.2 Japanese robotic designed to help old people with everyday living challenges.

In Europe the total population is predicted to decrease in many developed countries such as Germany, Spain, Greece and Italy due to a low birth rate and a rapid ageing population which may impact on the ability to care for the health of older people. This is contrary to Southern and Eastern European countries where families respect older people and try to live with them keeping the number of the institutionalized older population at considerably low level.

In Northern European countries such as Sweden, Norway, Denmark, Finland and the Netherlands much of the focus is still on the enlightened societal attitudes about ageing in a place. These countries have considered the provision of buildings that incorporate social, organisational, and physical factors that create a therapeutic environment for the residents in older care. There is a diverse range of living solutions for older peoples' care that vary in the geographic and cultural circumstances throughout these countries. Many of these countries integrate physical building with a service by locating the senior citizens living area in the centre in a community setting that offers services to a diversity of older people in the community. Another major factor in northern Europe is the financial commitment that the countries have to provide high quality health services for the lower socially economic proportion of their total population.

A study of Northern European models of persons care using different cases studies from Denmark will be to compared with New Zealand's care of older people. Both Denmark and New Zealand have implemented policies and programmes that ensure that the ageing population has good health, and quality of life. However in considering the situation now and in the future, the quandary remains in terms of what can be done to help in the ageing changes in a country, community and at a personal level?

In most developed countries there are a growing proportion of older people who require housing and health care with a number of studies of older people showing they prefer to grow old in their own house. In considering older people's housing we need to establish the importance of proactive health independence for older citizens. Active ageing looks at incorporating older people and within more enhanced social atmosphere.



ill. 24.1 Population diagram from year 2010.

Population Comparison

The number of people over 65 years of age (Statistics New Zealand Treasury , Denmark Statistics - 2011):

New Zealand
- 4% of the total population in 1901
- 12% of the total population in 1999
- About 580,000 New Zealanders, currently over 65 years of age. 13% of the total population

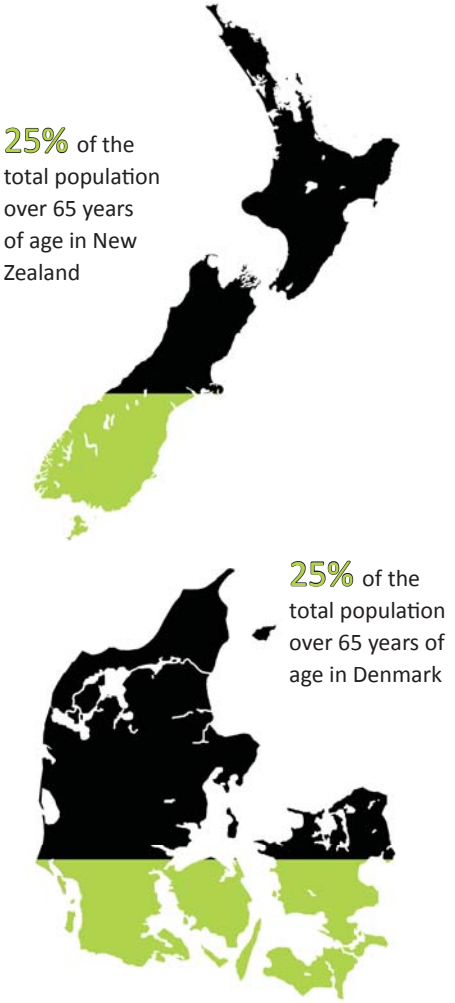
Denmark
- 17% of the total population in 1901
- 15% of the total population in 1999
- About 902,859 Danish, currently over 65 years of age. 16% of the total population

Projections over the next 20 and 50 years:

New Zealand
- 20% of the total population in 2020
- 25% of the total population in 2050

Denmark
- 24% of the total population in 2020
- 25% of the total population in 2050

The study shows a slow rise in the percentage of population for both countries.



ill. 24.2 Population predition diagram for year 2050.

Ill. 25.1 Bayswater Apartments, Auckland, New Zealand. External pretence matches that of a hospital.

Ill. 25.2 Plejehjemmet (Old Persons Home) Thulebakken, Aalborg, Denmark. Residential scale.

Ill. 25.3 Plejehjemmet (Old Persons Home) Smedegården, Aalborg, Denmark. Communal main atrium space with clusters of residential unit either side.

Both Denmark and New Zealand, have the same goal which is to take care of the health of society especially societal groups that are inactive in the work force, namely children, disabled and older people. What this allows is access to consistent health care and other services as required. Though both countries have this common goal there are differences between the two.

In New Zealand many of the healthcare services are publicly funded, but with the aging population the assets of an older person are assessed and public money is regulated to the persons needs. This is contrary to Denmark where the amount of financial assistance is minimal compared to the high price of older persons care and assisted services. What appears to be a trend in Denmark is the savings for retirement through private schemes. A survey done in New Zealand found that 42% out of 400 people had not saved money nor had any idea of the future costs of older persons care [stuff.co.nz]. With the constant changes in the cost factor of healthcare and the increasing proportions of older people relative to the overall population affects both:

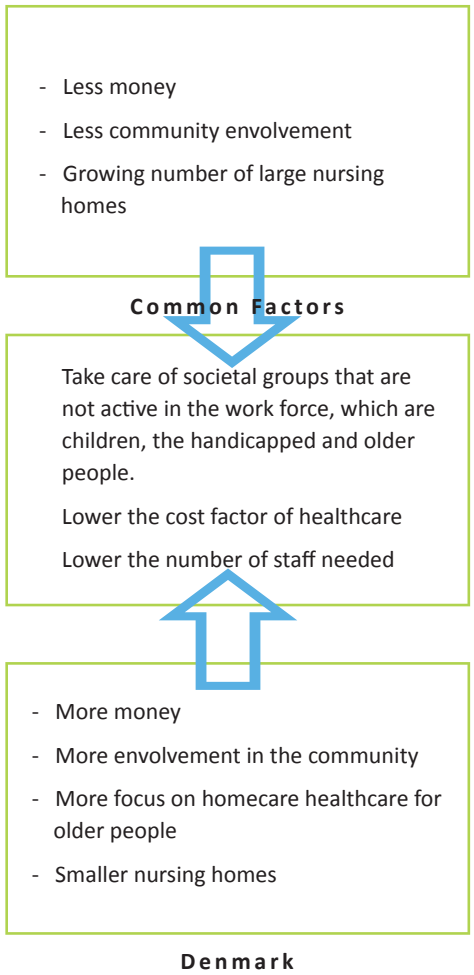
- demand for health services and the overall cost of health expenditure and
- the ability to pay these services through the tax base if the structure of the economy remains the same.

What is noticeable in both Denmark and New Zealand is the healthcare research such as evidence-based design which places the importance of the patients, staff and family welfare. Many of the conclusions of these studies show economic benefits with the savings of medicines, time spent in a hospital setting and staff turnover.

In New Zealand care of older people is undertaken a both the private and at a public level (DHB – District Health Boards). A large proportion of the private older persons facilities are built by private developers. The NZS 8134.0:2008 – Health and Disability Services (General) Standard sets out the requirements of the health, risk management, and consumer rights, while the New Zealand Building Code (currently under review) sets out requirement for the number of toilets, dimensions for a disabled toilet and shower, construction, fire needs etc. What both the NZ standard and building code fail to recognise is the emotional connections to an older person's surroundings when living in an older persons nursing home that can effect the older person both physically and psychologically.

As stated above in Northern European countries many the concerns for old people's care schemes consider the need to create a living environment but also stipulate how the building will serve the needs of the residents, promote therapeutic aspiration, operate efficiently, encourage social exchange, and support stimulating activities. Much of the running of nursing homes are stipulated in building codes that many of the building attributes take form from the enlightened focus on healthcare buildings. Within Denmark the Federal government assumes responsibility for the welfare of old people. What this means is that the State regional council districts and municipalities are responsible for organising the needs.

Traditionally Nordic countries such as Denmark have policies that aim to provide within their homes or senior living units by network of nurses and positions employed by the municipality. When older person reaches a point that they cannot remain a home Denmark has introduced a growing number of senior daycare centres which include social volunteer that can help each other in a variety of ways, moving away from the traditional nursing home environment.



ill. 26.1 Compare & contrast New Zealand & Denmark.

When comparing and contrasting two countries namely Denmark and New Zealand we see the common factor of having public health care for all of the older population. What makes New Zealand different to Denmark is the idea of utilising the community as part of a nursing home or old people's care in assisted living circumstances. When looking at New Zealand there is a fine line between public and private. Within the boundaries of old people's care we see the use of functional homes which cater for frail residents which are then associated to larger nursing home which has 24 hour care. This community is only available for paying residents what Denmark utilises as the surrounding community areas that are also incorporated as to the community of the nursing home and assisted living. When comparing the two countries they look upon the same values of healthcare for the ageing society but what differs is the controlled of the services to the public.

"This active ageing strategy focuses on reducing the prevalence of disability with more emphasis on prevention. It also considers that ageing, far from being a pure demographic phenomenon, is a dynamic process which social policy and care systems may certainly influence … Decisions taken now in terms of the balance of care, support for informal care and choices offered to older people will also largely determine the future." [Ministry of Health NZ]

Summary

There are many forms of factors globally that can contribute to understanding of possible design criteria's for assisted living. As with Denmark and New Zealand the major factor is the economical cost of nursing homes and assisted living. What the countries are working towards is a system that is beneficial for the ageing society which still supports the idea of independence and dignity. Nowdays as society changes and becomes more active people's choices they make now and in the future will have to be considered in future developments for old people's care. With a population numbers increasing in the ageing population and the number of staff projected to decrease additional factors have to be considered of the health and well-being of older people set against economical factors of future.

Effects of Aging

ill. 27.1 Good physical & psychological health, with general fralities of old age.

ill. 27.2 Good physical but bad psychological health often a result of Alzheimer's disease.

ill. 27.3 General frailties that require additional walking aids & assistance.

Frailty

Elderly grow frail at different rates and in different ways. This is classified in five general categories:

- Musculo-skeletal
- Cardio-vascular
- Respiratory
- Psychiatric
- Sensory

It is recognised that aging deterioration can be slow and progressive or raid. Different people can encounter problems with mental or sensory deterioration but can be physically strong while others can be mentally alert but suffer from physical decline. As these physiological changes take place many older people experience loss of independence, their quality of life is affected, and there is the increased susceptibility to accidents and illnesses. [Robson, Nicholson & Barker, 1997].

A number of older people who have been affected with progressive deterioration can adapt and still lead an independent life. Many older people are single due to a lost of spouse or their family and friends have moved away resulting in various changes to their lives they have been accustom to. With this change many have been forced to alter their social habits and as a result they often suffer from isolation, boredom and depression. [Robson, Nicholson & Barker, 1997].

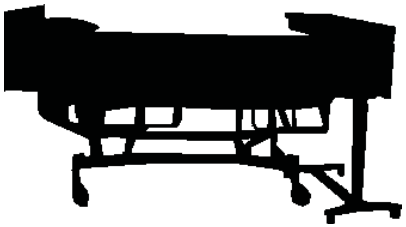
The increased longevity of people is attributable to the use of newer drugs and improvement in medical care. However the downside is that the longer people age the more health problems and disabilities can occur (dementia and Alzheimer's etc), which require additional help and care. [WHO, 2001].

Impairments and Disability

When people age they can be affected by many impairments that may not affect all people the same way, or on the same time scale. Mental and physical impairments can be problematic for a person by diminishing that person's ability to live the life they have previously been accustomed to. While it is said the older people are less resilient to impairments than the young such impairments are less likely if older people are placed in a social housing environment specifically designed to reduce a disability through a supportive environment.

ill. 27.4 Psysical frailties. Mostly depends on other means of mobility such as a scooter & assistance.

ill. 27.5 Psysical frailties. Depends on other means of mobility such as a wheelchair & assistance.



ill. 27.6 Poor psysical &/or psychological health. Requires intensive assistance & observation.

ill. 28.1 People are enjoying a longer life due to better health care.

ill. 28.2 Many older people worry cost factors of healthcare in their future.

ill. 28.3 Different changes for the health & home can be stressful.

The Economic Effects of Aging

People are living longer due to better health care and access to newer drugs. This can place extra strain on saving and economic benefits of a country. Generally older people draw their retirement income from four sources: retirement pensions and state benefits, savings and investments, occupational pensions, and employment. Due to the growth of economic cost of everyday living much of the retirement pensions are lower than the average wage.

In various countries there are many older people who have no assets or income and are almost fully dependent on state benefits. Many of these people live in rented accommodation and have little or no choice over how they are housed or receive care. Other older people who are still in possession of their own homes are disqualified from claiming additional state benefits to give them any real choice in care provisions creating worry about money and the security of their home.

Within the design of an assisted living and nursing homes, a cost factor should allow for a range of residences and their income without taking away their wellbeing. What studies have found through evidence based design is the savings that occurred from changing designs of hospital setting, by creating a more natural, healing environment, some of the cost savings where in medication use and depression etc by changing the environment or a view onto a natural scene. This could have that same effect within a nursing home environment towards medication cost factors and staff used by creating a positive environment which was stress free. In additional studies of nursing homes, showed that when an elderly person suffered from depression where less helpful with the staff, which illustrates the need to improve the homes environment.

The Social Effect and Wellbeing of Aging

In the context of architecture the idea of a building environment cannot manipulate the way a persons feels more of less lonely, but it can create the circumstances that encourage or discourage social contact. What older people need in the form of a built environment is be to healthy, well nourished, financially secure, a home which is adequate to their needs, warm, comfortable, affordable and secure, private and which enhances, independence, friendship, love and dignity. [Brummett, 1997].

Many people's expectations vary as they see life in an older person's home, comparing it to their previous life or the extent of their frailty. New residents may have experienced a period of hardship of discomfort, illness, and unhappiness. These can come in many forms, from retirement, loss of a spouse, income, or illness that has cut them off from society. What made have been considered a busy life is now hindered leaving along period of solitude and isolation. Loneliness, troubles with daily living and poor housing can lead to depression which in turn can provoke both physical and mental deterioration and increase isolation: a vicious circle. [Brummett, 1997].

Needs assistance with dinners. May have them delivered at home or at a communal nursing home environment.

May need assistance with washing.

Feels vulnerable and may need security within a group environment.

Needs 24/7 assistance.

Has trouble with accessibility and may be confined more to their home or nursing home.

Suffers from a small amount of confusion.

Suffers from Alzheimer's disease.

ill. 29.1 Key symbols for the levels of assistance.

Different Levels of Ageing and Assisted Needs (as discussed by Brummett. 1997)

Low Level of Assistance

Level I

- Good physical and psychological health
- General frailties and slight sensory impairments
- Has trouble travelling to social places and functions
- Feels vulnerable to accidents and/or crime
- May need the security within group living overseen by professional help

Level II

- Good psychological health but may have physical disabilities that is a burden them with everyday living such as household chores of cooking and cleaning
- General frailties and slight sensory impairments
- Has trouble travelling to social places and functions
- Feels confined to their own homes due to their disabilities
- Feels vulnerable to accidents and/or crime
- May need the security within group living overseen by professional help

Level III

- Good physical health
- Suffers from small amounts of confusion and disorientation
- Find everyday living stressful and difficult
- General frailties and slight sensory impairments
- Has trouble travelling to social places and functions
- May feel vulnerable to accidents and/or crime
- May need the security within group living overseen by professional help

Level IV

- Combination of physical and psychological frailties
- Find everyday living strenuous
- General frailties and slight sensory impairments
- Has trouble travelling to social places and functions
- Feels confined to their own homes due to their disabilities
- Feels vulnerable to accidents and/or crime
- May need the security within group living overseen by professional help

Level V

- Demanding physical and psychological frailties
- Depends on other means of mobility such as wheelchair, scooter or walker.
- Depends on transferred assistance
- Find everyday living strenuous
- Needs additional assistance with daily living
- Has trouble travelling to social places and functions
- Feels confined to their own homes due to their disabilities
- Feels vulnerable to accidents and/or crime
- May need the security within group living overseen by professional help

ill. 30.1 Mid range of assistance needed in a nursing home.

ill. 30.2 Low range of assistance required. May live at home, with dinners delivered during the day.

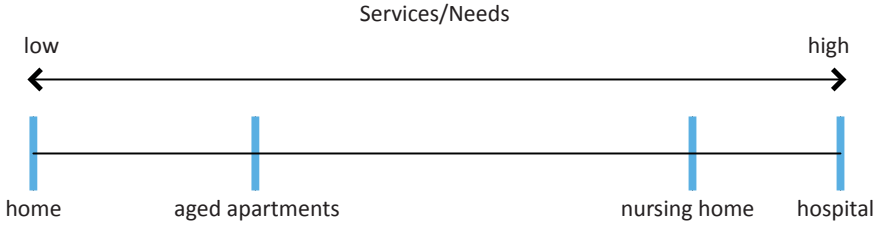
High Level of Assistance

Level VI

- Good physical abilities but intensive psychological frailties often a result of Alzheimer's disease
- May have regular mild periods of moderate to disorientation
- Needs constant assistance and observation

Level VII

- A combination of either or all the physical and psychological disabilities at all levels above
- Requires regular, intensive assistance and observation.



ill. Care model, showing the continuum of care in the building type.

The overview showing the levels of assistance listed above points to different disabilities that can occur. When considering the residential care home it should relate not just to the disability but also the social orientation. What makes it important is specificity as it relates to the needs of the person within the living arrangement can vary the housing arrangement but also own choice in a variety of housing types.

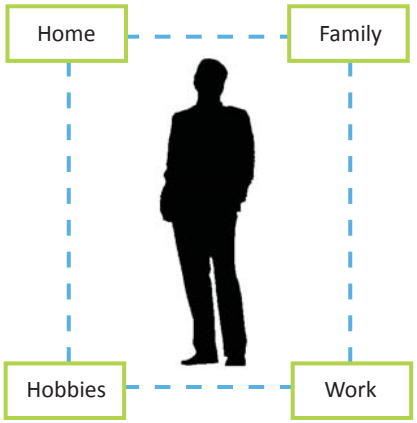
The overview of looks at a combination of assistance needs for old people but as discussed within evidence based design many of the aspects of design move towards the emotional connection to architecture. There are many points of importance to focus on including maintaining independence, preventing and delaying disease and improving the quality of life for older people. [WHO. 2001].

Emotional perception of moving to nursing home can be a stressful for an older person as it is thought of the final chapter in life and the humiliation due to disease or disability from becoming old. For older people the eventual need to move into a care home, due to reasons of physical or mental disability although no longer able to fully maintain their own home the need to support of the transition is important. Often the idea of moving from a private home built environment over a long life can be shattering for the older person and coming to terms with having to move into care home can be stressful.

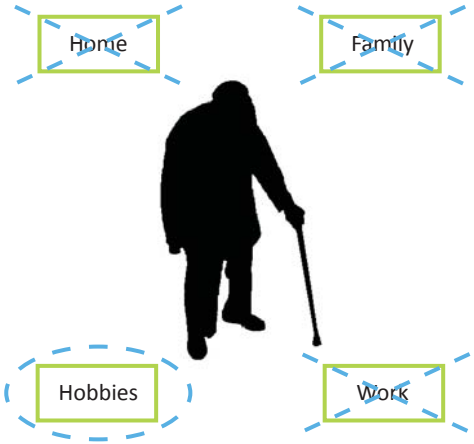
In addition the idea of changing the atmosphere the traditions of daily living can be daunting.

Todays' older people and in the future many individuals are characterised by great diversity across ethnicity, religion and social cultural backgrounds thus giving a diverse and varied background for the attitudes and desires of the older people. Within older persons care the idea of one size fits all is hard to depict therefore care homes must respond in the diverse needs of the older person to allow independent but also to improve and maintain the quality of life.

As far as the challenges of design and older persons' nursing homes is concerned, it is essential to recognise the strong need of creating a homely environment that allows independent living. Thus in the design of the older persons nursing home the aim is to create a physical environment that can provide a positive experience for a easy transition but also allows change to facilitate a homely feel for the individual.



Life leading up to retirement is full of activies, social events that keeps the person busy.



Life can change, families move away, frailties make home life hard, and retired from work, which leaves hobbies and interests that help aid in socializing and enjoyment.

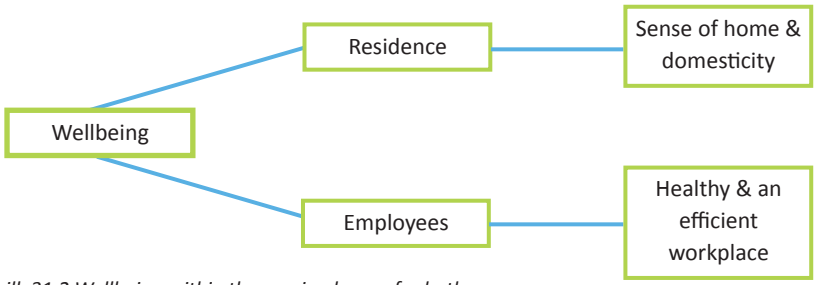
ill. 31.1 Before retirement and after retirement and subsistence of life.

Factors of Wellbeing

When considering well-being within the care concept of assisted living and nursing homes it is not only about assisting the residence in achieving a sense of home and domesticity, but also for the home to be healthy and an efficient workplace for employees. Some of the key priorities to improving well-being in old age are improved nutrition, increased physical activity, reduced depression, social isolation and loneliness, reduced falls and the promotion of integrated collaboration between housing and transport sectors and other areas of public health. Within these factors includes well-being where the idea is to create an environment in which the older age can feel safe and secure, private, independent and maintain their dignity. These aspects should be considered prior to any design and building offer to residents of a care facility.

Many well-being factors considered change as old people move into retirement or suffer injury. Within the diagram we see illustrated different well-being factors that are seen over a lifetime but as a person changes and moves into retirement or have family members, move away many factors are removed. When considering this, one of the possibilities is to turn the focus back towards such considerations namely hobbies, additional education and creating a new community of friends.

- Security
- Comfort
- Accessibility
- Physical activities
- Pleasure
- Community
- Diet
- Family and friends
- Social
- Sensory stimulation
- Independence
- Home



ill. 31.2 Wellbeing within the nursing home, for both residence & employees.

Summary

There are many challenges for the aged when living on their own but also when moving on to older persons' care facility.In the process of designing and building facilities and housing the aged, well-being and health are important priorities to consider. A number of negative factors such as depression due to physical and physiological disabilities and emotional perceptions need to be considered within the process of designing.

In New Zealand there is a gap between the private home and nursing home facility for old people. What we see in Denmark is more integration of private homes sitting with the security of a nursing home. This category includes a team to assist with day to day living which including catering for a wide range of care for all disabilities, age groups and social background. Other factors to consider are the cost for the person and the economic cost of running the facility.

ill. 32.1 By added shelving, tiles etc a disabled bathroom can become more homely without affecting the function of the room. Shelving for personal things.

Homes for the Aged

One important factor which is prominent in Northern Europe is the idea of creating a therapeutic environment. Using Northern European countries as examples of assisted living Reginier and Scott list nine goals that provided the development of a highly supportive, humane residential housing for the mentally and physically frail. [Reginier & Scotts, 2001, p53] These factors were:

1. Appear residential
2. Be perceived by residents as small in size
3. Provide privacy and completeness and residential units
4. Recognise each residents uniqueness
5. Foster independence, interdependent, and individuality
6. Focus on health maintenance, physical movement, and mental stimulation
7. Support family involvement
8. Maintain connections with the surrounding community
9. Serve frail persons

In addition to this:

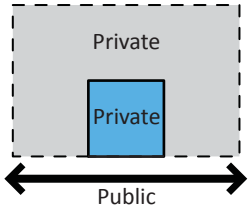
10. Connections to nature

What is found when looking at older peoples care are the many aspects of living that can be acquired through the ageing years. Depending on the level of physically most would look upon assisted living as a security of 24 hour a day assistance from a professional caregiver within an environment that embraces the quality and character of the private home.

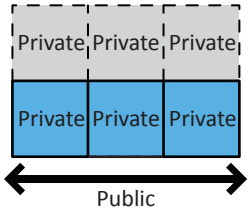
Older people are still independent but often require additional assistance with daily living. What is an important part of assisted living in older people apartments and nursing homes is to the delivery of assistance necessary which emphasises the residents' independence, dignity, and shared responsibility. The residence are considered the primary decision makers when it comes to their care and lifestyle thus making it important to create an environment within their private apartments that will establish this while setting up a supportive and extended family community. [Brummett, 1997]

Older people in assisted living have two needs, physical (functional) and those of emotional and psychological well-being. What is the greater requirement in a nursing home are the physical needs that require much of the staff assistance where the buildings requirements focus solely on the risk factors of the residence well-being. Through different technological advances caring for the frail has before easier with the use of electronic lifts and rail systems that transport of residence can be done by a single person.

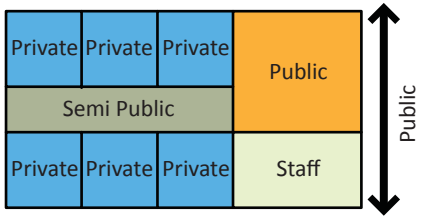
Through the investigation of evidence based design many conclude the befits of psychological well-being for a patients in a hospital setting. What was found in the studies was the reduction in pain medication and less need for depression medication by changing the environment with natural, stimulating views, daylight but also the connections to a homely environment which people could relate to.



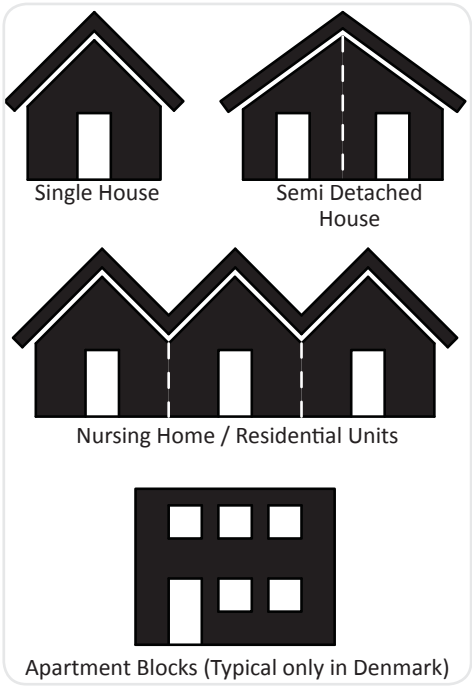
ill. 33.1 Private Home



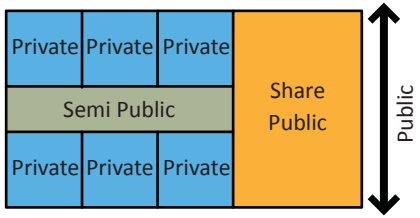
ill. 33.2 Assisted living/ serviced apartments or homes



ill. 33.3 Retirement homes and senior residence older persons nursing homes.



ill. 33.4 Typical housing types in New Zealand & Denmark.



ill. 33.5 Communal flats, co housing and communities.

Types of Living Arrangements

New forms of living for Older People

Private Home

The majority of Danish and New Zealanders live in private households. Healthcare is provided for older people instead of older people seeking the care. When special assistance is required a network nurses is employed to visit the older people and the homes. Additional help may also include cleaners and meals, where modifications are needed to allow for the ease and comfort for the older person(s) small alterations would be done. If an older person reaches a point where they cannot remain in their private home, they offered one of several residential options and older persons nursing homes [Jarden, 2009]

Assisted living/ serviced apartments or homes

Assisted living is similar to the private home in that it uses the same principal that each person has their own apartment or unit which they can live their everyday life more or less at their discretion. The design and fittings of the unit aim to assist in the needs of the old people for example possible mobile restrictions, but also allowing ongoing care and assistance so they can still lead the independent life.

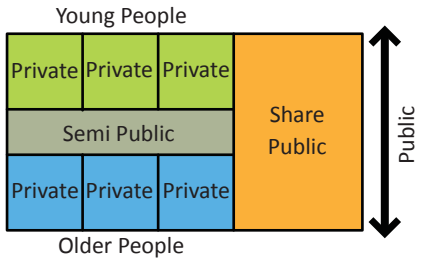
Retirement homes and senior residence older persons nursing homes

A retirement home or older person's nursing home consists of smaller apartments within an environment that offers care, assisted support, and common socialising.

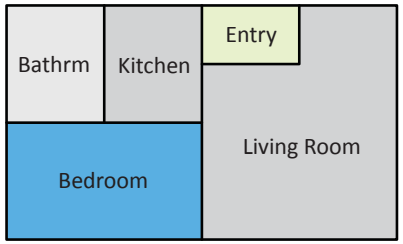
Often retirement homes take on a home-like character that consists of other amenities such as a restaurant and large eating areas. In most cases the services provided in the home consist of meals cleaning services and general health care support. Additional spaces are incorporated into the home such as common areas for example sitting rooms, libraries, swimming pools and areas that take on a clubroom feel or fire side room environment. These common areas can also extend out onto terrace and garden areas for all residents and staff. In addition to the retirement home other services of daytime care for the older people can be utilised in the facility.

Communal flats, co housing and communities

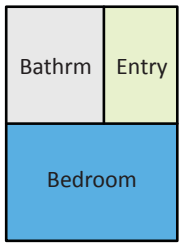
Within communal housing projects the residents live in their own living area but share multiple services for example shopping, washing, space for preparing meals in a communal setting of a kitchen and dinning area etc. Communal flats are common in Denmark where older less able people suffering from dementia can still lead an independent life within the close confines of others.



ill. 34.1 Urban-scale alternative: neighbourhoods for young and old.



ill. 34.2 Living unit type I & II. The space functions as a small unit within the community of a nursing home.



ill. 34.3 Living unit type III & IV. Social interaction outside of the unit is important but also the function of the area is to serve the frailty of the older person.

Urban-scale alternative: neighbourhoods for young and old

In the context of urban renewal many building developments of new and existing aspects of integrated neighbourhoods are made up of young and old. The use of shared housing networks can create mutual assistance where the young pensioners can be of valuable source in volunteering their time and relevant experience but also the potential of using the young as a source of assistance for the older people creating a focal point for the local neighbourhoods. [Feddersen & Lüdtke, 2009].

Types of units/apartments

The model programme undertaken by Denmark, (Modelprogram for plejeboliger, 2010) proposes four types of accommodation. These units work within the residence of nursing homes that relate to the resident's disability and the relationship to social orientation.

Living type I

The private, supportive housing allows for residents that depend on care due to limited disability but form their social orientation towards family and personal friends. Tenants can handle most everyday living and are confident to call for help when necessary. The unit's are considered homely and individualised through personal space for belongings and areas for to accommodate social activities with family and friends. A private accommodation comprises of an entry hall, large living room, bedroom, bathroom and kitchenette.

Living type II

The collective, supportive housing care is for residents that have limited loss of function. Within the private unit there is still support and help to give comfort for everyday living but also professional support to provide and nurture social relations between other residents. The home consists of the private unit in addition to common rooms, kitchen, utility rooms etc which worked within the context of homeliness and are shared with all residents. The private accommodation consists of entrance hall, living room, bedroom, bathroom and possibly mini kitchen.

Living type III

The social, nursing home cares for residents with extensive loss of function, such as dementia or physical disability. Here the tenants are orientated towards a social community where a new social context is forged which distinguishes between the difference of functioning residence and residents as dementia. The home consists of a domestic dwelling environment with, common rooms, kitchen and garden. The private accommodation consists of entrance hall, bedroom and bathroom.

Living type IV

The private, restful housing looks at giving home care to the extremely weak and sick people who are unable to do anything to help themselves other than self chosen social contact with relatives or friends in addition to staff who care for them. Much of the focus is on the private rooms where there is ample space for care and good opportunities for family and friends to stay. There is a need for familiarity with personal belongings and people are important to have around the resident. The private accommodation consists of a bedroom and a small bathroom.

In supporting housing for older people a combination of the different living types are used to integrate a cross-section of different people. An overview of the residence disabilities and their social orientation places each of them in a living arrangement that suits them. A combination of different types of residential care can place people that a frail or with dementia into different living arrangements. Places for people with dementia may see living arrangements three and four best suited for their disabilities. Living type III focuses towards the common areas in the living arrangement more than the private, where living type IV is used when the disease worsens. Within a place for frail would be on one and two living arrangements which are made up of large private housing to less private dwellings which have more shared open common areas.

Homely - Conceptual Thoughts

Ill. 35.1 Communal kitchen areas to take on a residential atmosphere where socializing can take place.

Ill. 35.2 External scale of the building should relate to the surround & typical residentual character.

In many assisting living facilities the ideas of a home or homelike environment is not met to the satisfaction of the residents. Studies have concluded Conclusions of the studies considered that the interiors felt more like a hotel or lacked authenticity. When designing a nursing home or hospital the fundamentals of wellbeing are there but then camouflaged with characteristics of home without looking beyond its appearance of homely but forget to focus towards its essence of what a home is. [Brummett. 1997]

For a typical housing setting much of the interior is expressed by choice of furniture including selected artworks and consumer electronics. Though one might say this is an expression of the person on the whole many people do not have choices in the design of the dwelling, and urban design of the surrounding neighbourhood. Much of the environment in urban areas dictates the way in which the building may look and feel thus making the interior decoration through furniture, photos important part of architecture that allows a person to express their position on life. [Wagenaar. 2006].

In relation to older persons care the purpose of the building is based on forming a function for the physical and mental disabilities for the residents but also the recognition of “home”. Establishing a territorial homeliness that creates a homely atmosphere through different arranges of the persons physical setting, décor and furnishing etc can make up the feel of homeliness. Though it is hard to replicate this in a nursing home the idea of giving independence of décor within an individual’s own units can help.

Factors of Homely

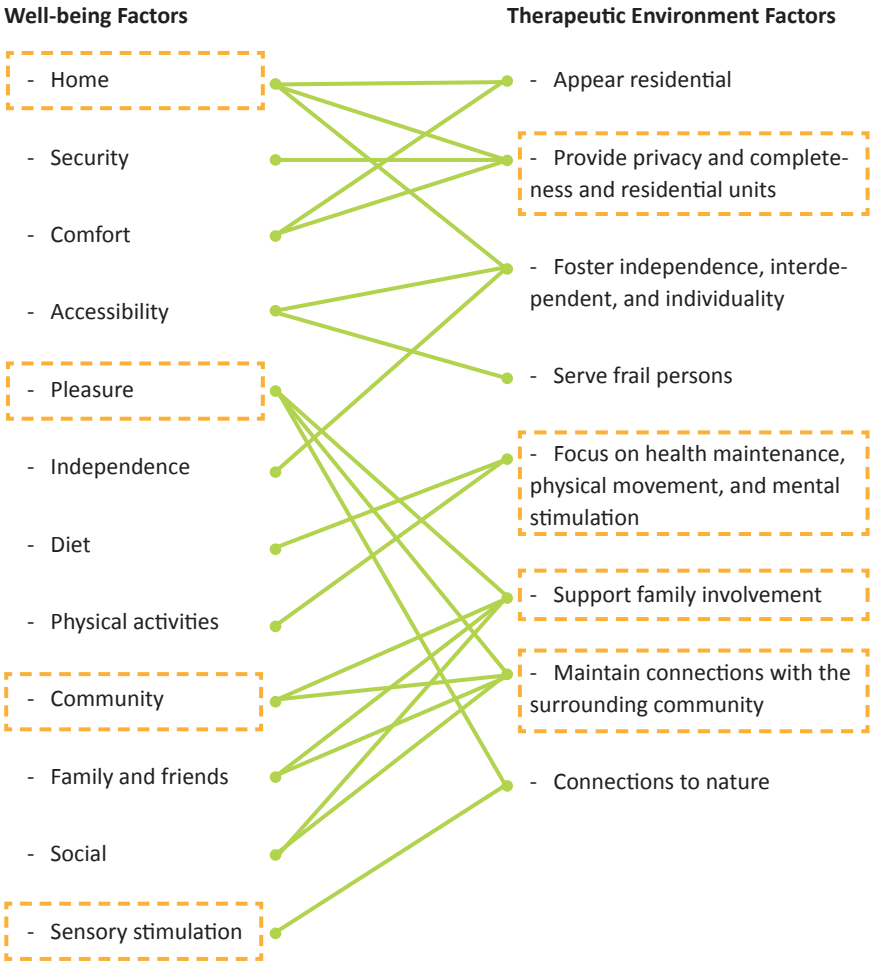
- Personalised entry
- Refined material quality and spatial character
- Refined scale
- Orientation
- Private apartments
- Clear thresholds
- Separate living and sleeping areas
- Outdoor space
- Orienting entry
- Kitchens
- Personally adjustable apartment controls
- Easy adaptability to changing needs

Ill. 35.3 Details within the home & residents units should have homely details. It should also feel open & inviting to vistors & families.

Ill. ill. 35.4 Allowing personal furniture to be used can help the resident adjust to life within the old persons home.

Ill. 35.5 Plejehjemmet (Old Persons Home) Smedegården, Aalborg, Denmark. Residence unit filled with their personal furniture & pitcures.

Ill. 35.6 Plejehjemmet (Old Persons Home) Thulebakken, Aalborg, Denmark. Residential style outdoor area.



ill. Interaction between well-being factors & therapeutic environment factors diagram

Diagram Overview

Through a review of evidence-based design that address the needs of older people, many factors that can be considered important when designing a nursing home. In the diagram different connections are shown between well-being and therapeutic environment factors. The main points to consider with this project are highlighted in orange.

The diagram shows many factors relating to each other thus giving an overview of issues that will be considered in the design project of a nursing home.

Factors to Consider

- Deconstructed corridors
- Community – integrated site
- Articulated mass and form
- Continuous and connecting circulation route
- Unobtrusive reception/observation
- Normalise and positive bathing
- Scale of dining areas
- Places for enjoyable rest
- Living room, activity space
- Small and comfortable shared spaces
- Activity kitchen
- Laundry as a multisensory experience
- Adaptable office connection – (staff)

Factors of Homely

- Personalised entry
- Refined material quality and spatial character
- Refined scale
- Orientation
- Private apartments
- Separate living and sleeping areas
- Outdoor space
- Kitchens
- Personally adjustable apartment controls
- Easy adaptability to changing needs

ill. Follow on from page 36 showing the Interaction between considered factors & homely factors diagram

Diagram Overview

Following the well-being and therapeutic environment al factors, aspects associated with design factors were considered. Factors that were considered included homely factors ranging from different scales of the nursing home to the personal units for older peoples' care. The underlying consideration is to create a positive environment that integrates homely factors on which a resident and/or staff member can relate to.

The overall factors diagram draws from the evidence-based research and healing architecture. By using different design factors the outcome is a move away from the sterile institutional atmosphere of hospital to a space that is considered more homely and relaxing.

It is these design factors that form the basis on which designs could be considered. What is important in these factors is their influence on the positive physiological as well as physical health of the residents. As a result the intention is that these factors contribute to the creation of an environment that is secure, homely, welcoming, serves the residents' needs, but also helps relieve stress and depression and resident may feel.

Users

ill. 38.1 Older people want to live in exciting and prosperous life after their work.

ill. 38.2 Older people are still active well after their retirement & still have a active roll in society.

Older People

The older people of the present and future want to live in exciting and prosperous life in their retirement years might have higher demands of the society and on themselves with many still want to continue to grow and knowledge, development, experiences and options.

Under the current the economical climate in Denmark and New Zealand more people are saving money for retirement through private and public pension schemes. In Denmark around 70% more people are saving for retirement than the previous generation allowing more financial backing to provide services that improve the quality of life. However the number of New Zealanders that do not have the financial backing to allow the choice of the older age where health and disability can become a burden is high.

The older person today and future is expected to no only live longer, but will be healthier and more active so the number of people with dementia will rise as people live longer.

When looking at the target group of the Danish older people the Ældre Sagen (an independent society for the health and wellbeing of older people in Denmark) preformed a study on the future wishes of people born in the period of 1938-1955. They were asked what the most important factor that made them happy was many identified good health and family with the highest priority where there was a major fear about getting old sack and having to be dependent on help from others. Some also feared that they would not get the proper care or would become lonely.

When surveyed in regards to retirement life, three words define a person's vision:

- Active - in society, life but also in health.
- Independence - to self-sufficient without the need to depend on others.
- Control - to decide for themselves.

Many people still want to maintain the dignity and respect that they have experienced through life.

Many older people who eventually retire focus on other elements of their life such as:

- Hobbies
- Family
- Travelling
- Visiting friends and neighbours
- Spend time on house and garden
- About a third planned to spend time volunteering

With the future older person's family was perceived most important social network, in addition to friends, acquaintances and neighbours. Within the social network helping each other becomes an important factor regarding both practical assignments but also helping others who are sick or disabled.

When asked in relation to the living conditions of the future older person and majority preferred living in their own home. Location was considered important in regards to where the home is situated in relation to service facilities, community and nature. [Ældre Sagen.]

Within different stages of aging, an older person can come out of health, functionally limited where help is needed, though the ageing of individual does not follow a chronological age.

ill. 39.1 Suffering from depression

ill. 39.2 Health & well-being is also important for the staff within the nursing home

Depression

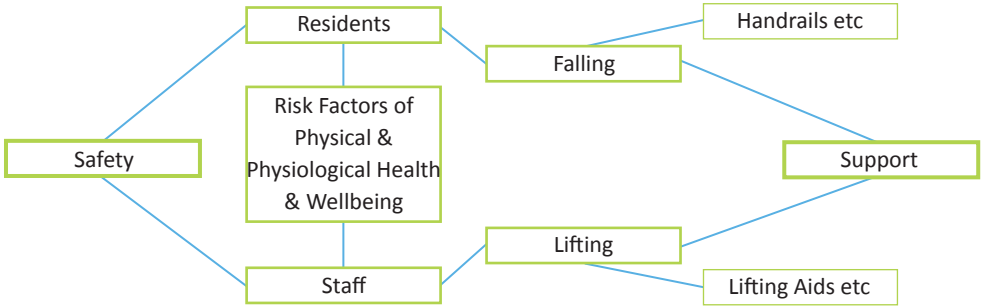
Research has shown that as much as 1% to 3% of the older population suffer from major depression where an additional 8% to 16% has clinically significant depressive symptoms although it was thought that fewer than 20% of cases were detected or treated. In addition to depression, studies identified the connection with poorer functioning, an increased perception of poor health, the utilization of medical services, and additional health care costs.

The typical risk factors for depression among older people are bereavement, sleep disturbance, disability, prior depression, and female gender. Within most of the factors changes can be taken to easy the depression by counselling and support, new skills training but establish more enhanced social supports with individual or group therapy within the community.

Staff

Aged care research of the numerous forms of nursing's care has also considered the facility's staff an important part of the community environment within the homes. How the staff feel can in turn fall back onto the residents. Stress can be a major factor due to a bad working environment but also the circle of stress a resident many feel which in turn can reflect onto the staff member.

Safety is a strong concept in Evidence Based Design. With the cost factor for the future of aged healthcare financial cuts will be made, which could also include changes to the staff to resident ratio . With design of nursing homes integrated functions can also be incorporated into the nursing home, for example rails that offer the task of moving a person to and from the bed and bathroom.



ill. 39.3 Safety within the nursing home is important, for both staff & residence.

Family and Friends

Guilt is something that a family may suffer when having to move a relative to a nursing home. Other times it the negative thoughts of the intuitional feeling one gets when entering a healthcare building. When discussing the ideas of homeliness within the nursing home form positive effects both for the residence and for visitors are important considerations. What is important is to allow the freedom of entering the building to visit the residences. Residence should also have the feeling that nursing home is their home where visitors can come and go as they please, and allow for private spaces that social interaction can take place.

Technical Investigation

ill. 40.1.
Architect - Christensen & Co Architects.
Project - Green Lighthouse, Denmark.

Within the traditions of daylight & architecture in Scandinavian countries the wellbeing & emotional experience of daylight plays an important part in architecture. The design of this project works with creating a building that is CO2 neutral but as the picture shows the experience of the daylight within the space is almost tranquil. The use of white surfaces reflects the light back into the space, diffusing the light as if it was sound. The placement of roof lights adds to the experience of the surrounding architecture by allowing the sunlight to cast shapes onto the large walls.

Light

Light allows us to see, there would be no visual form without light. Through evidence-based design research many studies show the importance of natural daylight for the well-being but also acceptable lighting condition for tasks at hand.

Daylight

With the importance of natural daylight, comes the benefit of welfare through sunlight by controlling the bodies circadian system, affecting mood and perception, by facilitating critical chemical reactions such as melatonin.

The healing benefit of the natural daylight exposure is essential for everyone. Many studies look at how high intensity of light during the morning can affect humans' circadian rhythm enhancing the idea of being awake during the day which improves the quality of sleep with these disturbances during the night. Others study showed that when exposed to bright light of the morning helped alleviate depression.

The natural source of daylight comes from the sun. Throughout the day the sun changes the surrounding atmosphere through the suns shadows, light intensity and colours. It's a free source of energy; it could be used in a sustainable manner by eliminating internal spaces and to be used as a passive house concept.

Within the concept of the elderly nursing home many people prefer natural sunlight to artificial light thus in designing units the orientation of windows towards natural daylight can be added benefit for improving quality of sleep but also to relieve negative thoughts. The added benefit of large windows is to allow the occupant view the natural surroundings. Other areas of the nursing home should also facilitate areas of seating, common areas that has eliminated by natural daylight. It is also a common factor that most people prefer natural daylight to artificial light for tasks. Within the health and welfare of the staff is important to allow contact with natural daylight.

Perception of Light

There are two forms of light natural and artificial. The lighting within the internal environment can affect the performance of visual tasks of the natural or artificial. Evidence-based design studies show that a higher light level can create better performance and visual tasks eliminating mistakes.

Within the building light source is a combination of natural daylight that in this through windows and skylights in addition to electrical light sources. Sunlight is an electro magnetic radiation in the wavelength is absorbed by the retina of the eye, which provides a wide spectrum of colours. The skin also takes in the sunlight, creating a chemical response by producing vitamin D which can aid in the absorption of calcium. The wavelengths of daylight differ over the day with the latitude, climatic conditions, and seasons, where artificial light is restricted in the different wavelengths of light that is limited to visible light spectrum.

Natural daylight can be problematic in the form of glare that without natural daylight the negative effects of self-esteem could create depression. When looking at the quality of light it is important that the lighting atmosphere can be controlled by personal meaning such as shading or electrical controls to artificial light.

Within the essence of architecture comes light be either natural or artificial to create a functional or decorative purpose or both. Within some forms of light comes the purpose of simple in the illumination of a visual task. Light in a building environment can be facilitated the purpose of official amenity but also to create emotion or to create a special expression. Within an internal environment it is important to allow the light to be easily controlled according to different spaces, meets, and time of day or night. [Major, Speirs, Tischhauser. 2005]

ill. 41.1.
Architect - Isay Weinfeild Architects.
Project - Ipanema, Rio de Janeiro, Brazil.

With the use of material & placement of shades light can be accentuated as a feature. In the photo and long strips create a visual texture on the wall & floor. As time moves the width of the strips of light change. Using a warm material such as wood can reflect into a space creating a warm glow of light.

Light and Materials

Light on a material illustrates what kind of texture is depicted on the surface. In addition to this the colour of the material or surface can also absorb light or reflected light back into the space.

Light is made up of a spectrum of colours. During the day these colours change the type of light from a blue light in the mornings to a warm light of the evening sky. Light has three primary colours of red, green and blue, which can be mixed to create other colours. Within this one primary colour the pigments are made up of magenta, cyan and yellow. When all colours are combined get a true white light. [Major, Speirs, Tischhauser. 2005]

Through architecture we look at the physical aspects of light but in addition there is also a physiological effect. Studies show covers of light can affect the motions of people. As an example, red and blue of the most commonly preferred colours, but are also known to increase blood pressure and stimulate the brain whereas blue light has the opposite effect. Many other colours represent different emotions.

There are three aspects that determine a colour value, and hue and intensity. The value determines the amount of light absorbed by the material and how much is reflected. For an example of white wall reflects about 82%, where the dark green or blue may only reflect 7%. Hue is the colour, when in light is cast on the coloured surface it adopts a hue that changes the colour of the reflected light. Intensity is the brightness of the hue which can be changed by adding white or black. By changing these three aspects of light and materials colours can change the experience completely.

With use of texture the material used in and considerable richness and variety and compositions through the use of different materials. The different material surfaces can also affect the reflection of light. The glossy surface can reflect much of the light compared to a matt surface which defuses the light. Through the different effects of light onto a rough surface can visually depict how the surface may feel.

Shadows

Shadows depict form. Though light is invisible to the eye, the light cast reflects light back. Shadows play with the form of a shape, surface material, and colour. Length and direction of shadow indicates both the time of the day and in the possession of the light source. [Major, Speirs, Tischhauser. 2005]

Shadows modify character in the meaning of optics and people credibility of light and shade. Shadow is considered a contrast it is different from darkness to light is always to present in the shadow. Within this sunny day there is more contrast where the shadows are strong and the humans eyes are constantly stimulated by the shift of texture and pattern.

Within intensity of light reflects the intensity of the shadow. When looking at the quality of light sunlight depicts a steady stream of light from one source in one direction which changes throughout the day we electrical lighting can stimulate multiple streams of light which to fuse the shadowed effect.

When moving between dark to light the retina of the eye adapts to the changes, so this is relatively slow strong contrast between the light source and its surrounds can create glare which can cause impaired visions or in some cases physical pain.

ill. 42.1.
Architect - Mellem Broerne II
Project - Nørresundby, Aalborg, Denmark.

Orientation in Relation of the Building

When looking at the orientation of the building in relation to natural daylight it is preferred that morning light comes into the bedroom, we and take the windows to the east. When the want excessive amount of light we place large windows to the south, though in the warmer seasons shading may be placed to minimise excessive glare and overheating. If the required effect of daylight is to not have shadows or harsh light, then we orientate windows to the north.

This is surrounding built environment plays an important part in the amount of daylight that enters the proposed building. If the surrounding buildings are too high or too close to the proposed building much of the natural daylight and sun can be blocked.

The building depth can impact the use of natural daylight. A narrow building would with openings to both sides can allow for natural daylight to penetrate into the central part of the building. This can help in energy savings by providing natural light versus electric light.

Another aspect in the orientation of the buildings interior is the effect of having a connection to the natural world where people can depict time, their position and be reassured. Within shopping centres that removed natural daylight caused problems with people's ability to orientate them towards an exit compared to other shopping centres that utilise natural daylight.

Those studies showed it's important to utilise natural daylight and negative aspects of overheating and clear can happen. Additional solar shading can be incorporated into the building that can be used when required to shade the rooms from glare and abundant amount of heat from the sun.

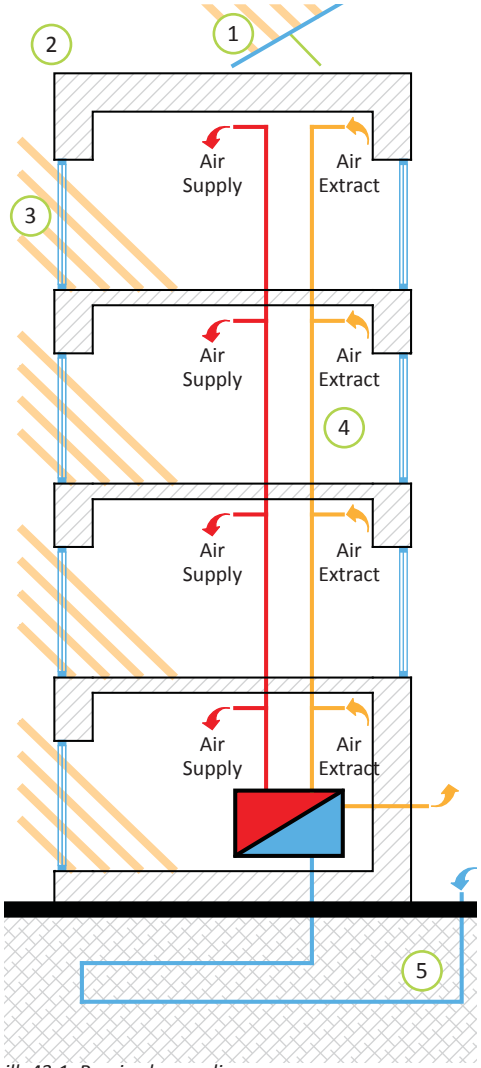
Safety

ill. 42.2.
Architect - Le Corbusier
Project - Harvard University's campus, USA.
The windows turn away from the sunlight & protecting the internal classroom from overheating. This also creates an interesting facade which is accentuated with the depth of shadows.

Summary

Through the studies of evidence based design in regards to light much of the conclusions show the benefits of utilising natural daylight. In turn natural daylight can create an architectural atmosphere that can be warm and inviting but also allow for a natural connection through openings that frame views of the outside. Important factors to consider with an old people's nursing home is the control of light by means of shading. The idea of using light is to support the quality of light that supports a positive atmosphere to all spaces.

- Light can benefit the well-being of the residence
- Improves the quality of sleep
- Helps alleviate depression
- Natural sunlight can be used within a passive house concept and help with engergy savings
- Natural light is preferred for tasks
- Lighter light levels can create better performance
- Sunlight help the body produce vitamin D which can aid in the absorption of calcium
- Sunlight can be problematic in the form of glare
- Light can create a emotion or to create a special expression within building design and with the use of colours



ill. 43.1. Passive house diagram.

KEY

1. Photo voltage
2. Insulation
3. Triple glazed windows
4. Ventilation system with heat recovery
5. Ground heat exchanger

Sustainability

"A host of contemporary environmental problems – climate change, ozone depletion, toxic pollution, decreased biodiversity – can be linked to the production and maintenance of the built environment." Compared to other building types the impact of the healthcare sector on the environment is huge. Much of the operations of the building consume large amounts of energy and resources; a hospital can use up to twice as much per square meter than an office building. [Guenther, Vittori. 2008].

Within the healthcare sector there is a strong ambition to reduced environmental impacts with design, construction, and operations of the building process. Creating a more self-sufficient building that depends on natural means for energy source and to create a healing environment. Within the proposed project much of the investigation relates more to the social architecture and the internal environment, sustainability will be consider but not to the extent of other subject matter in the project.

We see through international example of healthcare and their changes in the focus of natural resources and the implications of the changing environment. Many examples look back at the ideas the Enlightenment and the importance of a natural setting with clean air, and their concerns about the environment's effect on their patient's health. Through evidence based-design, natural factors of improving the internal environment of a hospital are studied. The importance of natural light and views, natural clean ventilation for the physical and psychological health of humans can be incorporated into the sustainability of the building. A sustainable building can be beneficial towards the society in the cost and, by creating a healthy community that works at strengthening influence of health and quality of life in the local communities. [Guenther, Vittori, Atwood. 2006].

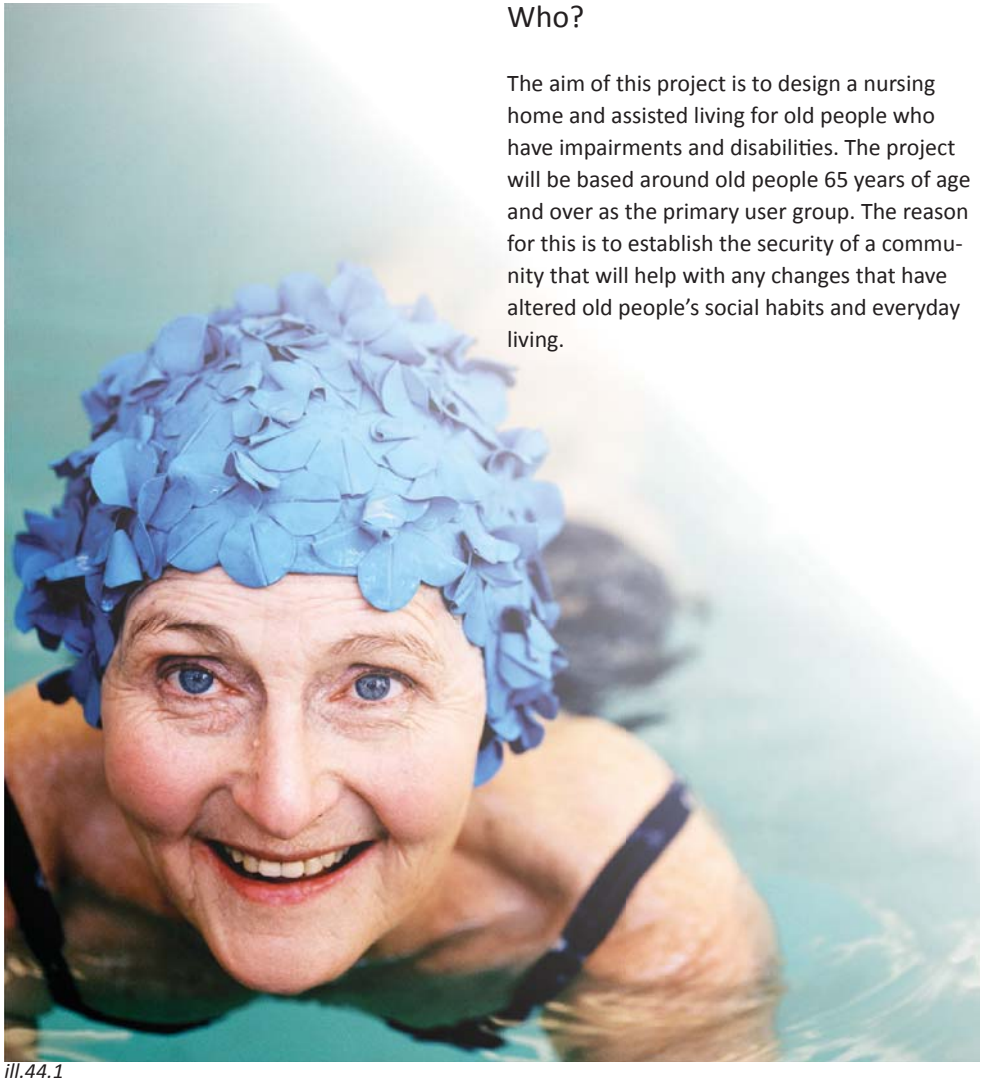
Life-cycle cost should be assessed to look at the total running of the building not just at present but throughout the future otherwise the costs of building usage and construction can deduct from technological advancement for new services and technological medical cures that would lead to people having to go to another hospital. The use of sustainability in building design and construction would lead to savings in the running of the building and could have an added befit of using natural means for ventilated, lighting and other resources in the building.

Cost/benefit – Cause/effect

In relation to the Danish building code for healthcare is classified as class 2, low energy buildings which is 26% less energy than the current regulation. This is for supplied energy for heating, ventilation, cooling, domestic hot water and lighting through the building.

Evidence based-design considers long-term concerns for the emerging medical changes and the strong focus not only on treating illness but also on restoring health through natural means. The natural environment in the use of light, views and natural landscape can improve the healing time and health of the patient.

Deliberation



ill.44.1

Who?

The aim of this project is to design a nursing home and assisted living for old people who have impairments and disabilities. The project will be based around old people 65 years of age and over as the primary user group. The reason for this is to establish the security of a community that will help with any changes that have altered old people's social habits and everyday living.

What?

The aim of the Assisted Living Older Persons Home is to create an environment based on the needs of the older people, with the focus of maintaining their independence and improving the quality of life for older people. The Assisted Living Older Persons Home will accommodate residences who range from level I to level V in assistance needs. They will be accommodated in a range of independent assisted living units, through to units that are associated towards a community in a nursing home environment. In addition to this, the environment of the building should consider well-being, therapeutic and homely factors that create a comfortable surroundings that fosters independence, interdependence, and individually in a stimulating, social community.

Why?

The purpose of the project is to secure the older people can age with a sense of security, dignity, independence and productivity of older citizens in society. The idea is to not, divide the different impairments and disabilities within the community and to integrate the residences into an environment that is self sufficient in their care and well-being.

Through the following chapters of different case studies will be investigated to create a basis to inspire the form finding process.

Overview of Case Studies

Introduction

Different aspects of nursing homes throughout Europe were studied, regarding the deliberation of investigations in relation to the design project. Two points of interest were the plan arrangement including the case study layout and the connections.

Through architectural examples of nursing homes, an understanding of different attributes and parameters will be obtained that can be used within the proposed design.

ill.45.1 Architect - Peter Zumthor
Project - Elderly Housing Project, Chur, Switzerland
1993

Plan Arrangement and Layout

Scale plays an important part of creating a homely environment. Defining the threshold of an entrance into a private space is important design factor to consider. The St Nikolau project clearly defines the entrance of the unit using contrasting materials. A common feature of the two projects is a feeling of openness leading up to the entrance to the unit. Though the Tårnåsen Housing & Activity Centre project has a long glazed hallway leading to the entrance of the unit a large amount of natural daylight enters into the space through the use of large windows. Much of this natural daylight is also incorporated into the design of the internal walls into the units through the use of secondary windows that are situated high in the wall into bathrooms of the residence units.

In the two projects the heights of the buildings range from one to two stories which relates well to the idea of being more residential than institutional.

In the formation of the floorplans, the public and personal space ratio is almost equal. Both floorplans have the main entrance of the building leading into the public communal spaces, where the personal units of the residence are situated way from the public spaces.

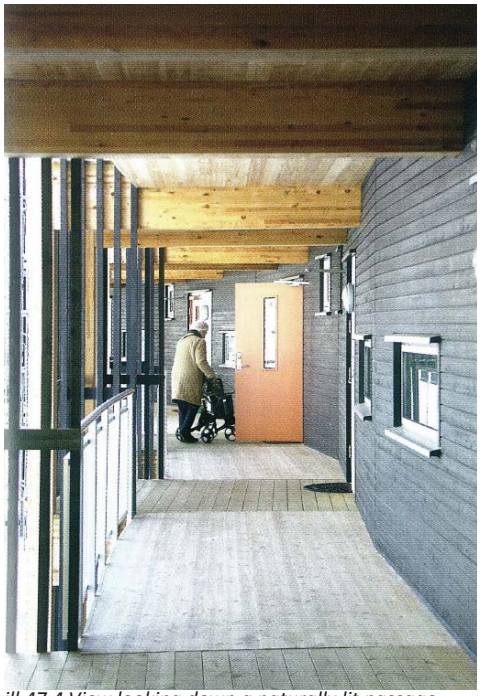
What makes the Tårnåsen Housing & Activity Centre relate well to the concept of a residential building is the choice of interior materials used. The building relates to the surrounding landscape in particular the forests by utilising the natural material of timber paneling on the walls and ceiling, though this may cause sound problems of reverberation and the travel of sound.

ill.47.1 External view of entrance off a walkway.

Illustration 47.1, 47.2 & 47.3.
Architect - Martini Architeken.
Project - St Nikolaus, Wipperfürth, Germany.

External walkways and areas outside the assisted living units that surround a external courtyard. Common area situated towards the street. Though the building is small the idea of having cluster building types could work. The external walkways can create spontaneous social interaction with other neighbors.

The entrance between the public space and private is clear from the walkway by the application of another material.



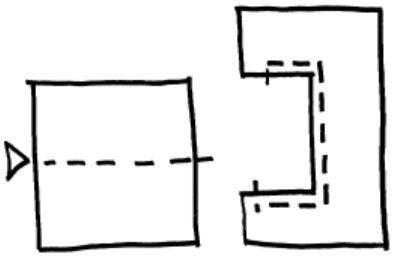
ill.47.4 View looking down a naturally lit passage towards a residence entrance.

Illustration 47.4, 47.5 & 47.6.
Architect - Kvernaas Arkitekter As. w
Project - Tårnåsen Housing & Activity Centre, Oppegård, Oslo, Norway.

The materials used take of a earthy texture of natural wood. The building curves around with a main passage that connects the units to the dinning room and common areas. Each unit has their own balcony and terrace to the outside. Natural daylight is utilized on both sides of the building. Additional secondary window light filter in the light from the glazed passage way.

"If it looks like housing, feels like housing, and smells like housing, then it acts like housing." [Regnier & Scott. P 59. 2001]

ill.47.2 Ground Floor Plan



ill.47.3 Simplified plan showing the access (dashed) throughout the buildings. The two different functions are separated by an open courtyard.

ill.47.5 Internal view from a passage towards a unit entrance.

ill.47.6 Ground floor plan

Daylight

Daylight is an important factor within these case studies. What they all have in common are large windows that utilize, natural daylight into the building. The Toftehaven nursing home comprises of a cluster of units that are connected with large glazed areas. Though these may overheat during the summer months, additional shading is provided by internal blinds, which also provides a homely feel. Internal light wells and atriums shown in Steinfeld project utilizes the natural daylight as a sustainable means of lighting the interior. This creates a soft light which reflects back to the interior by using soft or polished surfaces that reflects the light back into the interiors.

The Centerm project has the communal kitchen and dining room opening towards the daylight. The ceiling is racked towards the large windows allowing large amounts of daylight to filter in and reflect down onto the area. The space is bright and has a large visual connection to the outside. Different types of glass used as shading, to the top part of the windows blue glass is used which also creates a visual feature to the space.

ill.49.1 A buildings connection between the different area of the nursing home.

Illustration 49.1.
Project - Toftehaven, Ballerup, Denmark.

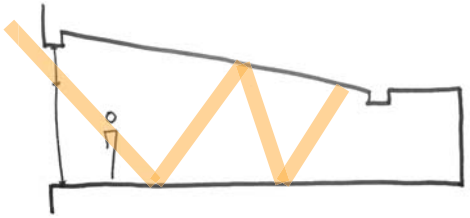
Using homely features such as blinds to the walking area can diminish the connections with a institution or a hospital setting.

Daylight fills the walkway giving an open view to the outside.

ill.49.2 The kitchen is an important social space for the residence & visitors.

Illustration 49.2, 49.3 & 49.4.
Architect - Dehan + Spinga Architects.
Project - Day-care Centerm, Le Creusot, France.

The kitchen area can be a therapeutic place where social interaction occurs. Within this design daylight adds a pleasant feature to the space.



ill.49.3 A sketched section of the kitchen & dining area with the natural daylight.

ill.49.4 Natural daylight can create a therapeutic space.

ill.49.5 Natural daylight that opens up the connections between rooms & functions.

ill.49.6 Integration of daylight & natural landscapes.

Illustration 49.5 & 49.6
Architect - Architekt DI Dietger Wissounig
Project - Residential and Care Home for the Elderly in Steinfeld, Austria.

Using internal gardens can help breakup large floor plans & integrate natural daylight into areas. Gardens can be a positive distraction for the residences. Natural daylight within the building can be beneficial for the wellbeing of the residence.

Plan Arrangement

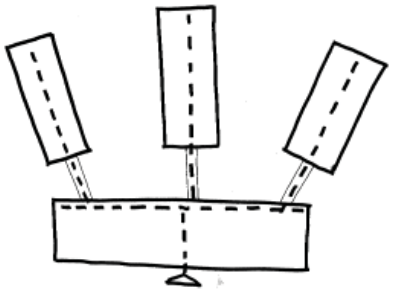
The buildings size can be either over whelming or more homely in scale. Within a small building the residence and staff can get to know each other which can help form familiarities in the surroundings to enhancing an emotional support system. Having cluster units can create a small neighborhood of people that can become close to each other. Within the environment other aspects of scale such as the size of the dinning room and living areas can help in the homely feel of the surroundings.

In Scandinavia many nursing homes have single occupancy units with their own bathroom that cluster around a small kitchen, dinning room and living room. Many of the dinning rooms have a single table which all the residents eat at, creating a family environment. This helps enhance the community environment and aids in the ability to motivate the residents in social interaction.

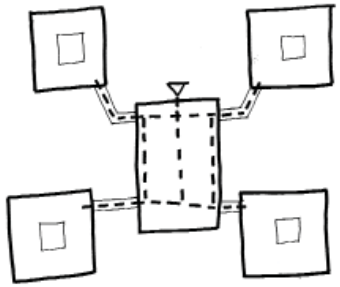
What makes an important factor in a majority of nursing home plans in the idea of cluster units that surround a small communal area. In figures 1, 2 & 5 shows a large main area where the smaller clusters extend off. What figure 3 shows is a long separate area the only houses the units. The distance to the main social area is far thus could create problems of some residence not being sociable & staying within their rooms.

With figures 4, 6 & 7 can be incorporated into the vertical cluster system where each floor can house a small group of residence who have a communal space to be social. The short length of movement between clusters is a positive factor in the vertical cluster system with a lift. A larger communal space could be situated on the lower or ground floor.

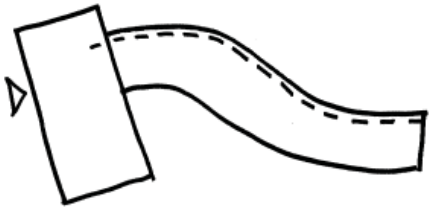
ill. 50.1 Mayfair Resthome, Christchurch, New Zealand. Architect: Paul Foley's Design.



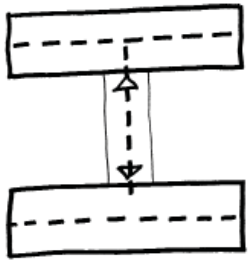
ill. 51.1 Cluster housing the radiates out from the main building.



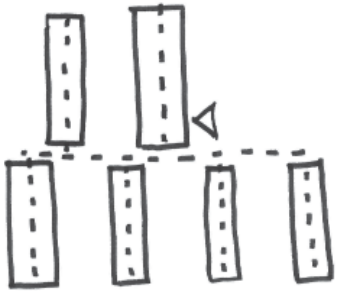
ill. 51.2 Cluster housing the surrounds the main building.



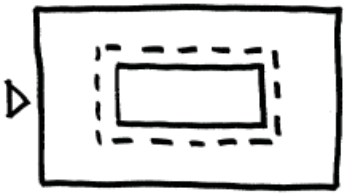
ill. 51.3 The main building becomes the social point that connects to the residence units.



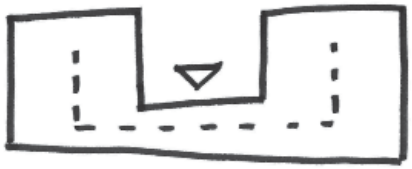
ill. 51.4 Cluster housing on different floors that are connected with a walkway.



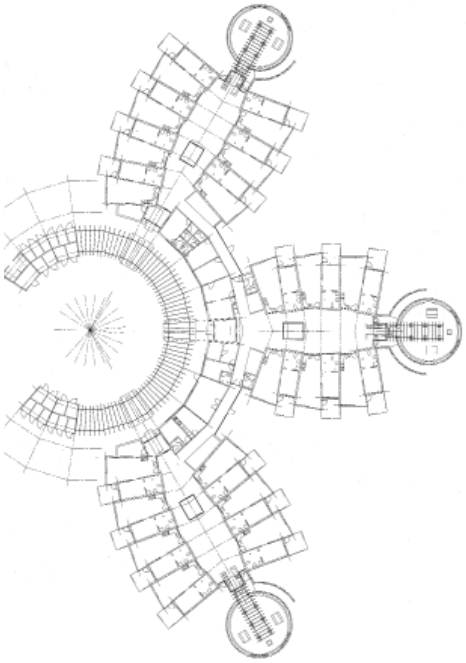
ill. 51.5 The main building becomes the social point that connects to the residence units.



ill. 51.6 Cluster housing on different floors, with a circular connection. The plan also has a visual connection around the floor plan.



ill. 51.7 The main building becomes the social point that connects to the residence units.



ill. 51.8 An example of cluster housing the radiates out from the main building.

Illustration 51.8 & 51.9
Architect -
Project -

The residential areas extend out from the main building & create neighborhoods. Within this space is a central area which the residence units radiate from. At the end of every cluster/neighborhood is the main social area the has a communal kitchen, dinning area & lounge.

The clusters are in close proximity to each other making additional social connections to other cluster easy.

ill. 51.9 Detail of the units & the outdoor terraces. Adjustable shading is integrated into the detailing of the windows. The windows are low for easy access

Personal and Social Space

Personal and social space is important in differencing public and private spaces. What a nursing home needs to provide is a space that a resident can call ‘home’. A unit should provide space that allows for personal belongings. In the two examples within the Toftehaven nursing home we see two residency units filled with personal furniture and belongings. The examples also show large windows that allow the daylight to filter into the unit in an addition to this; homely features such as curtains and blinds meant that the personal choice was the resident was applied.

Communal spaces within the project examples take on the persona of a homely environment through the use of natural daylight, furnishings and fixtures.

Through the examples we see that large windows from the residents units and communal spaces utilise the natural daylight and the stimulation of the surrounding contextual environment. The Frederiksberg Ejendomme floorplan shows cuts into the oval shape thus enabling natural daylight to penetrate the centre of the building.

Provide privacy and completeness and residential units

It important to have social interaction but also an environment that is private and secluded away from others, in addition to care provision and treatments. An individual residence should be flexible to allow for the residence furniture and belongings to be used to create a homely environment. What adds to the privacy and ownership of residences is to allowing personalised entrance areas to the unit such as room plate, numbers and artwork etc which gives each unit individuality and distinction.

Placement of staff in a non invasive way can help create a homely environment, by the use of concealment of the nursing stations behind netted curtains or blinds.

ill. 53.1 Large balconies extend out from the communal areas.

ill. 53.2 Large balconies extend out from the communal areas.

ill. 53.3 Large balconies extend out from the communal areas.

Illustration 53.1.
Project - Plejehjemmet Smedegården, Aalborg, Denmark.

A small viewing window allows for the carers to see into the communal area for safety reasons.

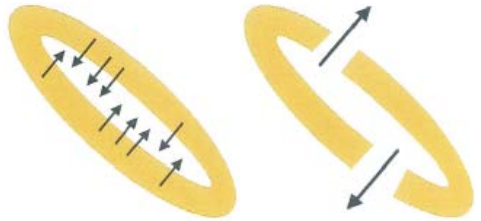
Illustration 53.2 & 53.3.
Project - Toftehaven, Ballerup, Denmark.

The Toftehavne nursing home has a range of different room types for the level of assistance a residences needs. Within the design of the units the space is large & open to allow for the residence to bring their own furniture.

Within these two examples the spaces have large windows which the residence have added their own curtains & blinds. The doors into the different space within the units slide back into the walls allowing for a clear opening for the residence to move through.

By allow for the residence to have their own furniture & memories give the resident a personal connection to the space. The space is large enough to have a few visitors but also has a homely feel through the personal possessions of the resident.

ill.53.4 View looking at the communal balconies.



ill.53.5 Concept of the floor plans shape & layout

ill.53.6 Large residence unit.

Illustration 53.4, 53.5, 53.6, & 53.7.
Architect - Frederiksen & Knudsen Arkitekter.
Project - Frederiksberg Ejendomme, Denmark.

Out of a design competition launched by the local authority came new housing complex which is defined as an 'hotel for senior citizens'. The grey slate coloured building stands out against the surrounding park. This set upon us thought that contains offices and facilities and fourth floors with 50 apartments for the elderly.

The floor plan is an elliptical shape houses 12 to 13 apartments that vary in size to the perimeter of the shape, surrounding the commonly used space to the centre. Through studies of other establishments showed the elderly and frail residents tend to spend most the time and these common areas they can meet their neighbors, where meals are served directly from open kitchen, and where nursing staff are always close by. Hence and motto that inspired the layout of a 'community at the centre'.

From the apartments full-length windows overlook the surrounding park. Within the plan of the elliptical plan to light shafts break the form allowing a full height of the building. Within the plan of the ellipsis the full building height light shafts break the shape of the building and allows daylight into the centre.

ill.53.7 Communal kitchen.

Connections

The surroundings of a nursing home are an important connection for the residents and staff. Both the two examples show connections to the outside extend out from the communal and private spaces within the nursing home. Much of the area around the nursing homes is landscaped with a mixture of hard and soft landscapes. External seating and garden spaces allow the resident to venture outside. This is reinforced in studies of evidence-based design connections to nature which have demonstrated the benefits to the well-being of the resident and creation a relaxing environment for the resident.

Within the context of the examples shown, the scale ranges from 1 to 2 stories which complement the surrounding building scale. This is important within the design of the nursing home. When designing in the central city to scale the buildings are a lot larger creating the focus of scale to the interior rooms of the units and home.

ill. 55.1 Large balconies extend out from the communal areas.

Illustration 55.1.
Architect - Vilhelm Lauritzen Architects.
Project - Toftehaven, Ballerup, Denmark.

The new addition to the nursing home works more with the concept of an homely environment. Every residence has their own outdoor space being a terrace or balcony.

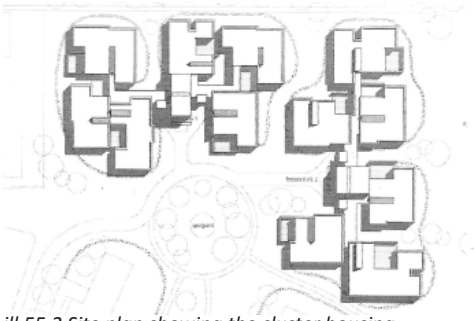
Around the building additional architectural functions such as a stair are incorporated into the design of the building. This breaks up the continuity of a large facade of the nursing home but also gives the residence a chance in using the stairs for physical exercise.

Illustration 55.2 & 55.3.
Architect - Mensel & Kasten
Project - Løgumgård, Denmark - design proposal

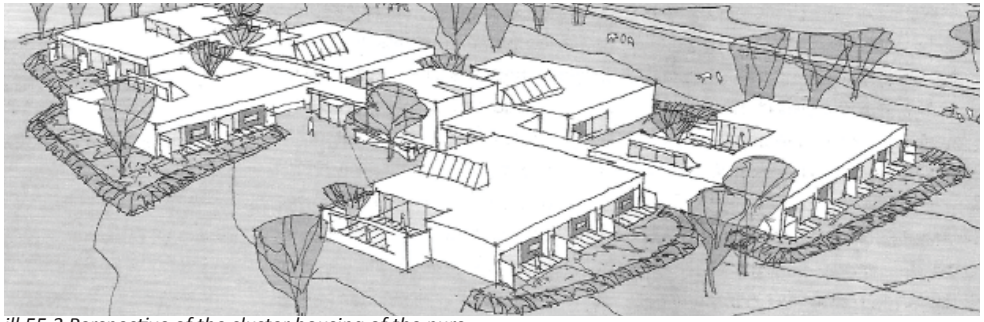
The site plans of the project has cluster buildings that extend out from the main buildings of the nursing home.

Through the use of scale throughout the building, the main entrance and buildings are higher than the cluster units of the residence. Large simple geometric forms are used with window lights that fill the communal space with daylight.

Small terraced areas extend from the private units and out from the semi private, communal spaces for the residence.



ill.55.2 Site plan showing the cluster housing.



ill.55.3 Perspective of the cluster housing of the nursing home.

Connections

Connections with the public and visitors of the residence are beneficial to physiological health and well-being of the residents by creating a stimulating environment where social interaction occurs. In the nursing home of Plejehjemmet Smedegården, a communal restaurant is open for the public and visitors to use, which integrates the surrounding residents which in turn creates a stimulating environment enabling social interaction for the resident.

The example of Toftehaven, Ballerup, shows the communal spaces are large and open to natural daylight. Within the two figures 57.1 & 57.2, the space is divided into smaller social spaces through the use of furniture.

Maintain connections with the surrounding community

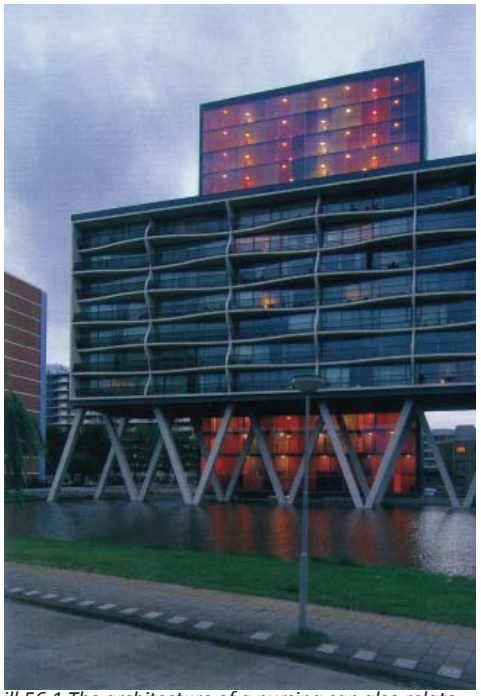
Integrating residents into the community instead of isolating them is important as many of the activities within the community will allow residence to draw a wider range of interactions rather narrow choice in the existing residence. Within the area there are many old people who live in their home that still require social interaction which the nursing home can provide.

What some European countries have done is to establish a community base centre, which offers many activities from social to well-being services. These services come in a range of physical therapy, meals, adult daycare etc. Many examples of nursing homes in Europe mix the buildings use, locating the nursing home in a dense housing area or above commercial shops on the lower floors.

Illustration 56.1
Architect - Arons & Gelauff Architecten.
Project - Residential Housing for Senior Citizens in Rotterdam, Netherlands.

Architecture can become a stimulating part of the landscape. This building the integrates the building into the surrounding residential area & creates a focal point. What this building shows is how a new way of thinking can create older peoples homes or nursing homes that relates to the surrounding residential context.

Ever country has a defined norm for different areas in a city or rural landscape for housing & nursing homes.



ill.56.1 The architecture of a nursing can also relate to the surround urban context.

ill. 57.1 The use of furniture can break up large spaces into more personal social spaces.

ill. 57.2 Light fills the area, creating an open light filled space.

Illustration 57.1 & 57.2
Project - Toftehaven, Ballerup, Denmark.

Within many Danish nursing homes the focus of the communal areas is the kitchen & dinning room areas. Much of the lunches & dinners provide a social environment that is found within a homely situation.

Keeping a small number of residences per cluster makes the communal area more personal & allows for the residences to get to know each other.

Within the Toftehaven nursing home the kitchen is open to the dinning room area, allowing the residence to either help or watch as the staff prepare the food. The area is light with the large windows the view out onto the open grass area around the nursing home.

ill. 57.3 Large open atrium that runs the length of the building allowing natural daylight into the building

Illustration 57.3.
Project - Plejehjemmet Smedegården, Aalborg, Denmark.

The large atrium has the main restaurant for the nursing home but is also open to the public in the community & any visitors. Around the atrium are small clusters of seating which allow for spontaneous socializing & creates an inviting environment for family & friends to come & visit the residence.

The atrium utilizes the natural daylight which creates an open, light area that stretches between the residences areas.

Though the interior is open to the outdoor daylight, the entrance is small and uninviting for the public to venture inside.

Focus on health maintenance, physical movement, and mental stimulation

There are long-term economic advantages in maintaining health and independent lifestyles for old people. Exercise therapy which builds the body strength and maintains muscles structure can control problems like incontinence. Activities that stimulate the mind such as reading or social activities can help form friendships but also may facilitate personal feelings. In turn the contact can counteract against depression.

Within Denmark some examples and nursing homes include the old people in the maintenance of everyday life within the home. The design of corridors, courtyards, and garden can facilitate and create an atmosphere that is warm and inviting to promote exercise. Atrium that have an indoor garden environment allow the residents all year access to an environment that has many outdoor attributes.

The internal and external environments around the building are important. Internal sitting room interiors that provide natural daylight and interesting views can help stimulate the mind. Other attributes that encourage mental exercise is to use of art work and photos that stimulate memory that can help recall positive past associations.

Within some examples of existing nursing homes the idea of integrating different design elements such as daycare for children allows old people and interesting view of watching the children play within the daycare centre. Other therapeutic benefits are animals which can insist on emotional responses through the senses and affection that pets provide. [Regnier & Scott. 2001] In addition to this many studies of evidence-based design, looked at the therapeutic benefits of having outdoor garden spaces. In Northern Europe it is typical for residents' rooms to extend out onto an outdoor patio or balcony. Outdoor areas have raised planted beds that allow wheelchair-bound residents access to the different textures, colour, and aroma of plants.

Connections to Nature and Sensory Stimulation

Natural daylight is significant for the health and well-being of the residents and staff. In addition to this, these examples show the connections to nature can create a stimulating environment that could potential help relieve the residents of pain and stress. Throughout the duration of the year residents were visually connected to the natural surroundings from inside the nursing home. The samples show a strong visual connection to the outside landscape is seen from the communal areas.

ill.59.1 A mixture of hard & soft landscaping

ill.59.2 All communal spaces have access outside onto a terraced area or to a balcony.

Illustration 59.1 & 59.3
Architect - Arkitema Architects
Project - Christians Have - Plejeboliger og ældrecenter, Denmark

The landscape shown extend out from the building in town to the natural water off the lake. The surroundings to the nursing home is a mixture of natural landscape and more dictation at mix of hard and soft landscapes. What this project integrates as a natural view that extends out from the allowing easy access for the residents to venture outside.

Illustration 59.2
Project - Plejehjemmet Smedegården, Aalborg, Denmark

Large pockets of the mixed landscape opens up from the communal areas of the cluster housing. French doors extend out onto hard paving, where outdoor furniture situated for the residents to utilise.

ill.59.3 natural daylight and landscape views are easily accessible to the multi-floor nursing home. This picture shows an elderly woman enjoying the sun.

Illustration 59.4
Architect - JSWD Architekten, Köln Olaf Drehsen
Project - Social Center with Housing for the Elderly in Düren, Germany.

Functional garden spaces can extend the freedom of a homely situation to the outdoors. Gardens can play an important part is a residence connections to the nursing home. Areas that have pot plants & gardens should be accessible to the residence.

ill.59.4 an external courtyard extends the curricular formations of the building. External lighting helps provide official connection throughout the night.

PROJECT PHASE

Context

ill.62.1 Map of Denmark

Introduction

Through an investigation of the Aalborg's local plan and visual studies of the area an overview and understanding of the limits of the site will be discussed. Within the regeneration of the area additional information regarding the nature and the surrounding of the site will be examined. From the investigation of the context, a design criteria will be formed to translate into the design of the proposed building.

Location

The site is situated close to the railway bridge towards the water front of the Limfjorden in Nørresundby, north of Aalborg. The study area has become one of the most central and highest priorities in the regeneration of old industrial land that extends towards Vestergade and the two bridges; Limfjordsbroen and the Railway Bridge.

Originally the area was a slaughterhouse house which opened in 1892 providing employment for hundreds of people of Nørresundby. In 2004 the site closed changing the industrial cultural heritage of Nørresundby and Aalborg. [aalborg-kommune.dk]

Since 2004 there has been rapid development of the site with a mixture of residential and commercial buildings uniting the public and private areas of Nørresundby and the water front of the Limfjorden.

The Nørresundby have a strong vision *"The overall objective of this area is to create an efficient and exciting urban area with significant, contemporary buildings and outdoor spaces of high quality."* [Lokaplan. 2006] for the area which consists of 16 planning zones. Each of the zones referenced in the local plan contain conditions restricting the type, height, depth, number of carparks, materials and placement of the structural and fixed elements of the buildings.

Owner and Designers of the Area

Around the proposed building site area, recently constructed residential blocks have been built, which are owned by A. Enggaard A/S and TIKA Holding A/S and were designed by Schmith, Hammer & Lassen (SHL), Danish architects situated in Arhus. The area to the bottom left is known as B3 area. B3I is planned to be an "architectural experiment", which is a competition area for the Bolig + project. B3II is to be mixed use building ranging from 3 to 5 stories high.

Vision of the Area

The vision for the area is to have a place that is coherent with different types of vegetation that is integrated into a built setting. This will relate well to the creation of an environment that is opens up to the pubic but also has areas that share a strong association to the surrounding buildings.

Within the area a cross section of different business activities will be integrated into the overall plan of the area. This will work with the idea that the area should be self sufficient in establishing residential housing and other uses that creates a vibrant area which is constantly used throughout the day. The area is to extend the existing Northeast of the local plan area is the historic centre of Nørresundby with shopping and close to urban settlements.

In the future a pedestrian and cycle bridge attached to the existing railway bridge will connect Himmerland and Vendsyssel together. The foot bridge will have different cultural installations, such as water fountains, a platfrom etc. The project is expected to be finish in the next two to three years. [kulturbroaalborg.dk. 2011]

ill.63.1 Map of Aalborg.

Building Plot

- Plot type B1 and D1
- The area's land area is approx. 99,400 m 2
- Maximum construction area – 72,000 m2
- 30,000 m2 residential
- 17,000 m2 business
- 25,000 m2 either residential or profession
- 95% of the development total floor area to be residential
- 30% green area
- Minimum area of 100 m2 for children's playground
- B1 & D1 plot size is about 6353.70 m2

[Lokaplan. 2006]

ill.63.2 Aerial view of Nørresundby and proposed site.

ill.64.1 Green space to the west of the site, looking along Strandpark.

ill.64.2 Lokaplan diagram showing the noise levels from Vestergade (shown in red the high noise level).

ill.64.3 Willow is an example tree that can be used to assist in soil remediation, that could be incorporated into the design of the area.

Green Spaces

Green spaces play an important part in the redevelopment of the area. In the local plan a strong emphasis has been placed on creating significant architecture with outdoor area of the highest quality. Much of the green areas are a mix of public, semi public and private spaces between the buildings, that range from gardens to recreational purposes that will add to the quality, characteristic of the area.

Due to the nature of the area all buildings have been raised one metre above the ground level due to predicted tide levels of the Limfjorden. This creates a natural barrier between the public and private area without completely closing off the areas.

Noise

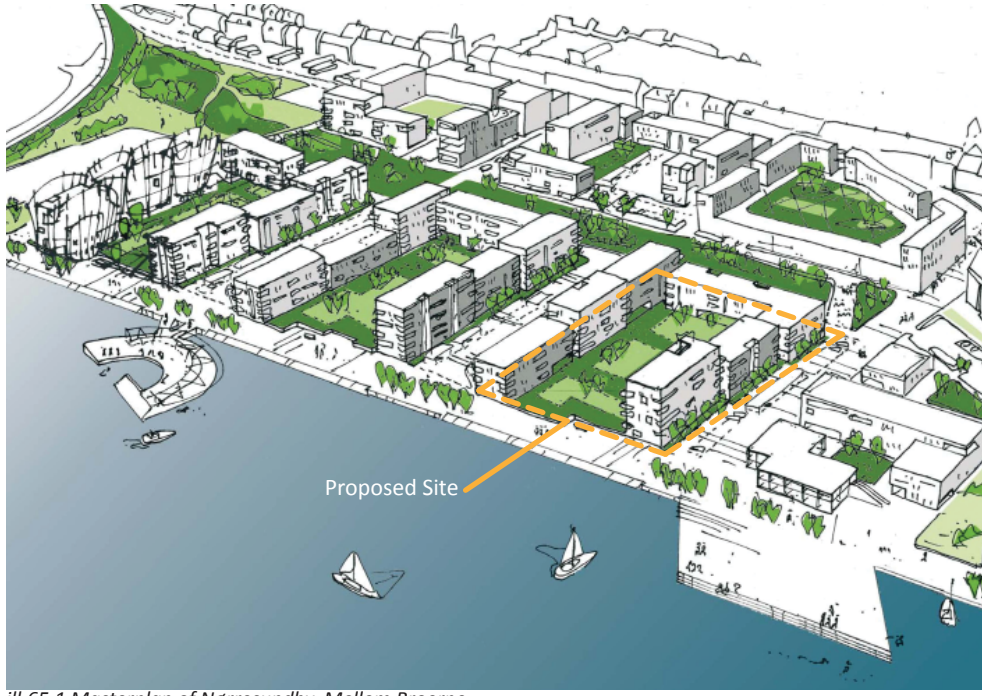
Large amounts of traffic noise comes from the Vestergade which runs towards the Limfjordsbroen Bridge, but also noise and vibrations around the building site from the railway track to the west of the site. Around the northern part of the site the traffic noise ranges from 50 dB to 55 dB. Studies have shown a the connection between stress hormones and any noise over 55 dB, thus making it important that the building is protected from the external traffic noise.

Within the whole area zoning of different building uses are depicted by the noise from Vestergade. The local plan looks upon Vestergade as not suitable for residential dwellings and sees the extension of business functions is a location along Vestergade also advantageous to the area. To this area the residential and office building zones are set back for a maximum level of traffic noise in areas to be used for residences is 55 dB and 60 dB for offices.

Environmental Contamination

As a result of former industrial activities much of the area's soil and groundwater is contaminated predominantly with petroleum hydrocarbons and heavy metals. Other sources of potential contamination include runoff from the existing railway and road. Although the environmental and human health risk associated with existing contaminated soils and groundwater is acknowledged in the local plan consideration has not been given to assessing the site to determine the extent of the contamination.

With this in mind additional assistance for soil remediation could be incorporated into the design of the area. Certain species of trees such as willow can be used to clean contaminated soil and ground water from wide range of contaminants including petroleum hydrocarbons. Using trees in the remediation of a former industrial site is an added benefit to the environment and surroundings which would be landscaped with many trees species. Other soil remediation methods include the installation of a low permeability cap at the site that is robust enough to prevent direct contact with contaminated soil and preclude further upward migration of contamination. The cap may be constructed from soil, clay, synthetic material although the use of the former would mean that lawn could be laid over the top.



ill.65.1 Masterplan of Nørresundby, Mellem Broerne, sketch

ill.65.2 Sketch proposal of Nørresundby, Mellem Broerne.

ill.65.3 Sketch proposal of Nørresundby, Mellem Broerne.

ill.65.4 Transitory Dwellings In Parla Madrid/ Rueda Pizarro Arquitectos.

ill.65.5 Retirement Home, Riedisheim, France / Atelier Zündel & Cristea. 2009.

ill.65.6 Y House, Beijing, China / Beijing Matsubara and Architects. 2007 – 2009.

Building Plot

Local Plan Requirements for B1 & D1

- B1 building depth should not exceed 16.0 m incl. balconies
- D1 building depth should not exceed 14.5 m incl. balconies
- Maximum balconies accommodated in 1 / 3 of the façade length.
- Floor Levels
  - 2 – 9.2 meters
  - 3 – 12.8 meters
  - 4 – 16.4 meters
  - 5 – 20.0 meters
  - 6 – 23.0 meters
  - 10 – 38.0 meters
- Parking
  - 1 ½ per residential house/apartment
  - 2 per townhouse/duplex
  - 1 per 4 nursing home dwellings
  - 1 per 100 m² average per commercial business

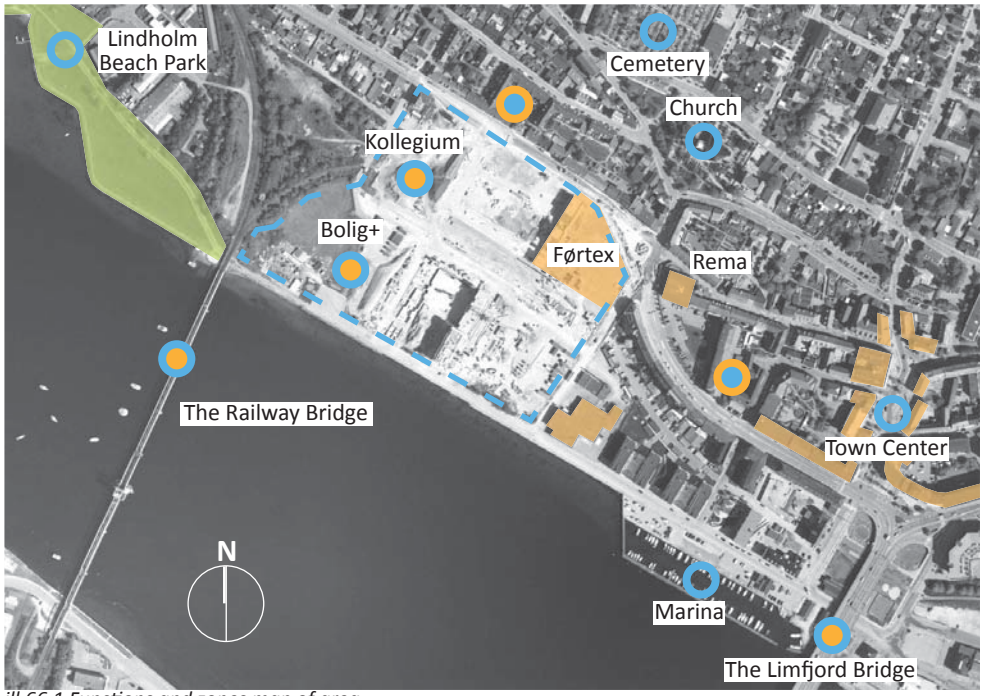
[Lokaplan. 2006]

KEY

- Nodes
- Landmarks
- Existing Nursing Homes
- Green Space
- Commerical Buildings

Functions and Zones

The proposed area connects to an existing open, green space to the western part of the study area. To the northern part of the study area dense residential housing can be found. This ranges from a combination of apartments in the central commercial district which changes in accordance with the typology of the land to single family houses and spaces apartment blocks at the top of the hill. Around the Limfjordsbroen bridge there is situated the commercial functions of the area that surround a city square and down the main roads, Vestergade and Østergade.



ill.66.1 Functions and zones map of area.

The area is populated with people of diverse backgrounds and age groups. Much of the area could benefit from a community centre for the older people. When looking along the streets of Vestergade the bus stop is situated opposite to the new Førtex supermarket down from the traffic light intersection, which has pedestrian crossing at all sides. Around different areas restaurants and other actives such as hairdressers, banks, shops etc. The area also contains heritage site such as a church from the 20th century.

The Fortex supermarket is located at the corner of Vestergade and Vesterbrogade, which acts as a focal point that different footpaths and roads lead to. Additional walking and cycling paths can be taken down through the city square toward the water front of the Limfjorden. The aerial photo shows the areas of heavy traffic, medium and light traffic, including the pedestrian access to the green areas.

The surround areas show three retirement homes in close proximity to the proposed building site. Extending out to these homes could be beneficial for social interaction in extending out the community of older people.

ill.66.2 Back entrance of Førtex. North of the proposed site.

ill.66.3 Existing marina off the Limfjorden, east of the proposed site.

ill.66.4 Newly built student kollegium, west of the proposed site.

ill.67.2 Looking towards the south - east of the site with existing apartment blocks in the background.

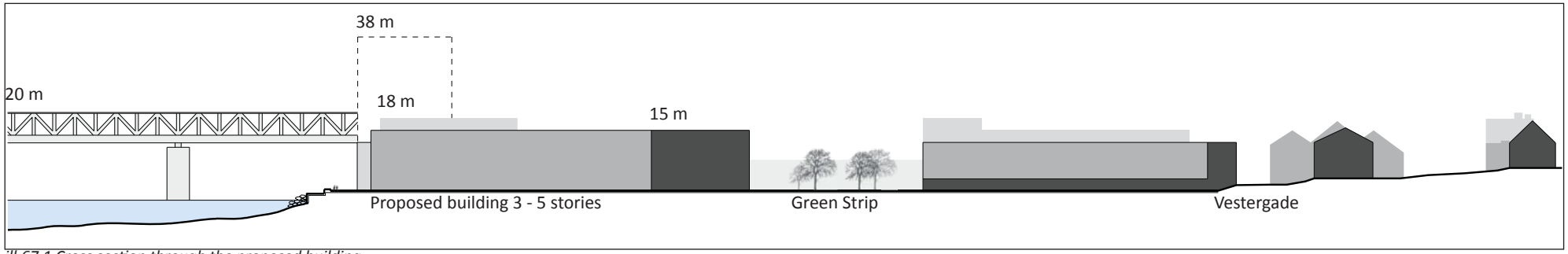
ill.67.2 Existing apartments, west of the site towards the marina.

Topography

In the plan of the area different colours represent the different building heights as found in the Nørresundby Municipality Local Plan.

Within the cross section of the area the railway track/bridge and the future Bolig+ building stands as the dominate part of the area as the height is larger than the other proposed buildings.

ill.67.2 Topogrphy of proposed development.



ill.67.1 Cross section through the proposed building development.

KEY

Railway / Train

Light Traffic

Medium Traffic

Heavy Traffic

Bus Stop

Paths

Vestergade is one of the main aerial routes that connects the western part of Denmark with Aalborg. Here the road has a large amount of traffic ranging from cars, trucks, the main bus route and cycles. When approaching Nørresundby from Aalborg via the Limfjordsbroen, the road splits into two main roads, Vestergade and Østerbrogade becoming Østergade. Here the intersection is large and cumbersome for pedestrians coming from Aalborg. Much of the heavy traffic uses this route. The map shown looks at the different traffic flows through Nørresundby, primarily the proposed buildings area and additional information regarding existing and future pedestrian and railway paths.

ill.68.1 Paths map of area.

ill.68.2 Pedestrian footpath east of the site leading from the Limfjorden towards Vestergade.

ill.68.2 Train crossing the Limfjord railway bridge.

ill.68.3 Bus stop on the opposite side of Fortex.

ill.69.1 Winter sun over the Limfjord. with Aalborg in the background.

ill.69.2 Evening time during summer.

ill.69.3 Ice low lying sun during over the Limfjord in winter.

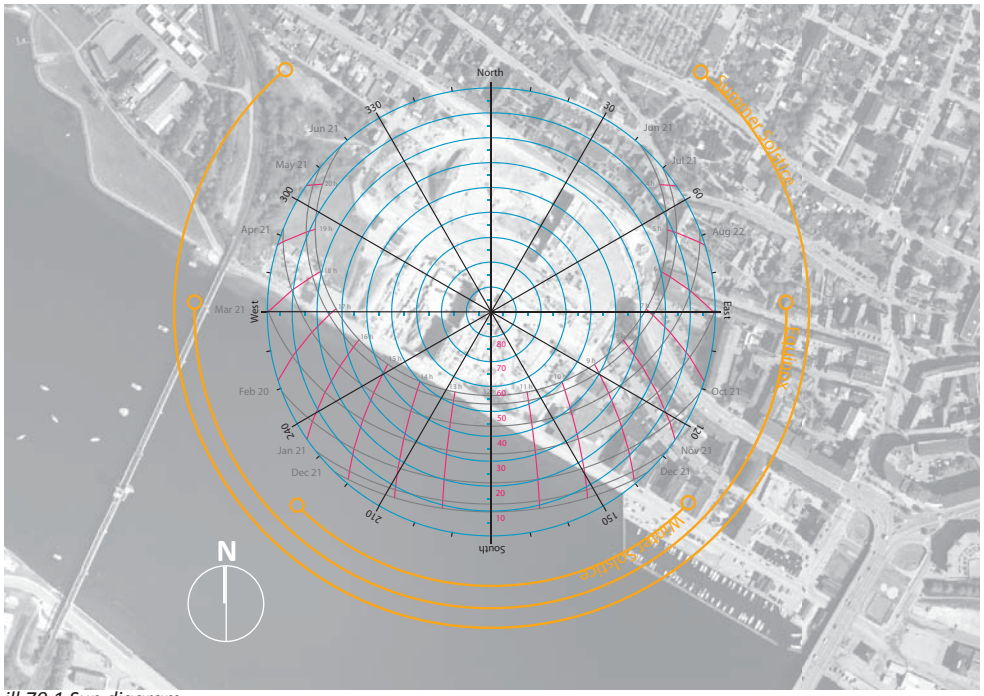
Climate

An initial investigation of the sites sun and wind direction, benefits and problem will be considered. The aim is to get an overview of the natural macro-climate and the local conditions of the sun and wind.

Why is this important factor for older peoples' housing and retirement homes? During this study many points of the health and wellbeing of older people are in response to the rising cost of healthcare and the growing numbers of older people globally. In Denmark and New Zealand the government has policy's that provide for publicly funded healthcare thus the changes in the care of older people can be an added strain on the resources of the existing system. In the future, buildings and health will have to look at being more cost efficient. From the perspective of construction the concept of passive housing can ease costs by relying on good architectural design that captures natural resources for heating and cooling.

Daylight

Danish architecture considers daylight as being important for animating a building and therefore an important factor required for good health. The importance of daylight extends into the Nordic winter months where there are less daylight hours during the day. Average daylight hours in Denmark range between 0.6 hours per day in December and 8.2 hours per day in June. [climatetemp.info/denmark/. 2011].



ill.70.1 Sun diagram.

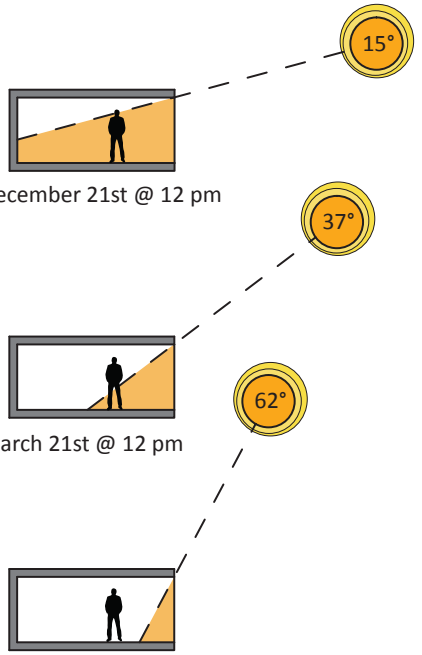
Daylight helps humans with health and routine throughout the day and night by, allowing a visual connection to the task at hand, in the control of the body's circadian system, absorption of vitamin D, affecting mood and perception, and by facilitating chemical reactions in the body (melatonin levels). While large windows can help with the visual connections of a view and in getting a lot of daylight inside many problems can also occur, such as heat over loading in the summer months and cooler winter months due to the size of the windows. The sun diagram shows the angles of the sun over the year which will help add in the design and position of the building to gain solar heating during the cooler month throughout the year.

During the winter months between, November to February it is important to have a natural heat gain from the sunlight. During the winter solstice on the 21st of December the sun is at its lowest, which means that the sun can penetrate deep into the building but doesn't have the needed light hours to heat up a building.

In the spring and summer month the opposite problem occurs with the overheating of a building during the summer from April to August. During the summer solstice on the 21st of June, the sun is at it highest angle, but doesn't filter deep into the building. The number of daylight hours during the day in longer and therefore can be a problem with overheating.

When concluding the sun study the dominate heat gain is from the south. This would influence the shape of the building, orientation of windows, size of windows and the buildings expression due to shading etc.

Another issue regarding the site and daylight are the shadows from existing and proposed building that surround the proposed site. Through a small sun study of the site and the winter solstice on the 21st of December and the summer solstice on the 21st of June.



ill.70.2 Sun intake.

Context Sun Study

The sun study shows there is an optimal amount of sunlight to the site and surrounding buildings do not exhibit the sunlight from reaching the site.
During the winter months the existing and proposed buildings to the west are low lying buildings which allow a substantial amount of sun to reach the site. However, it is proposed in the local plan to have a higher building to the north west of the site which may have an impact on the rest of the site during the winter months in terms of shading.

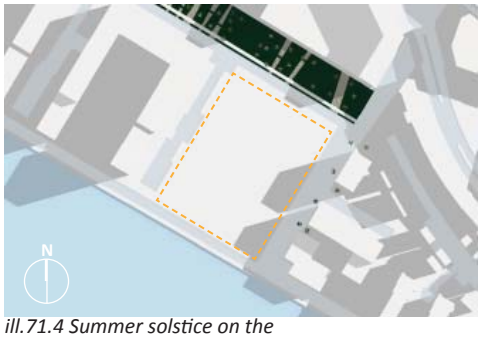
During the summer months the morning and afternoon sun reaches the whole site without much shade from existing and proposed buildings. In the evening the existing building to the south of the site shades the site by 30%, though the northern part of the site overlooking the fjord is still exposed to any the sun.

During the summertime shading would be needed to stop overheating within the building. This is contrary to the winter months where the sun pathway could be designed into the building for natural daylight and heating within the different functions of the building.

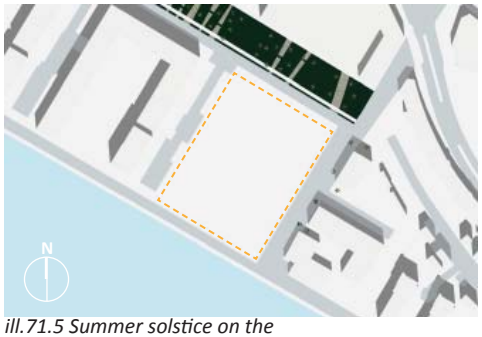
ill.71.1 Winter solstice on the 21st of December – 08:00.

ill.71.2 Winter solstice on the 21st of December – 12:00.

ill.71.3 Winter solstice on the 21st of December – 16:00.



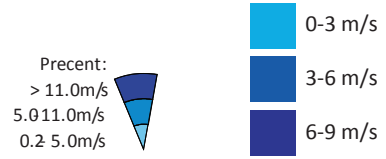
ill.71.4 Summer solstice on the 21st of June – 06:00.



ill.71.5 Summer solstice on the 21st of June – 12:00.

ill.71.6 Summer solstice on the 21st of June – 18:00.

KEY

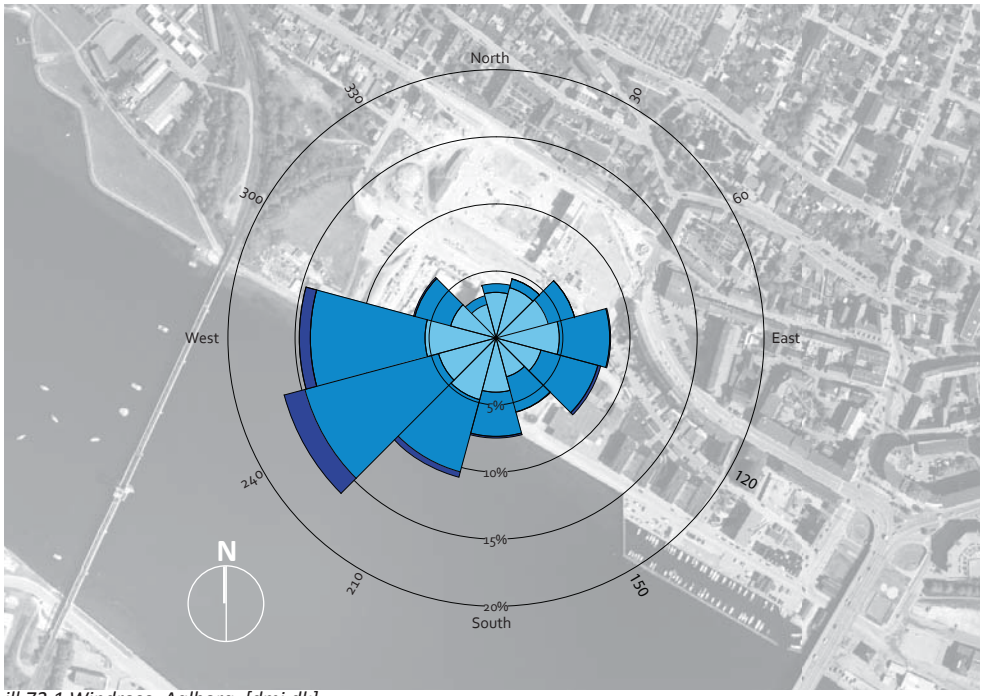


Wind

When considering the site that main concern is the wind condition in relation to the utilization of natural ventilation and impacts of the wind on the outdoor spaces.

The wind rose diagram shows the annual wind speeds and direction over Aalborg. The dominate wind comes from the west and south west of the wind rose, and therefore should be considered in the final design of the building. From an economic perspective, natural ventilation can be utilized in the design future running cost of the building. Other considerations regarding ventilation taken into account is the surrounding areas with the existing buildings and vegetation that could block ventilation to the building. Also the contaminated of the soil if not remediated may also become a problem, which filters wound have to be installed to ensure the indoor air quality is high.

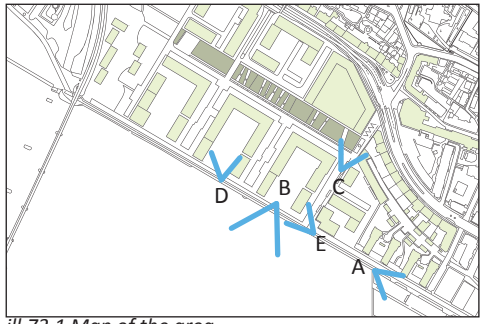
Due to the close proximity of the Limfjorden to the site, sea breezes can be created by the change in temperature of the land compared to the fjord. The cool air from the fjord, flows towards the land creating a cooler breeze near the coast. The strength of the sea breeze relates to the temperature difference between the sea and land. [Wikipedia. 2011] This could become a problem when there is excessive force of wind to the outdoor areas could deter older people from going outside to get active making it an important factor to incorporate landscaped areas to the buildings surroundings.



ill.72.1 Windrose, Aalborg. [dmi.dk]
Total number of observations = 29202 Calm defined as speed <= 0.2 m/s Number of observations with calm/varying wind: 1204 = 4.1 %

	%	% 0.2 - 5.0 m/s	% 5.0 - 11.0 m/s	% > 11.0 m/s	Mean Spead	Highest Speed
N	4.1	3.4	0.7	0.0	3.2	10.3
30	4.6	3.9	0.7	0.0	3.2	10.3
60	6.1	4.0	2.0	0.0	4.1	11.8
E	8.6	4.7	3.8	0.1	4.8	14.5
120	8.1	3.5	4.4	0.2	5.6	16.5
150	5.7	3.0	2.7	0.0	4.9	14.4
S	7.5	4.1	3.3	0.1	5.0	15.9
210	10.7	4.8	5.6	0.4	5.6	18.0
240	16.4	4.4	10.3	1.6	6.9	21.1
W	14.7	5.3	8.6	0.8	6.3	20.1
300	6.4	3.5	2.8	0.1	4.9	15.4
330	3.2	2.6	0.6	0.0	3.4	11.8
Total	95.9	47.2	45.3	3.4	5.3	21.1

ill.72.2 Wind average. [dmi.dk]



ill.73.1 Map of the area.

Views

The site has many views of natural and built areas the surround and fold in and around the proposed building.

As noted above in the section on climate the areas natural views looks towards the south which would mean in the building design large windows would be used to utilize the views and natural daylight. In addition to this problems may occur in the summer months with over heating and large amounts of glare from Limfjorden.

Within evidence based design much of the research supports the importance of having a natural view. Around the area there is much to see from the building site but also while walking around the area. Within close proximity of the site are large natural green space that has seating along the pathways. When looking at the area and the strong connection with nature can have a positive affect to depression, but also entice the older people to venture outdoor to exercise.

Other areas of Aalborg have walking clubs for the older people. This could be incorporated into the community of Nørresundby Midtby but also the surrounding area allowing social interaction between people but also provided the incentives for physical exercise.


ill.73.2 View A. View looking towards the marina & the Limfjord Bridge.


ill.73.3 View B. A panaromic view towards (south) the Limfjord from the site.


ill.73.4 View C. View looking through towards, Vestergade. The back of Fotex on the left.


ill.73.5 View D. Existing apartment block with a 1 metre high plinth to protect the building from flooding.


ill.73.6 View E. View looking back towards the railway bridge.

Conclusion - Context Analysis

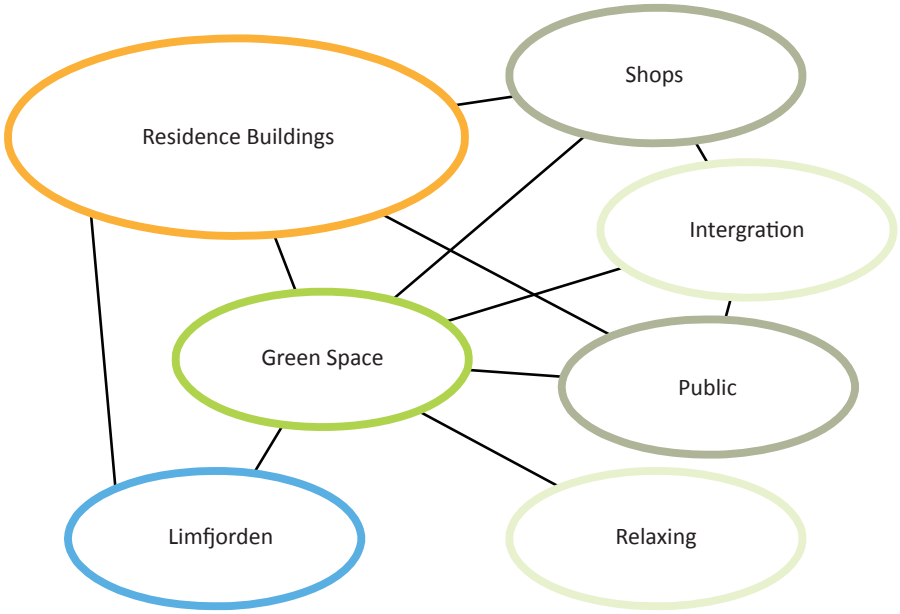
The position of the site has many positive factors that can be integrated into the overall area and the proposed buildings design. The site has a strong connection with natural features such as the fiord (water) as it is located flush with the Limfjorden which stretches across to Aalborg. The direction of the view opens towards the sun drenched south of site allowing the design to open its windows to the view and warmth of the sun.

The area existing buildings consists of the semi public and public areas that do not seem to be utilized by the public and residents living in the area. Pedestrian walkways are situated along the waterfront yet the connections to green areas are only seen to the western side of the site beyond the railway bridge or to north where there is a long stretch of green space that turns its back on the sun and view.

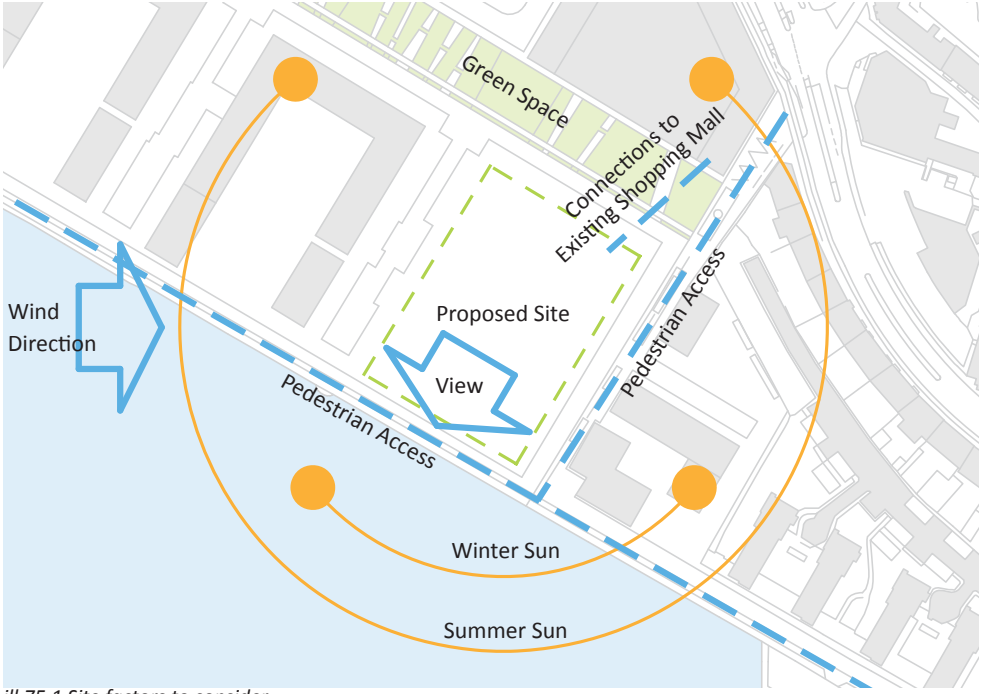
Using the proposed function of the building design, the idea is to create a stimulating surrounding for the buildings residence. The layout of the building and site area should try and connect the public and green spaces with the pedestrian areas to create an environment that is constantly utilized by people throughout the day. Much of the space can hold multiple uses for all age groups such as families with children that can come and use play functions but also to socialise with other people through public amenities such as a cafe. What is seen as an important factor in the research of the older people's nursing homes in the need to create a homely yet sociable environment. Connecting the public with the residents of the nursing home can help diminish the connection with the institutional side of older persons care to the freedom of socialising.

The macro climate of the site can be utilized through the sustainable aspect of the design by using the sun and wind as an integrated part of the overall design. While the site has an optimal location that is near a natural water body and situated towards the south, other disadvantages should be considered. The future changes in the climate as a result of anthrogenic activities could have a considerable impact of the materials and design of the building. The close proximity to the fjord and susceptibility to rough winds could expose the building to natural hazards by creating undesirable outdoor environments, therefore shading from sun and sheltering from the wind must be created.

Through the context analysis aspects for the building design and area there are many factors to consider. On the following page aspects of design factors are concluded and address the following:



ill.75.1 Conceptual thoughts in regards to the connections to the site.



ill.75.1 Site factors to consider.

- Relate to the existing surrounds of the site
- Utilising the public by creating stimulating views for the residence
- Integrate the community into the design
- Open up towards the south sunlight and view over the Limfjorden
- Utilise the natural sunlight and wind for the sustainable factor of the buildings design

Room Program

Total Room Program

The room program for the nursing home is based on an architectural competition for the Gødvad Plejecenter that gave an overview of a proposed center for 40 residents. There has been additional rooms placed into the program such as a laundry etc.

The final part of the room program shows the areas for the apartments which will share some of the stair well of the nursing home.

Through the investigations of older peoples care, it was found more important in establishing a place that catered for their needs but also an environment that enabled social interaction with other people. This was found important in creating a place that didn't feel institutionalised.

Through the introduction of other building functions the overall building area for the site may be over the proposed buildings persentage for the area as stated in the Aalborg Local Plan.

Room description	Area m² (netto)	Sub Total	Comments	Light	Operative Temp. Sum/Win	Air Ch.	**Natural Daylight**	**Outdoor Access**	**View Nature**
Main Entrance	50			Bright, indirect sunlight, 2500 lux min 2 h, 500 lux.	25 ± 0.5 °C / 22 ± 1 °C	5 h-1	+	+	+
Wardrobe	20		150 simultaneous users. At minimum 10 meters of coat-hanger-rod. Approximated .075m2/person	Bright, indirect sunlight, 2500 lux min 2 h, 500 lux.	25 ± 0.5 °C / 22 ± 1 °C	5 h-1	-	-	-
Toilets	16			200 lux.	-	0.5 h-1	-	-	-
Café	378		Seats 150 for eating. 2.1m2/person. Can with sliding walls be divided into 2 large rooms.	Bright, indirect sunlight, 2500 lux min 2 h, 500 lux.	25 ± 0.5 °C / 22 ± 1 °C	12 -15 h-1	+	+	+
Café Kitchen	100			Indirect, bright 500 lux.	25 ± 0.5 °C / 22 ± 1 °C	8 h-1	-	+	-
Café Storage	30			-	-	-	-	-	-
Workshop	56			Bright, indirect sunlight, 2500 lux min 2 h, 500 lux.	25 ± 0.5 °C / 22 ± 1 °C	5 h-1	+	+	(+)
Workshop Storage	20			-	-	-	-	-	-
User Toilet	5			200 lux.	-	0.5 h-1	-	-	-

Physical Training	158			Indirect, bright 200 lux.	23 ± 0.5 °C / 21 ± 1 °C	7 h-1	+	+	+
Storage - Physical Training	20			-	-	-	-	-	-
Office - Physical Training	12			Indirect, bright 500 lux.	25 ± 0.5 °C / 22 ± 1 °C	4 h-1	+	-	(+)
User Toilet/Shower	8			200 lux.	-	8 h-1	-	-	-
Fitness & Group Room	24			Indirect, bright 200 lux.	23 ± 0.5 °C / 21 ± 1 °C	4 h-1	+	+	+
Fitness - Kitchen	24			Indirect, bright 200 lux.	25 ± 0.5 °C / 22 ± 1 °C	8 h-1	-	-	-
Outside Group Room	23			Indirect, bright 200 lux.	23 ± 0.5 °C / 21 ± 1 °C	8.5 h-1	+	+	+
Outside Group Room - Wardrobe	10			Indirect, bright 200 lux.	-	3 - 4 h-1	-	-	-
Outside Group Room - Toilet	4			200 lux.	-	0.5 h-1	-	-	-
Meeting Room	72			Indirect, bright 200 lux.	25 ± 0.5 °C / 22 ± 1 °C	8.5 h-1	+	-	+
Clinc	16		Hairdresser, dentist, footcare	Indirect, bright 500 lux.	25 ± 0.5 °C / 22 ± 1 °C	8 - 12 h-1	+	-	+
Office for Assistant Area Leader	12			Indirect, bright 500 lux.	25 ± 0.5 °C / 22 ± 1 °C	3 - 4 h-1	+	-	(+)
Cleaning Room	6			200 lux.	-	0.5 h-1	-	-	-
Janitor Office & Workshop	20			Indirect, bright 500 lux.	25 ± 0.5 °C / 22 ± 1 °C	4 h-1	+	+	(+)
Technical Room	0			200 lux.	-	0.5 h-1	-	-	-
Changing Room (Men)	32		1 toilet 1 shower	Indirect, bright 200 lux.	28 ± 0.5 °C / 28 ± 0.5 °C	8 h-1	-	-	-
Changing Room (Women)	48		2 toilets 1 shower	Indirect, bright 200 lux.	28 ± 0.5 °C / 28 ± 0.5 °C	8 h-1	-	-	-
SUB TOTAL AREA		1165							
Outdoor Facilities									
Rubbish Shed	50			-	-	-	-	-	-
Container Yard	40			-	-	-	-	-	-

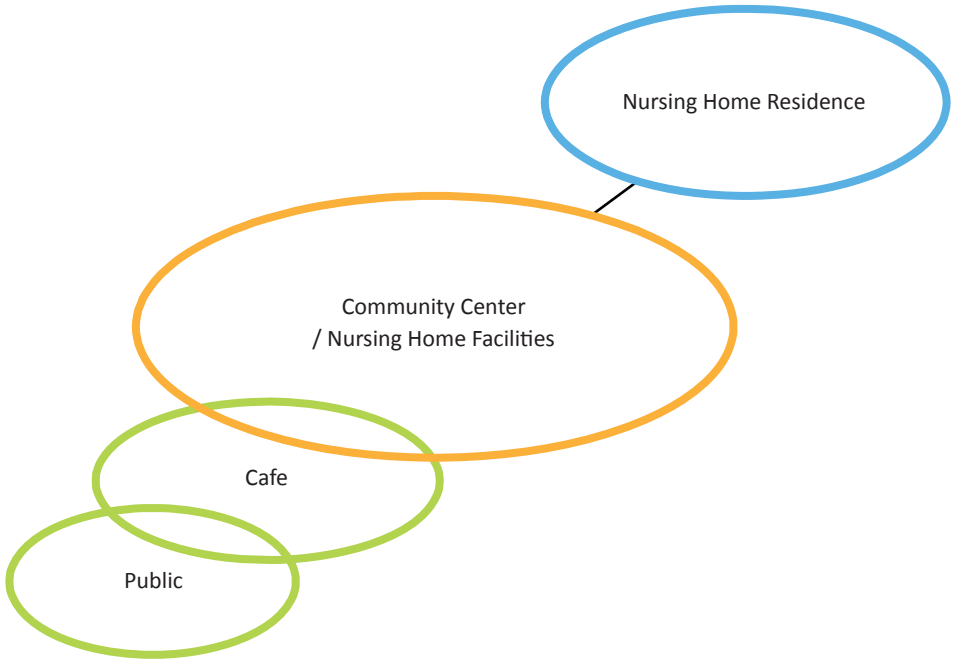
Bike Shed	45			-	-	-	-	-	-
Janitor Storage	45		Machine park & storage for garden furniture	-	-	-	-	-	-
Carport	30			-	-	-	-	-	-
SUB TOTAL		210							
Living Unit 1									
Apartments	450		10 2-room apartments. 45m2	Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	0.4 h-1	+	+	+
Kitchen	24			Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	8 h-1	+	-	(+)
Dining Room	28			Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	4 h-1	+	-	(+)
Common Room	82			Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	4 h-1	+	+	+
Personal Room	10			200 lux.	25 ± 0.5 °C / 22 ± 1 °C	4 h-1	+	-	-
Personal Toilet	8			200 lux.	-	0.5 h-1	-	-	-
Storage	10			-	-	-	-	-	-
Cloak Room	10			200 lux.	25 ± 0.5 °C / 22 ± 1 °C	0.5 h-1	-	-	-
Cleaning Room	6			200 lux.	-	0.5 h-1	-	-	-
SUB TOTAL		628							
Living Unit 2									
Apartments	450		10 2-room apartments. 45m2	Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	0.4 h-1	+	+	+
Additional Areas	178		See Living Unit 1	Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	See Living Unit 1	**See Living Unit 1**	**See Living Unit 1**	**See Living Unit 1**
SUB TOTAL		628							
Living Unit 3									
Apartments	450		10 2-room apartments. 45m2	Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	0.4 h-1	+	+	+
Additional Areas	178		See Living Unit 1	Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	See Living Unit 1	**See Living Unit 1**	**See Living Unit 1**	**See Living Unit 1**
SUB TOTAL		628							

Living Unit 4									
Apartments	360		10 units for people suffering from dementia 36m2	Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	0.4 h-1	+	+	+
Additional Areas	178		See Living Unit 1	Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	See Living Unit 1	**See Living Unit 1**	**See Living Unit 1**	**See Living Unit 1**
SUB TOTAL		538							
Living Unit 5									
Apartments	360		10 units for people suffering from dementia 36m2	Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	0.4 h-1	+	+	+
Additional Areas	178		See Living Unit 1	Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	See Living Unit 1	**See Living Unit 1**	**See Living Unit 1**	**See Living Unit 1**
SUB TOTAL		538							
Living Unit 6									
Apartments	260		10 units for temporary assistance 26m2	Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	0.4 h-1	+	+	+
Additional Areas	178		See Living Unit 1	Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	See Living Unit 1	**See Living Unit 1**	**See Living Unit 1**	**See Living Unit 1**
SUB TOTAL		438							
Living Unit 7									
Apartments	260		10 units for temporary assistance 26m2	Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	0.4 h-1	+	+	+
Additional Areas	178		See Living Unit 1	Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	See Living Unit 1	**See Living Unit 1**	**See Living Unit 1**	**See Living Unit 1**
SUB TOTAL		438							
Connection									
2 Stair Towers	90			200 lux.	25 ± 0.5 °C / 22 ± 1 °C	0.5 h-1	(+)	(+)	(+)
Connecting Hallways	0			200 lux.	25 ± 0.5 °C / 22 ± 1 °C	0.5 h-1	+	+	(+)
SUB TOTAL		90							

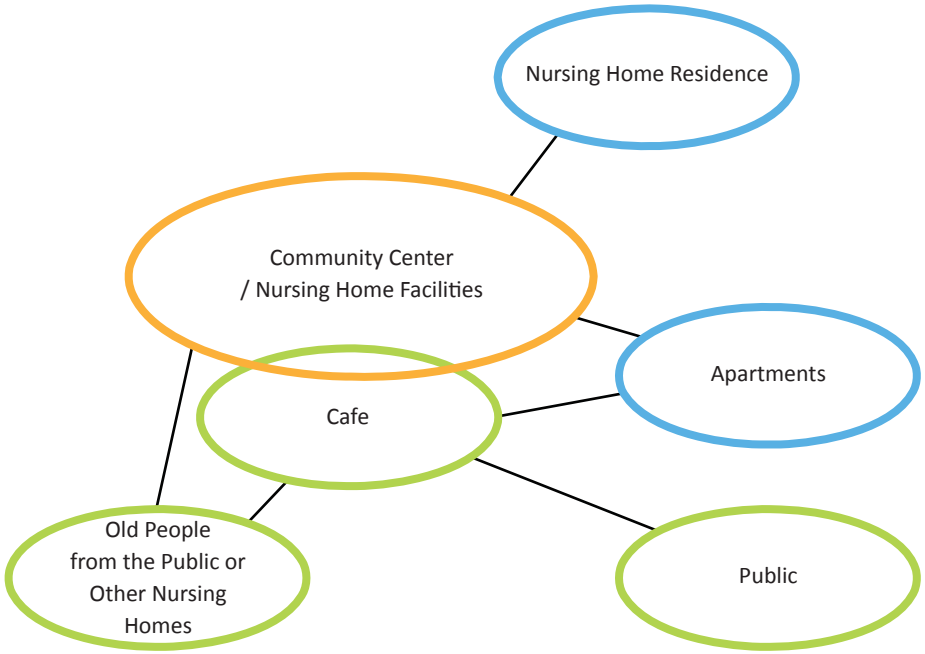
Other									
Suitcase Room	250			200 lux.	-	0.5 h-1	-	-	-
Technical-room	XXXX			200 lux.	-	0.5 h-1	-	-	-
Laundry	XXXX								
SUB TOTAL		250							
TOTAL NURSING HOME		5550							
Apartments									
Entrance	5			Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	0.4 h-1	-	-	-
Living Area	30			Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	0.4 h-1	+	+	+
Kitchen	20			Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	8 h-1	+	-	(+)
Dining Area	10			Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	0.4 h-1	+	-	+
Bedroom	15		Master bedroom	Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	0.4 h-1	+	-	+
Bedrooms x 2	20		Medium	Indirect, bright 150 lux.	25 ± 0.5 °C / 22 ± 1 °C	0.4 h-1	+	-	+
Bathroom	10			200 lux.	-	0.5 h-1	-	-	(+)
Sub Total		110							
50 Apartment Units Total		**5500**							
Connections									
3 Stair Towers	135			200 lux.	25 ± 0.5 °C / 22 ± 1 °C	0.5 h-1	(+)	(+)	(+)
Sub Total		135							
Commerical Space Total		2000							
TOTAL BUILDING AREA		**13185**							

Context Organization

The diagrams simplify the contextual ideas for developing the project within the surrounding auspices of the site. The bubbles show the interaction and connections between the public areas and the nursing home. The Community Center acts as the heart of the whole building organization of the site.



ill. 81.1 Conceptual overview of the Nursing Home.



ill. 81.2 Overview of the Nursing Home & other functions from the site & the surrounding community.

A typical day in a Danish nursing home:

A typical day in a Danish nursing home:

07:00 to 15:00

Two people take care of 10 residents for each designated cluster area.

They are helped up from bed. This may be different for each resident as it all depends on their needs

Breakfast is prepared

Morning tea

Serve lunch

Afternoon tea

One unit is cleaned per day

During the day there is scope for practical activities such for walks, playing games, singing and talking etc

15:00 to 23:00

One person takes care of 10 residents for each designated cluster area

Start making dinner

Afterwards clean up and then get the resident ready for bed

23:00 to 07:00

The ratio is two people for 56 residents

The caregiver looks over all the residents making sure they are in bed

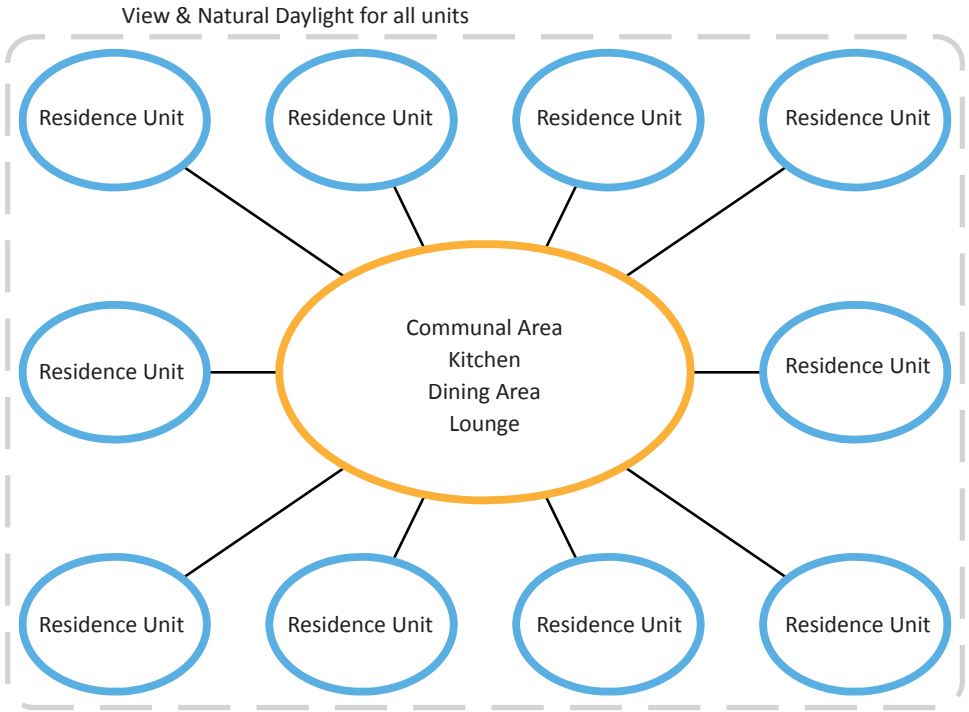
Afterward some of the residents may need special care during the night

Meals are prepared within the communal kitchen within each cluster and residents can have their meals in their rooms or in the communal dining room.

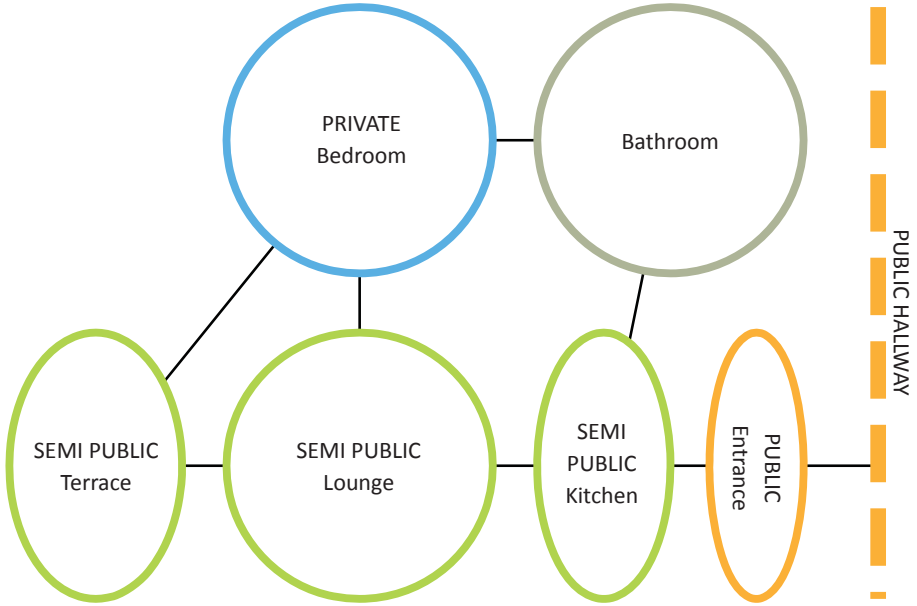
[Questionaire done by the staff members of the Hobro Alderdomshjem]

Room Organization

Diagram ill 83.1 shows the functions of each cluster being either a building or a floor. Every unit surrounds the main communal areas of the cluster. The goal of the project is to create a design that allows all units an equal amount of natural daylight and the view over the fjord.



ill. 83.1 Conceptual overview of the cluster area with 10 units.



ill. 83.2 Conceptual overview of a unit

Diagram ill 83.2 shows the relationship between public, semi public and private spaces within the unit. The entrance area defines the point between public and semi public space within the unit.

Design Criteria

Introduction

During this thesis was found relevant to question the future design and planning of nursing homes. In the following design criteria, guiding principles to help aid in the form finding process are based on previous investigations and case studies.

ill. 84.1 Future of the growing old is unknown

General

The building should be linked to the existing architecture of the area.
The building should cater to the ongoing changes of older persons needs.
The architecture should provide, zoning from public to private.
The architecture should inspire social interaction inside and outdoor spaces.
The building should be accessible to all residence and the surrounding community.
The building should be open to the families and friends of residences.

Perception

The building should be considered homely.
The perception within the building should inspire an active roll in aging.
The building should improve the quality of life in old age.
The building should create a center for the surrounding community of all ages.

Exterior

The exterior expression of the building should be conspicuous.
The outdoor areas should be an extension of the internal environment.
External areas should be integrated into the architecture of the building.
There should be access to the external environment at all times of the year.

Interior

The buildings interior should provide a clear definition of private and public areas.
Social spaces should be part of the natural flow of the building.
The interior should provide opportunities to utilize the space for an example, designing a functional windowsill for a place to rest.
The interior should emphasis a homely environment.

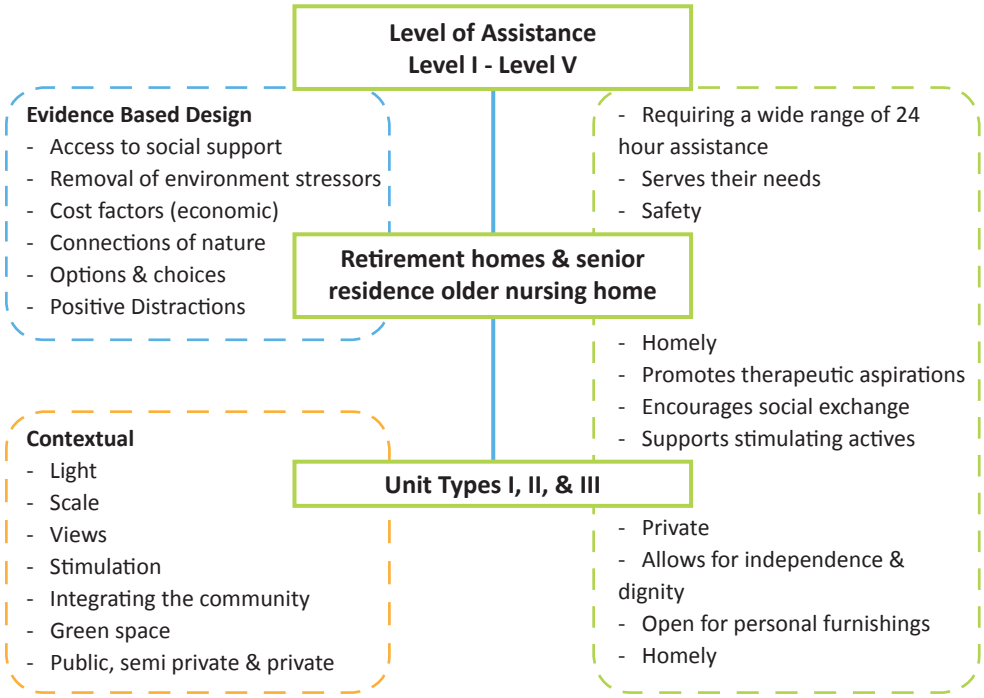
Vision

Vision

The aim of this project is to design a nursing home that will reinforce the community by creating a unique, welcoming building that also caters for the older residence within the home. The environment will integrate healing architecture properties of contextual, functional, technical and aesthetics that will aid in creating a place that is open to friends and family, is a pleasing place for caregivers, but also celebrates the individual needs of the residences.

This project will look into the environment of a nursing home in relation to the older residence medical, physical and physiological health and wellbeing inside and around the home.

The intention is to gain knowledge that can support an ongoing discussion for the future of New Zealand nursing homes.



ill. 85.2 User & design factors to consider in the next phase.

A 6.3 earthquake struck Christchurch, New Zealand on Tuesday 22 February. From this "Nine Christchurch rest homes were either wholly or partly evacuated because of earthquake damage, leaving the region with 600 fewer beds." (Stuff.co.nz)

Problem Statement

How can architecture improve the quality of life in old age within a functional environment for the aged, who require additional assistance?

DESIGN PROCESS

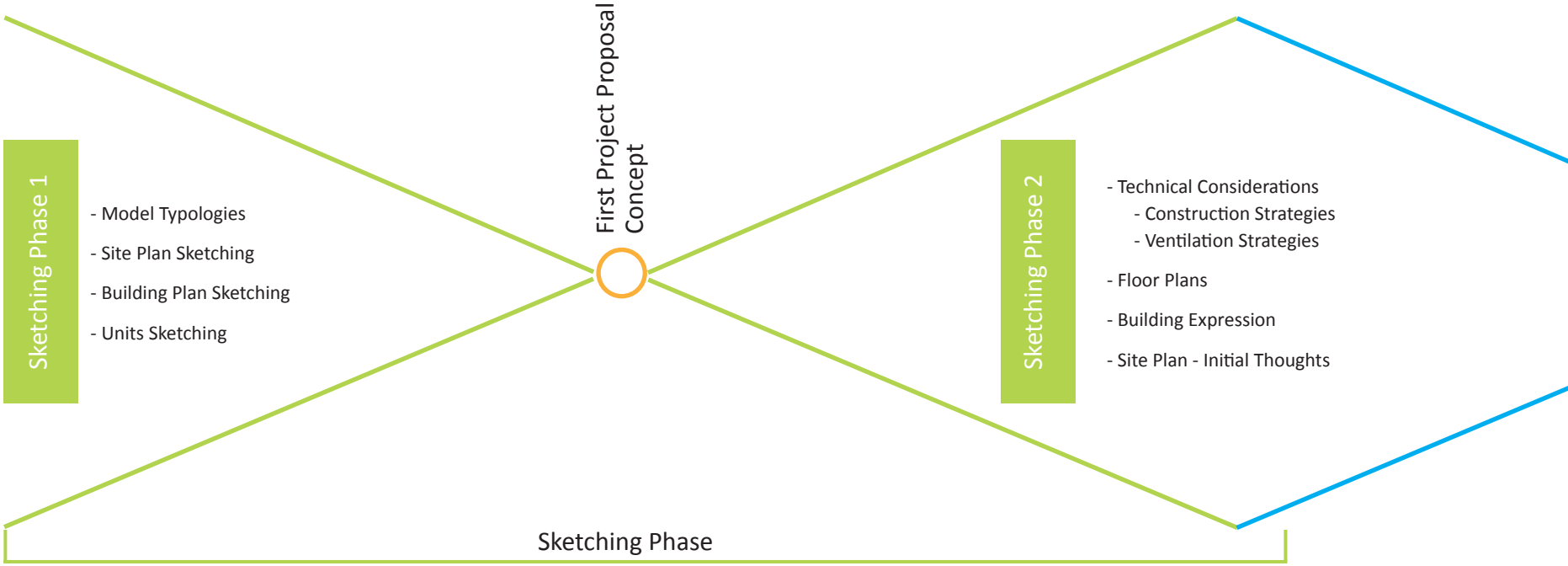
Process Overview

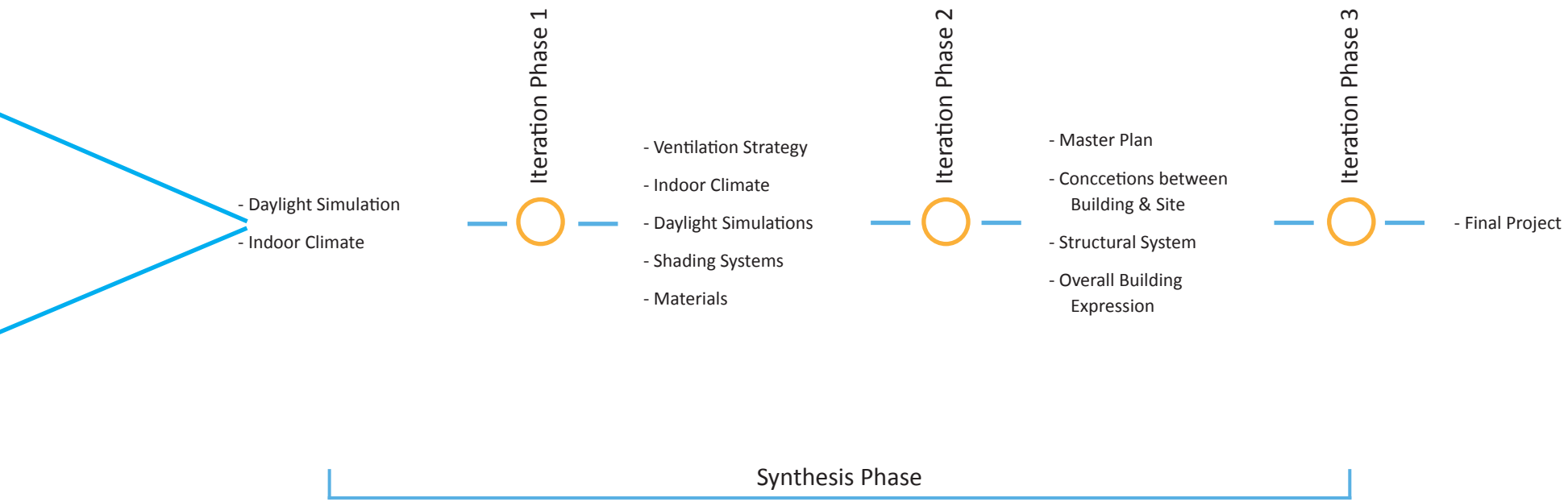
This diagram below gives an overview of the Design Process Phase of the project. The design process of the report will describe the development in a chronological order. The development of the design of the nursing home will be divided into two main phases;

- Sketching
- Synthesis

This diagram will try and visualize the integrated design process in a linear form as present within the report.

The sketching phase starts with wide contradictory investigations of the project that narrows down to a result of the first building proposal. This proposal is then used as a basis for the following synthesis phase, were the final project will be designed through a number of iterations.




- Daylight Simulation
- Indoor Climate
Iteration Phase 1
- Ventilation Strategy
- Indoor Climate
- Daylight Simulations
- Shading Systems
- Materials
Iteration Phase 2
- Master Plan
- Conccetions between Building & Site
- Structural System
- Overall Building Expression
Iteration Phase 3
- Final Project
Synthesis Phase

Sketching Phase 1

Morphology

Introduction

Following the conclusions from the research studies, design criteria and the vision for the project an initial prerequisite was created for the design of the Nursing Home. From this stage, the form finding will take place where sketches, models, simulations, calculations and descriptions will be used in the design process.

The integrated design method described in the program is cyclical process that consists of loops and parallel. Within the basis of the vision much of the design covers different scales; from the overall building shape to furniture, and covers different levels of detailing of technical and ascetical aspects of the changing stages from concept to detail.

The morphology process will start from the context of area and question the linkage between the nursing home and the surrounding public spaces and paths, continuing from the programs points of analysis.

Building Plot

- Plot type B1 and D1
- The area's land area is approx. 99,400 m 2
- Maximum construction area – 72,000 m2
- 30,000 m2 residential
- 17,000 m2 business
- 25,000 m2 either residential or profession
- 95% of the development total floor area to be residential
- 30% green area
- Minimum area of 100 m2 for children's playground
- B1 & D1 plot size is about 6353.70 m2

Local Plan Requirements for B1 & D1

- B1 building depth should not exceed 16.0 m incl. balconies
- D1 building depth should not exceed 14.5 m incl. balconies
- Maximum balconies accommodated in 1 / 3 of the façade length.
- Floor Levels
  - 2 – 9.2 meters
  - 3 – 12.8 meters
  - 4 – 16.4 meters
  - 5 – 20.0 meters
  - 6 – 23.0 meters
  - 10 – 38.0 meter

[Lokaplan. 2006]

Volume Typology Studies

By investigating the building is typology aspects of buildings following, square metres, and how they fit on sites were considered important. In addition to this through considerations for the context, and functional parameters and internal and external qualities concluded from previous investigations.

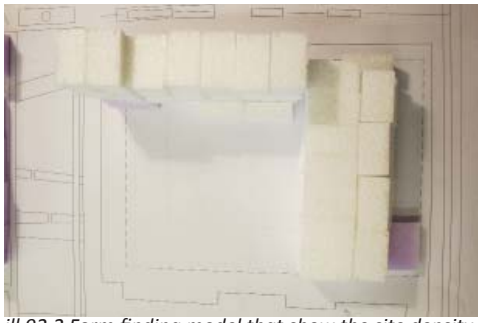
It was found important to consider the height in relation to the existing surrounding context. From the investigation and daylight poses an important factor in designing the building.

In relation to the surrounding spaces, integrating public spaces and paths would be beneficial to the surroundings. Building upon the existing public areas could create an interesting and stimulating environment for the people and surrounding residents.

To utilise the natural view over the fjord, accessible areas should extend out from the building and connect to the public areas. Through the investigations of evidence base design, natural views and garden spaces can be stimulating but also can create a harmonious atmosphere.
Due to the buildings functional use it is important to have a small travel distance to internal functions. Thus the idea of going up than out may create an easier movement throughout the building.

Through the investigations of evidence based design and healing architecture, daylight is an important design factor. Through the typology studies, considerations for light penetration through the use of narrow buildings, atriums and skylight are regarded.

ill.92.1 Form finding model that show the site density in the U shaped building



ill.92.2 Form finding model that show the site density in the L shaped building towards the fjord

ill.92.3 Form finding model that show the site density in rectangular shaped buildings

Conclusion

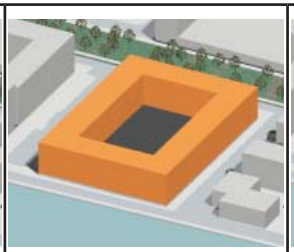
It came to the conclusion that option six would be a better option due to the fact that it uses less site area, and allows for the natural daylight penetrate the building due to the small width.

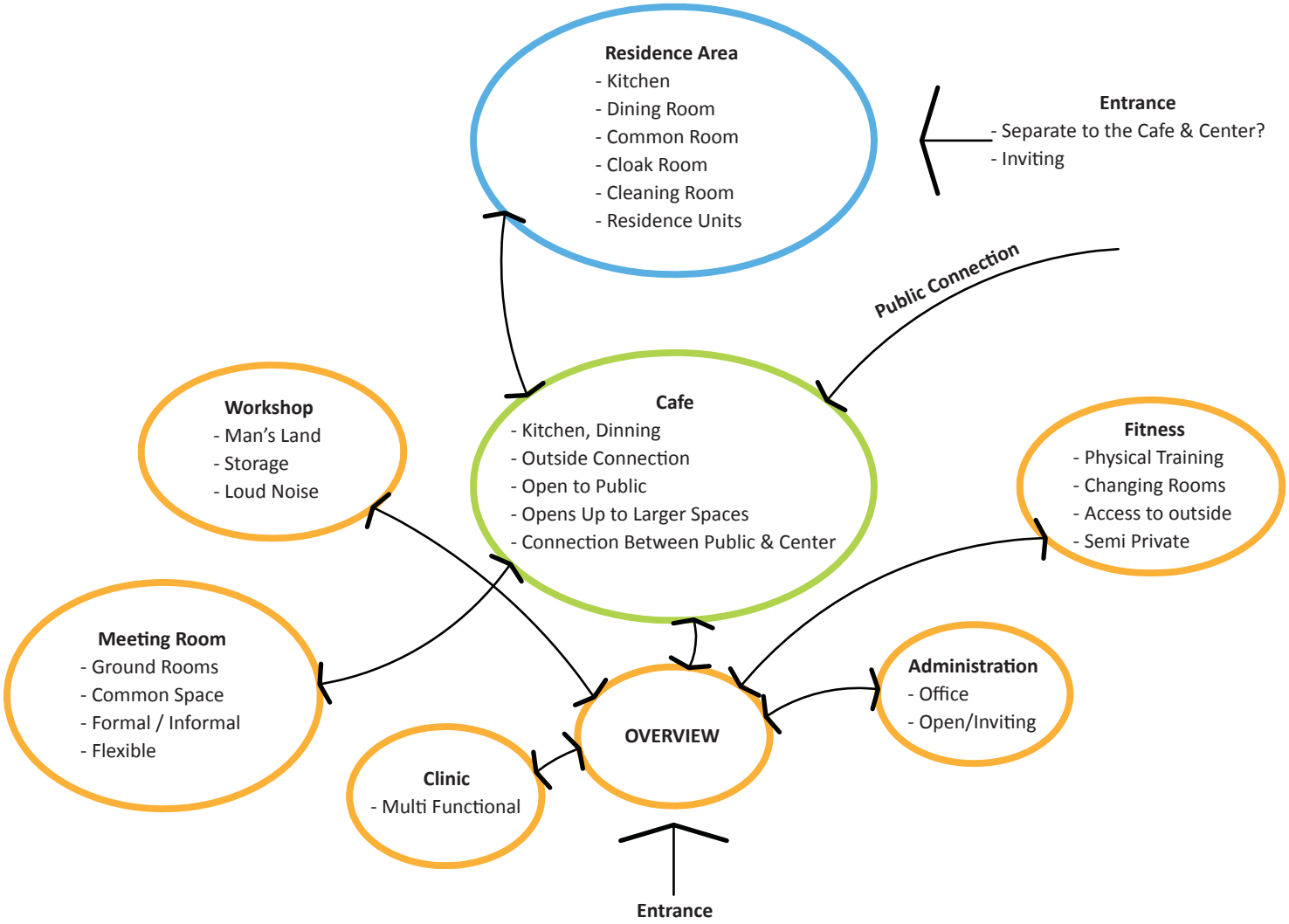
By using an L-shaped building that opens towards the northern part of the site, more natural sunlight can enter into the site and buildings. This also allows the overall experience of view from all apartments.

Illustrations 92.1, 92.2 and 92.3 show an overview of building typologies on the proposed site. It was found that the longer bulidings were better suited to the site as the rectangular volumes in illustration 92.3 did not have enough area around them to allow daylight. It was also a problem that most bulidings would have their view and sunlight blocked by other bulidings.

	 1 storey, 100 % footprint	 2 storey, 50 % footprint
Height relating to existing context	-	-
Integration of public spaces & paths	-	(+)
Creating outdoor spaces from the building	-	(+)
Small distance to internal functions	-	-
Light penetration	-	(+)

ill.92.4

						
3 storey, 30 % footprint	1 - 5 storeys, volume with court yards	1 - 5 storeys, fragmented volume.	4 - 5 storey, L shaped narrow volume	4 - 5 storey, U shaped narrow volume	4 - 5 storey, closed shaped narrow volume	4 - 5 storey, closed shaped narrow volume with broken paths
(+)	**(+)**	**(+)**	**+**	**+**	**+**	**+**
(+)	**-**	**+**	**+**	**-**	**-**	**-**
(+)	**+**	**+**	**+**	**+**	**+**	**+**
-	**-**	**(+)**	**+**	**+**	**+**	**+**
(+)	**+**	**+**	**+**	**+**	**(+)**	**(+)**



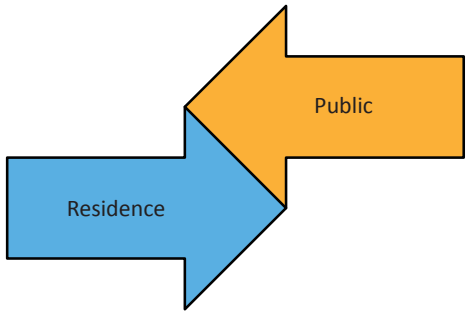
Inital Ideas and Princlipes

An overview of the concept establishes a design criteria of how the different function may relate to each other. In the center of the concept is the cafe which is the heart of the area creating a place where the residence can socialise in an environment that is open to the public. When entering into the community center an overview is important to establish a connection between the user and the function available. The functions within the building should be clearly defined and illustrate the different moods of the areas.

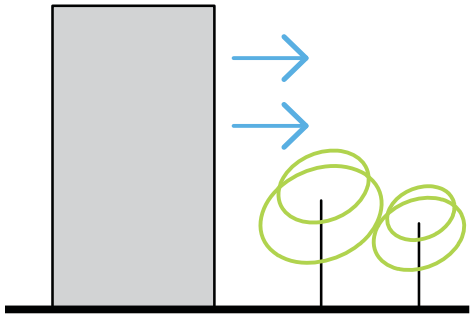
What poses as a challenging is the connection between the nursing home and the community center. In a home or apartment situation the connection is separate from any commercial functions. By creating a smaller, more personal entrance could relate to the changes of buildings functions from public spaces to semi-public areas of the residence.

Throughout the conceptual phase of the project it is importance to consider the wellbeing of the residence in the nursing home. Here the diagram shows design considerations when designing for the residence.

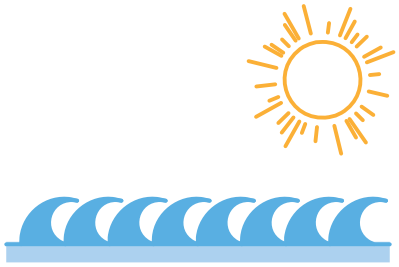
Aspects that relate to the physical and psychological aspects of wellbeing are derived from the research of evidence based design and healing architecture. Much of these aspects can be facilitated into the design of a nursing thus providing a positive, homely environment that is assessable to all residence.



ill. 96.1 The importance connection between residence & the public



ill. 96.2 Should have a persona of an open park that is inviting for the public, creating a stimulating place

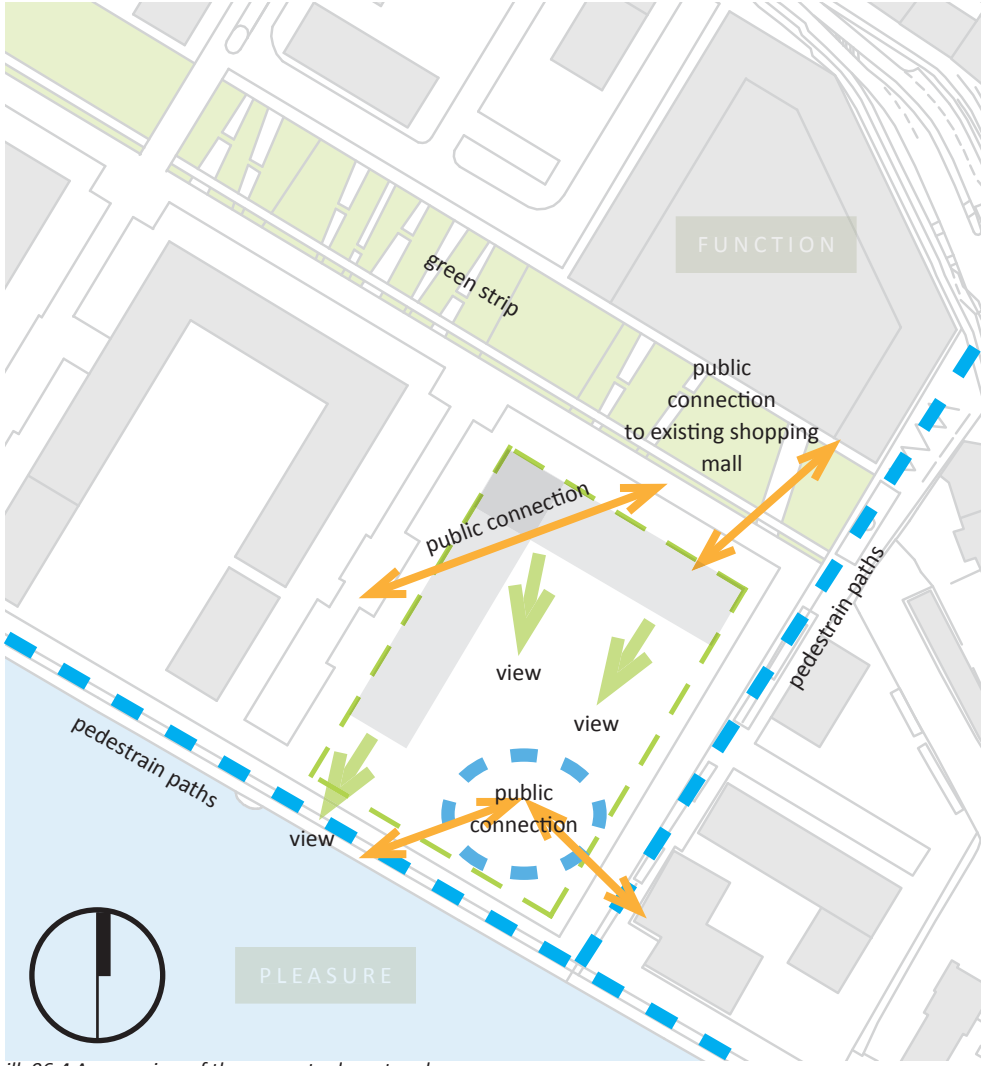


ill. 96.3 Utilise the natural daylight & sun as well as the view over the fjord

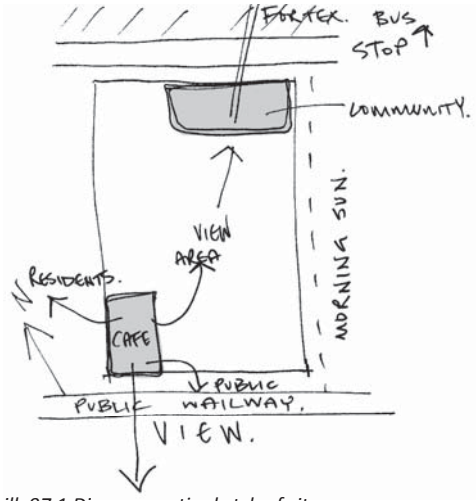
Site

In the initial part of the sketching phase, aspects from the investigation were sketched upon. With ideas of integration of the site, public functions paths were established which connected up from the waterfront and existing apartment blocks to the commercial functions of the Førtex supermarket on the corner. Additional to this the pedestrian walkway down from Vestergade towards the waterfront of the Limfjorden seemed to have inadequate green public space where people could rest and to enjoy the view.

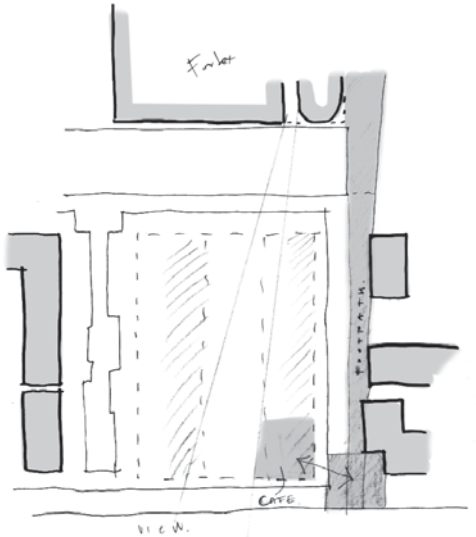
Illustrations 96.1, 96.2 and 96.3 look at the importance design factors for the planning of the master plan. Connection between publc and residence can create a place where social interaction and stimulation for the residence. As described through the research of EBD these and other distracted factors can create a postive environment within a nursing home. Natural views and daylight are important for the well-being of the residence and staff.



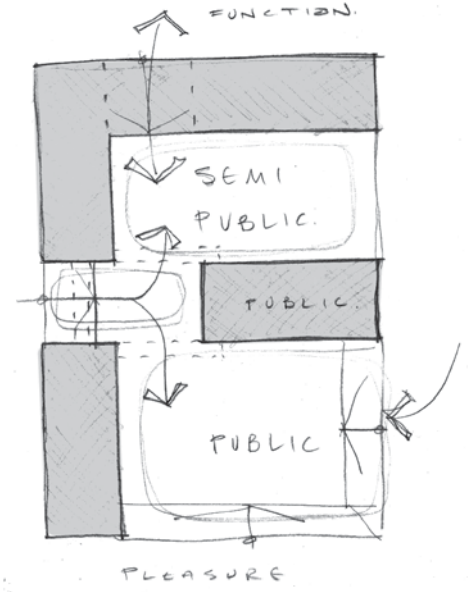
ill. 96.4 An overview of the conceptual master plan



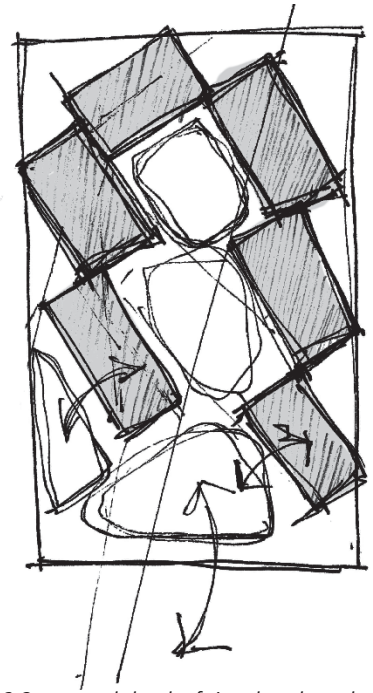
ill. 97.1 Diagrammatic sketch of site



ill. 97.2 Diagrammatic sketch of site



ill. 97.2 Conceptual sketch of site, showing public & residential buildings with connecting ramps



ill. 97.2 Conceptual sketch of site, that shows broken building forms that are turned towards north

Principles

It was important to have a physical view either through or around a building that would draw the public into the site. Illustrations 97.1 & 97.2 show the connections between the existing bulidings. A shared cafe between the nursing home and public is situated at the front of the site to utilise the view over the fjord. Illustration 97.1 connects the community center with the commerical buliding at the back of the site. Illustrations 97.1 & 97.2 use the buildings to de-fine areas of public and semi pubic spaces between the buildings. Different areas have pockets of open space that are open to the view and natural daylight.

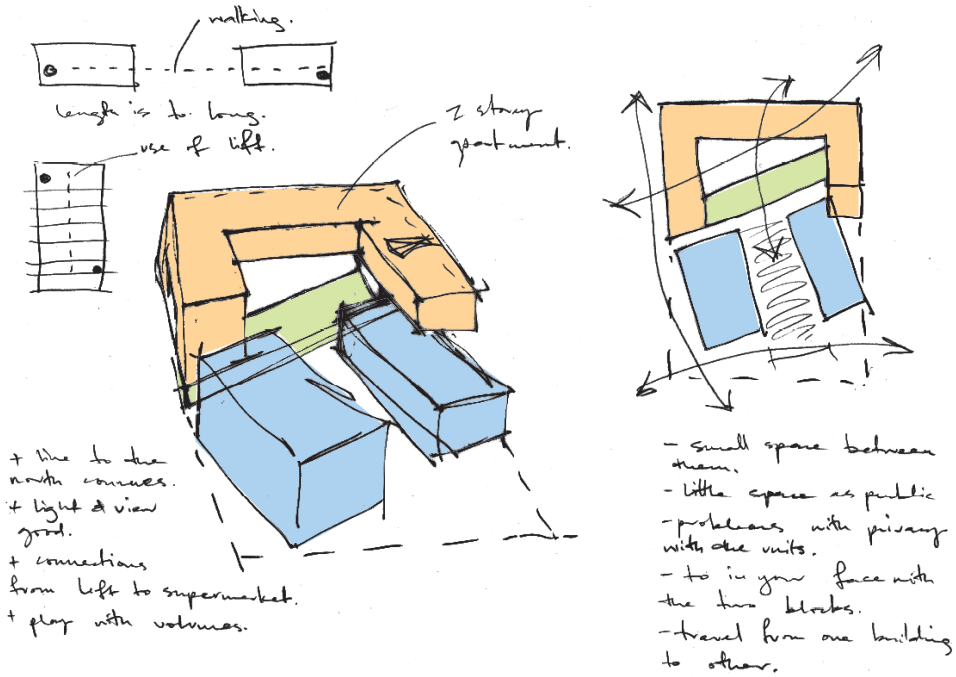
Building

Throughout the sketching phase 1 integration and organisation functions of residential apartments, older persons community centre and nursing home was looked upon. The idea was to establish an atmosphere that was non-specific to its purpose. In addition to this daylight and views plays an important part in establishing the criteria in which the buildings are positioned.

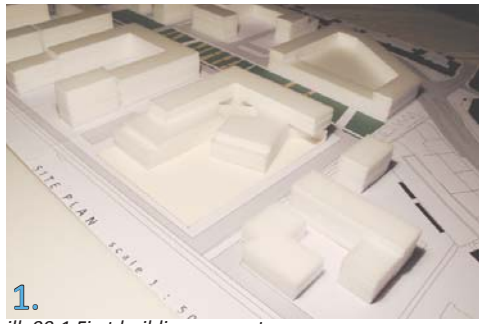
Principles of Building Expression

Illustration 98.1, visually looks at the different building forms that make up the proposed building design. Each function is segregated by a form or floor differences. Commercial functions (shown in green) are situated on the lower floors toward the back of the site where the building is sheltered from the sun that causes over heating in the building. The residential areas (shown in orange) are placed higher up to allow a visual connection of the fjord but it is also optimal placement for the suns path. An open area to the front of the site ties into the public, pedestrian area to the water front allowing the public to filter into the site and utilise the nursing homes communal cafe/ restaurant.

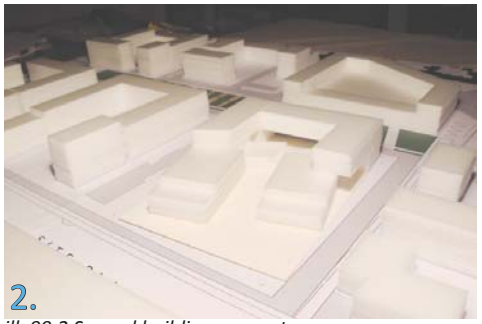
The nursing home (shown in grey) is split into two separate building volumes that opens out to an semi-private space between the buildings. Connections between the two building volumes are above the main community center, though this may be a problem due to the travelling distance.



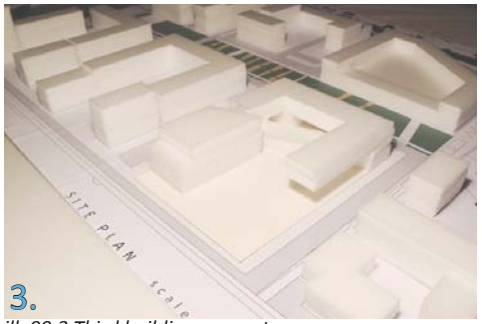
ill. 98.1 Sketch of a concept



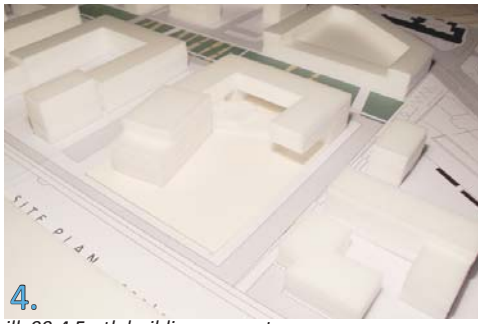
ill. 99.1 First building concept



ill. 99.2 Second building concept



ill. 99.3 Third building concept



ill. 99.4 Forth building concept

Principles of Building Form

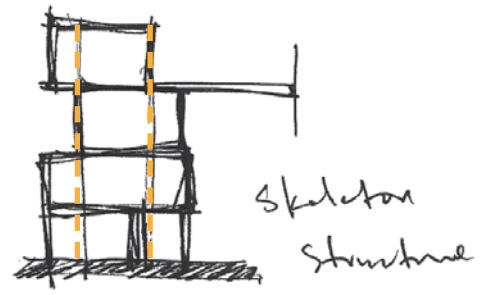
Through the progression of the buildings form the idea of replicating the line along the green path was establish as a point where the building form would start. From there the building spreads out towards the fjord, dispersing the regularity found in the existing building surrounding the site.

Number 1 concept establishes the building form as a mixture of commercial to the back areas (towards the green strip) which carry the residential apartments above. Through the integration of different built forms generate public spaces and paths, connecting the site with other functions. From the segmented building form, two building volume splay out to form the nursing home. The idea was to keep these buildings low and to create a form that could have a number of terraced areas around the building shape. It was found that a connection from the south to the north would be better thus number 2 concept moves the nursing home volumes apart creating a small public space between the buildings. Privacy and travelling distance was found a problem so it was considered best to create one volume (number 3) that housed the nursing home. Finally in number 4 concept it would be best to turn the building towards the south so both sides of the nursing home would get equal amounts of sunlight and view. Also in turning the building of the nursing home would establish an additional open space towards the west, which would catch the afternoon sun.

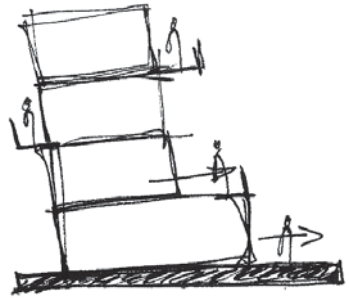
Principles of Building Construction

An initial sketch of the construction shows how the building might be formed and constructed by using a grid layout where the different floor can be placed. This could be done with load bearing walls or a column and beam system.

As a thought during the initial stage of the design having a building formation that could clearly define the different unit could add interest to the formation of the building but also help define, ownership of a single part of the nursing home.



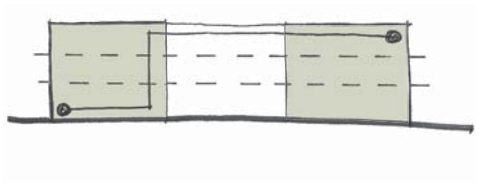
ill. 99.5 Cross section of the building


ill. 99.6 Cross section of the building showing balconies

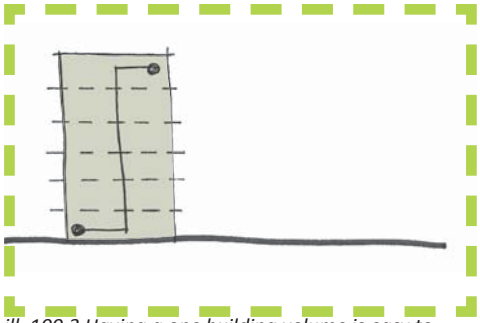
Height & Scale

In relation to the proposed building heights stated in the local plan (ranging from 3 to 5 storeys) would make it harder to form a building without large travelling distances for the residences. As shown in the illustrations ill. 100.2 and ill. 100.3, two buildings could create a border between the two building volumes which would be harder for someone to travel from one side to the other. When using a high rise building volume the travel distance is less, and easier due to the shorter, vertical travel distance of a mechanical lift.

Thru the investigations of the site and the placement of the proposed building it was found the height of the nursing home had to be considered due to travelling distances. When viewing the site from the opposite side of the Limfjord the placement of a large building volume to the center of the area would not inflict of the typology of the water front. In ill 100.1 the proposed Bolig+ (shown in orange) represents the 38 meter high building. When placing the proposed nursing (shown in blue) at the same height as the Bolig+ building (38 meter high) the water front still seems small. By keeping the line of the horizontal building volumes carries the eye from the railway bridge along the water front towards the Limfjord Bridge. By forming a narrow building volume of the nursing home would be considered acceptable for the daylight to the surrounding buildings.



ill. 100.2 Further travelling distance for the residence. A mix of vertical & horizontal movement

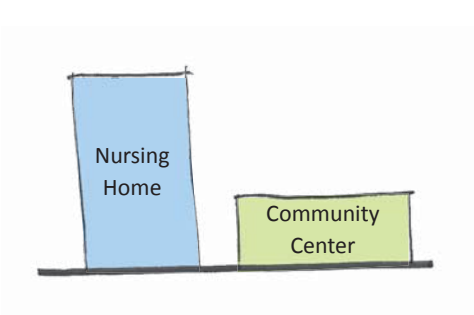


ill. 100.3 Having a one building volume is easy to move between floor by mechanical lifts

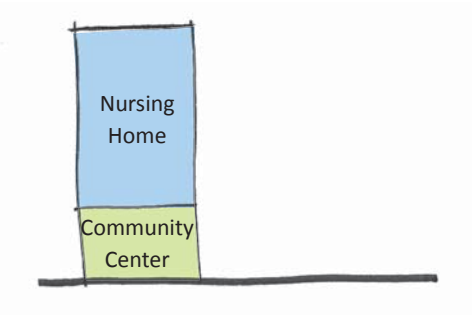
ill. 100.1 Panoramic of Nørresundby from Aalborg side of the Limfjord

Proposed Bolig+ Buildings.
38M - 10 storeys high building

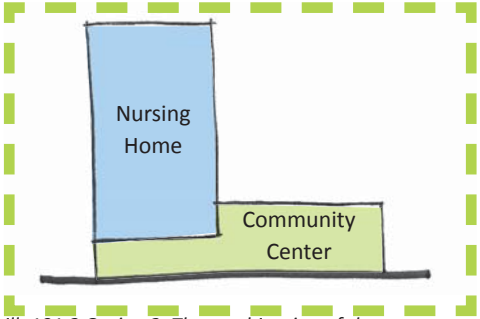
Proposed Nursing Home.
38M - 10 storeys high building



ill. 101.1 Option 1. Segregation between the two buildings



ill. 101.2 Option 2. Intergration of the two buildings

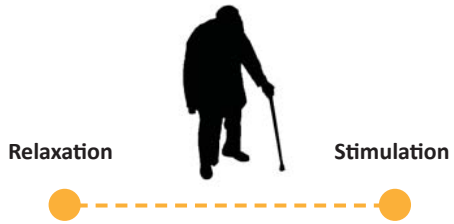


ill. 101.3 Option 3. The combination of the two options

Principles

Through the conceptual sketching phase of the building volumes it was found the option 3 (ill 101.03) was preferred. Option 1 (ill 101.01) posed problems for the privacy of the lower floors of the nursing home and was felt that the segregation of the two buildings was too strong to allow for an overall community feel of the area. Option 2 (ill 101.02) integrated the community center and nursing home together but was found problematic with the buildings height, thus leaving option 3 as the chosen proposal.

In the easy of building flow it was considered to place the café on the lower floor below the nursing home. This would guide people through the community center and would allow the café to open out towards the fjord, connecting with the public walkways.



ill. 102.1 Design considerations for the resident

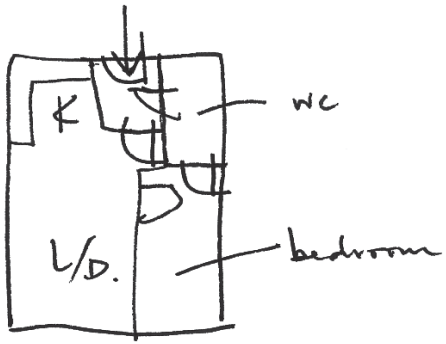
ill. 102.2 Design considerations for the resident

ill. 102.3 Design considerations for the resident

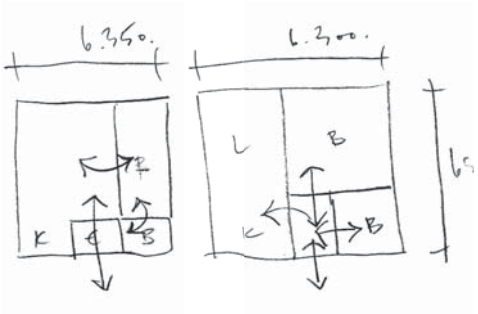
Nursing Home Units

The first design phase will look at the unit's layout as based on the organisation functions according to the room program. The idea is to place semi-public and public spaces away from each other, but most of important place the rooms in relation to daylight and the view. During this design process organisation of the units will look upon three types:

- average 46 m²
- dementia 36 m²
- temporary 26 m square



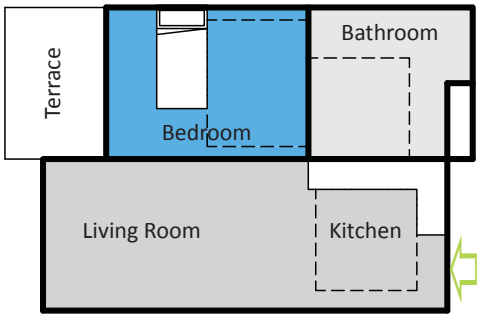
ill. 102.4 Sketch of a unit



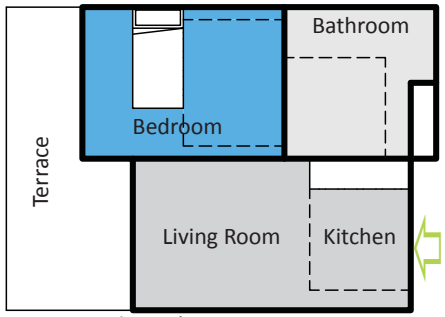
ill. 102.5 Sketch of a unit with different entrance types

Principles

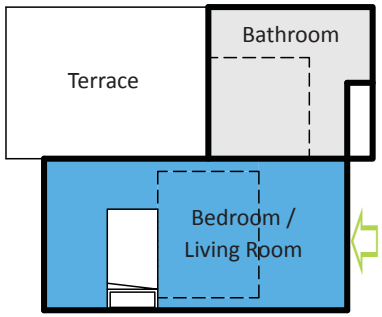
Throughout the studies of older people and nursing homes found the importance of establishing a private area that can be defined as home. In forming the floor plans it was considered important to have a recessed area the defined the change from semi-public areas to the private space of the residence unit. Inside the unit the bedroom is considered the most private part of the unit thus a wall with a sliding door could give the resident the option of opening or closing the rooms. An essential design factor is the use of sunlight. Large areas of the unit have a view or an open terrace area where the resident can use. The areas that are close to the windows are the sitting areas and bedrooms.



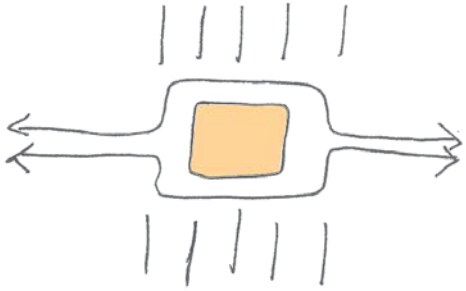
ill. 102.6 Average residents unit



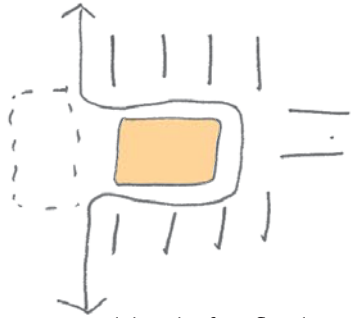
ill. 102.7 Dementia residents unit



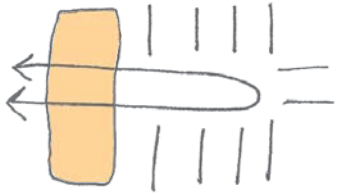
ill. 102.8 Temporary residents unit



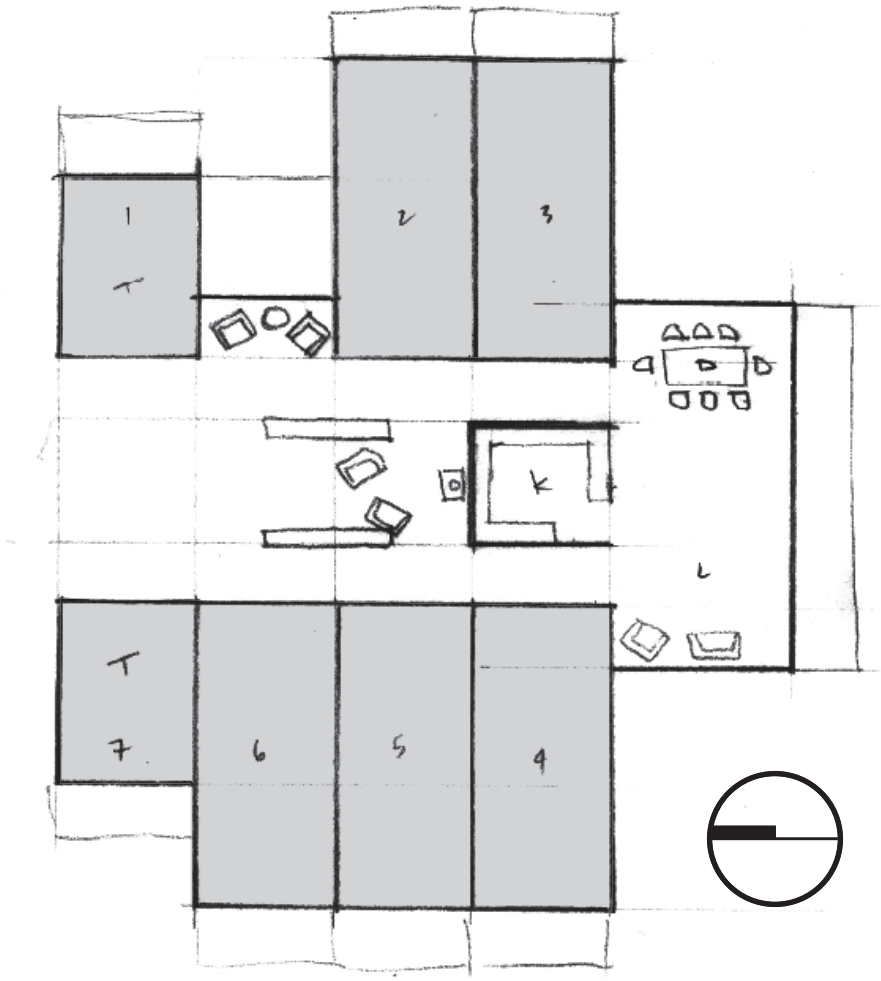
ill. 103.1 Conceptual thoughts for a floor layout



ill. 103.2 Conceptual thoughts for a floor layout



ill. 103.3 Conceptual thoughts for a floor layout



ill. 103.4 Sketch of a floor plan concept

Principles

When forming the floor plans different concepts were looked at. Illustrations 103.1, 103.2 and 103.3 show ideas of how the flow could work in relation to the unit arrangements and communal areas. It was found that a narrow floor plan that opened the communal areas towards the view would be better.

Daylight was considered an key design factor to incorporate into the floor plan. By pulling the units apart seating areas could be formed to allow for spontaneous social interaction between residence, staff etc. This also allows the daylight to filter into the internal common space by natural means.

It was found that the floor plan needed additional designing as the width of the building would be a problem due to shadowing existing buildings. In addition to this the communal area would be pushed forward towards the south creating a smaller passage way that was to be used as a connection between the entrance of the floor and the communal spaces.

Concept

Introduction

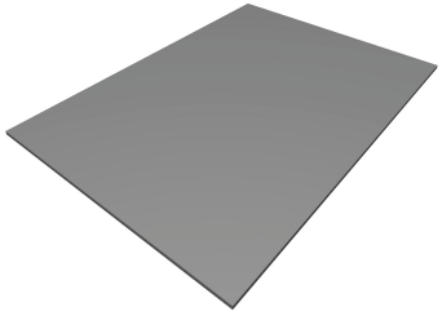
As the sketching process progresses the building form starts to unfold. What is shown below is the progression of how the building form is put together.

Colour Key:

Commercial

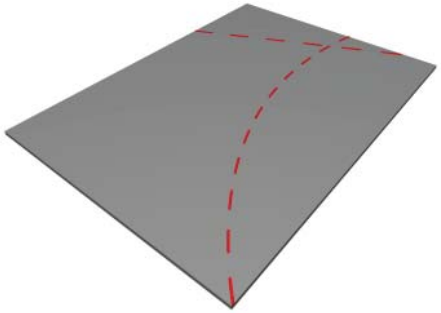
Community Center / Nursing Home

Apartments



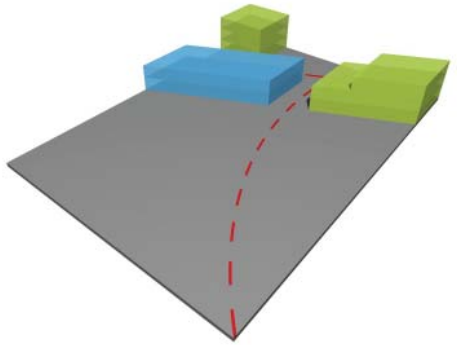
1 ST

Overall site of 6,353.686 m². The site has been raised from the existing level by a meter as per the Aalborg Local Plan.



2 ND

The two lines show the public paths that run through the site. The two direct paths run from the existing apartments to the west of the site while a large path has been built from the water front up towards the existing Føtex supermarket.



3 RD

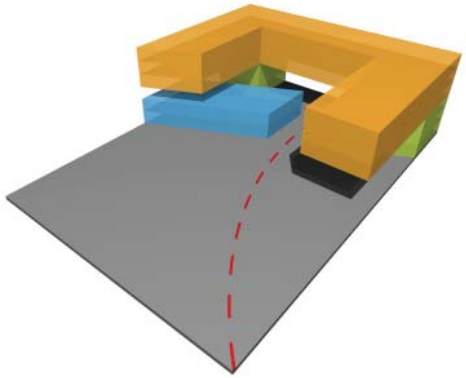
Two square forms to the northern corners of the site house the commercial functions. From the far left corner an offset of eight meters creates an angular building that extends from the right hand side to the western side of the site. From here the older people's community center is created.

Next Stage

The next stage of the sketching phase is to start analysing in depth the detailed design factors for the internal environment and external expression of the building forms. This is achieved through investigating different aspects of daylight, indoor climate calculations, structure and the detail of finishes and buildings' expression.

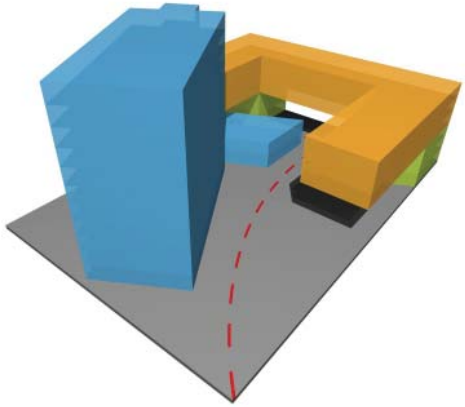
Estimated Sketching Areas:

Commercial	9.4 %
Community Center	5.6 %
Mixed Nursing Home / Public Cafe	4.9%
Nursing Home	49.3 %
Apartments	30.8 %



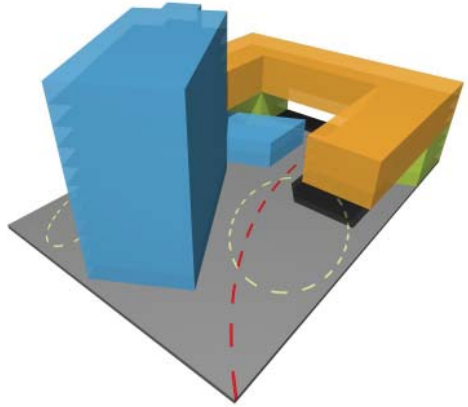
4 TH

By extending the line of the site, a simple U shaped building form is created which extends over the public spaces. The building form is extenuated by cantilevering out towards the eastern side of the site.



5 TH

The main focal point of the site is the building formation of the nursing home. This is the largest building form on the site which is 10 storeys high. This takes on a long form that faces the south, utilising the sunlight and view of the fijord.



6 TH

Public areas are integrated into the site, which creates a stimulating environment for the residence. The siting of public function facility such as a cafe to the ground floor could work as a drawcard for a diverse range of people.

Sketching Phase 2

Introduction

The next stage of the sketching phase is to start designing in detail the buildings form and planning of function in relation to a integrated design process where investigations such as daylight and indoor climate help dictates the formation of the design.

The following concept will investigated in more depth:

- Master plan
- Buildings expression
- Buildings functions
- Nursing homes
- Community center
- Nursing home unit functional layout

This will include sketch investigations of structure, daylight and an indoor climate study.

During this process factors of consideration from the investigation process will be developed in the design detailing of the proposed building design.

Total Energy Consumption

Energy consumption for heating pr m² floor area	70 kWh/m² per year
Energy consumption for cooling pr m² floor area	0.0 kWh/m² per year
Total energy consumption pr m² floor area	**70 kWh/m² per year**

Refer to Appendix for a detailed overview of parameters used in this indoor climate study.

Minimum Danish Building Requirements

Energy Frame Building (note 1)	52.7 kWh/m² per year
Class 2015 Low Energy Building (note 2)	30.1 kWh/m² per year

Note 1 -The energy performance for an energy frame building:
Per m² of heated floor area must not exceed 52.5 kWh/m² per year, plus 1650 kWh/m² per year divided by the heated floor area. (Section 7.2.2 of the Danish Building Code 2010).

Note 2 - The energy performance for a Class 2015 Low Energy Building:
Per m² of heated floor area must not exceed 30 kWh/m² per year, plus 1000 kWh/m² per year divided by the heated floor area. (Section 7.2.4 of the Danish Building Code 2010).

Overview of the Design

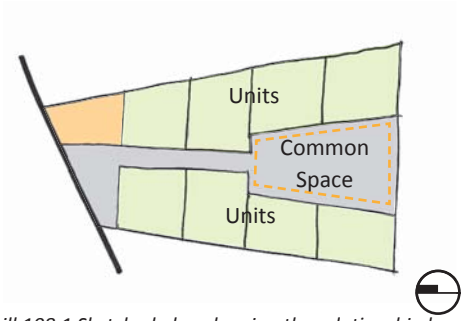
Indoor Climate

Using the Danish Building Regulations 2010 and the concept design, a calculation for the indoor climate to define the consumed energy of the building volume of the nursing home. As a tool the monthly average spreadsheet is used. The spreadsheet calculates the internal loads from people, lighting, ventilation, U-Values of the building envelope and windows and includes the orientation of the windows towards the sun for heat gain throughout the year. Through this study the calculation is only an estimation of the annual energy consumption and will be integrated into the designing of the building through the design process of the building.

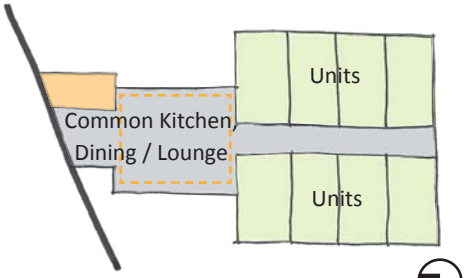
The parameters for this study are outlined below:
Number of Apartments: 70
Number of user: 150 (70 residence the rest staff & visitors)
Time of use: All day (7 days x 24 hours = 168 hours)

Net area 8151m²
Gross area 8657 m²
Heated area 8657 m²
Service life 168 hours/week

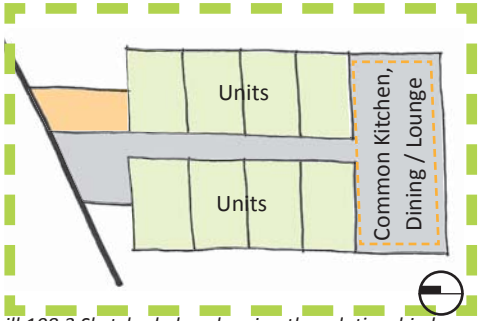
The Danish Building Regulation 2010 minimum specifications for windows were used for this study to provide an estimation on the number of windows and their placement compatible with the buildings form. The result shows, the overall energy consumption surpasses the acceptable energy consumption by 20.4 kWh/m² per year for an energy frame building.



ill.108.1 Sketched plan showing the relationship between the entrance (orange), units & common spaces



ill.108.2 Sketched plan showing the relationship between the entrance (orange), units & common spaces



ill.108.3 Sketched plan showing the relationship between the entrance (orange), units & common spaces

Functions and Plan Layouts

As the building concept develops much of the design is closely correlated. The internal functions can dictate the external expression of the building and vice versa. This part of the project takes one aspect of that process and simplifies it into a single functional process of the design. Though this is shown as one of the many functions of the development process the building was made up of a number of attributes that related to each other throughout the design development.

Using the design sketching of the plans it was found that 7 units per floor would create an environment that would be more personal and easier to work with. Each floor would have one or two temporary units for guests to stay.

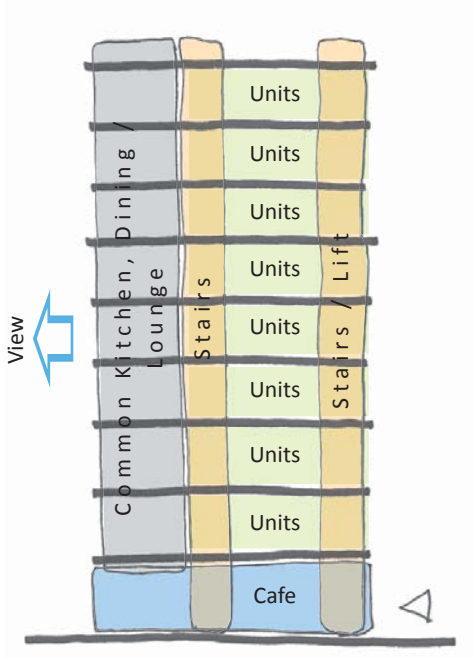
What needs to be considered when designing the internal floor plans of the nursing home is to the creation of a homely environment through articulated mass and form in the deconstruction of corridors and separation of personalized areas from the common spaces. What is considered throughout the design process is the question between the units opening out into the common space or out into a passage space.

The sketches of the floor plans present three different concepts that consider the provision of common spaces, a central passage and units.

ill.108.1 shows the common space towards the south overlooking the fjord. However this position is ideal for the common area as the units off the sides of the common space have less privacy to their entrances.

The second plan (ill.108.2) positions the units towards the south and the common area towards the north. This presents some problems as the entrance area enters into the common space inadvertently creating a passageway through to the units. The view is not utilized for all the residents making it problematic with the access to natural sunlight and view for all the residents.

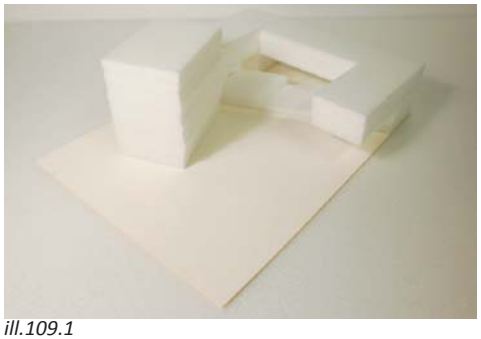
The final design proposal (ill.108.2) allows for residents to utilize the common spaces that overlook the fjord. Each unit extends off a passage with connections to public areas, views and all day daylight.



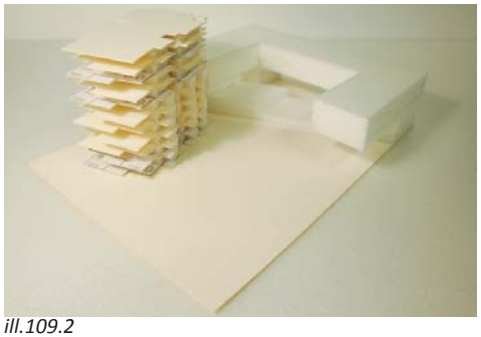
ill.108.4 Sketched section of the building showing the relationship of the chosen plan (ill.108.3) & access

Principles

The residents all have equal amounts of view and natural daylight. This is considered important in creating a positive environment within the unit and in the common areas. The lounge, kitchen and dining areas have the best views overlooking the fjord thus drawing the residents out to socialise in the common areas. A large open view allows the resident to have a stimulating view over the area within their units and from the common space. Having a long passage way symbolises the changes of semi private walkways to the entrance of the unit as seen in apartment and the path to a front door of a house.



ill.109.1



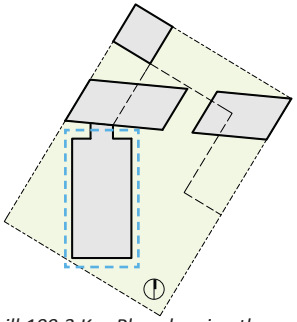
ill.109.2

Principles

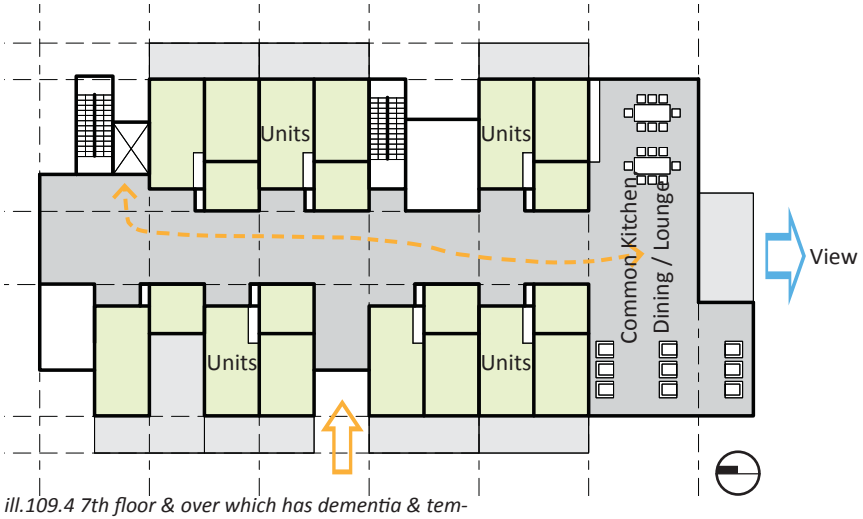
From the building concept the floor plans of the nursing home were developed in more detail. The initial idea was to form a passage way that symbolized a space seen before any residential apartment, a street, or a hotel room etc. The direction of the flow starts from the main northern entrance area and moves towards the shine of the southern where the main view of the site overlooks the Limfjord. Through this progression of movement each of the resident's doors exit out into the passage. Around each entrance space of the unit a recess is created. From a review of relevant studies and research of existing nursing homes this area is considered important in establishing a personal space that is semi public but still defined as an extension of the occupant's space which they can personalize. Partway through the hallway a small seating area has been place to enable natural daylight to filter into the hallway and create a place where spontaneous socializing can take place.

Principles

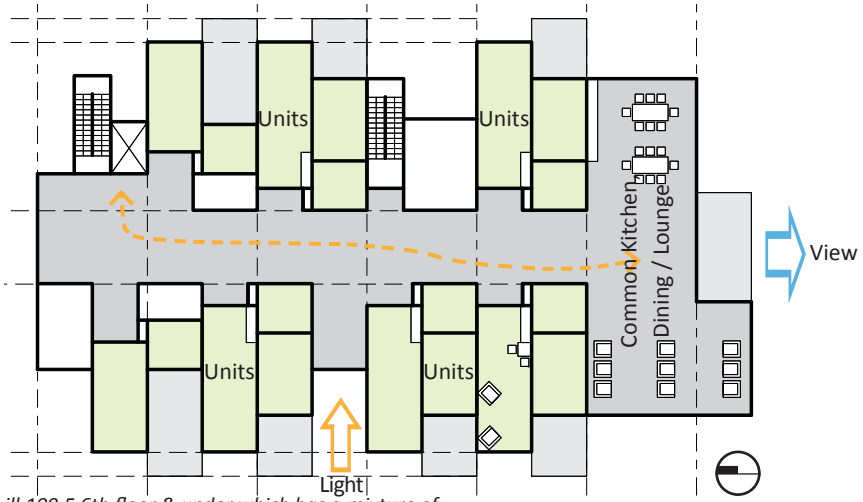
The two models show the changes in the building's volume from a solid volume shown in ill .01 to a lighter volume where the units' dictate the building overall expression (ill 109.02). Towards the southern end of the site the common spaces alternate at every floor to create an interesting line that folds up towards the roof. By placing a glazed area to the center of the volume makes it seem smaller. The common areas are orientated south, drawing the people out of the unit to socialize with other residents and staff.



ill.109.3 Key Plan showing the discussed building



ill.109.4 7th floor & over which has dementia & temporary units. Common area is towards the southern view over the fjord



ill.109.5 6th floor & under which has a mixture of average & temporary units. Common area is towards the southern view over the fjord

Principles

The floor plan has a small seating area that provides natural daylight into the passage area. The initial intent was the have a place to enable rest that is small and comfortable. Here spontaneous social interaction could occur between the residents, staff and visitors.

Different areas at the lift entrance and kitchen, dining and lounge enable natural daylight to penetrate the internal spaces. The elevation the units are placed in a regulator position on each floor. As they move towards the dementia units, the floor recesses back into the building. On the lower floor the cafe walls are placed in a straight line, creating a plinth between the ground level and nursing home, defining the different functions.

It is preferable to have a larger area that for the provision of more daylight into this social space. In addition to this, the building form would be split up into two towers through the segregation of the glazed areas.

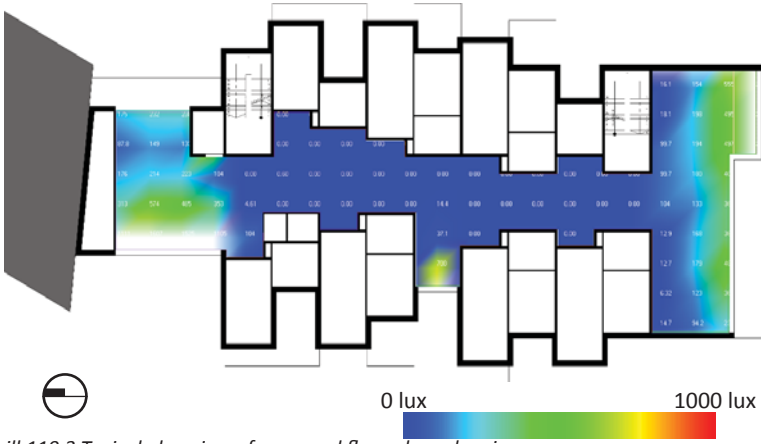
Daylight Factor Study

The daylight study shows very little daylight to the internal spaces of the floor. Different areas at the lift entrance and kitchen, dining and lounge enable large amounts of natural daylight as shown in the diagram (ill.110.3).

Required Modifications

- More internal daylight needed to the passage area
- Break the large building volume by moving the building apart & offsetting
- Accentuate the two volumes
- Place a roof that divides the two volumes

ill.110.2 West elevation of the nursing home & the rest of the building. The volume of the building seems wide compare to the height & scale of the other proposed buildings



ill.110.3 Typical plan view of proposed floor plans showing the light levels throughout the floor to the common areas

Daylight Factor:

Material finish reflectivity of 0.3 white
Lighting map positioned 500mm above the floor level
Total illumination was used in lux

ill.111.1 A perspective of the building from the south west showing the segregation of the building volume

ill.111.2 West elevation of the nursing home showing the glazed recess, creating two building volumes

Daylight Factor Study

Material finish reflectivity of 0.3 white
Lighting map positioned 500mm above the floor level
Total illumination was used in lux

More internal illumination is seen in the overall floor diagram (ill.111.5).
Higher average of daylight per floor area

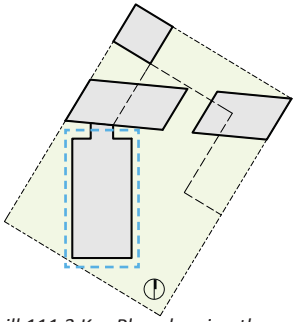
Modifications

of the Plan and the Building Expression

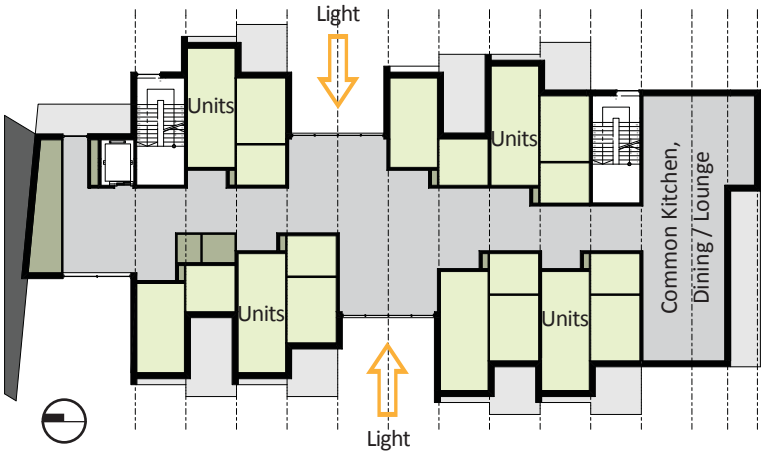
Through modifying the plan by extending a larger segregation between two parts of the building the buildings mass seems smaller and relates well to the other buildings. What is shown in the height of the other buildings is used as the width of the nursing home volumes.

Two spaces to the central part of the floor plans create a large space for enjoyable rest, which can be shared with other residence. Having seating areas on both sides allows the residence to view external activates outside and can have the choice of morning or afternoon sunlight and views.

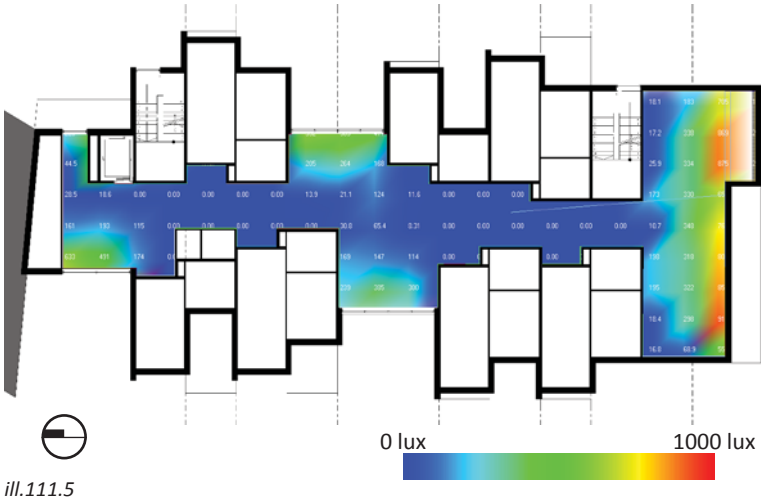
When looking at the daylight study the plan is divided into two spaces that will require additional electrical light to passage.



ill.111.3 Key Plan showing the discussed building



ill.111.4



ill.111.5

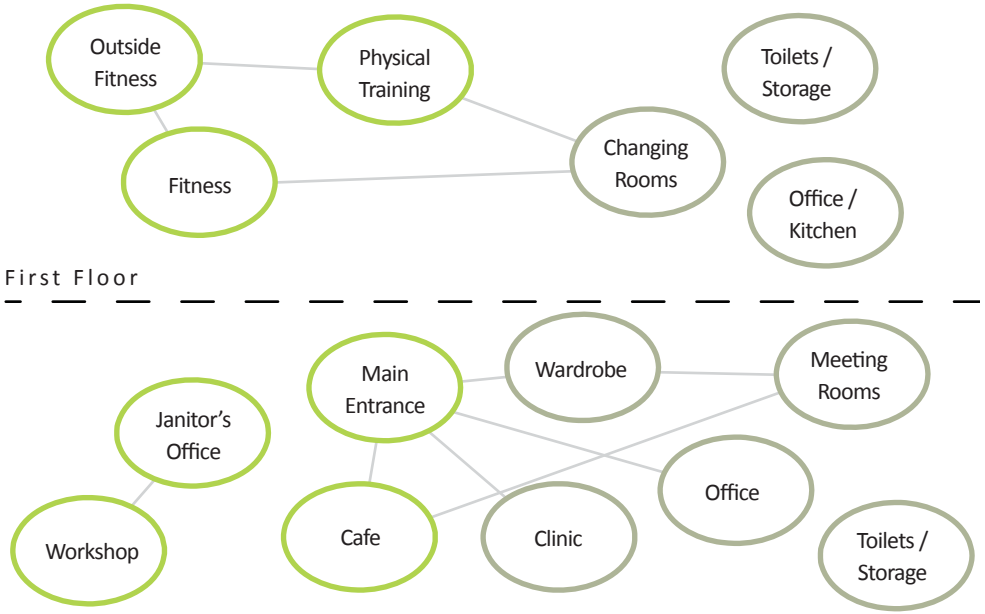
Connections to Other Functions

Throughout the study of this project, socialising both within the nursing home but also out in the community establishes an import connection to the area. What is essential in designing a nursing home is to create an environment that is open to visitors. The area focuses on establishing a central point that caters for different function for older people, like educational classes, fitness, group talks and events.

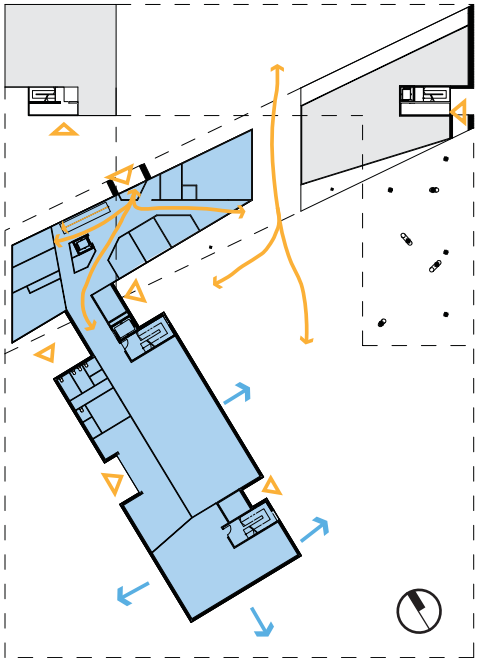
In connection to the center the nursing home has a restaurant/cafe that is open to the public. A public path along the water front catches the pubic into the communal cafe.

The center has two floors with an internal connection of a lift and stair. In the diagram the different function are shown between the two floors. Any functions that are connected to the outside are shown in green.

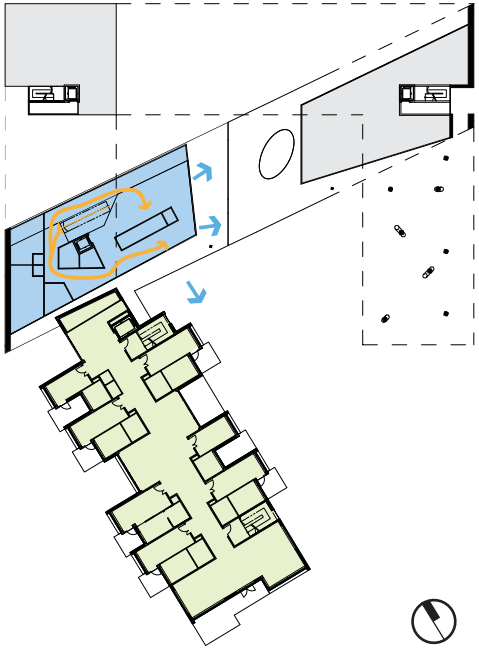
In the other parts of the building design there are the connections to the apartments above. Additional areas provide commercial spaces that could establish opportunities for connections to the nursing home such as a hair dressers etc. Other areas could have offices that are used by the surround apartments.



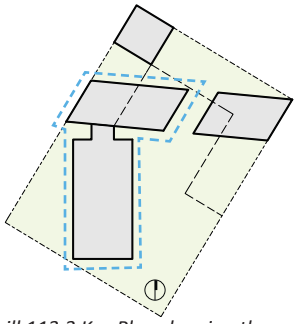
ill.112.1 A sketched overview of function in the community center. Outdoor connections are shown in green



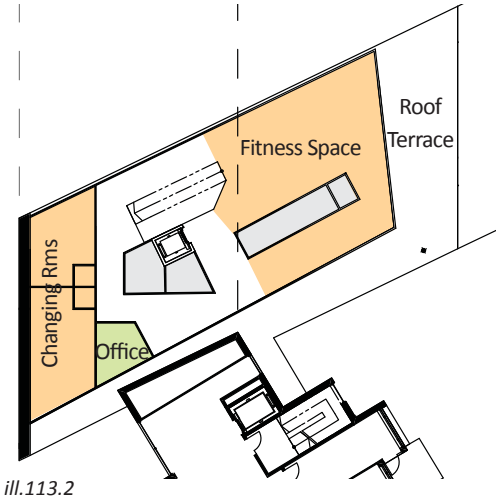
ill.112.2 Ground floor plan showing the proposed community center & restaurant in blue. Commercial buildings are shown in grey



ill.112.3 First floor plan showing the proposed community center in blue & the nursing home shown in green. Commercial buildings are shown in grey



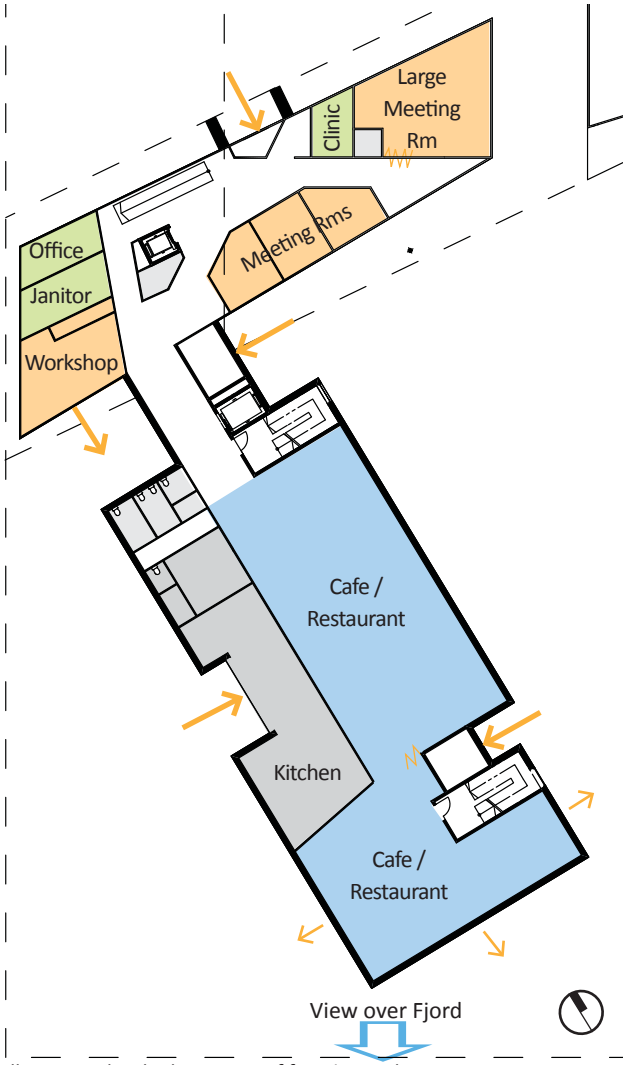
ill.113.3 Key Plan showing the discussed building



ill.113.2

Principles
On entering the center from the north, a clear overview of the center guides the people through. In close proximity to the entrance is the wardrobe and connections to the 1st floor. Towards the west are offices and the workshop which has an external connection. Other areas have small meeting rooms and a larger room that can open up towards a resting area overlooking the site. On the 1st floor the main function is fitness. Change rooms are close to the stairs and have a circular connection towards the fitness areas. This fitness space connects to a roof terrace where exercise can be taken outside without a large amount of visual connections from the public below.

To the south, the cafe/restaurant opens up towards the view over the fjord. The front part can be shut off from the main dining area for functions. All areas have a connection opening up toward the outside, where a terrace would allow outdoor dining.



ill.113.1 A sketched overview of function in the community center. Outdoor connections are shown in green

ill.114.1 Architect: Architectenbureau Micha de Haas, Aluminium Centrum, Houten, The Netherlands

ill.114.2 Architect: Architectenbureau Micha de Haas, Aluminium Centrum, Houten, The Netherlands

ill.114.3 Architect: Caramel Architekten, House H, Linz, Austria. Structure is seen extending up through the floors, along the external glazed walls

Building Form & Structural Expression

Throughout the concept of the apartments and community center, the design of the building form became the priority. To accentuate these building forms a visible structure which can be seen from the outside and inside was chosen.

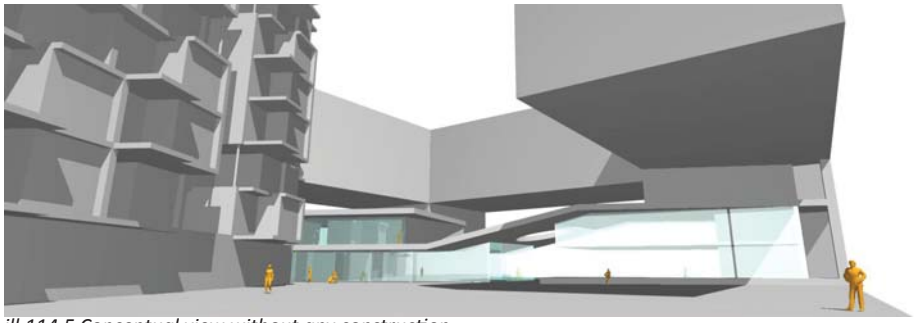
The principle shape and expression of the commercial buildings and community center is illustrated in ill.114.4. Here the line of the floor and walls is seen over lapping each other. A central area is open to people move through towards the fjord.

In the illustrations ill.114.1, ill.114.2 and ill.114.3 the structure in visible, and illustrates to the viewer the structural load transfer down to the ground. In the illustration XX the structure is seen as a light feature between the heavy lines of the roof and floor. The structure also extends down through the floors, tying the building together as a whole.

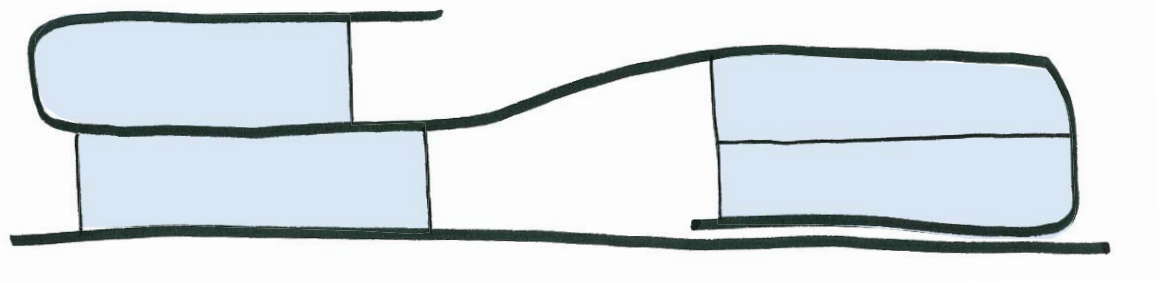
Principles

When looking at the examples of the structure, the columns visually illustrate the structural forces. By having larger columns that take more live and dead loads accentuates the forces seen in the structure of the building volumes.

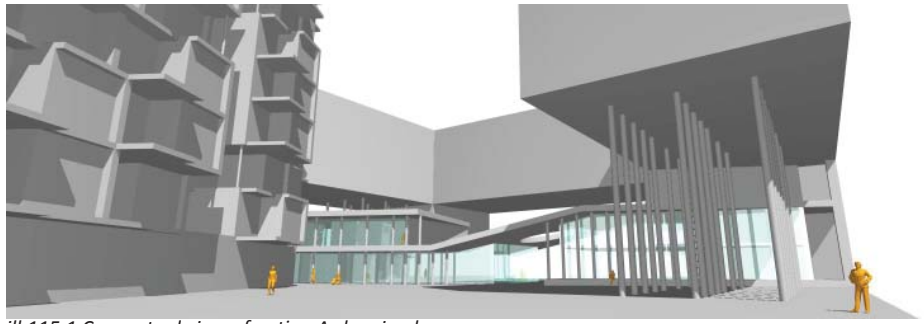
The community center has smaller columns that extend up through the first floor to the roof. This structure carries the folded formation of the walls and floor that start under the commercial area and rise over and down, folding again over the community center.



ill.114.5 Conceptual view without any construction



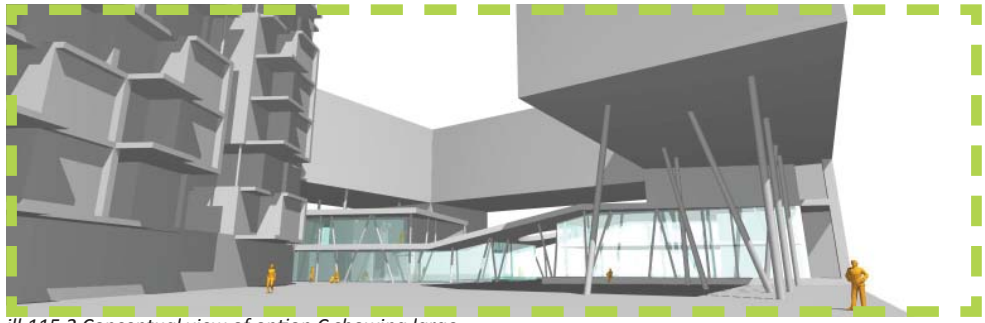
ill.114.4 Conceptual sketch of the community center that overlaps into the commercial space on the right



ill.115.1 Conceptual view of option A showing large 300mm dia & small 300mm dia columns

Option A - 300mm Ø large columns & 300mm Ø small columns

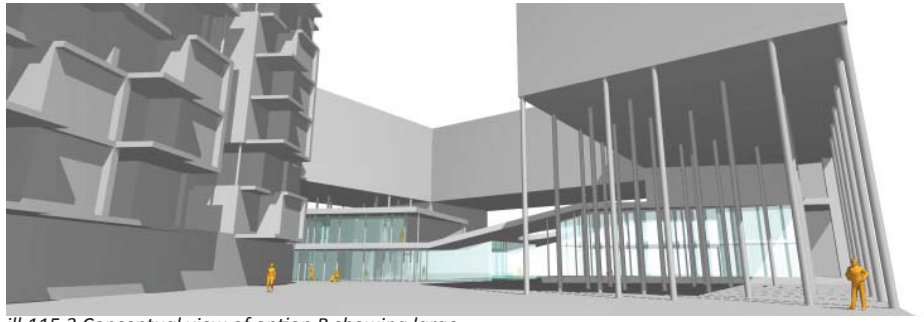
+ The smaller columns to the community center still allows for a visual connection to the outside
+ The columns are dense allowing for smaller columns
+ Larger columns are recesses accentuating the building volume above
- The larger columns are to uniform, and create another visual volume when moving around the columns
- Larger columns are dense creating more shadowing to the rest of the building



ill.115.2 Conceptual view of option C showing large 400mm dia & small 220mm dia columns

Option B - 400mm Ø large columns & 220mm Ø small columns

+ The smaller columns to the community center still allows for a visual connection to the outside
+ Angling the column visually accentuates the columns against the regularity of the building forms
+ Larger columns are recesses accentuating the building volume above
- Some of the columns made need to be a different size to take the additional load at an angle



ill.115.3 Conceptual view of option B showing large 300mm dia & small 150mm dia columns

Option C - 300mm Ø large columns & 150mm Ø small columns

+ The smaller columns to the community center still allows for a visual connection to the outside
+ Large number of columns, allowing for smaller columns
- Larger columns are not recesses extending the building volume above

Nursing Home, Units in Detail

Through the investigation of nursing homes within Denmark and New Zealand many people prefer their own homes to age in. What is important factor of designing a nursing home is to provide that same feeling of ownership, privacy and choice. The floor plan designs try to take into consideration all these factors.

Through many investigations of human's well-being and existing nursing homes concluded on a key design principle to create something can that is homely. There are many ways that one can feel homely by the use of furnishings, private pictures, textiles etc. To allow a resident to create their own homely environment it is important that the unit be able to adapt to their needs and to be open to personal furnishings.

In previous chapters the initial concept of the passage, relates to that of an apartment block. When looking at the ownership of privacy the entrance door is the border between semi-public areas and the privacy of the apartments. The design of the nursing home blur's this border of ownership, through refining the space outside the entrance, which can be personalised through names plates, decoration and a post-boxes etc.

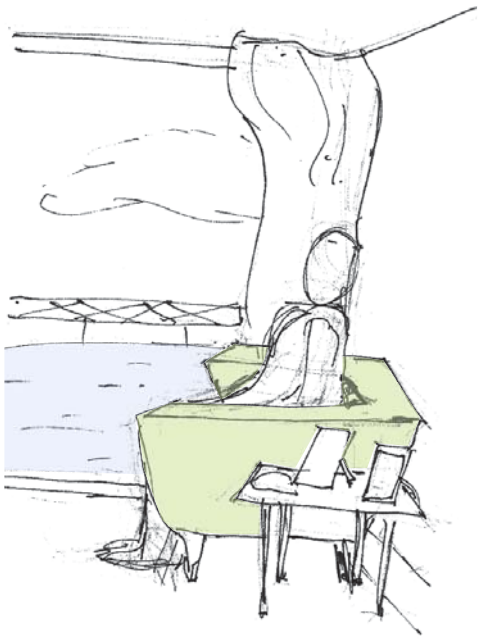
In illustration ill.116.1 section shows the progression of privacy between the main thoroughfare of the nursing home and the privacy of the unit. Here the ceiling represents the changes, as one enters into the entrance the ceiling is lower, when inside the unit the ceiling height represents that of residential dwelling of 2500 metres.

Key

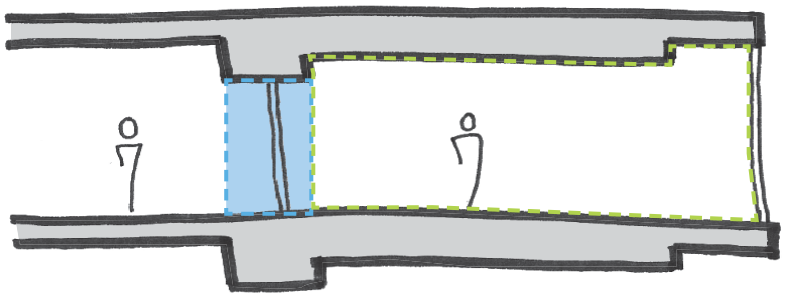
- Semi Public Space
- Private Space
- Bathroom Space
- Terrace Space

Factors of Homely within the Nursing Home's Units

- Personalised entry
- Refined material quality and spatial character
- Refined scale
- Orientation
- Private apartments
- Separate living and sleeping areas
- Outdoor space
- Kitchens
- Personally adjustable apartment controls
- Easy adaptability to changing needs



ill.116.2 Sketch thoughts of how one may use the space. Sitting near the window with a view & sun-light, personal belongs near by



ill.116.1 Sketch section of the ceiling height when entering the unit from the passage to the unit

Modifications

A. The bedroom door has change position to create a thoroughfare of movement around the kitchen area and within close proximity to the bathroom.

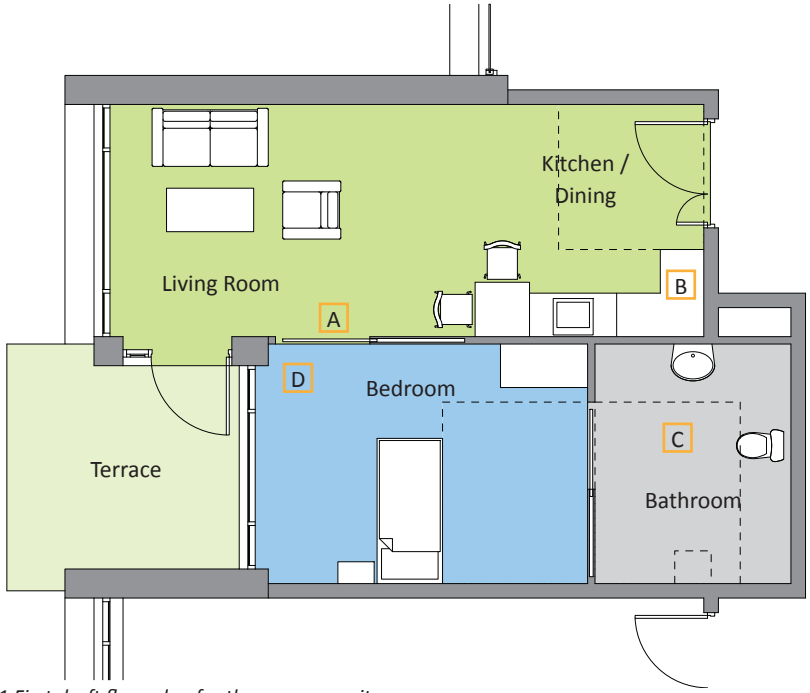
B. The kitchen has moved over to the other side of the room and replaced with additional storage behind the entrance door. Additional ducting has been placed behind the kitchen unit with an accessible panel above the kitchen splash back above the bench.

C. The bathroom has become more compact but has now a recessed storage unit which is recessed into the wall.

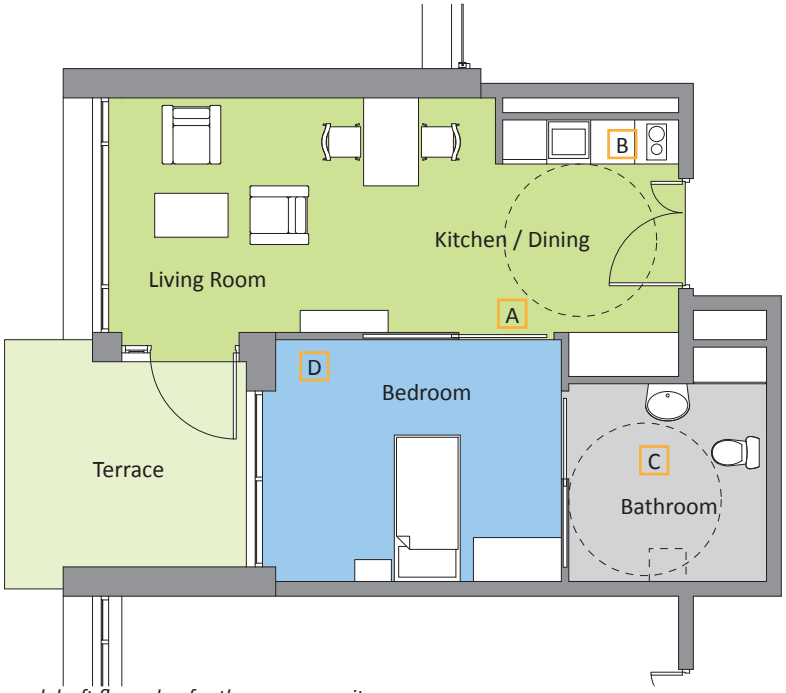
D. By moving the bedroom door and reducing the width of the bedroom window a small recess is formed for a personal desk or furniture.

The average unit caters for the more independent residents who may need additional care due to limited disability. The unit is considered homely and individualised through personal space for belongings and areas for social activities with family and friends.

Daylight was considered important in the placement of the functions throughout the unit. The living area and bedrooms have the majority of visual connections and daylight to the outside and the kitchen is based towards the entrance area.



ill.117.1 First draft floor plan for the average unit



ill.117.2 Second draft floor plan for the average unit

Modifications

A. The bedroom door has change position to create a thoroughfare of movement around the kitchen area and within close proximity to the bathroom.

B. The kitchen has moved over to the other side of the room and replaced with additional storage behind the entrance door. Additional ducting has been placed behind the kitchen unit with an accessible panel above the kitchen splash back above the bench.

C. The bathroom has become more compact but has now a recessed storage unit which is recessed into the wall.

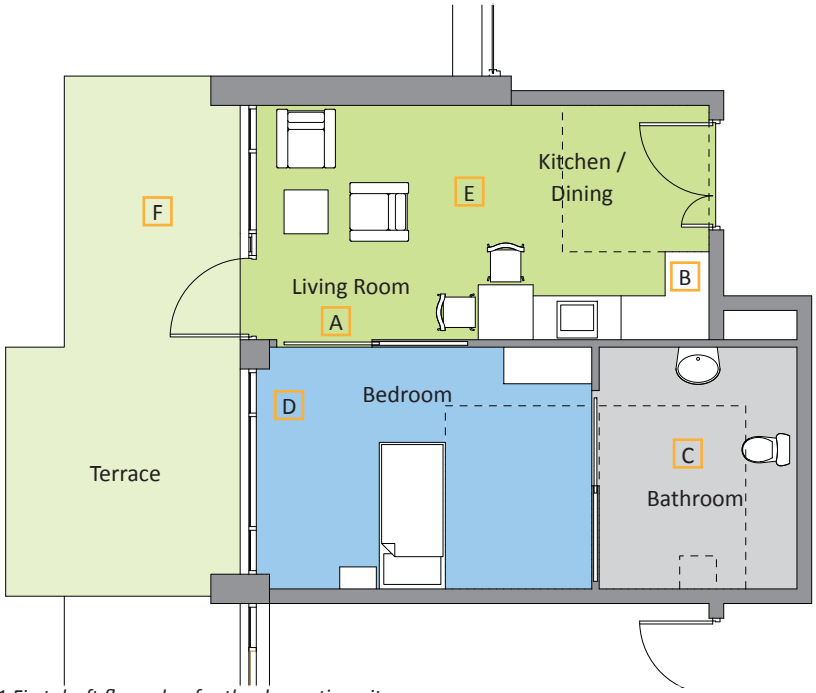
D. By moving the bedroom door and reducing the width of the bedroom window a small recess is formed for a personal desk or furniture.

E. The overall floor plan has become more compact to reduce the floor area.

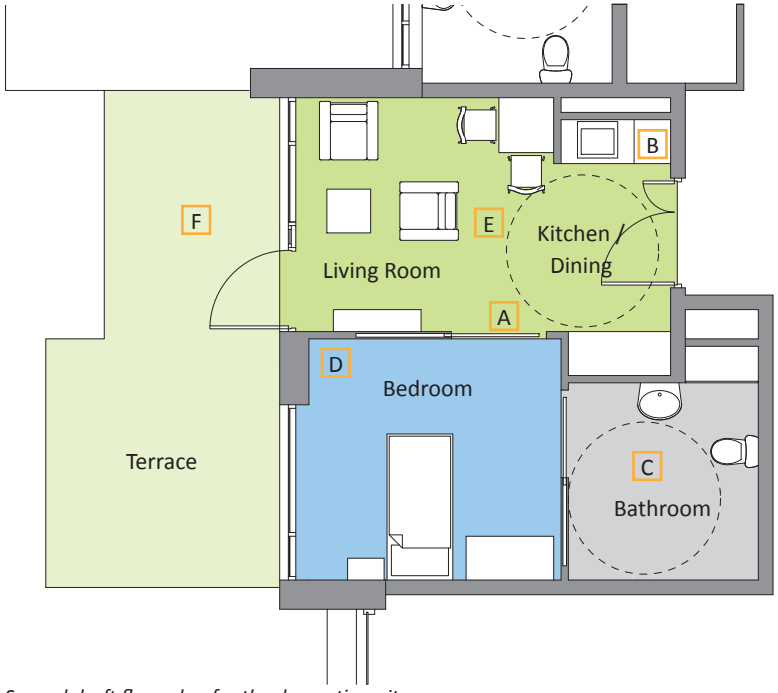
F. The terrace area has been enlarged for summer shading.

The circulation space of movement is situated in the kitchen area. From there the movement towards the daylight is to relax. A number of clear walls allow for personal paintings and photos. With the reduction of rooms the daylight can filter further into the space.

The main function of this room is to provide a personal space for the resident. Much of the time the residence are orientated towards a social community amongst other dementia residences.



ill.118.1 First draft floor plan for the dementia unit



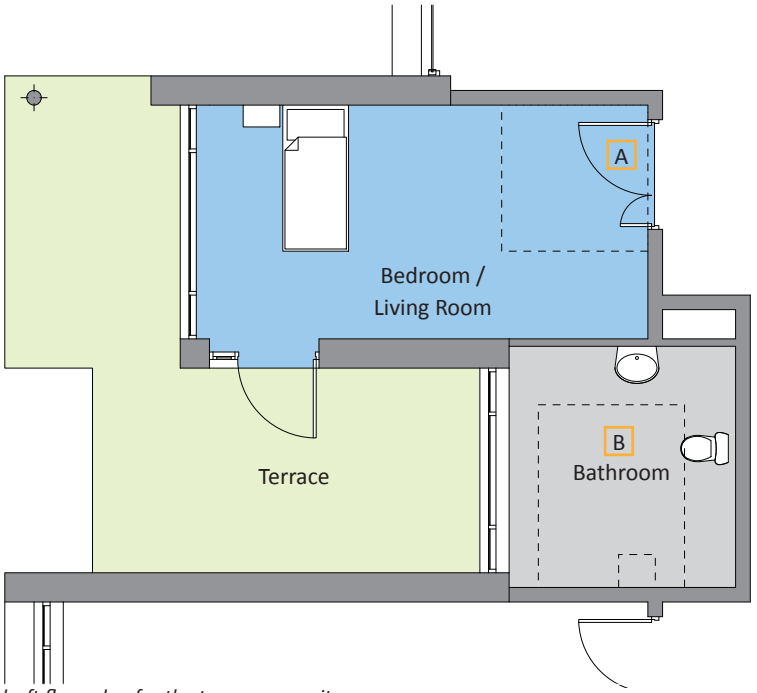
ill.118.2 Second draft floor plan for the dementia unit

Modifications

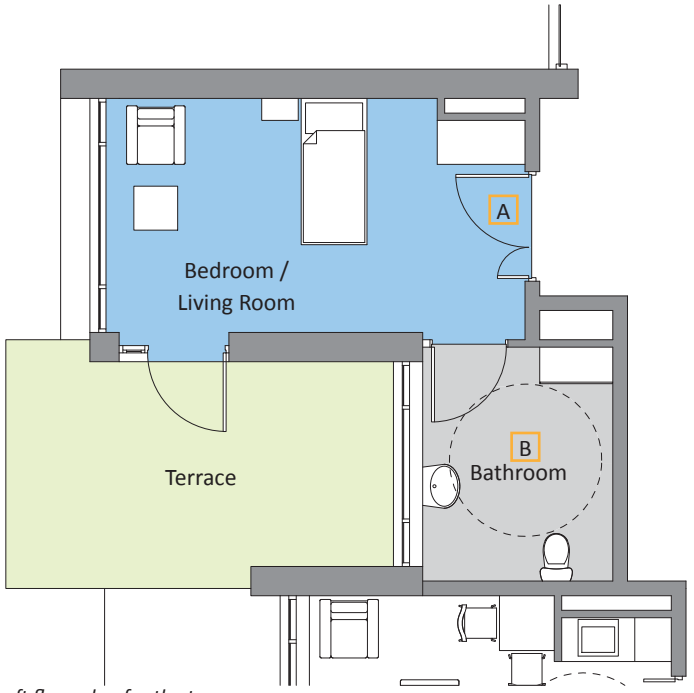
A. The entrance door has moved to accommodate a wardrobe behind the door.

B. The bathroom has become more compact but has now a recessed storage unit which is recessed into the wall.

This unit bases it environment on a hotel situation where a person can come and spend time in a place that is consider to be a home away from home, by using furnishings that have a persona of homely.



ill.119.1 First draft floor plan for the temporary unit



ill.119.2 Second draft floor plan for the temporary unit

ill.120.1 Architect: , Aalborg, Denmark.

ill.120.2 Architect: Marmol Radziner, Beach House, Palos Verdes Peninsula, USA. The design of the roof was inspired by the waves in the sea.

Building Expression

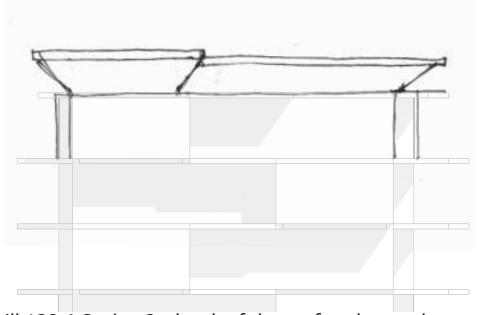
Roof Expression to the Nursing Home

During the initial stages of planning the functional layout of the nursing home floors and the buildings expression, it was concluded that the ventilation mechanical installation would be place in the roof space. In creating a roof design the volumes would seem complete but the segregation between the two volumes would be more defined.

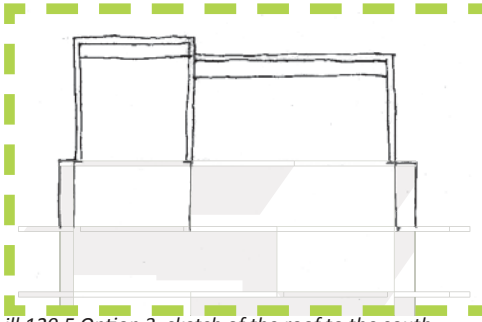
Many forms were considered from a more organic shape to a ridged form. When looking at the existing buildings around the site, many form rigid systems of block forms of a box. Their roofs are flat to keep the regularity of the area. With the proposed design of the nursing home compared to the rest of the buildings to the site the block forms are vertical but should the roof formation be similar to the block, flat roofed surrounding buildings or have its own expression?

The picture ill.120.1 shows one of the existing buildings along the Limfjord which plays more with the formation of the roof. The south facade opens up towards the view, sunlight over the fjord. Here the walls extend out to meet the angular roof. To the side elevations of the building, the roof profile is visually shows the form and purposed of the roof design. In the lower picture ill.120.2 the roof formation takes on the wave motion that curves down over the rest of the building. The representation of the design symbolises its surroundings by echoing the waves.

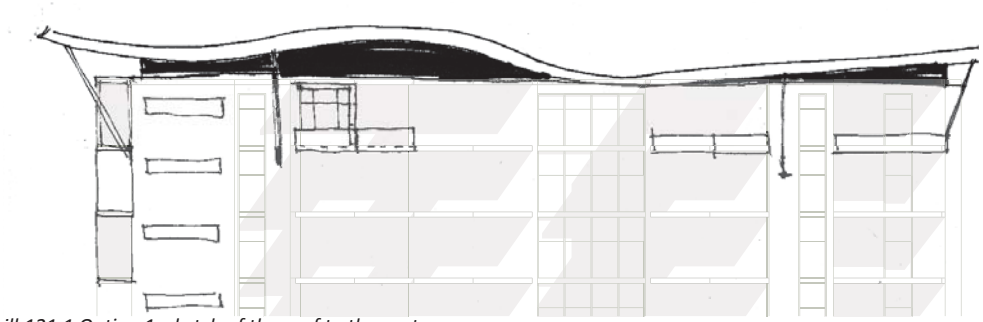
ill.120.3 Option 1. sketch of the roof to the south elevation



ill.120.4 Option 2. sketch of the roof to the south elevation



ill.120.5 Option 3. sketch of the roof to the south elevation

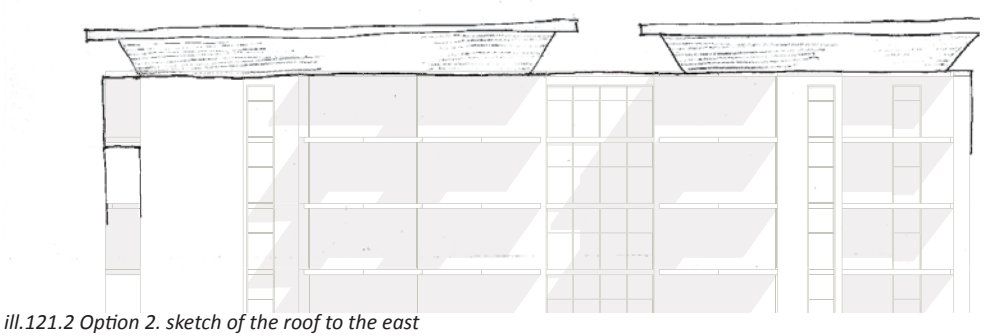


ill.121.1 Option 1. sketch of the roof to the east elevation

1.

The concept behind the shaping of the roof is the surrounding water of the fjord. The wave like motion rises as it moved towards the Limfjord (south) and held by angled braces symbolising the mask of a ship and a sail. As the wave rises to the south it houses the stairwell into the technical room for the buildings services.

Creating a large form as shown joined the two building volumes together, defusing the original concept of segregating the building parts into two.

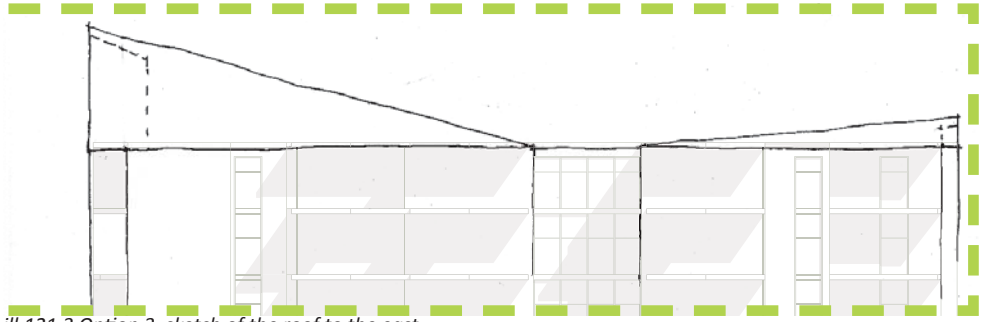


ill.121.2 Option 2. sketch of the roof to the east elevation

2.

The second option looked at creating an extension of the buildings volume by creating a featured roof that would stand out from the rest of the building. The roof shape has been simplified and placed at an angle from the roof level. The underside of the soffit could be accentuated with another material making in stand out.

The overall design of this doesn't really fit well with the building's design and looks odd compared the buildings formation.



ill.121.3 Option 3. sketch of the roof to the east elevation

3.

This roof option was inspired by some of the existing apartment blocks along the water front of the Limfjord. Here the roof is simplified and extends up from the buildings form into a angled roof. Towards the south the angle of the roof is steeper than the other part of the building to accentuate the two building volumes. Here the facade expression of folds (refer to the next page for discussion) that carry up to the roof.

This roof design was considered the best for the overall concept for the building of the musing home.

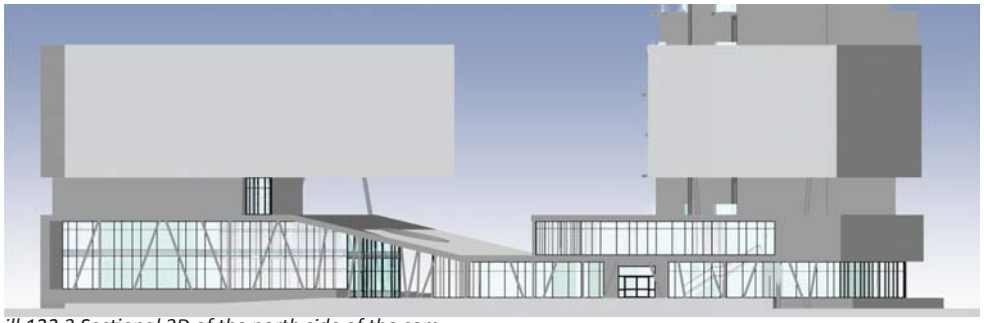
ill.122.1 Architect: Mack Scogin Merrill Elam Architects, Lulu Chow Wang Campus Center

ill.122.2 Architect: Mack Scogin Merrill Elam Architects, Lulu Chow Wang Campus Center, Massachusetts, USA. Internal view of glazing & structure

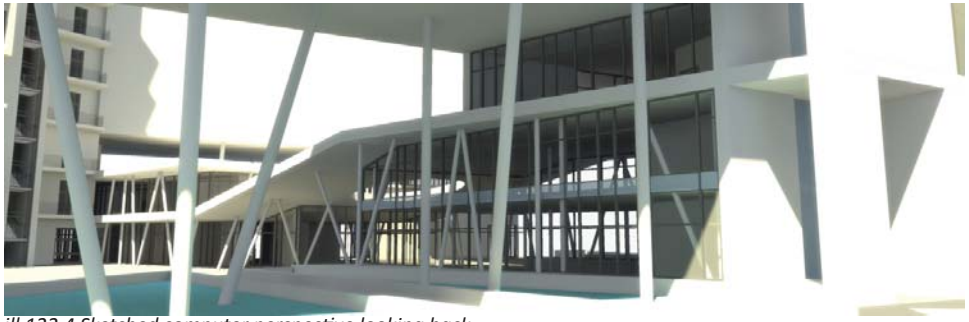
Building Expression of the Community Center

For a design such as a community center the expression is important to create a visual interest that draws people inside. What the existing area shows is a minimal experience opposed to the dynamics of the proposed building design. But could one say that what makes the design of a public building that is to achieve a memorable building form that also could establish itself as a dominate part of the area.

In the initial design the formation of the building is simple with a complicated yet easily understood structure. The expression of the structure makes the shape of the building come to life. The heavy weight of the roof curves down and over to the opposite building creating an interesting walkway towards the south.



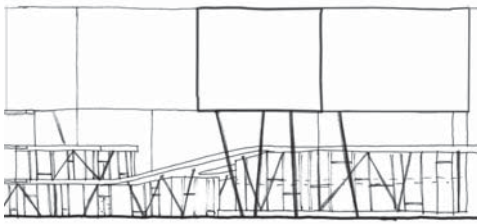
ill.122.3 Sectional 3D of the north side of the community center & commerical areas



ill.122.4 Sketched computer perspective looking back towards the community center & commerical areas showing the chossen expression of the form

The glazed structure of the mullions is based on a repeated block of 5 irregular spaces. Because of the width of the mullions the inside expression of the glazing is not so noticeable compared to the view over the fjord. In some parts of the community center the circular column structure of the apartments above extends down into the center.

As the initial form of the building was formed the structure and mullion expression was sketched as seen from illustration ill.122.5 in relation to the inspirational building design of Lulu Chow Wang Campus Center as seen in photos ill.122.1 and ill.122.2. From here the proposed mullions and structure was achieve throughout the community center and proposed commercial spaces as seen in illustration ill.122.3 and ill.122.4.



ill.122.5 Sketched expression for the community center & commercial areas

ill.123.1 Architect: Lundgaard & Tranberg A/S, Tietgenkollegiet. Mixed landscaping & seating areas

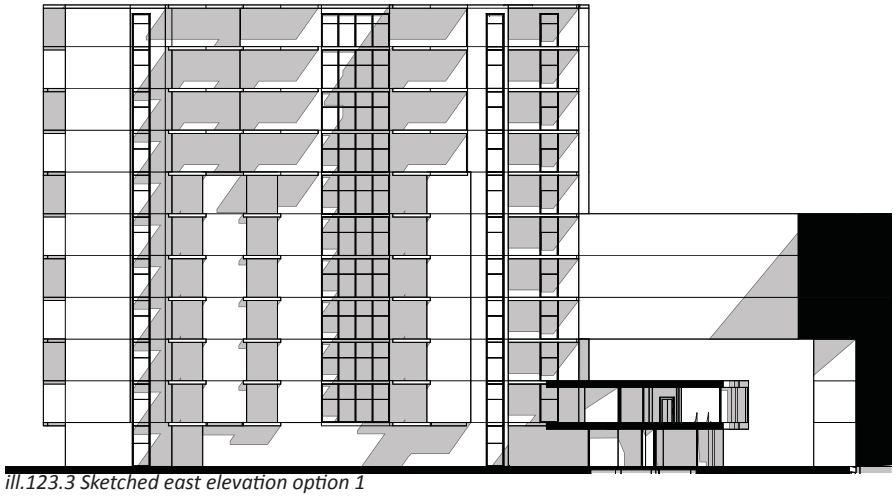
ill.123.2 A computer render showing the expression of the south facade

External Building Expression to the Nursing Home

Based on the gridular system of structure the unit can freely move in different formations. Thus the second initial sketch (ill.123.4) plays at breaking up the formalities of the first option (ill.123.3). When looking at the second option the set out of units gives interesting quality with the different shadows around the building. As the units have different depths the expression of volumes moved back and forth into the building as seen in the inspirational picture ill.123.1. By creating a more diverse building expression can make it more visually easier to see what unit a resident may live in from around the site, giving a connection to their space from the outside.

Toward the south elevation (ill.123.2) a folded expression is used. As the floors move up in height a wrapping system alternates from left to right. These folds are functional as balconies and shading.

The next stage of the external expression investigation is to look at the windows, balcony handrails and material.



ill.123.3 Sketched east elevation option 1

ill.123.4 Sketched east elevation option 2

ill.124.1 Architect: Lundgaard & Tranberg A/S, Tietgenkollegiet. Mixed landscaping & seating areas

ill.124.2 High Line, New York, James Corner. Intergration of hard & soft landscaping & historic connection

ill.124.3 A place where different people would come. Creating an environment that family members want to come & visit residence in the nursing home

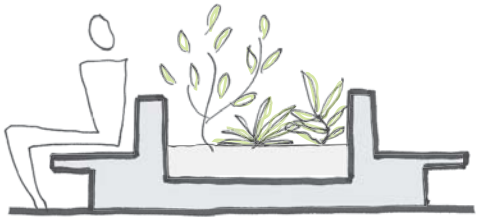
Master Plan

Initial Plans and Thoughts

Throughout the investigations of health and wellbeing in evidence based design and healing architecture, having a natural landscape was considered important.

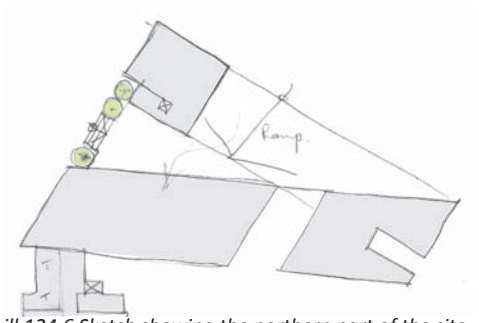
When moving past the site there is different levels of use for the area. Towards the Limfjord pedestrian walkways move along the waterfront, when moving into the site people may use this area for short breaks where they can sit and admire the view etc. Moving closer towards the buildings a cafe connects the public for a longer stay in the multi use cafe that caters for both the nursing home and public during the day. Around the sites landscaped areas, different functions allow a mixture of different people. Playgrounds invite younger children and families to utilise the space or grass area where young adults can lie. With this concept comes an environment which is stimulating for the residence in the nursing home. Constant movement of people mixed with a natural landscaped surrounding could create a positive distraction for any pain or depression.

ill.124.4 Accessible gardens for residents

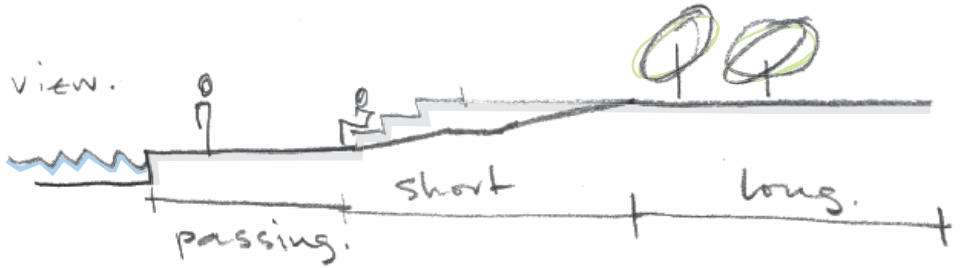


ill.124.5 Intergrated seating around a garden

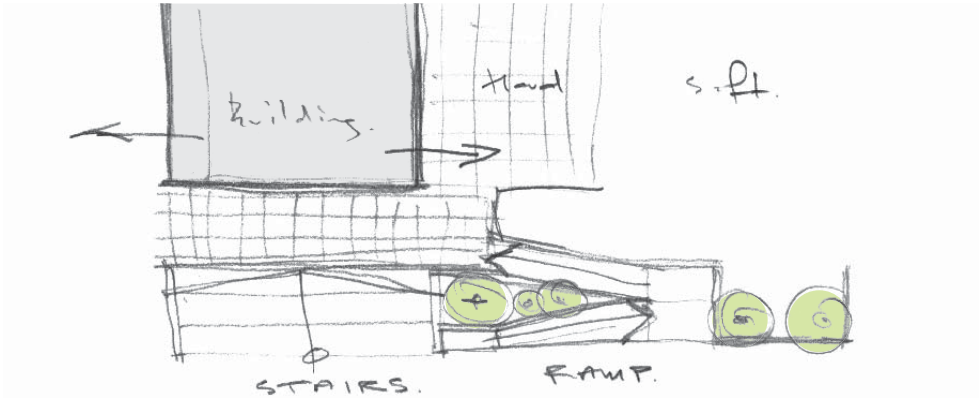
Principles
The landscaping is made up of soft and hard surfaces and planted areas which are on a plinth to allow, older people to access the gardens. A number of seats allow for spontaneous social interaction and enjoyment of the view over the Limfjord and the sunshine.



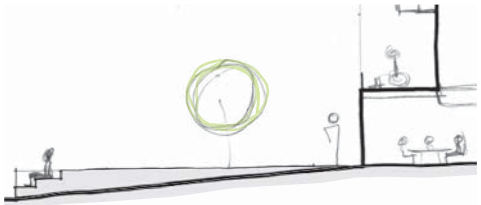
ill.124.6 Sketch showing the northern part of the site, where the public area is made up of staris & ramps



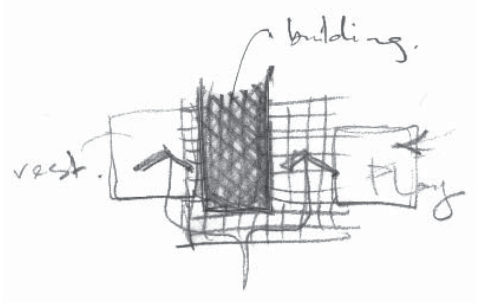
ill.124.7 Sketched section of the site towards the fjord showing the different lengths of stay leading into the site



ill.125.1 Sketched plan of the southern side of the site towards the fjord showing the steps & ramp



ill.125.2 Sketched section of the site towards the fjord showing the steps in relation to the building



ill.125.3 Sketch showing the flow where the west of the site is for rest & the east is for play

Principles
Large and small steps lead up to the built up area of the site, where people can take their time walking up towards the cafe or sit and admire the view. (ill 125.1)

The site is a meter (local plan requirement) from the street level which is seen throughout the edge of the site, where a wall defines the barrier. Large stairs and ramps still allow for a connection and an easy access to the site.

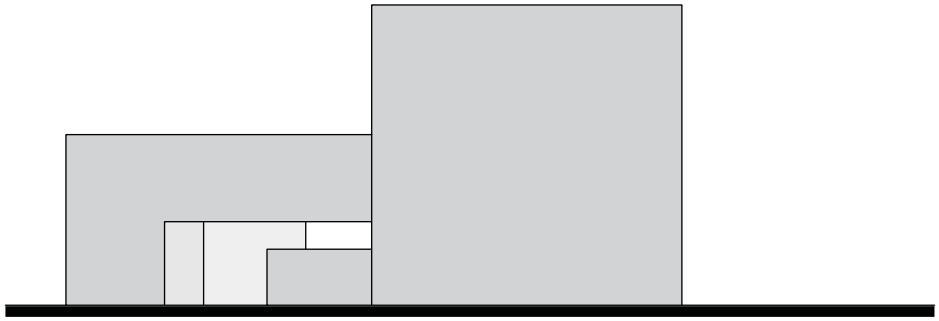
The architectural expression of the construction can be accentuated by using creating a water feature that reflects the length of the columns, but also allows the structure to be views from higher up the building with the use of the reflection.

ill.125.4 Proposed sketched design of the site plan, showing the paths, landscaping & functions of the area

Overview of Sketching Phases

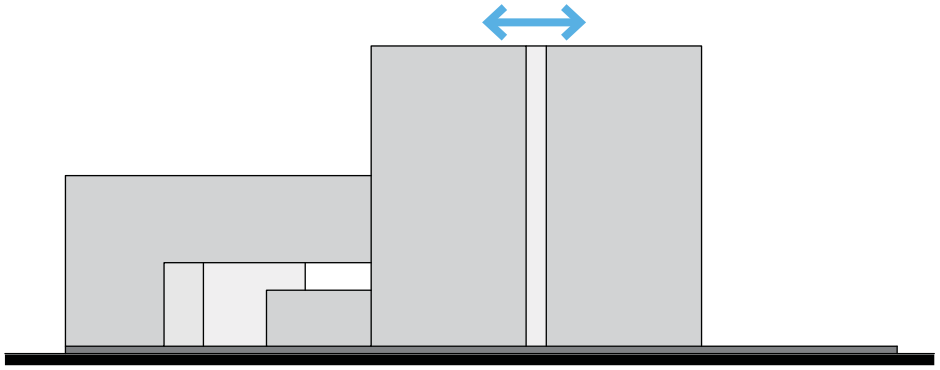
Introduction

Follow the concept stage the sketch phase becomes more detailed and a initial design proposal is formed. What is seen below is an overview of the different stages the process went through.



1 ST

From the concept form the building shape takes of a scaled form. Here it shows the different volumes and shapes of the building in a west elevation. The larger form is the proposed nursing home that faces the south.



2ND

From this point the nursing home is evaluated and discussed. The building form is too large and is then overset into two building volumes. Here glazing can be placed to allow for additional daylight into the common passage.

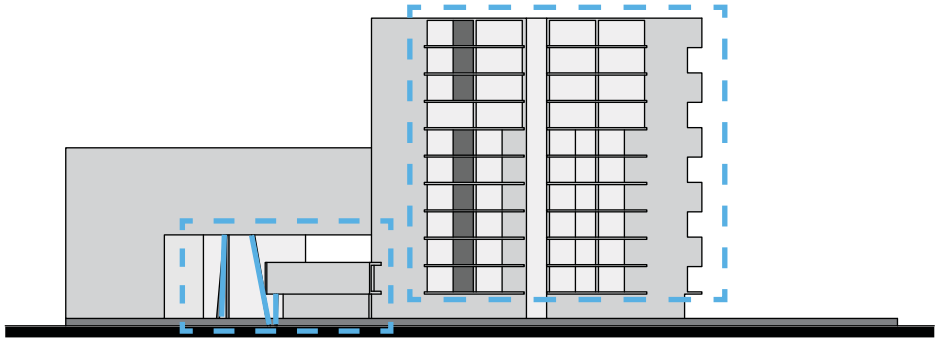
As a local plan requirement the building site is risen a minimum of 1 metre above street level.

Next Stage

Following on from the sketching phase the proposed design is detailed and dictions made about the types of windows, material, structure, services and the building is investigated and modified to comply with the building regulations.

Estimated Sketching Areas:

Commercial	8.2 %
Community Center	5.4 %
Mixed Nursing Home / Public Cafe	4.0%
Nursing Home	38.0 %
Apartments	44.4 %



3RD

The expression of the buildings starts to be created through structural elements of the columns to the community center, commercial areas and the apartments. The community center's design takes of a folding structural form with a glazing infill. In addition to this the units for the nursing home are placed on the floor plan. Here the expression of the nursing home changes as the small volumes move in and out of the main grid system of the structure.

4TH

Now the initial building design has been shaped to the proposed building with the addition of a simple shaped roof and the shift in the placement of units in the buildings expression.

The site starts to take form with the introduction of landscaping, stairs, ramps and water feature to the buildings site. Paths are formed in relation to the lines proposed in the concept stage.

Intergration Phase 1

Introduction

The next stage of the report is to start detailing the building, as an ongoing integrated design process where many detailed investigations can aid in the formation of the building design.

The following points will investigate the initial sketch of the proposed building design in more depth:

- Fire
- Construction
- Ventilation
- Daylight
- Shading Systems
- Materials

This will include sketches of investigations, calculations etc to help in the detailed investigation of the building with additional factors from the investigation process.

Total Energy Consumption

Energy consumption for heating pr m² floor area	50.1 kWh/m² per year
Energy consumption for cooling pr m² floor area	0.0 kWh/m² per year
Total energy consumption pr m² floor area	**50.1 kWh/m² per year**

Refer to Appendix for a detailed overview of parameters used in this indoor climate study.

Minimum Danish Building Requirements

Energy Frame Building (note 1)	52.7 kWh/m² per year
Class 2015 Low Energy Building (note 2)	30.1 kWh/m² per year

Note 1 -The energy performance for an energy frame building:
Per m² of heated floor area must not exceed 52.5 kWh/m² per year, plus 1650 kWh/m² per year divided by the heated floor area. (Section 7.2.2 of the Danish Building Code 2010).

Note 2 - The energy performance for a Class 2015 Low Energy Building:
Per m² of heated floor area must not exceed 30 kWh/m² per year, plus 1000 kWh/m² per year divided by the heated floor area. (Section 7.2.4 of the Danish Building Code 2010).

Overview of the Design

In addition to the concept stage of the indoor climate investigation using the monthly average spreadsheet as a tool. Through the prior sketching phases an overall idea of material and construction was formed allowing for a more detailed analysis of the proposed building design. For this study the parameters are mentioned below:

Number of Apartments: 70
Number of user: 150 (70 residence the rest staff & visitors)
Time of use: All day (7 days x 24 hours = 168 hours)

Net area 6664.9 m²
Gross area 5960 m²
Heated area 5960 m²
Service life 168 hours/week

The next stage of the indoor climate investigation is to have detailed dimensions of windows and the type of ventilation used.

Fire

For the analysis of fire the nursing home building was chosen as an example for fire protection.

In the planning of the floor plans fire protection and fire escapes have to be considered for the safety of the residence. The building is over maximum height of a fire truck, so special consideration has to be put into place to ensure that all the people can exit the building safely if a fire did occur.

Through the investigation of the fire the Danish Building Code 2010 and the Erhvervs- og Boligstyrelsen, Protection Against Fire in Buildings.

The information as follows:

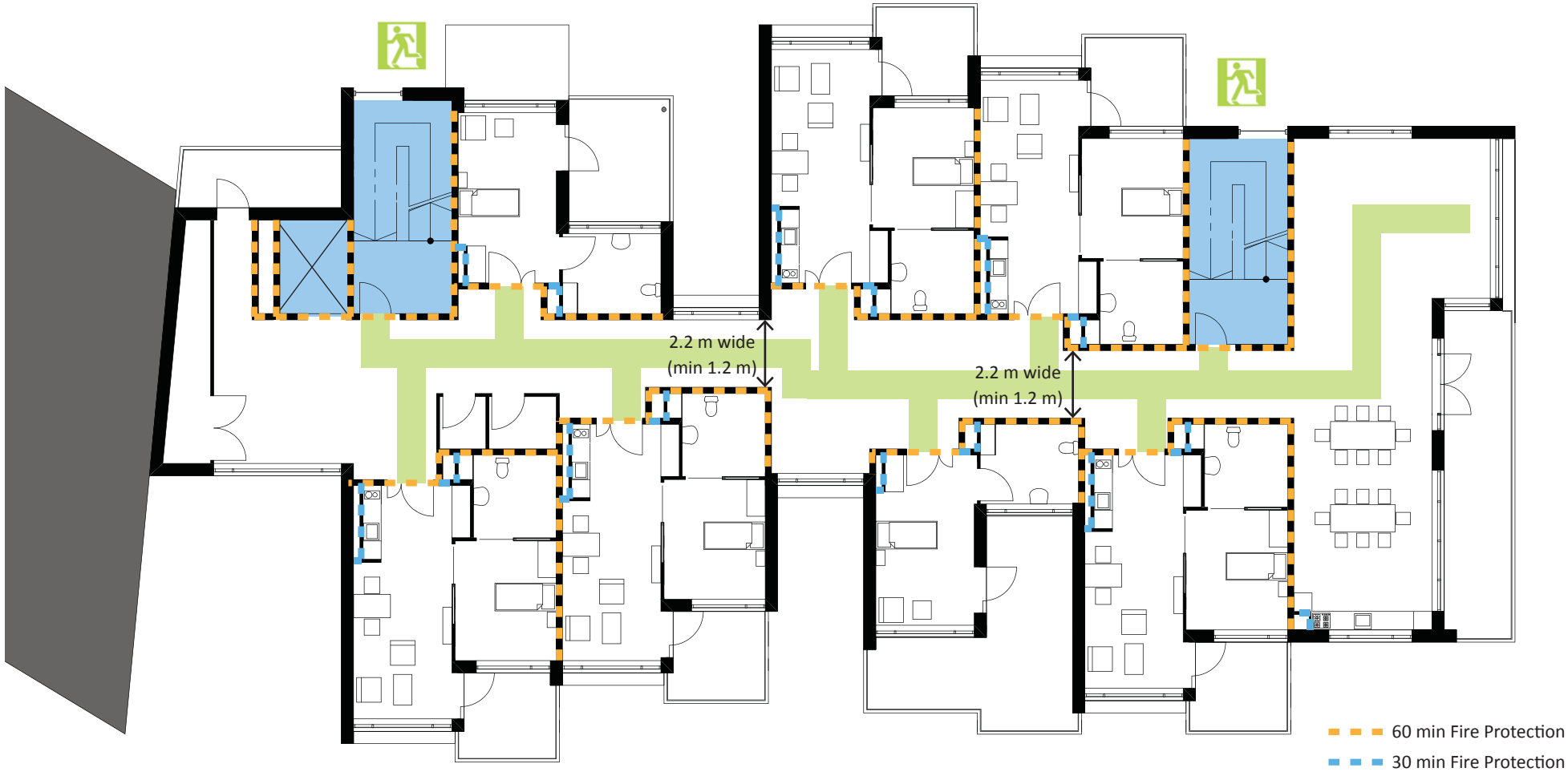
- The building use in a category 6
- Doors to have a minimum of 1.2m for hospital beds (1.4m proposed)
- Corridor is to have a clear width of 1.2m (2.2m proposed)
- Handrails are to be fitted to both sides of the walls for an easy escape

Fire Ratings as follows:

- Glazing may be used in the fire protected hallways for surveillance/safety reasons.
- Non structural walls to the protect fire passage is to be E30 (F – building component 30) with a door class of E30-C (F - door 30)
- All finishes to a fire protected route is to have (class 1 cladding) – K,10 B-s1, do
- All load bearing structure to have a fire rating of R60 (BD – building component 60)
- Fire rating between floors to be class R120 A2 – s1, do (BS – building component 120)
- Stairs to have a fire rating building component class R30 A2-s1, do BS – building component 30)

Notes on the floor plan design in regards to fire:

- The width of the hallway is 2.2m due to the comfortable distance, for people in wheelchairs to pass each other than to go for the minimum width of 1.2 m for the passage.
- Glazing has been placed in the door to provide a view for the staff without being too intrusive on the residence privacy.
- Any penetration to fire rated walls will have fire collars to stop the spread of fire between fire cells.



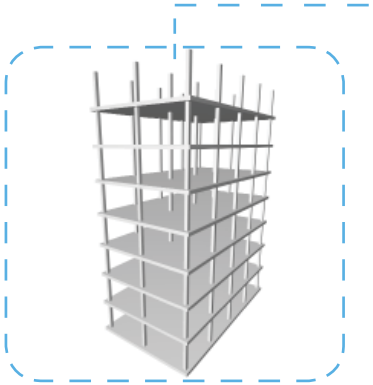
ill.131.1 Typical floor plan showing the protected path to the escape exits that lead to the ground floor

Construction Strategies

The purpose of the structural system is to deal with a live loads such as people, equipment and the self loads of construction together with external loads generated through climatic conditions such as wind and snow.

Based on a multi-storey building typology, four main construction strategies can be used within the structural system. In addition to this, structure is an important component not only for carrying uniform loads and stabilize a building, but to ensure enough flexibility is integrated within the design principles of the integrate process. The following illustrations represent some of the strategies that have been evaluated with regard to the design principles concerning the architectural quality. Strengths and weaknesses of the systems are marked as pros (+) and cons (-).

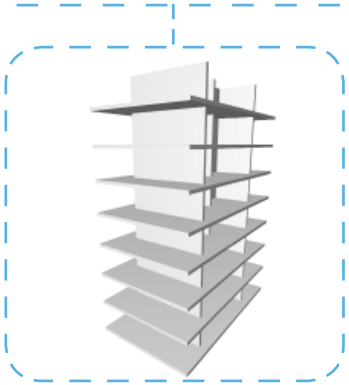
A



Column Load Bearing System

+ Freedom in the façade design
+ More room for insulation
+ Can accommodate larger windows to capitalize on naturalfor daylight
+ Vertical lines can be used in the external expression
+ Can expose or hide columns in walls
- Doesn't provide thermal mass
- Necessiates secondary bracing

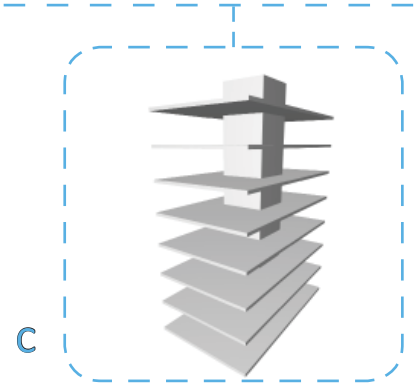
B



Internal Load Bearing Walls

+ Freedom in the façade design
+ More room for insulation
+ Can accommodate larger windows to capitalize on naturalfor daylight
+ Can be used for thermal mass
- Larger floor depths when cantilevering the floor slabs
- Restricted internal design

C



External Load Bearing Walls

+ Can be used for thermal mass
- Less freedom with the design of the façade
- Smaller windows to floor area ratio
- Less room for insulation of buildings envelope

D

Load Bearing Core

+ Freedom in the façade design
+ More room for insulation
+ Can accommodate larger windows to capitalize on naturalfor daylight
+ Can be used for thermal mass
+ Can be combined with lifts & technical cores
- Larger floor depths when cantilevering the floor slabs
- Because the core is invisible it is does not contribute any elements to the overall expression of the building

A External walls for better floor and balcony layout.

B Internal walls will allow for good thermal mass to the unit partitions. Other internal walls could be built with timber/steel construction with plaster board.

C Stabilizes the building around the stairs and lift cores. In addition to this service cores could also help.

ill. 133.1 Final outcome that uses A, B & C construction of beams & walls

Though the structure was not to be a focal point of the thesis the structure sizes where still considered. By using the “Dimensionering med diagrammer” a simple estimation could be achieved.

The following data was used as follows:

Height of columns: 3800 mm (floor to floor height)
Load area: 16.459m2 x 12 floor (including roof) = 197.508m2 total load area

Load character, “bolig last” [Dimensionering med diagrammer, Ahler, Knud]

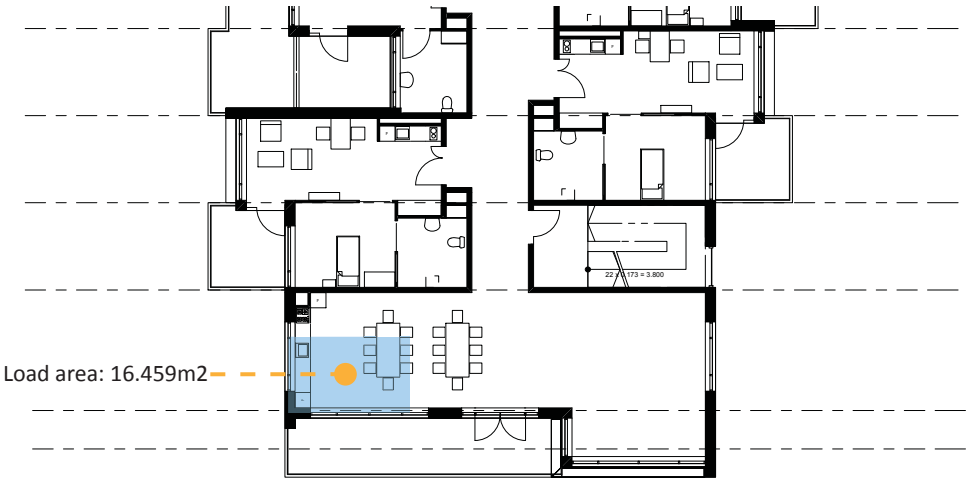
The following possibilities were found:

Columns, either:

200 mm HEM
240 mm HEB

Walls:
220 mm concrete wall (reinforced)

The widths of the walls are smaller with the used of a light steel construction. Having the internal wall at load bearing concrete can stabilises the over structure and can be used for heat gain in the winter times.



ill. 133.2 Typical floor plan showing the load area

Ventilation Strategies

As found through the studies of evidence based design, good indoor environment is a importance factor it creating a positive atmosphere. To ensure low energy consumption in relation to the Energy Class in BR10 Danish Building Code, it is importance to utilise both natural and mechanical ventilation in the building. During the year, both systems would be used over the summer period where only mechanical ventilation would be needed during the winter months.

When using natural ventilation it is important to consider the wind direction in relation to the building as this can help in providing a build up of pressure on one side that draws the air through the building. Through this could be done in the proposed design, fire regulations prevent openings to the internal passage between the units. What this means that the ventilation in the separate units is one sided, and would require thermal buoyancy to allow the natural ventilation to circulate throughout the unit.

Mechanical ventilation

A mixture of mechanical ventilation and natural ventilation would be used. Throughout a floor of the nursing home, different functional requirement such as cooking or extractors in bathrooms would require mechanical ventilation. In addition to this a mixer of inlets and outlets would be placed in the ceiling throughout the floor for ventilation. For this propose a large space between the floor and ceiling ranging from 500 mm to 1 meter and separate service cores are used for the buildings services.

Dimensions of the Ducts

Calculation of air amount

Calculate the air amount for a typical residences unit:

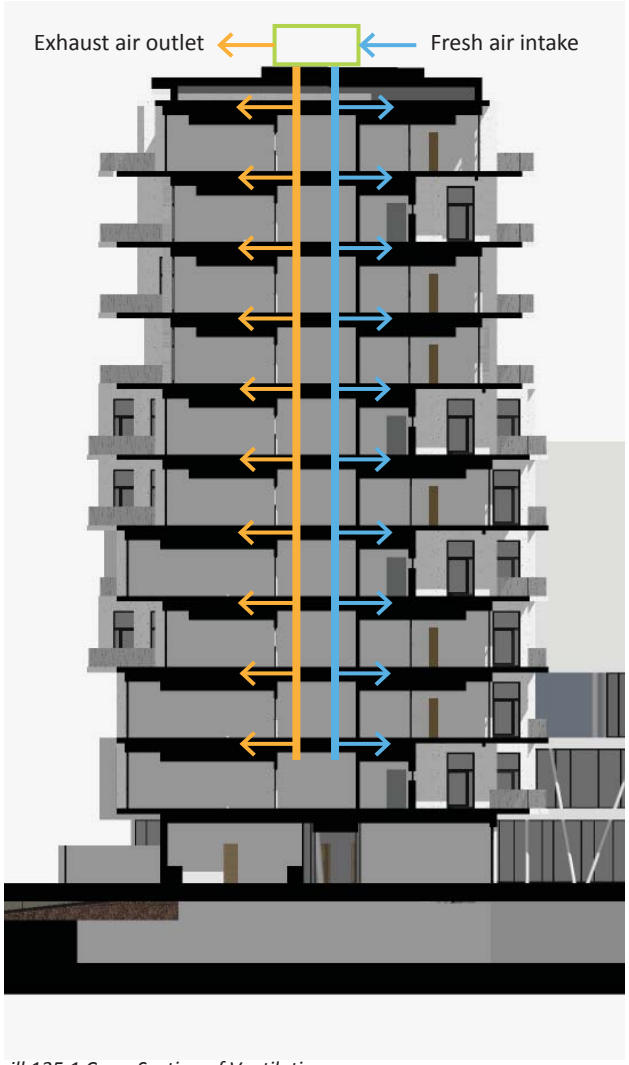
Kitchen with a size of 6.08 m²
Bathroom with a size of 8.91 m²
Bedroom with a size of 14.52 m²
Living room with a size of 19.52 m²
The rooms have a ceiling height of 2.5 m

Ventilation rates as per BR10 Danish Building Code (2010):

Kitchen	20 l/s per m²
Bathroom	15 l/s per m²
Other	0.3 l/s per m²

Ventilation air amount for the kitchen area
= 20 x 6.08 = 121.6 l/s = 0.121 m³/s = 435.6 m³/h
Ventilation air amount for the bathroom area
= 15 x 8.91 = 133.7 l/s = 0.133 m³/s = 478.8 m³/h
Ventilation air amount for the bedroom area
= 0.3 x 14.52 = 4.4 l/s = 0.004 m³/s = 14.4 m³/h
Ventilation air amount for the living area
= 0.3 x 19.52 = 5.9 l/s = 0.006 m³/s = 21.6 m³/h

Kitchen duct size	Ø 250 mm
Bathroom duct size	Ø 315 mm
Bedroom duct size	Ø 63 mm
Living room duct size	Ø 63 mm



ill.135.1 Cross Section of Ventilation

Natural Ventilation

Throughout each floor, a mixer of cross and one sided natural ventilation will be used.
In the apartment single sided ventilation in the summer months would allow for cool air to be drawn into the room and then heated, rising towards the ceiling and out the open window.
To the common kitchen, dining and living rooms cross ventilation will be used. In addition to this seating areas along the passage way would use cross ventilation through open windows. This works with the predominate wind from the west that will draw the air through the building and out towards the east side of the building.

Daylight Simulations

The conceptual plans showed a sketched view of the windows for the units. This was developed more in a detail by using 3D max Architecture, daylight simulation of the daylight factor within the units. The daylight factor looks at the overall light that would occur during an overcast day. What the daylight factor shows us is the minimum amount of daylight and the depth in which it filters into the unit's space. The unit has windows to one side as the fire code restrains the concept of having internal glazing between the passage and units as this may not be a cost efficient option.

Through the study of the daylight factor 1 % was considered the minimum requirement for the living area. This area would have seating to look out over the view of the fjord.

For this study the worst case scenario was used being the average apartment due to the depth.

Daylight study overview

- Daylight gird has been taken 100mm above floor level
- 2500mm high window with 50 x 100mm frame, without any sashes
- All materials were set as a matte white finish with a reflection factor of 0.3 (The floor reflectance should not be too low (>0.3)). [p 2-14, Nancy Ruck. 2000].
- Glazing had a transmittance refraction colour of 0.94
- Depth of living and kitchen area = 7.6m
- Depth of bedroom = 3.9m

Average Daylight Factor for a Dwelling

Location	%
Living rooms	1
Bedrooms	0.5
Kitchens	2

ill.137.1 Option 1

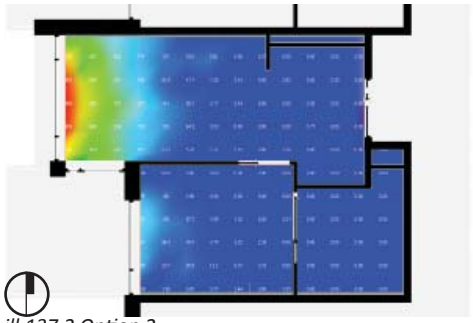
ill.137.4 Option 1 3D render of window

1.

2000 mm window
500mm sill
3500mm ceiling height

This was the poorest of all the daylight studies. Very little light made it into the bedroom space due to the window being recessed and a balcony protruded out.

This concept is more functional than the other as the window sill can be used for personal belongings.



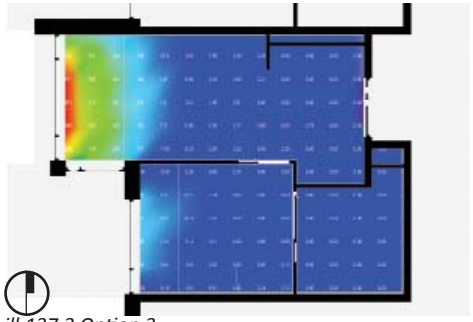
ill.137.2 Option 2

ill.137.5 Option 2 3D render of window

2.

2500mm window
3500mm ceiling height

This gave more light into the bedroom space. Within 1500mm into the room the daylight factor was 1.8 % and 3.4 % which is considered acceptable. Through the rest of the room the daylight towards the window was high.



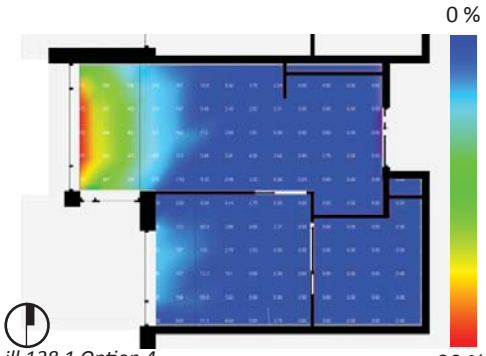
ill.137.3 Option 3

ill.137.6 Option 3 3D render of window

3.

2500mm window
2500mm ceiling height

The helped with the penetration of light into the spaces but still not deep into back areas as an example the kitchen/entrance area.



ill.138.1 Option 4

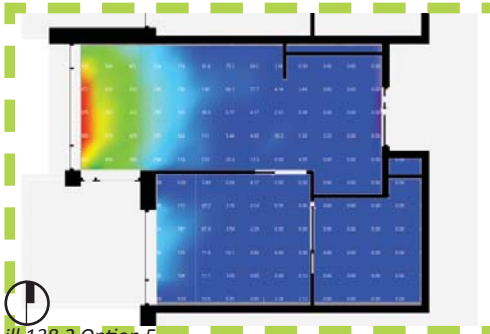
ill.138.4 Option 4 3D render of window

4.

2500mm window
2500mm ceiling height
Balconies width down by 700mm

It was an idea to try reducing the length of the balconies over the bedroom by 700mm to see if this would improve the daylight factor within the bedroom space. What was surprising was the outcome of the daylight, less daylight came into both areas.

Either this is a mistake in the program or the balconies helped, reflect daylight into the space.



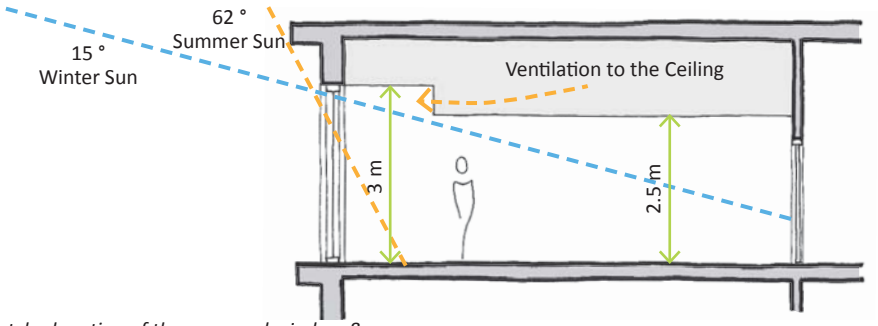
ill.138.2 Option 5

ill.138.5 Option 5 3D render of window

5.

3000mm window
2500mm ceiling height

By creating a higher ceiling area around the window more daylight filters into the rooms. This could also be a benefit by creating a bulk head to house the ventilation grill.



ill.138.3 Sketched section of the proposed window & ceiling detail

Conclusion

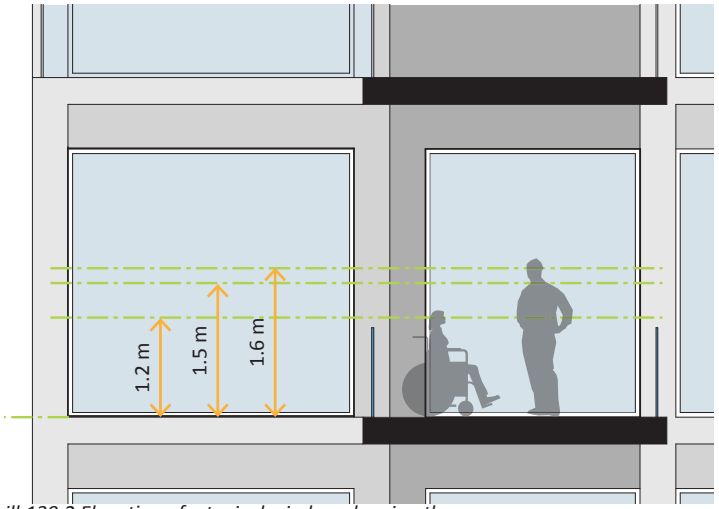
The investigations show is that the high ceiling made no difference with the daylight factor throughout the space. The only thing that did make any difference was option 1 where the light did not filter is so far.

What was concluded from the studies was the size of the window would be option 5 due to it being the highest but also the factors of the view, sunlight and the detail of the ceiling were considered.

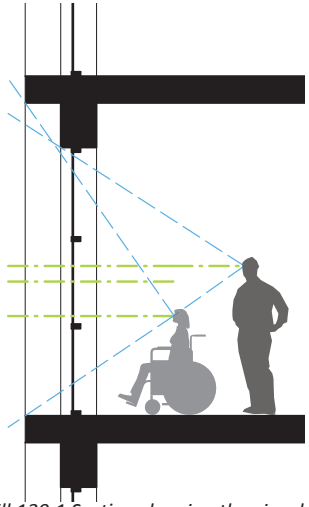
Window Expression

After the daylight investigation, the function and expression of the windows was explored. In illustration ill.139.2 considerations are made for the height of a mullion and transom. A typical eye level height for a wheel chair user is around 1.2 metres, for a standing person a typical eye level ranges around 1.6 metres high. For the personal comfort of the residence the windows are lowered to allow easy access for both a wheel chair user (a typical reach height of 1.5 metres) and a person who is able to stand. Having windows that can be opened in summer relates to the feeling of a domestic atmosphere but also allows for a natural connection to the outdoor environment like a summers breeze.

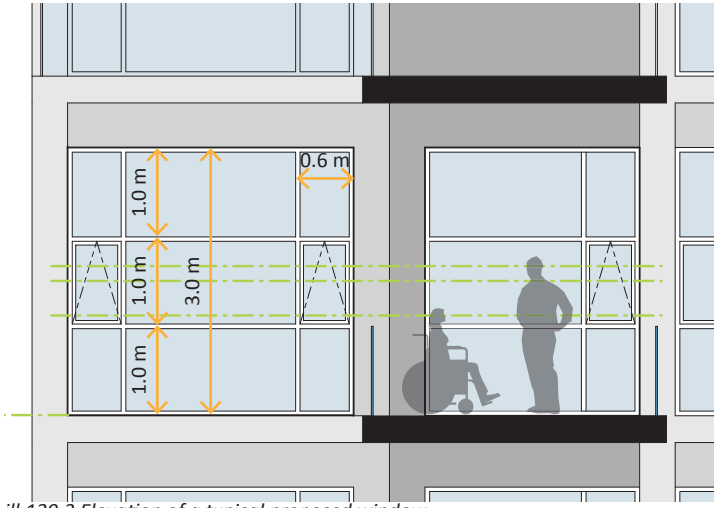
In illustrations ill.139.1 & ill.139.3 the proposed window expression is shown. In the cross section there is a large glazed area that allows for a visual connection to the outside view. Through many investigations of evidence based design, natural connections to the outside can help relieve pain and distract from depressing thoughts. In addition to this the resident can still be stimulated with the actives of everyday life, surrounding the building.



ill.139.2 Elevation of a typical window showing the visual dimensions for a wheelchair & standing person



ill.139.1 Section showing the visual areas for a wheelchair & standing person, from the window

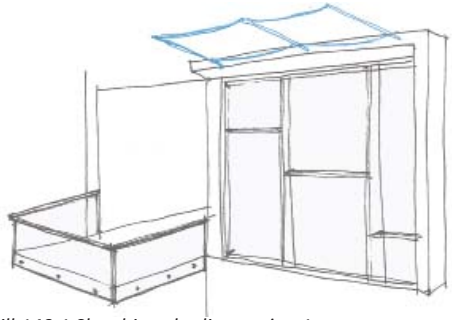


ill.139.3 Elevation of a typical proposed window expression with heights

Shading Systems

Through the investigation of daylight factors within the average unit was concluded the 3 metre high window would the best preference in utilising the view and daylight. But when there is a larger window there is will be problems in over heating to the units. During the summer months the windows to the living areas of the unit will allow large amounts of natural sunlight into the room. When viewing the importance of sunlight for the health and wellbeing of humans the most important factor for shading of windows is the control.

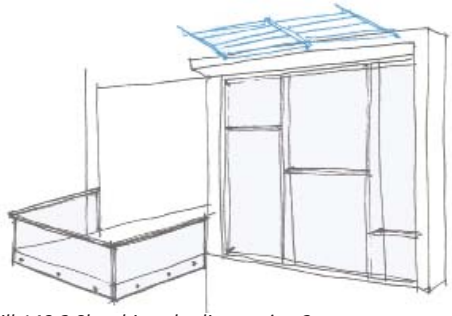
A selection of the types of shading gives an overview on what expression would be preferred.



ill.140.1 Sketching shading option 1

1. - Material type shading spans between frames.

+ Can change the colour or texture of the shading every year for a new expression
- May create noise when it gets windy
- Not adjustable
- Blocks the lower vertical views of the unit above



ill.140.2 Sketching shading option 2

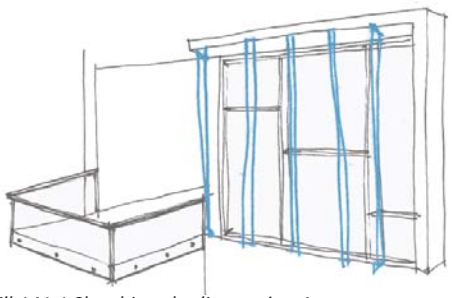
2. - Angled mental fins that span between frames fixed above the window.

+ Can be adjusted
- Blocks the lower vertical views of the unit above

ill.140.3 Sketching shading option 3

3. - Horizontal fins

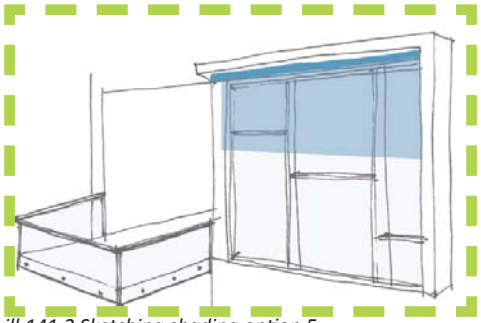
+ Can be adjusted
+ Allows additional daylight to reflect into the room
- Restricts the vertical views
- May give the feeling of confinement
+/- Gives a visual expression to the windows



ill.141.1 Sketching shading option 4

4. - Vertical fins

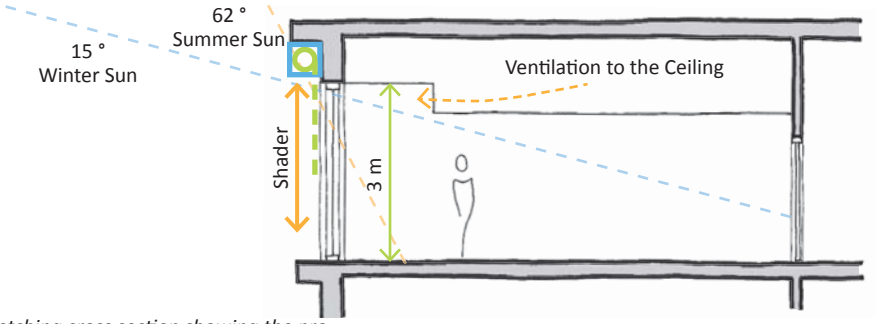
+ Can be adjusted
+ Allows additional daylight to reflect into the room
- Restricts the horizontal views
- May give the feeling of confinement
+/- Gives a visual expression to the windows



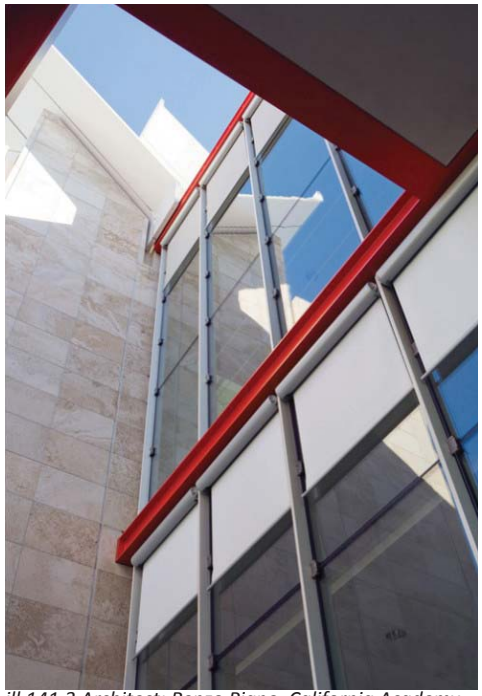
ill.141.2 Sketching shading option 5

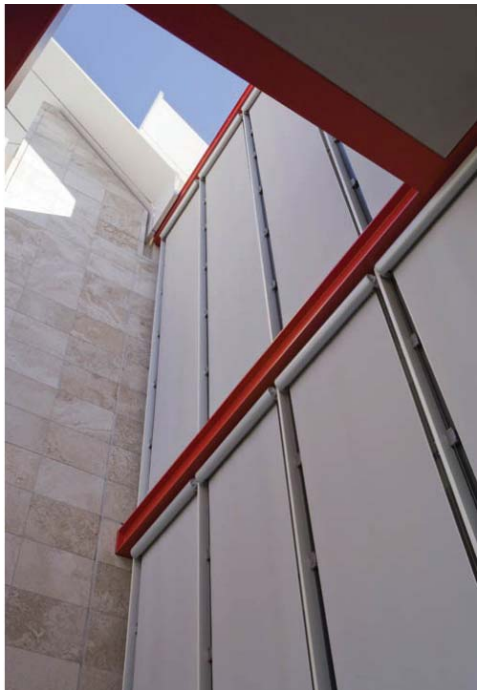
5. - Roller shading system with a 0.40 – 0.50 shading coefficient and a 0.06 – 0.08 visible transmittance

+ Can be adjusted
+ Considered more residential shading type
- Restricts the some of the view (but it is still able to be partially closed)
+/- Gives a visual expression to the windows



ill.141.3 Sketching cross section showing the proposed shading, option 5

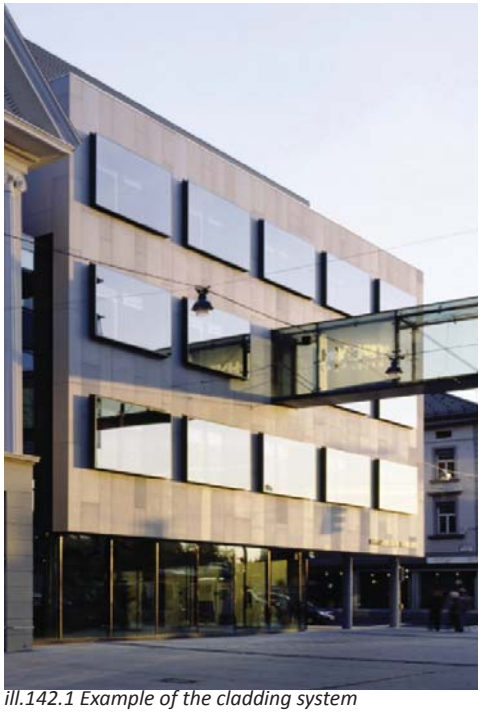




ill.141.3 Architect: Renzo Piano, California Academy of Sciences, USA. Example of external shading

Conclusion

Through the detailing of the window surrounds the shading devise chosen would be easily fixed without affecting the design when open or closed as seen in illustration ill.141.3. The use of colours can add in the overall finished design of the building expression.



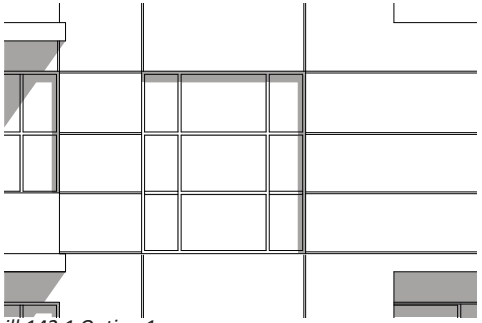
ill.142.1 Example of the cladding system

Materials

External Materials to the Nursing Home

The external cladding to the nursing home takes on a natural materiality of a light grey fibre concrete panel system with negative detail between joints. The expression continues from the gridular windows and in contrast from the proposed smooth surface of the apartments. The colour and finish enables a diffused light which can penetrate the surrounding buildings. Two surfaces are proposed (as seen in illustration ill.142.3) that are a uniformed colour but have different textures. This creates a textural appearance when close to the building but becomes more regular when further away from the building.

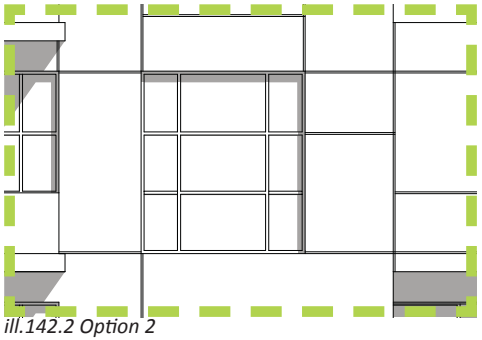
For the consideration for the design, two options were drawn up and discussed.



ill.142.1 Option 1

1.

The expression of the cladding systems works within a gridular system that line up with the windows and balconies. Here the shapes of the panels are regular and set out in a repetitional configuration.



ill.142.2 Option 2

2.

Here the expression still works within the gridular system but the sizes of the panels are irregular in the set out of panels. This option relates to the expression seen in the glazing system of the community center and commercial spaces where the mullions are set out at irregular spaces.

ill.142.2 Example of the cladding system

ill.142.3 Example of the cladding system

ill.142.4 Example of the cladding system

ill.143.1 Internal view of finishes

Internal Materials

The internal material is a mix of an off white plastered finish to the walls and natural timber for the floors and doors. The internal colour scheme is left blank in the units to allow the residence the choice of decoration and colour to their surroundings. Through the investigations of existing nursing home in Denmark take on a management scheme that each resident provides their choice of internal fittings such as curtains, lights etc. These qualities are also seen in the culture of housing in Denmark, that all lights and personal fittings are taken to the next home.

For the functionality of trouble-free cleaning all floors throughout the nursing home is timber with the additional carpet and floor rugs. In the kitchen space the design is assessable to all users, so all residence can take part in the preparation of food throughout the day.

Throughout the day the internal environment changes as the sun moves around the buildings. In choosing natural timber floor and white walls the reflected light gives off a warm tone that creates a pleasant atmosphere to live in.

ill.1433 Beech timber sample of the doors

ill.143.4 Beech timber sample of the flooring

ill.143.2 Plan of unit

ill.143.5 Sample of a domestic style of wall tiles to the units bathroom

Details of Construction

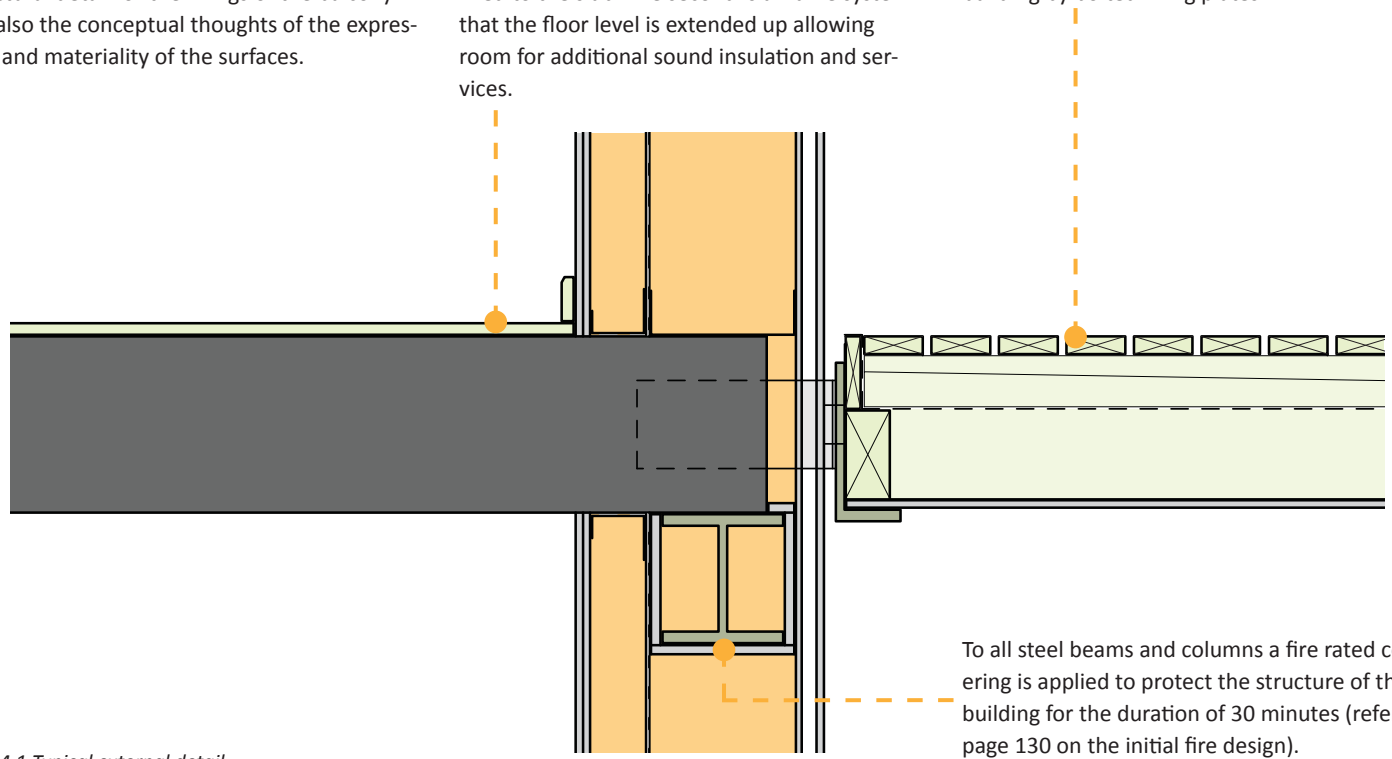
Through the design process consideration for cold bridging was considered when designing the areas around the balconies. The fixing of the balconies can allow the cold (in winter) to move through the external structure and affect the internal energy use for heating. This detail shown was considered an important sketched structural detail for the fixings of the balcony but also the conceptual thoughts of the expression and materiality of the surfaces.

The internal wall is 380 mm wide with a U Value of 0.13 (insulation show in orange). This is made up of a larger steel stud structure that spans the height, between the floors and a external frame system that the external fiber concrete cladding is fixed to.

The detail of the floor could have two options for fixing. The first is shown, where the floor is fixed to the slab. The second is a frame system that the floor level is extended up allowing room for additional sound insulation and services.

External grade timber covered the balcony. Here the water can filter beneath to a galvanized steel tray (with a black finish). Below the balcony is made up of steel beams and timber framing that span the width of the balcony.

To the perimeter na angle beam ties the balconies construction together. From here the structure is tied into the main structure of the building by bolted fixing plates.



To all steel beams and columns a fire rated covering is applied to protect the structure of the building for the duration of 30 minutes (refer to page 130 on the initial fire design).

ill.144.1 Typical external detail

Materials for the Community Center

The building expression to the community center creates a focal point. To work with this a simple cladding of the white fibre concrete cladding was chosen. This would allow the formation of the building stay the focal point. To the glazing the frames will be a dark colour to contrast against the select white of the large columns holding the overall building structure. Large amounts of glazing allow the for a view out over fjord but also light to filter into the building.

At night the building's roof formation and the large structural columns will be lit. Here the structure will become a focal point seen from the other side of the fjord.

ill.145.2 Sample concrete finish

ill.145.3 Beech timber sample of the flooring

ill.145.1 Part view of community center

ill.145.3 Window colours

Intergration Phase 2

Introduction

Following on from the integration phase 1 of the report, integration phase 2 reviews the information in the final development of the building's design.

The following points will be investigated

- Indoor Climate
- Updated Room Program

Total Energy Consumption Using the Monthly Average Spread Sheet

Energy consumption for heating pr m² floor area	48.6 kWh/m² per year
Energy consumption for cooling pr m² floor area	0.0 kWh/m² per year
Total energy consumption pr m² floor area	**48.6 kWh/m² per year**

Refer to Appendix for a detailed overview of parameters used in this indoor climate study.

Minimum Danish Building Requirements

Energy Frame Building (note 1)	52.8 kWh/m² per year
Class 2015 Low Energy Building (note 2)	30.2 kWh/m² per year

Note 1 -The energy performance for an energy frame building:
Per m² of heated floor area must not exceed 52.5 kWh/m² per year, plus 1650 kWh/m² per year divided by the heated floor area. (Section 7.2.2 of the Danish Building Code 2010).

Note 2 - The energy performance for a Class 2015 Low Energy Building:
Per m² of heated floor area must not exceed 30 kWh/m² per year, plus 1000 kWh/m² per year divided by the heated floor area. (Section 7.2.4 of the Danish Building Code 2010).

Overview of Design

For the 3rd phase of the design the windows and door sizes where calculated into the monthly average spreadsheet, to find the buildings total energy consumption. For this study the parameters are outlined below:

Number of Apartments: 70
Number of user: 150 (70 residence the rest staff & visitors)
Time of use: All day (7 days x 24 hours = 168 hours)

Net area 6664.9 m²
Gross area 5960 m²
Heated area 5960 m²
Service life 168 hours/week

Following on from this investigation the indoor climate for the proposed building design will be analysed using the Danish indoor climate program, Be10.

Results from Spreadsheet

If the ventilation air has the same temperatures as the outside air

24 hour average temperature	23.9°C
Temperature Variation	4.3°C
Max. Temperature	26.0°C

If the ventilation air has a constant temperature which equals the 24 hour average temperature of the outside air

24 hour average temperature	23.9°C
Temperature Variation	2.1°C
Max. Temperature	24.9°C

If the ventilation air has a constant temperature of 19 C

24 hour average temperature	22.6°C
Temperature Variation	2.2°C
Max. Temperature	23.7°C

Indoor Climate

24-hour Average

As an initial analysis of the indoor temperature for the hottest month inside a single unit of the nursing home the 24-hour average spreadsheet was used. This will give an idea for the temperatures and thermal comfort in general. For this investigation a typical average unit on the 1st floor, west side of the building was selected.

July was selected for the month of the investigation as this time of the year has the highest temperatures out of all the months during the year.

On average the acceptable internal temperature for an apartment ranges between 20 to 25°C, but most people perceive the quality in different ways. To allow for the individual differences a category percentage is used for people who fin an environmental parameter unacceptable. To help with this the Danish Standard CR1752, has 3 categories. For this project category B was chosen, where 20 percent are believed to be dissatisfied. See appendix for ventilation calculation.

The result shown in the first table show that natural ventilation proposed in summer has an acceptable 24 hour average temperature of 23.9°C. What the 24-hour average fails to detail is the overall hour to hour temperatures and any consideration for regulating the temperature throughout the day.

Total Energy Consumption Using Be10

Energy frame in BR2010 total	51.7 kWh/m² per year
Energy frame low energy building 2015 total	41.6 kWh/m² per year

This investigation used U values as shown:

Table of U values	U value W/m² K
External Walls	0.13
Suspended Floor	0.13
Slab	0.10
Roof	0.10
Doors / Windows	1.10

Foundations, line loss: 117.9 m around foundation, 0.13 W/mk loss, 7440 m around windows, 0.03 W/mk loss.

Be10

The Be10 program gave a verified outcome for the indoor climate calculation. The U values are listed to the left hand side. In addition to this about 80 % of the wall area to the east, south and west was glazed to utilize the natural view and daylight.

For this study the parameters are outlined below:

Heated area 6664.9m²
Normal usage time, 168 hours/week
Rotation of 0°

Mechanical ventilation rate, winter
Average ventilation rate 0.30 l/s m²

Mechanical ventilation rate, winter
Average ventilation rate 0.05 l/s m²

District heating was selected as the cost for it in Aalborg and Nørresundby is very cheap.

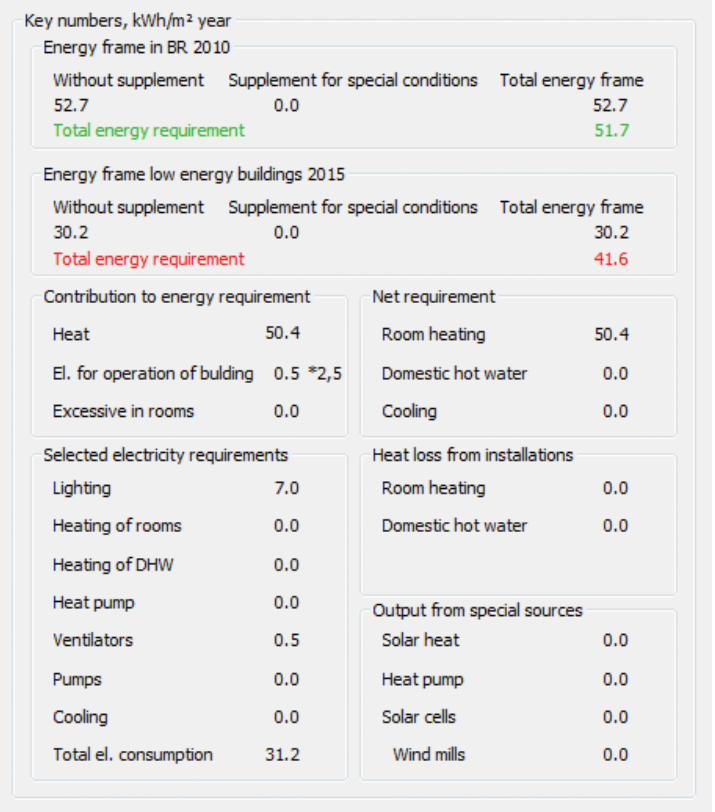
Average lighting lux was between 100 and 200 lux.

Shading from balconies and projecting wall were calculated into the program.

Domestic hot water was used with 250 average for the building, litre/year per m2 of floor area hot - water consuption (water 55°C, cold water 10°C).

The result shown is acceptable rate of energy consumption per year for the Energy frame in the Danish Building Code BR2010. During the process of working with this program, it was found to have discrepancy between the English and Danish versions, which may have altered the hot water heating and the overall energy total.

Results from Be10



Room Program

Introduction

This section of the report looks at the overview of areas. During the sketching of the concept the number of unit changed from 10 to 7 units per floor, creating a higher building with a smaller plan area.

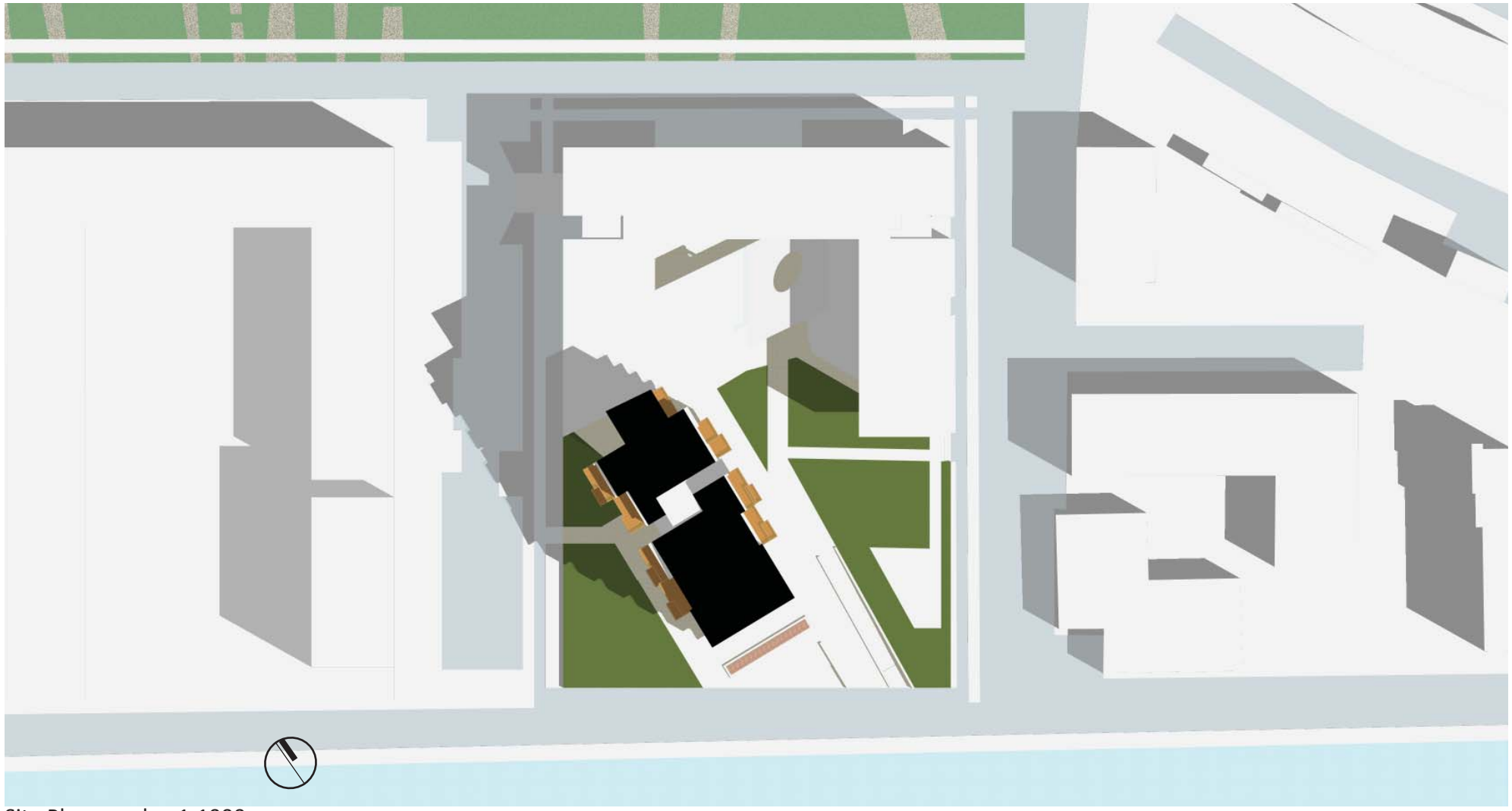
Room description	Area m² (netto)	Sub Total	Comments
Community Center			
Ground Floor	401		
First Floor	340		
Sub Total		741	
Café		549	
Nursing Home			
1st Floor	536		
2nd Floor	537		
3rd Floor	537		
4th Floor	536		
5th Floor	537		
6th Floor	536		
7th Floor	510		
8th Floor	498		
9th Floor	498		

10th Floor	498		
Sub Total		5226	
Commercial Space			
Ground Floor	324		
1st Floor	461		
2nd Floor	338		
Sub Total		1123	
Apartments		6082	
TOTAL BUILDING AREA		1321	
Unit Type 1			Average Unit
Living / Kitchen	24		
Bedroom	13		
Bathroom	8		
Sub Total		45	
Unit Type 2			Dementia Unit
Living / Kitchen	17		
Bedroom	11		
Bathroom	8		
Sub Total	36		
Unit Type 3			Temporary Unit
Bedroom	18		
Bathroom	8		
Sub Total	26		

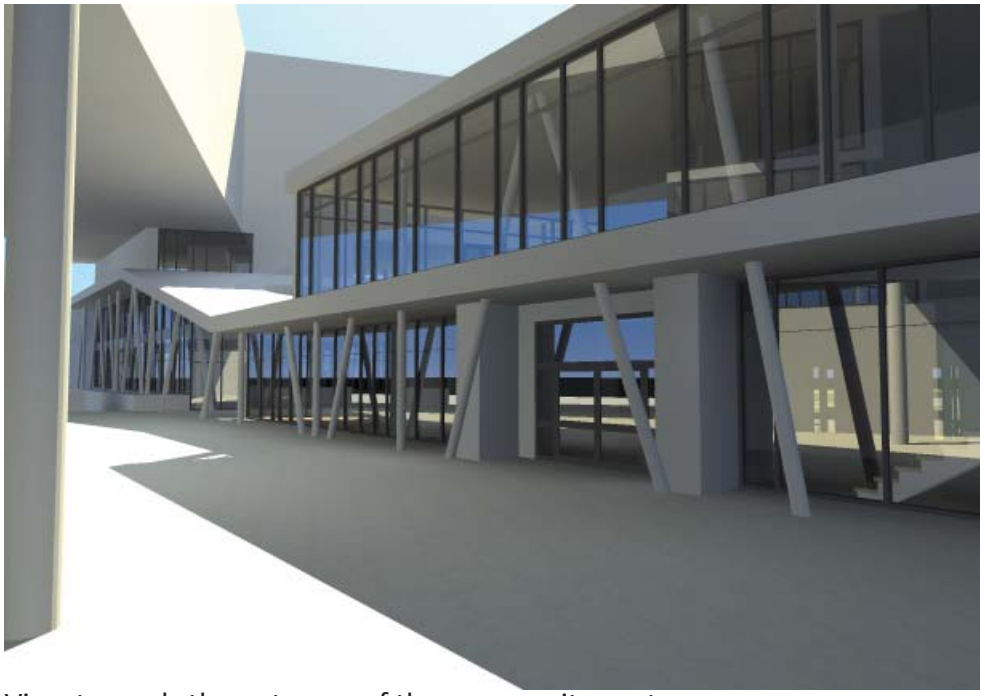
PRESENTATION

Site Section scale : 1:1000

Site Section scale : n.t.s



Site Plan scale : 1:1000



View towards the entrance of the community center

View looking back towards the buildings

North Elevation scale : 1:500

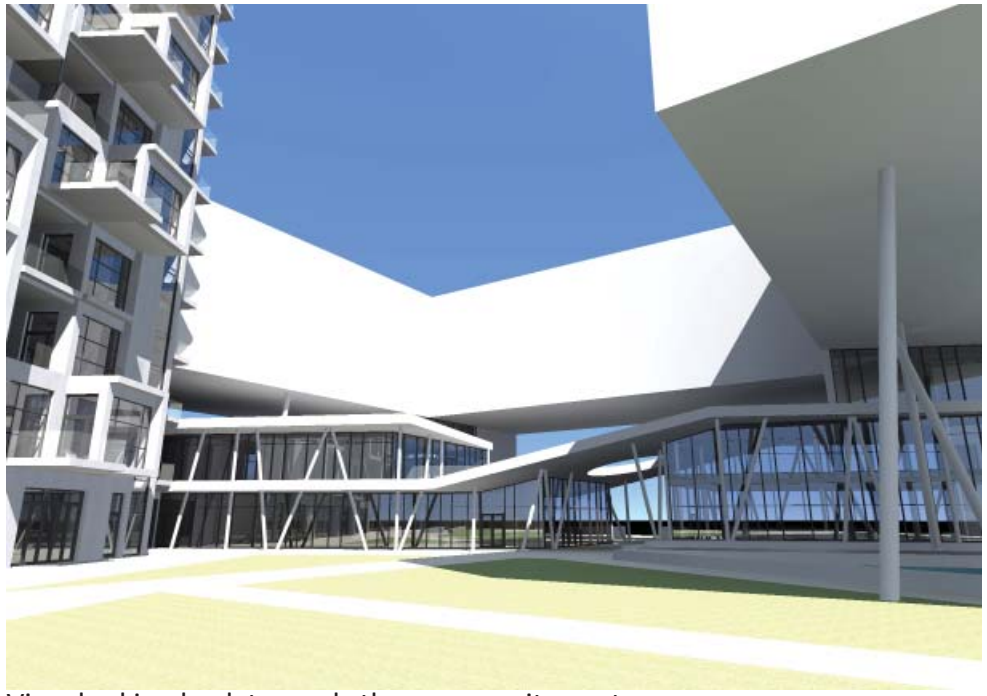
South Elevation scale : 1:500

East Elevation scale : 1:500

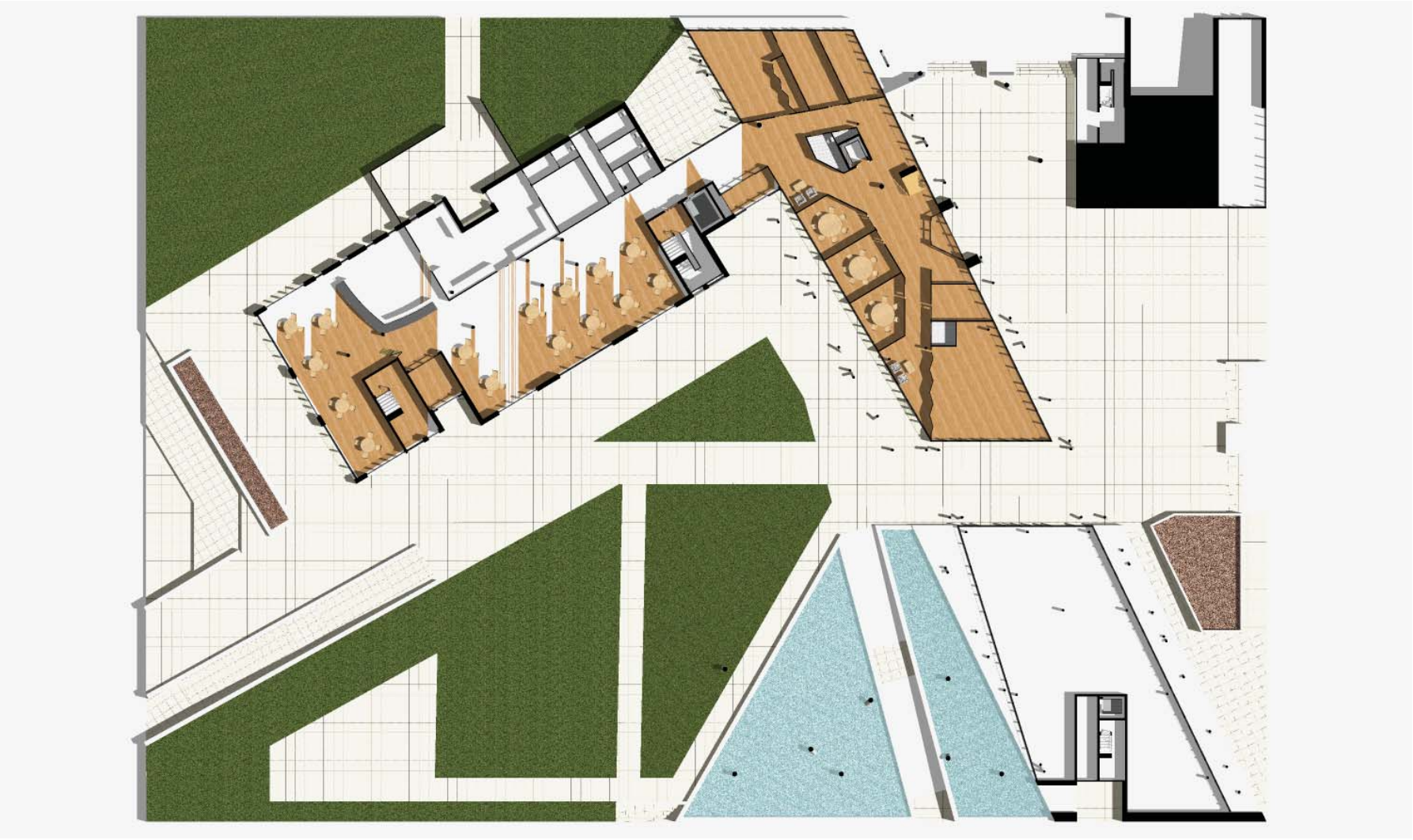
West Elevation scale : 1:500

Cross Section Through Nurshing Home scale : 1:500

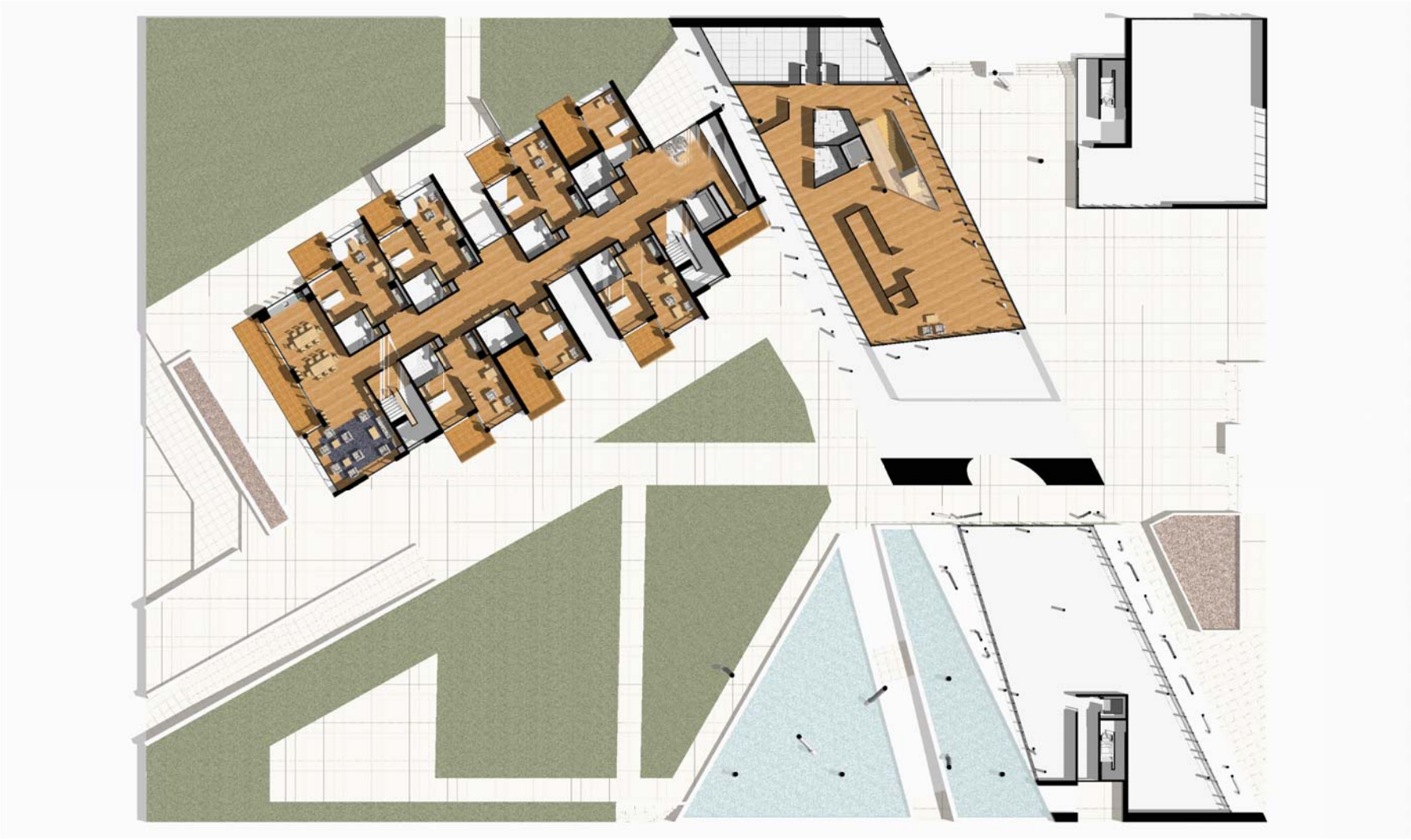
View looking toward north



View looking back towards the community center



Ground Floor Plan scale : 1:500



First Floor Plan scale : 1:500

View looking towards the entrance of the community center

View looking from the gym area

First Floor Plan scale : 1:500

7th Floor Plan scale : 1:500

8th Floor Plan scale : 1:500

View looking out from the cafe

Nursing homes common area

Typical Average 45m2 Unit scale : 1:100

Typical Temporary 26m2 Unit scale : 1:100

Typical Dementia Unit 36m2 Unit scale : 1:100

View inside a unit

Conclusion

Evidence Based Design Factors

The initial investigation focused on evidence based design as a guide to form other factors that affect people's well-being. The proposed building works within the natural environment of the fjord by focusing the buildings view towards the south. The surroundings of the site remove any environment stressors by creating a public area where people can congregate

Well-being Factors

- Homely
- Pleasure
- Sensory stimulation

Therapeutic Environment Factors

- Provide privacy and completeness and residential units
- Focus on health maintenance, physical movement, and mental stimulation
- Support family involvement
- Maintain connections with the surrounding community

Design Factors

- Community – integrated site
- Articulated mass and form
- Places for enjoyable rest
- Living room, activity space
- Small and comfortable shared spaces
- Daylight

Evidence Based Design

- Removal of environment stressors
- Connections of nature
- Options & choices
- Positive Distractions

Factors of Homely within the Nursing Home's Units

- Personalised entry
- Refined material quality and spatial character
- Refined scale
- Orientation
- Private apartments
- Separate living and sleeping areas
- Outdoor space
- Kitchens
- Personally adjustable apartment controls
- Easy adaptability to changing needs

surrounded by nature form a positive distraction and stimulating view for the residence in the nursing home.

Well-being Factors

Factors that relate well with evidence based design is the focus on well-being factors within the nursing home. The older people need a homely environment that sparks pleasure.

Therapeutic Environment Factors

The building design of the community center opens up the connection between the proposed nursing home but the larger surrounding community of older people. What people may come to see is the service the center provides but also the surrounding view over the fjord. This connection between the nature and site is utilized by forming common space to all floor where the residence can form a smaller community. In addition to this the residence and surrounding community has access to an open café for the public. To the site a mixture of landscaping provides a number of age groups a place to come, and by doing this make a pleasing play where family want to come and visit.

Inside the nursing home, privacy is achieved by placing public services on the lower floors. Each unit has their own private balconies are a large internal space where they can furnish with their personal belongings.

Factors of Homely within the Nursing Home's Units

Within the design of the units the entrance provides a transitional area connecting the semi public spaces with the privacy of the unit. The units have their own kitchen, living area, bedroom and bathroom. Every unit has equal amount of view and daylight, as this was an important consideration for the initial design.

The spaces and scale of the spaces within a unit take of a persona of a typical house and apartment, which has room to interoperate their own preferences for the furnishings.

Design Factors

Two lines move through the site connects to the front area towards the fjord with the northern shopping area. By integrating these paths the residence have a freedom of movement back and forth. Multiple entrances to the residential area of the nursing can allow choices in the privacy of entering the building. The community center is more open too many people by provide space for many activities and small shared spaces. On moving up the to the stories the floor plan allows for a private entrance to the residence unit before entering into the communal spaces which gives a more homely context.

From the outside the buildings expression articulates mass and the form of the units by moving them into the building or projecting them out. The expression creates private areas that still open towards the view and daylight. To the inside different areas are form where people can go for some quiet or to socialize.

Daylight

Daylight was a strong consideration to integrate into the building's design. With the positioning of the building towards the south not only does it reserve abundant sunlight but a view over the fjord. Different areas of the site provide spaces where people can follow the warm of the sun as it move from the east to the west. This is seen around the café area.

Concluding Perspective

The intention of this thesis project was to present architectural knowledge I have gained through the investigation of the societal problems associated with an ageing population. As stated in the beginning, the aim of this thesis was to establish a nursing home that focuses on maintaining independence and improving the quality of life for older people. What was found in the original investigation prior to starting this thesis was the number of older people in nursing homes that were depressed, hence the motivation for this thesis topic.

There are many factors consider in this thesis that are not architecturally related however what architecture can create is a positive environment that provides people with a homely connection where they feel safe, secure and have the options of social interaction at different scales.

The buildings design evolved using the conceptual formation of the buildings in relation to the flow and functions of the area. In developing the nursing home, building the expression was derived from the single unit, which created girdler lines where the unit would recess or protrude. A detailed analysis of the nursing home elicited a number of the surrounding buildings and proposed apartments daylight factors were affected by the height of the nursing home. A conclusion that was drawn from the final design was the importance of a more in depth study of the surroundings in relation to sunlight. While the existing buildings to the north create winter shadows on other existing buildings, it was felt that the proposed design should have work better in terms of improving the quality of daylight to surrounding buildings and proposed apartment buildings on the site than the status quo.

A large proportion of the investigation demonstrates the importance of social interaction within a nursing home where the first priority for consideration is choice. Many older people experience sociological challenges with the death of a loved one and/or having to move from their own homes due to adverse health reasons. The persona of a unit should resurrect a person's confidence that they can have a defined space of their own doing. A home should not be regarded as simply consisting of walls, a ceiling and floor rather the personal memories that people can reflect on. Providing a space that accommodates these memories through personal items such as furniture, textiles and pictures is beneficial for the integration of a resident into a nursing home environment.

Economical benefits were evident from the many investigations associated with Evidence Base Design. Aspects of these benefits are reflected in factors that were incorporated into the design using attributes that relate to the context of the project. Much of the research of Evidence Based Design in other countries such as America and the United Kingdom focuses on the hospital environment. In this thesis Denmark was showcased as an example of a country,which provides a healthcare system that is paid through personal taxes. During the course of this research common living types found in Denmark and Scandinavia were used as a basis for the finalised overall design. Some of the common factors from this research could be placed into a New Zealand context for older people's homes despite the normal way of living differing between Denmark and New Zealand.

On reaching the end of this thesis, an abundant amount of information has been drawn which is relevant and should be reflected in future New Zealand nursing home design. The importance of personal space was a key factor identified in terms of health and well-being within a nursing home. the provision of an independent unit with separate bedroom and space to personally furnish can help the resident in connecting to their new environment. Discretionary choices for the resident makes should be reflected in different aspects of social interaction, layouts of their units, options available for exercise activities? etc. Daylight and natural views help in creating a positive environment that can assist in dispersing potential depressing thoughts. Positioning a nursing home adjacent to a public area provides the resident with a stimulating view of activities that they can watch at their leisure during the day. In addition to this, the formation

ill.174.1

of the floor plans creates a personal entrance area with the common spaces away from the units. This helped to maintain the homely feel as reflected in apartments and entrance areas to a residential house.

While the building is higher than is allowed by the provisions contained in Aalborg's Local Plan, this is outweighed by the positive aspects in terms of the buildings design. The formation of a highrise building means the travel distance the residences have to take is less than a lower, long building. In doing this the resident could feel more inclined to move outside.

The important aim of this thesis was the utilization of the sunlight and view. The building was positioned towards the south to ensure that the common areas are with the units were not displaced either side which in turn resulted in the provision for each unit of equal views of the fiord and morning or afternoon sun.

At the beginning of the thesis I was very anti the idea of architecture as mere art without a consideration for the functional use of the building, for the users. What was established through this study was the importance of creating an identity for the building and adjacent area through the use of architecture. What this building has provided is a place that utilises not only the surrounding functions but has created a hub where people can come and go at their leisure. With the integration of multiple functions people can work and live in the area without the need to have a car creating which in turn ensures a more sustainable living arrangement for the future.

Bibliography

Books

Wagenaar, Cor (ed.). T*he Architecture of Hospitals*. (2006). Rotterdam : Netherlands architecture institute.

Major, Mark, Tischhauser, Anthony, Speirs, Jonathan. *Made of Light: The Art of Light and Architecture*. (2005). Basel: Birkhäuser Verlag - Basel.

Johnson, Paul-Alan. *Theory of Architecture : Concepts, Themes and Practices*. (1994). New York: Van Nost. Reinhold.

Regnier, Victor. *Design for Assisted Living: Guidelines for housing the physically & mentally fra*il. (2002). New York: John Wiley & Sons.

Robson, David, Nicholson, Anne-Marie, Barker, Neil. *Home for the Third Age – A Design Guide for Extra Care Sheltered Housing*. (1997). UK, Rugby: George Over Ltd.

Brummett, William. *The Essence of Home – Design Solutions for Assisted Living Housing*. (1997). USA: Van Nostrand Reinhold.

Moe, Keil. *Integrated Design in Contemporary Architecture*. (2008). New York: Princeton Architectural Press.

Feddersen, Eckhard & Lüdtke, Insa. *A Design Manual – Living for the Elderly.* (2009). Basel, Switzerland: Birkhäuser Verlag AG.

Hertzberger, Herman. *Lessons for Students in Architecture*. (1991). Netherlands: Uitgeverij 010 Publishers.

Zimmerman, Sheryl. *Assisted Living Needs, Practices and Policies in Residential Care for the Elderly*. (2001). USA: The Johns Hopkins University Press.

French, Hilary. *New Urban Housing*. (2006). China: Laurence King Publishing Ltd.

Hobday, Richard. *The Light Revolution – Health Architecture and the Su*n. (2006). Finland: WS Bookwell.

Ballard Bell, Victoria. *Materials for Design.* (2006). New York: Princeton Architectural Press.

Schwarz, Benyamin & Brent, Ruth. *Aging Autonomy, and Architecture – Advances in Assisted Living*. (1999). London: The Johns Hopkins University Press.

Erhvervs- og Byggestyrelsen. *Modelprogram for plejeboliger*. (2010), Erhvervs- og Byggestyrelsen, Copenhagen.

Ruck, Nacy. *Daylight in Buildings - A Source Book on Daylighting systems & Components*. (2000). USA: International Energy Agency (IEA).

Magazines

Architecture + Competitions. *Building for the Elderly*. (December 2007). Karl H. Krämer Veglag GmbH & Co. Stuttgart.

Martin G. Cole & Nandini Dendukuri. *Risk factors for depression among elderly community subject: A systematic review & Meta-Analysis* (2003). The American Journal of Psychiatry

Papers

Peggy Edwards, WHO, (2001). *Health and Ageing*, A Discussion Paper

Khawaja, Mansoor and Thomson, Nicholas (2000), *Population Ageing in New Zealand, Wellington, Statistics New Zealand Treasury.* - http://www.stats.govt.na/reports/articles/pop-ageing-in-nz.aspx

Mary E. Jarden & Jens Ole Jarden. *Social & Health-Care Policy for the Elderly in Denmark.*

Bibliography

Websites

http://www.ageing-in-europe.org/murciapapers/thomsen.pdf
27.01.2011

http://www.globalaging.org/elderrights/world/densocialhealthcare.htm
27.01.2011

http://www.dst.dk/homeuk/Statistics/focus_on/focus_on_show.aspx?sci=872
27.01.2011

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1477908/pdf/pubhealthrep00175-0036.pdf
27.01.2011

http://www.springerlink.com/content/wh73762186450pp0/
27.01.2011

http://www.dhbnz.org.nz/Site/Current-Issues/ARC-Review.aspx
28.01.2011

http://www.thestar.com/article/532841--elderly-thrive-in-denmark
28.01.2011

http://www.enhr2007rotterdam.nl/documents/W03_paper_Matsuoka.pdf
28.01.2011
http://www.globalaging.org/elderrights/world/densocialhealthcare.htm
28.01.2011

http://www.alzheimer-europe.org/Policy-in-Practice2/Country-comparisons/Home-care/Denmark
04.02.2011

http://www.stats.govt.na/reports/articles/pop-ageing-in-nz.aspx
09.02.2011

http://www.climatetemp.info/denmark/
16.02.2011

http://en.wikipedia.org/wiki/Sea_breeze
16.02.2011

http://www.kulturbroaalborg.dk/
16.02.2011

http://www.un.org/esa/population/publications/ageing/ageing2009chart.pdf
08.03.2011

http://www.stuff.co.nz/the-press/news/4681696/Many-Kiwis-clueless-about-retirement-needs
08.03.2011

http://www.ballerup.dk/get/34669.html
10.03.2011
http://www.engineeringtoolbox.com/light-level-rooms-d_708.html
23.03.2011

http://www.engineeringtoolbox.com/air-change-rate-room-d_867.html
23.03.2011

http://www.parkingconsultantsltd.com/rampfaqs.htm
15.04.2011

http://www.stuff.co.nz/national/christchurch-earthquake/4922983/Choice-gone-for-Chch-old-folk
26.04.2011

http://www.faberblinds.co.uk/Default.aspx?ID=5630
04.05.2011

http://www.mechoshade.com/WhisperShadeIcon/
04.05.2011

http://uk.markilux.eu/cms.aspx?topic=awnings/window_blinds/markilux-720_820_725_825.php%3fvariante%3d20#
04.05.2011

http://www.engineeringtoolbox.com/circular-ducts-d_1009.html
10.05.2011

http://home.wlv.ac.uk/~in6840/Daylightfactor.htm
23.05.2011

http://www.claddingsolutions.com/
25.05.2011

Illustration List

Ill. 12.1 http://costablog.com/wp-content/uploads/2011/01/elderly_people_sign.jpg
Ill. 14.1 http://www.checkonsite.com/browse/architect/featured-architects/alvar-aalto/
14.2 http://www.life.com/image/50571606
16.1 http://www.corbisimages.com
16.2 http://www.corbisimages.com/Search#p=1&q=Connections+to+Nature&mt=2&s=200
17.1 http://www.corbisimages.com
17.2 http://www.corbisimages.com
17.3 http://www.corbisimages.com
17.4 http://www.corbisimages.com
18.1http://www.corbisimages.com
18.2 http://www.corbisimages.com
19.1 http://www.corbisimages.com
19.2 http://www.corbisimages.com
22.1 http://www.corbisimages.com
22.2 http://www.corbisimages.com
22.3 http://www.corbisimages.com
23.1 http://www.corbisimages.com
23.2 http://www.corbisimages.com
25.1 http://www.legacyconstruction.co.nz/portfolio/show/bayswater-apartments2.html
25.2 http://www.life.com/image/50571606
25.3 http://www.archdaily.com/117890/in-progress-nasa-sustainability-base-william-mcdonough-partners-and-aecom/
28.1 http://www.corbisimages.com
28.2 http://www.corbisimages.com
28.3 http://www.corbisimages.com
30.1 http://www.corbisimages.com
30.2 http://www.corbisimages.com
32.1 http://www.corbisimages.com
35.1 http://www.corbisimages.com
35.2 http://www.corbisimages.com
35.3 http://www.corbisimages.com
35.4 http://www.corbisimages.com
35.5 http://kvernaas.no/prosjekter
35.6 http://kvernaas.no/prosjekter
38.1 http://www.corbisimages.com
38.2 http://www.corbisimages.com
39.1 http://www.corbisimages.com
39.2 http://www.corbisimages.com
97 http://www.hbc-as.dk/ContentId/682/Default.aspx?MenuItemId=461
98 http://www.corbisimages.com
99 http://www.corbisimages.com
100 http://www.archdaily.com/121719/meander-uarchitects/
101 http://www.archdaily.com/123287/residence-for-the-disabled-atelier-zundel-cristea/
102 http://www.archdaily.com/123287/residence-for-the-disabled-atelier-zundel-cristea/
103 http://www.gade-mortensen.dk/files/ref/bolig/Tietgen.html
104 http://urbanlabglobalcities.blogspot.com/2010/10/expectations-on-performance-of-urban.html
105 http://www.worksop.towntalk.co.uk/news/d/17052/
106 http://www.nikiomahe.com/sustainable-design/green-lighthouse-denmark-by-christensen-co-architects/
107 http://www.nikiomahe.com/sustainable-design/green-lighthouse-denmark-by-christensen-co-architects/
108 http://www.topboxdesign.com/tag/brazil-architecture/
109 http://www.archdaily.com/126347/195-melbourne-street-tridente-architects/2010-05-8914-01-195melbst-davidsievers/
110 http://www.archdaily.com/126347/195-melbourne-street-tridente-architects/
111 http://www.schwarz-architektur.ch/index2.php?gallery=04_alterswohnen&id=1
112 http://www.schwarz-architektur.ch/index2.php?gallery=04_alterswohnen&id=1
113 http://www.schwarz-architektur.ch/index2.php?gallery=04_alterswohnen&id=1
114 http://www.archdaily.com/128921/lulu-chow-wang-campus-center-and-davis-garage-mack-scogin-merrill-elam-architects/19_msme_wc_0101-87315-d/
115 http://www.archdaily.com/128921/lulu-chow-wang-campus-center-and-davis-garage-mack-scogin-merrill-elam-architects/08_msme_wc_0101-87321-d/
116 http://www.flickr.com/photos/amuroskie/4898681349/in/photostream/
117 http://www.archdaily.com/24519/ucsd-price-center-east-yazdani-studio/1321422392_ucsd-all-plans/
118 http://2.bp.blogspot.com/_GeJo-5E2MMbk/SlwG4yrkCcI/AAAAAAAAYYE/RcUC-XAILz8/s1600-h/8.jpg
119 http://www.flickr.com/photos/mikelhendriks/3606093149/sizes/l/in/photostream/
120 http://www.flickr.com/photos/60178593@N05/5494722132/sizes/l/in/pool-1617126@N20/
121 http://inevitablefragments.tumblr.com/post/478962961/house-h-linz-austria-caramel-architekten-13-5m
122 http://hometrenddecorating.com/roof-design-house-beach-wavy-like-waves-by-marmol-radziner/roof-design-house-beach-wavy-like-waves-1/
123 http://www.flickr.com/photos/yaheestado/918172945/sizes/z/in/photostream/
124 http://www.claddingsolutions.com/downloads/fibre-c/
125 http://www.claddingsolutions.com/downloads/fibre-c/
126 http://www.archdaily.com/63230/motorized-external-roller-shades-hunter-douglas-contract/2-155/
127 http://www.archdaily.com/63230/motorized-external-roller-shades-hunter-douglas-contract/1-174/

Appendix

Indoor Climate

Monthly Average spreed sheet

Information placed into all calculations shown:

Number of Apartments: 70
Number of user: 150 (70 residence the rest staff & visitors)
Time of use: All day (7 days x 24 hours = 168 hours)

People Load:
100 people 00.00 – 07.00
150 people 07.00 – 20.00
100 people 21.00 – 24.00

Activity Level:
Daytime (Sitting Relaxing) – 1.0 met
Night time (Lying Still) – 0.8 met

Time and effect of lighting:
100% 07.00 – 09.00 and 17.00 – 22.00
33.3% 09.00 – 17.00 and 22.00 – 23.00
16.6% 06.00 – 07.00 and 23.00 – 24.00

Concept Sketch Phase Investigation

This investigation used the minimum U values required in the Danish Building Regulations, 2010 as shown:

Table of U values	U value W/m² K
External Walls	0.30
Suspended Floor	0.40
Slab	0.20
Roof	0.20
Doors / Windows	1.80

Ventilation values used are:
Ventilation rate, summer
Service hour's 1.73 l/s m²
Outside service hour's 1.04 l/s m²
Average ventilation rate 14.10 m³/s

Ventilation rate, winter
Service hour's 0.50 l/s m²
Outside service hour's 0.00 l/s m²
Average ventilation rate 4.08 m³/s

Room temperature requiring heating 20°C
Room temperature requiring cooling 24°C

Net area 8151m²
Gross area 8657 m²
Heated area 8657 m²
Service life 168 hours/week

Total Energy Consumption

Energy consumption for heating pr m² floor area	70 kWh/m² per year
Energy consumption for cooling pr m² floor area	0.0 kWh/m² per year
Total energy consumption pr m² floor area	**70 kWh/m² per year**

Requirements under the Danish Building Regulations 2010

Energy Frame Building (note 1)	52.7 kWh/m² per year
Class 2015 Low Energy Building (note 2)	30.1 kWh/m² per year

Iteration Phase 1

This investigation used upgraded the U values as shown:

Table of U values	U value W/m² K
External Walls	0.13
Suspended Floor	0.13
Slab	0.13
Roof	0.13
Doors / Windows	1.1

Ventilation values used are:
Ventilation rate, summer
Service hour's 0.35 l/s m²
Outside service hour's 0.35 l/s m²
Average ventilation rate 2.33 m³/s

Ventilation rate, winter
Service hour's 0.35 l/s m²
Outside service hour's 0.35 l/s m²
Average ventilation rate 2.67 m³/s

Room temperature requiring heating 20°C
Room temperature requiring cooling 26°C

Net area 9407m²
Gross area 8657 m²
Heated area 8657 m²
Service life 168 hours/week

Total Energy Consumption

Energy consumption for heating pr m² floor area	50.1 kWh/m² per year
Energy consumption for cooling pr m² floor area	0.0 kWh/m² per year
Total energy consumption pr m² floor area	**50.1 kWh/m² per year**

Requirements under the Danish Building Regulations 2010

Energy Frame Building (note 1)	52.7 kWh/m² per year
Class 2015 Low Energy Building (note 2)	30.1 kWh/m² per year

Iteration Phase 2

This investigation used upgraded the U values as shown:

Table of U values	U value W/m² K
External Walls	0.13
Suspended Floor	0.13
Slab	0.13
Roof	0.13
Doors / Windows	1.1

Ventilation values used are:
Ventilation rate, summer
Service hour's 0.35 l/s m²
Outside service hour's 0.35 l/s m²
Average ventilation rate 3.29 m³/s

Ventilation rate, winter
Service hour's 0.40 l/s m²
Outside service hour's 0.35 l/s m²
Average ventilation rate 2.67 m³/s

Room temperature requiring heating 20°C
Room temperature requiring heating 26°C

Net area 6664.9 m²
Gross area 5960 m²
Heated area 5960 m²
Service life 168 hours/week

Total Energy Consumption

Energy consumption for heating pr m² floor area	48.6 kWh/m² per year
Energy consumption for cooling pr m² floor area	0.0 kWh/m² per year
Total energy consumption pr m² floor area	**48.6 kWh/m² per year**

Requirements under the Danish Building Regulations 2010

Energy Frame Building (note 1)	52.8 kWh/m² per year
Class 2015 Low Energy Building (note 2)	30.2 kWh/m² per year

Note 1 -The energy performance for an energy frame building:
Per m² of heated floor area must not exceed 52.5 kWh/m² per year, plus 1650 kWh/m² per year divided by the heated floor area. (Section 7.2.2 of the Danish Building Code 2010).

Note 2 - The energy performance for a Class 2015 Low Energy Building:
Per m² of heated floor area must not exceed 30 kWh/m² per year, plus 1000 kWh/m² per year divided by the heated floor area. (Section 7.2.4 of the Danish Building Code 2010).

Carparking Requirements

The Aalborg Local Plan requires carparking to all buildings to the area. Working with the areas of the proposed buildings this was the outcome:

Requirement of the local plan:

Residential: 1 1/2

Nursing Homes: 1 per 4 nursing units

Commercial: 1 per 100 m2

From the areas calculated there was a final numbers of carparks needed:

Community Center: 7 1/2

Cafe: 5 1/2

Commerical: 11

Nursing Home: 17 1/2

Apartments: 37 1/2

TOTAL: 79 carparks

The outcome of this investigation was 79 carparks were needed for the proposed building. Due to this large number is was considered best to place a basement under the main building area. This space could be connected to the center, nursing home and apartments through the proposed lifts and stairs.

Refer to attached drawing for the basement layout.