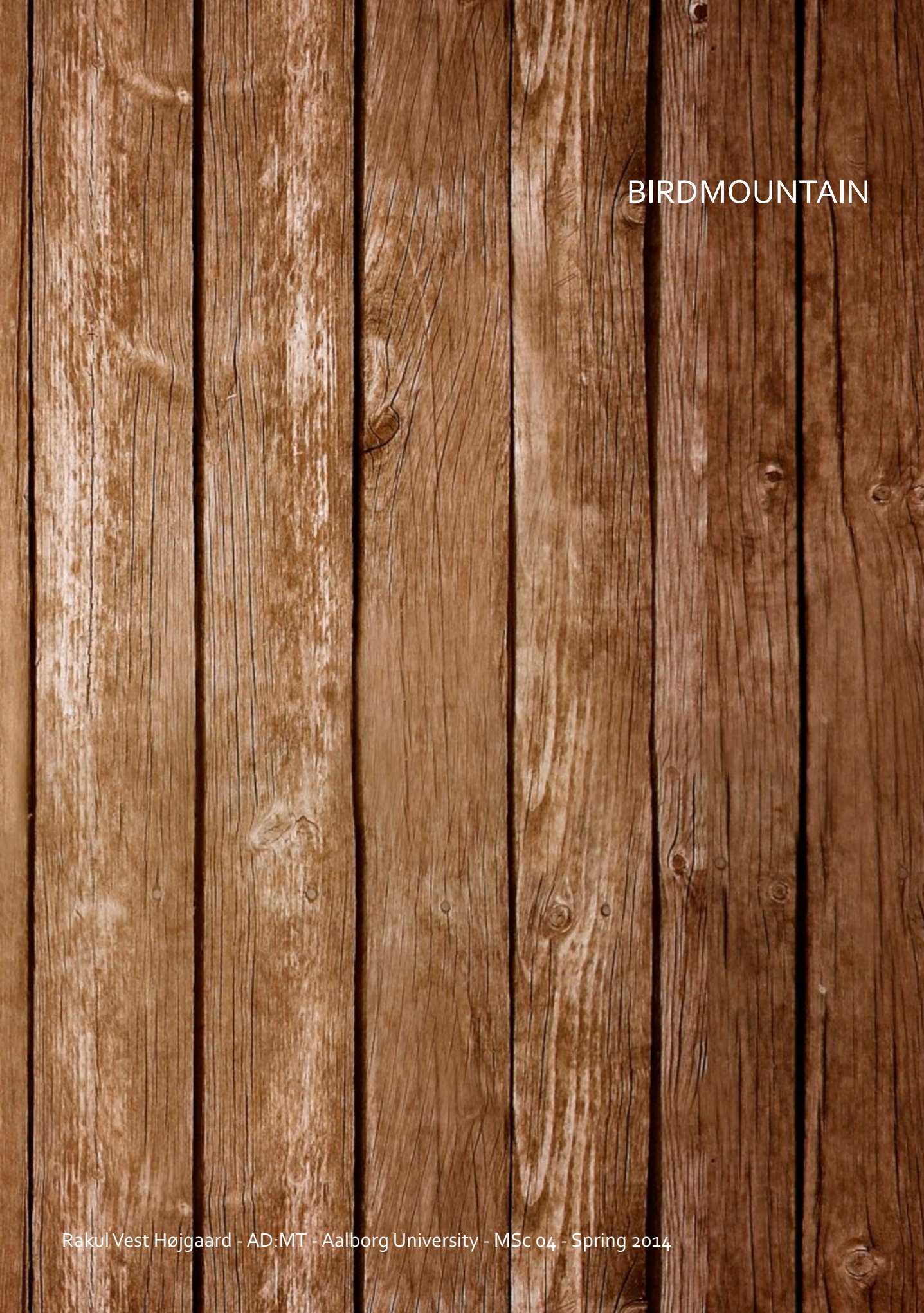

BIRDMOUNTAIN

Rakul Vest Højgaard - AD:MT - Aalborg University - MSc 04 - Spring 2014

ABSTRACT

The aim of this project is to design a sustainable apartment building in the heart of the Faroe Islands. The point of departure is a new urban plan for the city center of Tórshavn, where a harbor front environment with apartments is to be located at Eystara Bryggja.

The challenge of this project is to build on a location beloved by the people of the Faroe Islands. The solution is an area and a building belonging to the people of the Faroe Islands as well as the inhabitants of the building. The area connects the different scales in the landscape and integrates the energy resource in the area.

The building is in dialog with the context and is made accessible for all, not just the inhabitants. The apartments are made private in a public area and have a central heart, generating the life of the home.

TITLE PAGE

Aalborg University
Department of Architecture, Design and Media Technology
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Title: Birdmountain
Theme: Sustainable Architecture in the Faroe Islands
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Main Supervisor: Mogens Fiil Christensen
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Rakul Vest Højgaard

PREFACE

This project is the master thesis developed during the spring 2015, at the Department of Architecture, Design and Media Technology, Architectural direction. The semester description states, that the objectives of this semester is to stage a manifestation of the students' abilities to design solutions defined by the student. The problem should be solved with a design proposal integrating engineering considerations in the design of architecture. Both tectonics and sustainability engineering must be a part of the process and indoor climate, energy and structural considerations must be an integrated part of the design.
[Semester Description, MSc04 Ark Spring 2015]

The specific project concerns a sustainable apartment building located in the Faroe Islands and the report describes the steps from initial motivation to final design. The report is divided into five main sections; Idea, Analysis, Sketching, Synthesis and Presentation, followed by the Appendix and list of literature and illustrations, stated according to the Harvard method. Besides the report there is a technical drawing folder and a CD, with a digitalized report, Be10 files and BSim files.

Unless otherwise stated, all plan drawings are with north upwards.

TABLE OF CONTENT

INTRODUCTION

In the middle of the North Atlantic Ocean lie 18 small islands, The Faroe Islands, which from the beginning of civilization have been totally depended on the nature and its resources. A respect for the nature was necessary to survive, and this is very evident in the culture, people's behavior and in the architecture. Today The Faroe Islands are a modern community, with all the modern techniques and influences, but still the connection to the old culture and the respect for the nature is visible.

"The people of the Faroe Islands were from the outset the little people in the great nature. Should anywhere the nature have an effect on the mentality and way of behaving, then it had to be in these small mountain villages by the ocean, and the storms and darkness, loneliness and fear have not gone without a trace over the Faroese People." [Jacobsen, J. F., 1970; 22]

MOTIVATION

The Faroe Island has around 50000 inhabitants and 20000 of them live in the capital, Tórshavn. Evan though almost half of the people of the Faroe Islands live in the capital, the town center is lifeless. The old town plan, with a few exeptions, was to build low and dense, and as result of this, there is not much space for habitats, shops, office etc. There are shops and public functions in the city centre, but these do not seem to manage to bring life to the center. As a part of the solution for bringing life to the center, the Municipality of Tórshavn wants people to live in the city centre, bringing life to the area the whole day, and not only during opening hours. In the search of finding the solution, in January 2014, the municipality of Tórshavn wrote a competition to design a new urban plan for the city centre.

In finding inspiration for the competition description, the municipality held an initial workshop, where architects, urban designers and others were invited. The result of the workshop was these key areas, both geographically and socially, which needed to be dealt with:

1. A mixture of space for children, young, old, families, offices, public and private services, shops, tourism, recreational spaces, marked place, etc.
2. Infrastructure and parking.
3. Public functions and functions with "life" the whole day on ground floor and private functions above.
4. More shared spaces.

The result of the workshop was a competition description, which among other said:

"A city isn't a city without people living in it. Tórshavn is a small city, and the center shifts according to the clock, but also according to the activities. The city center is not about parking and making it comfortable for the cars. What creates life in the city is interplay between buildings, people and activity."
[http://www.torshavn.fo/get.file?ID=1757]

"... it [Tórshavn] is the place where big city culture and Faroese village culture live side by side."
[http://www.torshavn.fo/get.file?ID=1757]

Furthermore the description states, that the projects do not have to follow valid town plan.

The architects behind the winning proposal were Zeta architects. Ranging from cultural house, parking, infrastructure, apartments, green areas and others, the project Stitching Landscape deals with 10 different focus points in the center. The vision is "*Based on the city's existing diverse structure the vision for the future focuses on mixing functions, users and building typologies to increase interaction and symergy.*" [http://zeta.fo/project/torshavn-city-center] One of the focus points is building a new waterfront with apartments on Eystara Bryggja, and this is where the focus of this project will be.

ill. 1

METHODOLOGY

This project is worked out in an Integrated Design Process, as Mary Ann Knudstrup formulated it, meaning that it is worked with all the design parameters at the same time – esthetical, technical and functional. By doing so, all the parameters are well integrated in the design, and there is a synthesis between all three in the final design.

Furthermore the project is worked out in an iterative process, consisting of five phases – the Idea, the analysis, the sketching, the synthesis and the presentation. The first two are theoretical aspects, the next two are practical and the last is presenting the project. As you make new discoveries and decisions you go back and forward through the phases, but due to readability the phases are presented separately in the report.

Idea

The first phase is rather short, and consists of a description of the initial idea, which is to be worked with during the project. In this phase focus points are decided and the course of the project is set.

Analysis

In the analysis all the data and background information for the design process is collected. First the site is analyzed both from the top and from the ground. The methods which is used to analyze the site from the top is Mapping, as defined by Kevin Lynch in the book *The Image of the City*. [Lynch, K. 1960] In this method one uses edges, nodes, paths, districts and landmarks to understand the city from the top. A more phenomenological understanding of the place is gathered during a study trip to the site, where the atmosphere is experienced. Furthermore sustainability, tectonics and other themes are defined from researches and some existing examples, both architectural and technical, are investigated in case refernces. In the case references it is not the whole project, wich is analysed, but specific aspects, which are considered relevant for this project - as staded by Steven Holl architecture is not experienced as a whole but in the details by our senses.
[Holl, S., 2007]

Sketching

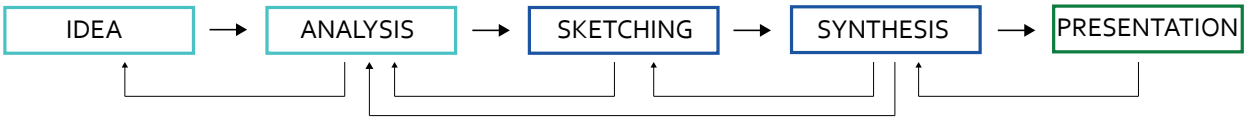
With departure in the analysis the sketching is begun. Hand sketches, physical models and computer models all help to develop a form and should end up with an architectural concept for the project.

Synthesis

After finding the concept for the project the synthesis begins. In this phase the project takes its final from and detailing and optimizations, of both technical and architectural aspects, are made.

Presentation

In the final phase the project is presented. This is done with computer visualizations, hand drawings, technical drawings, models, pictures etc.
[Knudstrup, M.A., 2004]
[Knudstrup, M.A. 2005]



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TOOLS

During the design process different tools are used. The schedule below presents which tools are used in which phase.

	Analysis	Sketching	Synthesis	Presentation
Drawing	x	x	x	
Models		x	x	x
Illustrator	x	x	x	x
Photoshop				x
SketchUp		x	x	
AutoCad			x	x
3d Studio Max				x
Calculations			x	
Velux			x	
Be10			x	
BSim			x	

ill. 3


BLUE WATER

ANALYSIS

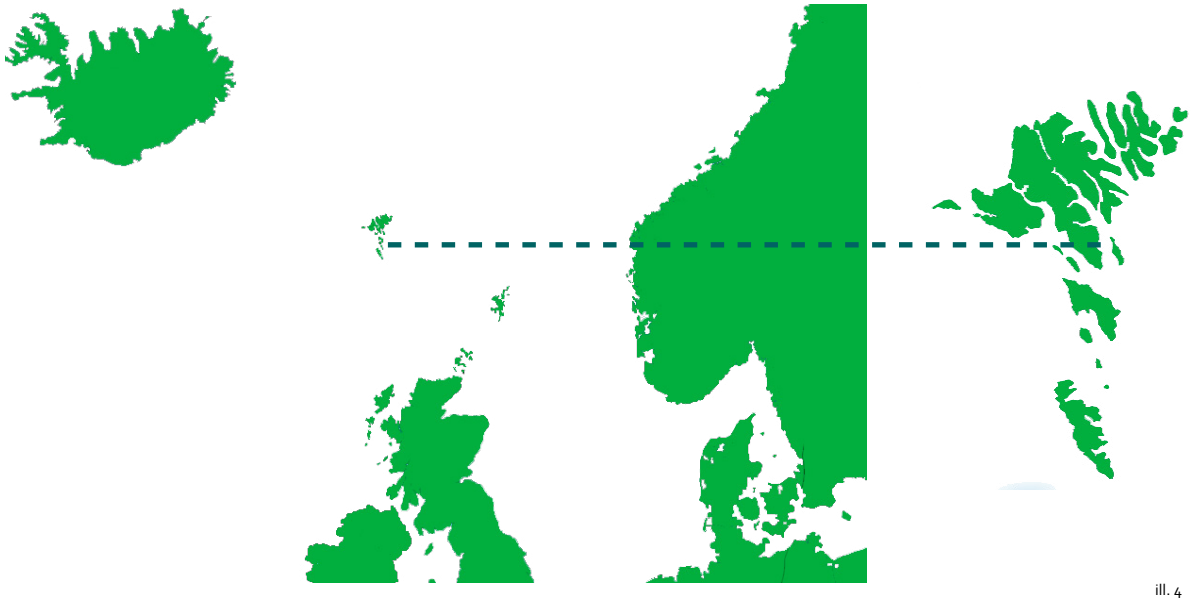
In this chapter the basis and all the background information for the following design process is presented. More precisely the analysis is dived into four subjects – Site Conditions, Themes,Research and Conclusion. Initially the site is analyzed – from the top and from the ground, and data such as weather conditions and sun diagram are collected.

Following is a description of the different themes of the project, like Sustainability, Tectonics and others. Finally there are some references and research of materials, light and renewable energy resources. The conclusion of the analysis is presented in form of the target, room program and problem statement.

SITE

About 55 million years ago the Faroe Islands arose as a result of volcanic activity in the area, and because of the volcanic base, there is not much vegetation on the islands – mostly just grass and heather. The landscape is dominated by fiords and mountains. The mountains are not particularly high, the highest is 882 m, but since they go straight from the water to the mountain top they seem majestic.

The specific project site is located at the harbor front of Torshavn, at the southern edge of the city center. It lies between history, industry and newer habitations.



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EDGES

The dark green line represents the edges of the city center as defined by the municipality of Tórshavn. In the competition description about designing a new urban plan for Tórshavn, it was within these lines, the suggested changes were to be designed. The edge is in most places defined by a road with heavy traffic, and generally it can be said, that the areas outside the edge are open residential areas, while the area inside the edge is a denser mixed use area. The typologies of the area are mostly point and stock buildings.

The light green line defines the project site. It is within this area the winning proposal suggests that apartments and a waterfront environment are designed. As it is at the moment, there is a parking lot, as well as a transit area at the chosen site.

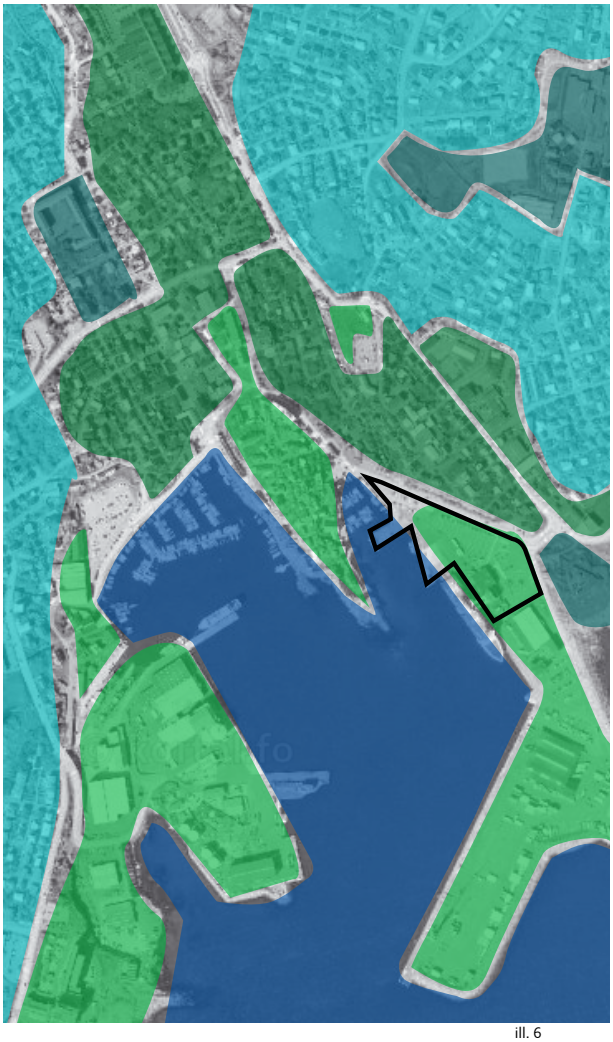
City Center

Project Site

ill. 5

DISTRICTS

As mentioned, the area outside the competition area is generally residential, while the area inside is mixed use. The project site lies in a clash between it all, with the harbor to the south, the historical/political center to the vest, the main transit area to the south east and a residential area to the north and has to take account to all of this.



ill. 6

Residential

School, Kindergarten and Recreational

Harbour and Harbour Front

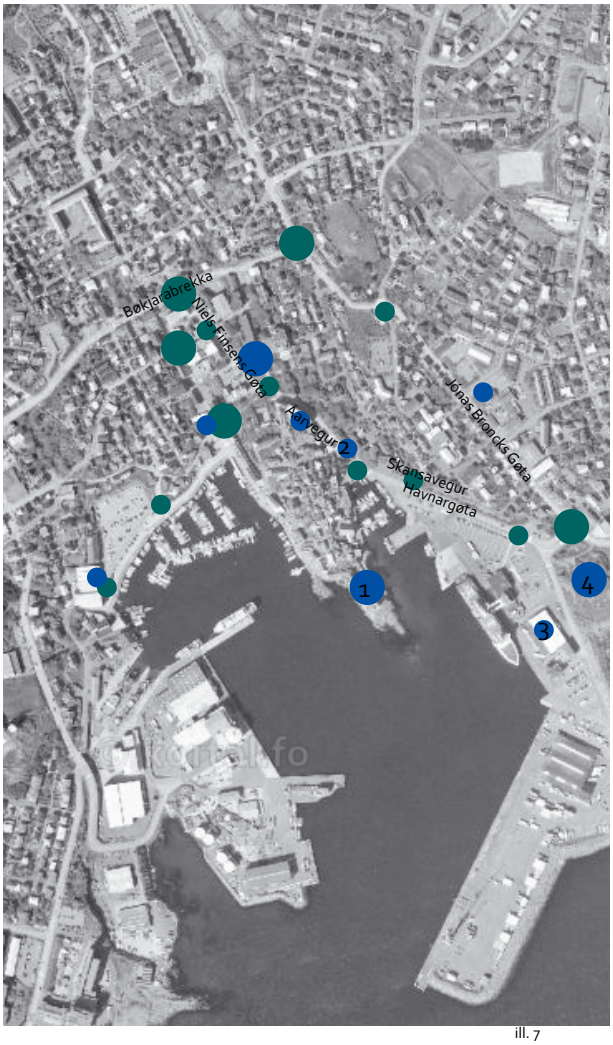
Industry, Culture and Parking

Shops, Office and Residential

NODES AND LANDMARKS

Being the center of the Faroe Islands, there are several nodes and landmarks in the area. The nodes are generated, where roads and paths meet, for example where Áarvegur and Havnargøta meet and where Kongabrúgvin and Havnargøta meet.

The most dominant landmark in the area is Tinganes, the historical/political center, and this is also the most important landmark in the whole of the Faroe Islands. Other landmarks in the nearby area are Café Natúr, an old local pub, to the northwest and to south-east are the boat terminal and Skansin, an old prison, which today functions as a green recreational area.



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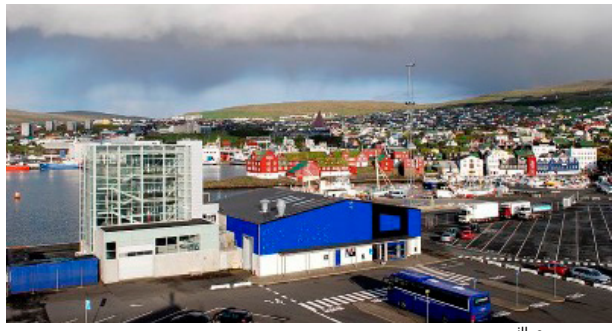

ill. 9

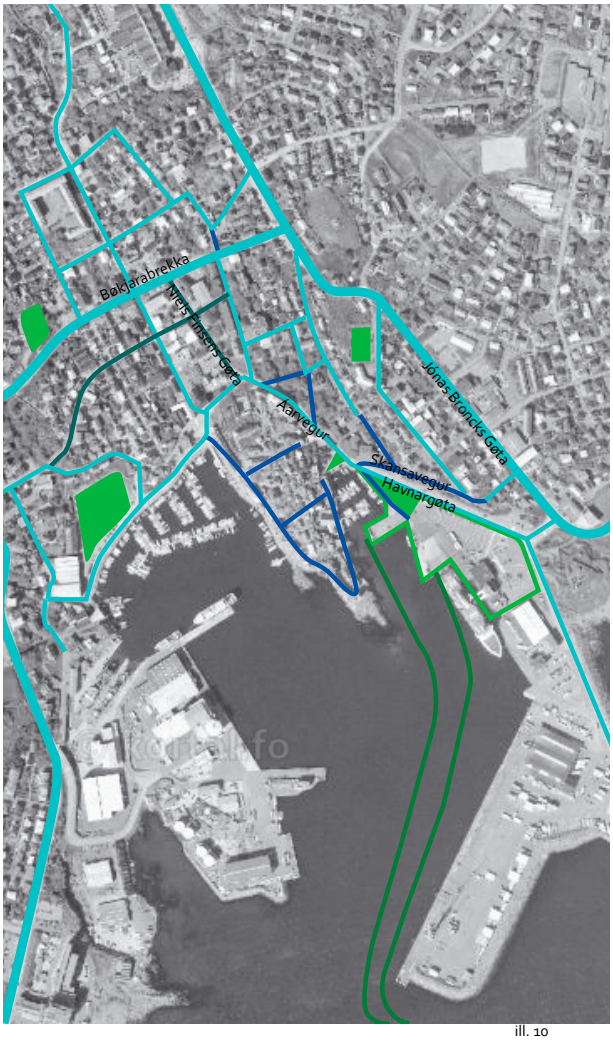
- Nodes
- Landmarks
- 1 Tinganes
- 2 Café Natúr
- 3 Boat Terminal
- 4 Skansin

PATHS

One of the issues in the center of Tórshavn is the roads and the cars and this is one of the problems the municipality wanted solved in the competition suggestions. The traffic going through the center is too heavy for the roads to carry and some of the main infrastructural oars of Tórshavn are through the city center, making it difficult to make an environment, where pedestrians thrive.

A path going up the cliff in the area is frequently used by pedestrians. Havnargøta, the road driving by the project site is a direct side road to one of the main roads of Tórshavn, resulting in some traffic. But in the winning proposal of the new urban plan, there is to be a waterfront environment in the area, so the car traffic is lead in another direction.

The path of the ships and boats in the area are to local islands and to other countries, mostly Northern.



ill. 10

ill. 11

Cars

Shared Space

Pedestrians

Parking

Ships

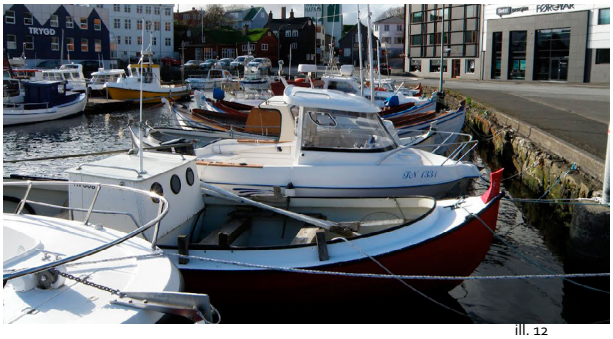
ATMOSPHERE

The atmosphere at the site is a mix of maritime, cultural/historical and that of a transit-/industrial area. It lies right next to the harbor and boat terminal, but has the view over Tinganes, the historical political and trade center of the Faroe Islands.

The architecture of the Faroeses cities and villages is very colorfull, the most dominant colors being red, white, black, yellow and green as well as the natural color of wood. This is also the case at the site, but since all the old buildings at Tinganes are red, this is the main color visible at the site. The most used building material, both when it comes to buildings and when it comes to boats, is wood. An old building tradition is to use gras on the roofs, and most of the houses on Tinganes have this.

The low and dense urban planning of Tórshavn contributes to a rather human scale, where the most buildings have a maximum of three floors, although there are a couple of never office buildings to the northeast, which are up 5 stories high. Lying in a maritime area, the scale of boats is also an important factor. The harbor lying up against the site is for small boats for personal use. This contributes to an even more human scale.

Besides containing a parking space and a transit area, the area also contains another important function. For two days a year, Torshavn turns into a big festival area, namely when Ólavsøka, the Faroese national festival is held the 28. and 29. of July. These days the national sport, Faroese boat race, is held and the harbor and the harbor front at the site is the center of this event.



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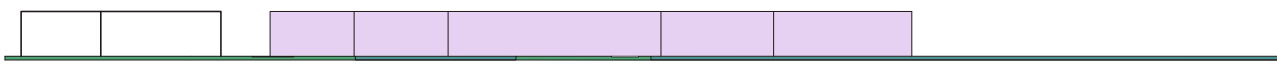
TOPOGRAPHY

The topography of the site is quite complex. As the site is at the harbor, it lies in a valley with slopes to all sides, except to the water. A cliff to the northeast lies as a wall to the site and creates a natural edge. The water is to the west and on the other side is a headland, on top of which Tinganes is. Building in a landscape like this you have three possibilities – Leveling the land, let the architecture follow the landscape or a combination of these.

Section A



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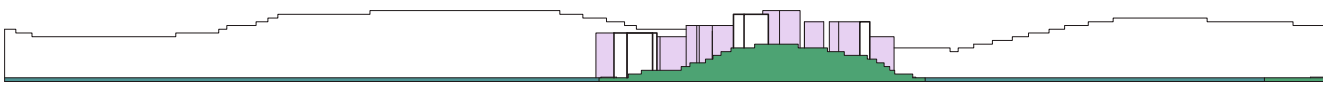

Section A

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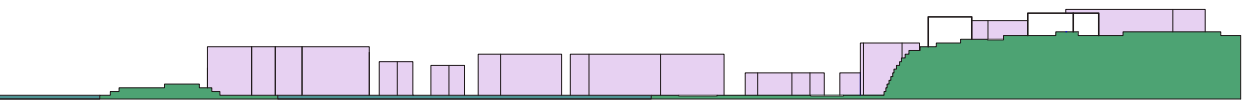
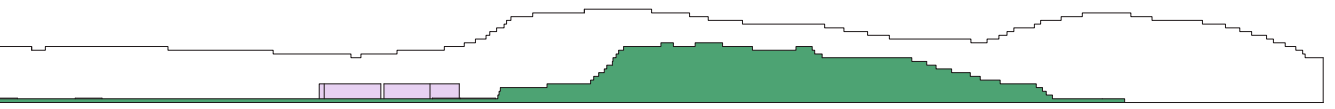
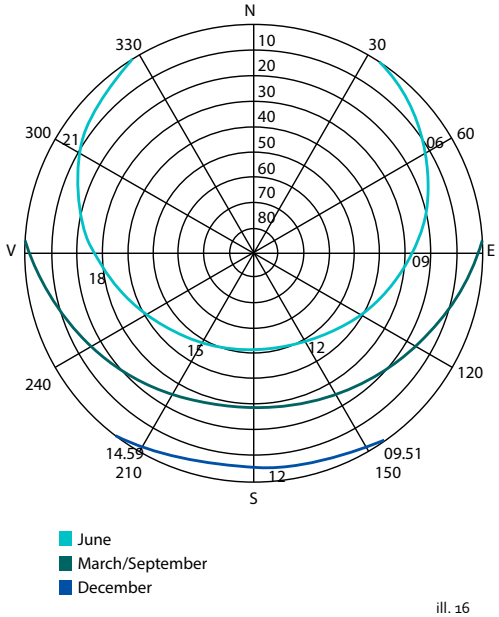




ill. 15

SUN DIAGRAM

Located on the 62. Nordle latitude the summer days are long and the winter days short. In the winter there is a low angle sun creating long shadows, but only for 5 hours, as the shortest. In the summer, on the other hand, the longest day has 15 hours of sun at a high angle.



ill. 16

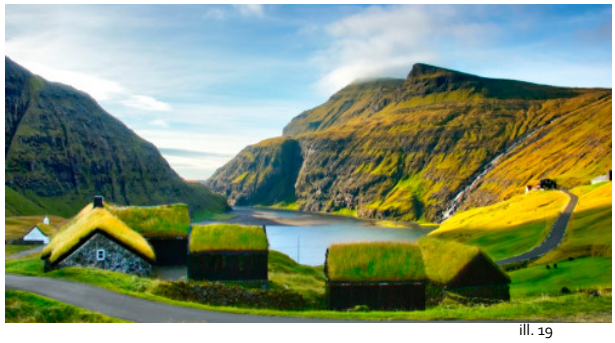
ill. 17

CLIMATE CONDITIONS

The climate conditions on the Faroe Islands are very shifting and you can experience all four seasons in a couple of hours. This variation in climate conditions mostly applies to sun, wind and precipitation since, as shown on the diagram, the temperature does not vary allot - the winter is mild and the summer cold.

The most evident natural forces on the Faroe Islands are wind and rain, and the respect for these is high. The most common wind direction is from the vest, and having a costal climate, there is a lot of it. Wind speeds of 40 m/s are not unusual in the winter. The Faroe Islands arose as volcanic islands, and partly because of the hilly landscape, there is a lot of precipitation. In a year there are on an average 209 days where it rains. [http://www.dmi.dk/faeroeerne/arkiver/klimanormaler/]

ill. 18



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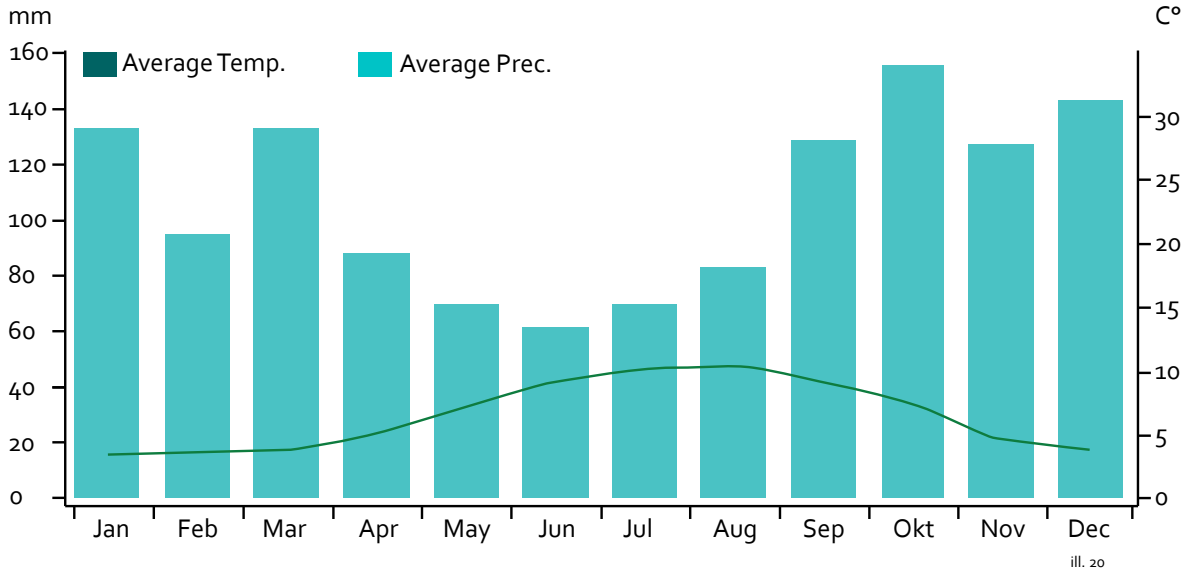

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NORDIC TRADITION

The Stockholm Exhibition in 1930 was in a way the breakthrough for the new Nordic Architecture. It has resemblance to modernism and functionalism, but the Nordic tradition is more a way of working, than a specific style. Of important architects can be named Gunnar Asplund, Sverre Fehn, Jørn Utzon and Alvar Aalto.

The Nordic tradition brought architecture into everyday life and people's homes. It has a deep respect for the context it is built in, since the way of living in the Nordic countries depends so much on the nature – the weather is shifting and often rough, there is not much daylight and you are surrounded by sea and mountains. These factors are important for Nordic architects, and therefor they work a lot with natural light, the contrast between light and dark, the border between nature and manmade as well as the border between inside and outside, views and others. The Nordic tradition has a deep respect for the context, in the sense that it does not want to dominate it, but wants to coexist with it and uses local and honest materials. It never pretends to be something it is not. [Lund, N. O., 2008]

TECTONICS

Since the sense of place and honesty in materials and construction is of uttermost importance to Nordic architects, they often also have a tectonic approach to architecture.

The term Tectonics, as Frampton states, originates from the ancient Greek word tekton, meaning a craftsman, carpenter, and at some point it emerged to the term archi-tekton, meaning master builder. [Frampton, K., 1995]

One can say, that the tectonic approach contains two aspects. The concrete aspect, where there is a self-explanatory and transparency in the structure, materials and form and the more poetic part, where the architecture has a gesture, and principle.

"The material, detail and structure of a building are an absolute condition. Architecture's potential is to deliver authentic meanings in what we see, touch and smell; the tectonic is ultimately central to what we feel." [http://www.roemervantoorn.nl/interviewalvaros.htm]

ill. 21

FAROESE ARCHITECTURE

"Faroese architecture is a special Nordic mix of traditions and inspirations from Norwegian and Danish architecture, formed in this special Faroese context of a demanding natural environment, a profound sense of community balanced with a strong and colourful individualism."
[http://www.faroeislands.fo/Default.aspx?ID=13593]

From the beginning of civilization, about 1500 years ago, the inhabitants of the Faroe Islands have used materials, which were in the natural environment. Since there wasn't much vegetation in the nature, the materials were stone, turf and driftwood and this tradition is still visible in today's architecture, were many buildings have grass-covered roofs, and the preferred building material is wood. The wood needed protection, traditionally this was provided by tar, but in never times the inhabitants use paint to express their individuality, resulting in colorful cityscapes.

The Faroese word for house, "sethús" is in plural, implying the fact that the first homes didn't consist of only one house, but of one main house and several outbuildings. The main building had a front room, roykstova, where a fireplace was located centrally. The fire place functioned as the kitchen, as well as providing heat for the house. The front room was also used as a slaughter house, workspace for the women, and around the room were benches on which the inhabitants ate their dinner and in the night, the servants slept on these benches.
[*Andersen, I. F., 2012; 248*]

The development in architecture from local craftsmanship to educated architecture wasn't until the beginning of the 20th century, when the first Faroese architects went to Denmark for education. Some examples, reffered to in the references, of characteristic Faroese architecture are the Nordic House, designed by Ola Steen and the terraced houses Inni á Gøtu, designed by Gunnar Hoydal.


ill. 22


ill. 23


ill. 24

FAROESE NATURE

ill. 25

The Faroese landscape is dominated by fjords and mountains and the Faroese nature is best experienced hiking in the mountains. Hiking the mountains, one can enjoy the silence, fresh air and stunning view – then suddenly, the mountain stops. The ground is taken under you. This is when you stand at a cape, one of the Faroe Islands most dramatic nature phenomena's. Looking down you see the sea breaking against the cliffs, 700 meters below you. Evan though it is very dramatic, and walking out the edge means certain death, the cape is full of life. The cape is in fact the seabirds' homes, birdmountains – where they nest. The capes ground is layers of basalt, but where there is a spot of earth you find an almost tropical vegetation. This is a result of the heat from the sun, which shines perpendicular on the cape, combined with the birds guano, which fertile the earth.

SUSTAINABILITY

The definition of sustainability was defined in the Brundtland Report from 1987, and states: "*The development that meets the needs of the present without compromising the ability of future generations to meet their needs.*" [Brundtland et.al. 1987:51] Furthermore sustainability is divided into three subjects, which together form a holistic approach; The environmental, the social and the economical.

Creating social sustainability is of importance when designing, because it ensures a well-functioning environment. Since the needs can vary from person to person and from situation to situation it is important to create an environment which soothes the specific user. "Maintaining a cultural diversity must be seen as an integral component of a sustainable architecture, because history would seem to show that variety among human societies is the source of adaption and of innovation." [Williamson, Radford and Bennetts 2003:89]

In the environmental aspect there are two main issues; the emission of substances such as CO_2, toxics, noise, etc. and the extraction. There are the non-renewable extraction resources as fussil fuels, and the renewable resources as energy from the sun, wind, waves and others.
[Williamson, Radford and Bennetts, 2003: 86-89]

There are two means by which the sustainability is ensured; Passive methods and active methods. Thoroughly considering the geometry, orientation, natural daylight, natural ventilation and others, the passive methods reduce the emission. After reducing the emission to a minimal, active methods such as mechanical ventilation and heat-pumps are implemented.

When resources are used in a responsible and beneficial way over a longer period, they are considered economical sustainable. If you for example install a natural energy resource or use long term durability materials, the cost of installing these should be served back over a reasonable time. It is also considered social sustainable If a project contributes to the economics of the context; this could be by using local materials and labor.
[Williamson, Radford and Bennetts, 2003: 89-91]

The social sustainability is of most important for this project. In order to be of any meaning and be of use, the design has to live up to its purpose and be used as it is intended to. This is ensured by generatingsocial sustainability.

Second there is the environmental sustainability, which can have many different approaches. The project is made sustainable by fulfilling the requirements for the low energy class 2020 in the Danish Building Regulations. This is accomplished by using passive methods first and secondly implementing active methods. Although it is important to fulfill the requirements, it is important to make the design user-friendly. It is of no success fulfilling the requirements, if it is not fitted for usage.

Because of the focus of this education, the economic sustainability is not considered as high in this project, as the two other aspects. Still, it is considered in the sense that local materials and building costumes are used.

ill. 26

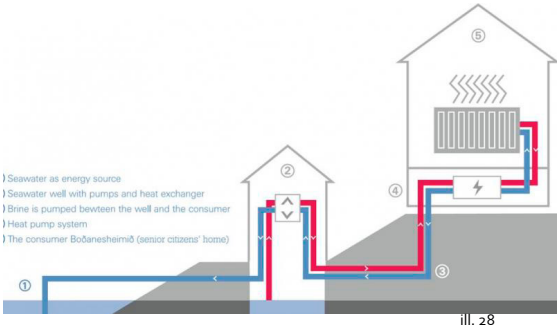
RENEWABLE ENERGY IN THE FAROE ISLANDS

In 2001 the Faroe Islands made their own report concerning the strategy for the sustainable development of the islands. Because of the fact that the report is poor in describing the energy consumption requirements, it is mostly referred to the Danish Building Regulation, when discussing environmental sustainability and renewable energy. [Samuelsen, 2002: 21]

The forces of nature in the Faroe Islands are quite intense. On the positive side, these can be used for energy. On a national basis the most used renewable energy resources are wind and water. There is one electricity company in the Faroe Islands and on an annual basis 60% of their production comes from wind and water. [http://www.sev.fo/default.aspx] These require big installations, but on a more local plan, heat pumps are very successful – especially the water to water system, where heat is gained from the ground. A hole with pipes is dug into the ground, and a pump, which is installed up on the ground pumps the heat op, which then can be used to heat the house (well suited for floor heating) and heats the water. Ground heat has the advantage, that it is relatively constant at a certain debt (about 9 m) - in the Faroe Islands it lies between 3 and 10 degrees.
[http://demich.fo/fo-FO]

Boðanesheimið, 2012, is a nursing home located in Tórshavn and is the first building in the Faroe Islands, which gains heat from the ocean. The Gulf Stream runs by the Faroe Islands, and this ensures, that the temperature of the seawater is always between 6 and 10 °C. The heat pump principle is the same, whether the heat is gained from the ground or water. The nursing home, which is designed by the architects Albert Isfeld and Gudmund Hansen is 5250 m2 and the heat gets transmitted from the seawater by four big Vølund/Nibe pumps, each of 60 kW. This supplies heat and warm water for the nursing home, which on an annual basis has an electricity need of 360000kWh. The four heat pumps are located in a technical room in the nursing home and a small pump house which pumps the seawater from a well to the nursing home is built near the coast.

ill. 27



ill. 28

THE NORDIC HOUSE

ill. 29

ill. 30

The Nordic House, built in 1983, is a good example of the combination of modern Nordic architecture and traditional Faroese architecture. The building is a symbiosis of Nordic elements – the stones on the floor of the foyer are from Norway, the furniture in the house are designed by the Finn Alvar Aalto, the floors and walls are clad with Swedish wood and the glass and steel on the façade are from Denmark. The Faroese element is the characteristic grenn roof and as it lies there in the outskirts of the city center of Tórshavn, it reminds you of the Faroese landscape. [http://www.nlh.fo/Default.aspx?pageid=6167]

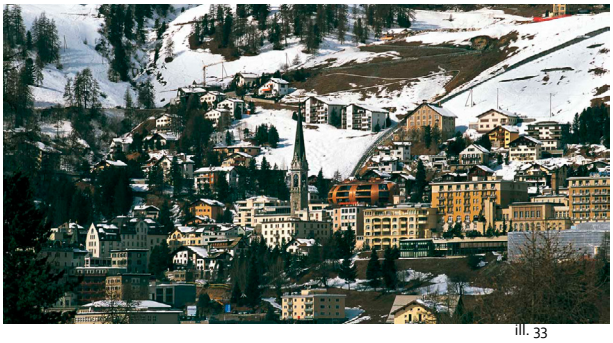
INNI Á GØTU

ill. 31

ill. 32

At the outskirts of Tórshavn lay the terraced houses Inni á Gøtu (ill.??), as a city wall, following the landscape. The architects intentions was to provide the individuality, which the inhabitants of the Faroe Islands cherish so high, in a new, more dense form. The result was terraced houses, where the owners got two walls, within which they could build whatever they wanted. The result is a very diverse society, with good social sustainability. Even so the houses lie in an area, which is very open to wind, the hoses form a barrier, and within the barrier, the children can play in a good environment.

CHESA FUTURA



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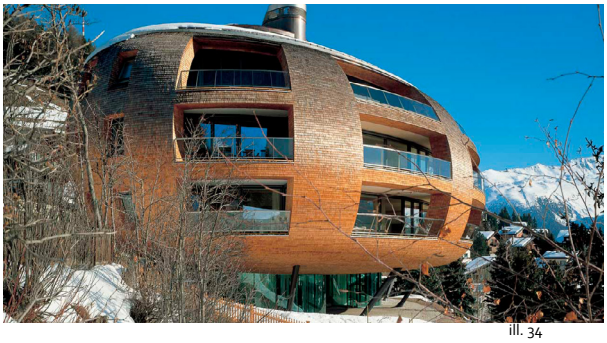


ill. 34

Chesa Futura 2000-2004, designed by Norman Foster, is a three stories high apartment building in the picturesque landscape of Switzerland and is special in the way it relates to the steep slope it is located on. Instead of digging into or letting the building follow the landscape, the Chesa Futura is raised above the landscape, making the impact on the nature minimal. It is separated from the ground by eight large steel columns and the curve shaped façade is clad with larch wood shingles. This combines old local building techniques with modern designing tools. The shape is somewhat alien to the context, but using local materials it creates a dialog with the surrounding architecture and landscape.
[http://www.fosterandpartners.com/projects/chesa-futura/]

VILLA VALS

ill. 35

ill. 36

The holiday house Villa Vals, 2009 was designed by SeARCH and CMA and is located in Vals, Switzerland, within a walking distance to the famous thermal bath of Vals. To avoid affecting the landscape and the view of the bath, the house is built into the mountain having only one façade. The difficulty of getting enough daylight into the house, having only one façade is solved by designing the façade spherical, creating a larger surface for windows and giving the possibility to get light from different angles.
[http://www.villavals.ch/]

MATERIALS

ill. 37

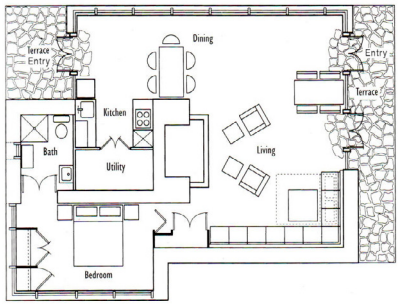
A much used material in the Nordic Tradition as well as in the Faroese building tradition is wood. Located in a very wet environment, the wood needs protection, and being the most used material in the Faroe Islands, also for cladding, this need for wood protection has resulted in a very colorful cityscape. Traditionally, all the way back to the old Viking Age, tar was used for protection, both for houses and boats. The tar used for this purpose is derived from pine, by a destructive distillation. It is a tick substance, but can be mixed with linseed oil, for easier application. It takes some time to dry, up to several weeks but if it is applied correctly, it has a long durability, up to 20 years, since it dries very deep into the wood. As opposed to using regular paint which most often is full covering, tar lets the structure of the wood shine through, making it authentic.

Using tar would, besides being good for protection, give a historical reference to the project. It has also got a special smell – smell of old days, which on sunny days would spread to the rest of the harbor front, with the view to the historical TInganes.
[http://www.linoliebutikken.dk/traetjaere/hvad-er-traetjaere.html]


ill. 38

A strong characteristic of the old Faroese houses is the green roof, making the buildings morphing into the landscape. A green roof is cooling in the summer and more important, it keeps the warmth inside the house during the winter – the Vikings had a sense for sustainability. Furthermore it is good at absorbing water, a useful quality in a country which has 209 days of rain a year. The architectural expression can vary allot, depending on what you want to grow on the roof, the most usual is grass – long or short. There are some challenges in having a green roof. It is very heavy, and requires a strong construction. Being a heavy construction, there is also a risk that the grass and soil slides down the roof, and there for the roof should not have a high angle.
[http://www.bolius.dk/graes-som-tagbelaegning-19187/]

OPEN PLAN



ill. 39

The open plan layout makes use of large, open spaces, where the walls are kept to a minimum. In the 1880's, with Frank Lloyd Wright as one of the advocates, small, enclosed rooms where being replaced by big open rooms, containing several functions. The homes often had a centralized kitchen, as a meting point for the family and where the wife of the house could function as a hostess while cooking for her guests, instead of being hidden in the kitchen, away from the guests.

This open plan can be compared to the old Faroese homes, where there was a central fireplace, around which all other functions of the home were distributed, but fulfilling modern needs, like the privacy of the bedroom.

ROOM PROGRAM

Building in such a unique environment, the price for the apartments would naturally be high and attract people with certain means. This could be young educated people starting a family as well as elderly people, whose suburban villa has gotten too big, after the children have moved out.

The room program is a symbiosis between the concept of dense living, while maintaining spatial quality and functional comfort. Considering the user group, the apartments are two and tree bedroom apartments, between 90 and 105 m2. Due to the privacy of the apartments and to provide quality to the harbor front environment, public functions like Café and Tourist Information Center is located on the ground floor.

Apartments:	Size	Daylight	Temperature	Functional Needs
Entrance	6 m2	2%	Winter 20-24 °C Summer 23-26 °C	Storage
Kitchen/Living Room	40 m2	3%		Kitchen facilities, dining, relaxing
Bathroom	6 m2	2%		Shower, Toilet, Sink, Storage, Washer
Master Bedroom	14 m2	2%		Bed, Storage
Bedroom 1	12 m2	2%		Bed, Storage, Play area
Bedroom 2	10 m2	2%		Bed, Storage, Computer
Terrace	10 m2	-		Dining, Grill
Technical	1 m2	-		-

ill. 40

CONCLUSION

The analysis' purpose is to gather background information for the upcoming sketching phase. This is done by means as site analysis, theme specifications and research of existing examples and details.

The project site lies in the town center of Tórshavn, up against different functions and atmospheres and filled with local – and national landmarks. At its back is a cliff, on top of which a residential area is located, to the southeast is a transit area and a recreational area, and to the southwest is the harbor. Furthermore it has the view to the historical political center of the Faroe Islands. The project should take account to all these aspects by relating to the functions in the area, creating views and add value to the harbor front environment. The main themes of the project are tectonics and sustainability. The design is to be honest in construction and in use of materials, whilst form, structure and materials form a unity. This is done in a Nordic sense, where the focus is on the context, light, views, local tradition and nature.

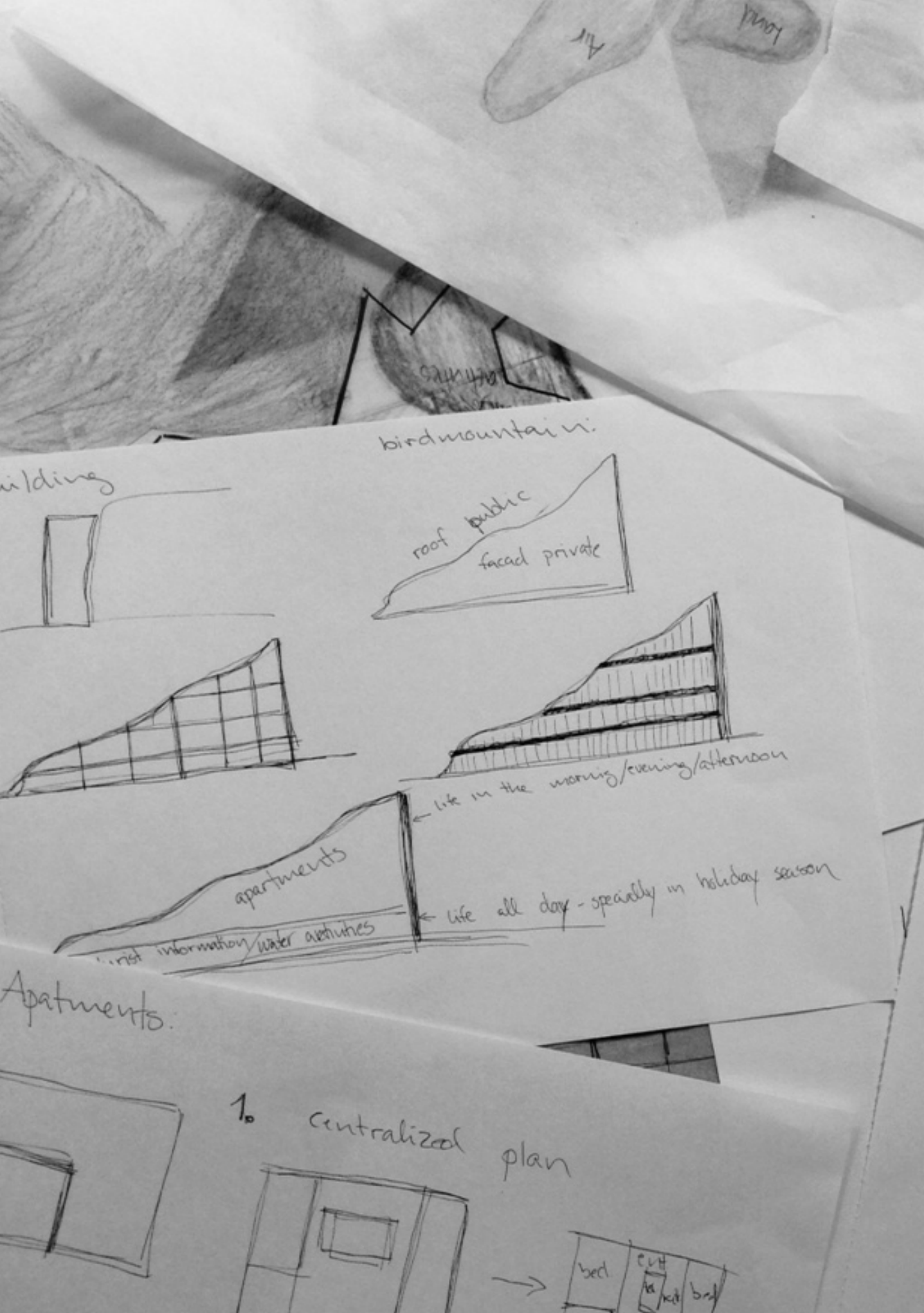
When it comes to sustainability the main focus is on two aspects – the social and the environmental. In the social sustainability the focus is on generating a good environment for the users of the building as well as contributing to the harbor front environment. In the environmental sustainability, passive methods such as building envelope, orientation, natural ventilation and others are used to reduce the emission. Furthermore passive methods to extract energy are implemented to supply the building with the energy it needs to run, and mechanical ventilation to ensure a comfortable indoor environment.

The references show examples of how Faroese architecture relates to the nature – how the Nordic House blends in with the nature using local building traditions as the green roof and the terraced houses how they follow the hill they are located on and form a shelter inside the wall creating a good social environment. Research shows the benefits – and challenges of using local building traditions such as tar clad wood and green roofs. Furthermore the research shows that on a local plan, the most successful source of energy is heat from the ground, extracted by heat pumps.

PROBLEM

How to generate an area and a building belonging to the people of the Faroe Islands, while ensuring the right amount of privacy and warmth for the single apartments.

Furthermore how to integrated sustainability, both social and environmental, in the area, making it a part of the everyday life.


birdmountain:
roof public
facad private
life in the morning/evening/afternoon
apartments
life all day - specially in holiday season
Apatments.
1. centralized plan
bed

SKETCHING

With departure in the analysis and the vision for the project, the sketching is begun.

First the area is divided acording to qualities and functions. Then it is investigated, how different volumes and shapes interact with the context, and finnaly the overall idea for the apartment plans is developed.

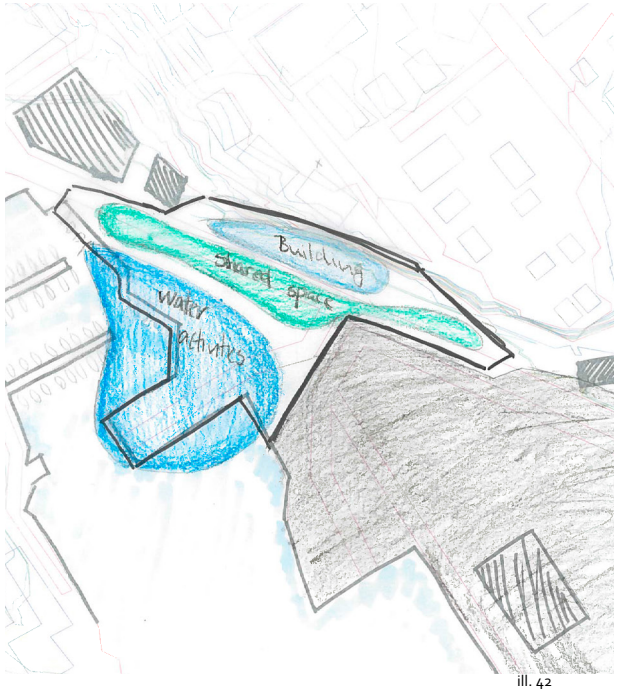
The sketching is summed up with the concept for the three scales of the project - The Area, The Building and The Apartment.

ZONING

To begin the design process, the area is divided into zones, according to the functions. In the winning project of the new urban plan for the city center of Tórshavn it is proposed that the whole area marked on illustration 41 is transformed into a harbor front environment, but it in this project it is chosen to let the area marked with grey on illustration XX be as it is. The grey area is the main ferry station of the Faroe Island with new expensive buildings, so to make the project as realistic as possible, it is chosen to integrate the ferry station with the project, instead of moving it to another site.

After the definition of the project area the site is furthermore divided into three smaller areas. The edge of the harbor front and the area closest to the water is to be used for water sport and recreational activities. The road which is currently going through the area is curved and traffic is slowed down with the help of materials and objects placed in the area, generating a shared space for cars, pedestrians and bicycles. The apartment building itself is located to the north of the area up against the cliff, connecting with the residential area in the northeast of the city.

ill. 41



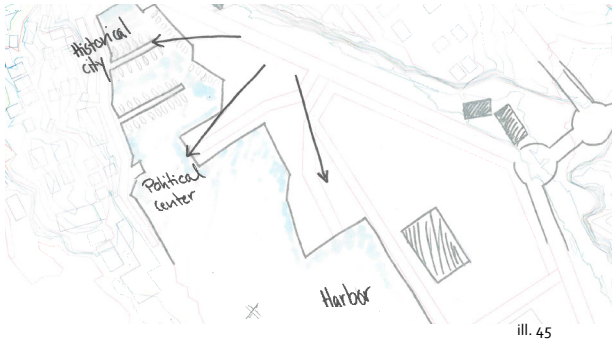
ill. 42

VIEW

An important factor when designing the apartments, as well as the orientation of the different function in the area, is the view. The view, combined with the suns path, decides the placements of the windows and viewpoints of the building and enhances the recreational value of the area.

According to the site analysis it is the view to the west and south, which are of most interest. To the vest and south west is the relaxing static view of the historical city and political center while to the south there is a view over the dynamic activity and traffic of the harbor. The view to the north is blocked by the cliff at the edge of the site and to the southeast is an industrial area towards the view is less interesting.

ill. 43



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WATER

Lying at the harbor front, water is an essential element at the site and the connection to the water has to be integrated in the design process. In this project the water is used for recreational purpose, water sport activities as well as for practical purpose. The small quay in the middle of the harbor front divides the harbor in two, still water to the north and open water to the south. The quay, which is used by a small ferry and the small marina to the south of the quay are preserved, to maintain the maritime environment, and the harbor front in this area is to be used for recreational purpose, relaxing and as a meeting point for the boat owners. To the south the harbor opens up to the ocean, and this area is to be used for water sport activities and the possibility of winter bathing.

During the sketching process it is worked with the possibility of opening the harbor, letting the water further into the area all the way to the building. Making a small canal from the harbor to the buildings east end would, besides the esthetic effect, serve three purposes;

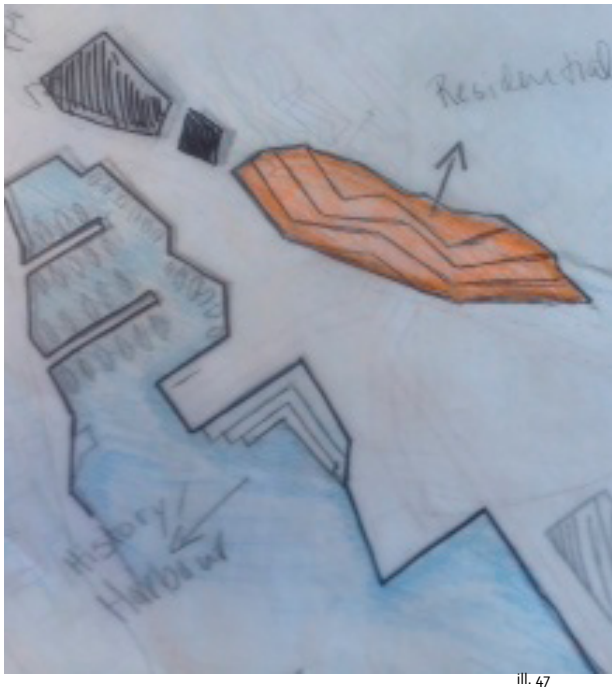
1. Due to safety reasons there is a need for a border between the public area and the ferry station to the south. At the moment there is a big fence around the area, but instead of a fence the canal could function as the border.

2. There is an idea of using heat pumps with heat from the sea water as the energy resource for the building. Normally a pump house is built near the water, which pumps the water up to the building through pipes, but making a canal up to the building you bring the water up to the pump instead off the pump to the water.

3. Bringing the water to the building would give the inhabitants and users of the building in general direct access to the ocean. The inhabitants could for example store a kayak in the building and easily launch it to the canal from their homes.

Sketching

Area



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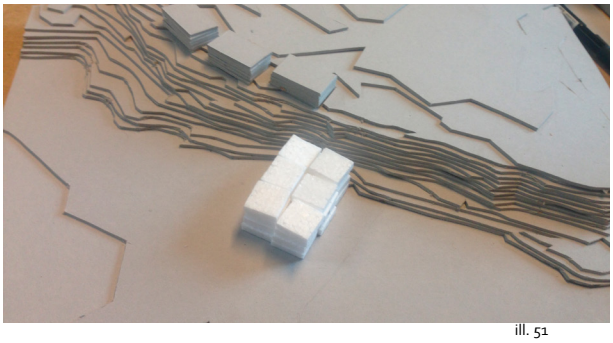
ill. 50

VOLUMES

In finding the volumes of the building, a context model is built and volumes of 100 m2 are combined in different forms, near the cliff. The buildings in the area are mainly four stories high, and there for the volumes also have this height as a maximum. This fits well with the cliff, which is 16 meters high. The square and the open block volumes are cutting through the landscape, dividing the area, while the stock volume is following the landscape. Since there is a wish to respect the context, it is chosen to further develop the last of the three.

In the last three examples the volumes are stepped according to the slope of the cliff, so the natural form of the cliff is moved out to the façade. In the first, the volumes has the same height, which makes the building follow the cliff in the vertical ax but not in the horizontal. Some examinations are made of the volumes with different heights, resulting in a volume, which lies in a stock, stepped according to the cliff in the vertical ax and according to the height, following an old path, going from the bottom of the cliff to the top.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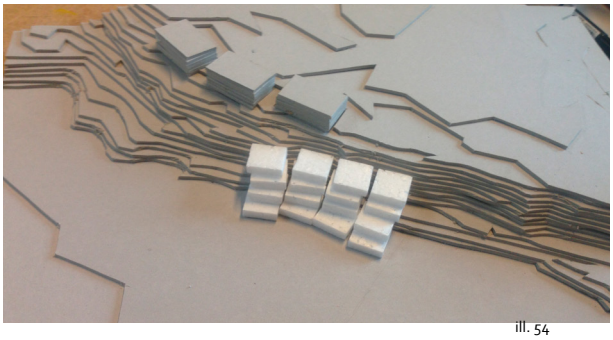
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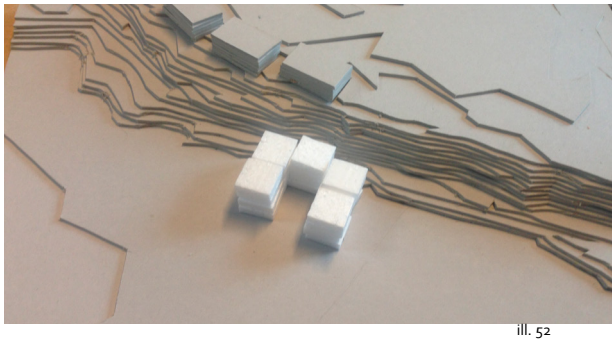
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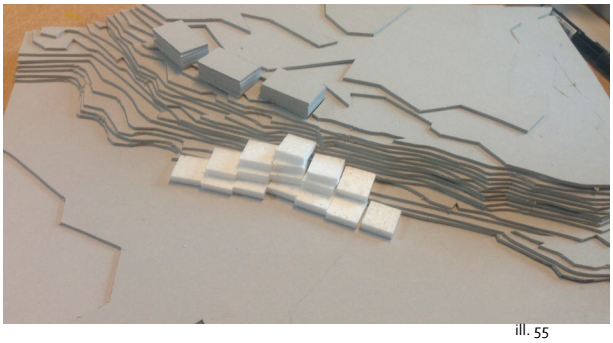
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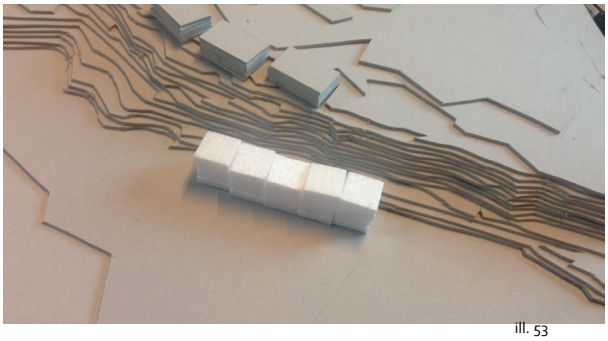
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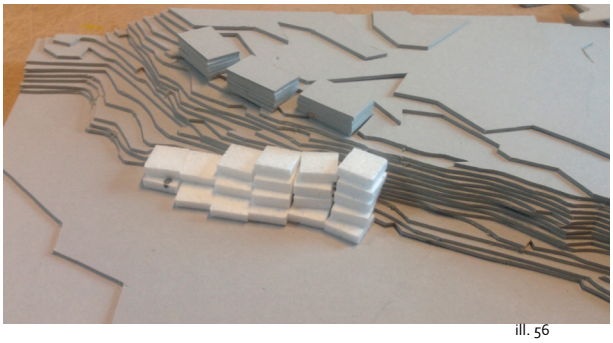
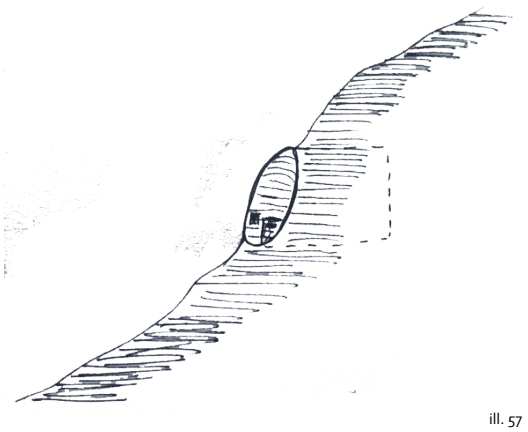

ill. 56

BUILDING AGAINST CLIFFS

Three of the case studies made in the analysis address the topic of building against and on top of sloping landscapes. They represent three different degrees of doing so. On one hand there is the Villa Vals in Switzerland, where the architects have chosen to build the whole volume underground with only the façade visible from the outside. This ensures minimal visual impact on the nature, but digging a hole in the mountain is quite an intervention. On the other hand there is the Chesa Futura by Norman Foster, where the whole building is lifted from the ground on columns, ensuring minimal impact on the landscape itself, and in between are the houses Inni á Gøtu, which lies on a mountain top, following the natural slope, without making incisions on it.

The cliff at the site has a historical value to the capital of Tórshavn and has the affection of the people. Therefore the volume is built against the cliff with inspiration from Chesa Futura and Inni á Gøtu. The shape of it is defined by the cliff, like the houses Inni á Gøtu, but without making incisions in it, respecting the landscape, like the Chesa Futura.



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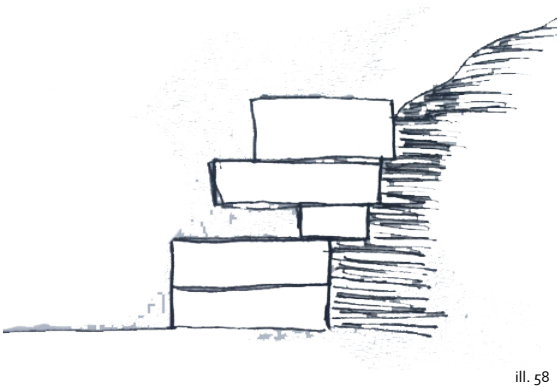

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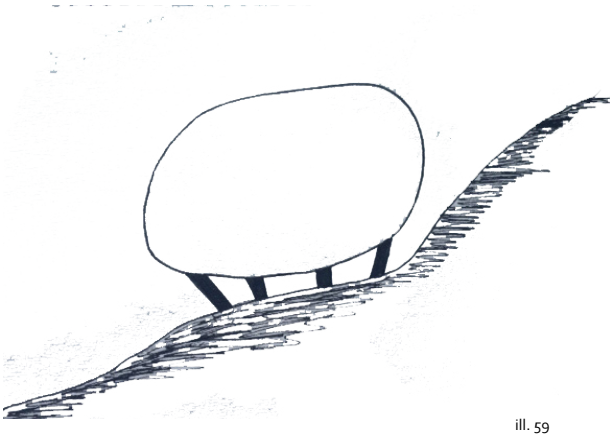


ill. 59

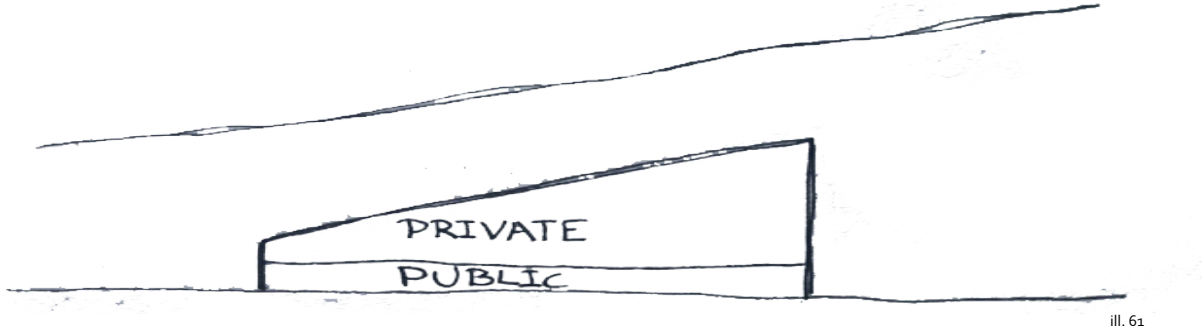
CONNECTION & FUNCTIONS

The concept for the area is to connect the sea, the land and the air. Since the building lies at the edge between the land and the air, it is used to connect the two. The volume studies resulted in a volume, which followed the natural slope of the cliff, and this resulted in a form, with a bottom and a top, the bottom connected to the land, leading up to the top, connected to the air. The form reminds of a birdmountain, described in the chapter about the Faroese Nature in the Analysis.

According to the municipality, the wish is to have public functions on the ground floor. To contribute to the other functions of the area, a Café, a Turist Information Center, storage for water sport equipment as well as a technical room for the heat pumps is located on the ground floor.

The apartments are placed on top of the public functions. This provides for privacy, better view and better light condition for the inhabitants of the building.

ill. 60

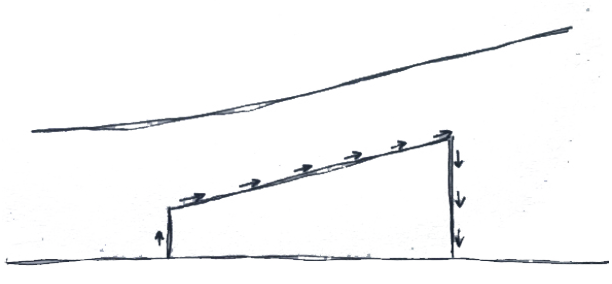


ill. 61

ROOF & FACADE

Since the area is cherished by the people of the Faroe Island, it is important that the building contributes to the community and is accessible for everyone, not just the inhabitants. Therefore, besides the ground floor, the roof and the gable of the building are made public. The roof has the same qualities as a bird mountain, where people can enjoy a walk up the top and enjoy the view from different heights', and then they can rappel down and climb up the gable, much as the Faroese Men used to rappel down the mountain side, to catch bird eggs. Besides adding value to the community, this would bring the same qualities and challenges to the inhabitants of the building, as they would get living in a village, but with the comfort ability of living in a city.

If one zooms further into a bird mountain, the structure reveals itself. The fine vertical lines stand in contrast with the more defined horizontal lines, where the birds nest. This structure is transformed to the façade of the building, where the direction of the materials and windows is vertical, while the balconies where the inhabitants rest are the horizontal contrast.



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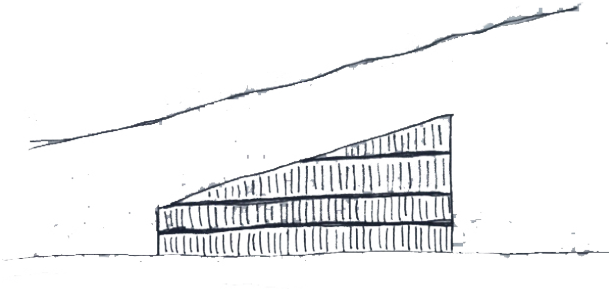

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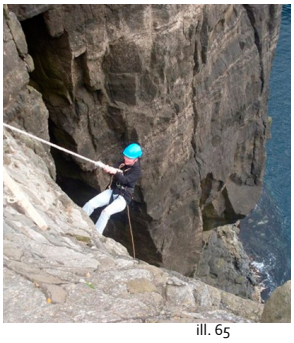


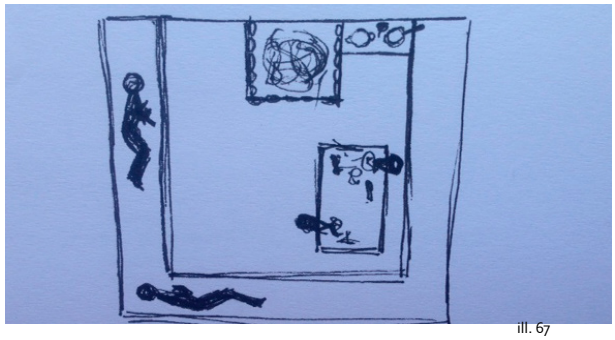
ill. 65

ill. 66

THE HEART OF THE HOME

The sketching of the apartments takes its departure in the old faroese homes as described in the analysis. In the center of the main room was a fireplace which provided for food, warmth and a gathering place for the family. Around the room were benches for eating, relaxing, sleeping as well as the workspace for the women.

In the sketching of the apartments, the qualities of the old Faroese homes is transferred into rooms with an open flow, connecting as many rooms as possible, around a core, which provides for food and warmth – the heart of the home.



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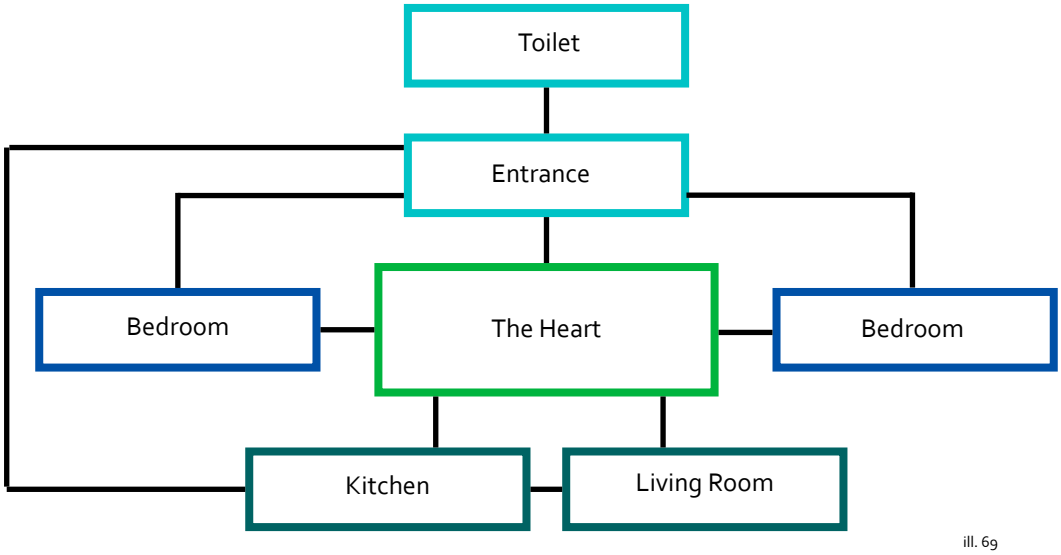


ill. 69

PLAN IDEATION

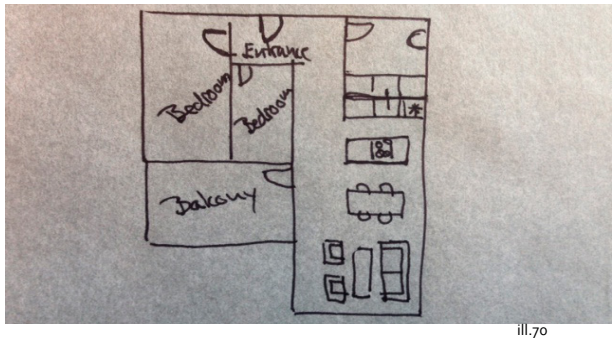
With the idea of an open plan with a central heart connecting the different functions, the plan ideation is begun. The plans are organized according to light, privacy and view, with the private functions and the functions which do not need much natural light towards the cliff, and the common functions, in need of natural light and view towards the harbor.

In the first shown example the organization is manly planned according to the light, privacy and view. The kitchen and living room is open and functional, but there is not a heart generating a circular flow and the distance between the different functions is long.

In the second example the toilet is used to generate the circular flow and light shafts are placed at the north façade. In this plan the right flow is achieved, but there is less privacy in the bedrooms, and also the effect of the light shafts is minimal, since the different floors are terraced, letting minimal light down to the bottom floor through the shaft.

In the third example the bedrooms are pushed away from the façade facing the harbor and the toilet is moved to the side, sharing a wall with the east bedroom. This provides for more privacy for the bedrooms, but the circular flow is lost and it leaves a space between toilet and the west bedroom which is hard to furnish, since it has poor light and view.

The final example shows the last step in the ideation of the plans. The result of the plan sketching gives a plan, where the organization is made according to privacy, view and light, with the bedrooms and entrance in the back of the apartment, the living area in the front of the apartment, where there is light and view. The kitchen functions as the heart of the home and the toilet helps generating the wanted circular flow, where there is easy access to all the functions in the apartment.



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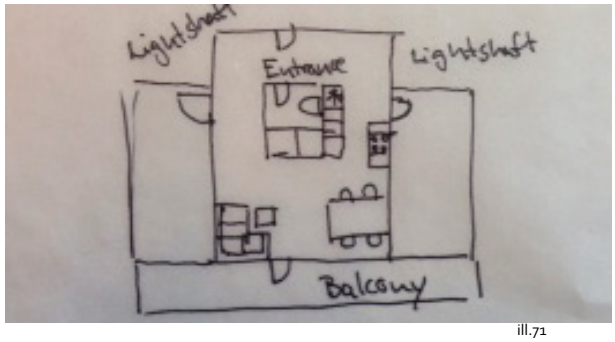

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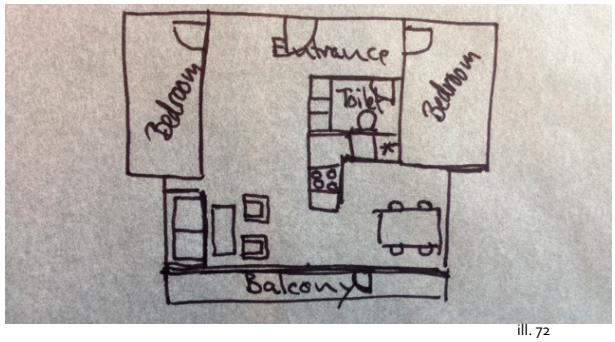

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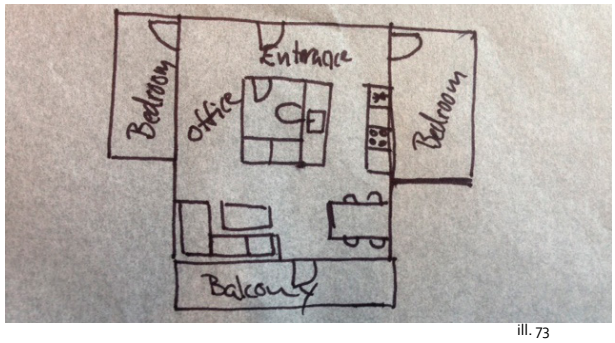

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CONCEPT

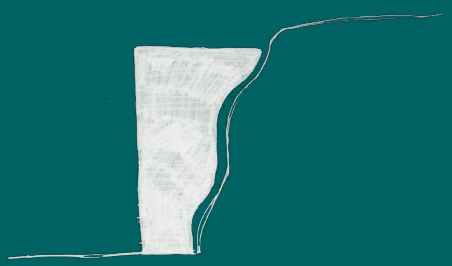
The concept is developed in three different scales - The area, the buidling and the apartment.

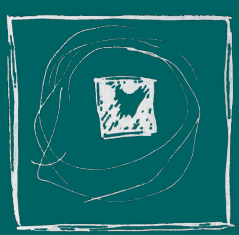
The area connects the different levels at the site, going from water to land to air. It joins the area, making all levels available for all - both residents of the building, and people in the community.

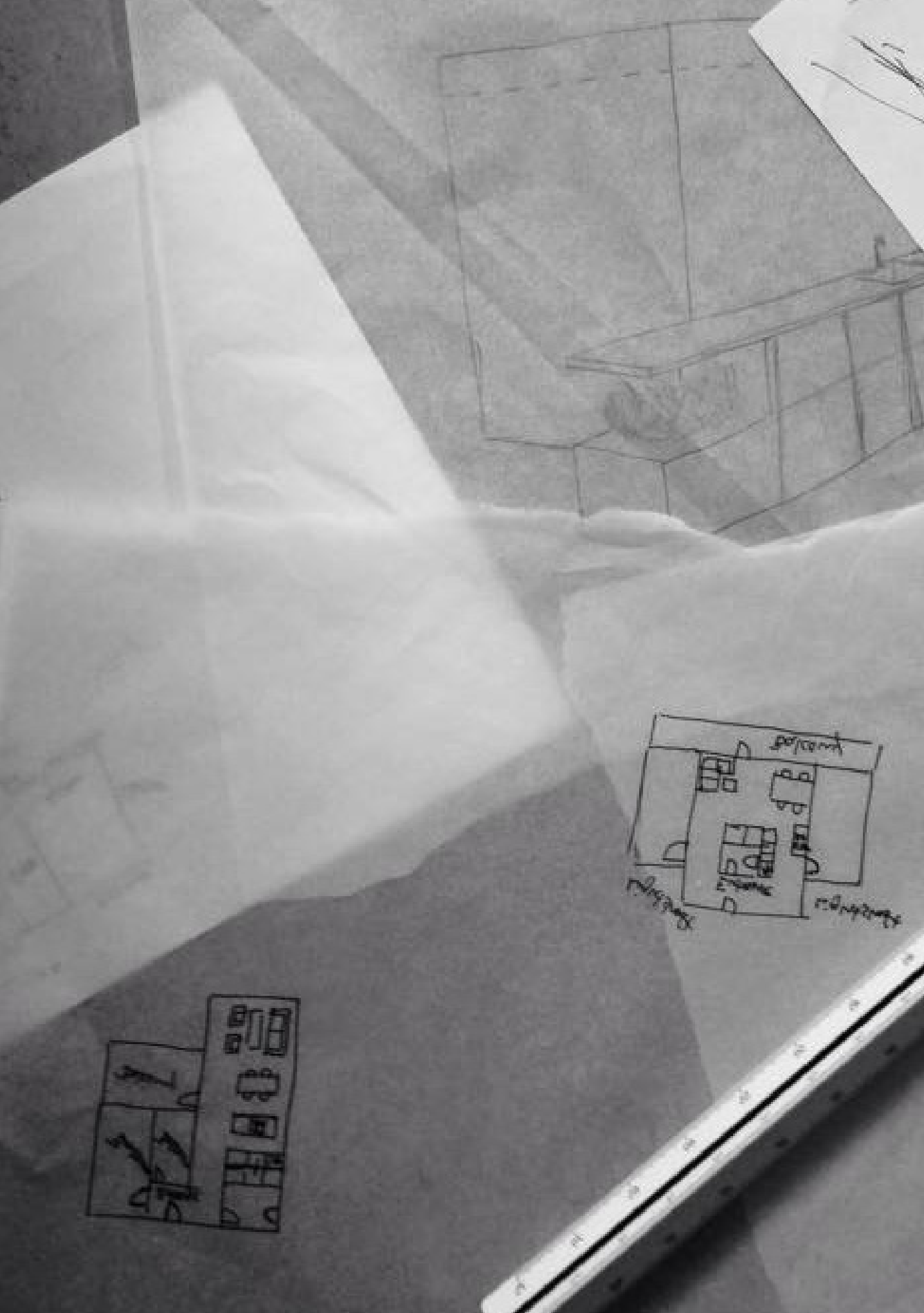
The building is in dialog with the cliff behind it by being defined by it, without maiking impact on it.

The apartment is distibuted around a centreal heart, genereting the flow and the life of the home.


WATER
LAND
AIR







SYNTHESIS

In the Synthesis the project takes its final form through detailing, testing and optimizations, of both technical and architectural aspects.

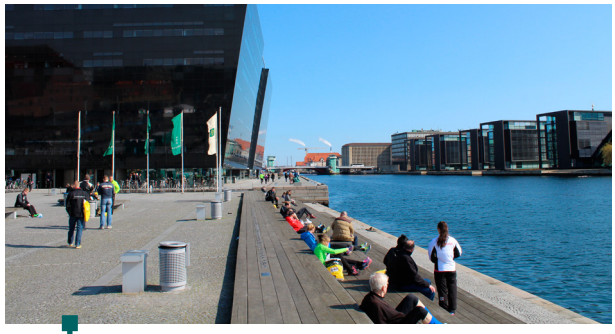
FUNCTIONS

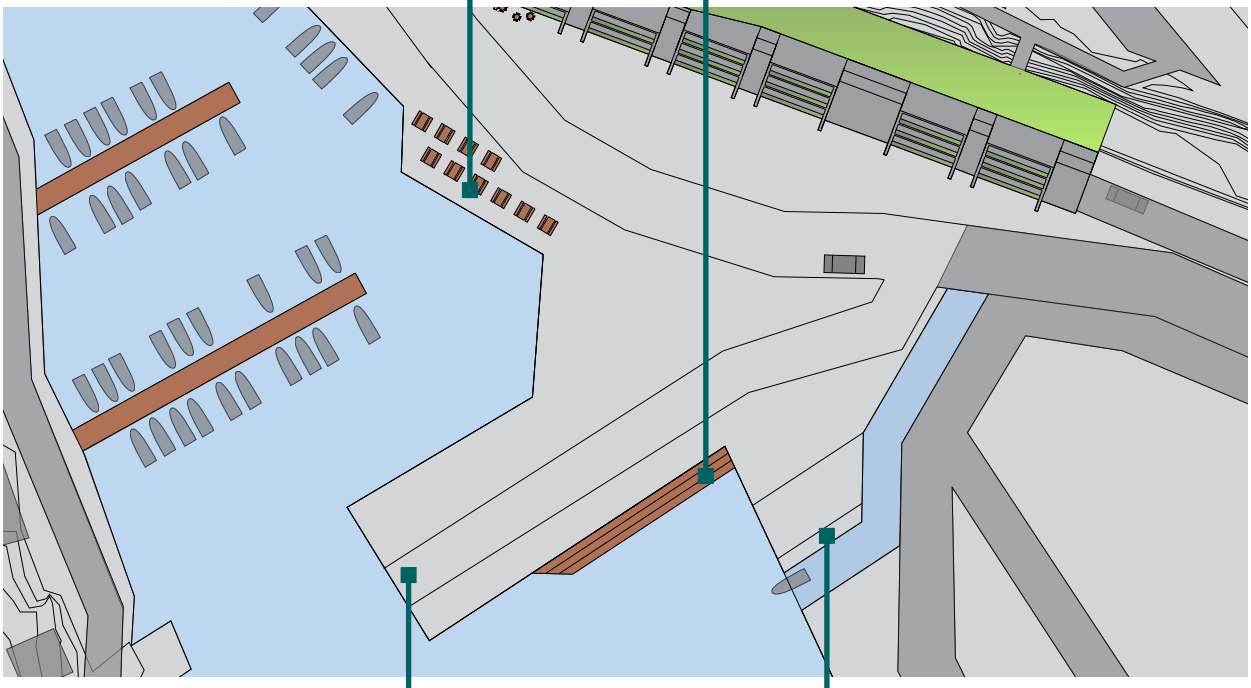
The functions on the site are planned according to the existing functions in the area and to help generate a harbor front environment. In the northwest area, which is more sheltered than the southeast, dining tables are placed. These lie in connection with the shopping area, which is to the north, and can be used as meeting place for the boat owners as well as the costumers of the café located on the ground floor of the building.

The quay in the area is used by a small passenger ship, which has 10 departures daily and can contain 95 people and 35 cars. This function is maintained, to preserve some of the newer history of the area, and to maintain the maritime environment. With its small amount of departures and capacity, it is not estimated that the traffic, both on land and on water, will disturb the other users of the area.

On the south side of the quay benches are terraced down towards the water. Facing towards the sun and the open harbor these are to be used for relaxing, sunbathing and watching the traffic of the harbor.

The canals public function is as a physical connection to the water. At the south end a ramp leads down to the water, and this ramp is for launching small boats, jet skis and other. Once a year, during the national festival, the area is used to launch the rowing boats for the national sport, and the area is used to celebrate the winners when they come up again. As it is now, a temporary ramp is set up during the festival, but in the new plan this permanent ramp could be used for this purpose as well.





ill. 74

INFRASTRUCTURE

The two paths in the area are kept, but with minor changes. Skansavegur, which is the pedestrian path going up the cliff, is used in the design, as the building follows the inclination off it, making sure the path is above the rooftop of the building, so the pedestrians view is not disturbed.

Havnargøta, which is a slow traffic road today, is, as supposed in the design suggestion by Zeta, changed to a shared space, connecting with the shared space at Niels Finsens Gøta. This is done by curving the road and changing the materiality of the it, which will slow the cars down, creating a comfortable environment for the pedestrians and bicycle. The destination of the cars going through the area is manly the shopping street at Niels Finsensgøta, and as a shortcut to the vest area of the city. The municipality has a plan to widen Jónas Broncks Gøta and making a tunnel under Bøkjarabrekka, so the heavy traffic gets led around and under the city center, which will result in less traffic through the project area.

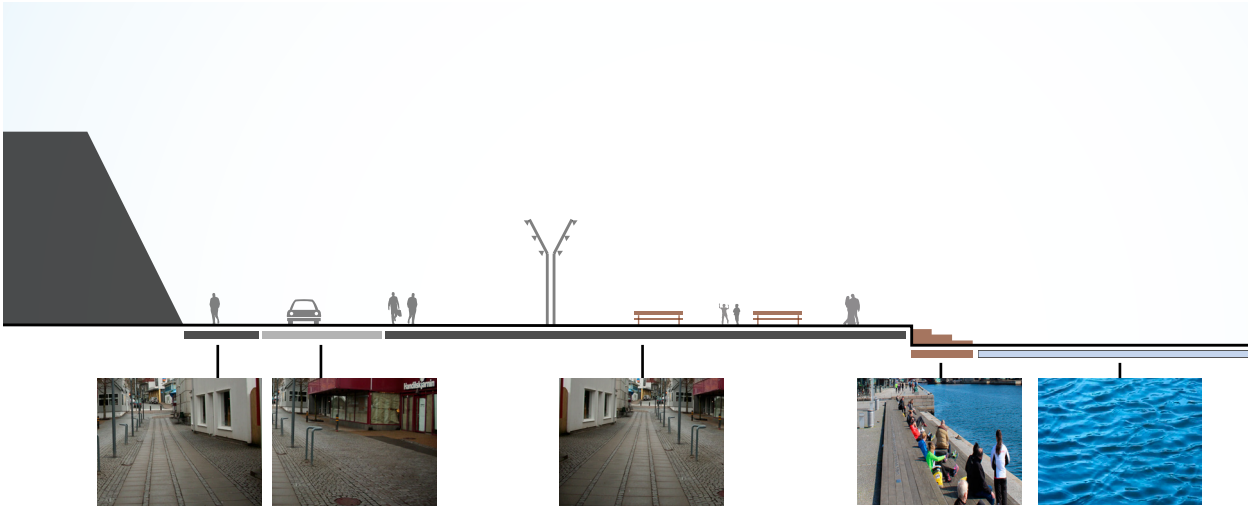
ill. 75

ill. 76

MATERIALS

To contribute to the shared space the materials on the ground in the area all have the same materiality. The materials of the road are the same as the materials of the shopping street. This to create a connection and a reference between the both. The area for the cars is covered with paving stones, slowing the cars down and the area for pedestrians and bicycles is covered with larger tiles, suitable for walking.

All the sitting arrangements in the area are in wood, as is with the benches leading from the harbor front to the water. The wood is in the same color, as the wood on the façade of the building. Besides being a reference to the old Faroese tradition of using wood, wood is a natural material, which is comfortable for the skin to be in contact with.



ill. 77

ADAPTING TO THE CLIFF

According to the concept, the shape of the building is to be defined by the cliff, without touching it. This is done by letting the building slope, according to the cliff, creating balconies on each floor, and on the back of the building, the access gallery creates a distance between the building and the cliff.

Through the process of adapting the building to the cliff, there is worked with a solution where, besides the floors terracing according to the vertical lines, the apartments are shifted according to horizontal lines of the cliff. This solution has too many technical difficulties to weigh up the esthetics, since the shifting is not visible from a distance.

ill. 78

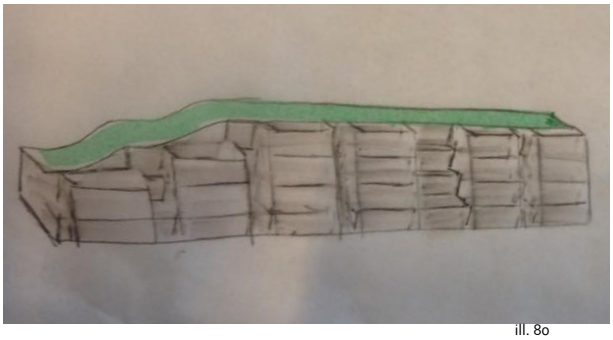
ill. 79

ROOF

As a part of integrating the building in the area and making it public, a public green roof is installed. The different levels of the building contribute in giving the users the same experience as when they are walking up a mountain slope.

There are different ways of connecting the three levels of the building and the illustrations show three different possibilities. The first is one, where there is a slope between the levels. This gives a smooth transition, but it makes it difficult to stay on the first and second level, and it is a too literal interpretation of the mountain, which it is not supposed to be according to the concept.

The second and third illustrations show a solution, where there are plateaus on all three levels of the roof which gives grate opportunity for stay and views in different levels. The levels are connected by a stair one with the width of the roof and one with the width of two meters. The second has a similar expression as the first illustration and provides for a safe transition between the different levels, but the stair steals a lot of the plateaus space. The last solution, where the stair is two meters wide, provides for a light and elegant expression, while leaving a lot of space on the plateaus.



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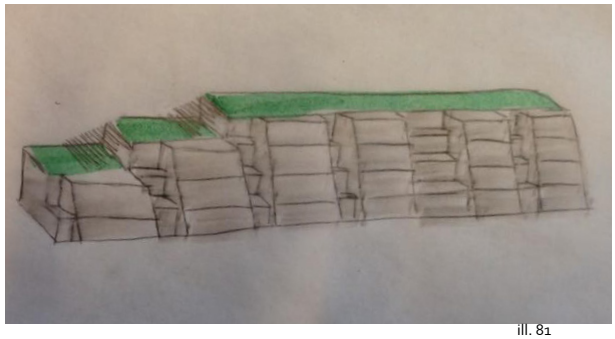

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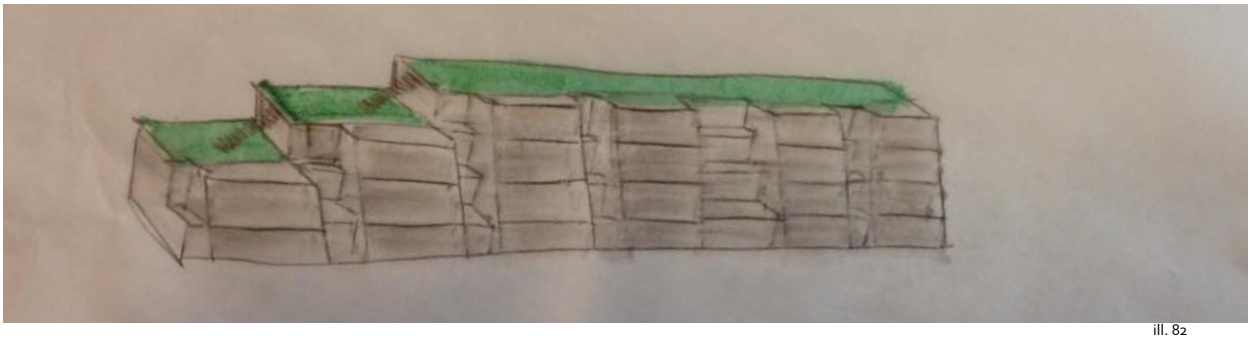
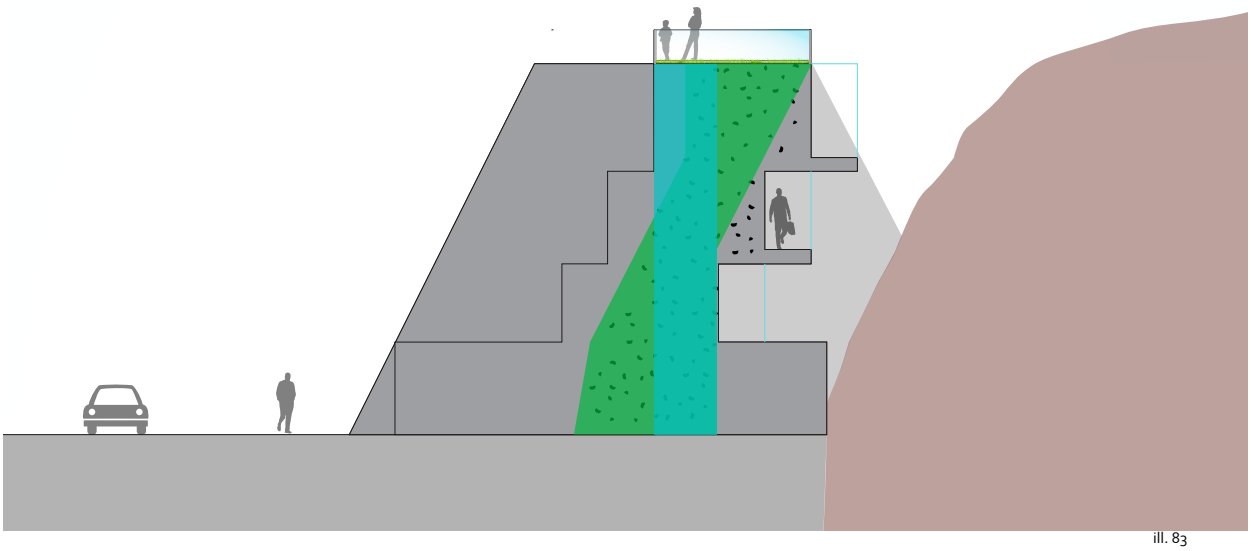


ill. 82

CLIMBING WALL

As a part of making the building public, a climbing/ rappelling wall is installed on the east facade. Referring to the old tradition of rappelling down the mountain sides after bird eggs, this wall is a modernization of the old tradition, containing the same challenges. These activities are to be managed under controlled circumstances by the Tourist Information Center located on the ground floor in the building as an experience for tourists, as well as the inhabitants of Tórshavn and the building.

To define the area for rappelling, there is a need to find the area of the building, which goes straight down all the four floors. The part of the façade which goes straight down, marked with blue on the illustration, is two meters wide and 12 meters high. The area for climbing is more flexible, since it is easier for the climbers to climb diagonal. So practically they could use the whole façade for climbing, but due to privacy for the inhabitants of the building, there is a minimum of 1 meters distance to the south façade and the apartments balconies.



ill. 83

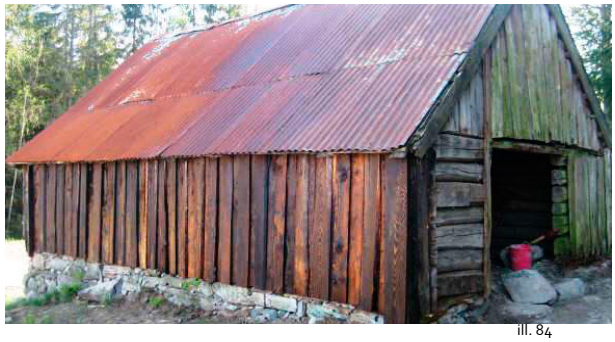
MATERIALS

The choice of materials on the exterior is made from a combination of local building traditions and new building techniques practiced in the Faroe Islands.

The main materials visible on the façade are wood protected by tar and concrete. Wood is used on the exterior walls which are not bearing, and according to the tradition the beams are vertical and covered with tar. The tar gives a dark color, similar to the cliff behind the building, while letting the structure of the wood come through. Tar is great for protection in wet areas and has a historical smell to it. The bearing structure, which is partly visible in the façade, is in concrete. Concrete has a great flexibility when it comes to forms, and esthetically it is a contrast to the wood.

An old local building tradition, which can be social, environmental and economically sustainable, is the use green roofs. In the social sustainable aspect, the green roof of the building is a public space, connecting and activating people, and giving the whole community, and not just the inhabitants, a ownership of the building. The green roof is environmental sustainable on several aspects but its main quality is it insulating properties, and its ability to absorb rainwater. The absorbed rainwater is then used for functions, which do not have to have the same quality as drinking water, like toilet flush and washing machines. It is economically sustainable in the way that it uses local building traditions and the distance to it is short. Besides these three main aspects of sustainability, it has a factor of ecological sustainability. Grass is the main source of nutrition for the land animals in the Faroe Islands. It is not unusual to see sheep grassing on the green roofs of the Faroe Islands and on the green areas on the apartments balconies, birds can nest.

The public roof and the balconies of the building need railing. These are in glass, to make them as invisible as possible, but still having a elegant expression.


ill. 84


ill. 85


ill. 86

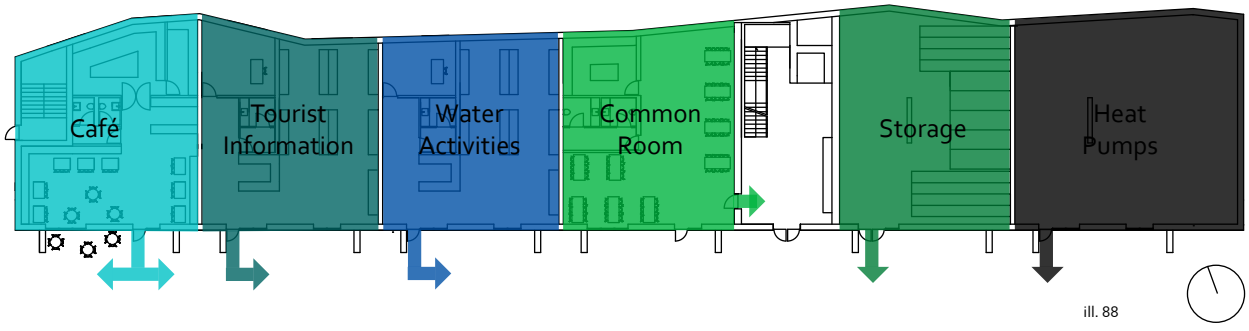

ill. 87

GROUND FLOOR

The ground floor of the building is for common and public use. This brings a openness towards the public area on the harbor front, while providing privacy for the apartments, by lifting them from the public eye.

Furthest to the west is a Café, in connection with the shopping center to the northwest and the tourist coming from the ferry terminal. Second is the Tourist Information Center, also in connection with the terminal. Here tourist can get information about attractions on the Islands and go on tours. Furthermore the Tourist Information Center manages the climbing wall on the east façade. In the middle of the building, as an expansion of the Tourist Information Center, is an Activity Center, focusing on water sports. These arrange boat trips, lend out kayaks, jet skis and so on. To the west of the staircase is a common room, which can be leant by the inhabitants of the building, for parties, gatherings, etc. To the east of the staircase is a storage room for the water activity center, where they can store the kayaks and jet skis. The room lies right next to the canal, so the costumers do not have to walk far, to get down into the water. Furthest to east is the room for the heat pumps. The canal brings the water right up to the pumps in the building, avoiding the need of building a pump house at the harbor front.

The variety of functions on the ground floor combined with the apartments brings live to the building all hours of the day, all year around. In the morning and the evening, the inhabitants are at home. During the day, when they are at work, there are visitors at the café. The Tourist Information Center and the Water Activities Center's busiest time is during holiday season, a time, where many of the inhabitants are away on vacation.

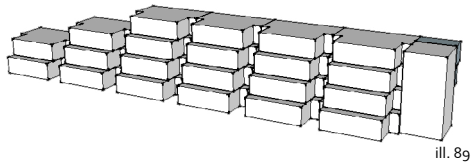


ill. 88

ENTRANCE & FIRE ESCAPE

The entrance for the apartments is between the fourth and the fifth apartment from the west, between the common room and the storage room. Throughout the design process different placements of the entrance have been tested - entrance at the gable, behind the building and in the middle of the building, and this solution is estimated best for the building, regarding to practicality, harmony of the building and for escape routes. The entrance contains a staircase and an elevator connecting all the levels of the building as well as mail boxes for the residents of the building. On the stair level between the floors a storage room for the apartments on the floor is placed.

The requirement for escape routes is that there is a maximum of 25 meters to the nearest fire cell, which leads the safe ground. The distance from the apartment furthest to the east to the staircase is 22 meters, but the distance from the two apartments furthest to the vest is more than 25 meters. To provide for escape route for these apartments, a bridge on each floor is connecting the west end of the building to the path going up the cliff. Besides functioning as escape routes, the bridges connect the green roof with the path, letting the public onto the roof. The parking basement does not have the connection to the roof and instead a staircase is placed at the west of the basement, leading up to safe ground.



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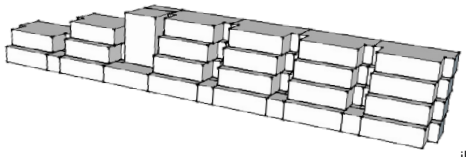

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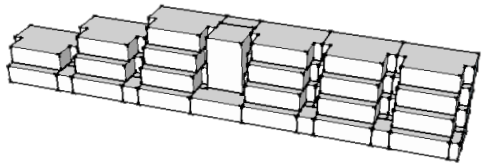

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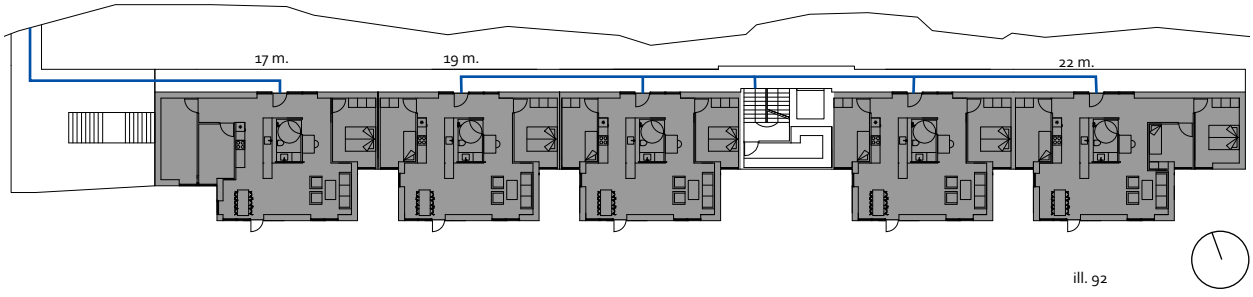


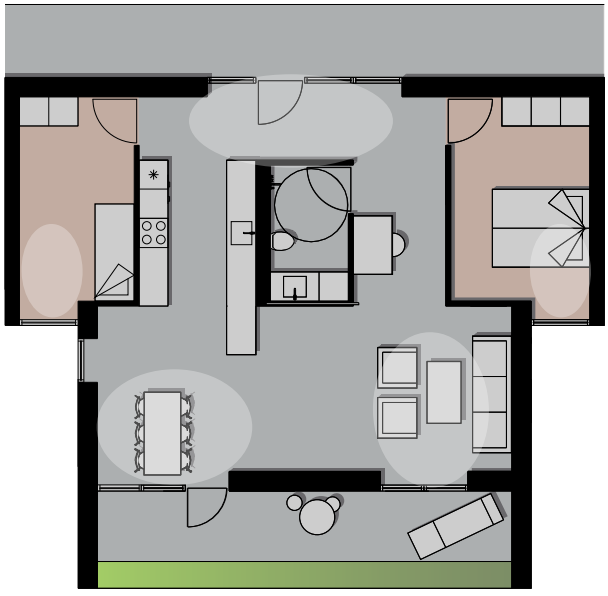
ill. 92

WINDOWS

ill. 93

As a contribution to the vertical direction of the facade, the windows of the apartment go from floor to ceiling. There are window areas, which are more wide than they are high, but the vertical direction is kept, by dividing the area into windows between 0,9 and 1 meter.

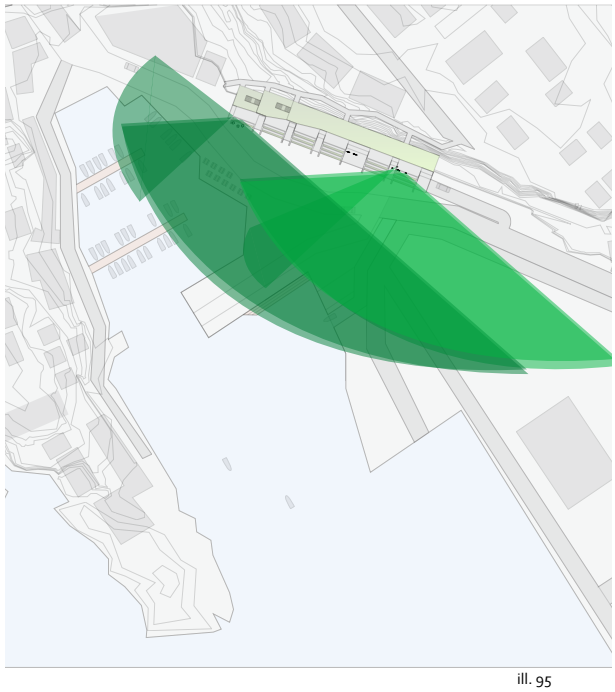
Due to the energy consumption of the building, the façade is 0,4 meter tick. This takes up quite some space, but is used as a quality, since the placement of the windows create different zones in the apartment – a dining zone, a relaxing zone, an entrance zone and in the bedrooms the thickness of the façade is used to pull the functions into the room, providing for more privacy.



ill. 94

VIEW

To make the apartments seem more spatial, they are given big windows from floor to ceiling, with a view covering a wide range. Each apartment has at least 136 degrees view from the living area. From the dining area and sofa area the inhabitants can enjoy the relaxing view over the historical city to the west and to the south they can follow the activities and traffic of the harbor. Evan though the window in the west façade's main function is to bring light into the kitchen, it also gives a glimpse of the historical city, in a framing way.



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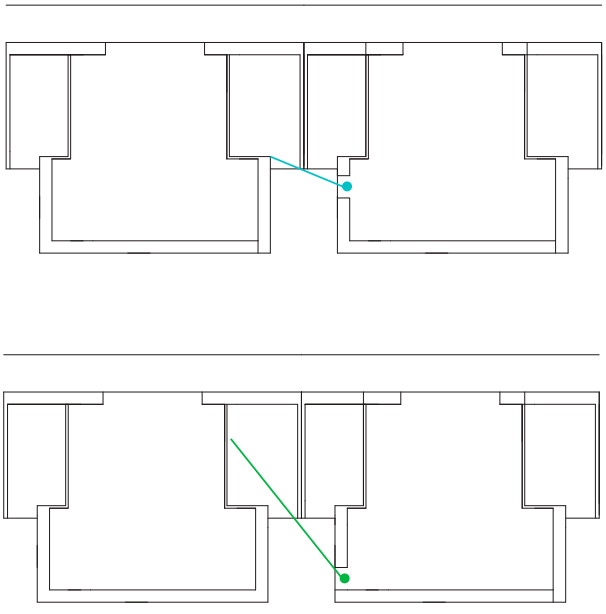
PRIVACY

Regarding the privacy for the apartments, there are two main matters to consider – the view line between the dining area of one apartment to the bedroom of the neighbor apartment and the view line from one apartment's balcony to the balcony of the apartment below.

In the first design solution the window at the dining area is at the south end of the west façade. The problem with this solution is that it is possible to look directly into the neighbors' bedroom while dining. This problem is solved by finding the maximum distance from the south façade the dining window can be, while insuring that the view line between the two windows is broken. The distance is 27 cm., which results in worse view for the apartment, but in this case the privacy is valued higher, since there is a great view in the rest of the apartment.

The stepping of the balconies makes it possible to look straight from one balcony to the one below. This is solved by making an eave of half a meter, which is not accessible, from each balcony. Furthermore the balconies are given sides, which slope according to the stepping of the building. Because of the slope, the inhabitants have a good view while standing, and when seated they are sheltered from the wind and neighbors' view.



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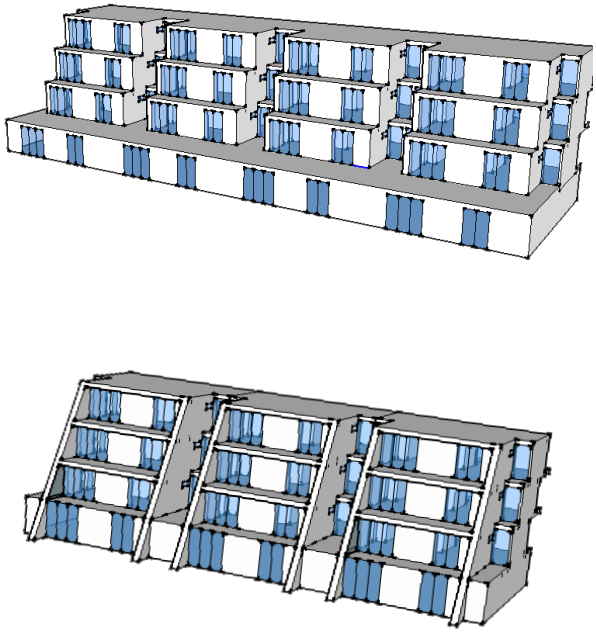


ill. 97

THE HEART OF THE HOME

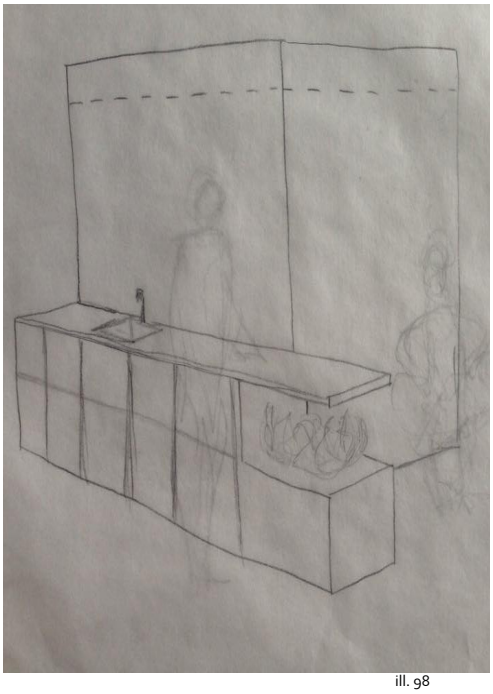
The idea of the apartment is to have a centreal core, or a heart, which generates the life and the flow of the home. It is a reference to the roykstova in the old Faroese houses, which was a multifunctional room with a fireplace in the center, providing for food and warmth for the residence.

The heart is located centrally in the apartment, around the toilet. The kitchen is located in the room created vest of the heart, grooving out of the hearts volume. The kitchen table continues one meter into the living room, dividing the living room in two zones – one for dining and one for relaxing. In this extension a gas fireplace is located, just like the fireplace was in the center of the old Faroese homes.

Like the veins run to the heart to keep it beating, the technical shaft is located in the wall between the toilet and the kitchen. It provides the apartment with heath, water, electricity and takes out waste water and extraction from the gas fireplace. The technical shaft is 0,3 x 1,5 meters, and since the floors are stepped 1,5 meters each, the shaft on the 2. Floor runs diagonal, to connect the 3. Floor with the floors below.

To the east of the heart is a multifunctional room, which can be used for storage, as an office etc. In the case that this area is used as an office, it may require some degree of privacy and silence. A sliding door placed in the south wall of the heart provides for this privacy.

The apartment has a room height of 2,55 to generate a light an open feeling. The bathroom does not have the same need to be light, and can make do with a room height of 2,3 meters. The extra 0,25 meters above the toilet is used as a extra storage space entered from the office area.



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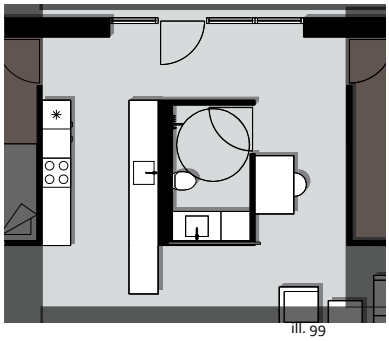

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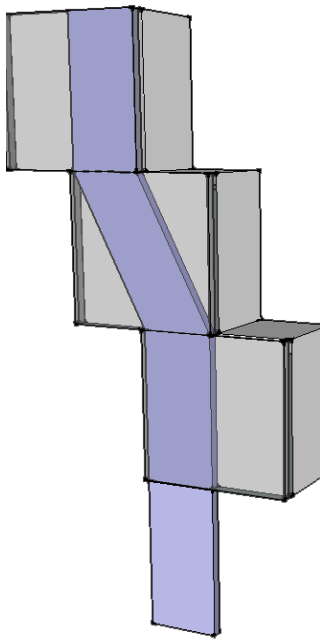


ill. 101

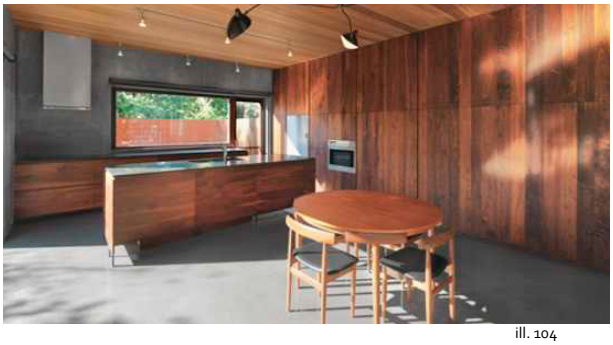
MATERIALS

The heart of the home, as well as the kitchen arrangement on the other side, is in natural colored oak. The heart and the kitchen being in the same material create a whole, making the heart appear as a united box in the home and emphasize the importance of it. As a contrast to the warmth of the heart, the floor in the living area and the bathroom is in concrete. Concrete has a cold expression, but with the use of floor heating, it is warm and comfortable to walk on. Having the floor in the living area in the same material provides for flexibility in the furniture arrangement, and makes opportunity for the inhabitants to make different zones - For example with the use of carpets under the sofa arrangement. The concrete floor continues out on the balcony, connecting the inside with the outside.

All the other walls in the apartment are in white plasterboard and the floors in the bedrooms are in white wood, since these have another function than the living area.

ill. 102

ill. 103



ill. 104

THE CLIFF

To make the galleries and the back of the building more interesting the cliff is used as a visual element. Enclosing the galleries would make them dark and uninviting, but putting glass towards the cliff, the gallery gets lighter and the cliff gets framed.

Furthermore the cliff is used as an ornament in the apartment. This is done by making the facade of the area at the apartment's entrance in glass, making it possible to get glimpse of the cliff in the whole apartment, always reminding the inhabitants of the context.

During the dark hour's artificial light lights up the cliff, enhancing its texture and providing for light in the gallery. The light is also visible from a distance emphasizing the distance between the building and the cliff.

ill. 105

COMFORT

A comfortable indoor environment is acquired by fulfilling the BR2020 requirenments, when it comes to temperature, CO_2 level and light. According to the requirements, there shall only be 100 hours a year, where the temperature is above 26 degrees, the maximum CO_2 level is 1000 ppm and there is to be an average of 2% daylight factor. The living area is modeled in BSim to see which factors had the most effect on the temperature and CO_2 level. During the design process, it was evident, that the area and direction of the windows had quite an effect on the indoor temperature. In minimizing the energy consumption, big window areas to the south are collecting passiv solar heat, but due to the highly insulated walls used in sustainable architecture, this can cost over heating. In the initial apartment plan, there were six 0,9 m x 2,55 m windows in the south façade, but after simulating the apartment in BSim, it shoved an overheated room. By removing one of the windows the hours of temperature above 26 degrees each year went from 254 to 79. Removing one window has an effect on the daylight factor, and it is checked in Veluz, if there is still sufficient light.

The CO_2 level is kept down using hybrid ventilation. The bedrooms have single sided natural ventilation, and the living area has cross ventilation and mechanical ventilation, to ensure an air change of minimum 0,3 l/s. In the summer, it is mostly the natural ventilation which is used, but in the winter mechanical ventilation is used, to avoid losing heat by opening the windows. The mechanical ventilation is provided by a micro ventilation system, installed in each apartment. By using the micro ventilation system, you avoid big ventilation pipes, and each apartment can control the ventilation themselves. Two ventilation units are put in the façade, one letting air in and one letting air out, and it has a heat recovery above 85 %.
[http://www.inventilate.dk/Mikroventilation-fungerer-s%C3%A5dan]

The result of the BSim modul is shown in appendix A.

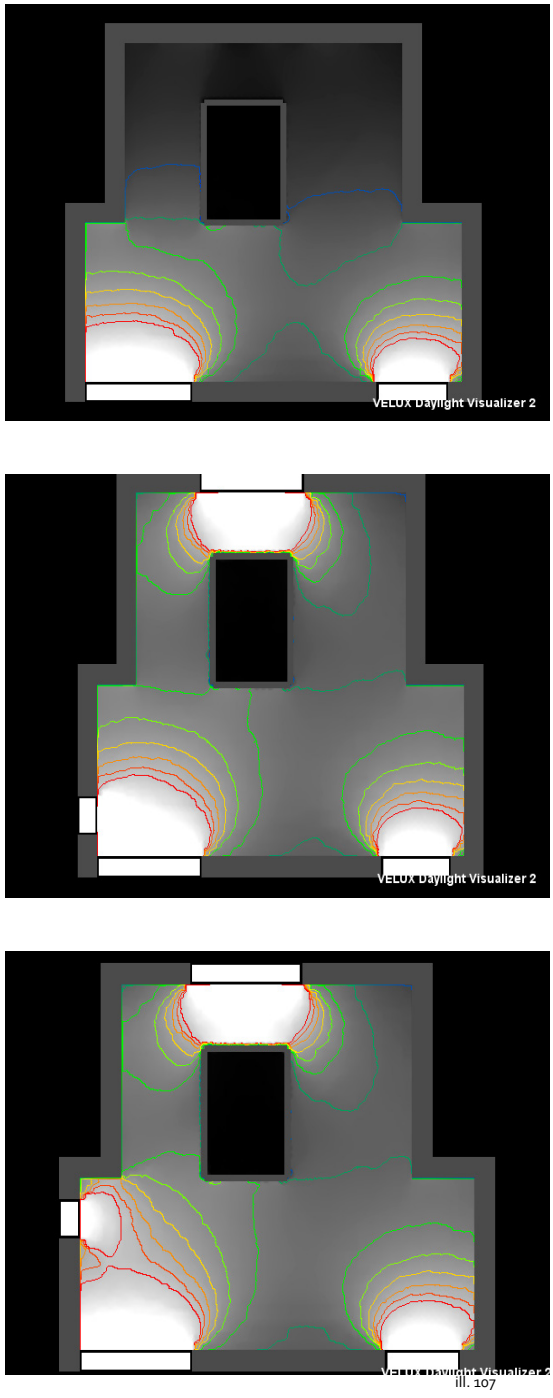
ill. 106

LIGHT

After the principle of the windows is defined, it is tested if it brings sufficient amount of light into the apartment, and how different placement of the windows will affect the daylight factor. The goal is to have minimum 2% daylight factor all places in the living area.

In the first test there are only windows in the south façade. This gives a satisfactory daylight factor in the living room, but not in the rest of the apartment. In the second test a window is placed on the vest façade, bringing more light into the kitchen. Furthermore a window is placed in the north façade where the entrance to the apartment is. Since the north façade lies around three meters from the cliff, there is not comming as much light in, as the illustration shows, but it is still estimated that the window makes a significant difference, in making the daylight factor in the entrance and office area sufficient.

Due to privacy reasons the third test concern what difference it has on the daylight factor, if the window in the west façade is moved further to the north. This weakens the view through this window, but the privacy for the neighbor is be better, and as the illustration shows, it brings more light into the kitchen.



ill. 107

ENERGY CONSUMPTION

As for the energy consumption, the aim is to reach the Building Regulations 2020 demands, which is a maximum of 20 kWh/m2 per year. This is done by first implementing passive strategies like insulation, orientation, solar gain, thermal mass and natural ventilation. As the project begins to take shape, the program Be10 is used, to see how different parameters affect the energy consumption. Early on it is clear, that there is a need for mechanical ventilation during the winter, since too much heat would be lost, if there was only natural ventilation.

One of the parameters which are changed according to the results shown in Be10 is the thickness of the outer walls. It is tested, how different u-values effect the consumption – 0,08 as the lowest value and 0,12 as the highest. If the 0,08 value is used, the total energy consumption is 15,3 kWh/m2 per year, and the insulation in the wall would be 485 mm. If instead 335 mm insulation is used, the u-value is 0,12 and the energy consumption is 17,2 kWh/m2 per year. This gives more room in the apartments, and they still fulfill the energy consumption requirements.

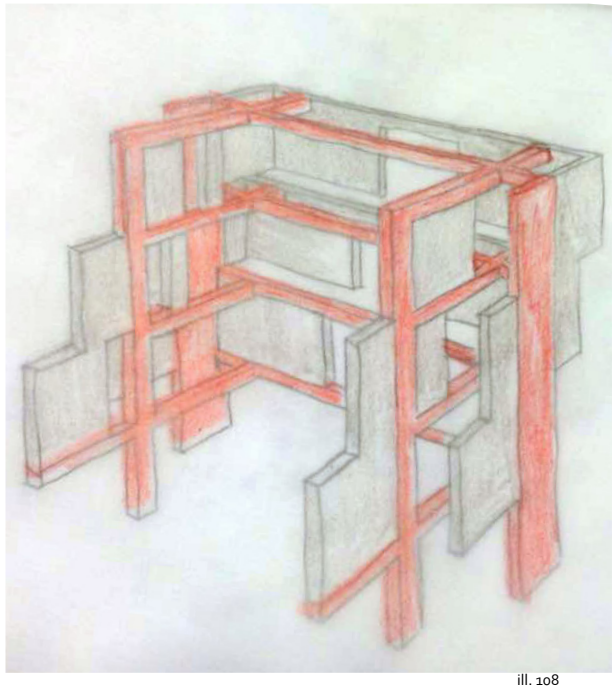
The building needs 34159 kWh per year, and this energy is gained from the ocean surrounding the Faroe Islands. The channel going through the area leads the water to the building, and here heat pumps extract the heat from the water. It is used to heat the pipes in the floors of the apartments and to heat the water.

The result of the Be10 calculations are shown in appendix B

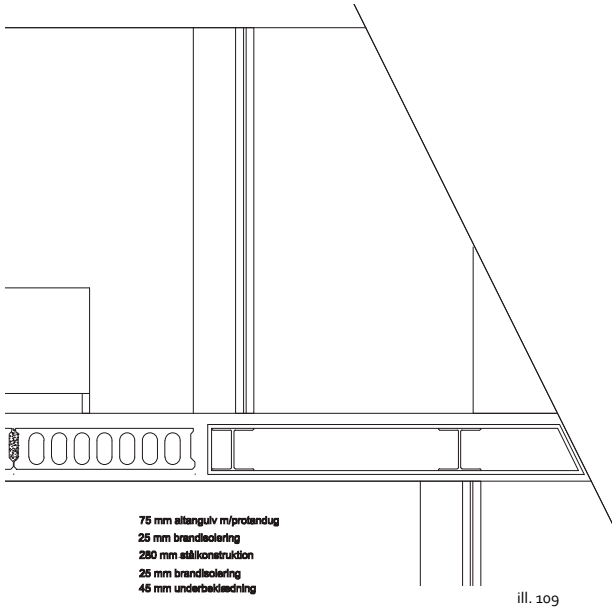
STRUCTURE

Illustration 108 shows the structural principle of one apartment section. The fact that the building is terraced gives some challenges. The areas going all the way through the building function as load bearing columns. In this case there are four columns, consisting of concrete – one at each apartment partition and one at each balcony partition. It is the columns in the apartment partitions, which carry the most loads, and they have a section measuring 300 mm x 2100 mm. The columns load bearing capasaty is calculated in appendix D. Between the columns there are I-profile steel beams.

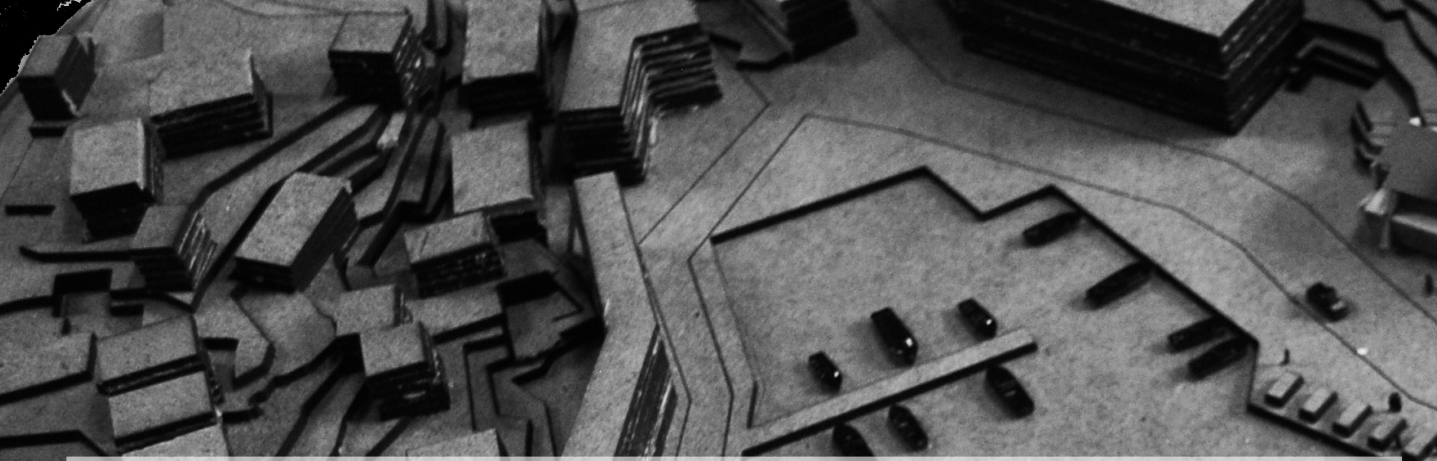
The idea of the balconies was that the indoor floor continued to the outside. Due to thermal bridges this is not practically possible, but the detail drawing shows how it is solved technically, while maintaining the visual effect.



ill. 108



ill. 109



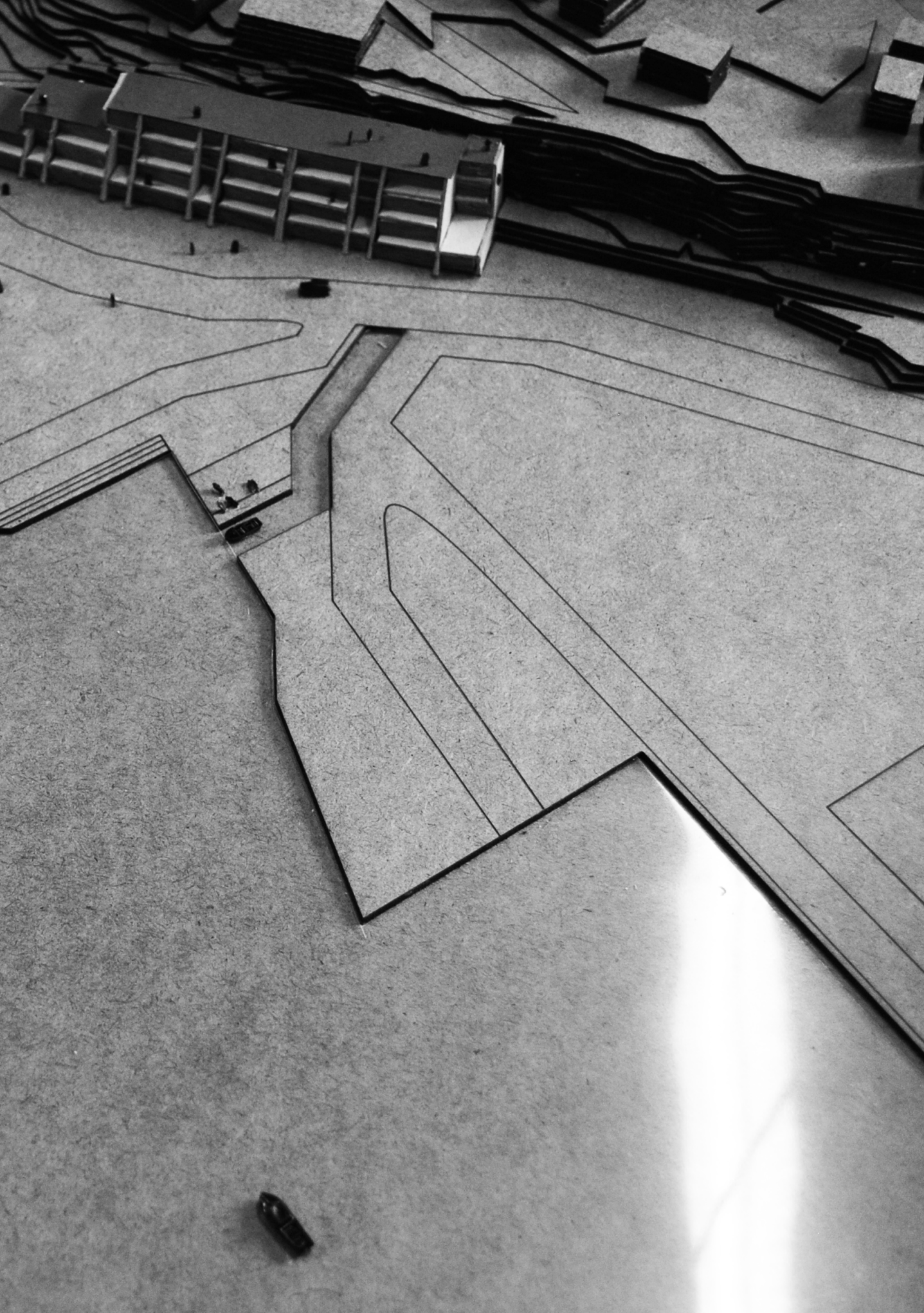
PRESENTATION

2 Bedroom Apartment x 10	
1. Bedroom	12 m2
2. Bedroom	10 m2
Kitchen	8 m2
Living Area	29 m2
Toilet	6 m2
Balcony	12 m2
Total	93 m2

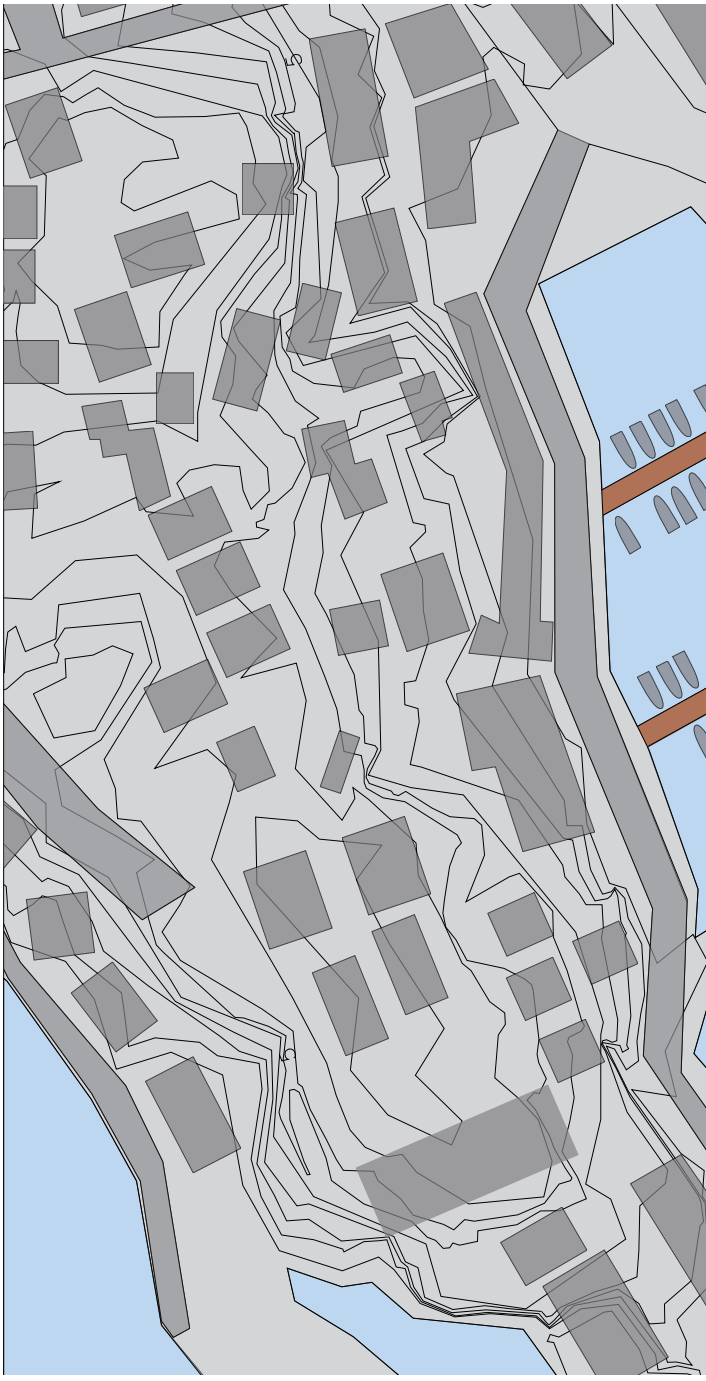
3 Bedroom West x 2	
1. Bedroom	13 m2
2. Bedroom	10 m2
3. Bedroom	9 m2
Kitchen	9 m2
Living Area	27 m2
Toilet	6 m2
Balcony	12 m2
Total	111 m2

3 Bedroom East x 3	
1. Bedroom	13 m2
2. Bedroom	8 m2
3. Bedroom	9 m2
Kitchen	9 m2
Living Area	29 m2
Toilet	6 m2
Balcony	12 m2
Total	109 m2

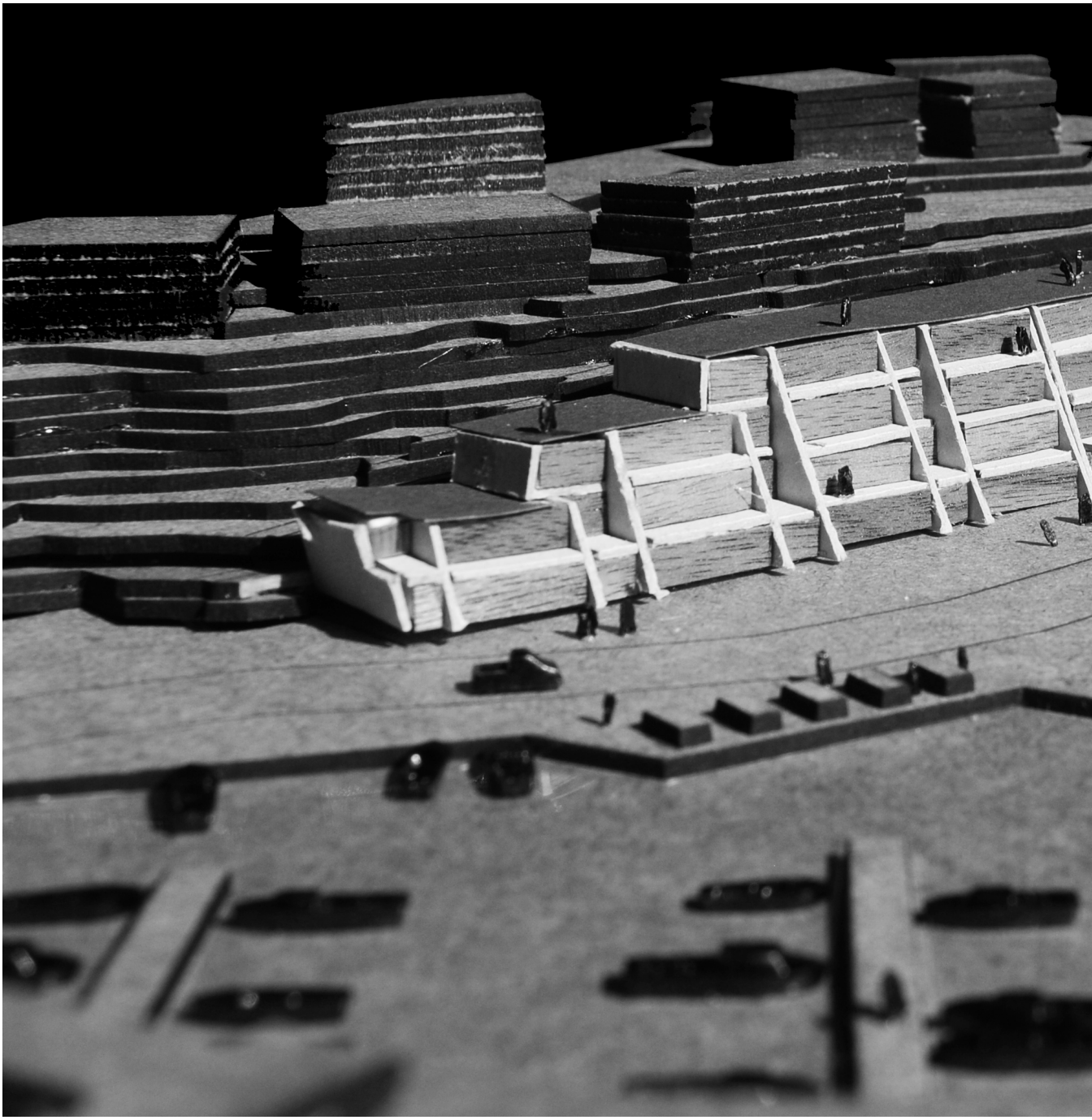
Ground Floor & Parking	
Café	139 m2
Tourist Information	158 m2
Water Sport	155 m2
Common Room	157 m2
Storage	171 m2
Technical	220 m2
Parking	1045 m2
TOTAL FLOOR AREA	3823 m2

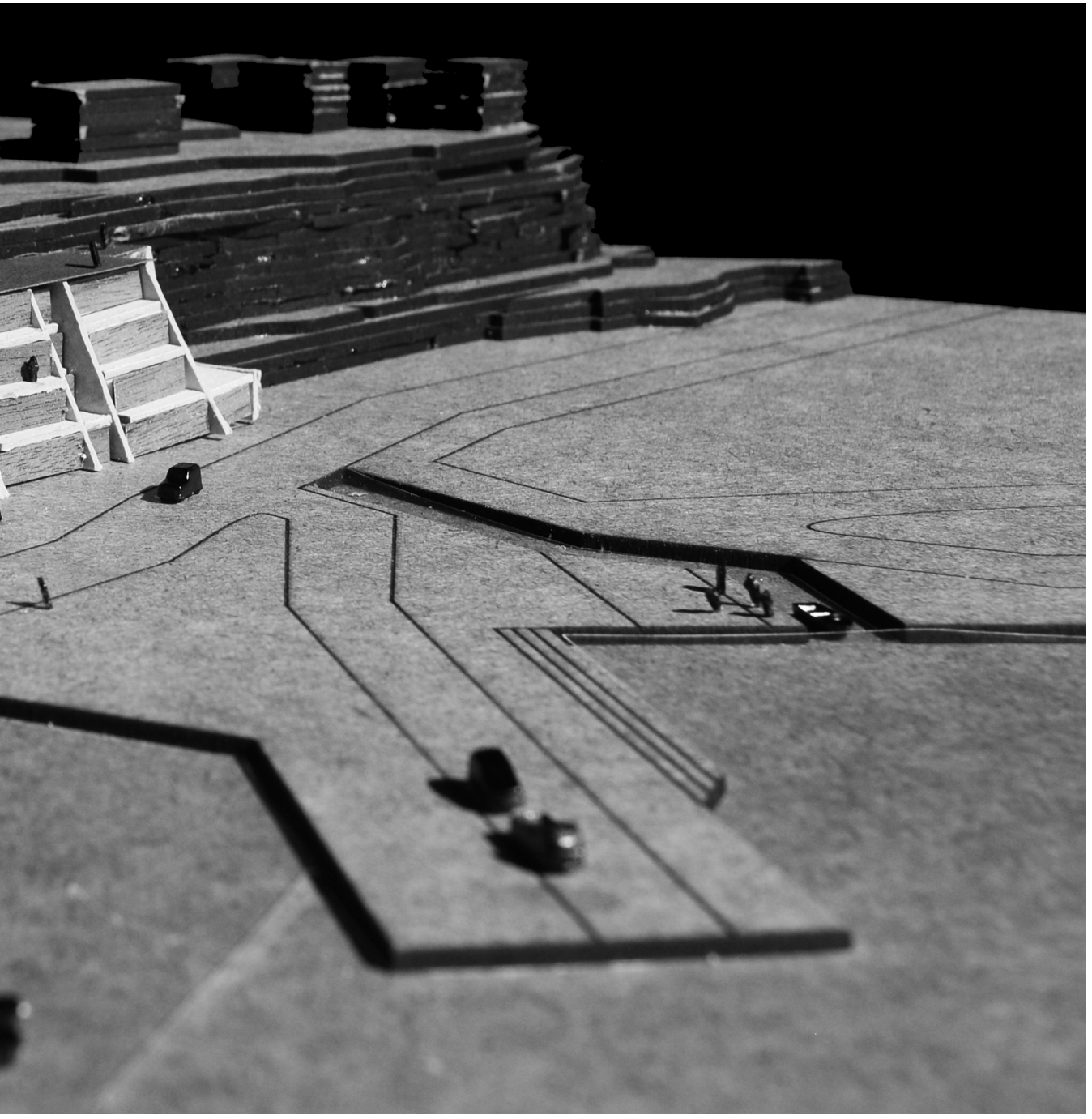


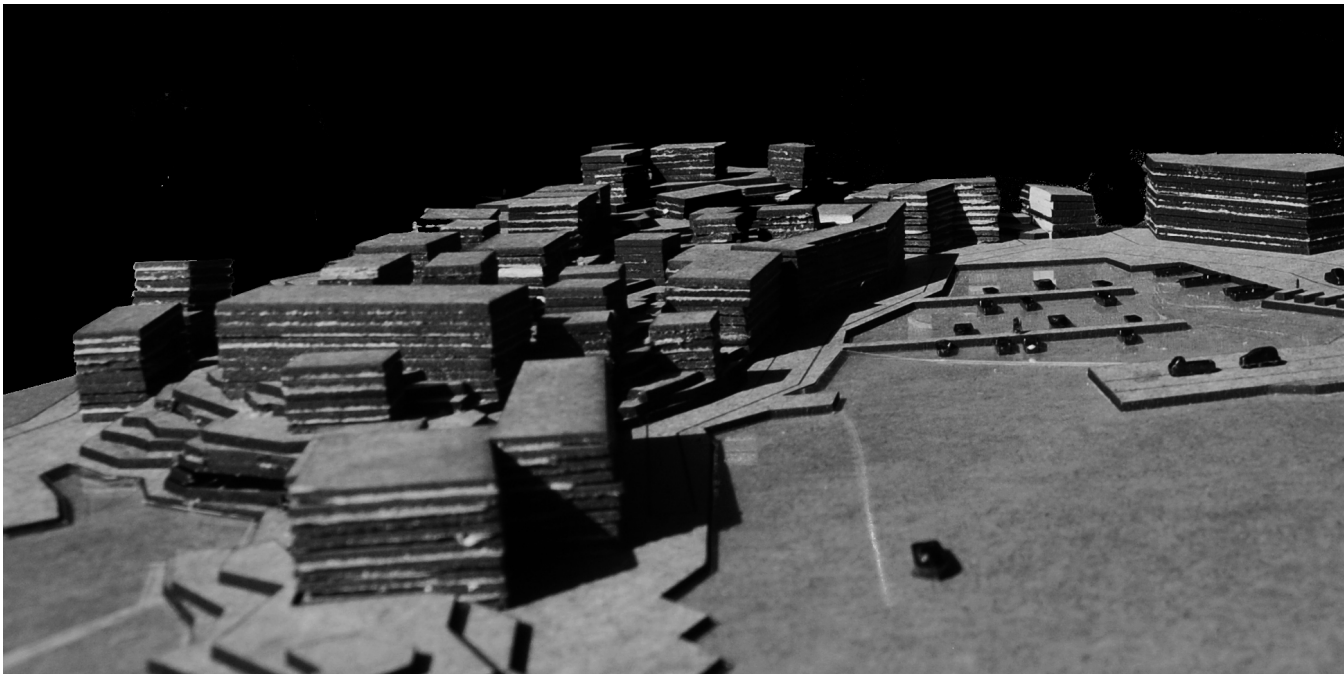
MASTERPLAN 1:1000



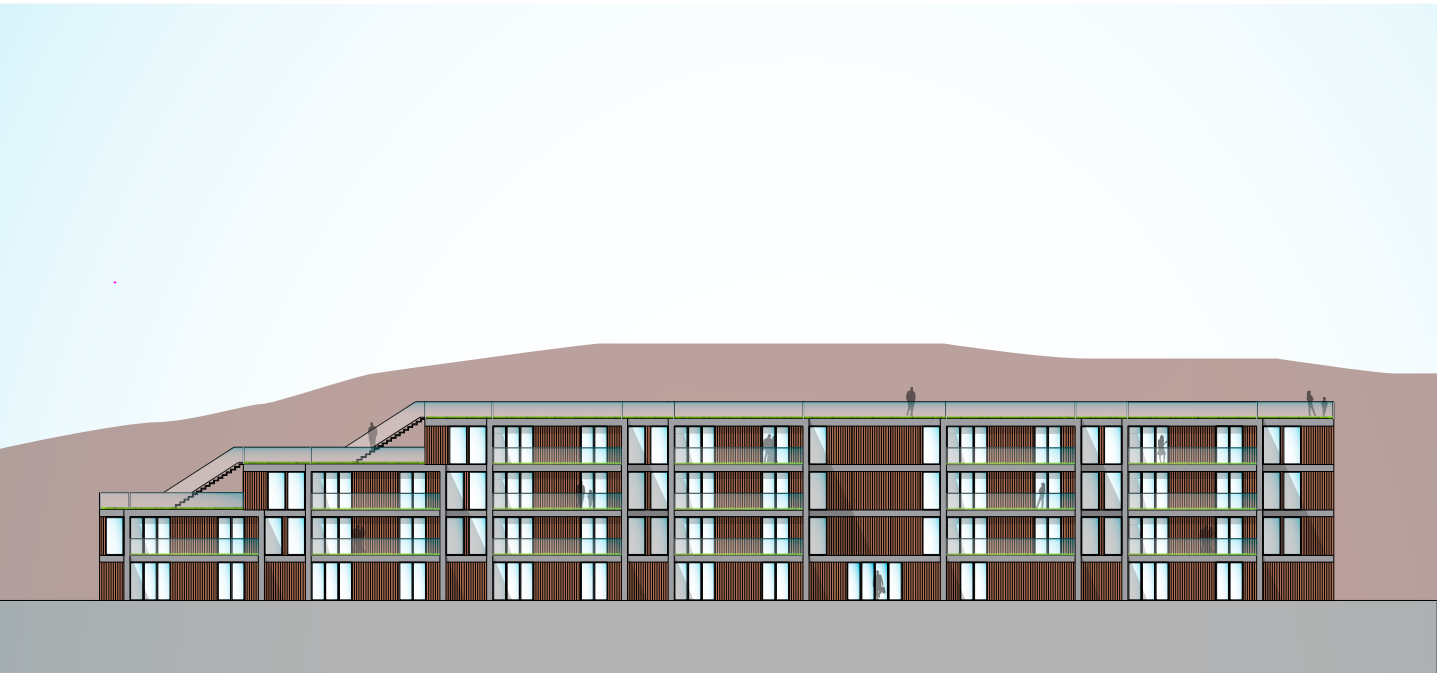

B
A

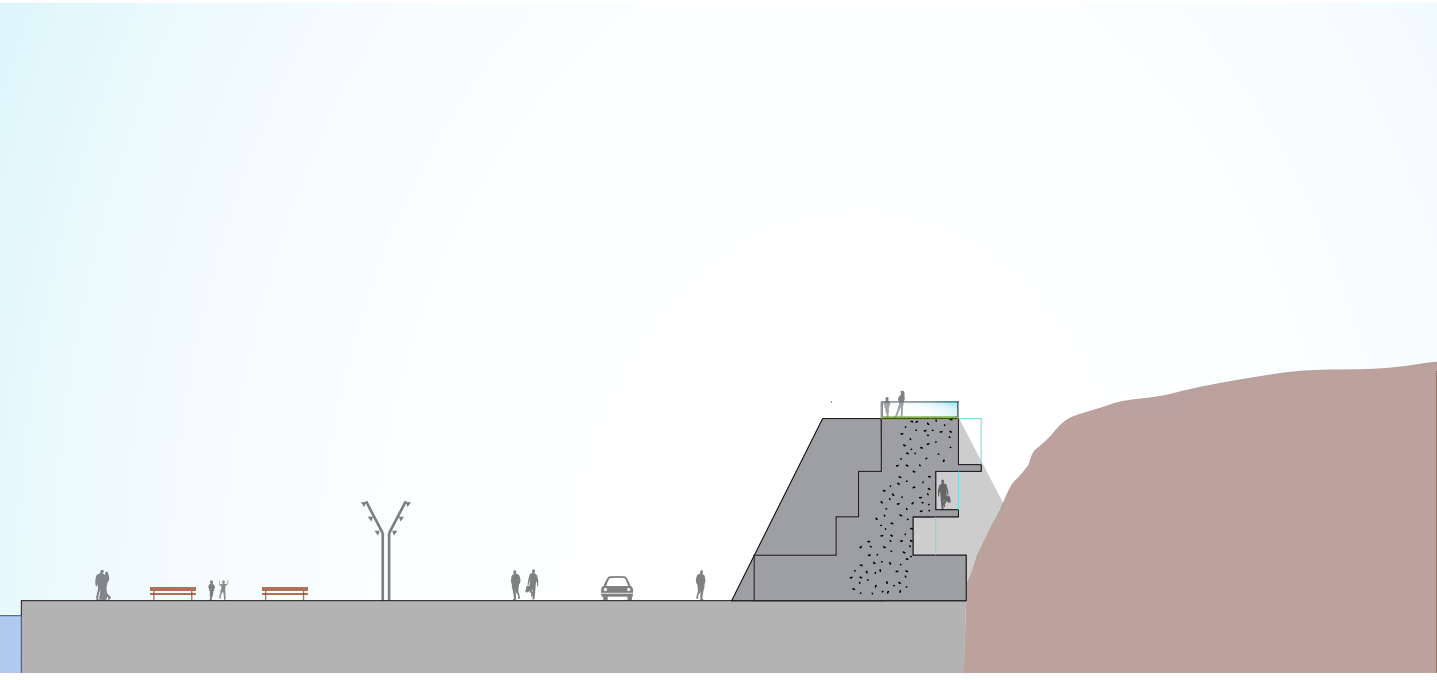




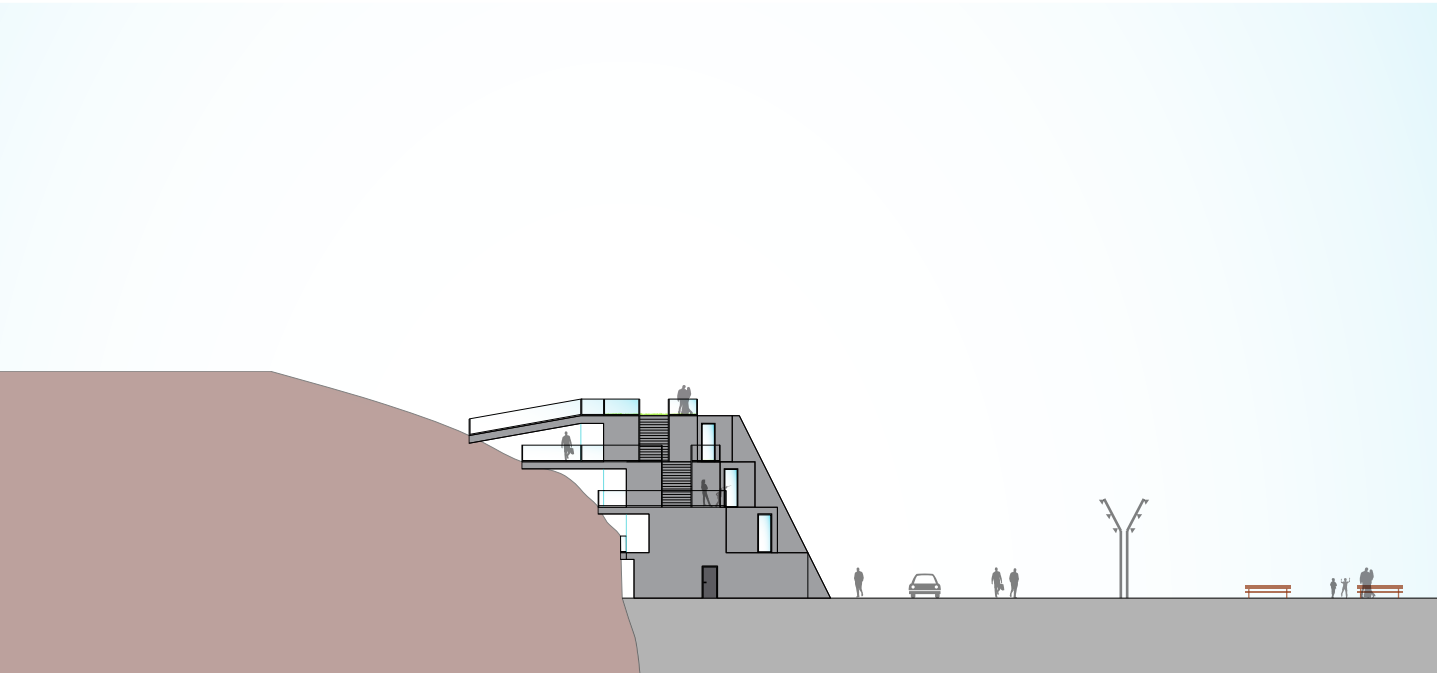


SOUTH & EAST 1:500

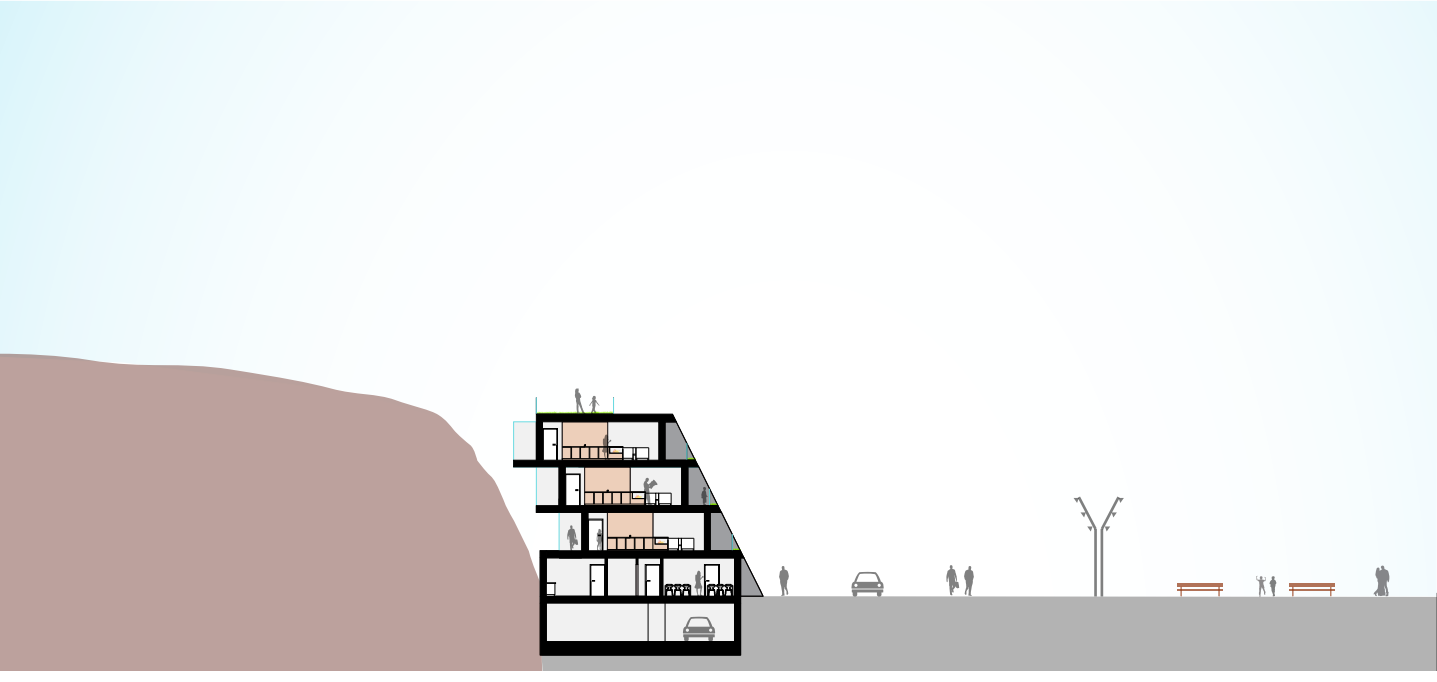




NORTH & WEST 1:500

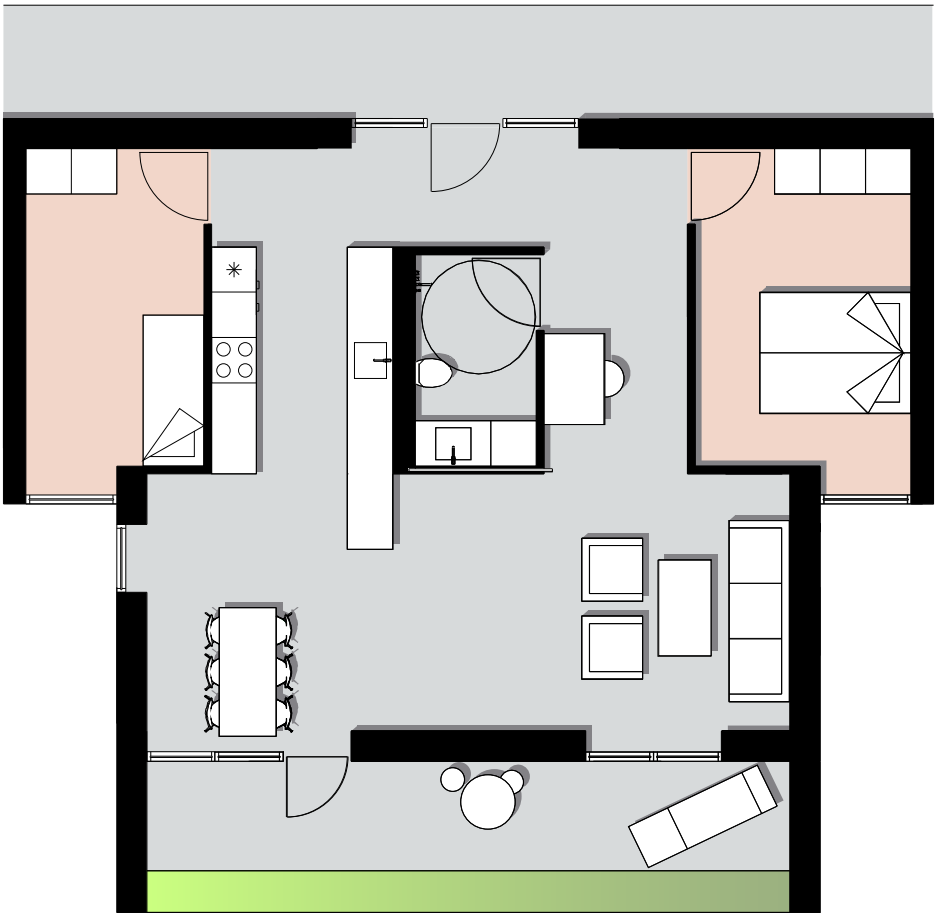


SECTION A 1:500



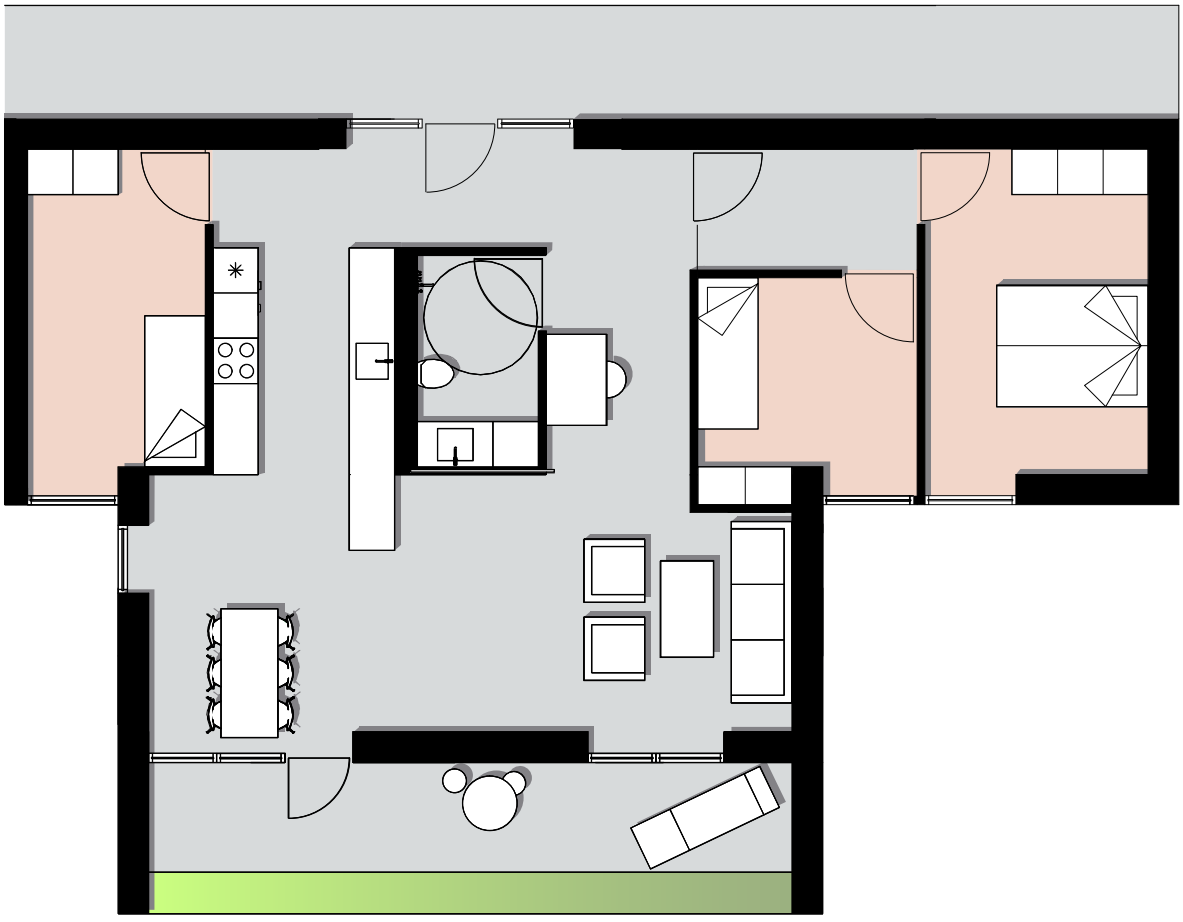
SECTION B 1:500

2 BEDROOM APARTMENT 1:100

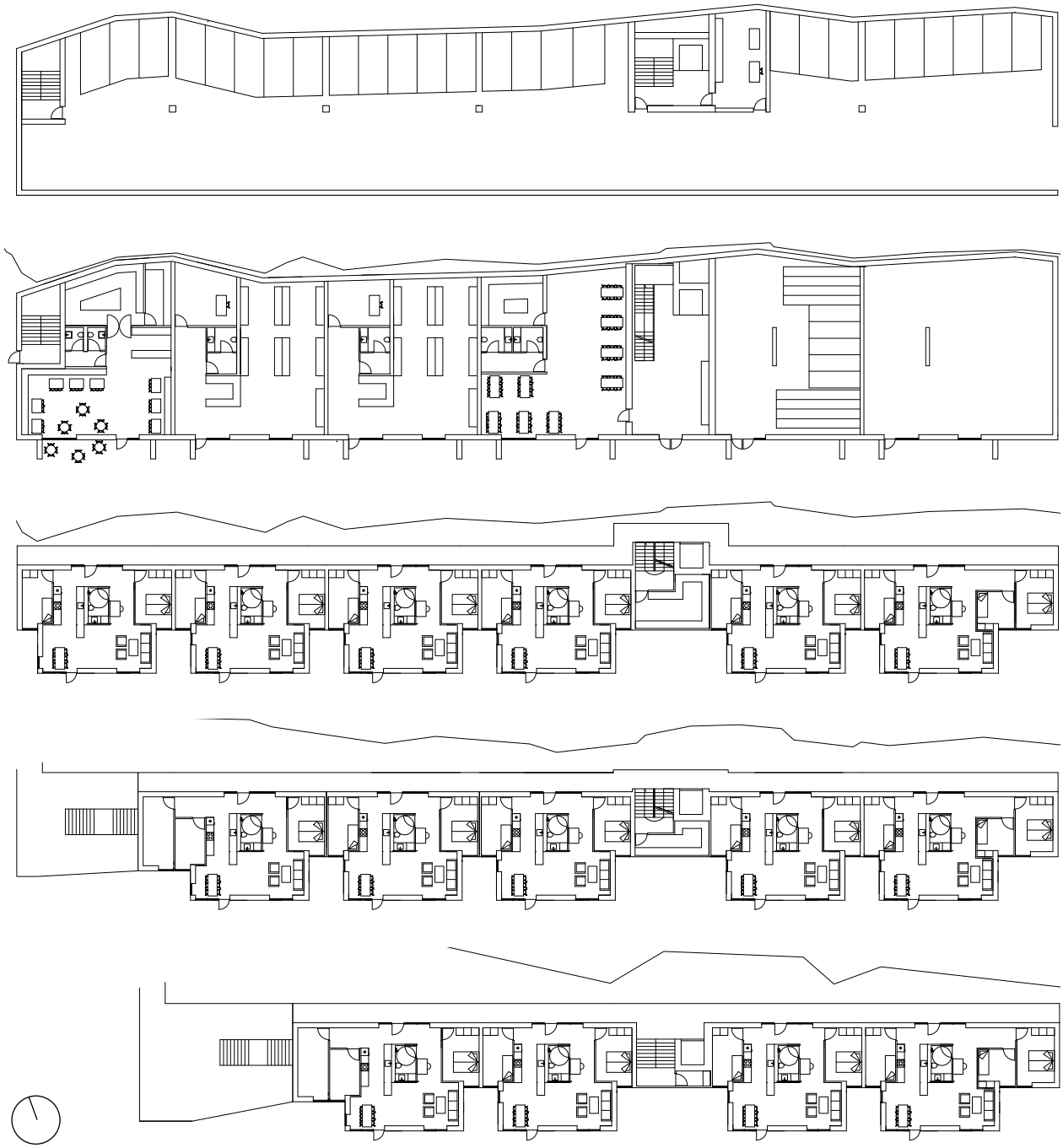


3 BEDROOM APARTMENT WEST 1:100

3 BEDROOM APARTMENT EAST 1:100



FLOORS 1:500



KITCHEN

LIVING ROOM

GALLERY

CONCLUSION

During the design process it has been worked with the project on three different scales, the area, the building and the apartment, to solve the problem stated in the analysis.

The area is made social sustainable in the sense that it is a meeting point for the inhabitants of the building, the people of the Faroe Islands as well as tourists. It works with connecting the different scales in the area, from the channel leading into the area, connecting water and land, to the building sloping upwards, connecting the land and the air and then down again from the climbing wall to the channel, connecting the air and the water.

The channel going through the area integrates the environmental sustainability with other functions, in the sense that it functions as a supplier of energy to the building, it is a barrier between the public area to the north and the industrial area to the south and it is a connection point between the water and the land, where water equipment can be lunched.

The buildings volumes are arranged so they are determined and follow the context, without making impact on it. This shows a respect for the historical context, and the building would be easier accepted in an area, beloved by the people. The building is inspired by the Faroese bird mountain, where the roof and ground is public and accessible for all, while the vertical plane, the façade, is only for the inhabitants. The green roof is public, and is made accessible from the path going up the cliff. It gives the people the same experience as when the hike the mountains – big open planes, with a stunning view. In the summer time, during the national festival, the spectators can watch the national sport, the boat race, from the roof and at the land, they can celebrate the winners, as they bring the boat to the channel.

With the public area in front of the building and on top of it, the apartments are made private by placing public functions on the ground floor, thereby lifting them from the public eye. The roof and the climbing wall is arranged in the sense, that there is not a visual connection to the apartments bedroom, and a privacy barrier between the both is ensured. The apartments are furthermore made private by arranging the apartments according to privacy. The bedrooms are pulled away from the façade and the living area is closer to the façade, but still with the balcony as a barrier between the area and the apartment, and with the eaves ensuring privacy from the neighbors.

With the idea of an open plan, the apartment layout is inspired by the old Faroese homes, with its central heart, generating the life, flow, warmth and energy of the home. The apartments are open and light, with a wide view over the area, and to the north the cliff is used as a visual element in the apartments and the gallery, reminding the inhabitants of the context they live in. A good indoor environment is ensured by investigation the daylight factor, co2 level and the temperature in the apartments, the year around using passive and active methods. People's behavior is hard to force, but with the possible energy usage of 17 kWh/m2 per year, the inhabitants are given the right circumstances to fulfill their environmental duty.

REFLECTION

The technical focus of this project has been on the sustainability and this has had some effect on the tectonics of the building. For example was there a wish that the structure of the building was visible in the façade, but due to thermal bridges, this was not possible. So instead of letting the floors and partitions continue from inside to outside, they had to stop at the façade, and a replica of them was attached to the outside façade, as balconies and partitions on the balconies. One can discuss if this is tectonic architecture, since it is not fully honest, but on the contrary, it fulfills the wish of expressing the structure on the outside, evan though it is not the actual structure.

As is with all projects, there is a time schedule to comply and it has an effect on the level of detail in the project. However, had there been more time, there are some obvious aspects, which would have been further developed. The comfort of the bedrooms has not been fully tested. The bedrooms are pulled back in the façade, which limits the amount of light coming in. And a quick test in the computer program Velux shows, that the back of the rooms get little to none daylight. It can be argued, that the need of daylight in the back of the room is minimal, since this is where the closet and door is placed. Furthermore it is the preference of most, that the bedroom is chilled and with no direct sunlight.

As for the process this project period has been very different than other projects on one matter – solitude. All other semesters' main projects have been made in groups of minimum five people, and this project is made by one. This has both ups and downs and especially the time spent on the different phases has to be organized differently. The phases like analysis and presentation, where the group usually produces a lot of material takes longer time, but the design phases take less time, since there are few to none discussions. The lack of discussions can be challenges at times, since you can get blocked and can begin to doubt your own decisions, but it helps sitting around fellow students, who gladly give their opinion, even though they work on other projects. Writing alone also gives the opportunity of working with all the aspects of the project, oppose to develop and work with the aspects you are good at, which is often the case in group projects.

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ill. 4 - Own illustration
ill. 5 - Own illustration
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BSIM

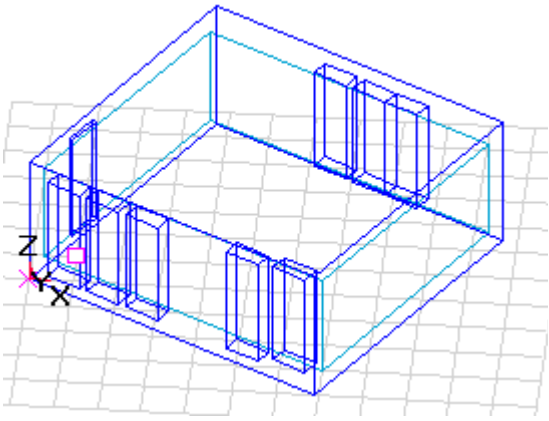
The following shows the data and results gotten from BSim simulation, with focus on temperature and CO_2 level. The results of march are shown, since the geographical information is for Denmark, and the conditions in march are representative for the summer conditions in the Faroe Islands

Building	Design Heat Loss, W	Rotation, deg	Net - Gross Volume, m³	
Living		0	128,405	198
Site	**Weather File**	**Ground**	**Terrain Type**	
Site1217	CPH.DRY	Ground1220	Open flat country	

Thermal Zone	Design Heat Loss, W	Net - Gross Floor Area, m²		Net - Gross Volume, m³	
ThermalZone1216		51,7764	60	128,405	198
Room4		51,7764	60	128,405	198
Enclosing Elements	**Building Element**	**Thick, m - U, W/m² K**		**Net - Gross Area, m²**	
Constructions	Gólv Ydervæg LightweightConcrete	0,41 0,431 0,1	0,147664 0,0978885 0,521999	103,553 19,878 30,4945	120 33,99 47,07
Enclosing Elements	**Building Element**	**Orient, deg - U, W/m² K**		**Glass - Opening Area, m²**	
Windoors	SuperLavE-Kr i træramme SuperLavE-Kr i træramme SuperLavE-Kr i træramme SuperLavE-Kr i træramme	210 210 30 300	1,05967 1,06239 1,06239 1,05967	4,44999 1,09999 3,3 1,14999	9,44999 2,33999 7,02 2,42999
Systems	**Component**	**Control**		**Time**	
Cooling (inactive)	No Component				
Equipment	Equipment335	Kitchen		Kitchen	
Heating	Heating344	HeatCtrl380 HeatCtrl380		Weekend Days	
PeopleLoad	PeopleLoad381	DayProfile385 DayProfile386		Days Weekend	
Ventilation (inactive)	Ventilation560	(No Control) RacCtrl569		(No Time) Days	
Lighting	Lighting338	LightCtrl339 LightCtrl339		Winther Weekend Winther Weekend	
Venting	Venting342	VentingCtrl343		Days	

Appendix

A



ThermalZon	Sum/Mean	1 (31 days)	2 (28 days)	3 (31 days)	4 (30 days)	5 (31 days)	6 (30 days)	7 (31 days)	8 (31 days)	9 (30 days)	10 (31 days)	11 (30 days)	12 (31 days)
Co2(ppm)	848,8	957,6	944,1	937,8	900,7	800,3	690,3	624,3	636,8	864,8	924,2	950,1	954,3
Hours > 21	8722	733	660	740	720	744	720	744	744	720	744	718	735
Hours > 24	857	2	5	4	23	108	180	233	227	53	18	3	1
Hours > 26	167	0	0	0	0	20	51	44	47	5	0	0	0
Hours < 20	0	0	0	0	0	0	0	0	0	0	0	0	0

BE10

Nøgletal, kWh/m² år

Energiramme BR 2010

Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme
53,3	0,0	53,3
Samlet energibehov		19,4

Energiramme Lavenergibyggeri 2015

Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme
30,5	0,0	30,5
Samlet energibehov		19,4

Energiramme Byggeri 2020

Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme
20,0	0,0	20,0
Samlet energibehov		17,2

Bidrag til energibehovet

Varme	0,0
El til bygningsdrift	3,1
Overtemp. i rum	11,7

Netto behov

Rumopvarmning	1,8
Varmt brugsvand	13,1
Køling	0,0

Udvalgte elbehov

Belysning	0,0
Opvarmning af rum	1,8
Opvarmning af vbv	0,0
Varmepumpe	0,0
Ventilatorer	1,3
Pumper	0,0
Køling	0,0
Totalt elforbrug	39,3

Varmetab fra installationer

Rumopvarmning	0,0
Varmt brugsvand	0,0

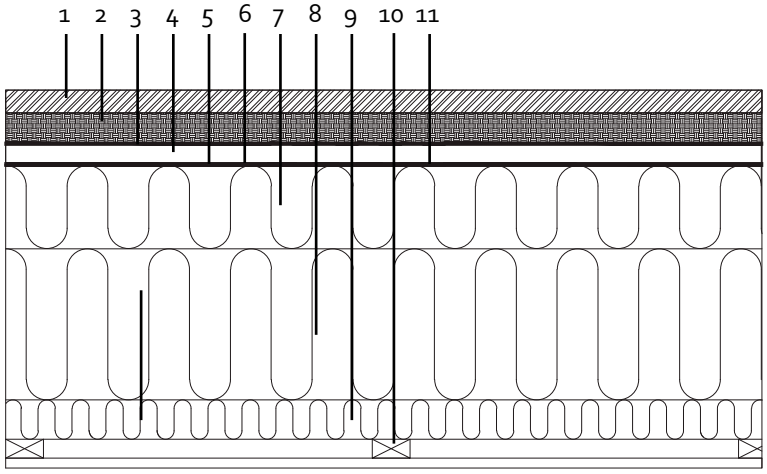
Ydelse fra særlige kilder

Solvarme	0,0
Varmepumpe	0,0
Solceller	0,0
Vindmøller	0,0

	MWh	Januar	Februar	Marts	April	Maj	Juni	Juli	August	Septembe	Oktober	Novembe	Decembe	I alt
	Varmebehov													
+1	Trans.- og vent.tab	15,47	14,32	13,81	10,52	6,57	3,65	2,72	2,87	5,48	8,23	11,10	13,97	108,71
2	Vent. VF (total)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
3	Vent. VGV nedreg.	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
4	Varmetab	15,47	14,32	13,81	10,52	6,57	3,65	2,72	2,87	5,48	8,23	11,10	13,97	108,71
5	Solindfald	4,75	7,15	10,59	14,10	16,96	16,14	15,99	15,54	12,12	8,36	5,10	3,20	130,01
6	Internt tilskud	9,26	8,37	9,26	8,96	9,26	8,96	9,26	9,26	8,96	9,26	8,96	9,26	109,06
7	Fra rør og VVB konst	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
8	Samlet tilskud	14,01	15,52	19,85	23,07	26,22	25,10	25,25	24,81	21,08	17,63	14,07	12,46	239,07
9	Rel. tilskud, -	0,91	1,08	1,44	2,19	3,99	6,87	9,29	8,65	3,85	2,14	1,27	0,89	
10	Del af rumopv.	1,00	0,37	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,95	
11	Variabl. varmetilsk.	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
12	Tot. tilskud	14,01	15,52	19,85	23,07	26,22	25,10	25,25	24,81	21,08	17,63	14,07	12,46	239,07
13	Rel. tilskud, -	0,91	1,08	1,44	2,19	3,99	6,87	9,29	8,65	3,85	2,14	1,27	0,89	
14	Udnyt. faktor	0,98	0,90	0,70	0,46	0,25	0,15	0,11	0,12	0,26	0,47	0,79	0,98	
15	Varmebehov	1,77	0,14	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1,64	3,55
16	Vent. VF (centralvarm	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
17	I alt	1,77	0,14	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1,64	3,55

GREEN ROOF DETAIL

On top of the roof construction is the green roof DIADEM 100 from Byggros.
[http://www.byggros.com/da/produkter/12000-groenne-tage/diadem-gronne-tage-systemer/sedumtag-100]



1. 30 mm Green Roof Substrate
2. 40 mm Extensive Substrate
3. Felt Filter
4. 25 mm Dranaige Resevoir
5. Protection Layer
6. Waterproof Membrain
7. 100 mm Insulation
8. 200 mm Insulation
9. 52 mm Insulation
10. 25 mm Wooden Battens
11. 13 mm Plaster

ill. 110

LOAD BEARING COLUMN

Loads: Area = 40,6 m²

Snow load:

$S = A \cdot S = 40{,}6 \cdot 0{,}72\,kN/m^2 = 29{,}23\,kN$ [Stebi p. 168]

payload:

A1: Housing = 1,5 kN/m²

A2: Roof Area = 0,5 kN/m² [Eurocode 1]

$Q = (1{,}5 \cdot 40{,}6) + (40{,}6 \cdot 0{,}5) = 263{,}3\,kN$

dead load:

$G = 4{,}08\,kN/m^2 \cdot 40{,}6\,m^2 \cdot 5 = 828{,}24\,kN$

Load Combination:
It is assumed, that the payload is the biggest

$P_1 = 1{,}0 \cdot G + 1{,}5 \cdot Q + \Psi \cdot S$

$= 1{,}0 \cdot 828{,}24\,kN + 1{,}5 \cdot 263{,}3\,kN + 0{,}6 \cdot 29{,}23\,kN$

$= \underline{1240\,kN}$

Column: Area: $40{,}6\ m^2$

150 mm x 2100 mm

L: 3000 mm

Concrete C25: $f_{ck} = 25\ MPa$

Partial Coefficient: $\gamma_c = 1{,}4$

Strain: $\varepsilon = 2{,}1\ MPa$

Concretes Compressive strength

$$f_{cd} = \frac{f_{ck}}{\gamma_c} = \frac{25\ MPa}{1{,}4} = 17{,}86\ MPa$$

Column Carrying Capacity

$$N_c = (150\ mm \cdot 2100\ mm \cdot 17{,}86\ MPa \cdot 10^{-3} = \underline{\underline{5625{,}9\ kN}}$$

$5625{,}9\ kN > 1240\ kN \Rightarrow N_c > P_1 \Rightarrow$ The column is capable of carrying the load