architecture as a spatial landscape

designing a clubhouse

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SYNOPSIS

This project focuses on exploring a personal attitude towards architectural design through the development of a sketch proposal for a golfclubs clubhouse. Examining the interplay between architecture and landscape and how they both can contribute to each other.

Jesper Thøger Christensen

TABLE OF CONTENTS

THE ASSIGNMENT

This chapter will be introduced by an explanation for the need of a clubhouse and why I have chosen this as the theme for my final project.
Next it will discuss the scope of the project and my personal attitude towards architectural design.
Terminating with an objective and methodology for the project.

PREFACE

VIEW FROM THE SITE TOWARDS THE FJORD

THE CLOISTER THAT THE CLUB IS NAMED AFTER

EXISTING CLUBHOUSE AND CONTAINER FOR THE PRO-SHOP

LARGER EVENTS ARE DEPENDENT ON THE WEATHER

THE CRAMPED CONDITIONS IN THE EXISTING CLUB-HOUSE

A SUMMER DAY ON THE TERRACE

PROJECT BACKGROUND

This project for a clubhouse for Sebber Kloster Golf Klub near Nibe, Denmark, departures from the requirements and wishes issued by the club's board, daily staff and ordinary members.
Since 2004 there has been a range of different proposals for a new clubhouse, however none of them have had sufficient economic foundation to be build. However the current board of Sebber Kloster Golf Club works with a strategic plan from 2011-2013, that tells what should be done to develop the club further. One of the actions are a new clubhouse, when a set of conditions regarding the operation of the club are meet.
The board has almost meet all requirements from the strategic plan, and have during the last year started a process to develop requirements and wishes for a new clubhouse. In March 2012 the General Assembly of the club, consisting of all its members, will decide if the board should continue develop and finally build a new club house.
The current economic situation has changed the conditions for operating a golf club, and the competition between the neighbouring clubs has been intensified. The existing clubhouse exists of a pair of former refugee barracks, that since the course's extension to 27 holes in 2004 has been adapted for a temporary clubhouse. The house is about 170m2, minimally insulated and considered to have worn out its lifetime due to its long history. Additionally the clubhouse is too small in proportion to the number of users who make use of it, 650 members and 5.000 guests on a yearly basis. The cramped conditions make it difficult to provide the service expected of a modern golf club. For both daily activities and larger events.
The need for a new modern clubhouse has not diminished over the years and is an important element if Sebber Kloster Golf Club will compete with neighbouring clubs and continue to retain and attract new members, guests and events in general, to the area on the outskirts of Aalborg Municipality.
Though interviews with the staff, board and members of the club, their ideas and visions, have contributes to form the basis of the project. I would therefore like to thank them all for their support to create the scope for this project.

WHY?

My interest in this project, arise from being a member of the club and personally deeply involved in a range of voluntary work under several comities in the club. Thus as a golf player I also myself know the requirements a player would issue for a modern clubhouse. I'm also involved in the actual planning of a new clubhouse, and will use the project as an opportunity to affect the design of a future clubhouse.

The following paragraphs will discuss my intentions in more detail, however one of the primary reasons for choosing this type of project is it's small size. It allows me to, not only work with the primary concept and the building seen from the outside, but more important the building seen from a person inside it. Thus giving myself the opportunity to work with the concept on different scales, and apply it into the actual experience of the building.

The current economic situation of the club and the market in general, calls for a project of a certain size and a limited budget, that won't necessarily meet all the requirements for a modern clubhouse at once. As this project primarily is made for an educational purpose, and should act as a vision for the golf club, the economic limitation will not act as a primary focus.

MOTIVATION, SCOPE & OPPORTUNITIES

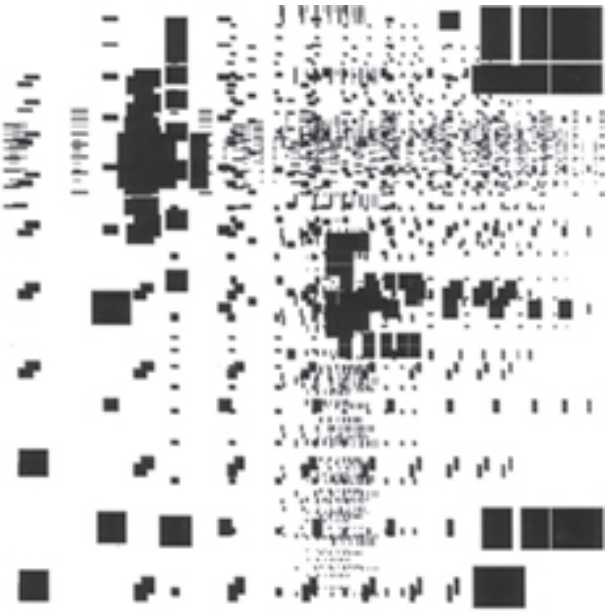
ARCHITECTURE AS A SPATIAL LANDSCAPE – AN OPEN FORM

One of the primary focus for this project emanates from my idea of an open form, and this paragraph will give an introduction.

THE CHARACTER OF THE BUILDING SHOULD BE THAT OF ACCUMULATION AND ADDITION

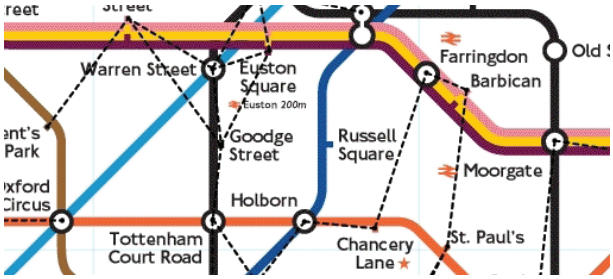
The project will be used to investigate my interest in different aspects of spatial organization. Seeking to explore an open form, not creating a finished design that is outdated by the time of conception, but a design that can continuously grow.
Making the design expandable throughout the design process, but also as a built construction, making future additions to the house as natural as the original design. Leaving the idea of a complete and beautiful composition for the notion of a work in the making.
The character of the building should be that of accumulation and addition, and not that of hierarchy and composition.
Several layers will create foreground, background and everything in between.

SILO AT ETERNITTEN IN AALBORG

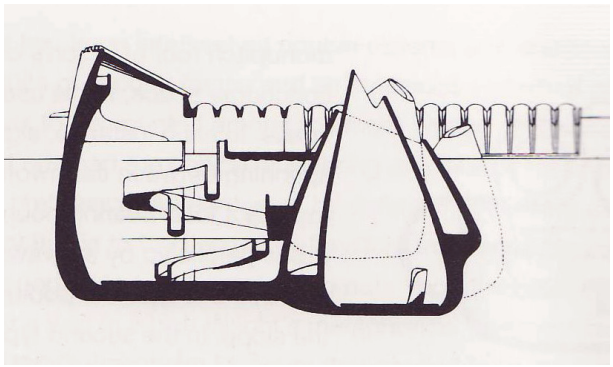


FORM AS ORGANISATION AND STRUCTURE

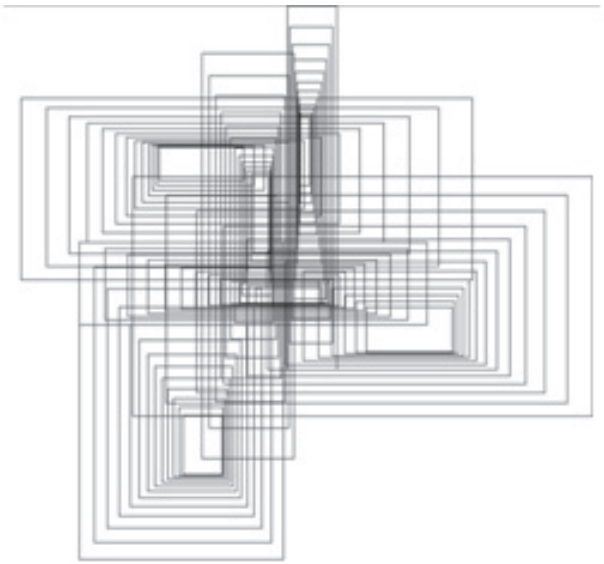
The clubhouse should be form conceived as organisation and structure, not as figure and object. Like a network, where any part of it can be taken away without the network failing.
Not reducing it to a composition of repetitive components as with modernism and structuralism. But an approach inspired by Jørn Utzon's notion of an organic additive architecture, derived from patterns of growth in nature.
Not an approach where elements are repeated by certain rules, as with the seriality of industrialised architecture, but rather probabilities for spaces to connect.
An approach where the connections are not determined one to one but many to many, allowing for a vareity of possible solutions. Creating stories for the architecture to tell, instead of focusing on the form as an object.
Designing with rupture, surprise and discontinuity, instead of seamlessness, expectation and continuity. The montage of various sequences in a unordered way, will create changing stories from time to time.



NODES OF THE LONDON METRO SYSTEM



SILKEBORG ART MUSEUM BY JØRN UTZON, 1964



LANDSCAPE AND BUILDING AS ONE CONTINUUM

Further the opportinuty to work with the landscape as an integral part of the building, seaking to blur the gap between them, is another primary focus, that this specific project allows me. Thus just as every hole on the course defines a space in itself, that again cointains various spatial quilities, the clubhouse will become just another space containing many various qualities.
This paragraph will contain examples, that can be considered as a catalogue of design parameters to be used in the sketching phase.

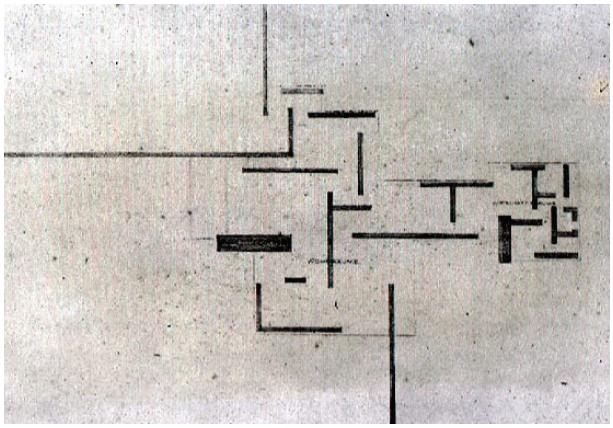
THE LANDSCAPE WILL FORM THE EXPERIENCE OF THE ARCHITECTURE

The requested connection, both visual and physical, to the golfing activities taking place within the landscape, gives an opportunity to investigate the relations between landscape and building, creating a point of gathering for the members of the club.
Seeing the house as a part of the landscape and the landscape as part of the building. Not separating the two by creating a house as an object or closed form in the landscape, but molding both house and landscape to allow them to weave together.

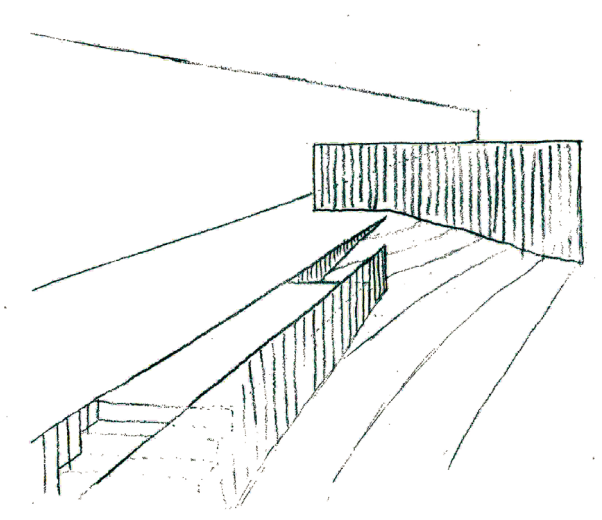
The landscape will form the experience of the architecture, and the architecture will through its dynamic and atmospheric qualities accentuate qualities of the surrounding landscape.

The clubhouse is an investigation in between the scales of the house and the landscape. It finds inspiration in the nature and culture of the place and translates it into a clubhouse that becomes a place of gathering, conversations and life in general.

A BOUNDED OUTDOOR SPACE IN CONTUNIATION OF AN INDOOR SPACE CREATES AN INTERMEDIATE ZONE BETWEEN LANDSCAPE AND BUILDING

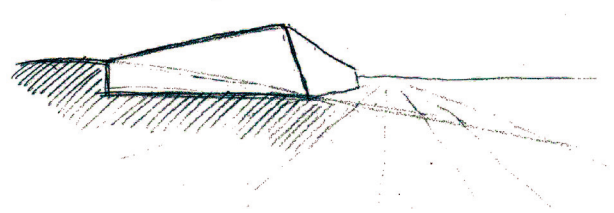


COUNTRY HOUSE IN BRICK BY MIES VAN DER ROHE, 1923



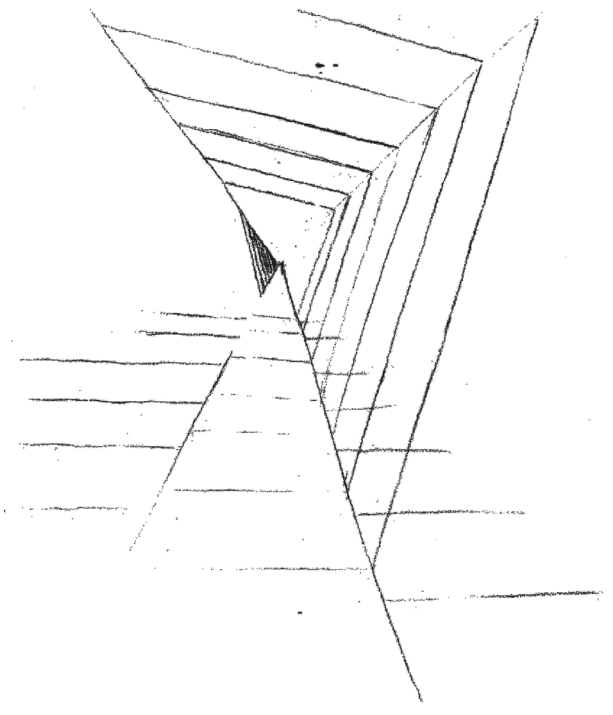
THROUGH USE OF MATERIALS AND FORM THE BUILDING SEAM TO HAVE GROWN FROM THE GROUND

SÄYNÄTSALO TOWN HALL BY ALVAR AALTO, 1951

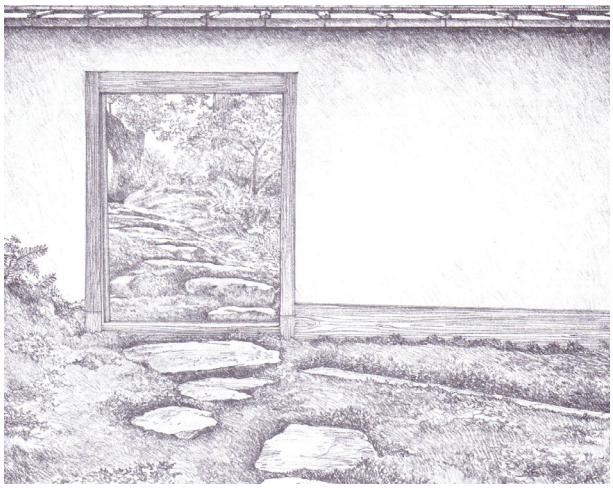


A 4 KILOMETER LONG TUNNEL OF THOUSANDS OF TORII GATES ORCHESTRATE THE APPROACH TO THE SHRINE

FUSHIMI INARI SHRINE, KYOTO, JAPAN

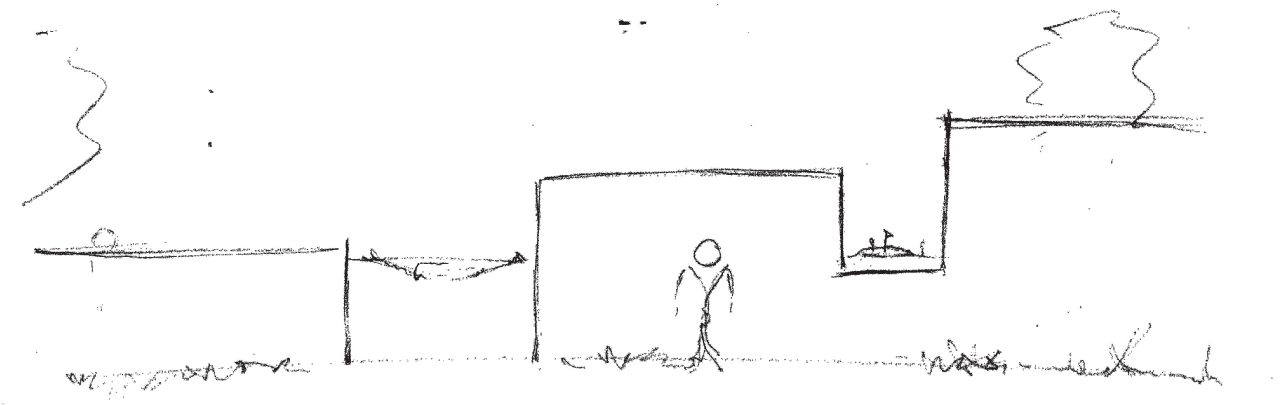


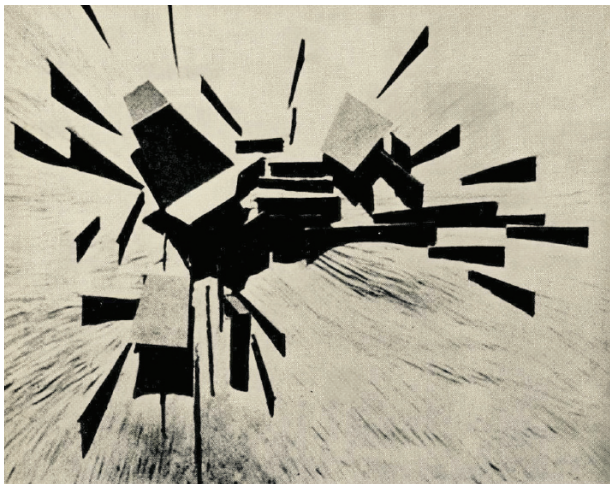
PULLING THE LANDSCAPE CLOSER BY FRAMING VIEWS OF IT. A WALL SEPARATES, WHILE A GATE AND A PATH OF STONE PROVIDES CONTINUITY.



KATSURA IMPERIAL PALACE, JAPAN, 17TH CENTURY.

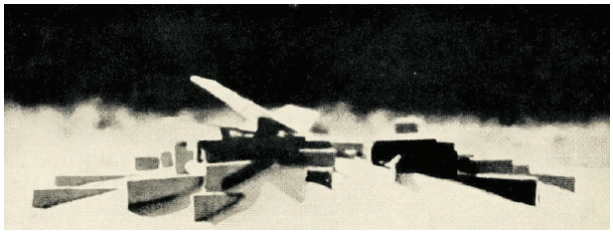
LANGEN FOUNDATION BY TADAO ANDO

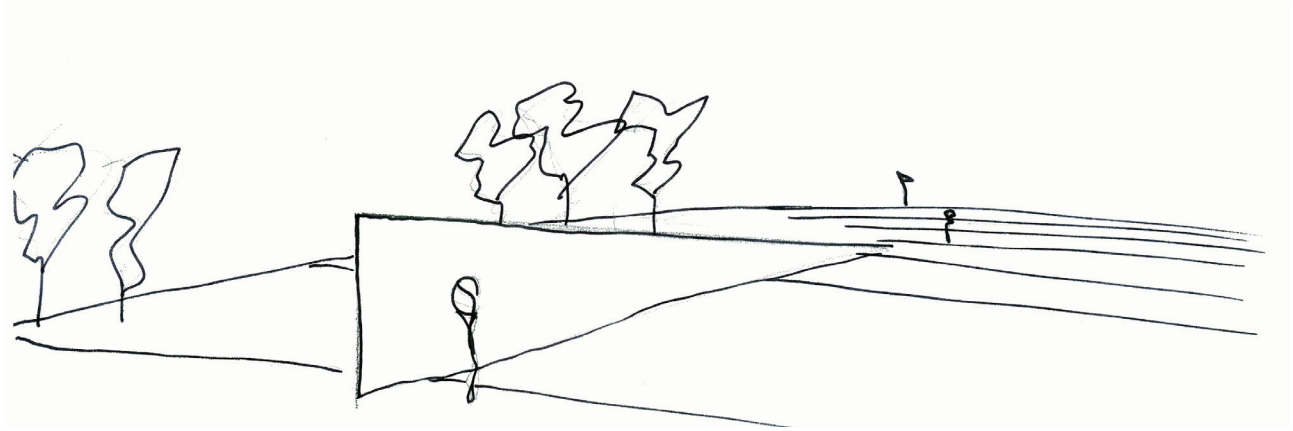


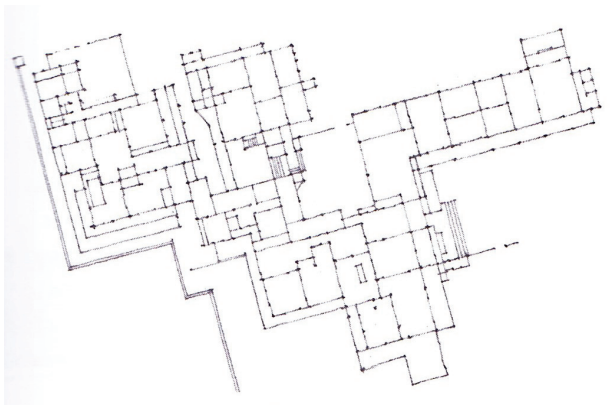


CREMATORIUM BY JØRN UTZON, 1945

WALLS BUILT OF BRICKS, ONE BRICK FOR EVERY DECEASED, THUS THE WALLS GROW SLOWLY AS TIME GOES BY. THE HORIZONTAL WALLS EMPHAZISE THE SOFT MOVEMENTS IN THE TYPICAL DANISH TERRAIN.

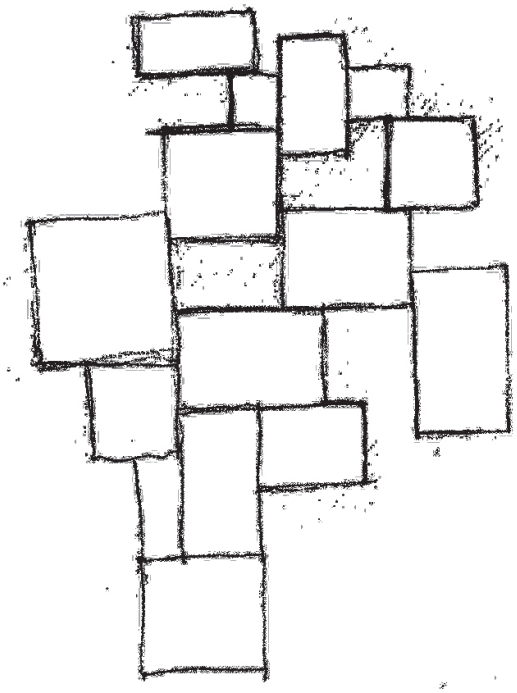






KATSURA IMPERIAL PALACE, JAPAN, 17TH CENTURY.

AN IRREGULAR COMPOSITION OF REGULAR FORMS. ORDERED BY A GRID OF SMALL MODULES, THAT ALLOWS THE RECTANGULAR SPACES TO BE FREELY ARRANGED IN LINIAR, STAGGERED OR CLUSTERED PATTERNS. THE JAGGED APPERANCE OF THE FORM, RENDERS IT UNFINISHED.

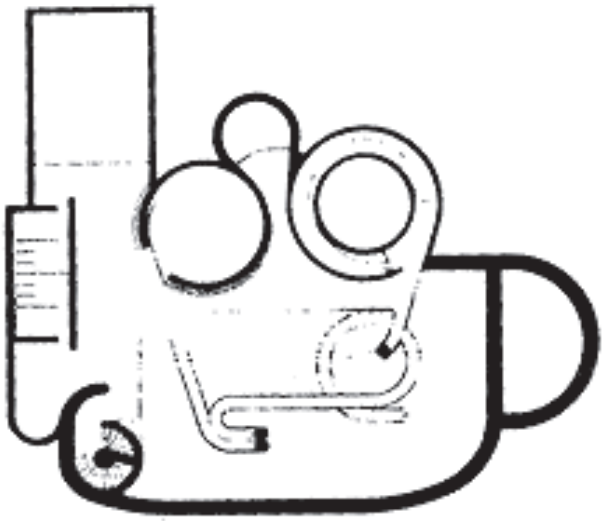


A SENSOROUS BODILY EXPERIENCE

Another primary focus for the project is the actual experience of the building. This paragraph will explain my conception of the headlines below, and how they will be incorperated in the design.

THE TACTILE, TECTONIC AND MORPHOLOGICAL

Buildings consists of built elements like walls and columns. Architects however mostly speak of architecture consisting of 'space'.
The current emphasis on space as pure geometry has weakened the awareness of the tactile, tectonic and morphological potential of walls, floors, columns and openings.
In this project I will like to focus on the experiential and tangible aspects of architecture, rather than abstract spatial relations or space measured by pure quantity and geometry.

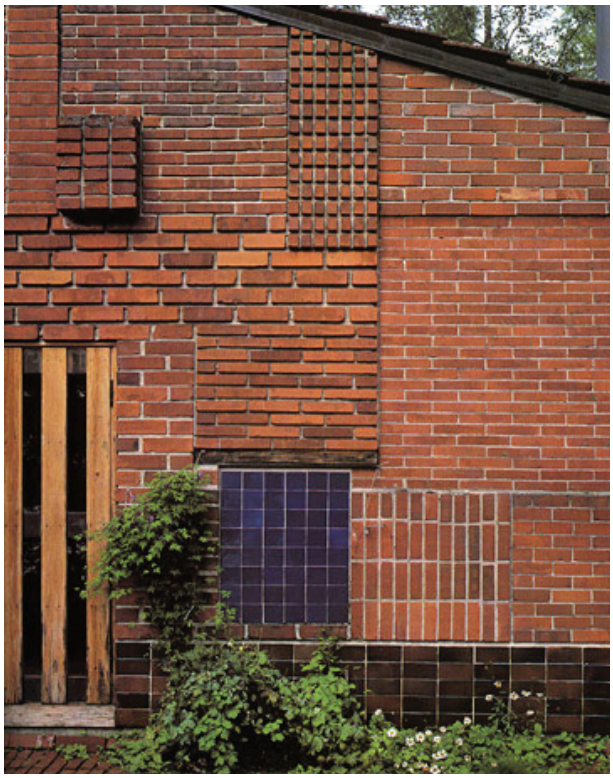


SILKEBORG ARTMUSEUM BY JØRN UTZON, 1963

MORPHOLOGICAL POTENTIAL OF WALLS, FLOORS AND COLUMNS CREATES A FLUID SPACE

SPRINGTECTURE H BY SHUHEI ENDO, JAPAN, 1998

**MORPHOLOGICAL POTENTIAL OF SHEET MATERIAL.
WALLS BECOME CEILINGS AND FLOORS.**



EXPERIMENTAL HOUSE BY ALVAR AALTO, FINLAND, 1953

**ONE OR MANY SURFACES
TACTILE POTENTIAL OF WALLS**

A NORDIC/TECTONIC APPROACH

I am excited about exploring the typology of a small scale rural house, that encourage one to look into details and rural vernacular architecture, not to mention the synergy and composition of space, light, structure, materials and form through a Nordic/tectonic approach to architecture.
The creation of useful spaces rather than iconic representations. A more sensuous, phenomenological and site specific experience of architecture, through the interplay of place, space and time.

BAGSVÆRD CHURCH BY JØRN UTZON, 1976

SYNERGY OF SPACE, LIGHT, STRUCTURE, MATERIALS AND FORM

A PHENOMENOLOGICAL APPROACH

Its about the space, and not the image, but the creation of an intense experiences of being in time and space creating place.
Working with emotions and spaces from within.
It's about the quality of the space and not the quantity. The atmospheric instead of the physical shape.

Another way to put it is, that you need to distinguish between the image and your imagination.
The image is a projection of your imagination. This projection will be individual, so you have to allow people to create their own images by allowing them to imagine rather than passively watching.

For this to happen, you need to feel a kind of consequence/causality. So it is important that your body is fleeing part of the space, and not just in front of the picture.
If the space is tangible, you have a sense of being able to change the space by moving through it, creating meaning from it instead of being told what to believe.

OBJECTIVE

I have listed the headlines from the previous pages to form a board of statements, that together with the statement below, is set to guide the process of design.

"Designing with the tactile, tectonic and morphological potential of walls, floors, columns, openings, materials and landscape.
Creating several layers of differentiated spatial qualities, supporting the activities taking place by the play of golf in the landscape."

ARCHITECTURE AS A SPATIAL LANDSCAPE – AN OPEN FORM

THE CHARACTER OF THE BUILDING SHOULD BE THAT OF ACCUMULATION AND ADDITION
FORM AS ORGANISATION AND STRUCTURE

LANDSCAPE AND BUILDING AS ONE CONTINUUM

THE LANDSCAPE WILL FORM THE EXPERIENCE OF THE ARCHITECTURE

A SENSOROUS BODILY EXPERIENCE

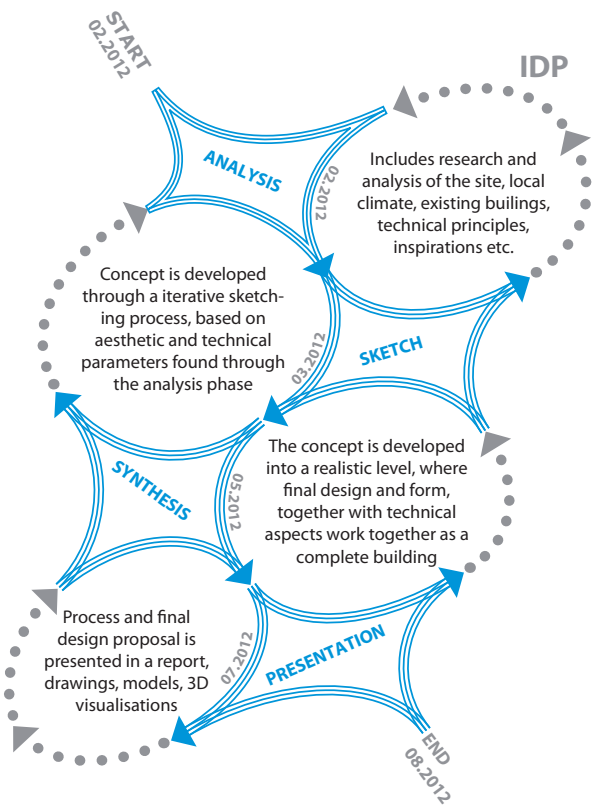
THE TACTILE, TECTONIC AND MORPHOLOGICAL
A NORDIC/TECTONIC APPROACH
A PHENOMENOLOGICAL APPROACH

METHODS

The integrated design process (IPD) is used to structure and develop the project. This method facilitates that technical aspects are incorporated in the project at an early stage of design, ensuring technical and aesthetic solutions work together to create a design. This involves many iterations and a range of creative processes with various goals (see illustration to the right) [M. Knudstrup. 2004]

SCALE

The project will be developed through sketches and models in different scales.
1:500 for the site and landscape
1:100 for organising spaces
1:50 for detailing certain spaces



THE INTEGRATED DESIGN PROCESS

DESIGN AND VISUALISATION

In general sketching, physical models, sketchUp, rhino, grasshopper and 3d studiomax will be used to develop and visualise the design.

ARCHITECTURE CONCEIVED AS BUILDABLE

Optimization has led to tedious architectural design with no variation and ambiguity. In this project design will be conducted as an interplay between to feel and to measure. Computational tools will be used to aid in construction and design simultaneously.
Thus Architecture conceived as buildable and not only imaginable. However it should still be ambiguous.

CONSTRUCTION

In the initial stages of the design simple hand calculations will be used to find initial dimensions of constructional elements.
In the later stages of design these calculations will be done in accordance with the national Danish standards.

ENERGY

The thoughts on the construction will have the primary focus, so no actual calculations will be done on the energy consumption. However thoughts on energy, daylight and heating will be covered by incorporating passive solutions in the design phase, by the use of shading, materials etc.

ANALYSIS

In this section the various contextual influences are analysed, to create a solid platform to start sketching.

GOLF

This section will give a general introduction to the game of golf, for those not familiar with the game. The second part will explain the different features of a golf course and how they will be used to inspire the design of the clubhouse.

INTRODUCTION TO THE GAME

Golf is defined, in the rules of golf, as
"playing a ball with a club from the teeing ground into the hole by a stroke or successive strokes in accordance with the rules."
[Wikipedia]

The founding principle of the rules is fairness. As stated on the back cover of the official rule book:
"Play the ball as it lies, play the course as you find it, and if you cannot do either, do what is fair."
[Wikipedia]

It is a game that does not require a standard playing area. Instead, the game is played on golf courses, each of them featuring a unique design. A typical course consists of 18 holes, divided into a front nine and back nine, with the possibility of a short stop at the clubhouse, to go to the toilet or buy refreshments.

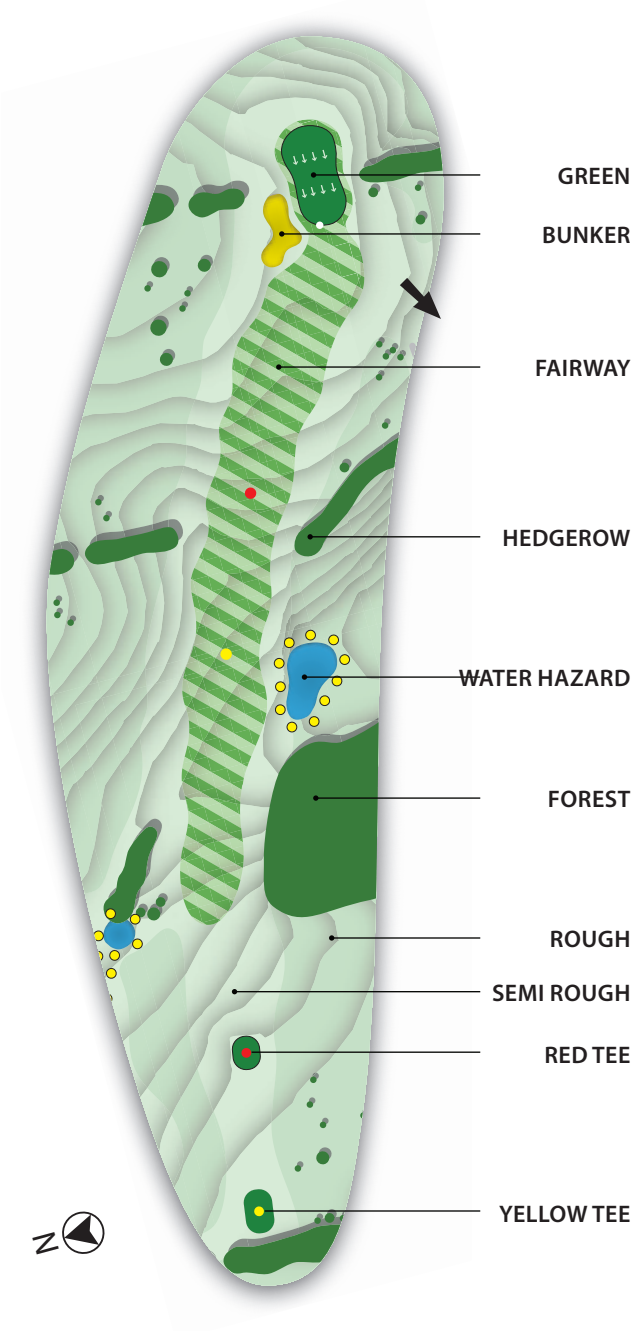
The modern game of golf originates from Scotland in the 15th century. Early Scottish courses were laid out on links land, being soil-covered sand dunes directly inland from beaches. These courses are named links courses and regarded as the original type of course to play the game of golf.

ELEMENTS OF THE GOLF COURSE

The Golf Course consists of 18 holes and is divided into different areas with different levels of difficulty.
On each hole you start at the tee, where you aim for the fairway, trying to get it as close to the green as possible, or in a good position to go for the green in the next shot. From the fairway, you hit your ball towards the green and putt into the hole.
If you miss the fairway or the green you end up in some of the more natural features of the golf course. Areas that are designed or left as natural as possible to make golf more challenging and difficult. That can be a water hazard, forest, bunker or the rough. These areas slows the ball on contact and might result in a lost ball, or you will have a hard time advancing the ball further. You can consider these areas as obstacles, you should try to avoid.
All the different areas requires you to hit special shots and make use of various golf clubs. Further it is through the golf swing and the club that you shape the flight of the ball. Thus by changing the position of the ball at setup and the plane of your swing, you can shape various shots according to the layout of the hole, the slope of the landing area, the wind conditions etc.

CONCLUSION

Essentially making you experience the landscape and it's features by the swing of the club, you can say the game of golf makes you aware of the qualities of the landscape.



EXPERIENCING THE LANDSCAPE THROUGH THE SWING

The way the course is laid out makes a path through the landscape, that enhance certain qualities from hole to hole and shot to shot.
During the play of golf you experience many different spatial qualities, such as enclosure, view, framed/ borrowed landscape etc.
On this particular course many holes are designed without a direct line-of-sight from the tee to the green. Thus many holes bend either to the left or to the right.
The game of golf and this course in particular therefore forces the play not to be a passive observer of the landscape, but engaging one's body in the experience of the landscape.
Depending on the shape of the hole, the terrain and various natural obstacles, the player will have to take an active choice of how to strike the ball:

- Shooting it high to let the wind carry it further, or stop it quickly when it lands.
- Making the ball go low to force it under the wind, and allow it to roll more when it lands.
- Curving the trajectory to the right or the left, to make the ball follow the path of the fairway, and thereby prevent it from being lost in ex. the rough or a water hazard. In other words letting it curve away from the obstacles.
- When having to make a shot from the rough the player will feel the resistance of the high grass and change the shot accordingly.
- Likewise when playing from a sand bunker one have to hit the sand before the ball.
- When making a putt on the green, the player can brush the grass to remove loose natural impediments, and will have to read the slope of the green to determine the roll of the ball toward the hole.

OPEN CHARACTER OF THE FONT NINE

CONCLUSION

A small collection of shots and experiences, that exemplify the player have to take an active choice of shot to play, and thereby becomes engaged in the landscape, sees its details, touches the grasses, feels its resistance and senses its contours.

The following section will therefore analyze the different features of this particular course, concluded by a remark on how they will be used in the design of the clubhouse.

CLOSED CHARACTER OF THE BACK NINE

TEE

The Tee is a flat surface shaped as a rounded rectangle. It is designed as a small plateau for one to have a good view where to aim for the first shot on the hole. You can consider it as a small plateau moulded from earth.

CONCLUSION

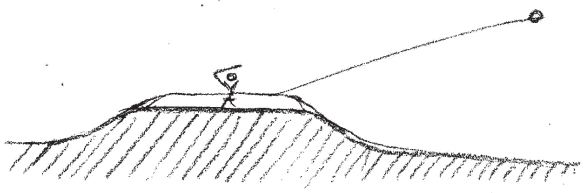
In the design the concept of a plateau can be used as a place for observation or simply marking a bounded area for a specific purpose.

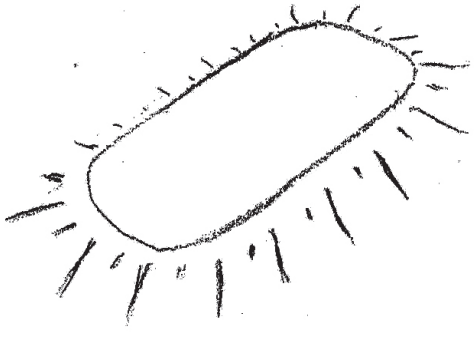
FAIRWAY

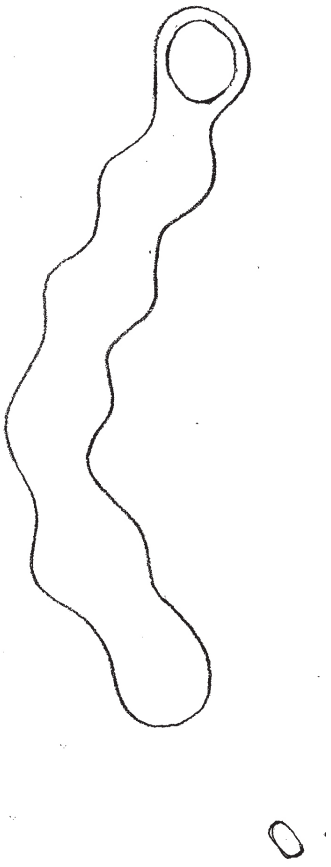
The Fairway is a stretch of closely mowed grass that extends, often in patches, from the tee to the green. To hit the ball into the fairway, makes it a lot easier to advance the ball to the green, than from the rough or a hazard. Therefore the fairway can be considered as a loose path set by the architect through the landscape.

CONCLUSION

This type of loose path will also be needed in the design of the clubhouse, if one should have the possibility to create various paths through the building.





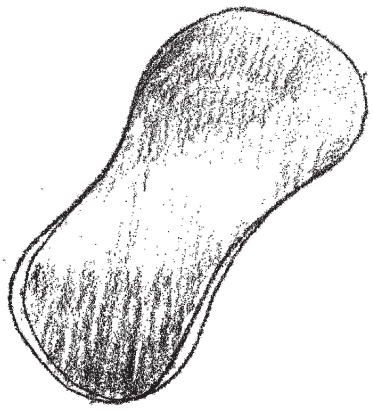


GREEN

The Green surrounds the Hole marked by a flagstick. It has very well groomed grass where you can make your putt for the hole. The shorter the grass the faster the ball will roll.
Greens differ in slope and firmness making reading the green a big part of the game. Golf balls roll faster on firmer greens than on wet ones.
Thus on the green you have to pay attention to the smallest detail, such as the slope, loose blades, fallen leaves or tiny stones, that can change the path of the ball when rolling towards the hole.
By brushing loose impediments away from the expected line of the ball, and by repairing ball marks, you experience it as a rather soft surface moulded from earth. A more soft plateau in the landscape than the teeing ground.

CONCLUSION

When designing, this concept of touching the soil will be used to draw attention to details, materials etc.

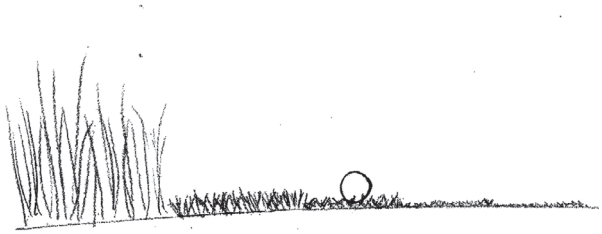


ROUGH

The Semi rough borders the sides of the fairway and green. The semi rough is rougher, as the grass is kept higher and is less groomed than on the fairway and green.
The Rough borders the semi rough and is the patch of wild nature that separates one hole from another. It is only mowed once a year, so it is even rougher than the semi rough. An area you try to avoid as a golfer.

CONCLUSION

In the design this concept of various groomed grass will be used to create differentiated experiences of the landscape surrounding the clubhouse.

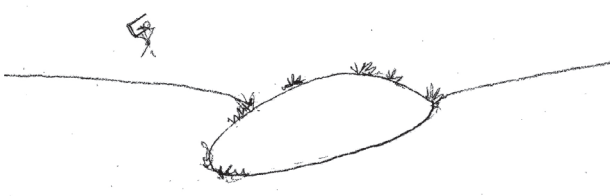


WATER HAZARD

The Water hazards on this course are natural ponds that have been extended to introduce obstacles in what else would have be a stretch of grass and trees.

CONCLUSION

As you cant walk on water it can be used as a guiding element in the design.

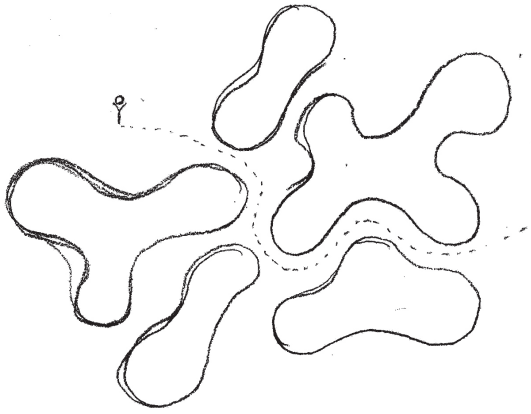


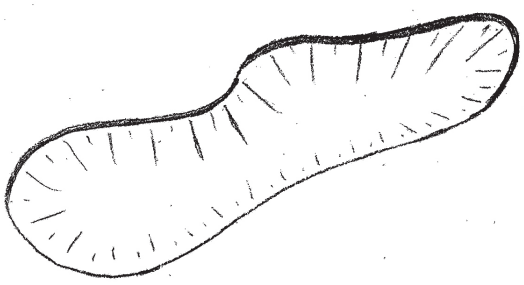
BUNKER

The bunkers are pits of sand that are located near the green and fairway. Bunkers can give very difficult situations like a buried lie.
These areas are formed as recesses in the landscape, exposing the sandy soil beneath. It is also an element you will tend to walk around, as you have to rake the bunker when leaving it.

CONCLUSION

Thus it can also be used as a guiding element in the design. But the concept of a recess can also be used to create shelter in the landscape surrounding the clubhouse.





HEDGEROWS

The hedgerows are a reminiscence from the time when the area was used as farm land. These rows of trees and bushes functioned as windbreaker to protect the crops. The hedgerows are still present. Sometimes they act as a wall in the landscape parallel to the hole. In other places they have been broken through by the golf course, and acts as a gate you need to pass.

CONCLUSION

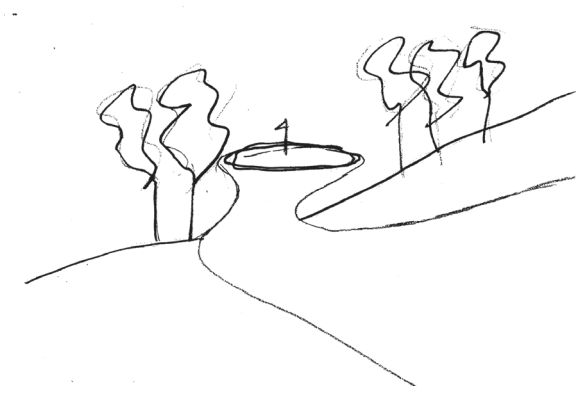
This concept of a wall will be used in the design to define spaces without enclosing them entirely.

FOREST

The forest on the course consists of patches of closely grouped trees. It consists of both soft- and hardwood trees. Beech, birch and spruce together with pine, oak, larch etc.
The last nine holes had a large amount of trees, and hole 14, 15, 16 and 17 was cut into the forest, like big clearings. That gave you a very different experience of the landscape, than the more hilly landscape with occasional view to the horizon, that the first nine holes possess.
However most of the forest fell under a hurricane-like storm in the winter of 2005, just a year after the holes opened for the public.
The forest is however slowly re-erecting itself and the golfers are daily, monthly and yearly witness to this process.

CONCLUSION

In the design this concept of a clearing and grouped trunks will be used as a spatial and constructional principle, to create shelter at the same time as carrying the load of the roof.




N
SEBBERSUND
LIMFJORD
SHORE OF HALKÆR

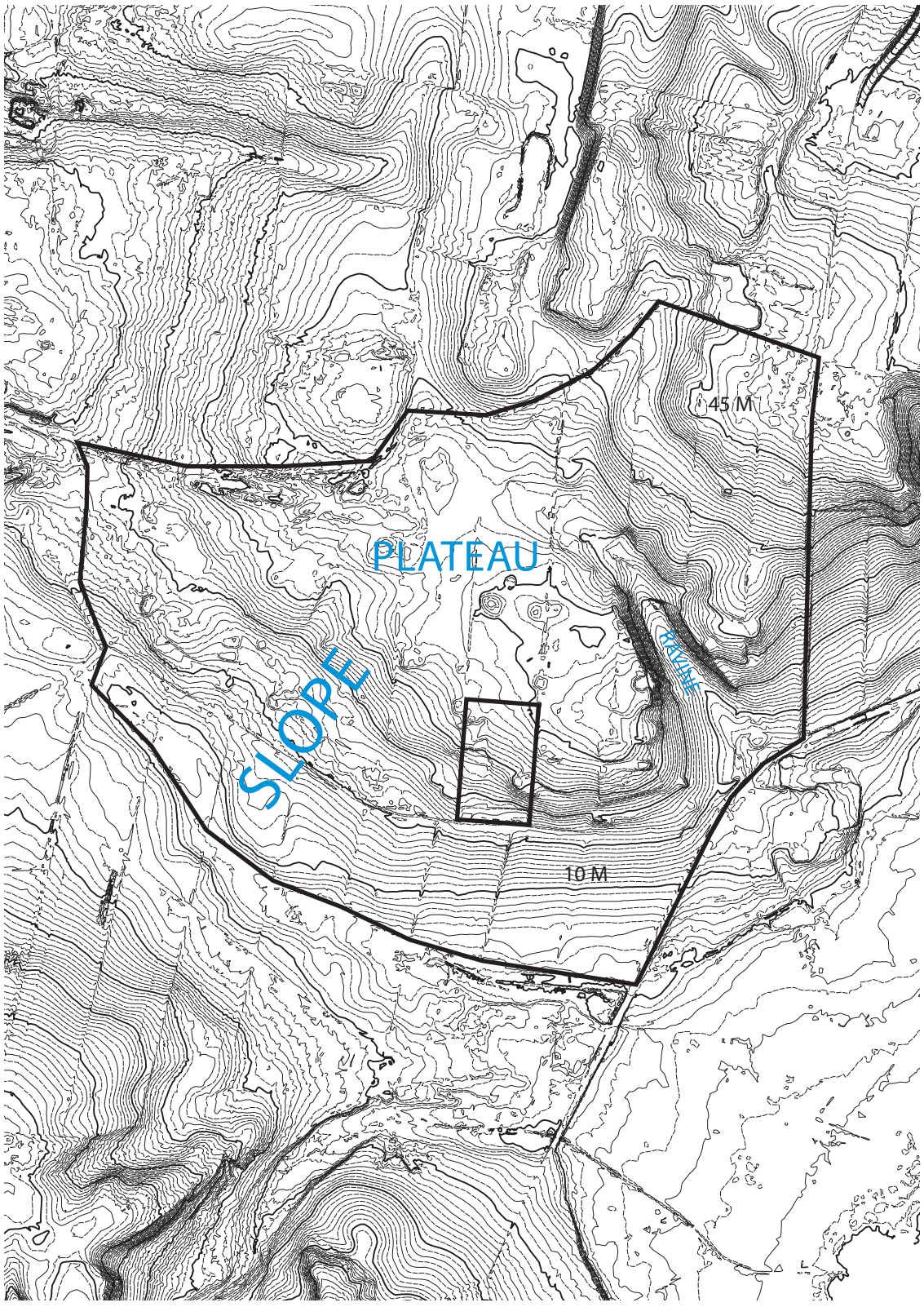
CONTEXT

This section will start by a general introduction to the area and the character of this particular course. Followed by an analysis of the site, that will set up criteria for where to place the clubhouse.

INTRODUCTION TO THE AREA

This particular course can be considered as a combined heath land and forest course situated in the natural surroundings of a hilly landscape close to the Limfjord, 10 kilometres vest of Nibe in Aalborg municipality.
The front nine I will consider as a heath land course characterised by its sandy soil, gentle, rolling fairways winding through a landscape full of bushes, shrubs and with less trees than a highly manicured parkland course. The back nine can be regarded more as a forest course with an abundance of trees as natural obstacles. The more open character of the front nine also makes the wind an ever present factor of the game.
The total area of 85 hectares include both forest, lake and meadow. The soil is quite sandy, and one of the reason for making a golf club, was the like the original Scottish links, that the soil was too poor for ordinary farming.

There are almost no settlements in the neighbouring area except smaller farms, summer cottages and the like. In a range of 3 kilometres you find smaller villages like Sebbersund, Valsted and St. Ejstrup Nearby you find the local church, where the clubs name “Sebber Kloster” originates from.
The cloister was formed by a group of Benedictine nuns, that settled in the church in the early 13th century. Today the cloister is gone but the church remain and the adjoining manor is now functioning as a golf resort with rooms and a big dining room for larger events.



1:10.000

TOPOGRAPHY

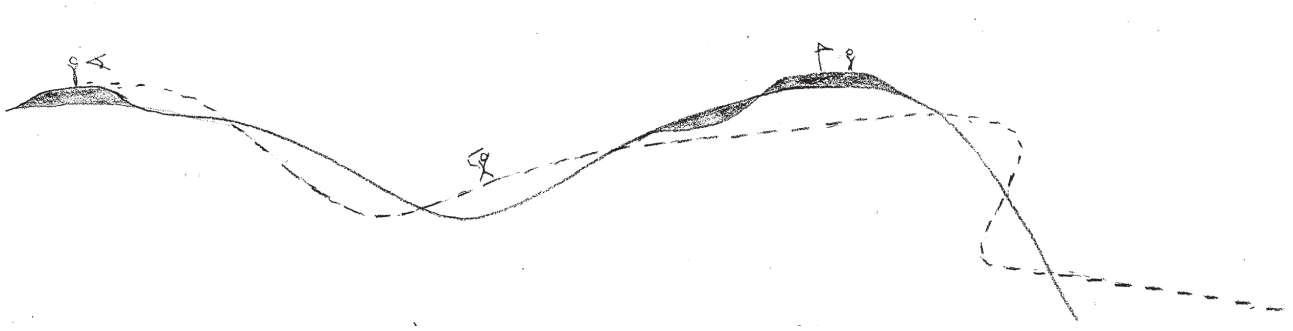
In general the soil have been moved and moulded gently in certain areas to facilitate the play of golf. That will be tees and greens that have been build up from the ground, whereas bunkers have been digged into the ground.
The highest point at the course is 45 meters and the lowest 10 meter above sea level, so you are almost always on the way down or up the terrain. In certain areas you experience a sudden change in elevation like a ravine, whereas others are more flat like a plateau.
From certain locations, the proximity of the Limfjord and the hilly landscape makes you experience a unique view of the fjord, the shore of Halkær and the horizon.

CONCLUSION

As stated earlier the design should support and emphasize qualities of the landscape and the golf course within it.
Thus breaking the surface of the soil or adding soil to facilitate the building of a clubhouse, will be in line with what is done when forming the course in the first place.
Further this analysis of the site reveals some spatial qualities, that should be incorporated in the design. A differentiation between the open field with a view to the horizon and the enclosure and attention to details experienced in the forest, hollows and the ravine.

PLATEAU

RAVINE



TEE PLATFORM | **FARIWAY SLOPE** | **BUNKER RECESS** | **GREEN PLATFORM** | **PATH RAVINE**

1:2.000

BUILDING SITE, LOOKING SOUTH

SITE FOR BUILDING

In the district plan for the area, there has been marked a zone for building a clubhouse and the adjoining facilities like: locker rooms, smaller shelters and annexes. The total area of building may not exceed 600 square meters, however as there are no immediate neighbours, it has earlier proved easy to get a dispensation from this limitation.
Furthermore it is possible to make parking space for 125 cars in the area.

TYPOLOGY

The existing buildings are as earlier stated worn out, and will be demolished when building a new clubhouse.
The existing bag lockers will be reconfigured for a better use and access.
Thus the new building will have no immediate neighbouring buildings, that it should relate to.

CONCLUSION

The most important contextual influence are therefore the topography of the site, access routes and the path of the sun and wind.

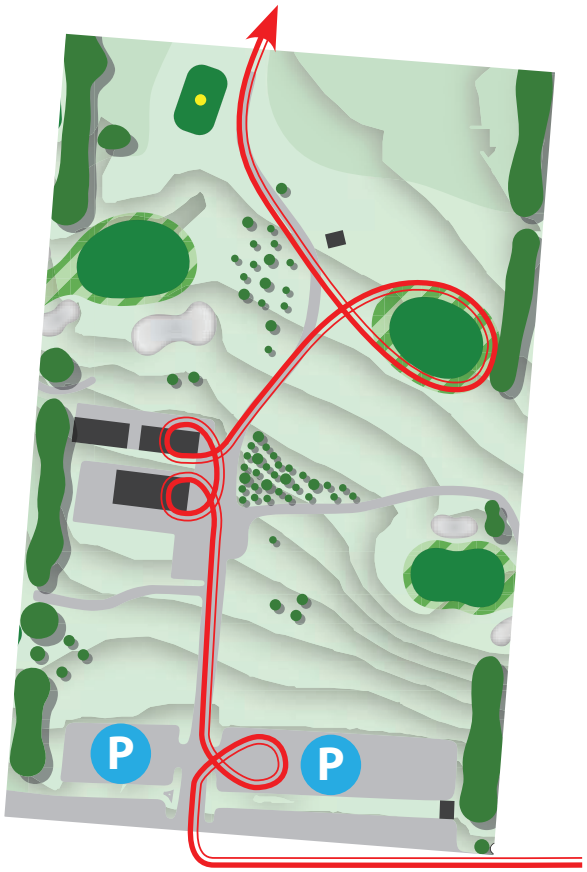
ACCESS ROUTES

Access to the site happens along an asphalted road, parallel to the slope of the terrain.
As you come by car, you park in the gravelled parking space in the middle of a small slope, rising towards north.
You walk up to the clubhouse and confirm the time you booked in advance.
Then you collect you bag from the golf bag lockers.
If you want to practice the long game, you walk downhill again towards the driving range.
Otherwise you can practice your short game at the putting green, before you walk of to the first tee to start your round of golf.

CONCLUSION

The investigation of access routes has led to the following things that can be improved in a new club house:

1. View from clubhouse to hole 9, 18 and the fjord
2. View and easy access from clubhouse to putting green
3. View from office to hole 1
4. Parking for staff near the clubhouse that does not block the view to the fjord,
5. Easy access for deliveries to various storage rooms in the clubhouse

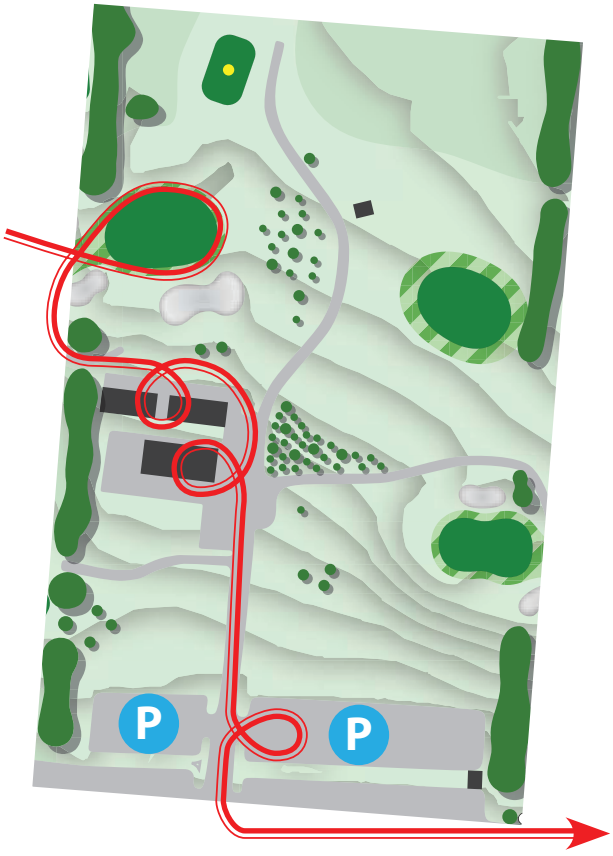


BEFORE A ROUND OF GOLF

1. Arriving at car
2. Confirming the time booked
3. Collecting the golf bag
4. Practicing at the putting green
5. Starting at hole 1

STOP INBETWEEN HOLE 9 AND 10

1. Putting at hole 9
2. Short stop at the clubhouse to get refreshments and go to the toilet
3. Teeing out on hole 10



AFTER A ROUND OF GOLF

1. Putting at hole 18
2. Storing the golf bag in the locker
3. Sitting in the club house or at the terrace to socialize, enjoy a drink and maybe a simple meal.
4. Leaving the club by car

DELIVERIES AND PARKING FOR STAFF

MICROCLIMATE

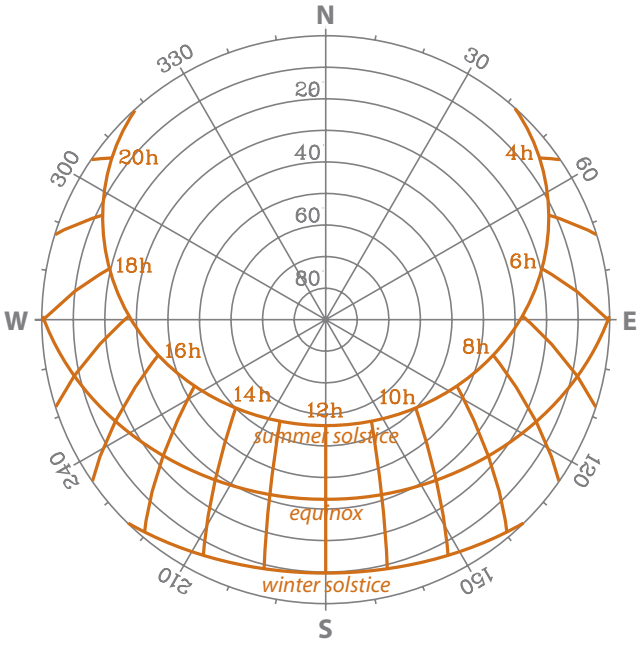
When designing a building, and one want to use passive means to cut down the use of energy, one have to know the climate of the site. Some of the factors, that have the biggest influence, are the sun and wind. These will therefore be analysed for how they can contribute to the design.

SUN

Due to the open surroundings, the site is exposed to the sun every day all year round.

CONCLUSION

Thus nothing external prevents the utilization of sun in the building for lighting or passive solar heat gain in the winter. In relation to the potential exposure to solar radiation there might be a need for shading during the summer.



SUNPATH DIAGRAM FOR NIBE.

Utilisation of daylight

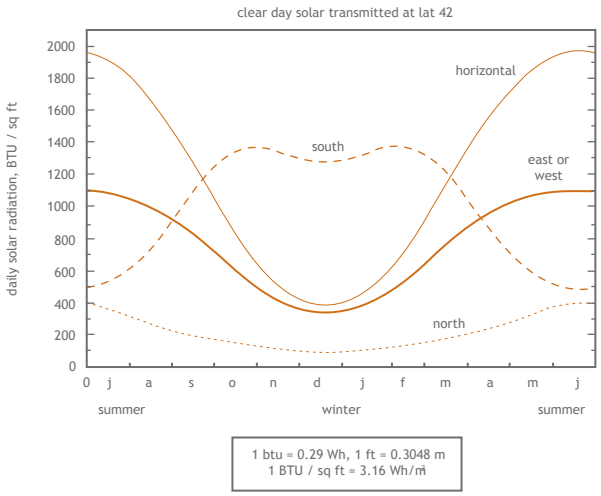
Solar heat gain

Shading

SOLAR RADIATION

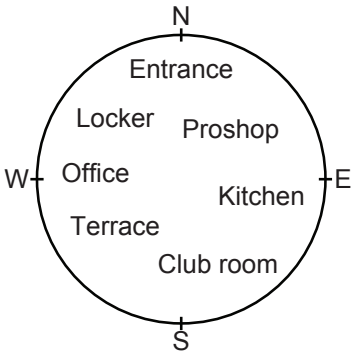
The scheme investigates how much of the daily solar radiation is transmitted through window.

The sun path is shorter and lower in the winter than the summer. Thus east and west facades do not receive a significant amount of radiation in winter, while in summer east and particularly west facades are major recipients of unwanted solar gain.
An appropriate strategy for winter solar heating therefore is to orient the major wall and window areas of the building to the south. An orientation slightly east of south is favoured (typically 15-30°), because this exposes the building and enables the house to begin to heat from the morning.



CONCLUSION

To optimise passive solar heat gain and daylight conditions the orientation of spaces in the building is important. That could be an west- or southwest facing window for the office, so it does not heat up during the office hours. The main clubroom and terrace can be oriented towards the south and west to take advantage of the sun during the day and late evening. However being aware that the western sun can contribute to overheating during the early evening from spring to fall.
Lockers, kitchen, proshop and storage rooms can be placed towards north as they don't require as much direct daylight.

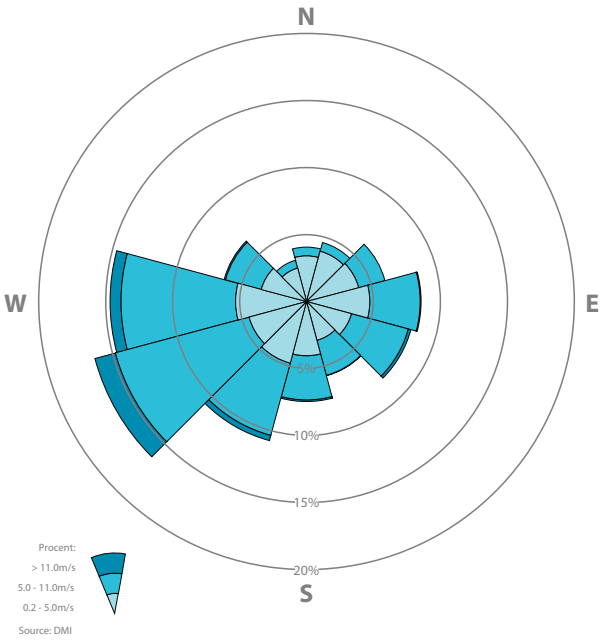


WIND

The proximity to the Limfjord and open rural surroundings provides the site with fresh, cold air mainly coming from the west.
The wind is not always coming from the west but changes in intensity and direction according to time of day and year. In the morning and afternoon the wind is calmer than during day time and stronger and more directional in the winter time compared to the summer.

CONCLUSION

The fresh air can be utilized for natural ventilation in the building. In summer time, where the buoyancy forces are small, good natural ventilation requires locating openings in opposing pressure zones. As the ventilation has to rely much more on wind, and the prevailing wind direction is western, this would imply inlets from the west.
But the open rural surroundings also implies that the site is highly exposed to the wind and calls for solutions for how to shelter from the wind, to make a pleasant outdoor space for the terrace.



WIND DIAGRAM FOR NIBE.

	J	F	M	A	M	J	J	A	S	O	N	D
00-04	↗		→	←	↘	⇆	↙	↙	⇆	↑	↓	↙
04-08	↑	→	→	↗	↘	↘	↙	↙	→	↓	↙	↘
08-12	↑	→	→	↓	↖	↖	↙	↙	←	↙	↓	↓
12-16	←	↓	→	↖	←	↖	↖	↑	↓	↙	↓	↖
16-20	←	↙	→	↖	↓	↙	↙	↙	←	↓	↓	
20-24	←	↖	→	↖	→	↘	↗	↙	↖	↙	↙	↖

WINDSQUARE DESCRIBEING WINDDIRRECTION IN ACOARDANCE TO TIME OF YEAR AND TIME OF DAY.

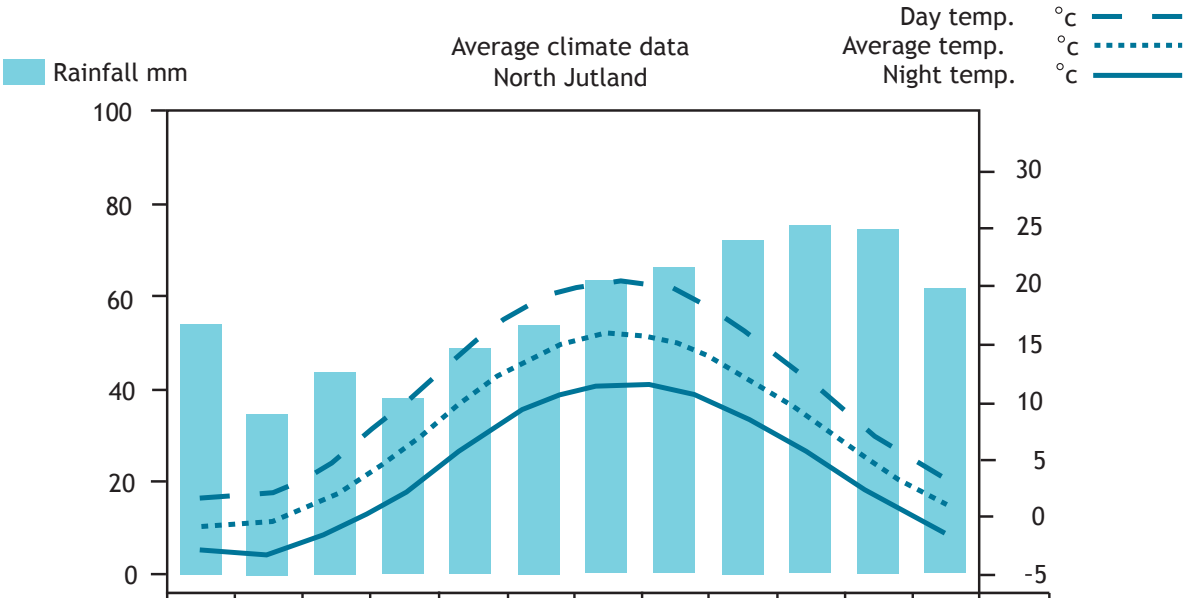
Wind cooling

Wind shelter

TEMPERATURE & RAIN

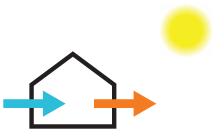
On the basis of the relatively low summer temperatures natural ventilation can be utilised to cool the building during the summer period.
On the other hand heat recovery will be needed during the winter period because of the large temperature difference.

The relative rainy summer period also calls for various covered outdoor areas. Thus covered terrace, buggy parking etc.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rainfall mm	54	35	44	38	49	54	64	67	72	76	75	62	689
Rainfall days	11	8	10	8	9	8	9	10	12	13	14	12	124
Day temp.	1,7	2,0	4,9	9,8	15,2	19,0	20,1	20,0	16,2	11,9	6,8	3,4	10,9
Average temp.	-0,4	-0,4	1,9	5,6	10,7	14,4	15,7	15,5	12,3	8,9	4,3	1,3	7,5
Night temp.	-2,9	-3,2	-1,1	1,8	6,4	10,0	11,7	11,2	8,6	5,6	1,5	-1,3	4,0
Sunshine hours	30	72	117	167	200	218	200	186	130	87	57	42	1534

THE SCHEME SHOWS AVERAGE CLIMATE DATA FROM NORTH JUTLAND.



Natural cooling

Heat recovery

PROMOTE NATURAL VENTILATION

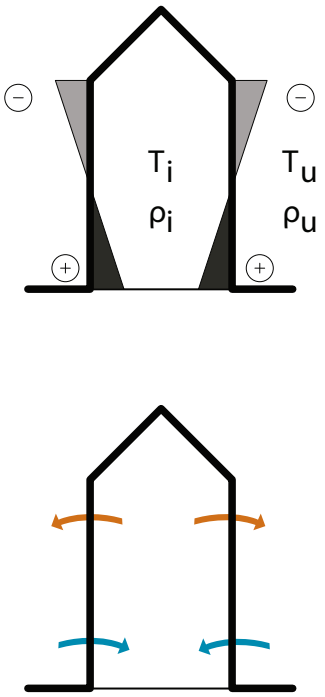
To reduce energy consumption one can make use of natural ventilation. Heat recovery is probably necessary during the winter period. This might result in the requirement for design of a hybrid ventilation system; a combination of natural and mechanical ventilation. Natural ventilation can be utilised during spring, autum and summer when outdoor air can be used without the requirement of preheating. This will decrease the energy consumption during this period.
Utilising natural ventilation during winter might on the other hand result in an increased heat loss, as the methods for natural heat recovery is not very efficient. Thereby energy consumption will increase. Mechanical ventilation with heat recovery should be the main ventilation system during this period when the outdoor temperature is lower than the building temperature.

CONCLUSION

As the building in question is mainly used during spring, summer and fall, mechanical ventilation will probably not be needed in the entire building.
The following diagrams illustrate the natural driving forces available and how natural ventilation can be utilized in the design.

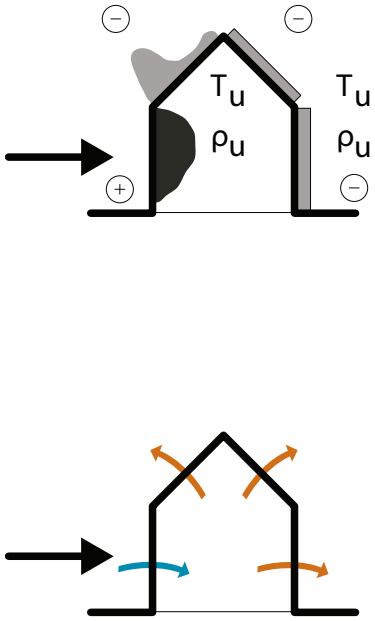
DRIVING FORCES

THERMAL BUOYANCY



Air exchange is created between zones because of difference in air density, caused by temperature and moisture differences.
Thermal buoyancy then leads to vertical pressure difference which drives the ventilation and implies inlets below outlets.

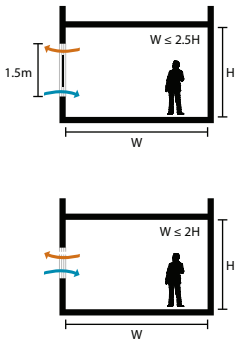
WIND



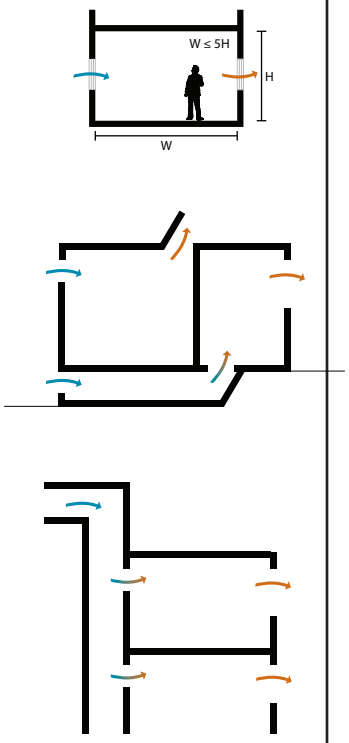
Air exchange is created between zones because of difference in air pressure.
Distribution of wind induced pressure over the surface of the building, then implies inlet in the facade that the wind hits and outlet on one of the other surfaces.

NATURAL VENTILATION PRINCIPLES

SINGLE SIDED

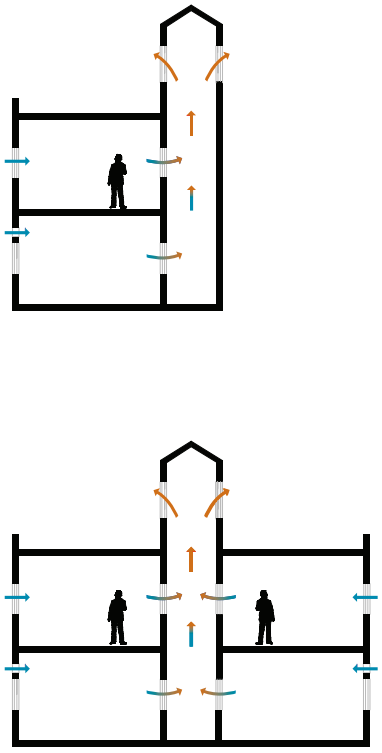


CROSS



Wind induced pressure difference between inlet and outlet.

STACK



Thermal buoyancy.

DRIVING FORCE

Thermal buoyancy

Wind tubulence

CONCLUSION

The analysis have brought forward some design parameters that should be used in the design process. In general one could say that the design should support and emphasize qualities of the landscape and the golf course within it.
A differentiation between the open field with a view to the horizon and the enclosure and attention to details experienced in the forest, the hollows and the ravine.

The room programme summarises the demands for area, functionality, view and proximity, that have been made from conversations with staff, board and members of the club in general.
The remaining parameters in the room programme are summarized from the previous chapters.

ROOM PROGRAMME

INDOOR	**Area [m2]**	**Functionality**
Hall	30	- Marking entrance for guests - Registration and booking - Notice board for members and guests
Office	20	- Two desks for staff - Shelves for storrage - Closeable counter
Men's & Women's locker	2x25	- Privacy at the entrance - Lockers for storage of clothes
Toilets	10	- 1 handicap toilet - 4 toilets
Technical space	10	- Manegment of geothermal heat - Cleaning room with a sink
Proshop incl. storage	50	- Wall area for display of products - Changing room - Open counter
Kitchen incl. storage	50	- Closeable counter - Selfservice from vending machines
Main space	140	- Possibility for partion of the space - Corner with television - Corner with fireplace - Seating for 100 people
Meeting room	40	- Wall to be used for projections - Seating for 40 people
Area	**400**	

View to	Proximity to	Spatial quality	Architectural concept
- Parking space Hole 1 tee	- Parking of golf bags before and after a round - Area for renting out trolleys	- High ceiling - Hard materials	- Joint - Path
- Parking space Hole 1 tee	- Parking space	- Enclosure - Good light - Opening	- Overview
	- Hole 1 tee - Hole 9 green	- Dark - Narrow	- Enclosure
	- Hall - Main space	- Light	- Cave
	- Kitchen - Hall		
	- Hall	- High ceiling - No daylight	- Cave
	- Storage - Outdooor space for waste managment	- Light - Opening	- Wall, Niche
- Hole 9 green - Hole 18 green - Putting green Fjord	- Hall - Kitchen - Proshop - Terrace	- Various moods ranging from dark to light. - warm	- Platform - Corner - Edge, - Niche
- Fjord	- Main space	- warm - light	- Cave with view

NEAR CLUBHOUSE	Area [m2]	Functionality
Open terrace	100	- Shelter from wind
Covered terrace	60	- Shelter from sun and rain
Covered area for golf trolleys and bag parking	20	
Parking for staff and deliveries	100	- Deliveries to kitchen, proshop - Easy access to office and technical space
Area	**280**	

OTHER FACILITIES	Area [m2]	Functionality
Golf bag locker	100	- Lockers for golf bags - Workshop for pro-trainer
Covered area for golf buggies	20	- Near golf bag locker
Area for cleaning	10	- Cleaning of clubs, trolley and shoes
Parking for 125 cars	2000	
Area	**2130**	

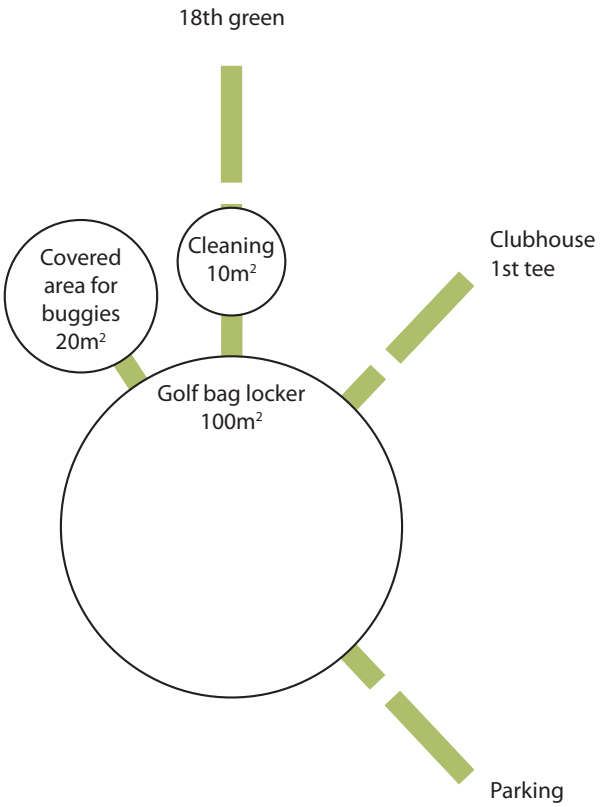
View to	Proximity to	Spatial quality	Architectural concept
Same as main space	- Main space	- Exposed	- Platform
Same as main space	- Main space	- Protected	- Shelter - Column - Roof
	- Hall	- Protected	- Shelter
	- Clubhouse		

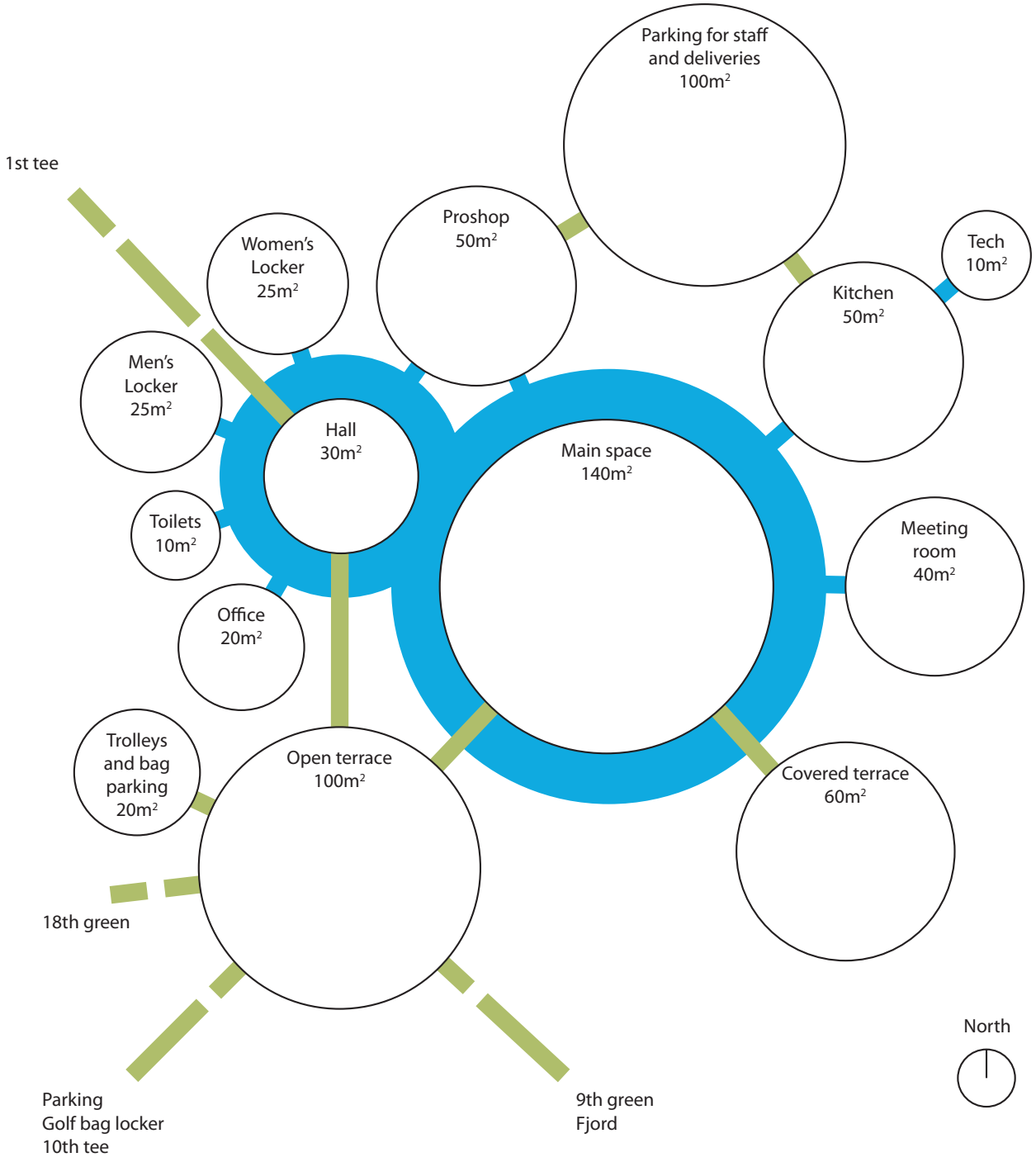
View to	Proximity to	Spatial quality	Architectural concept
	- Hole 18 green - Parking space	- Protected	- Shelter - Platform
		- Protected	- Shelter
	- Golf bag locker - Hole 18 green	- Clean	- Shelter
	- Golf bag locker	- Open	- Platform

FUNCTIONAL PROGRAMME

A rough disposition of the indoor spaces of the room programme in connection to the immediate outdoor spaces.
The spaces are placed:

- according to interrelationship between various functions,
- to allow for a view from the main space to the surrounding course and the fjord towards the south
- to have the terrace towards the south
- to have a connection from the hall past the locker rooms towards the first tee
- to have direct access from the parking for staff and deliveries to the kitchen and proshop
- to have a view from the office towards the first tee and the main parking area
- to have more introvert functions towards the north and more extrovert towards the south to allow for passive solar heat gain from the south and less heat loos towards the north
- etc...




Parking for staff
and deliveries
100m²
1st tee
Proshop
50m²
Women's
Locker
25m²
Tech
10m²
Kitchen
50m²
Men's
Locker
25m²
Hall
30m²
Main space
140m²
Toilets
10m²
Meeting
room
40m²
Office
20m²
Trolleys
and bag
parking
20m²
Open terrace
100m²
Covered terrace
60m²
18th green
North
Parking
Golf bag locker
10th tee
9th green
Fjord

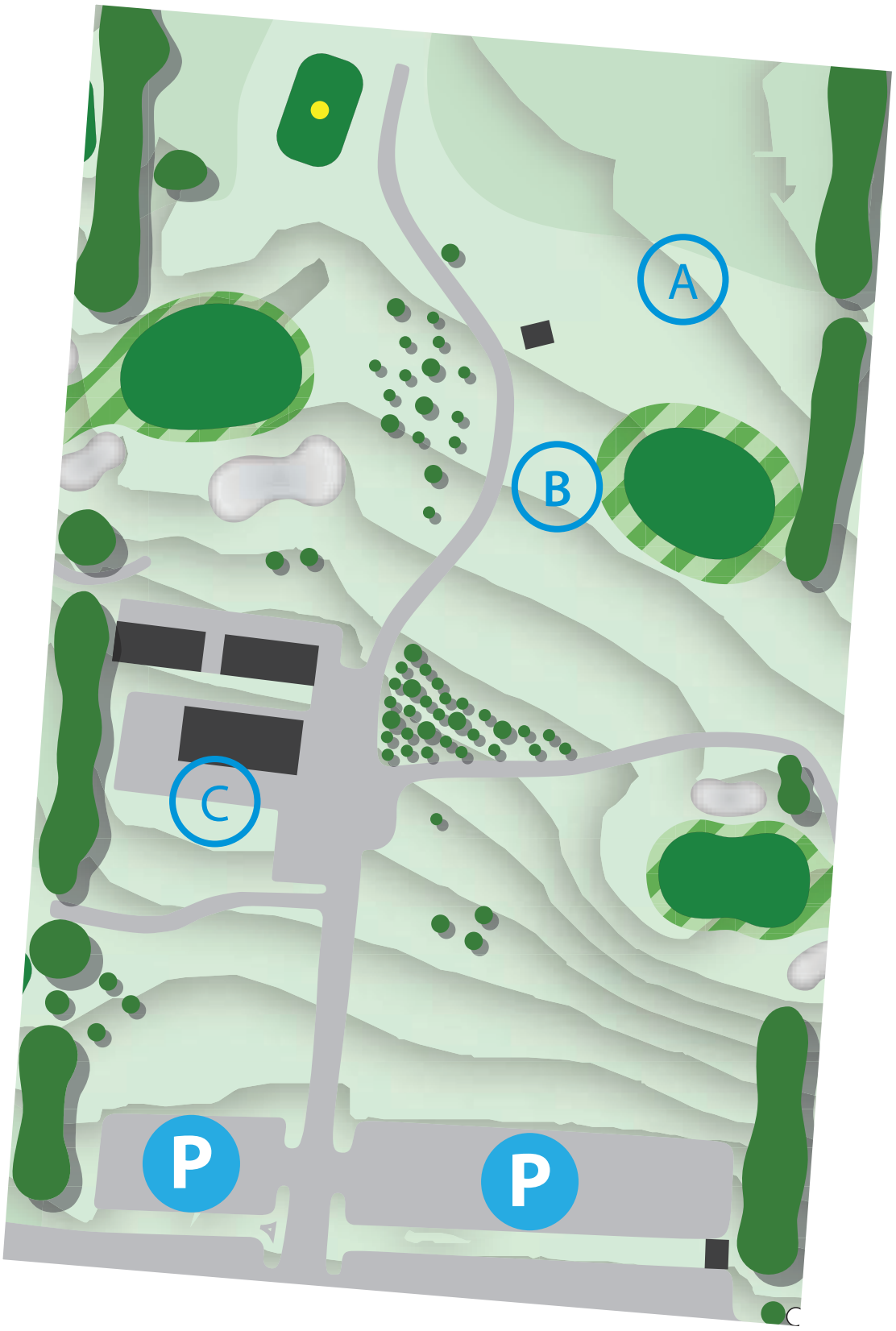
SKETCHING

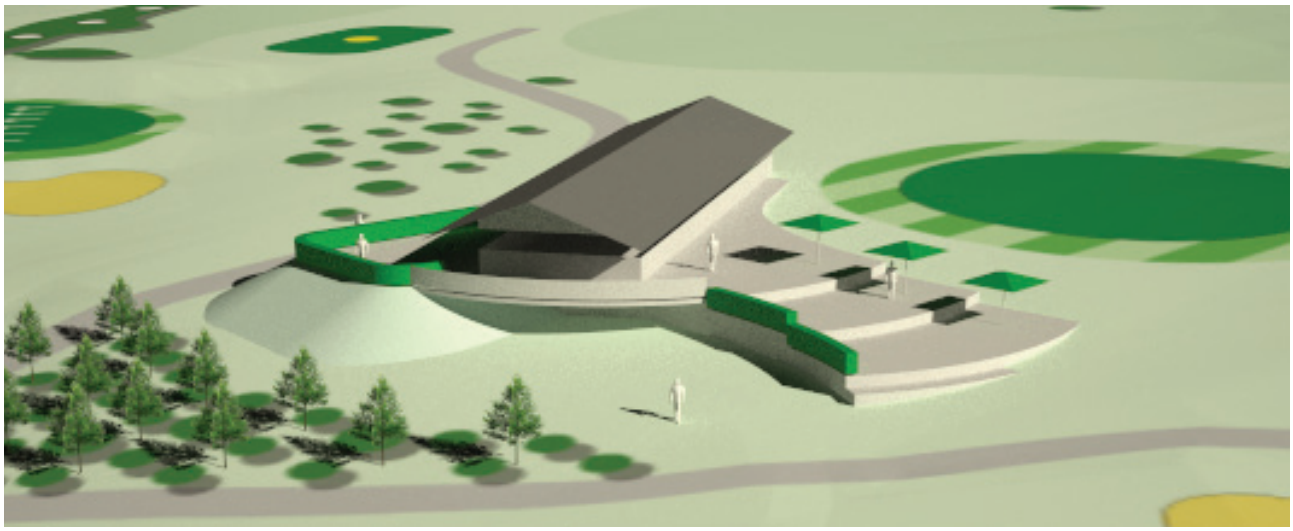
This section describes the background for the presented solution, and those choices that have been made to reach this design.
The section is divided into smaller chapters that describes the development of different aspects of the design.

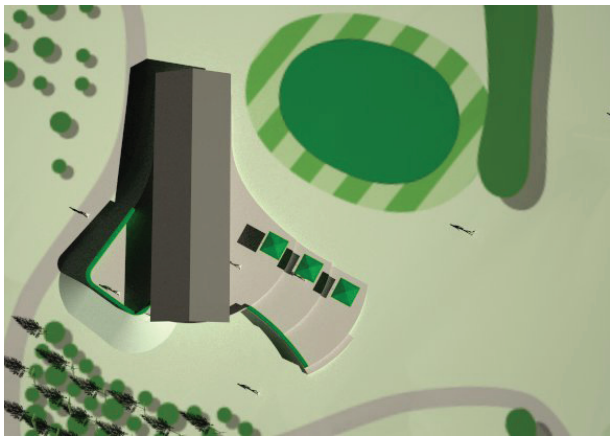
PHASE 01 - SITE WITHIN SITE

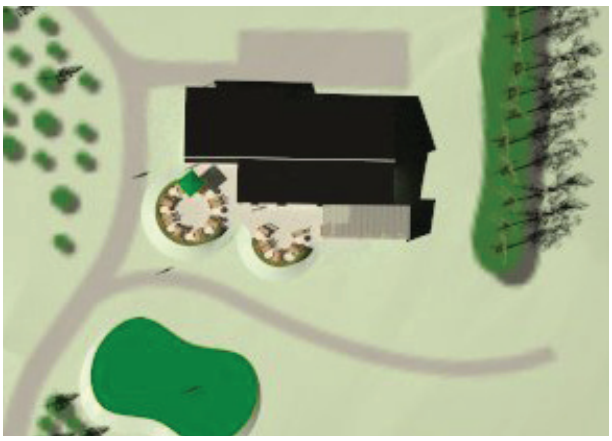
One of the goals with the building is that the members and visitors should have access to the necessary facilities before and after a round of golf. Therefore the general layout of facilities and how they are connected to the golf course is of great importance.

Thus the first step has been to select a site, within the site, to build the clubhouse and adjoining facilities. Three possible sites have been picked based on view, access and availability.









TWO OF SEVERAL PROPOSALS FROM THE EARLY STAGES OF DESIGN

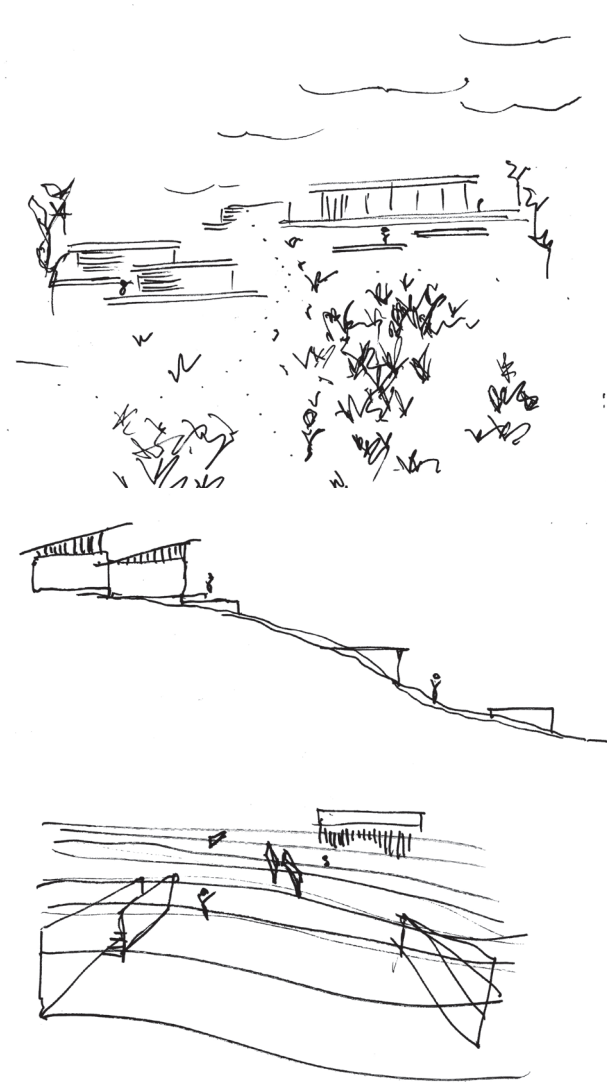
CHOOSING A SITE

The scheme summarises the wishes from the analysis. For each demand there has been assigned a number from 1 to 3, that describes how the site fullfills the demand.
1 is given to the best solution and 3 to the worst.

Based on this scheme the site named C seams the best fit for the practical wishes. However site B seams the best fit for the wishes of view and visibility.
As one of the primary wishes, pushed forward by memebers and staff, has been view to the golf course and the possibility to use the existing clubhouse while constucting a new, site B has been selected for further development.

CHOOSING A SITE BASED ON:	A	B	C
PROXIMITY TO			
- PARKING	3	2	1
- DRIVING RANGE	3	2	1
- PAY AND PLAY	3	2	1
- 9TH GREEN	3	2	1
- 10TH TEE	3	2	1
- 1ST TEE	1	1	3
- CHIPPING GREEN	1	2	2
	17	13	10
VIEW TO OR VISIBILITY FROM			
- 18TH GREEN	2	1	3
- 9TH GREEN	2	1	2
- 1ST TEE FROM THE OFFICE	1	1	3
- 10TH TEE FROM THE OFFICE	3	3	1
- FJORD	3	1	2
- ROAD AND PARKING	3	2	1
	14	9	12
WISHES FOR THE TERRACE			
- SHELTER	3	2	1
- WALK PAST BETWEEN THE 18TH GREEN AND PARKING	3	2	1
	6	4	2
DELIVERIES AND PARKING			
- POSSIBILITY FOR DELIVERIES TO THE CLUBHOUSE	3	2	1
- SHORT TERM PARKING NEAR THE CLUBHOUSE	3	2	1
	6	4	2
CIRCUMSTANCES DURING CONSTRUCTION			
- USE OF EXISTING CLUBHOUSE	1	1	3
- USE OF EXISTING PUTTING GREEN	3	3	1
	4	4	4
TOTAL	47	34	30
1: TO A HIGH EXTENT	4	6	12
2: TO SOME EXTENT	2	11	5
3: TO A LOW EXTENT	13	2	4

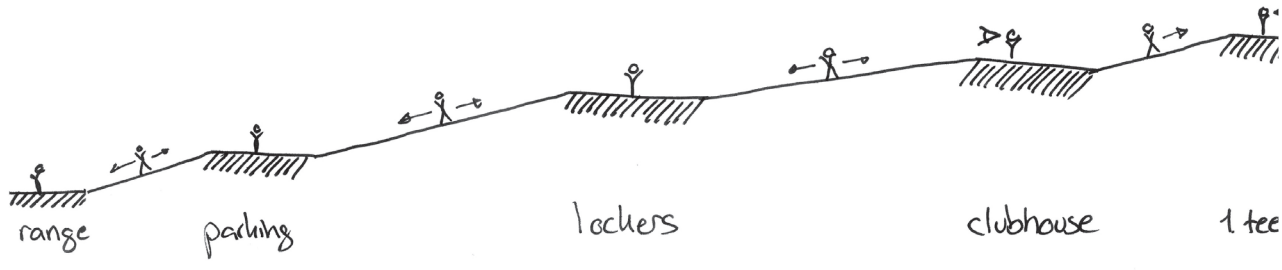
PHASE 02 - SITE PLAN



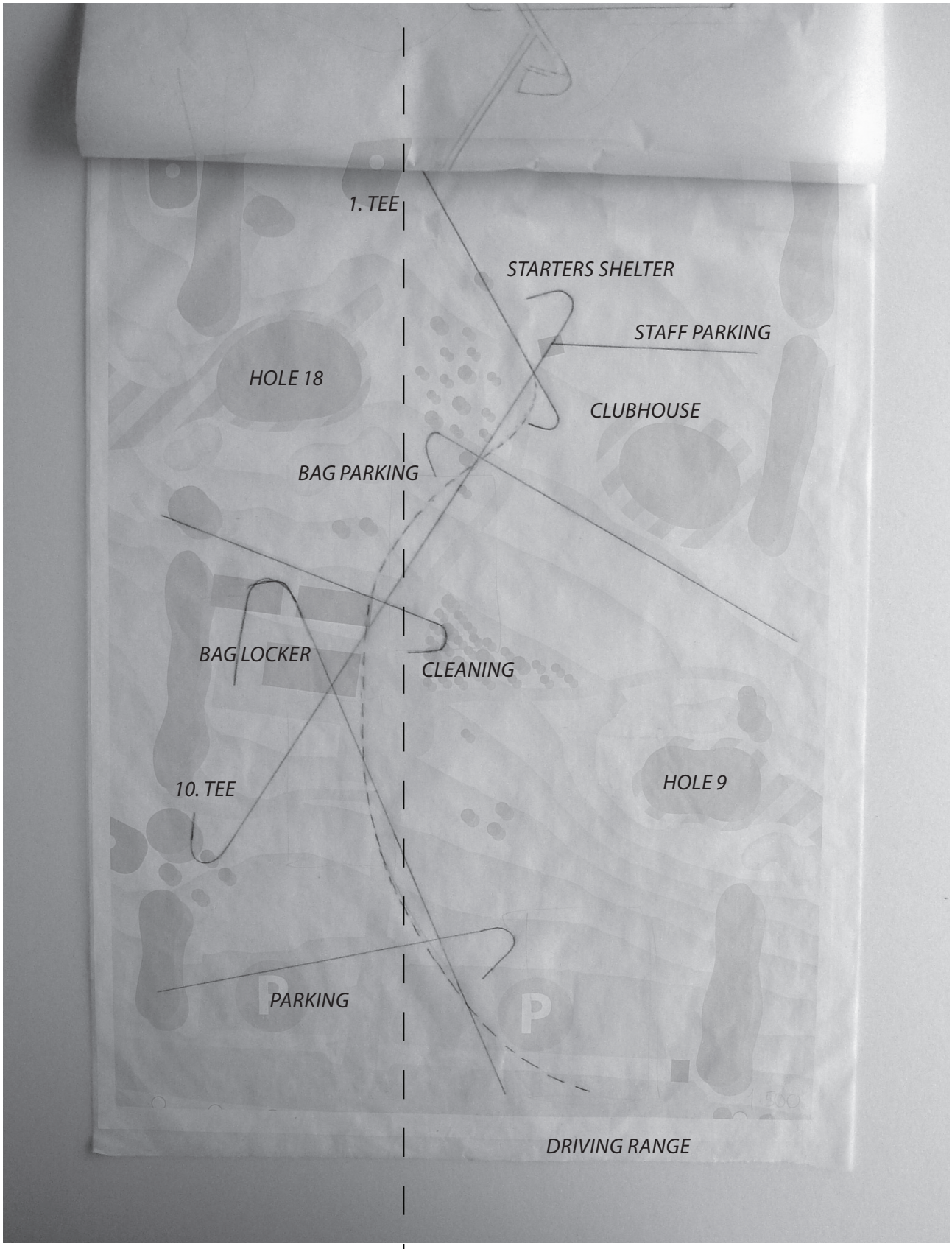
It is a wish, that the architecture should support the experience provided by the golf course, and therefore the building will be conceived as part of the spatial landscape of the entire golf course. Not only a point for relaxation after a round of golf, but just as much as a passage for various other events. It can be deliveries to the clubhouse, access for staff, going to the toilet, taking a bath, buying equipment in the proshop etc.
Thus the architecture should act as a passage through the landscape.

Based upon the previous analysis of access routes etc., sketching begun by placing the various functions along a path to the clubhouse.

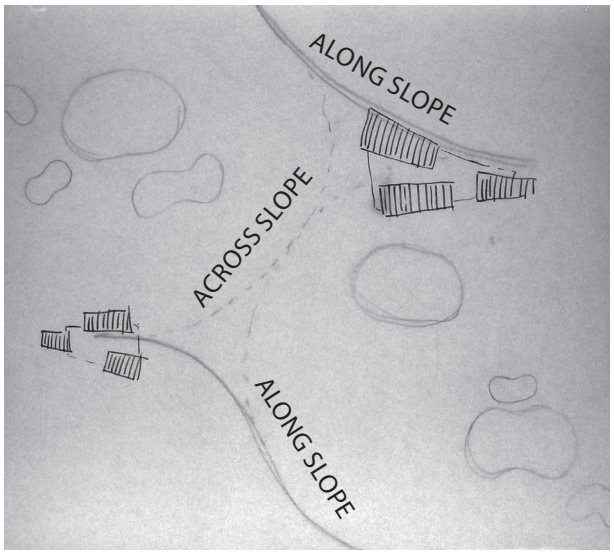
CONCEPTUAL SKETCHES OF THE APPROACH TO THE CLUBHOUSE



A SECTION FROM NORTH TO SOUTH PLACING THE VARIOUS FACILITIES ON SEPERATE LEVELS

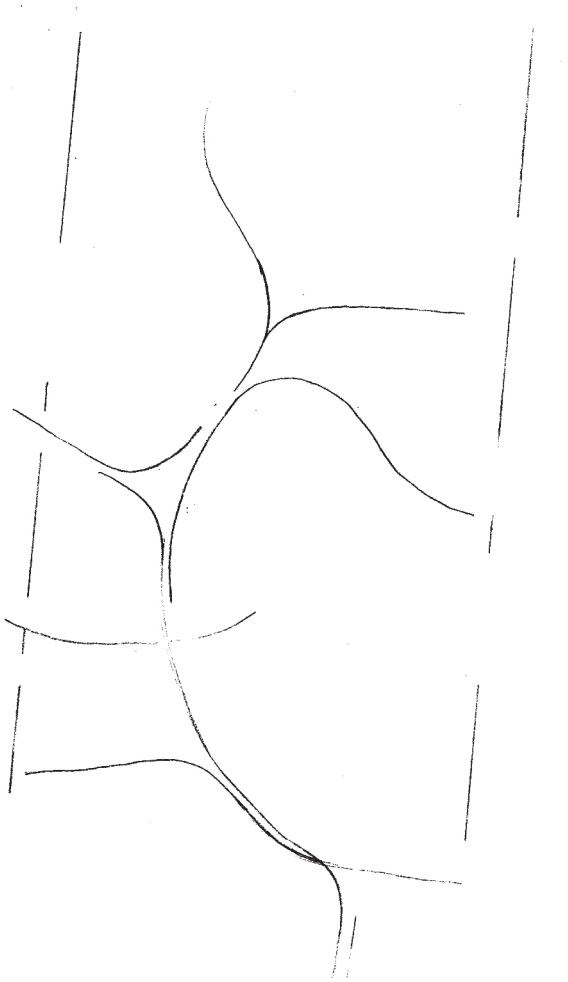


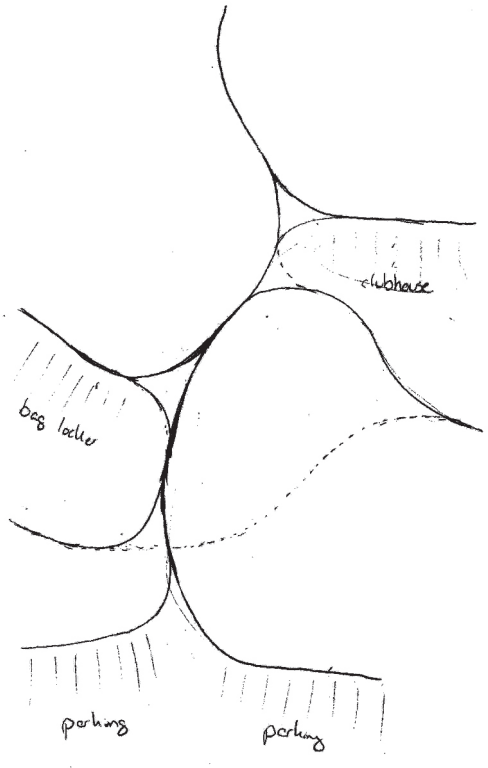
PLACING THE VARIOUS FUNCTIONS ALONG A PATH TO THE CLUBHOUSE

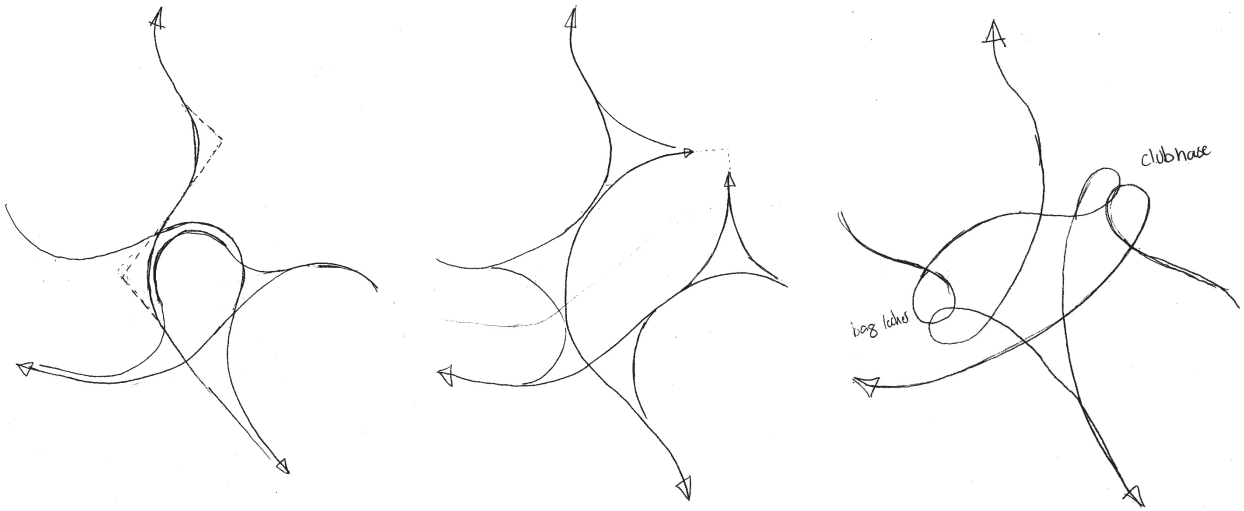


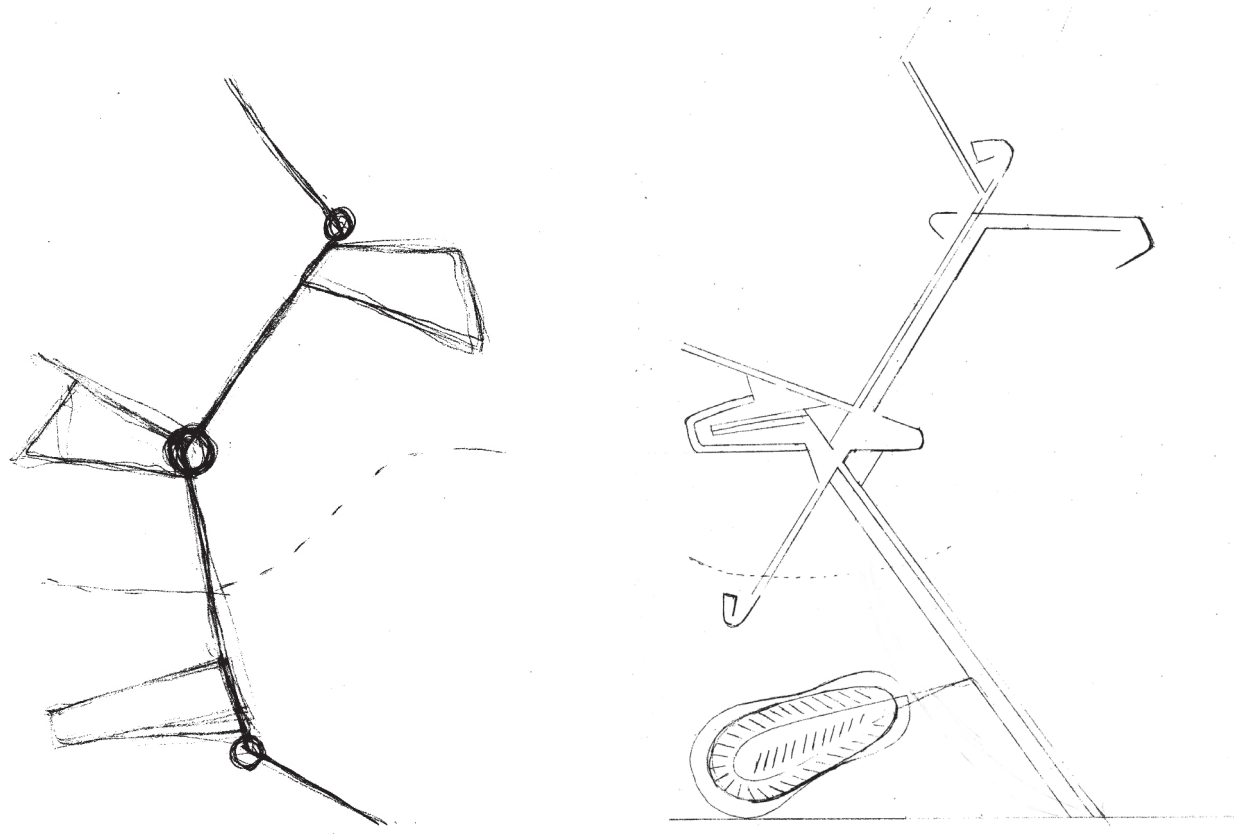
PATHS

Various proposals for paths through the site were sketched upon.
Some trying seamlessly to adapt to the contours of the site by a continuously curved path. Others dividing the experience into several staged sequences by laying out straight paths in the landscape.
A common idea however was to use the contours of the site to guide the approach to the building. Not placing all facilities at one level, or creating a direct path from a to b, but orchestrating the approach, by introducing several levels and destinations in the landscape.






clubhouse
boat ramp



SITE PLAN

The final proposal for this project is not very detailed, however the main idea has been to have a spine from the asphalted road in south towards the 1st tee in north.
The spine start by running parallel to the slope when arriving at the site, then it slowly rises as the landscape rises towards the clubhouse, and finally it flattens out again on the top of the landscape, when arriving at the 1st tee.
The spine connects various levels and plateaus. Thus along the spine the different functions such as parking, bag locker, clubhouse etc are placed on separate levels.

The path from the level of the bag locker to the clubhouse, is up hill, but when arriving at the entrance, you walk along the slope to a plateau in the landscape. A reminiscent of how one moves in on the golf course. Starting at the plateau of the tee, travelling along the winding path of the fairway, and arriving at the plateau of the green.

Trees and walls placed on lines and in clusters reaches out into the landscape and orchestrate the approach to the clubhouse.

Likewise the potential use of various heights of grass, can define various areas, paths and experiences of the building in the landscape.
An idea have been to let the high grass go all the way up to the building several places to give the impression that one is surrounded by nature.

As outdoor spaces in proximity to the building I have med to partly covered terraces in direct extension to the two primary indoor spaces.


1. TEE
BAG PARKING
STAFF PARKING
HOLE 18
CLUBHOUSE
BAG LOCKER
HOLE 9
10. TEE
PARKING
DRIVING RANGE

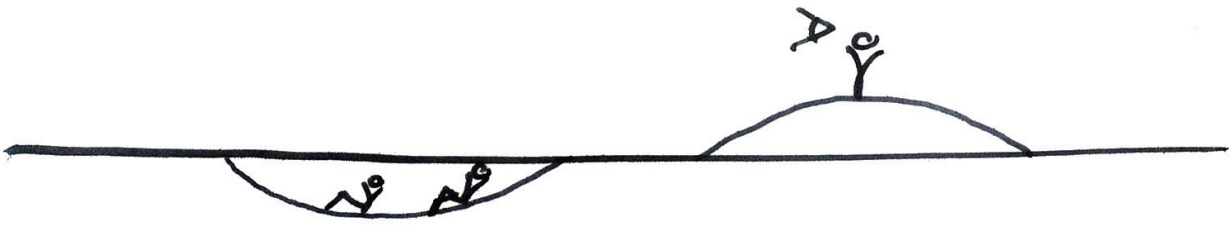
PHASE 03 - INITIAL CONCEPT

Based on the previous section, my personal attitude towards architectural design and the analysis of the site, I have come to a concept that consists of 4 layers.

- First a terraced plateau on the slope.
- Second a functional program defined by walls oriented south/north.
- Third a structural layer of columns and solids.
- Fourth the covering of the roof.

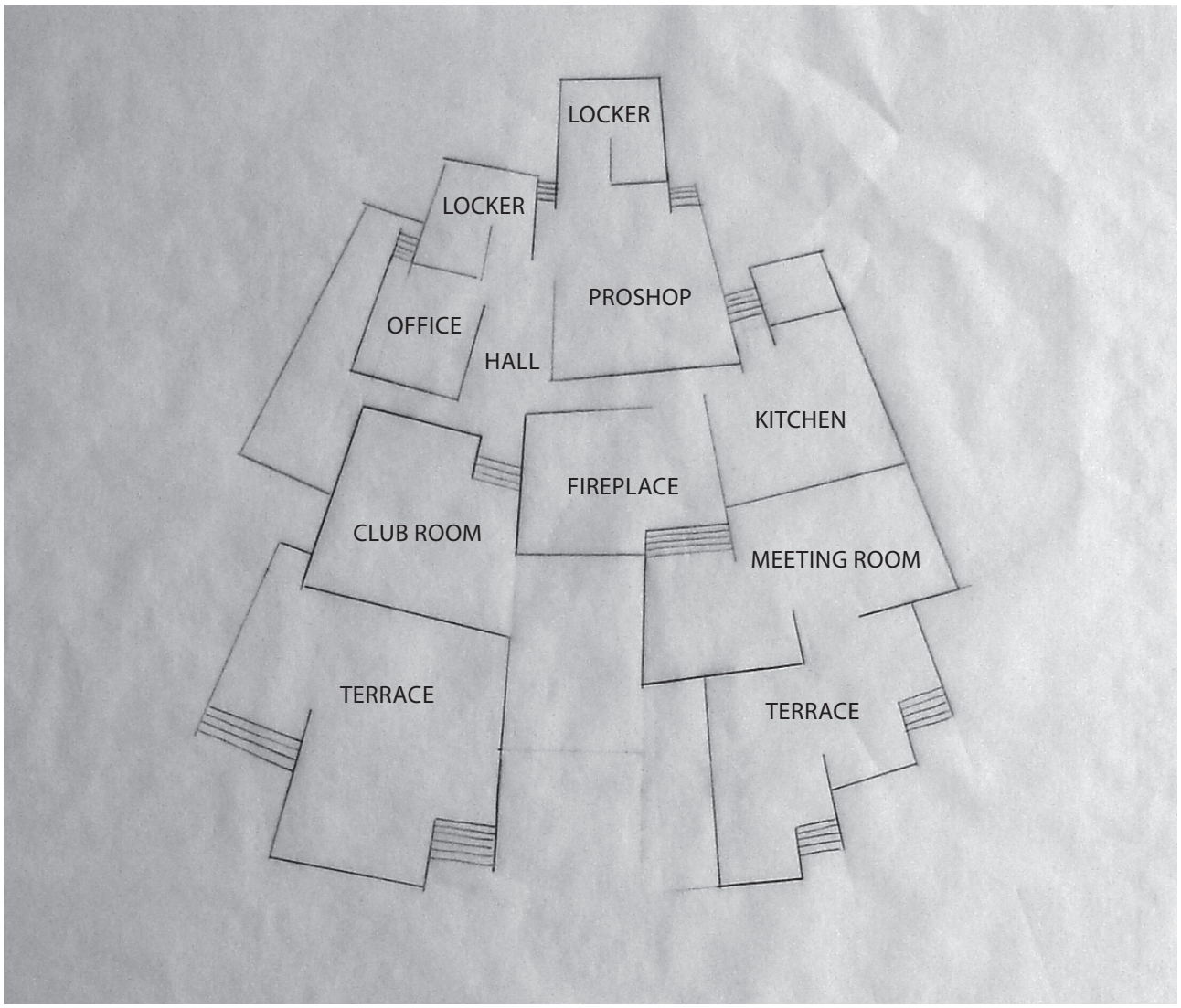
A TERRACED PLATEAU

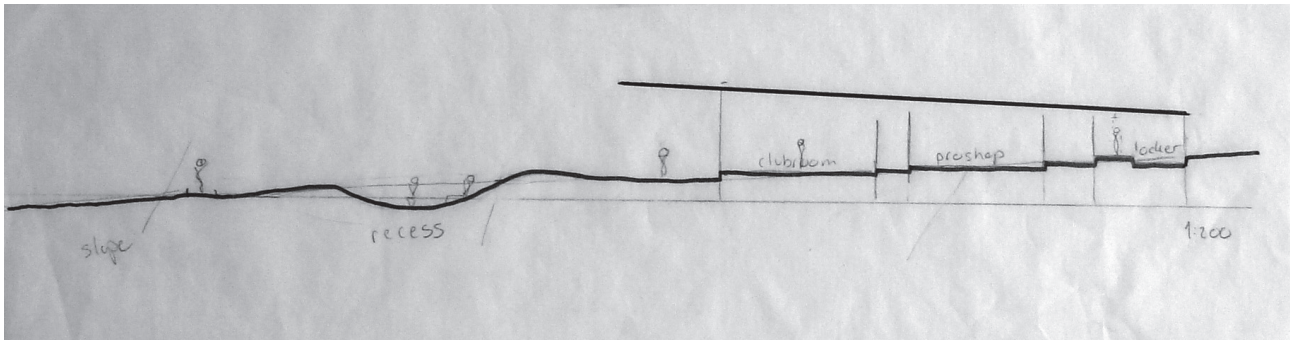
First a terraced plateau on the slope. Creating a base for the functional program, emphasising and adapting to the sloping terrain.
Plateaus on the slope resembling greens and tees with a view to the horizon.
Recesses in the terraced plateau resembling bunkers with shelter and a place to rest.



BUNKER
RECESS CREATING SHELTER

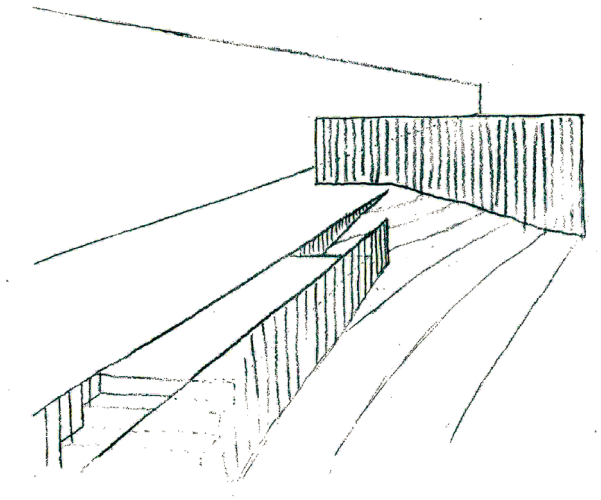
TEE / GREEN
PLATEAU WITH A VIEW


LOCKER
LOCKER
PROSHOP
OFFICE
HALL
KITCHEN
FIREPLACE
CLUB ROOM
MEETING ROOM
TERRACE
TERRACE

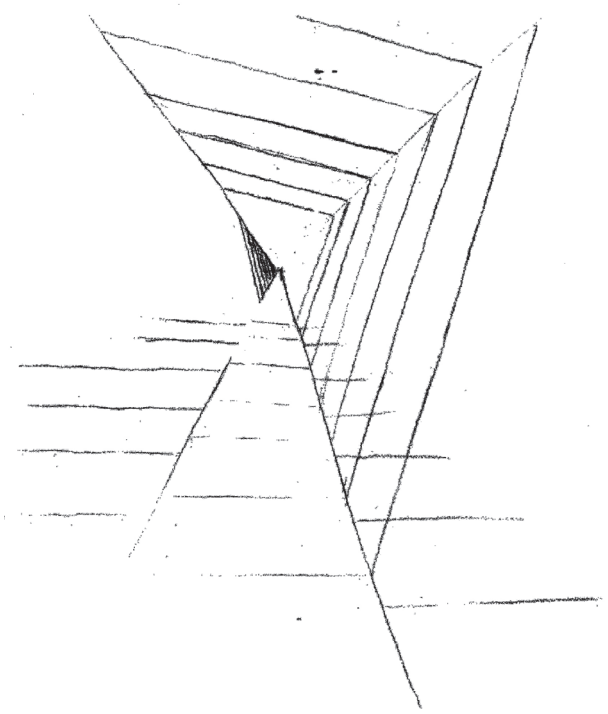

clubroom
proshop
locker
slope
recess
1:200

A FUNCTIONAL PROGRAM

Second a functional program defined by walls oriented south/north.
Originating from the clubhouse but penetrating into the open landscape, to scale down the experience of a building in the landscape. Letting it grow in scale as you approach the building.
Resembling the hedgerows in the landscape, defining certain spaces, shelters, views and paths through the landscape.
The sketches below exemplify some of the walls potentials described earlier.



A BOUNDED OUTDOOR SPACE IN CONTINUATION OF AN INDOOR SPACE CREATES AN INTERMEDIATE ZONE BETWEEN LANDSCAPE AND BUILDING



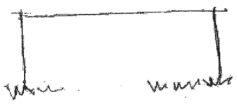
A TUNNEL OF GATES ORCHESTRATE THE APPROACH TO THE CLUBHOUSE

A STRUCTURAL LAYER OF COLUMNS AND SOLIDS

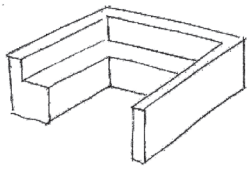
Third a structural layer of columns and solids.
The columns resembling the more freestanding trees, defining a space around them, in the open landscape.
Whereas the walls to the north densify and become solids that are partially load baring, the walls towards the south densify to become permanent furniture for the main space.
Using the potential of creating space inside the solids by excavating one's way through it.

THE USE OF ARCHITECTURAL ELEMENTS

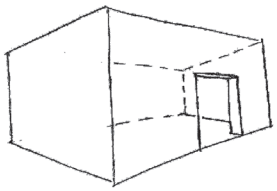
COLUMN
SPACE AROUND IT



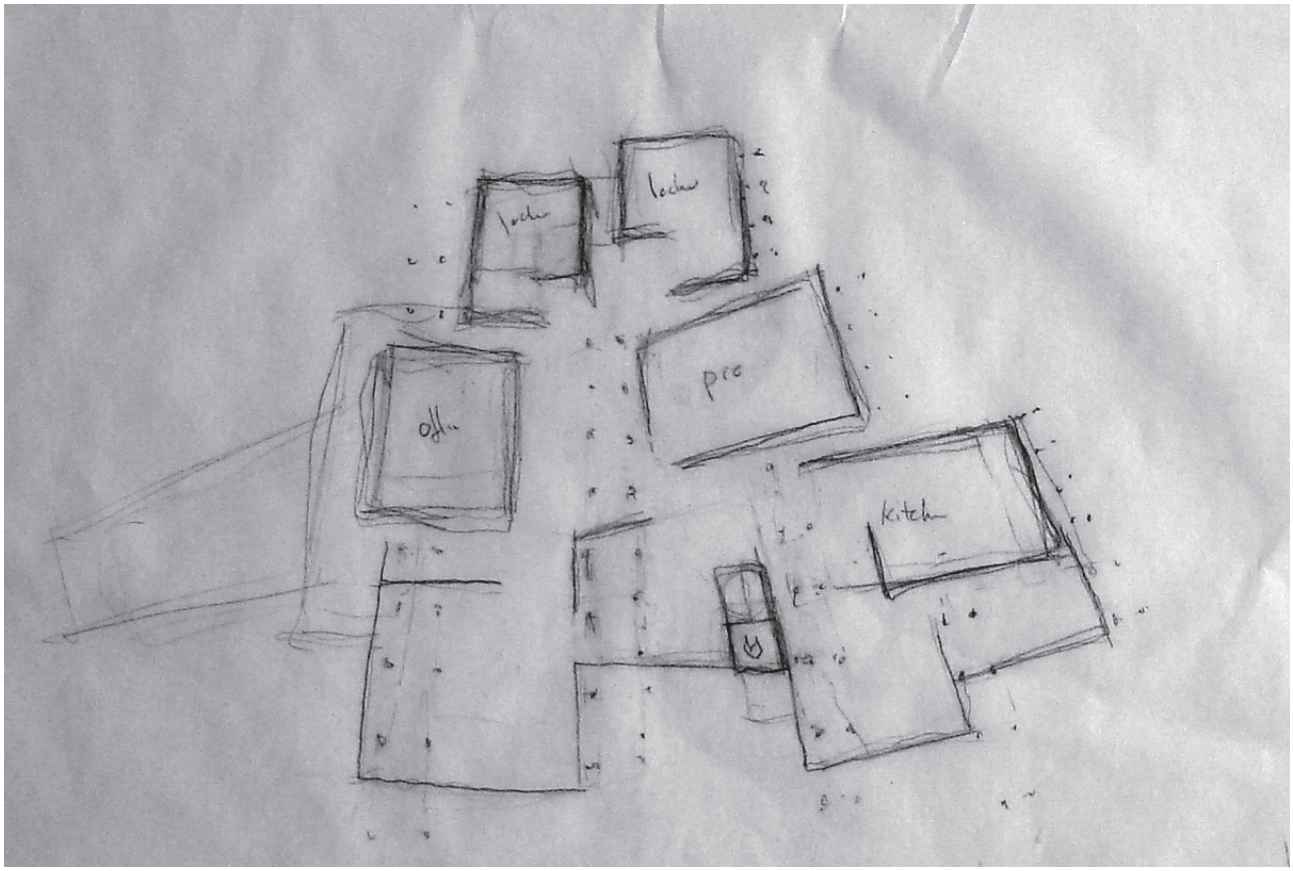
WALL
SPACE BESIDE IT

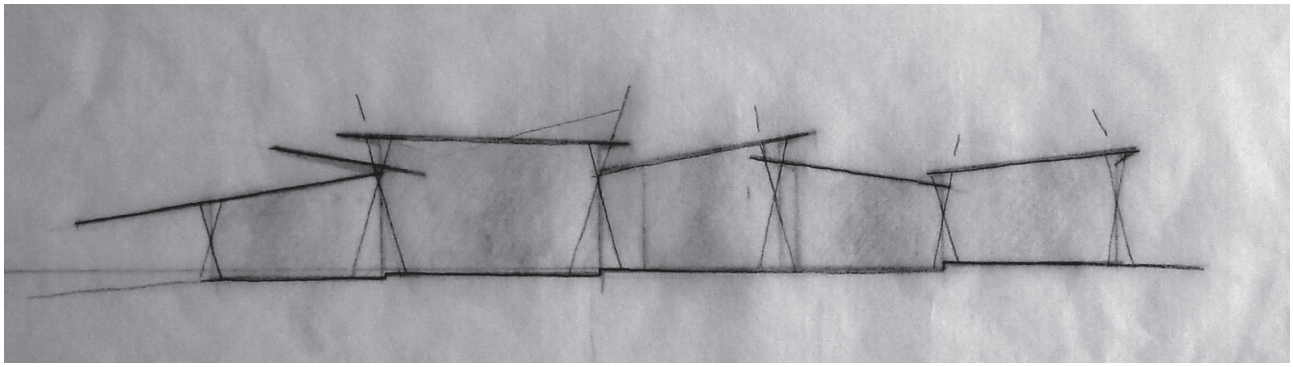


WALL AS FURNITURE
SPACE ON IT



WALL AS SOLID
SPACE INSIDE IT

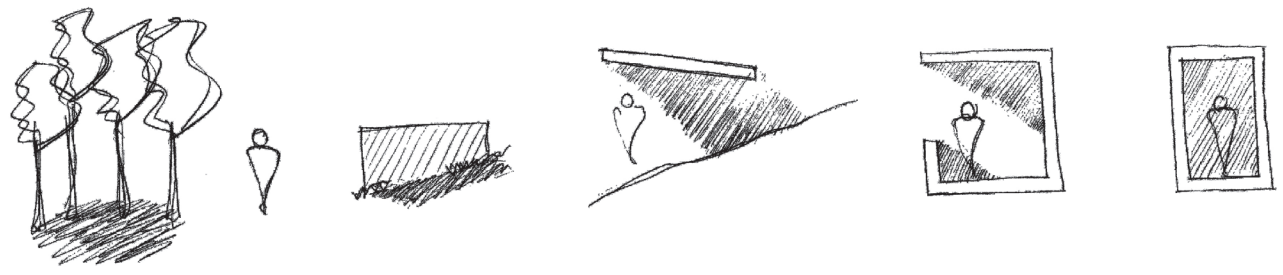

pre
Kitch



COVERING OF THE ROOF

Fourth the covering of the roof.
Creating shelter from the climate, but also allowing the sun to penetrate the interior spaces of the house. Creating differentiated light conditions depending on the functional needs.

LIGHT AS A GRADED PROGRESSION



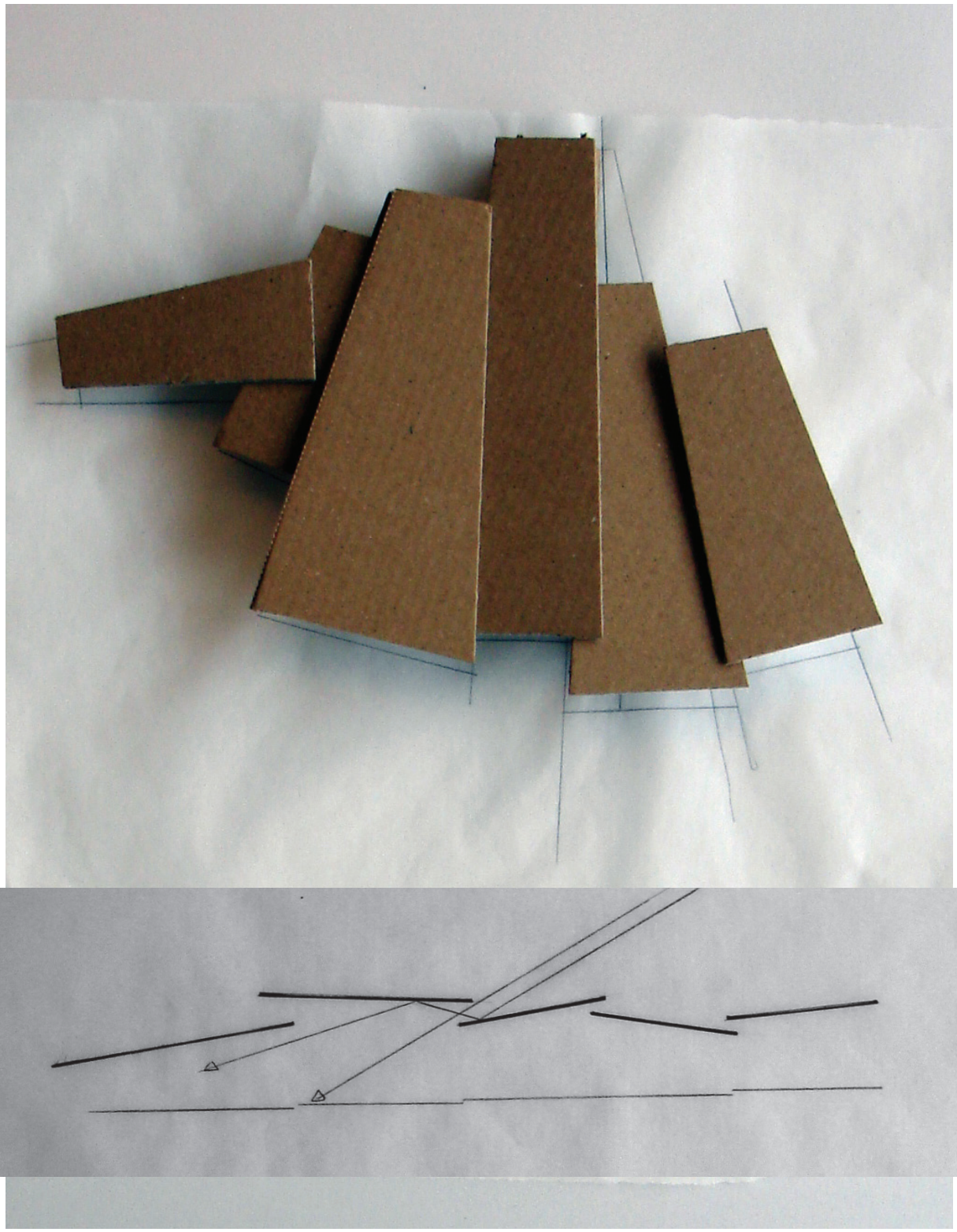
FORREST AND CLEARING

WALL IN LANDSCAPE

COVERED SPACE

PROTECTED SPACE

ENCLOSED SPACE



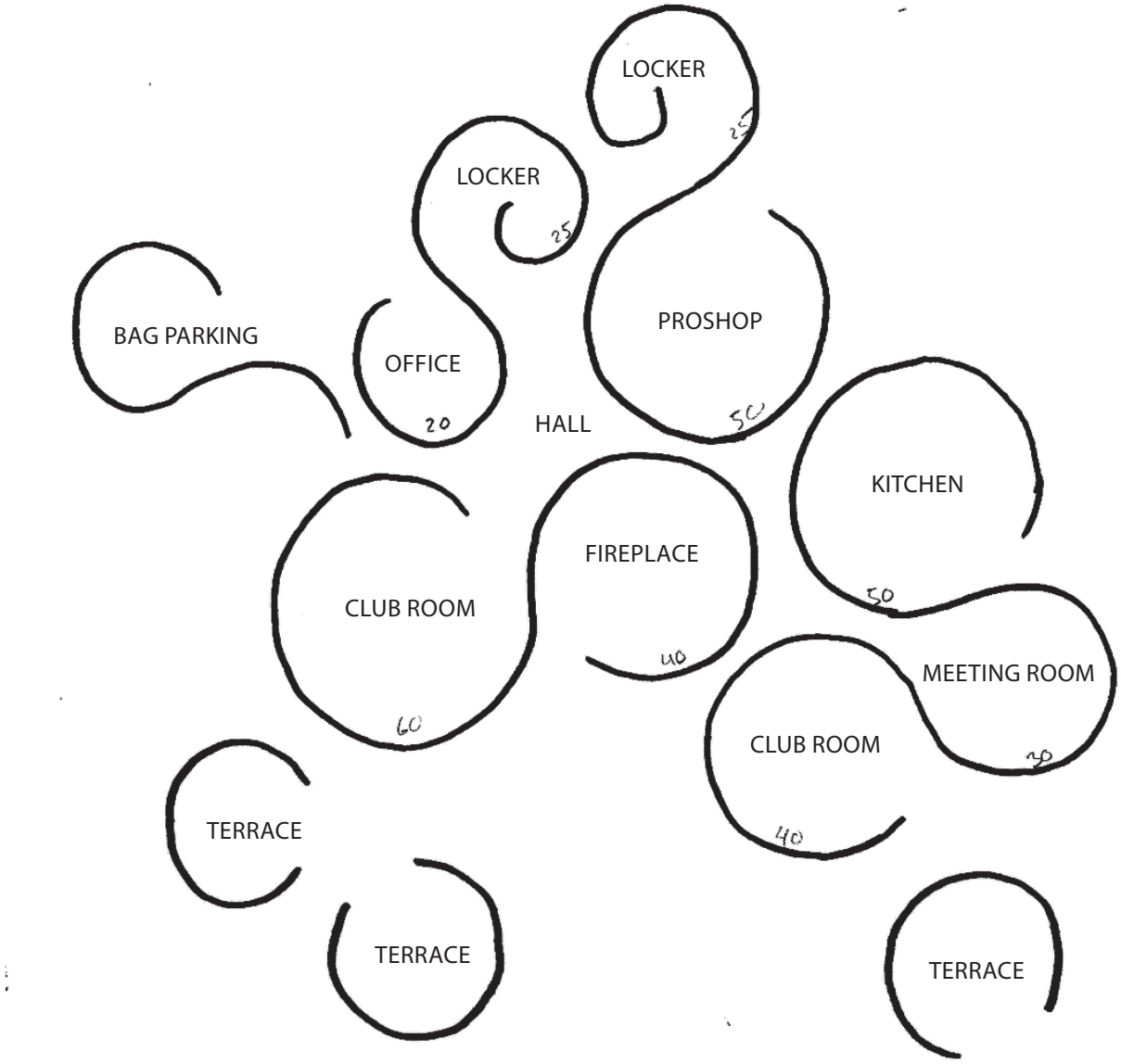
PHASE 04 - PLAN

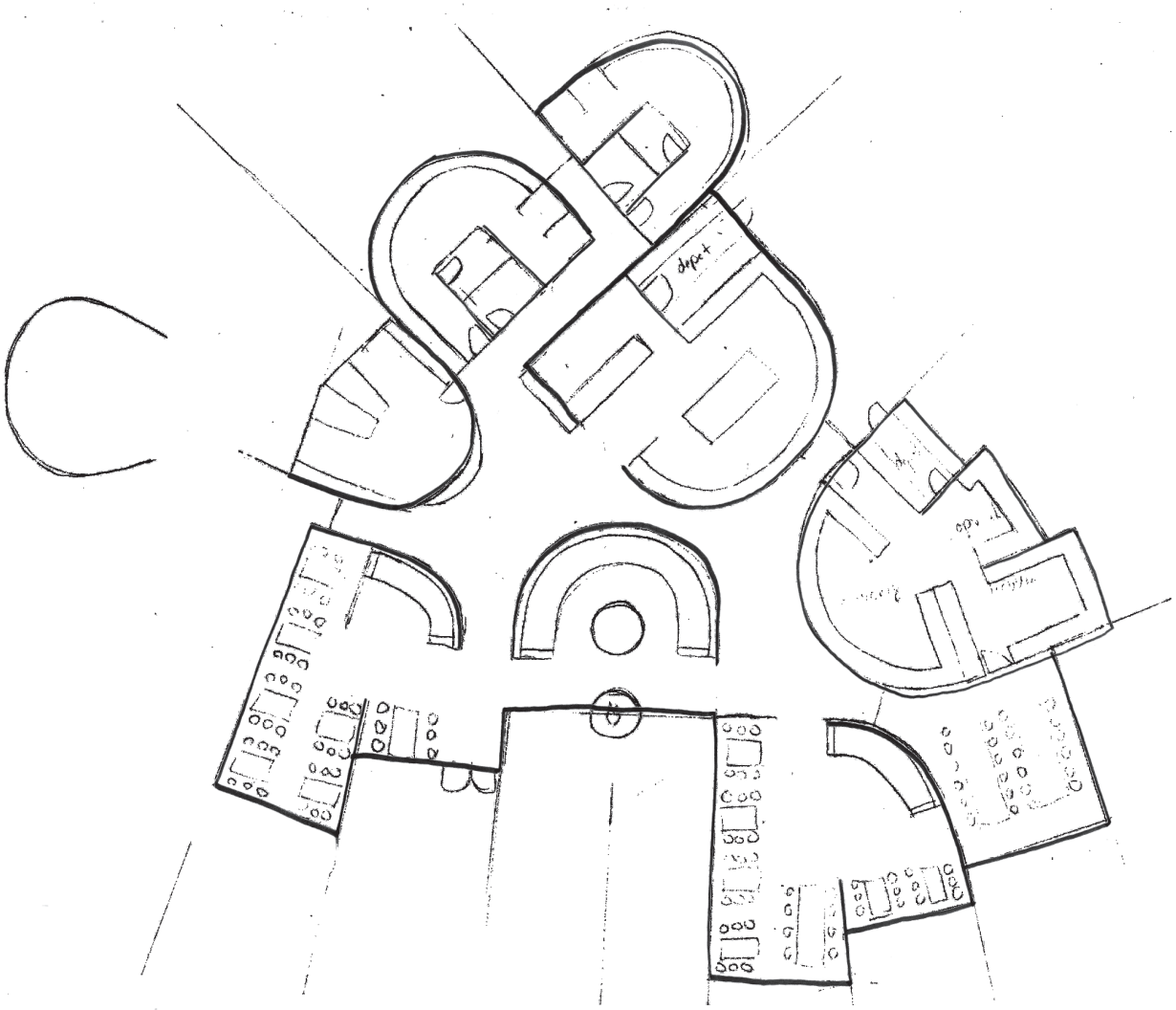
Based on the initial concept this section will show how the florplan developed.

One of the starting points, were to play with circular forms, inspired by the shape of the surrounding greens.
Each space from the programme, was represented with a circle, with an area equivalent to the size of the space specified in the room programme. Some spaces were divided into several circles.

This simple sketch resulted in an interesting spatial landscape, with different spatial qualities such as caves, narrows, gaps and more open spaces connected by a soft spiraling movement.

The next step of detailing the plan resulted in various suggestions, more or less organic in shape. Some more organic and closed towards the north, while more orthogonal and open towards the south.

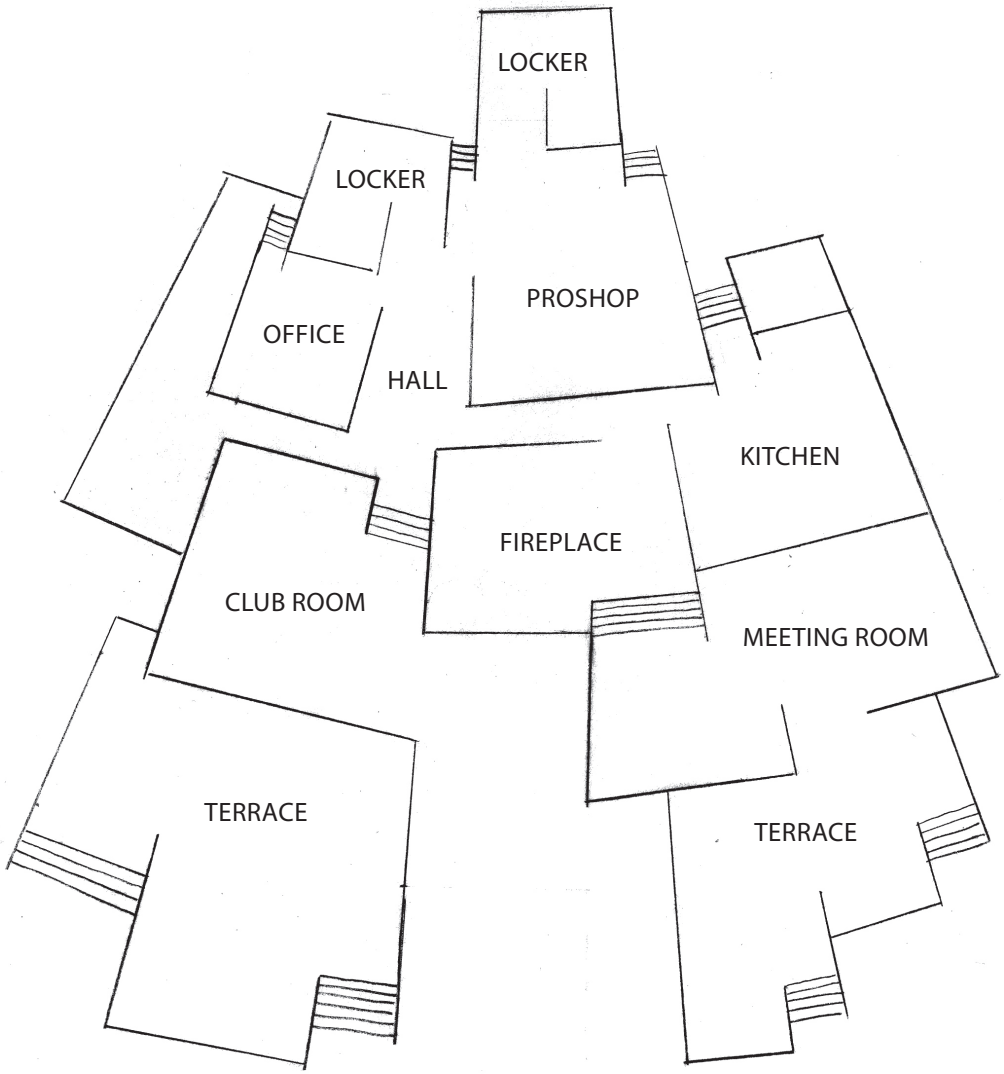


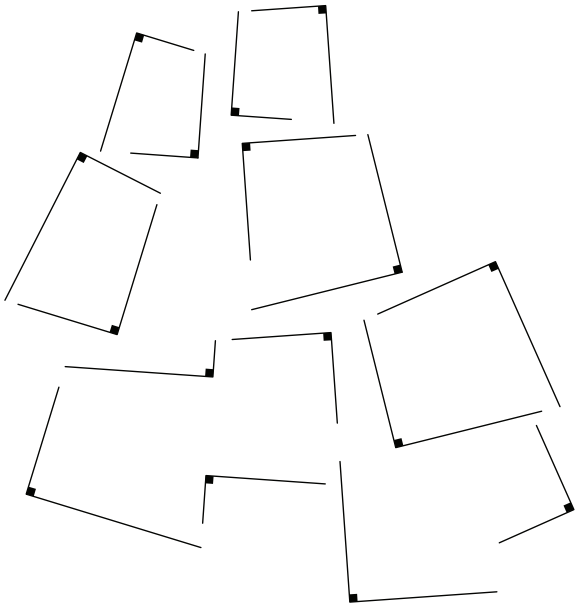

dept

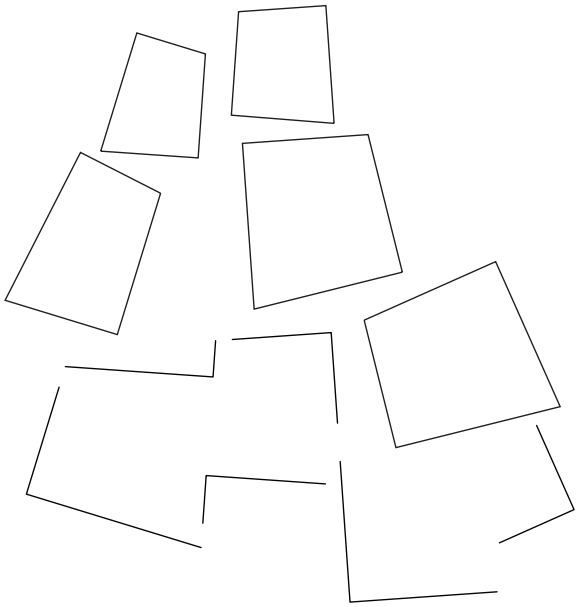
Another solution played with L-shaped walls that together could form either a closed solid or a connected open space.

The solution with the L-shaped walls was chosen for further investigation as i allowed for an easier distinction between the various plateaus.
Further the roof would come to consist of several independent planes, which this solution come to fit the best.

Secondly this solution made a more clear distinction between the various spaces, with the potential of using the gaps to frame certain views and allow daylight to enter the building.





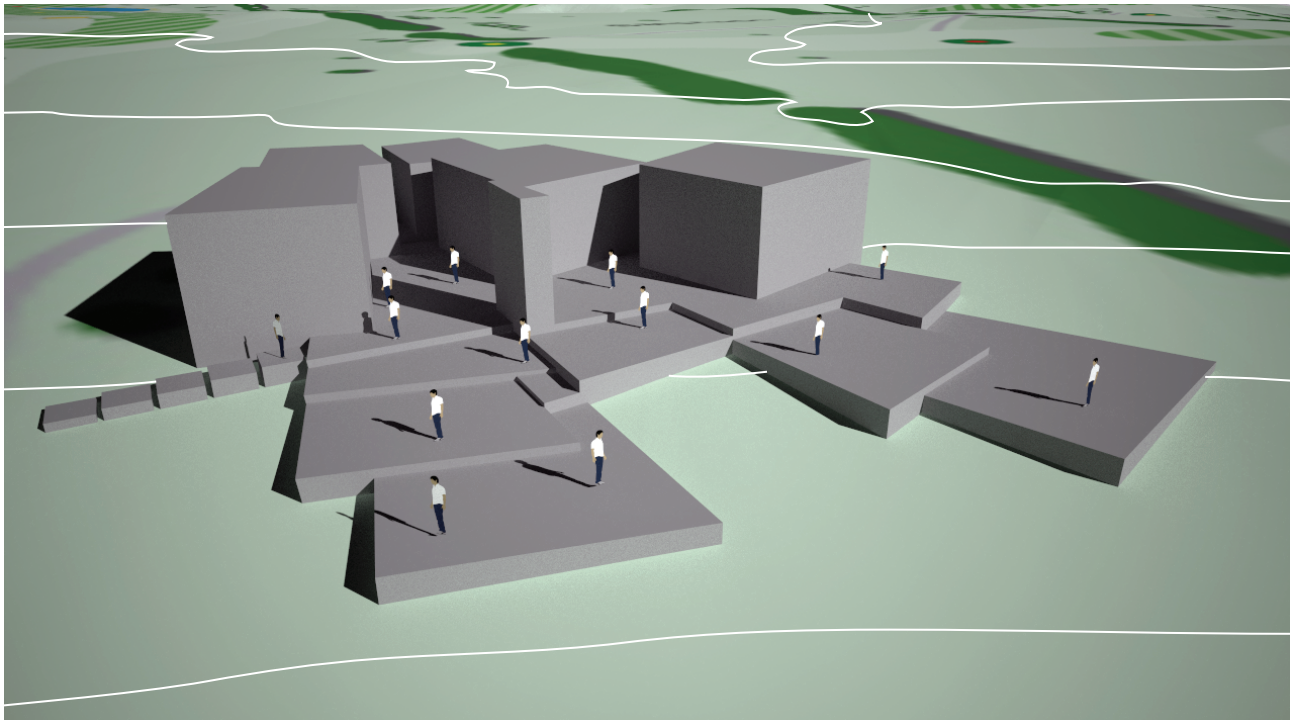


PHASE 05 - SECTION

While sketching on the plan also the roof and section was investigated.

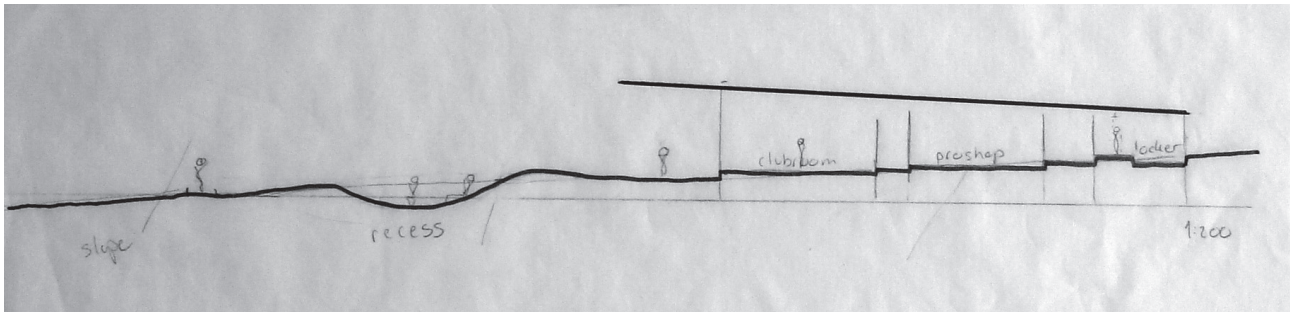
The idea is that the plateaus should reflect the actual slope of the original terrain and define spaces within the open plan towards the south.

Thus the level of the floor will be more or less planar from east to west, as this section is parallel to the slope of the terrain.
The roof however was sketched consisting of several layered planes, allowing sun to penetrate to the middle of the house, and create a differentiated height of the various spaces. Defining the spaces not only by means of walls, but also by light conditions and the height of the room

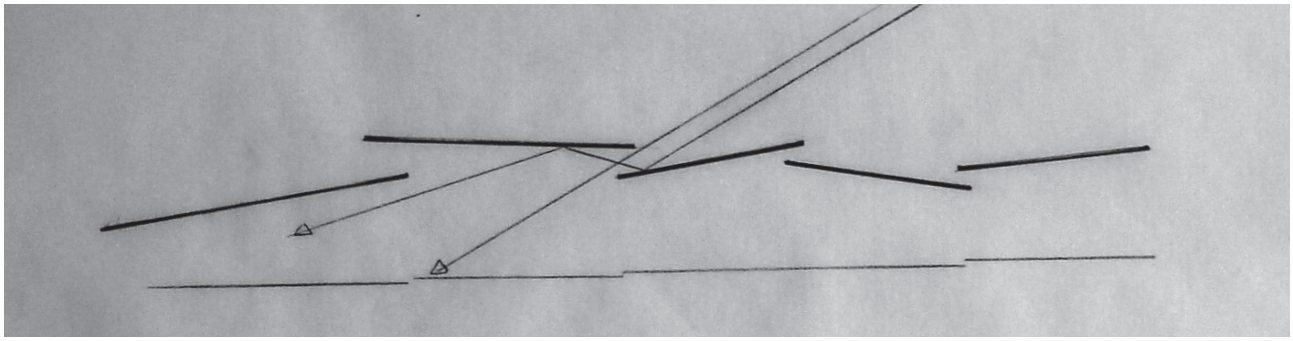


PLATEAUS ADAPTING TO THE SLOPE OF THE TERRAIN

Whereas the section south to north was placed perpendicular to the slope and the various plateaus, making it go from a large open and light space in the south to a small closed and darker space in the north.



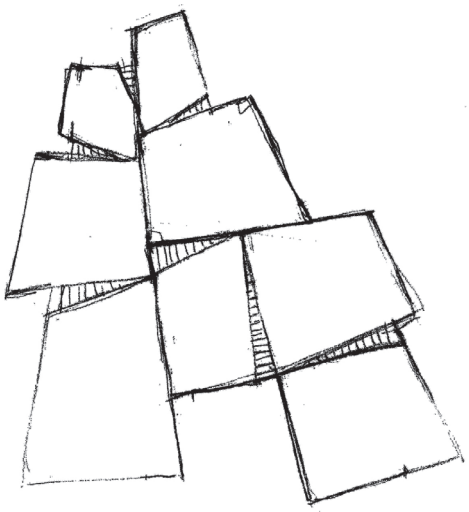
SECTION SOUTH TO NORTH

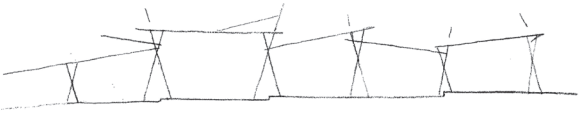


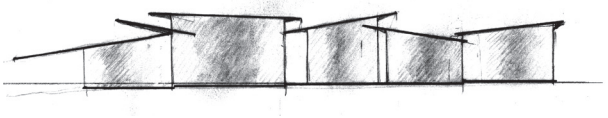
SECTION EAST TO WEST

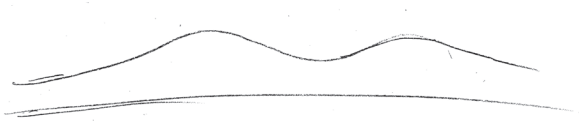
Other solutions with either a continuous roof or one consisting of even more planar roof surfaces was also investigated. However, placing openings in the continuous roof, did not seem natural, whereas more planes seamed to confuse the experience from the interior of the house.

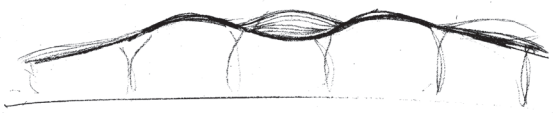
Thus the solution with 5 roof planes was investigated further, taking into consideration how to dewater the roof and how the roof could support the spatial experience of the spaces below.

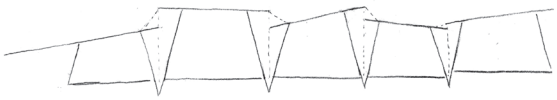


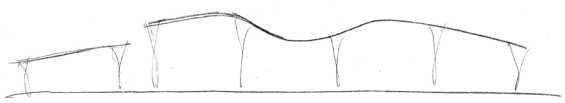


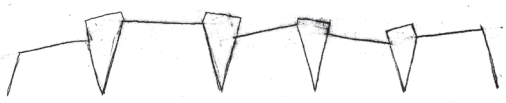




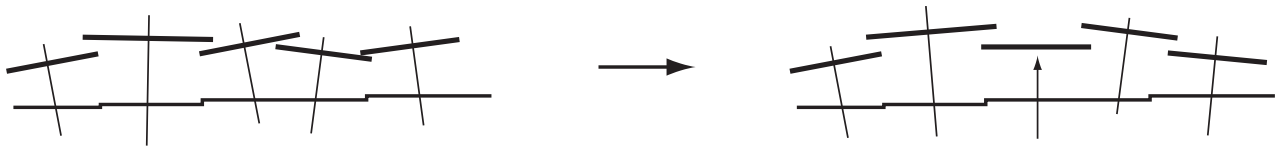


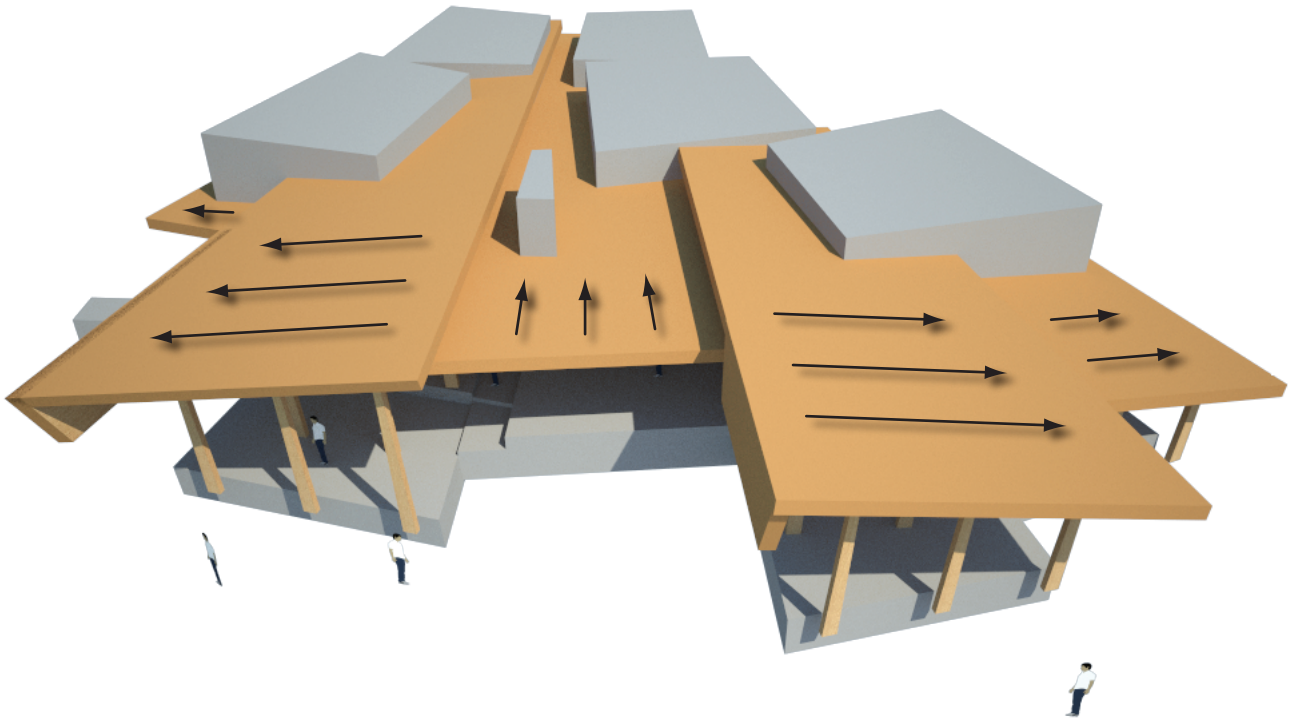






This lead to a proposal where the roof plane in the middle, hovering over the fireplace, was pulled down, compared to the neighbouring roof planes.
To allow the roof to dewater, the roof plane in the middle only slopes down to the north whereas the others also slopes down to either the east or west.



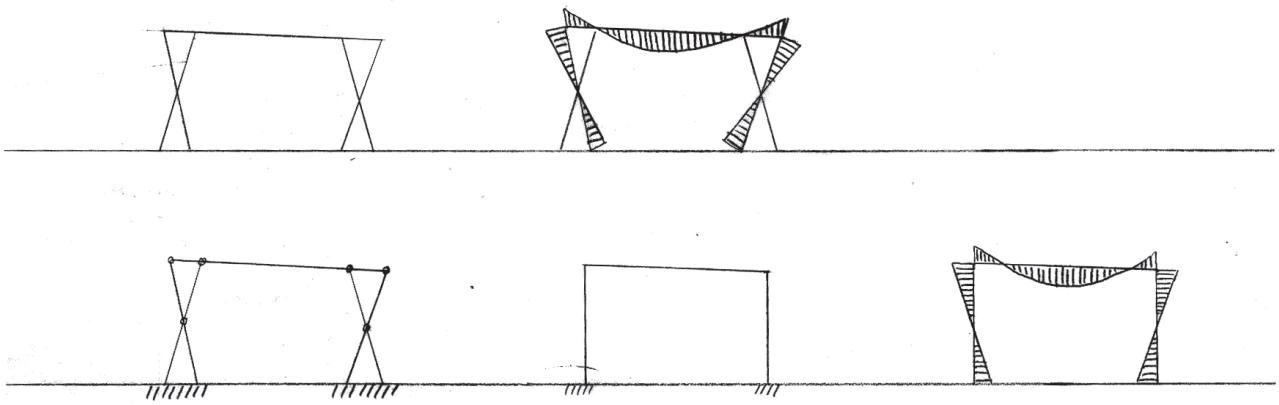


PHASE 06 - CONSTRUCTION

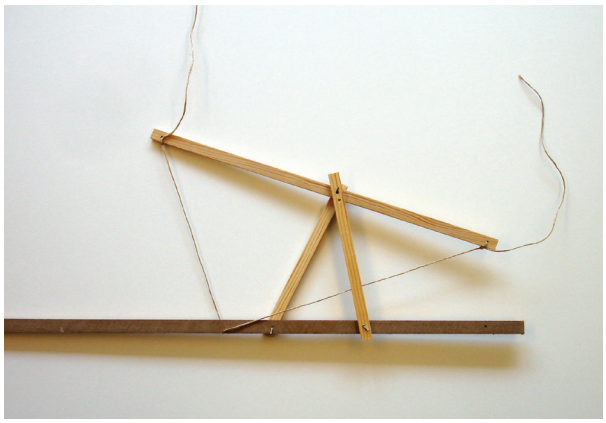
The roof hovering over the building will need some points of support.
Thus simultaneously as sketching on the architectural plan and section, sketching was also performed on the structural system.

INITIAL STRUCTURAL SKETCHES

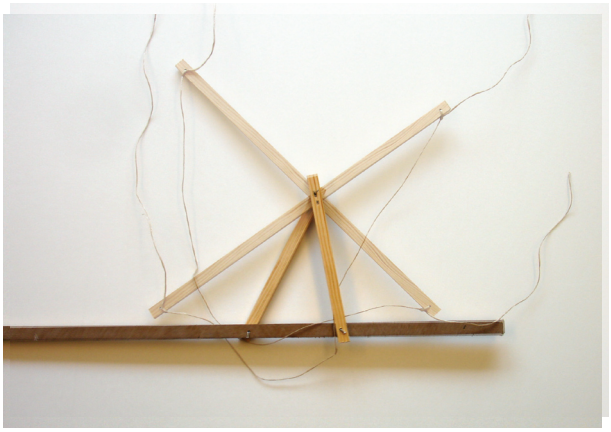
Initially various structural systems was sketched upon, to get ides for structural systems to be used in the design.
When sketching, not only the structural elements was sketched, but also the flow of forces and how the elements were tied together.
A simple model was also build to test the physical performance of a roof with one point of support, stabilised by two steel wires.



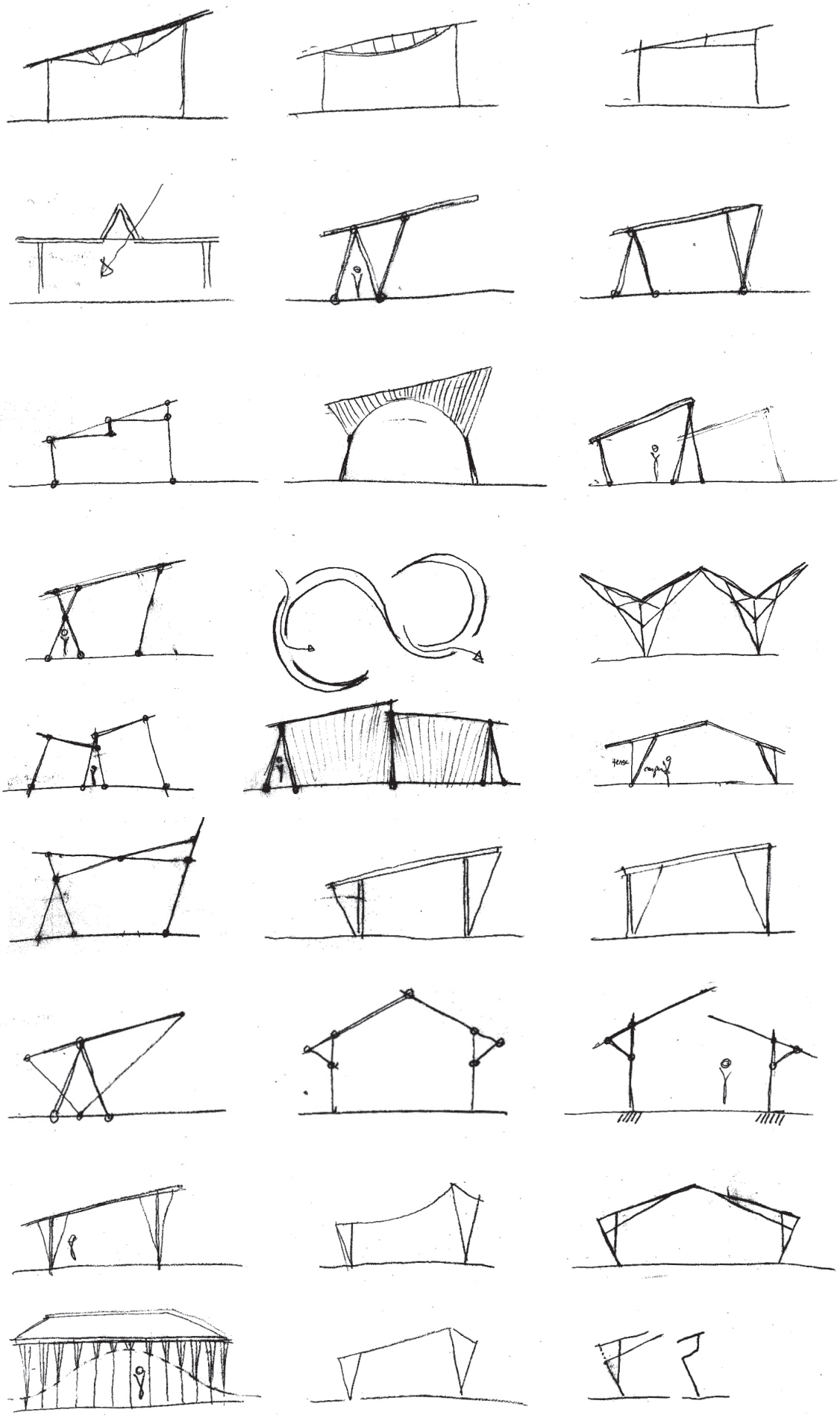
SKETCHING ON THE FLOW OF FORCES BASED ON HOW ELEMENT ARE TIED TOGETHER



PART OF THE BEAM WILL ACT AS A CANTILEVER, DEPENDING ON THE LOAD



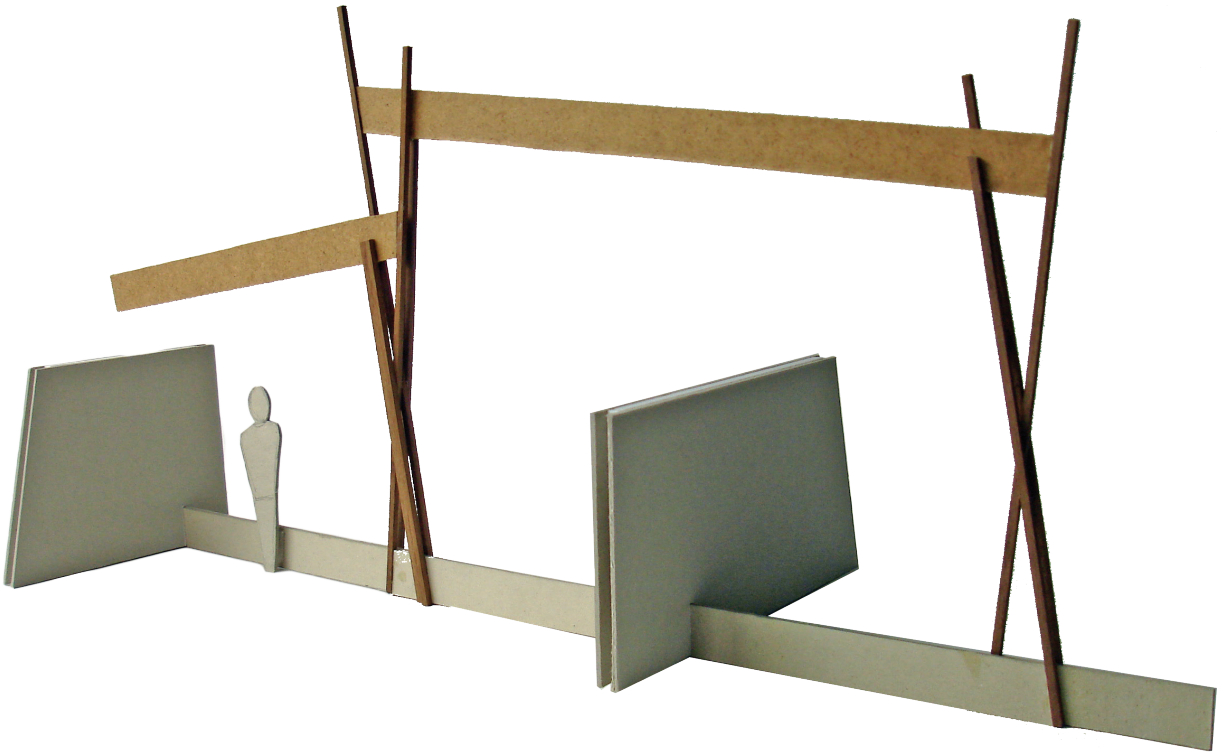
WITHOUT THE STEEL WIRES, THE ROOF WILL COLLAPSE

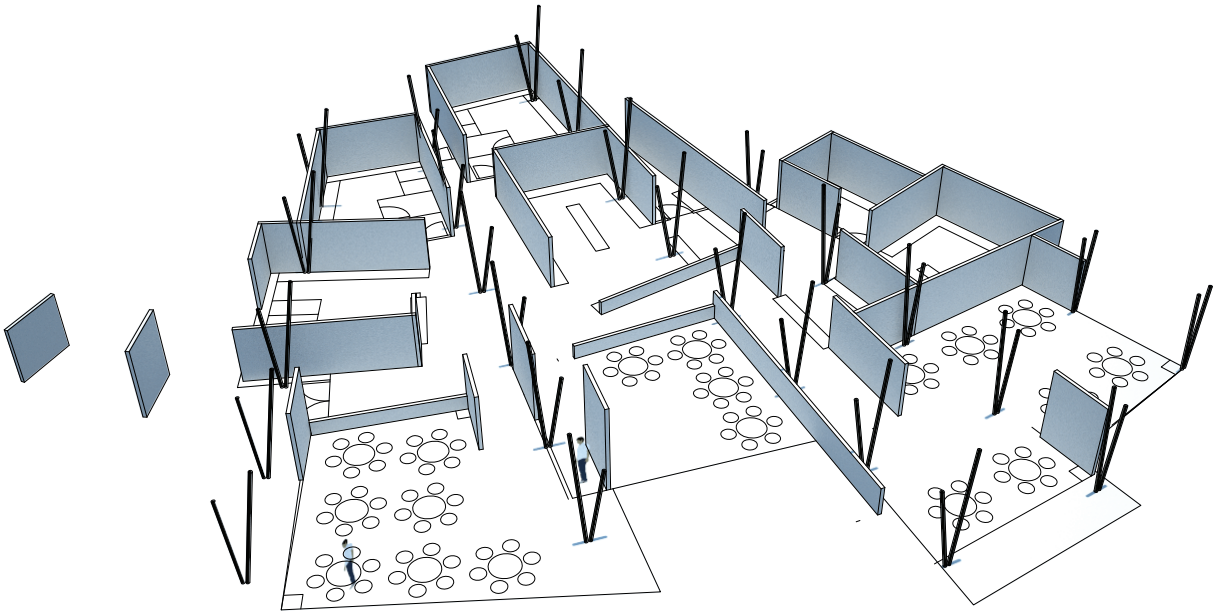


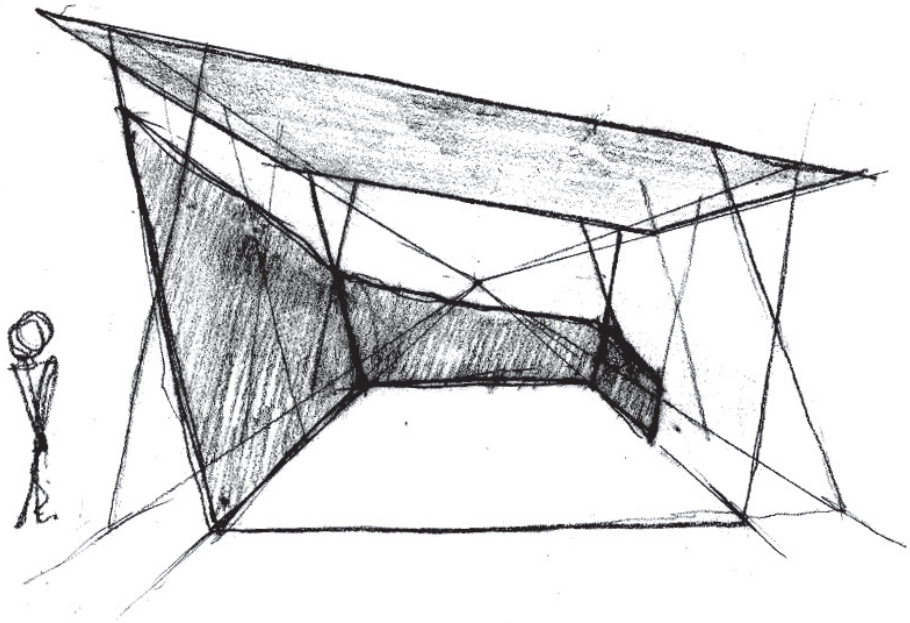
INITIAL SKETCHES ON THE STRUCTURAL SYSTEM

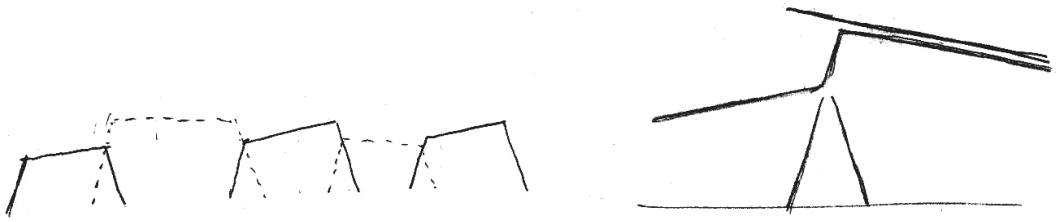
COLUMNS ALONG THE EDGE

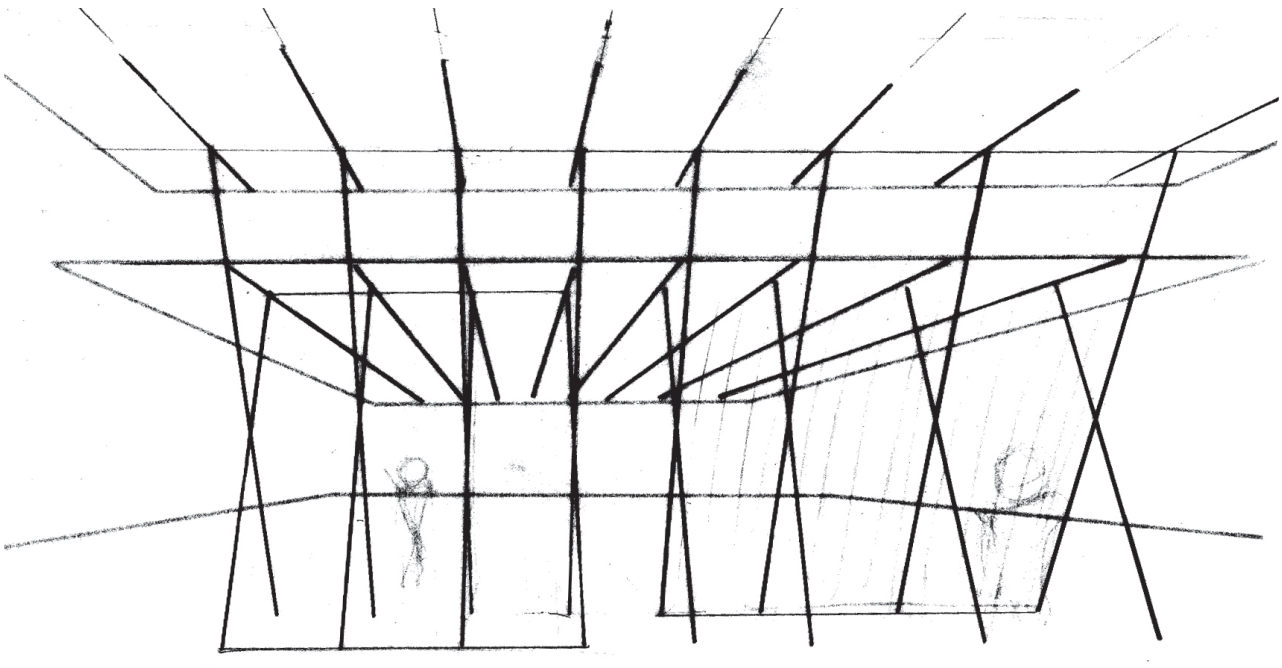
First a solution with columns, placed along the edge of neighbouring roof planes, was investigated.
In this proposal, only the columns would support the roof, and the walls would only function to define space. Thus the construction had 3 parts: Columns, beams and the actual roof plane.
In the open parts towards south this solution worked out, but towards the north the columns clashed with the walls. In general the columns took up to much space.





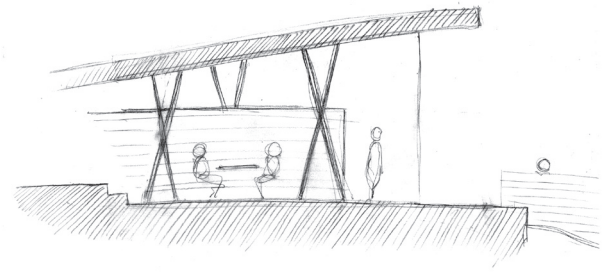


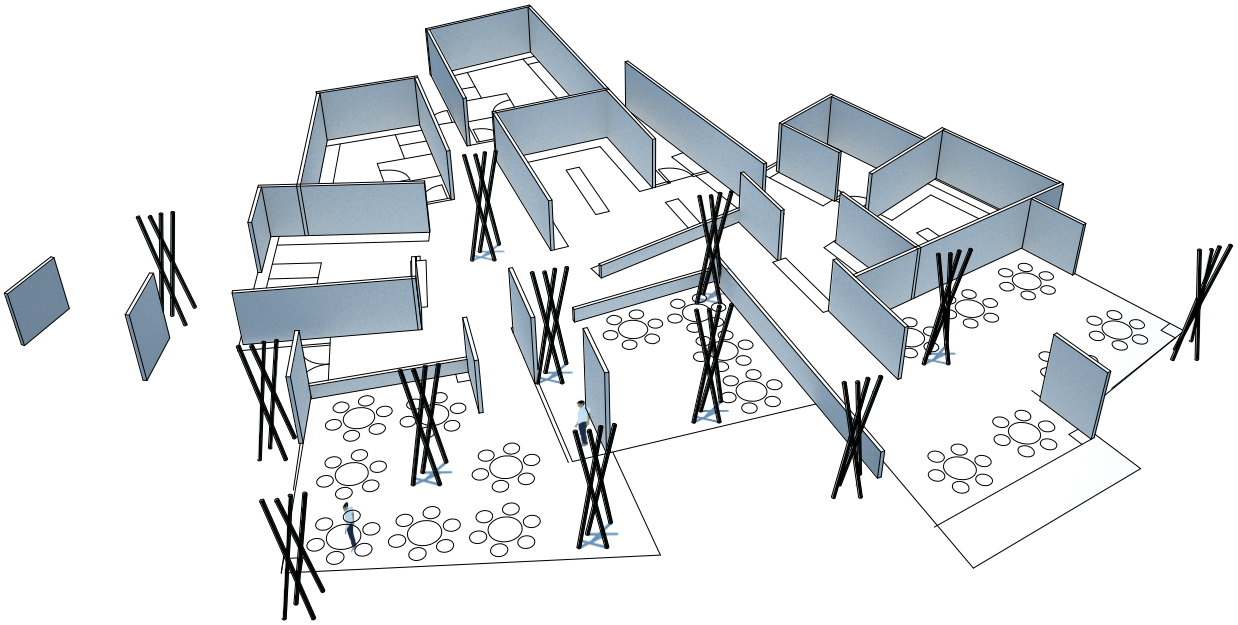


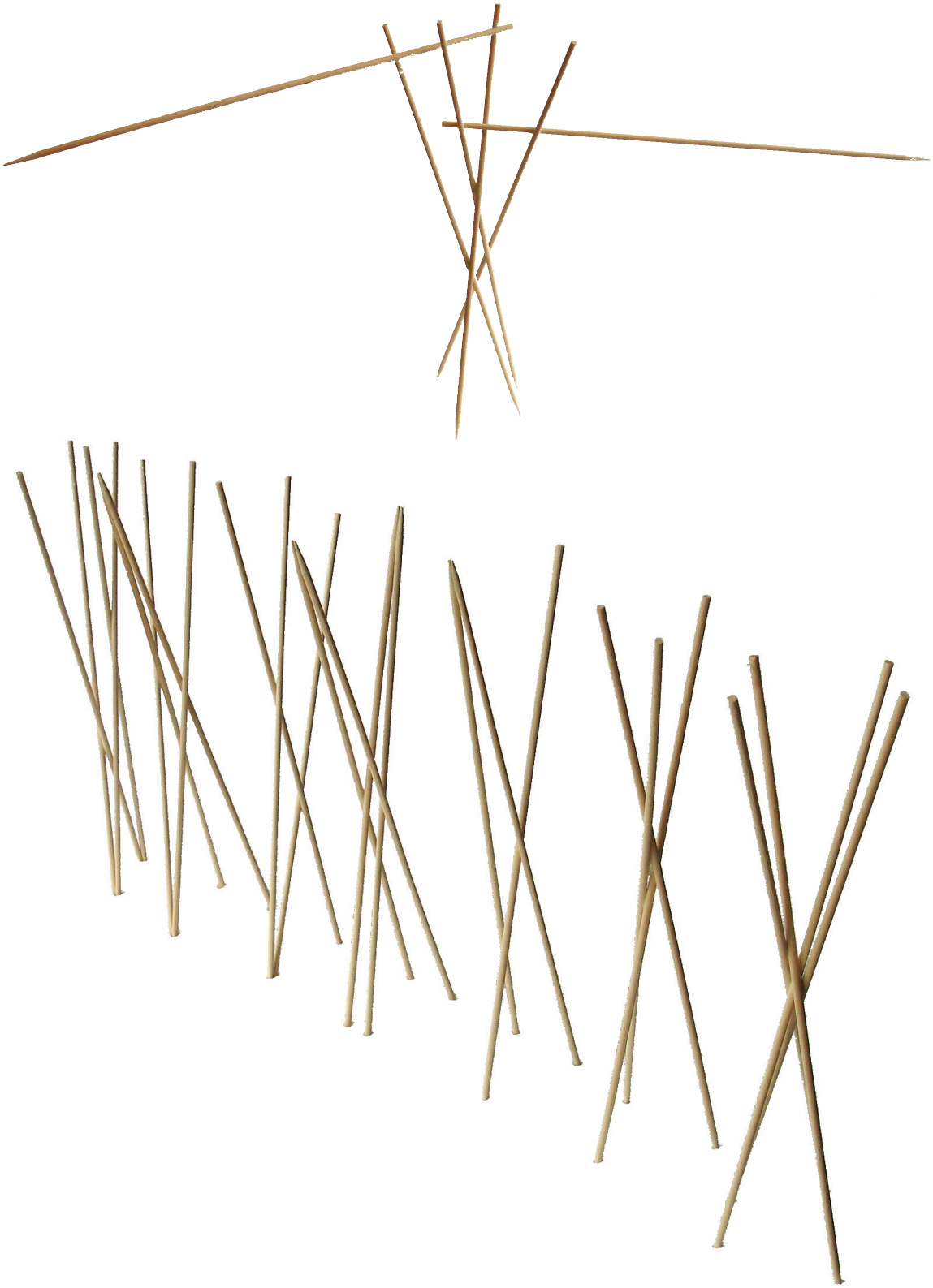


COLUMNS AS POINTS

The second solution placed the columns more freely underneath the roof, separating the structural system of columns from the spatial division of walls. The columns become points in space contrary to the line of the walls.
However the solution seemed too confusing at first and took up to much space like the first proposal.

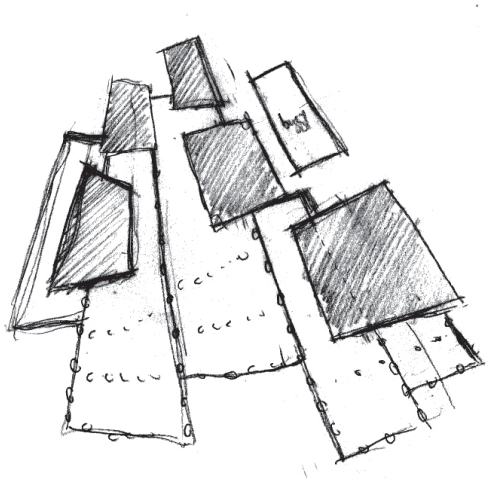


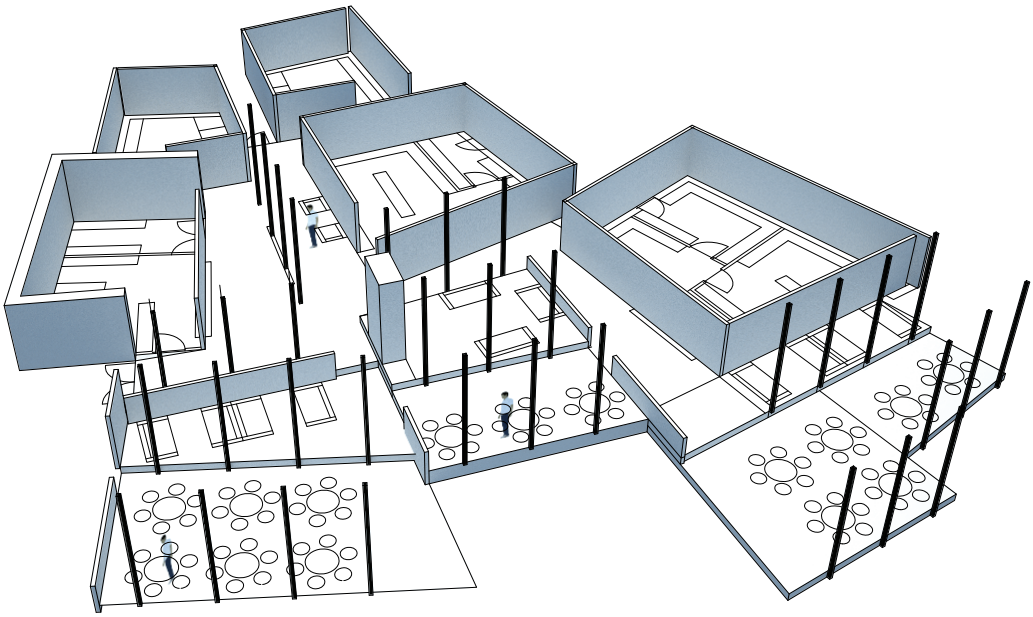




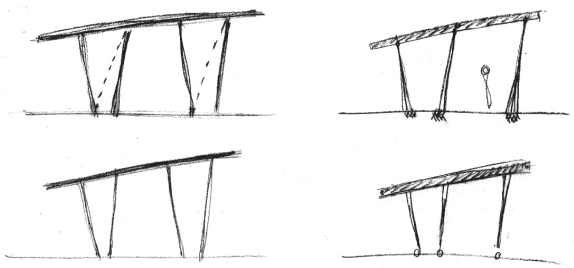
COLUMNS AND SOLIDS

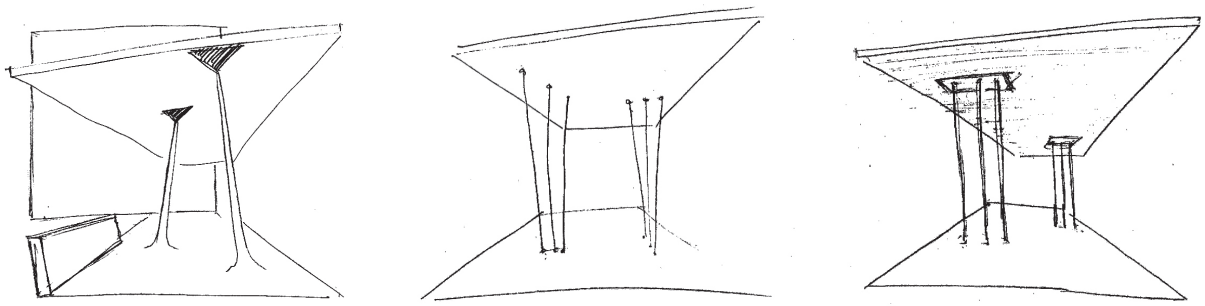
Seeking for a way to place the columns, that would not take up to much space, and still be opposing the lines of the walls, a third proposal appeared.
Letting the walls to the north densify and become solids, opened the possibility for the solids to become load bearing towards the north.
Whereas columns would remain load bearing towards the south, where the plan was more open.
The columns were this time placed on the edge of the various plateaus to emphasize the space of these, while taking up limited space in plan.

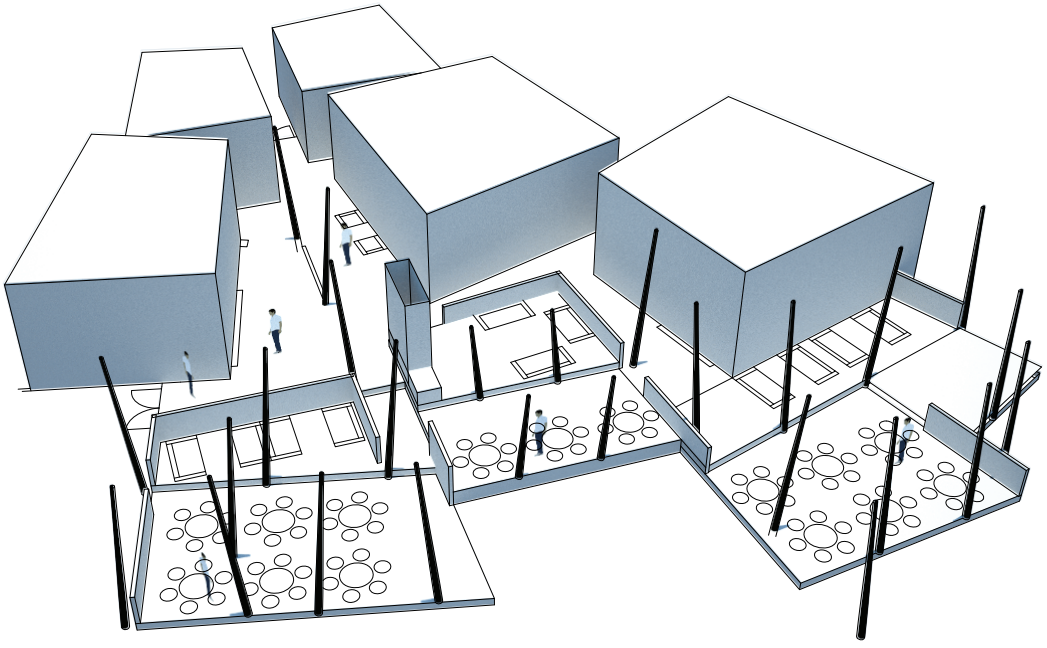




As stated earlier the columns should resemble the more freestanding trees, defining a space around them, in the open landscape.
Therefore different solutions to make the columns seam less organised and more randomly placed, was sketched upon.
Many different proposals was tested, however it quickly became very confusing from the interior space.



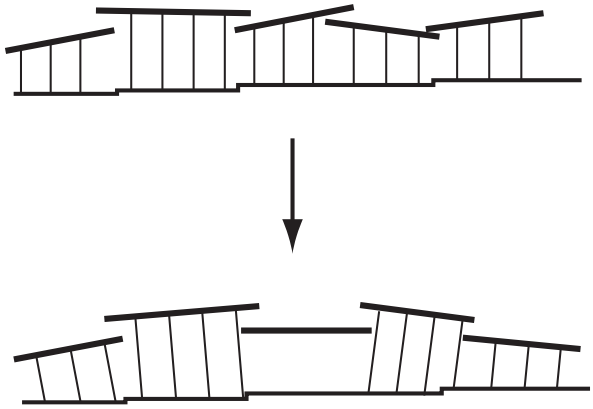


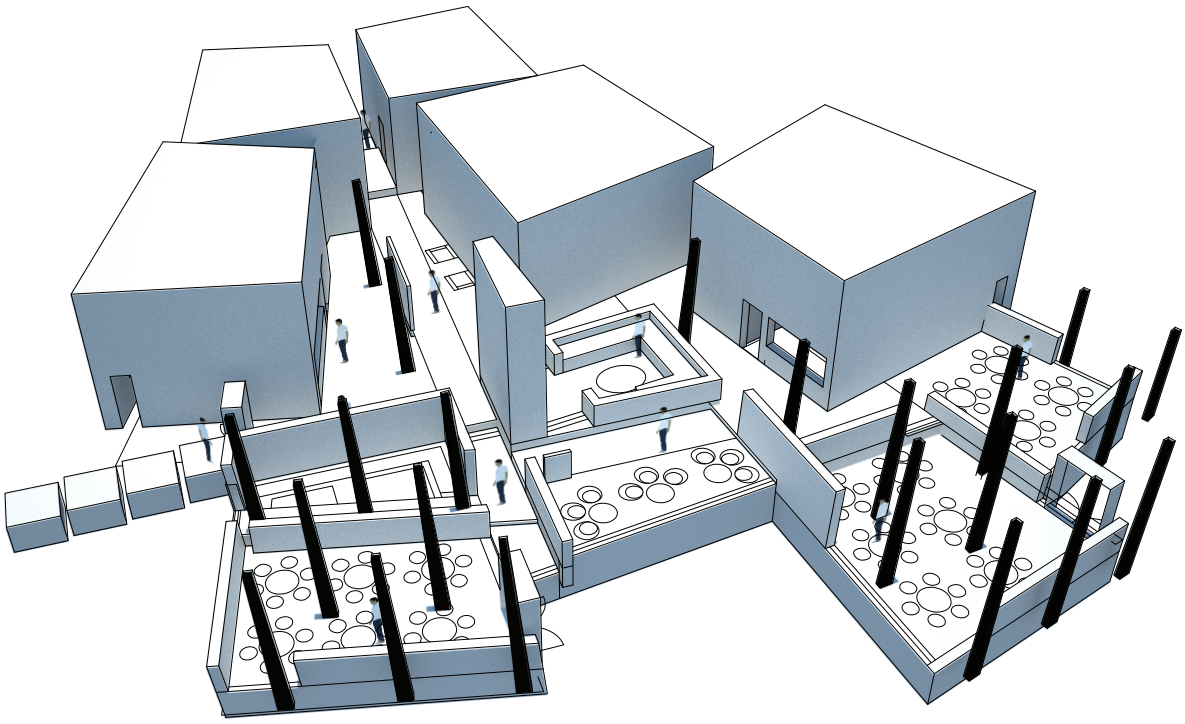


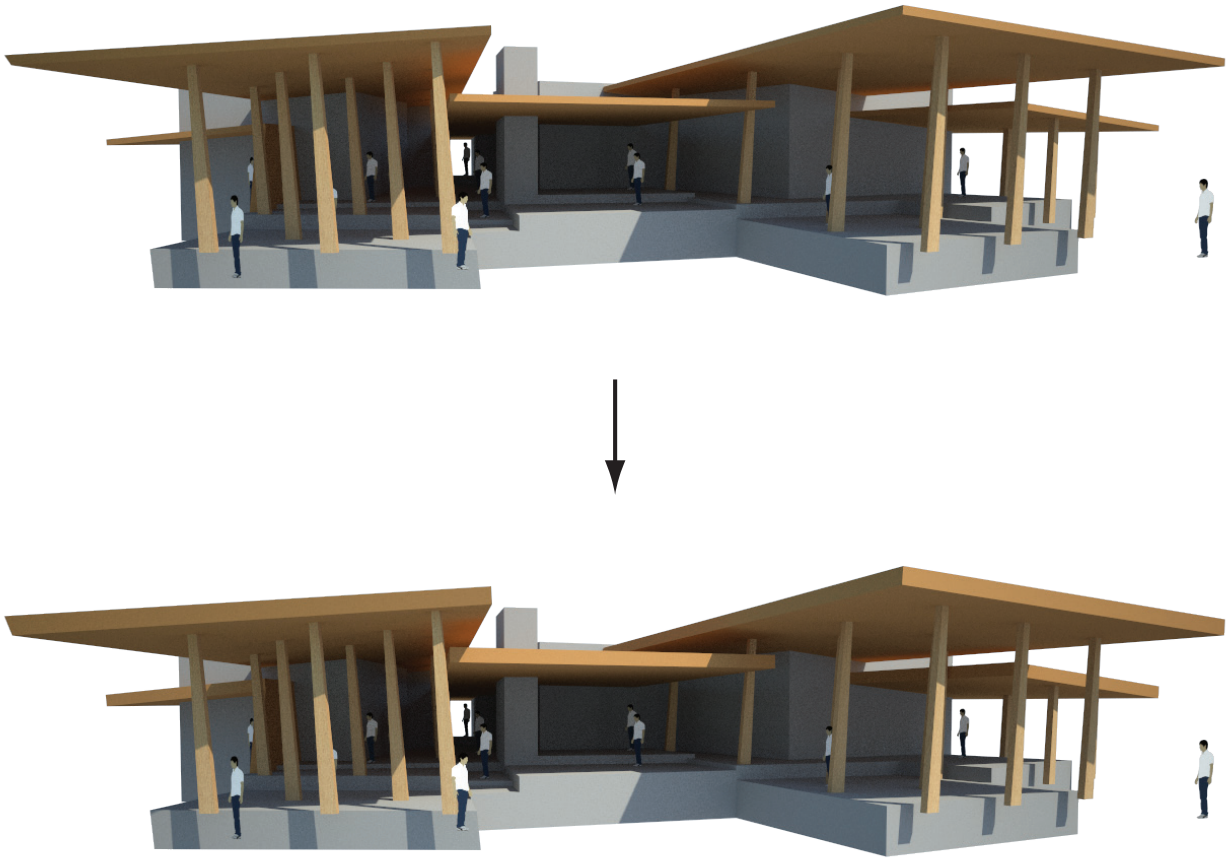
COLUMNS PERPENDICULAR TO THE ROOF

A solution, to let the roof plane in the middle seam pushed from the earth and up, pushing away the neighbouring roof planes, created an obvious solution for the columns. Namely that they should be perpendicular to the roof.
However the roof plane in the middle is left supported at the edge, creating a kind of a clearing in the forest of columns.

This solution with tilted columns, made it possible to make the roof appear heavy. So that the heaviness of the roof would cause the columns to become unstable and tilt to one side.
This concept of a heavy roof supported by columns on a plateau is also inspired by traditional Japanese architecture.







STRUCTURAL SYSTEM

The overall stability of the building will be analysed, to set up a case for a calculation in the next section.

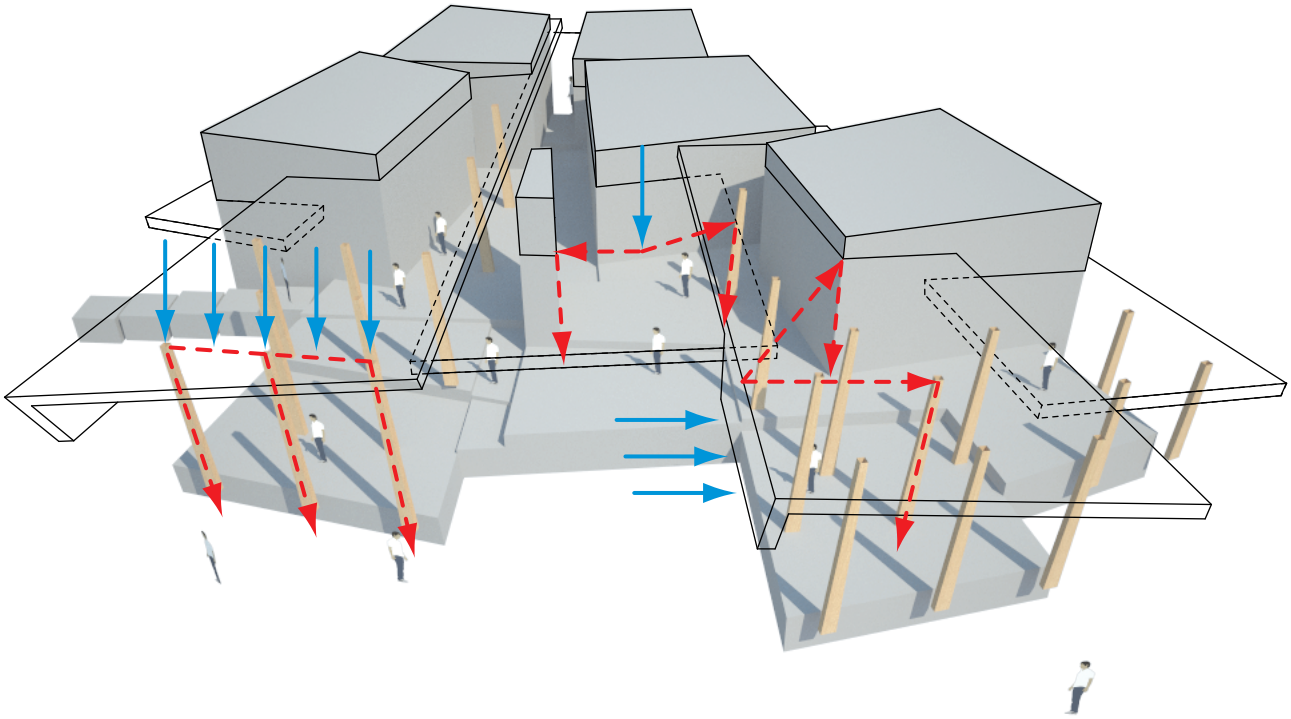
As one can read in one of the coming sections, the columns will be made from wood, the solid cores from concrete and the roof from massive wooden elements.
The columns are fixed at the bottom and together with the solid cores and planar roof ,that act as a plane, they transfer vertical and horizontal loads to the ground.

Architecturally the roof lets in light and create various spaces underneath. The columns create the image of a forest. Whereas the solid cores creates an anchoring point for the tilted columns and roof.

Three cases can be seen from the diagram.

1+2) The load of snow and the wooden roof in itself, will be transferred to the ground through the roof, the cores and the columns.

3) The loads from wind, will be transferred through the roof to the columns and cores, that will take the forces to the ground.



DIMENSIONING THE COLUMNS

One of the columns will here be investigated in more detail, for how it should be dimensioned to withstand the different loads acting on it. Not only carrying the load, but expressing the flow of forces architecturally.

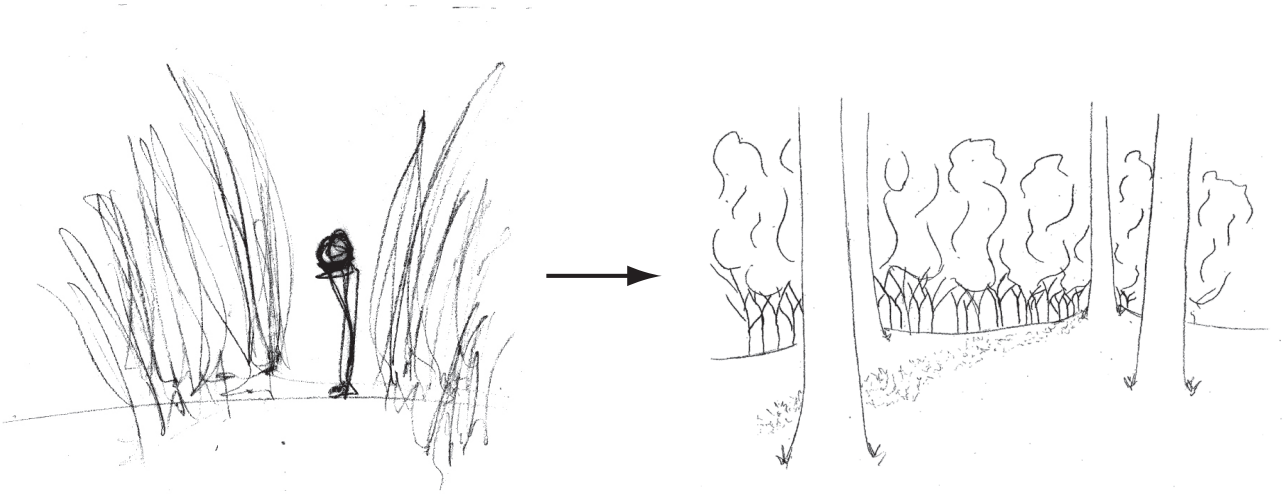
In the early stages of design, wood was thought as material to be used for the columns. However during the process, steel was also thought of.

One concept was to let the columns resemble the long and slender straws of grass swaying in the wind. An image that is ever present on the golf course. With steel as material the columns could be very slender indeed. However from an aesthetical point of view the columns seamed to become too slender and unstable. In other words they became too thin in comparison to the heavy roof, and lacked a presence in the space.

Thus wood was chosen as the material for the columns, as it together with the choice of a wooden ceiling, created an image of being inside a forest. The warm colours of wood, also created a warm counterpart to the solid cores made from concrete.

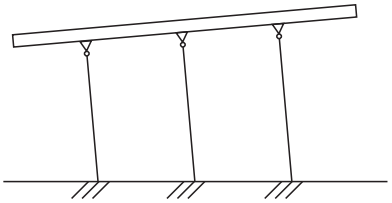
One idea for dimensioning the columns, has been to change the size of the cross section according to the load the column is carrying. Thus some would be smaller than others, just like the trees outside.

However the final proposal has placed the columns, to allow for circulation around them and the placement of various furniture.
Thus the columns are placed more or less evenly across the open space towards the south. The needed dimension for each column would therefore become more or less the same, and the change of cross section would become diminishing small.

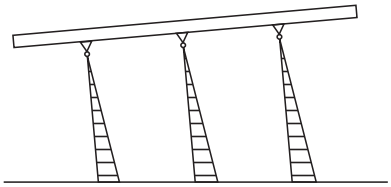


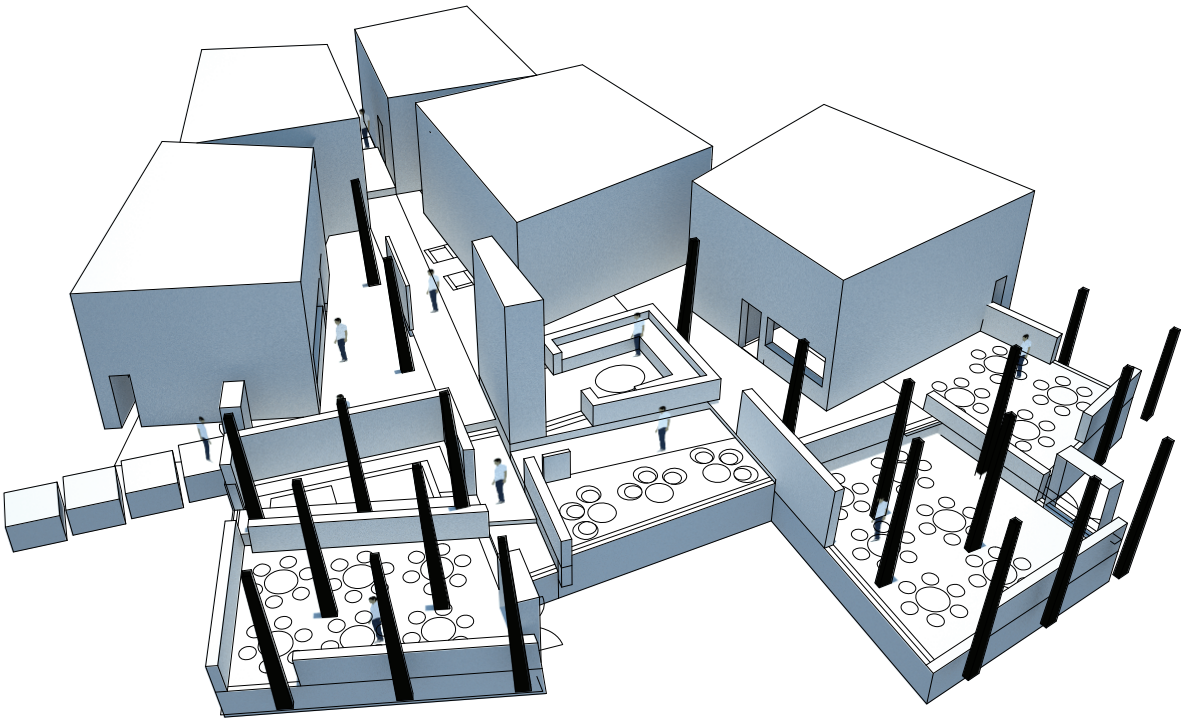
CHANGE OF CONCEPT FROM COLUMNS REPRESENTING STRAWS OF GRASS TO REPRESENTING TREE TRUNKS

Instead a solution to make the cross section bigger at the foundation and smaller at the ceiling, resembling actual trees, was chosen. With a pinned connection at the top and a fixed connection at the bottom, this also fits with the way the forces are distributed in the column, where the forces increase towards the bottom.



The final proposal for columns therefore measure 400x200 at the bottom and 200x200 at the top. For the calculations a constant cross section of 200x200 mm have been chosen. A full calculation for wooden columns with this cross section can be found in the appendix.





DETAILING THE JOINTS

Detailing how the column would connect to the base of the plateau and the roof plane, will be explained here.

Several proposals have been sketched upon, mainly focusing on how to express the two types of connections - a pinned and a fixed joint.

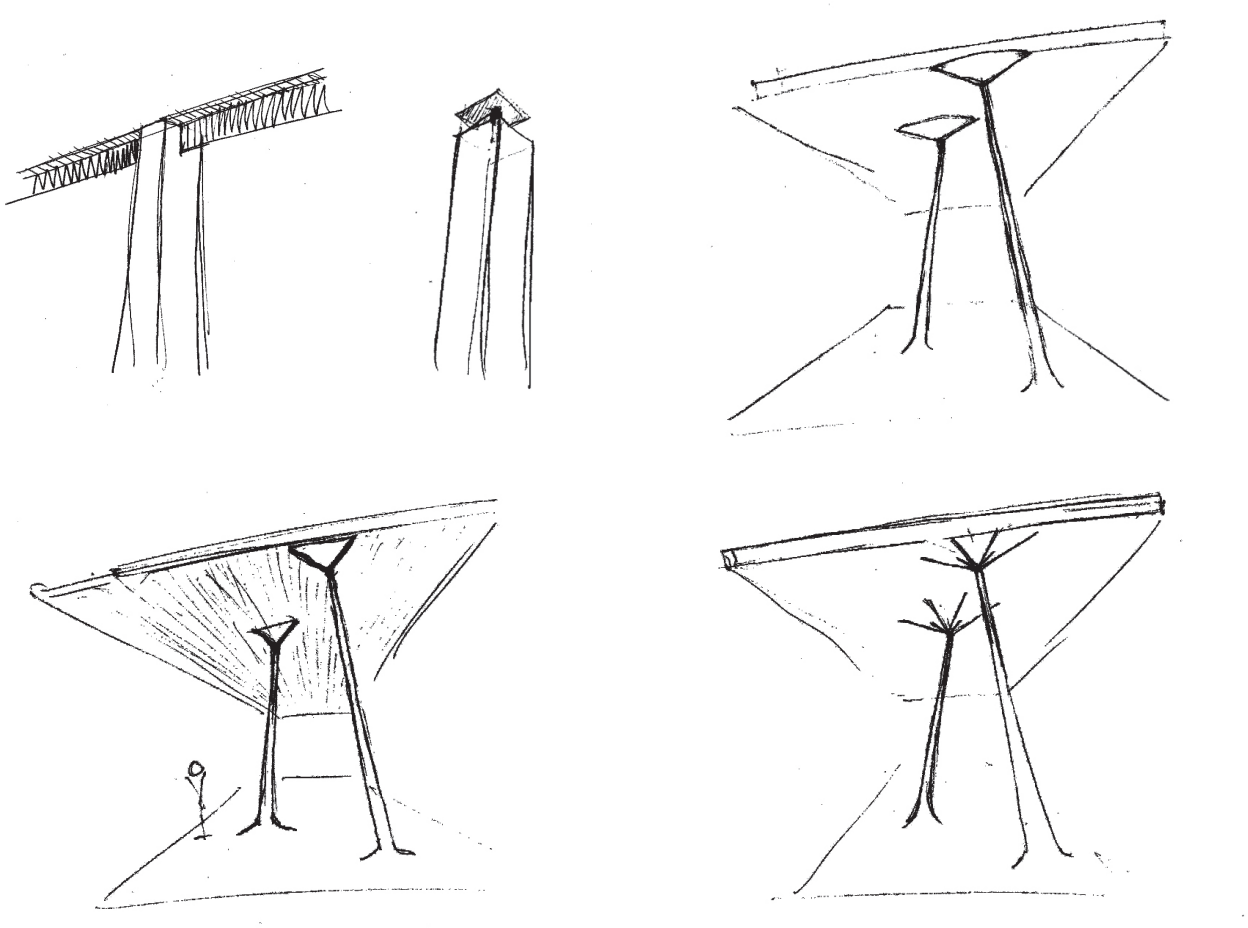
The pinned joint was object to several investigations. Some suggestions tried to emphasize the pinned joint with a triangular form coming down from the ceiling and connecting to the column. However this broke the surface of the roof.

Thus architecturally the thought was, that the roof should be made from massive wooden elements, and be considered as an unbroken plane, that meet the columns in a point on the surface. This in accordance with the character of the pinned joint, being a point.

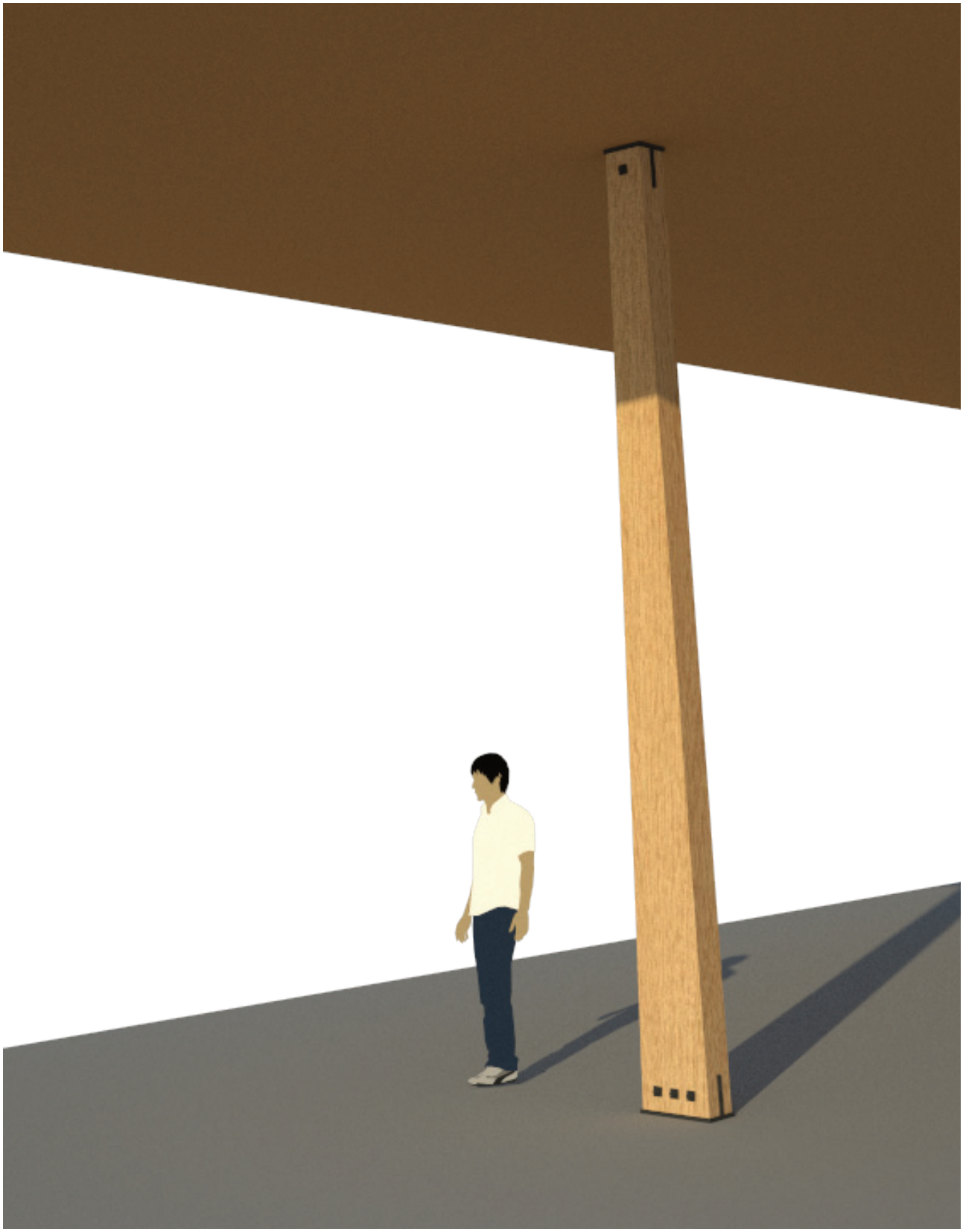
The final design proposal for the pinned joint was therefore to make it rise all the way to the ceiling, connect it to a steel bracket, and be pinned by one bolt.

The fixed joint at the base was quickly determined, as placed on, and bolted to a steel bracket. Expressing the fixed character of the joint, by the use of several bolts.

Further the five roof planes will be cut by the solid cores, so that the edge of the roof will be resting on the walls of the solids. However this detail has not been object for investigation in this project.



SKETCHING ON THE JOINT



PHASE 07 - MATERIALS

The choice of materials has a big influence on the architectural expression as well as the energy performance of the building.
This project primary choice of material has been wood and concrete. The following section will explain how these materials will work together in different parts of the building.

Concrete is chosen as material for the solid cores towards the north, to make them seam heavy, and sunken into the earth, like the bunkers on the west coast.

Concrete is a high strength building material, that works the best in compression. Thus it is used to carry parts of the wooden roof in compression.

Furthermore it has a high density and works well as a thermal mass. Storing energy when hot during the summer, to prevent the building from overheating. In general it will reduce the temperature fluctuations indoor and secure a more constant indoor climate.

Aesthetical concrete is rather cold and heavy, which is the reason to supplement with wood both indoor and outdoor.

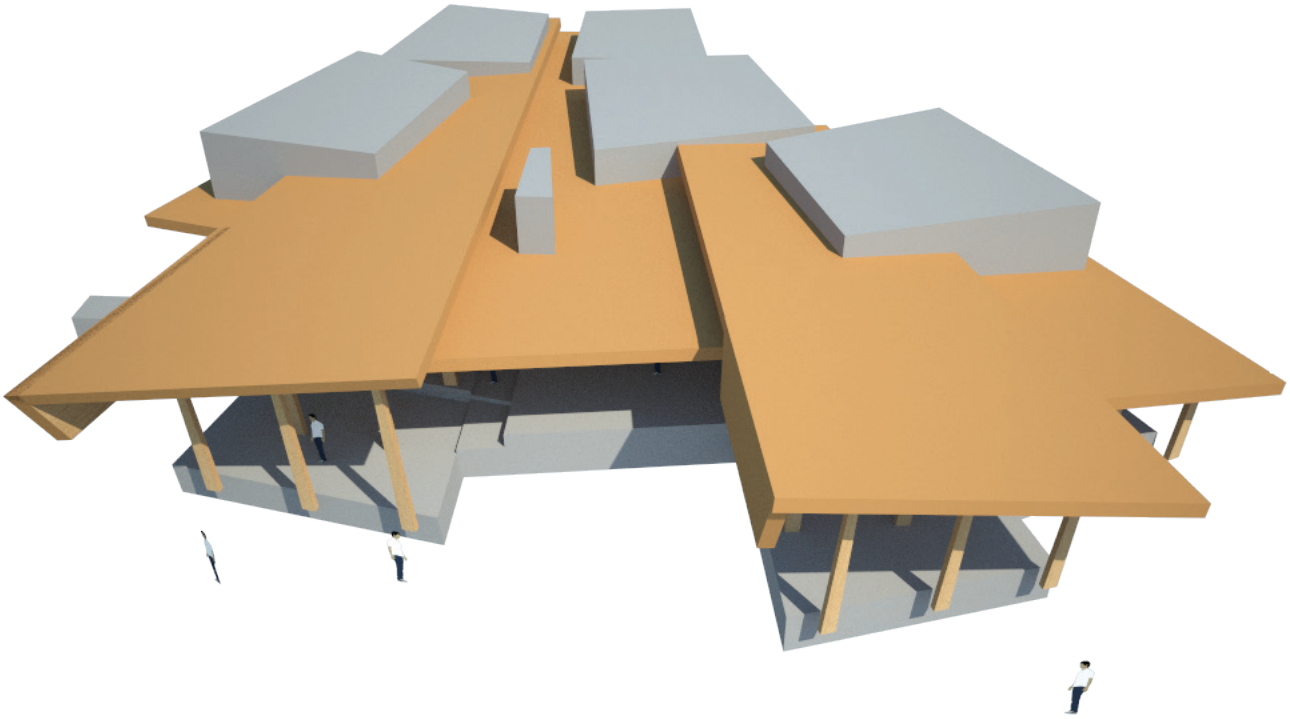
I have chosen wood as the main construction material for roof and columns, as it is a natural material, that can be found in abundance locally on the site, in many different species, colours and strengths. Thus it will work both as a load bearing material and provide a tactile understanding for the site.

Wood is a relatively high strength building material with low weight. It consists of cells whose cavities provide energy saving thermal insulation and whose cell walls absorb and release moisture.

Wood is an anisotropic material. That means it's resistance to stresses are different parallel and perpendicular to the grain. Being most resistant parallel to the grain.

Wood's ability to absorb and release moisture can have a good effect on the interior climate, as it can regulate the moisture level.

Further wood is softer than concrete and is therefore useful to absorb noise to create a better acoustic environment.



In the final proposal the plateaus are made from concrete, as it is durable and easy to keep clean on a daily basis.
Further the areas closest to the south facing windows will act as a thermal mass.

Towards the north concrete will be used for both walls and flooring.
Whereas to the south concrete will primarily be used for flooring and wood for columns and roof.

Oak will be used for the columns and roof as it has a warmer glow, and is a bit stronger than normal construction wood made from pine.

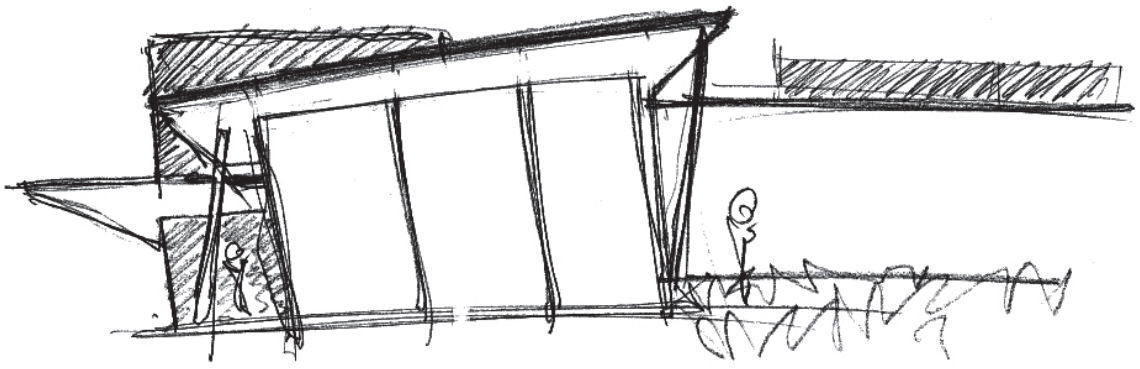
The solid concrete volumes will be insitu cast with a soft finish towards the interior spaces and a more rough character towards the exterior.

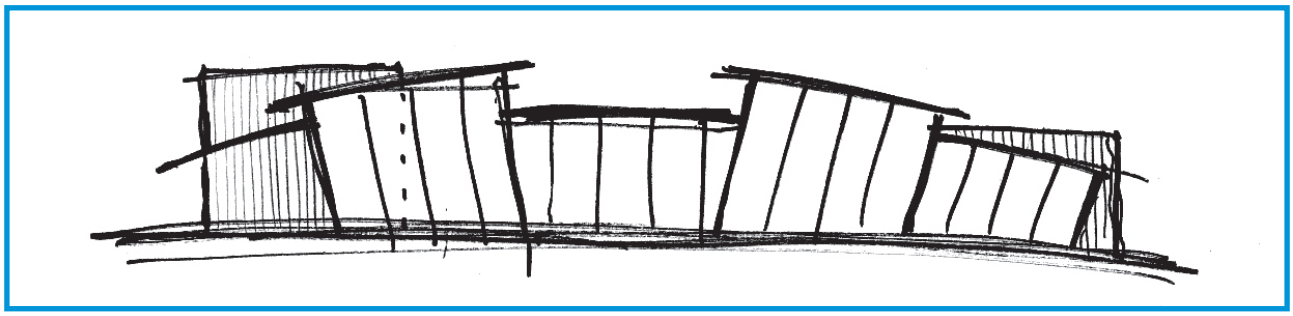
Whereas the roof will be clad with corten steel panel to support the idea of a heavy roof, that have caused the columns to become unstable and tilt to one side.

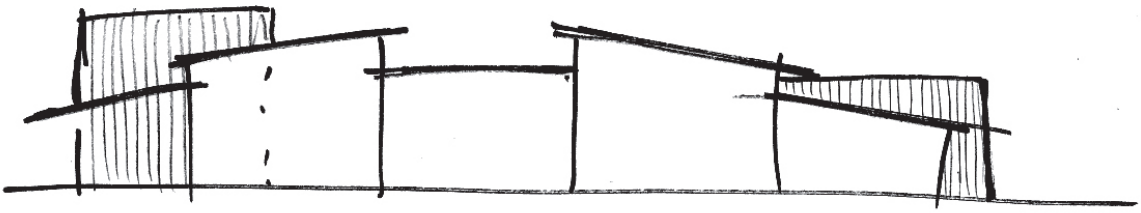
PHASE 08 - FACADE EXPRESSION

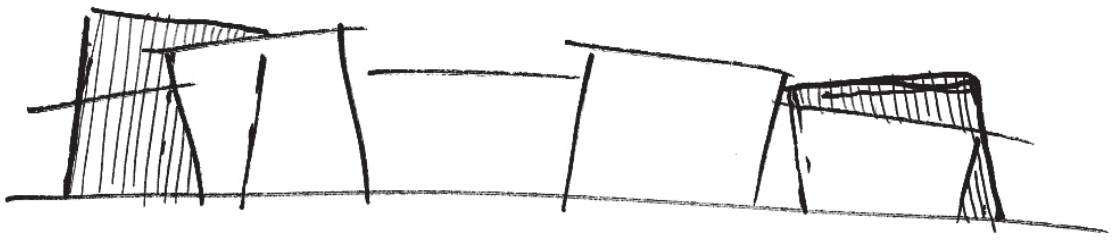
The tilt of the roof planes have been explained earlier, however the expression of the solid cores to the north and the glazed facade to the south, has not been documented.
This section will explore the exterior expression of the building.

As the columns were tilted to become perpendicular to the roof plane, the obvious choice was also to make the glazed east and west facing facades tilt in the same manner.
For the expression not to become too chaotic, the walls of the solid cores were chosen to be vertical. Thereby the solid cores was expressed as an anchor point, and as an actual solid, that the roof would lean against structurally and visually.





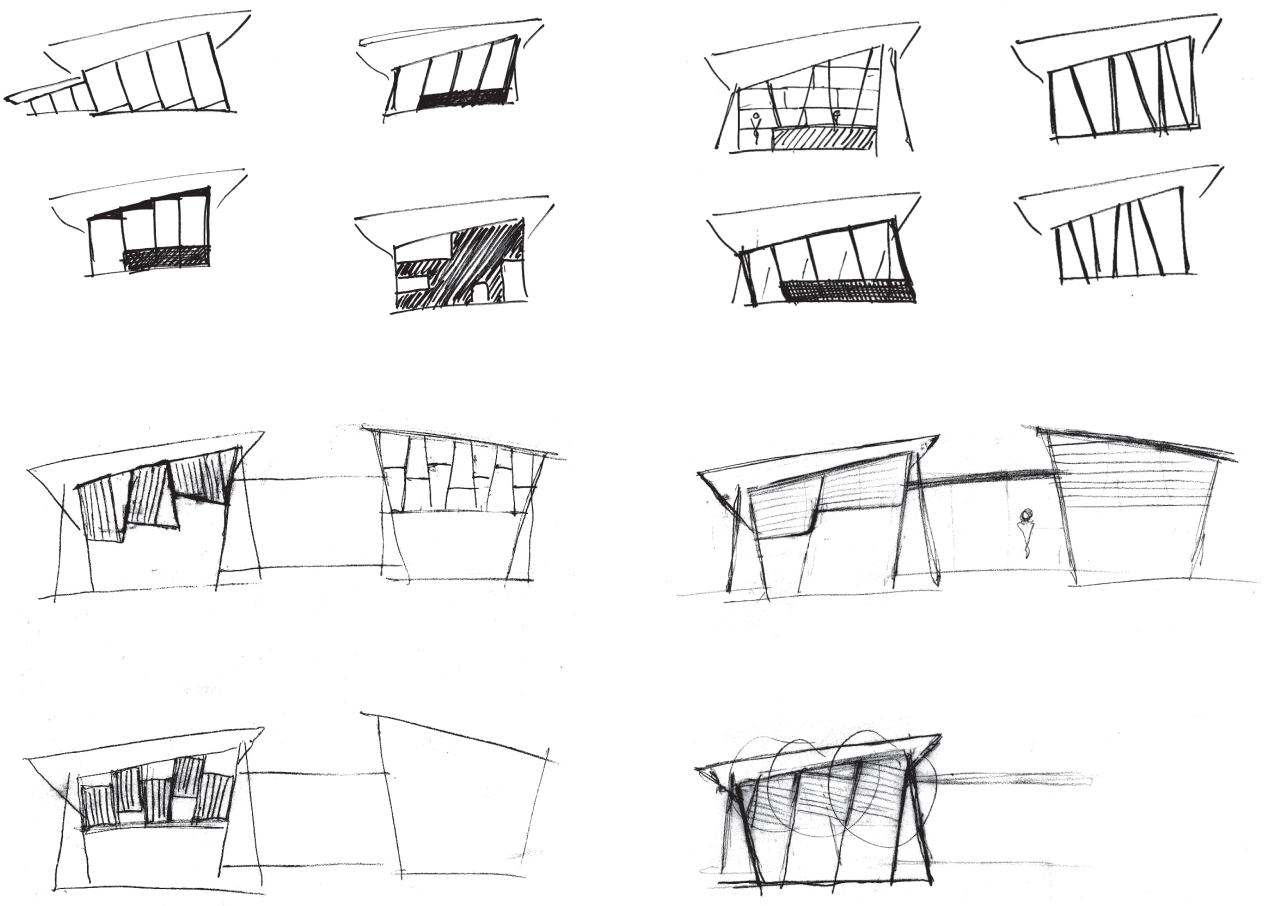




GLAZING AND SHADE

Next up was detailing the glazed facade towards the south. Having it glazed form top to bottom would cause the house to become highly exposed to the solar radiation. And architecturally the facade needed some kind of layering, to create a soft transition from inside to outside.

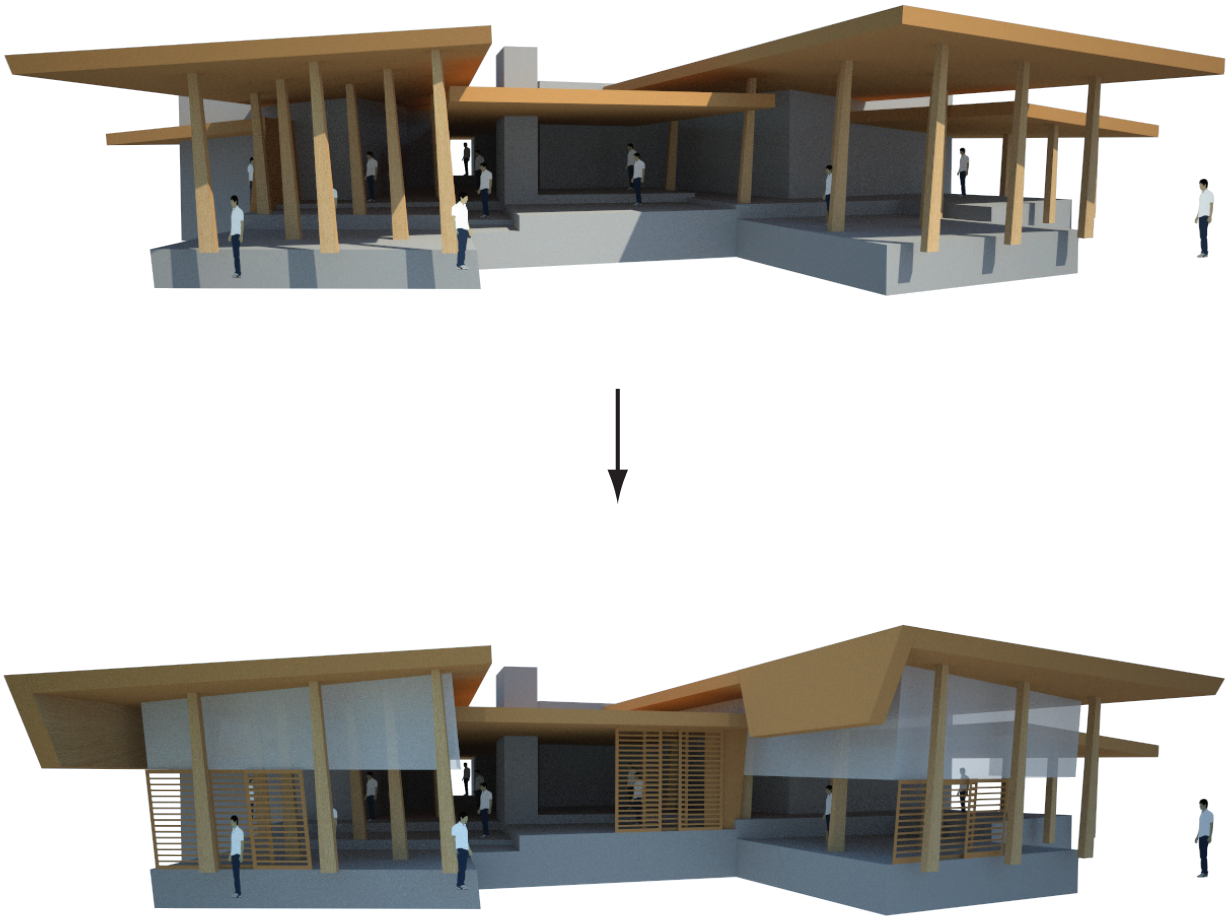
The solution selected was a combination of polycarbonate in the top of the facade and normal glazing towards the bottom.
The polycarbonate allowing transmission of indirect light, without contributing too much to heating.
The glass to allow for a panoramic view to the exterior of the surrounding area.



EXPERIMENTS WITH VARIOUS SHUTTERS, LAMELLAES AND SIMPLE MULLIONS WAS CONDUCTED. HOWEVER MOST OF THEM SEAMED TO BECOME TOO COMPLEX.

A third layer of simple external shutters were introduced to shade for the interior space and prevent if from overheating.
Lastly the roof was pulled down in two places to create shading for the two west facing facades. At the same time this solution made the roof appear even heavier.

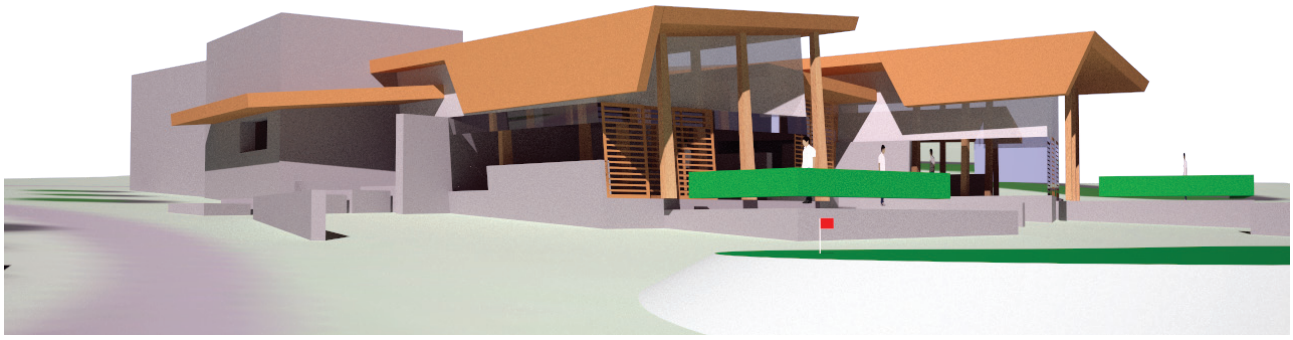
An effect that was wanted, to give the roof a volume, that the columns would seam struggling to carry.
To further emphasize the heaviness, the roof is clad with corten steel panels.



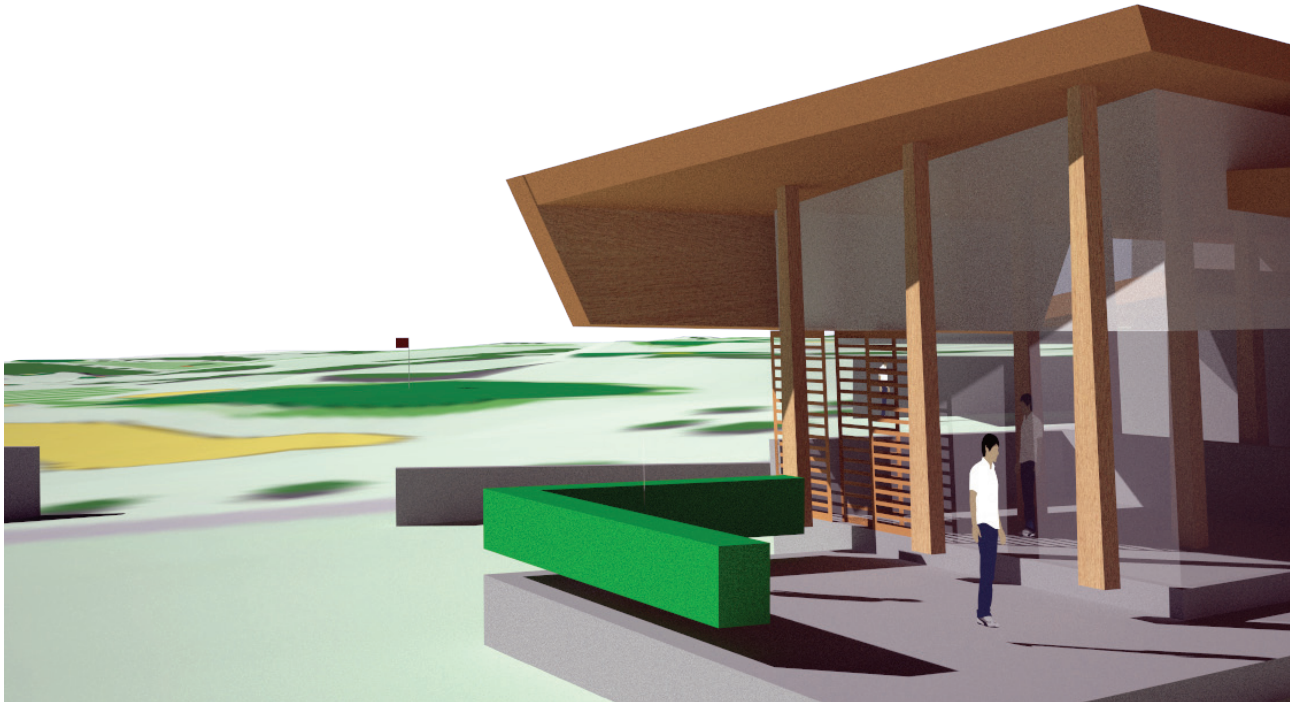
PRESENTATION

In this part of the repport, the final proposal are presented through plan, section and facade drawings. For further explanation read the chapter on sketching.

SITE PLAN 1:1000

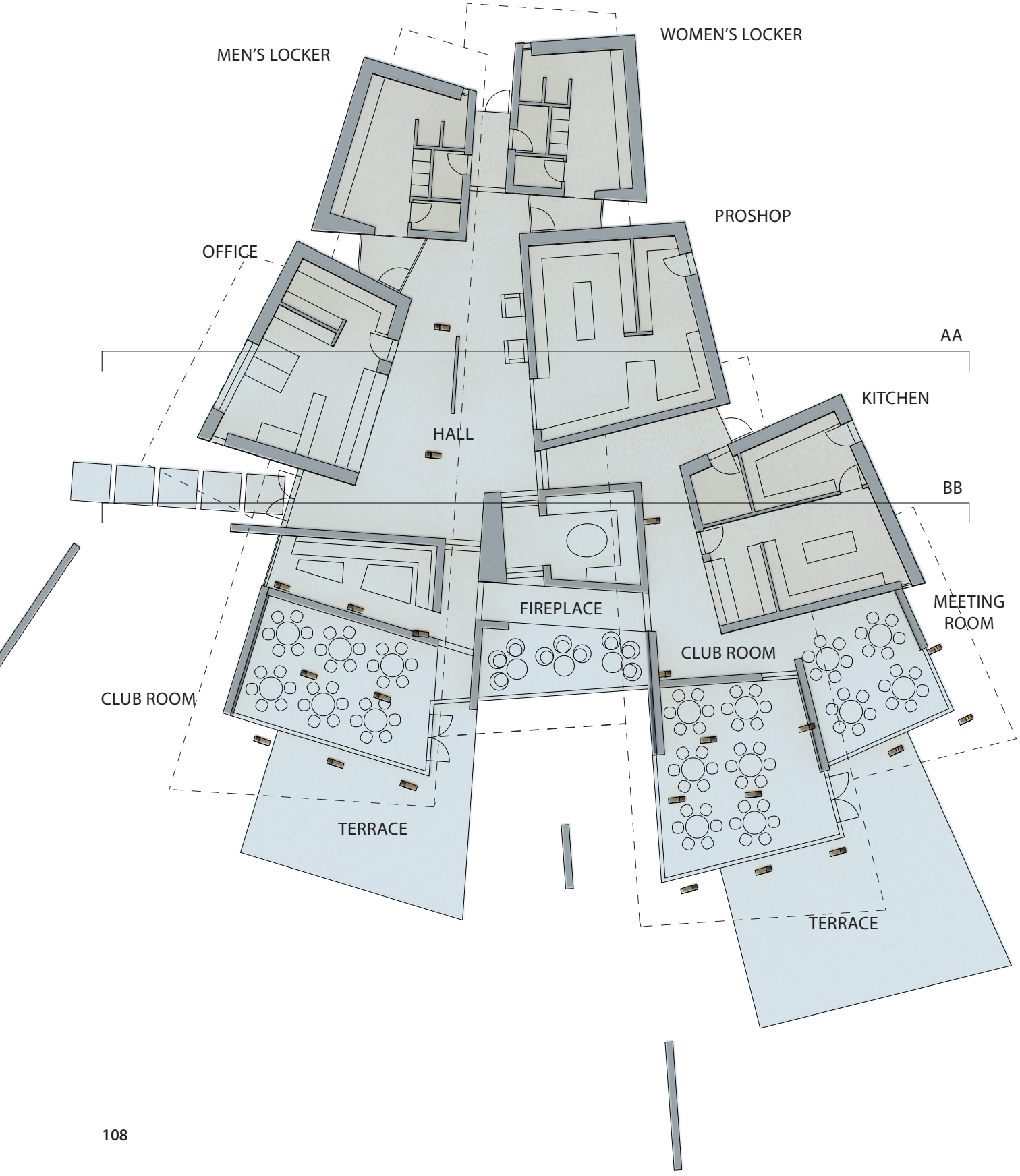


APPROACHING THE CLUBHOUSE FROM SOUTH

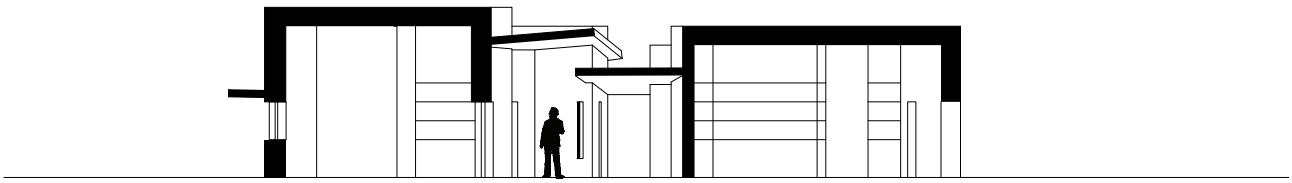


VIEW TO THE 18TH GREEN FROM THE TERRACE

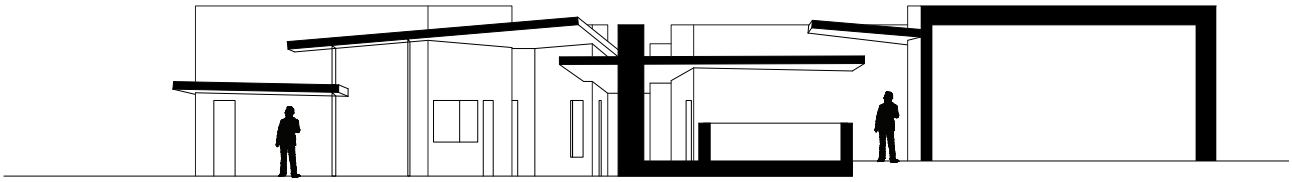
PLAN 1:200


MEN'S LOCKER
WOMEN'S LOCKER
PROSHOP
OFFICE
AA
KITCHEN
HALL
BB
FIREPLACE
MEETING ROOM
CLUB ROOM
CLUB ROOM
TERRACE
TERRACE

SECTION 1:200

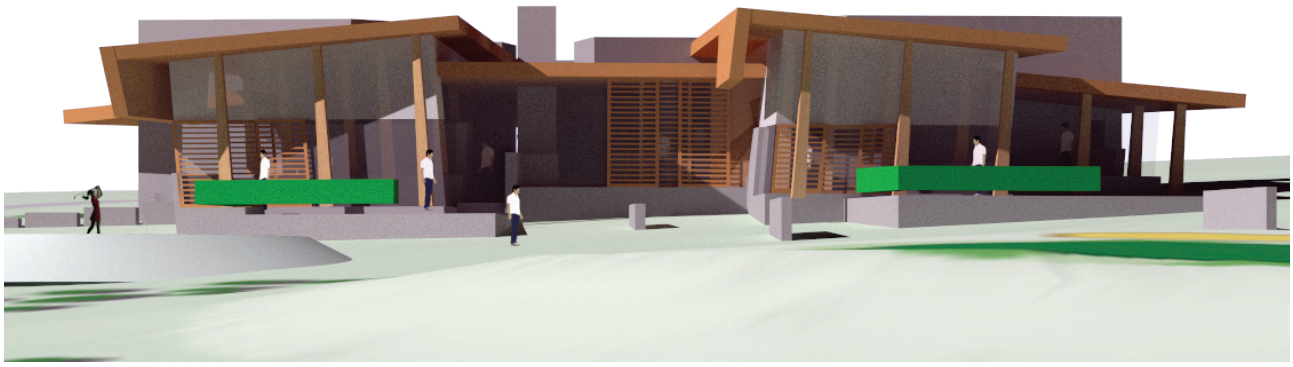


AA office hall proshop

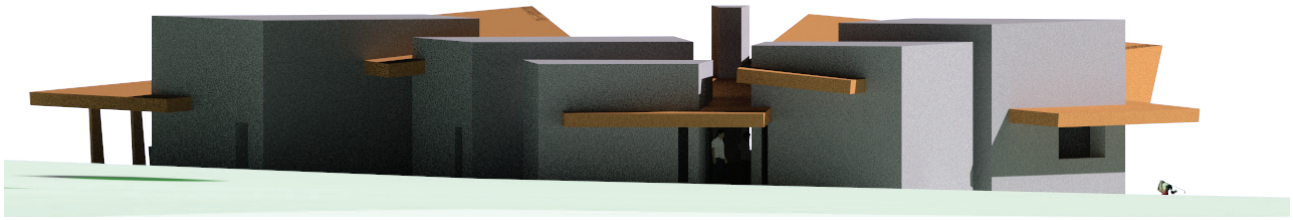


BB covered area entrance hall fireplace kitchen

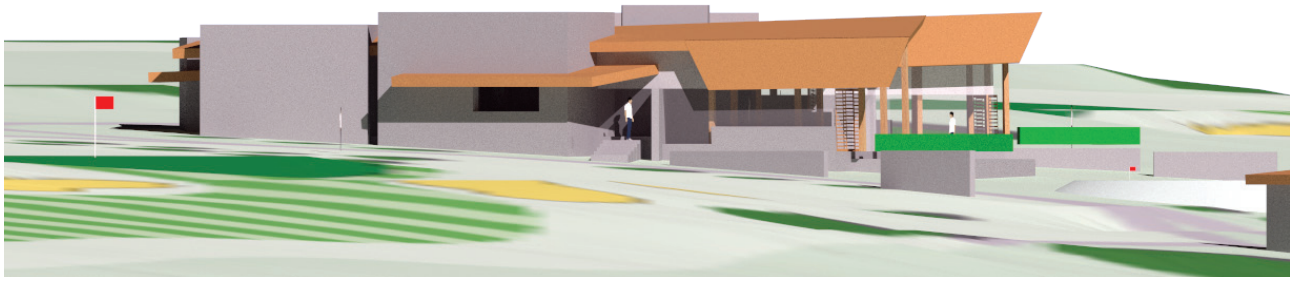
FACADES



FROM SOUTH



FROM NORTH



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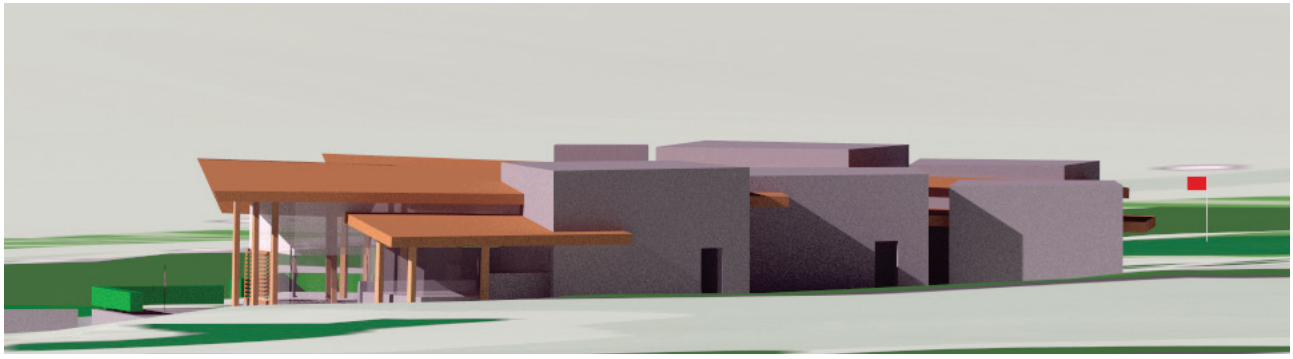

FROM EAST

FINAL REMARKS

This section contains a reflection on the project and the list of litterature.

CRITIQUE

This section will reflect on final design proposal and the choices made during the process.

It has been exciting to be the one defining the task at hand, and be able to set the framework for the project. To set up this framework has taken some time, compared to choosing to design a proposal for an actual competition.
However it has opened the possibility to come closer to a personal attitude towards architectural design.

Conceptually I'm quite satisfied with the proposed design. However the project is, at the point of submission, still very conceptual.
Thus during the process, many variations have been tested, instead of choosing the first and best. This however means that not all details have been thought through into the very detail.

Further the presentation of the final proposal is unfortunately not very well documented. Maybe leading to more questions than it answers. Specially the interior is not documented. I'm planning to have this ready for the examination.

Likewise an important parameter has been to create a fluid relation between the landscape and the building. This is however not detailed in the siteplan and the immediate outdoor spaces, to a level, that I would have wanted.

Except from not going into every detail, I consider the initial objective of the design and the demands of the room programme, met and documented through the sketching phase.

Objective:
"Designing with the tactile, tectonic and morphological potential of walls, floors, columns, openings, materials and landscape.
Creating several layers of differentiated spatial qualities, supporting the activities taking place by the play of golf in the landscape."

In terms of tectonics, sustainability and the integrated design process, this is also documented by the sketching phase. Most of the considerations are made based on my previous experience, however I would have liked to document it even further, by the use various tools.

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APPENDIX

Appendix 1 - Loads

The characteristic loads that affect the construction of the roof is determined in the following paragaph. The loads are the selfweight and the loads of nature; snow and wind.
The paragraph also consists of material properties and a simplified load combination to be used for determining dimensions of the columns supportnig the roof.

Loads

Loadgroups

When working with wood as the construction material these loads must be grouped in relation to how long they last, as shown below:

Permanent load (P-load)	selfweight
Short length load (K-load)	snow load
Immediate load (Ø load)	wind load

Loads

Selfweight

Selfweight

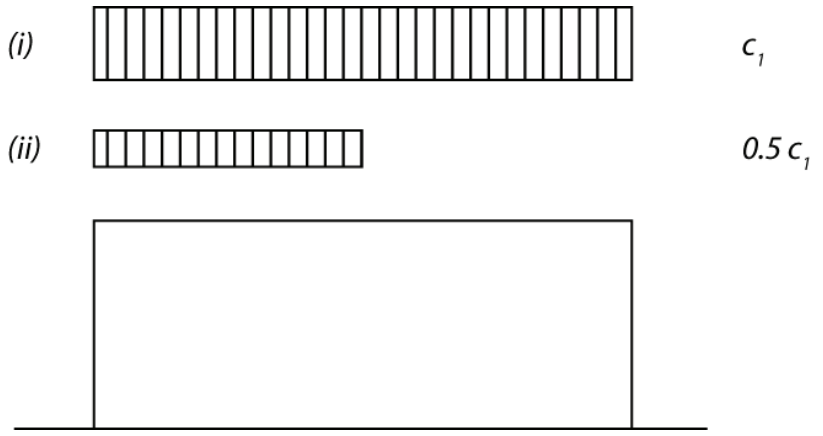
The selfweight of the roof, including the structural deck of massive wood elemnts, insulation material and cladding is set to be 3.0 kN/m^2 because it is considered to be a heavy construction

$$g_{roof} := 3.0 \frac{kN}{m^2}$$

Selfweight

Snow load on a flat roof

Two load arrangements are to be investigated when snow acts on a flat roof [DS 410 p81]
(i) evenly distributed load on the entire roof
(ii) evenly distributed load, but only acting on one half of the roof and with half the intensity



Shape factor for snow load:
the required slope of the roof is the required 1/40 and the angle is therefor below 15 degrees

$c_1 := 0.8$

Location factor:
is set to 1 to be on the safe side

$C_e := 1$

Thermal factor:
is set to 1 to be on the safe side

$C_t := 1$

Basis value for the snows terrain value:

$s_{k0} := 0.9\,\frac{kN}{m^2}$

Season factor for the snows terrain value

$c_{års.s} := 1$

The snows characteristic terrain value

$s_k := s_{k0} \cdot c_{års.s}$ $s_k = 0.9\,\frac{kN}{m^2}$

Characteristic snow load

2 loadcombinations are to be considered when investigating snow on a flat roof as shown on the diagram above.

(i) One acting on the entire roof $S_1 := c_1 \cdot C_e \cdot C_t \cdot s_k$ $S_1 = 0.7\,\frac{kN}{m^2}$

(ii) One acting on one half of the roof $S_2 := 0.5c_1 \cdot C_e \cdot C_t \cdot s_k$ $S_2 = 0.4\,\frac{kN}{m^2}$

Wind load in general

1. Basic wind speed

[DS 410 p31]

Because it is a permanent construction, most of the parameters can be set to 1

Direction factor for wind speed

$c_{dir} := 1$

Basic value for basic wind speed

$v_{b0} := 24\frac{m}{s}$

Season factor for wind speed

$c_{års.v} := 1$

Basic wind speed

$v_b := c_{dir} \cdot c_{års.v} \cdot v_{b0}$ $\quad v_b = 24\frac{m}{s}$

2. Basic speed pressure

Air density:

$\rho_{air} := 1.25\frac{kg}{m^3}$

Basic speed pressure:

$q_b := \frac{1}{2}\rho_{air} \cdot v_b^{\,2}$ $\quad q_b = 0.36\frac{kN}{m^2}$

3. The constructions height over terrain:

$z := 6m$

4. Terrain category

Area with low vegetation and single obstructions spaced a minimum of 20 times its height

Terrain category

2

Terrain factor:

$k_t := 0.19$

Roughness length:

$z_0 := 0.05m$

Minimum height:

$z_{min} := 4m$

5. Terrain roughness when $z_{min} < z < 200$ m

$c_r := k_t \cdot \ln\left(\frac{z}{z_0}\right)$ $\quad c_r = 0.91$

6. 10 minutes average speed pressure

Topography factor:

$c_t := 1$

10 minutes average speed pressure

$q_m := c_r^{\,2} \cdot c_t^{\,2} \cdot q_b$ $\quad q_m = 0.3\frac{kN}{m^2}$

7. The winds turbulence intensity when $z > z_{min}$

$I_v := \frac{1}{c_t} \cdot \frac{1}{\ln\left(\frac{z}{z_0}\right)}$ $\quad I_v = 0.21$

8. Characteristic maximal speed pressure

peak-factor:

$k_p := 3.5$

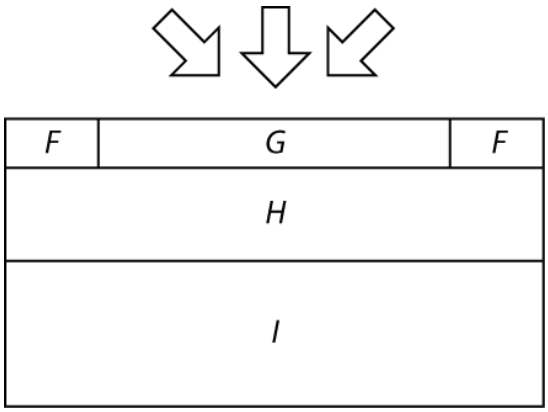
Characteristic maximal speed pressure:

$q_{max} := \left(1 + 2k_p \cdot I_v\right) \cdot q_m$

$q_{max} = 0.73\frac{kN}{2}$

Wind load on roof

Calculation of the wind load on the roof for westerly wind [DS 410 p 54]



9. Largest (L) shape factors and wind loads on the roof (r)

$c_{pe10.LF} := 0$ $W_{r.LF} := q_{max} \cdot c_{pe10.LF}$ $W_{r.LF} = 0.0 \frac{kN}{m^2}$

$c_{pe10.LG} := 0$ $W_{r.LG} := q_{max} \cdot c_{pe10.LG}$ $W_{r.LG} = 0.0 \frac{kN}{m^2}$

$c_{pe10.LH} := 0$ $W_{r.LH} := q_{max} \cdot c_{pe10.LH}$ $W_{r.LH} = 0.0 \frac{kN}{m^2}$

$c_{pe10.LI} := 0.2$ $W_{r.LI} := q_{max} \cdot c_{pe10.LI}$ $W_{r.LI} = 0.1 \frac{kN}{m^2}$

The wind load is only acting as preasure on the eastern part of the roof.

$W_{r.LI} = 0.1 \frac{kN}{m^2}$

9. Smallest (S) shape factors and wind loads on the roof

This is not considered because it creates suction on the roof, which works in favour of the dimensioning. The construction is considered to be fastened to the ground, which will prevent the roof from lifting.

Summary of loads

Loads

A summary of the loads calculated above is shown below

G	selfweight	$g_{roof} = 3 \frac{kN}{m^2}$	
S	snowload	$S_1 = 0.7 \frac{kN}{m^2}$	$S_2 = 0.4 \frac{kN}{m^2}$
W	windload	$W_{r.LI} = 0.1 \frac{kN}{m^2}$	

Summary of loads

Material properties

Material properties for glued laminated oak

The following paragraph describes the properties for the material used as columns

Laminated oak

The material properties for glued laminated oak is supposed to be the same as for GL28h [TS p314]

Characteristic strength figures

Compression parallel to fiber $f_{c.0.k} := 26.5MPa$

Compression perpendicular to fiber $f_{c.90.k} := 3.0MPa$

Security

Safety class: normal $\gamma_0 := 1.0$ [sup DS 413 p15]

Material control: tighten $\gamma_3 := 0.95$ [sup DS 413 p16]

Application class 1 (indoor) [DS 413 p11]

Loadgroups

Permanent load (P-load)	selfweight
Short length load (K-load)	snow load
Immediate load (Ø load)	wind load

Partialcoefficient for modulus of elasticity and strength figures

Service limit state $\gamma_{m.s} := 1.0$ [sup DS 413 p15]

Ultimate limit state $\gamma_{m.u} := 1.3 \cdot \gamma_0 \cdot \gamma_3$ $\gamma_{m.u} = 1.2$ [DS 413 p22]

Design value of the strength figures

Ultimate limit state (u)

k_{mod} considers the reduction of the strength with time due to the combined effect of load and moisture, and is therefore dependent on application class (indoor, covered or outdoor) [DS 413 p30]

In this case I will consider the columns placed indoor

$k_{mod} := 0.60$

The design value of the strength figures is determined by the shortest acting load in a load combination. Due to the increase of the strength figures at short acting load, it will often be the load group with permanent load (P-load) that set the dimension for a construction of wood rather han steel. Thus I will only calculate with the strength figures for P-load.

Compression parallel to fibre $f_{c.d.(loadgroup)}$

P-load $f_{c.d.0} := \frac{f_{c.0.k}}{\gamma_{m.u}} \cdot k_{mod}$ $f_{c.d.0} = 12.9\,MPa$

Compression parallel to fibre $f_{c.d.(loadgroup)}$

P-load $f_{c.d.90} := \frac{f_{c.90.k}}{\gamma_{m.u}} \cdot k_{mod}$ $f_{c.d.90} = 1.46\,MPa$

Material properties

Load combinations

Load combinations and design criterias

Ultimate limit state, load combination

As the permanent load is large in relation to the variable load at rare exposure a simple load combination, with no load reduction factors, is used.

$L_1 := g_{roof} + W_{r.LI} + S_1$ $L_1 = 3.87\,\frac{kN}{m^2}$

Failure in construction is checked by making tests in every part of the construction. If stresses are below the design value of the strength figures, then there is no failure in the construction.
The design value of the strength figures that this load combination has to be related to, is normally dependent on the shortest working load in the combination. However to simplify the calculations, and because the permanent load is dominat in relation to the other loads, strength figures for P-Load will be used as comparison.

Load combinations

Appendix 2 - Ultimate limit

For ultimate limit state the vertical loaded colums have to be tested for instability. Whereas the wooden elements have to be tested for crushing at the point of support by the columns.

Vertical loaded column

Vertical loaded column

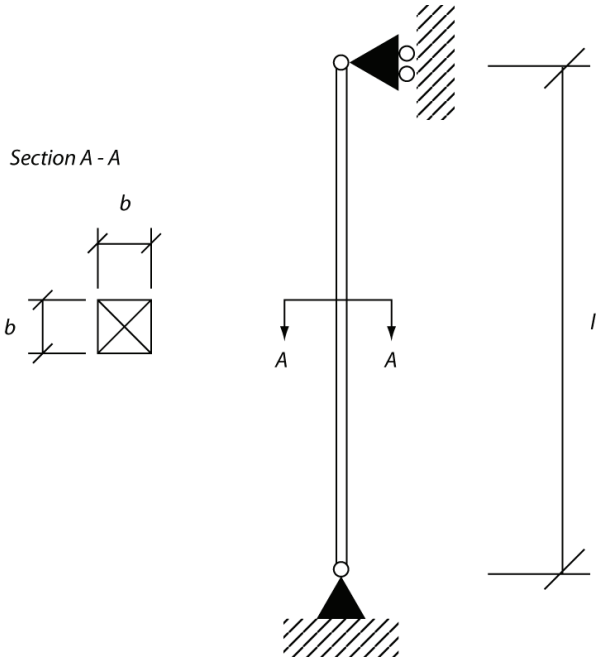
To avoid instability of vertically loaded columns the following equation must be proven

$$\frac{\sigma_{c.d}}{k_c \cdot f_{c.d}} \leq 1$$ [TS p 326]

Column

Looking at the model the column with the biggest axial load is investigated.
This column carries approximatly 20 m^2 of the roof

$f_{column} := 20m^2 \cdot L_1$ $f_{column} = 77.33\ kN$



The column is made from laminated Oak with a crosssection of 200 x 200mm

$b_{column} := 200mm$

$I := \frac{1}{12} b_{column}^4$ $I = 133.3\ 10^6 \cdot mm^4$ [TS p35]

$\sigma_{c.d} := \frac{f_{column}}{b_{column}^2}$ $\sigma_{c.d} = 1.93\ MPa$

Determining k_c

$l := 4m$

$l_s := 0.7 \cdot l$ $l_s = 2.8\ m$ [TS p324]

$k_{rel} := 0.056$ supposed to be the same for oak as for GL28h [TS p324]

$\lambda_{rel} := k_{rel} \cdot \frac{l_s}{200mm}$ $\lambda_{rel} = 0.78$

$k_c := 0.904$ read from the value of λ_{rel} [TS p325]

Evaluation

$f_{c.d.0} = 12.9\ MPa$

$\frac{\sigma_{c.d}}{k_c \cdot f_{c.d.0}} = 0.166$

The equation is fullfilled, thus it is proven that the columns can withstand the vertical loads

Vertical loaded column

Compression perpendicular to the fibers

The columns support the massive wooden elements, and to avoid the wooden elements from crushing the following equation must be proven

$$\sigma_{c.d} \leq k_{c.90} \cdot f_{c.d.90}$$

[TS p 321]

Looking at the same column as in the test for vertical instability.

$k_{c.90} := 1.75$

$f_{c.d.90} = 1.457\ \text{MPa}$

Evaluation

$\sigma_{c.d} = 1.933\ \text{MPa} \quad < \quad k_{c.90} \cdot f_{c.d.90} = 2.55\ \text{MPa}$

The equation is fullfilled, thus it is proven that the roof will not crush at the support of the columns