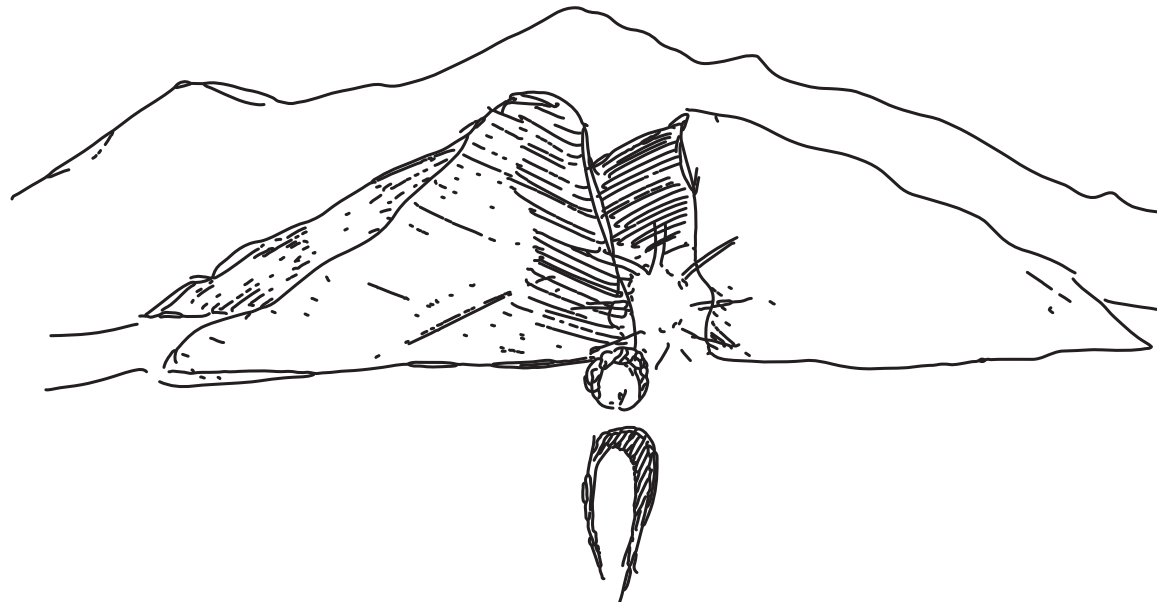


# Biathlon resort for Gautefall



MA4 ARCH 18 -2013  
Kenneth Rytter Porse



# Biathlon resort for Gautefall

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## Abstract

Dette project omhandler udformningen af et biathlon resort/hotel ved Gautefall, i den sydlige del af Norge. Projektet tager afsæt i inspirationen fra det Norske landskab samt brugen af traditionelle materialer. Projektet tager en poetisk drejning da facinationen af Norske fjælle bliver en primær inspiration, fra det punkt og frem omhandler projektet transitionen fra det naturligt element til en arkitektonisk form.

Projektet omhandler samtidig biathlon atleters behov og ønsker som bliver klar gjort gennem dialog med folk indenfor feltet, dette skaber en række vigtige design parametre hvoraf det sociale aspekt bliver vægtet højt.

Projektet stiler samtidig efter at nå den danske energi standard fra år 2020.

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Kenneth Rytter Porse

## INTRODUCTION

This report is a Master Thesis project in Architecture, at (Architecture, Design & Media technology), Aalborg University. The project deals with the design of a new resort area at the ski destination Gaustefall, Norway. The new area is situated next to the existing hotel with direct access to the biathlon arena. The new area seeks to attract biathlon user all year around both amateur and professionals for training and competitions. The design aims to create accommodation for two hundred biathlon users both summer and winter with a clear focus on accessibility and the direct connection to the biathlon area. The apartments become a hybrid between a hotel room and a cabin, taking qualities from both and creating a new topology.

The project has evolved around a personal interest in the particular area, and focuses on designing a new area attracting summer costumers. The project takes inspiration from Nordic architecture and sustainable solutions and seeks to combine these into a Norwegian sustainable architecture.







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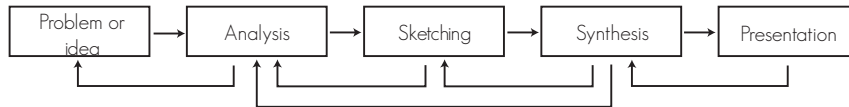
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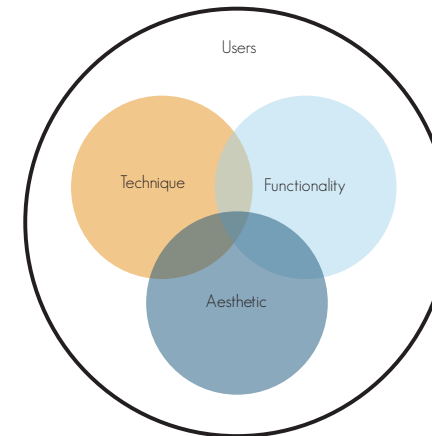
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III. 1.2 Integrated design process [Knudstrup, 2004]



III 1.3 - Integrated approach

## METHODOLOGY

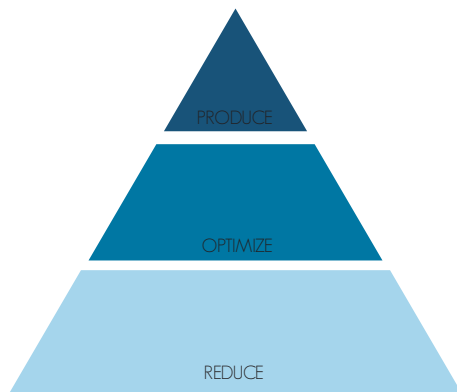
To ensure an integrated building design the project takes departure in the understanding of how functional, aesthetic and technical parameters should work together, creating a design that relates to all the subjects. In this design strategy the user becomes an essential parameter in the creation of an optimized design. This combination of function, aesthetics and technique together with the understanding of the users becomes an important strategy and will affect the entire project. (III 1.3.)

### INTEGRATED DESIGN PROCESS

This project seeks to create an integrated building design; therefore the iterative process of the Integrated Design Process (IDP) is applied to the project. III 1.2

This approach applies a relationship between architectural, technical solutions from the very beginning increasing the plausibility for an integrated design solution. The method is divided into five phases these phases are not seen as milestones through out a process instead as more fluid and dynamic stages where the constant evaluation using both technical and esthetic tools makes it possible to

create loops jumping back and forth through out the process, this ensures a close relation between the architectural and technical process. [Knudstrup, 2004]



ill 1.4 - Sustainable pyramid [Larsen, 2012]

## SUSTAINABLE APPROACH

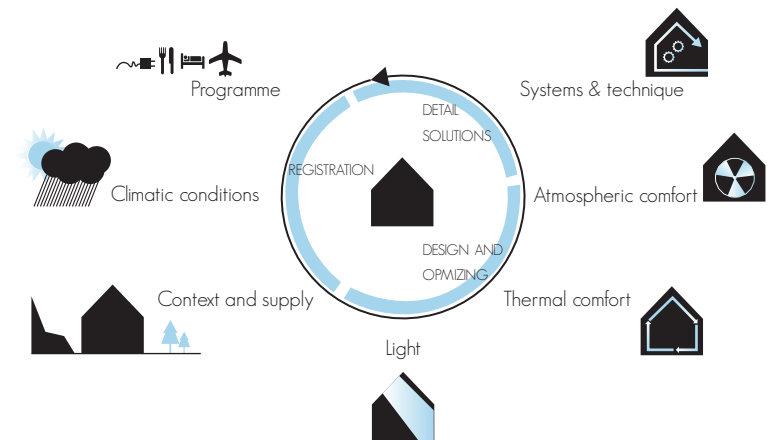
To ensure that the building design fulfills the energy demands a series of sustainable approaches are applied already in the sketching phase.

The sustainable pyramid divides building design into three stages (ill 1.4).

1. REDUCE - through a good design
2. OPTIMIZE - through technical solutions
3. PRODUCE through integrating renewable energies.

The first principle concentrates on light, space and form whom all relates to the building performance, these are cheap passive strategies but effective in the building entire life span.

The second principle optimizes the building performance using technical solutions, as an example applying a recovery unit, reducing the energy use and thereby the carbon emission. The last principle concerns applying energy producing techniques to the building design [Larsen, 2012]



ill 1.5 - Sustainable approach [Larsen, 2012]

When aiming for an integrated sustainable design approach it becomes important to make decisions according to the given time in the process ill. 1.5 shows the different stages taking departure in the registration similar to the analysis phase in IDP then design and optimizing which is part of the sketching phase and then detail solutions as part of the synthesis. By using this process the sustainable approach should become part of the architectural process through an iterative process. [Larsen, 2012]

## PHASE

Problem formulation

Analysis

Sketching

Synthesis

Presentation

## DESCRIPTION

-Result of the interial analysis

- Site analysis (Functions, flow, typologi, typographi, materials and the spirit of the place)
- Climate analysis (Solar exposure, shadows, temperatures and wind)
- Case Studies, interview
- User group (activities, daily pattern, needs)

- Site plans, floor plans
- Solar studies
- Wind studies
- Indoor environmental strategies
- Daylight analysis
- Phenomenological studies
- Volume studies
- specifying architectural concept
- specifying sustainable concept

- Natural ventilation strategies
- Internal loads
- Materials (Quality, U-value, thickness.)
- Mechanical systems

- Report
- Final design (Plans, section, elevations, facades)
- 3D visualizations and physical models
- Diagrams
- Final calculations
- Details

## TOOL/APPROACH

- Autodesk Ecotect (wind analysis)
- Autodesk Vasari (sun, shadows)
- Temperature charts
- Methodes (Kevin lynch, Genius logi etc.)
- Interview users and owners.

- BSim and Spreadsheets
- Autodesk Ecotect
- Autodesk Vasari
- 3D models (Sketchup, Revit)
- Physical modelling
- Hand sketches
- Brainstorms, mindtress, workshops

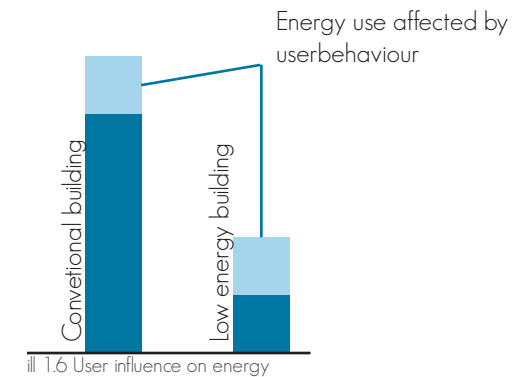
- BSim, Spreadsheets
- Autodesk Ecotect
- Builddesk U-value
- AutoCAD

- Adobe CS6
- Google SketchUp and Revit
- 3D Studio Max (VRay)
- AutoCAD
- BSim
- Physical models

## ENERGY

In 2009 an energy group was formed in Norway, the group focused on the introduction of zero energy standards in new building by the year 2020. In 2010 the group presented a report describing the difficulties in introducing a zero energy standard by the year 2020 but the group concluded that by year 2015 every new building should fulfill the passive house standard and by 2020 they should fulfill an almost Zero energy standard. This publication is ambitious and even more ambitious when comparing it to the existing energy plan.

When comparing the current energy standards of Denmark and Norway, the current energy use in Denmark is 52,5-60 kWh/m<sup>2</sup>/year and in Norway 150 kWh/m<sup>2</sup>/year. This goal of building new energy zero dwelling has influenced the mindset of architects and engineers but also the basic understanding of architecture among people. In Denmark a technical component like a photovoltaic has become a common product in the local department store, this interest in sustainable solutions has started to define a new architectural language where technology plays an important role. This interest has increased over the last ten years but when comparing Denmark to



Norway these products has not yet been introduced to the common dweller, therefore this new energy thinking is not only demanding to reach construction wise but also the sustainable thinking and esthetic quality seems far from the Norwegian understanding. Therefore it becomes interesting to define and introduce a new sustainable architecture in the amazing landscape of Norway. [Cowi,2011]

The Norwegian and Danish standard have a lot of similarities therefore this project will seek to fulfill the Danish 2020 energy standard using Bsim with a Norwegian climate profile.

BR10 Demands	Energy Frame for a hotel
Standard 2020	25 kWh/m <sup>2</sup> year
(SBI-Anvisning 213)	





Still 1.7 - Overview of the existing hotel

## MOTIVATION

### PERSONAL MOTIVATION

Through my father's job as hotel manager and investor I have spent many holidays on the slopes or by a mountain pond with my fishing pole, ever since I have followed progression of the area.

I first spend a holiday here in 2004, since then the area has evolved rapidly with new cabins, new skis center more slopes and even a biathlon arena large enough to host the Norwegian championships. Since then the area has aimed to become a tourist goal for families both summer and winter, still progressing in size but focus on attracting customers for the summer period.

Through my holidays I have become very fond of the Norwegian nature, the snowy winters and the sunny summers and a landscape so far from the Danish, and my internship at an architectural office nearby introduced me to the Norwegian people and their close relationship to nature.

I believe that the existing typology of a hotel could be optimized, and become more suited for the user group, both regarding energy, functionality and the important connection to nature, but also become a binding factor for the whole area generating more activity both summer and winter. The area is now branded and focused on skiing instead the area must find a new identity that attracts people both summer and winter.

## NORDIC ARCHITECTURE

*After experiencing the site first hand, an inspiration from Nordic Architecture seemed obvious, context, materials and light.*

*The new Nordic architecture has its roots in the traditional Nordic values; modesty, honesty and the close connection to nature, but economic growth from the North Sea has ensured increased prosperity, expenditure and luxury which influence the fundamental core of Nordic architecture. This change has also shifted the cultural landscape from a working and production based society to a more recreational and tourist minded society.*

*The transformation made people move close to the cities but the increased wealth has given space for holiday cabin in the woods, ensuring a close connection to nature. These new holiday cabins are larger and more luxuries than before, comparable to newly build apartment in the city, both in size and equipment. (Arkitekten, 2012)*

*This new Nordic architecture is not about going back the Nordic traditions but instead to reuse geographical qualities in the new and global settings, keeping in mind the identity and culture of the location, the "genius loci - the spirit of the place. Nordic architecture was a direct result of its context, traditions and culture from that given location but today the globalization has resulted in a society where we "sample" and steal cultural identity from other cultures because we are constantly influenced from the media and the ever changing global society.*

*Some would argue that this globalization can result in a more homogenize culture where the cultural characteristics are lost. Then again this new internet society has resulted in people wanting to be unique, often by breaking the norms and form a smaller society inside society. People posting a flash mob to become part of an identity that reflect the individual or simply braking the pattern of the grey suits by doing a public dance show, this shows a new culture being a result of the individual instead of the geographical location and history.*





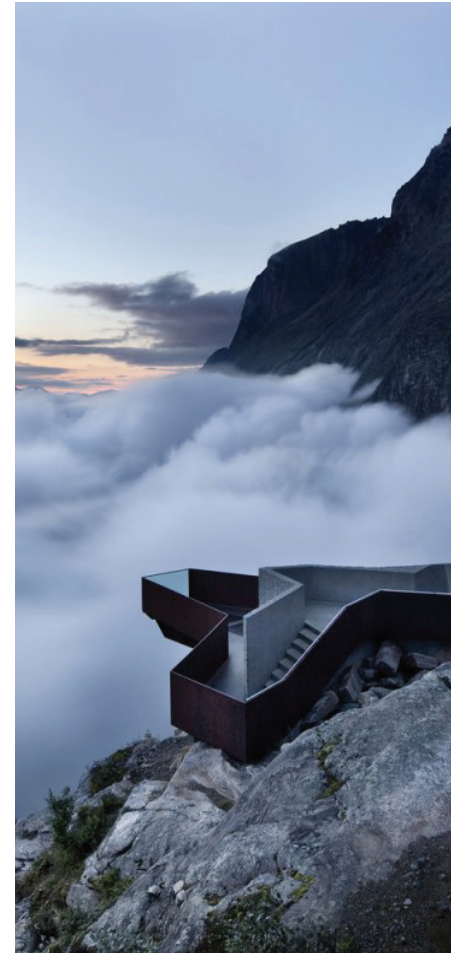
ill 1.9 - Kilden



ill 1.10 - Snøhetta



ill 1.11 - Oslo Opera Snøhetta



ill 1.12 -

Many new Nordic projects seek inspiration in the traditions of what is referred to as Nordic architecture but also uses some of the fundamental ideas of the pragmatic methodology defined by Dutch architecture. These very different architectural languages has a common interest in the location and quality of the site, this is what makes the New Nordic architecture interesting with the understanding of the site and the values implemented in local material the use of nature and light together with the very direct and icon quality something

very new evolves but still with clear contextual signals implemented in form and material.

The pictures above shows some of the new architecture build in Norway, which takes inspiration in context and creates an interesting icon building that shows understanding of the Nordic values.

## LOCATION

Gautefall is located in the southern part of Norway between Kristiansand and Oslo, in the municipality of Drangedal.

The area is very low populated only around four thousand inhabitants in an area of one thousand square meters which is third the size of Fyn. The area is mostly known for its beautiful nature and outdoor activities, during winter the main attraction is Gautefall which is the largest companies in the municipality creating jobs to more than one hundred people. Gautefall is an important meeting point for the area, where many of the locals either work or spend their weekends using the facilities in and around Gautefall.

Nature has always played an important role in these low populated areas where people interact through nature or simply uses nature as an important space to spend time. Gautefall gets most of its visitors from Norway, Sweden and Denmark because of the short drive from the ferry and the easy slopes these are mainly families and new beginners. (Drangedal, 2012)



ill 1.13 - Location and ferry connections



ill 1.14 - Location between Oslo and Kristiansand



DESTINASJON  
**GAUTEFALL**  
TELEMARK



HEISER	Lifts	SYMBOLER	Symbols	LOYPER	Slopes
A	Melkeveien	↓	Informasjon	Big Jump	Ekspert
B	Tvillingen	↓ ↓	Information	Half Pipe	Middels
C	Karlsvogna	⌵	Billetsalg	1/4-pipe	Lett
D	Lillebjørn	⌵	Tickets	Booking	Veldig lett
E	Storebjørn	↓	Skiutleie	Barneområde	Turloyper
F	Skibånd/Ski carpet	⌵	Ski hire	Skiløyper	Ski
G	Framtidig prosjekt	⌵	Skiskole	Cross country	
H	FP	⌵	Ski school	Tursti	
I	FP	⌵	Skipatrolje	Path, flood light	Skoytebane
J	FP	⌵	Ski patrol	Overnatting Bed	Skating
K	FP	⌵	Restaurant		

BAKKER - LENGDE		Pists	Length	HEISER	L	
1	◆	Slatåmen	1000 m	11	◆	1200 m
2	◆	Brattthengen	1000 m	12	◆	1800 m
3	◆	Kula	1000 m	13	◆	600 m
4	◆	Gaufefallet	1000 m	14	◆	1200 m
5	◆	Renna	1000 m			Framtidig
6	◆	Liafallet	1000 m			prosjekt
7	◆	Hotellfallet	1200 m			Projects
8	◆	Knerten	300 m			
9	◆	Kjelkebakken	300 m			

↓	Tallerkenheis
⌵	Platter lift
⌵	T-krokheis
⌵	Stolheis 2
⌵	Chair lift 2
◆	Snoprodukt
◆	Snow making
◆	Lys Light



ill 1.16 - Panoramic view facing the Hotel seen from Rytterspranget

## GAUTEFALL

What started out as one "heis" in 1967 has since then evolved into an international ski sport area, with more than thirteen slopes and a biathlon arena suited for the Norwegian championships.

The area provides a series of activities both summer and winter and all together the area accommodate more than four thousand people.

In 2006 The municipality of Drangedal together with Gautefall formed a plan for the further evolving of the area, the plan was to make Gautefall a summer and winter resort attracting more customers outside the winter season, this would stabilizing the economy and ensure more workplaces for the municipality. This ambition of attracting more summer guests resulted in the construction of the biathlon arena; the arena gave possibility to train both summer and winter and host large competitions. Since then the area has stopped evolved and the owner still seek a way to attract more guests outside the winter season.

During winter Gautefall is still filled with customers, attracting families from Denmark, Norway and Sweden to the area. The Danish and Swedish guests rents cabins while many of the Norwegian families have bought a cabins or an apartments in the area.



## USERS

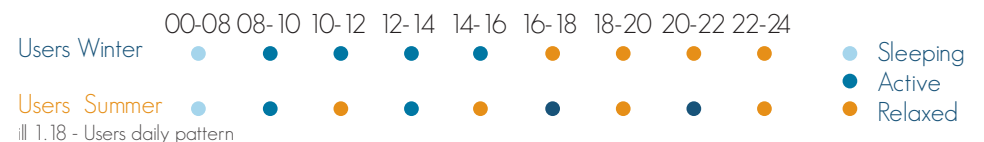
When the snow starts falling in November and until spring arrives in April the two hour drive from the ferry in Kristiansand and Larvik attracts families with small children and new beginners in all ages. These guests choose the destination because of the short drive and the family friendly slopes. Most of these guests stay for a week in a rented cabin where they cook their own food and spend most of their evenings. The area is also visited by groups whom arrive by bus these customers stay for 2-3 days either renting hotel rooms or apartments, often these guests use the dining facilities on the hotel instead of cooking their own food. The area is also participated by cabin owners who primarily isolates themselves but uses the slopes and biathlon.

When spring arrives and until winter comes the area attracts people whom enjoys the nature and the activities provided by nature, but when comparing this season with winter the amount of customers is very low.

(Bjørn Halvor - Daily manager)



ill 1.17 - Primary users



The diagram above illustrates the daily pattern of the users.

During winter almost everyone follows the opening hours of the alpine center, therefore most of the users are occupied from 8-16 when the center is open, then they return to the hotel/cabin for relaxation and family time.

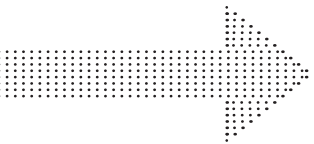
During summer the pattern is more random, the users choose when, where and what to do.

## STATEMENTS OF FORMER OWNER AND MANAGER STEEN RYTTER

Which words comes to your mind when I say Gautefall?.....	Closeness, all in one, walking distance, security, family minded, rookies.
Which activities do Gautefall provide?.....	Biathlon, Climbing, Mountain biking, Canoe/kayak, Cross-country skiing, Alpine skiing, Swimming, Waterfall (Jette gryderne), Fishing, Trekking and Hunting.
How did Gautefall perform before the crisis started?.....	The turnover before the crisis was approx one hundred million DK, and around fifty thousand visitors. Last year the turnover was around twenty-five million DK.
How is the balance between summer and winter?.....	The area is mainly used during the high season of winter, from January to Marts, these months' accounts for ninety-five percent of the total sale.
What is the ambition and future of Gautefall?.....	The ambition was to create an "all in one" area both winter and summer, where the sale would be distributed fifty/fifty. When referring to an "all in one" area I draw parallels to Club la Santa in Spain. An area that welcomes all types of people to do all sorts of activities, a place where everything is located in walking distance so no need for cars. One would say like a city of leisure and activities located in the picturesque surroundings of Norway. The area would still focus mainly on and being a family friendly area, but by using the potential of the area and the short distance to Denmark, the potential of creating something unique is certainly present.
Where would you place this new Club la Santa version of Gautefall? .....	I would place the new complex behind the biathlon, opposite the skiing hill. This area has the panoramic view over the whole area and is facing the sun; it would be possible to connect the area to the skiing center using a cable cart.
This new complex, how many people and which facilities should be present? .....	The existing hotel consists of seventy six hotel rooms and thirty apartments. An activity area with pool, fitness, gym hall, and a dining area, bar and after ski and also conference rooms. The new area should accomodate around two hundred people, and with a majority of apartments instead of hotel rooms.

“LIKE A CITY OF LEISURE AND ACTIVITIES LOCATED IN THE PICTURESQUE  
SURROUNDINGS OF NORWAY” (STEEN RYTTER)

## OUTPUT



ill 1.19- Pictograms showing potential and existing activities

## INITIAL PROBLEMSTATEMENT

The interview with the former owner revealed a series of statements characterizing the area and its future plans. The area wants to evolve and ensure more summer guests, creating this 50/50 balance between summer and winter, already the area has tried to attract more summer guests by building a 35 million kroner biathlon arena, but the project has not yet ensured this balance. As part of the future development of the site the aim is to become an all I one destination attracting guest all year around and to build new accommodations for two hundred guests. But all these ambitions are not yet fully defined and a series of unanswered questions arise.

Where should this new area be build? What should characterize this area? and Whom should use this area?

These are just some of the questions asked, therefore an analysis of the area is preformed to answer these questions and give a deeper understanding of the areas challenges and potentials.



ill 1.20 - Family trout fishing



ill 1.21 - View facing nearby lake area



ill 1.22 - Poetic winter picture



# INITIAL ANALYSIS

AREA & TYPOGRAPHY

WEATHER AND WIND

DISTRICTS

SUMMER WINTER ACTIVITIES

FLOW

CONCLUSION ON MAPPINGS



ill. 1.22 - Panoramic view facing the lake

## AREA & TYPOGRAPHY

The area is situated in a valley between two mountain peaks, the southern mountain is used for skiing slopes and a series of cabin areas, and the northern mountain is used for biathlon and wild life experience. In the bottom of the valley lies a lake, the lake is part of the biathlon course but is also used for a series of wild life activities.

The sections show the hotel being located in-between the two mountain peaks and overlooking the biathlon and lake area of a small hill. The sloping terrain characterizes the whole area, the hotel and the two mountains are visible from almost every location.



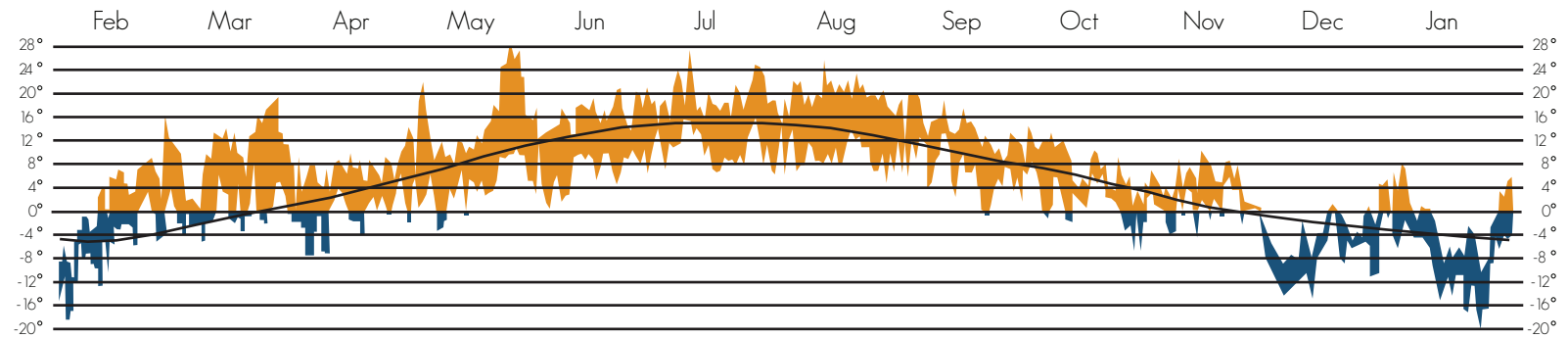
ill. 2.1 Section AB - 1:20000



ill. 2.2 Section AA - 1:20000



Figure 2.3 - section lines show on the site



ill 2.4 - Temperature chart from Gautefall

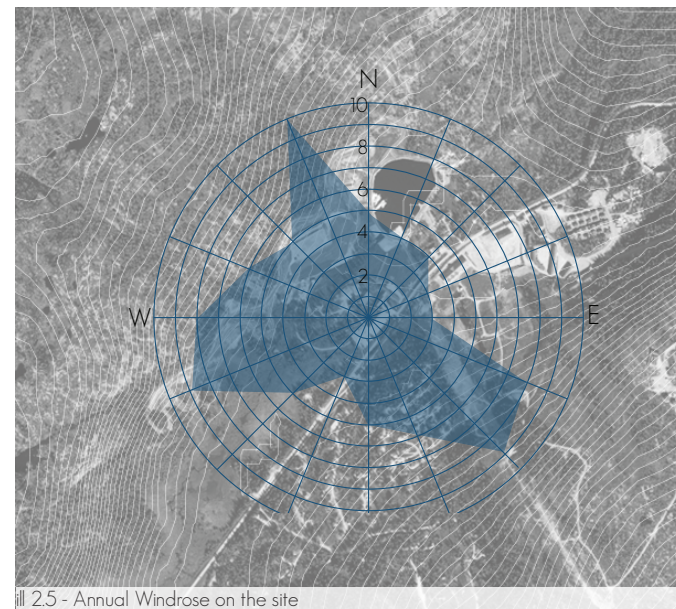
## CLIMATE

A weather station only fifteen kilometers away gives a good indication of the weather scenario at Gautefall, during winter the temperature goes as low as minus twenty and during summer up to twenty eight. One would look at these temperatures together with the strong wind speeds and conclude that the winter would be unbearable but because of the location between hill tops and far from the coast the low temperatures are bearable the hills protect the area from the wind and only occasional rough on the tops. During summer it becomes like an oven but the lake and forest area nearby gives possibility for relaxation and shadow.

*Protected against wind but open towards south west and north east.*

*Flat grounds around the site, good solar radiation.*

*Possible relaxation by the lake on warm summer days.*



ill 2.5 - Annual Windrose on the site



## DISTRICTS

The area is divided into different districts each of them focusing on different user groups.

Biathlon and lake area ill. 1 and 2

Housing area ill. 3

Cabin district with permanent residents and a small church

Mixed dwelling area ill. 4

This district consists of cabins, apartments and caravans focusing on lower budget, self-sufficient users

Slopes ill. 5

Alpine skiing area

Rytterspranget ill. 6

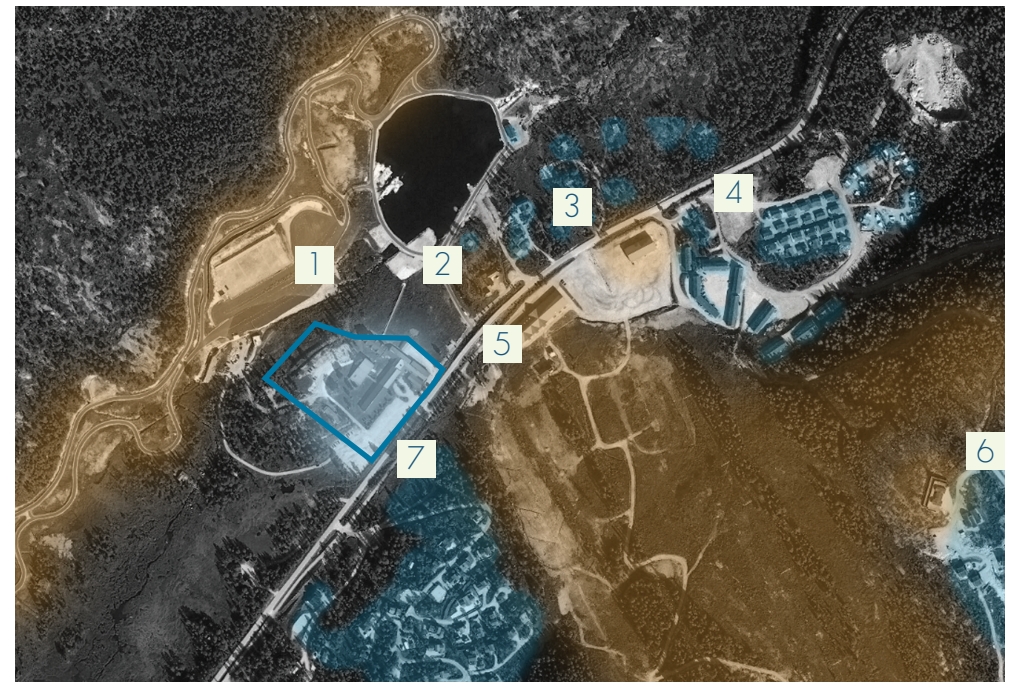
Newest cabin area, high quality almost residential dwellings.

Cabin area ill. 7

Large scale cabins, rented to group of ten or more.

Hotel

focusing on higher quality, leisure and dining facilities



ill 2.6 - Diagram of the different districts



ill 2.7 - One of the apartment areas

## TYPOLOGIES

The area is a mix between cabins and apartments some dating back to the years before world war two and others still under construction. The first cabins build are small traditional wooden cabins painted in black and red and with vegetation on the roof, see illustration 2.9. They are suitable for at least six persons and the layout consists of three bedrooms, living room, bathroom, kitchenette and a small patio facing south.

Next to the old cabins lies a series of two stories apartment blocks, see ill 2.7, the apartments are painted black and greyish blue and also these has a vegetated roof, each apartments is suitable for ten persons and the layout consists of three bedrooms, living room, bathroom, kitchen and either a veranda or patio facing south witch is also the direction of the skiing area.

On the top of hill Rytterspranget is a series of newly build luxury cabins, almost comparable to housing, these cabins varies from one hundred square meters up to five hundred square meters. Also in their architectural language they vary, from very traditional log cabins, ill 2.8 to more modernistic double cabins with panoramic windows. ill 2.10.

*What characterizes the whole area is the use of pine wood either painted or natural varnished and heavy green roof to ensure tightness in the construction. Most of the dwelling also have a patio facing the skiing area.*



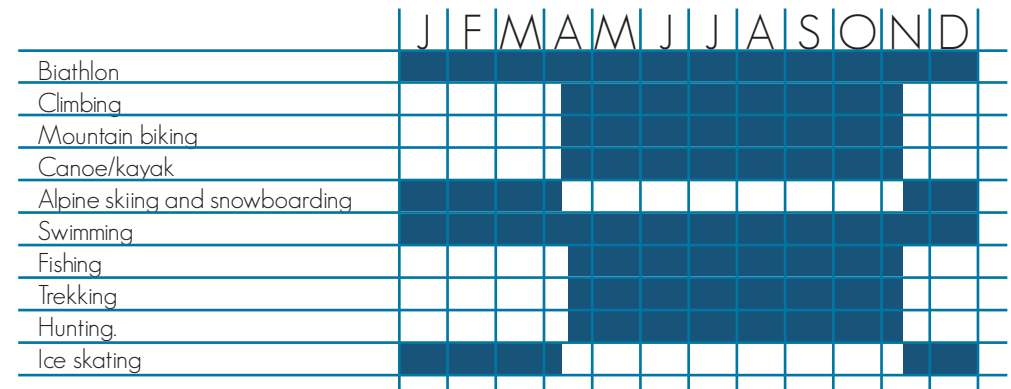
Ill 2.8 - New traditional cabin on Rytterspranget



Ill 2.9- Old traditional cabin



Ill 2.10 - Mordern dobbel luxury cabin on Rytterspranget



ill 2.11 - Annual activity chart

## SUMMER WINTER ACTIVITIES

The area provides a verity of activities both summer and winter, mentioned in the interview with Steen Rytter, 95% of the visitors are during the winter months where the skiing area is up and running. ill 2.11. shows the variety of activities and when they are desirable.

Mapping the activities show that the southern area concentrates on skiing and snowboarding make this area the primary goal during winter season. The northern area consists of a series of summer activities and the all year biathlon arena, this area shows potential in becoming the summer destination for guests.

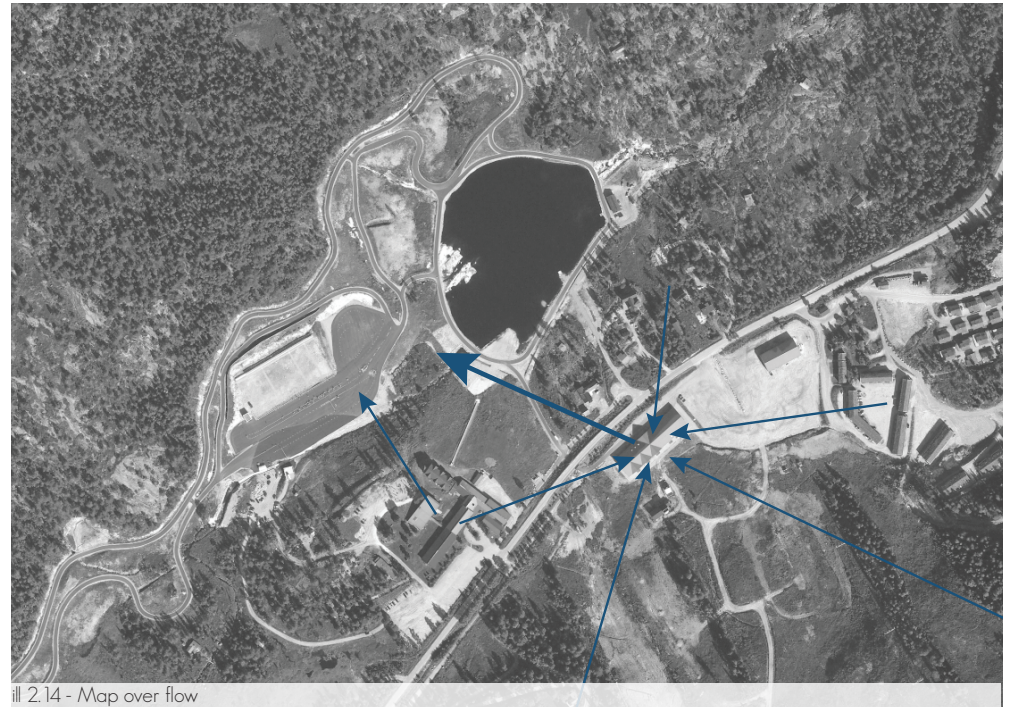


## Flow

Looking at the flow both summer and winter the ski center becomes the primary destination, the ski center provides: dinning, bar and rental of equipment. Therefore this center becomes the hearth of the area and the primary meeting point. A secondary flow is towards the lake and biathlon area, this area provides a series of wild life activities and the hotel nearby has dinning and relaxation facilities.



il 2.13 - Que in front of the skicenter



il 2.14 - Map over flow

Where should this new area be build?

On the small hill overlooking the biathlon course in connection with the existing hotel, sharing facilities and together creating a resort

What should characterize this area?

The combination of biathlon and nature.

Whom should use this area?

people wanting to use the biathlon facilities.

## CONCLUSION ON MAPPINGS

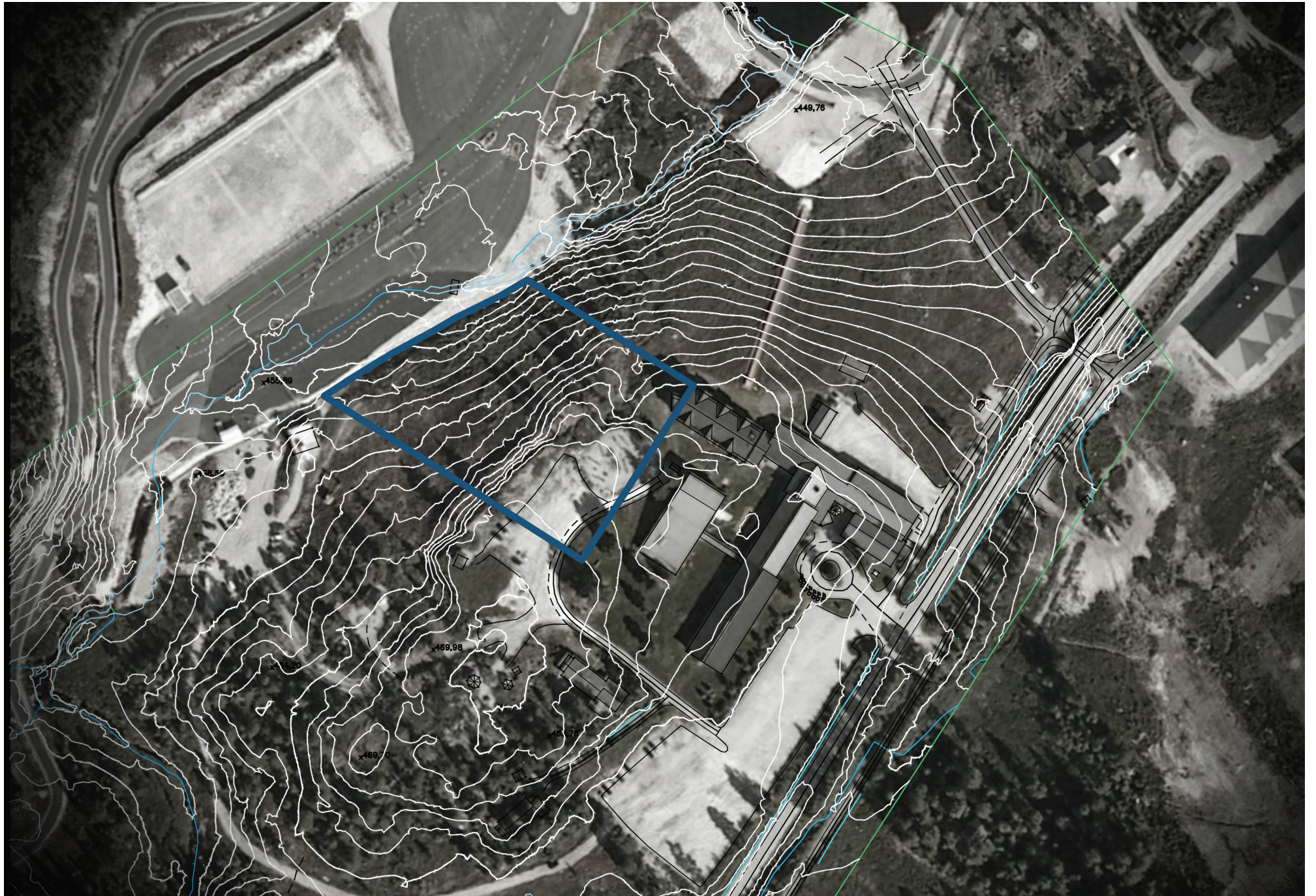
Through the analysis of the area it has become clear that the variety of activities both summer and winter has the potential of attracting more customers, the area seeks to attract more customers during the summer period and are in the need for more apartments. The mappings clearly indicate that a majority of cabins and apartments are connected to the alpine skiing area, therefore it has become clear that the two hundred new accommodations should instead connect with the biathlon and lake area. This area concentrates on the low season, providing a series of activities through nature.

The lake area provides both relaxation and activities giving this area a different atmosphere and quality than the fluid alpine area.

The biathlon arena also attracts a different segment of people and having the quality of attracting these guests both summer and winter. The paved and illuminated course ensures that these visitors are able to use the route all year around giving Gautefall a unique potential of concentrating on biathlon.

By focusing on biathlon and nature in this area, it is possible to attract a different user group, a group that wants to experience nature trough cross-country skiing. Connecting this new area with the exist-

ing hotel it is possible to share facilities and together create a resort like feeling.





# CONTEXT ANALYSIS

SITE SECTION

EXISTING HOTEL

PANORAMIC VIEWS

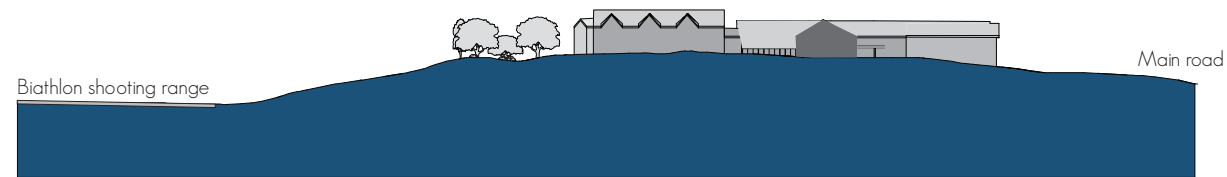
ACCESS WAYS

TPOLOGIES

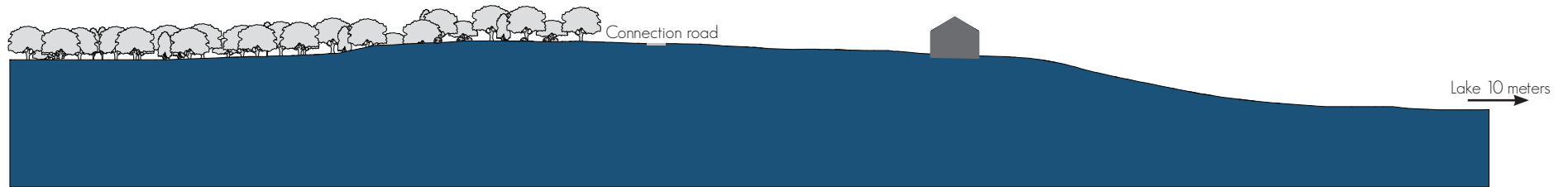
BIATHLON

CONTEXTUAL MATERIAL

CASE STUDY: ROCKSRESORT



ill. 3.1 Section AA - 1:2000

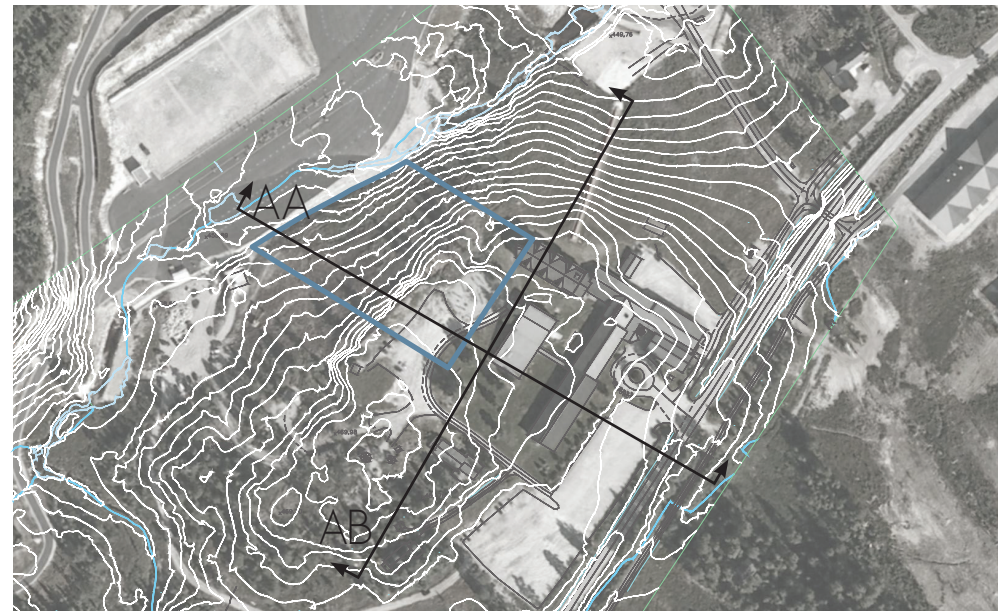


ill. 3.2 Section AB - 1:2000

## SITE SECTION

The chosen site is located on a small hill side next to the existing hotel, the site slopes towards the shooting range of the biathlon course and ensures a great view overlooking both the biathlon and lake area. Towards south a smaller forest merges with the site but still allowing wind and sun to reach it. a small road runs in the center of section AB connecting the site to the hotels parking lot which is located next to the main road.

Exposed to the sun towards south  
View facing west (biathlon) and north(lake)  
Connected to the existing parking area.  
Forrest towards south

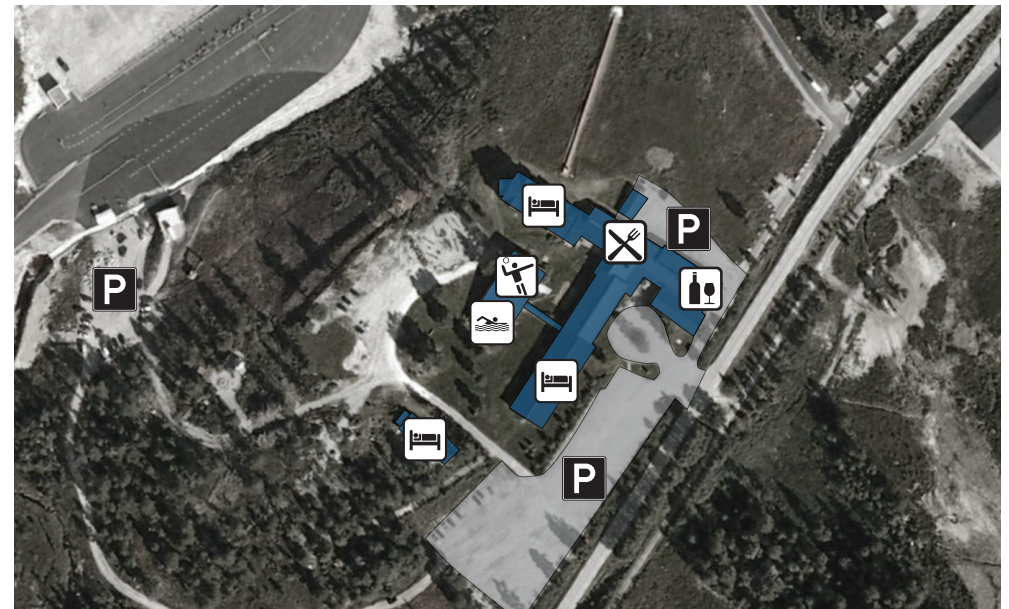




## EXISTING HOTEL

The hotel is from the 1960ies built using concrete elements the facades are covered with horizontal timber cladding and with a distinctive horizontal belt of concrete. The east end of hotel offers dining and bar facilities overlooking the ski and lake area. Towards the north is the newest attachment a three stories apartment block consisting of thirteen apartments, this newest block separates from the rest of the by being purely timber cladding but still in the gray color like the rest of the hotel. The southern part of the hotel consists of seventy six hotel rooms on two stories. The hotel is connected to a fitness, pool and sport hall by a glass corridor.

Next to the hotel is the manager's cabin which is a large black timber cabin with private garden. South of it is the large parking lot accommodation both hotel guests and biathlon users, two small parking lots can be found in the area.





1.ill 3.4 - Panoramic view facing the lake



2.ill 3.5 - Panoramic view facing the biathlon

## PANORAMIC VIEWS

These photos show the most interesting views from the building site. The photos are described below.

1. The lake and the slopes,  
- When facing north and east one is met by a breathtaking view overlooking the lake and the skiing area.

2. The biathlon arena  
- Towards east is the biathlon arena and still possible to view the lake.

The south view  
- The view towards south is the large cabin area, thus the sun direction this view is not very interesting

*The location on a small hill ensures a 360 degree view of the area.*



ill 3.5 - Diagram showing views

## ACCESS WAYS

The map shows the possibilities of entering the site either by car or foot, and the advantages and disadvantages for each of them will be discussed.

### Access by car

The road is the primary connection in the whole area, and is the only road leading to the site.

- + view (branding)
- Heavy traffic, high speed, separates the area.

### Access by foot

The primary access road connects the site to the slopes, the site is accessible in every direction but only by foot.

- +accessibility by foot, openness, different atmospheres
- Only one pavement connection, using a tunnel



Illustration 3.6 - Access the site by foot



Illustration 3.7- Sign warning to cross the main road



Illustration 3.8 - Tunnel connecting site with alpine area

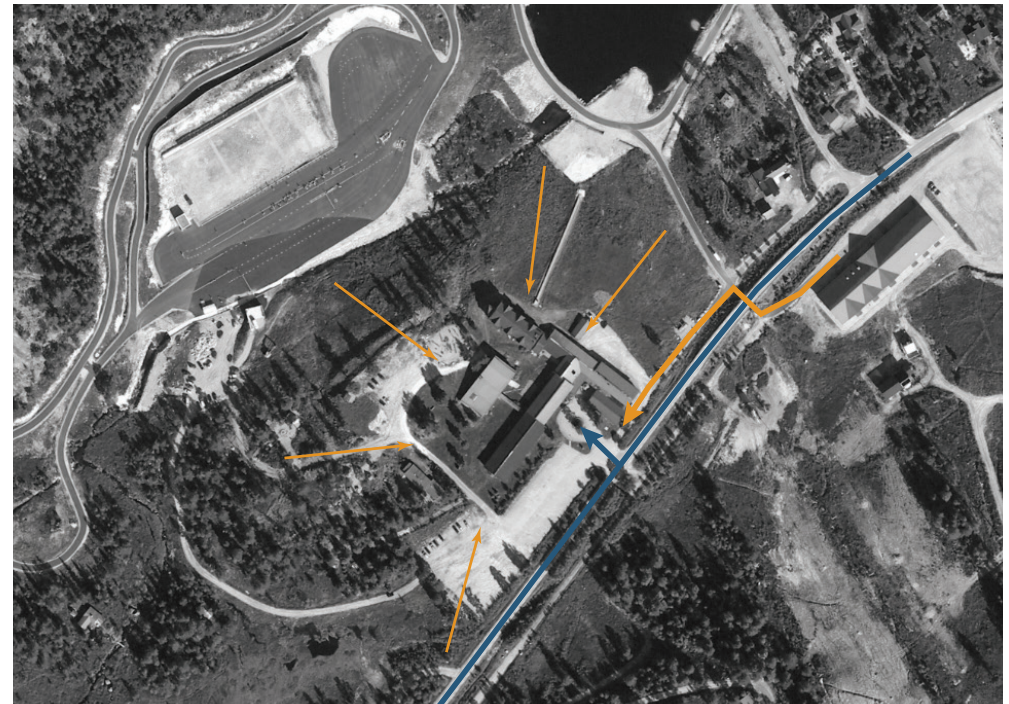


Illustration 3.9 - Diagram showing Access way

## BIATHLON

*Biathlon is a combination of cross-country skiing and target shooting, the first competition dates back to 1767 but was first acknowledged as a competition in 1958.(Skiskytterskolen) Since then Biathlon has become the most popular sport discipline in Norway (vg.no).*

*To understand the biathlon users' needs and wishes, contact was made to Bjørn Runar, general manager of the biathlon arena at Gautefall whom ensured contact to Ulrich Koch.*

*Ulrich Koch is former Trainer and currently active in the organizing committee of the Norwegian Championships, Norwegian Cup and Eastland Championships. Ulrich pointed out a series of design wishes and parameters.*

### *Accommodation*

*Preferred family rooms of 4 in groups of 10 to 30.*

*Training is cloth demanding, therefore good storage space.*

*Safe storage of weapons.*



ill 3.10 - The true purpose of Biathlon ?

### *Facilities*

*possibility for maintenance of equipment.*

*Gathering space, overlooking the biathlon arena, monitoring of results.*

*Short distance to the arena, the existing is to long.*

*Conference room for group meetings.*

*Restaurant serving nutritious food.*

### *Social*

*Social interaction space without alcohol, could include pool, foosball, TV lounge.*



ill 3.11 - Gautefall - Wooden tower

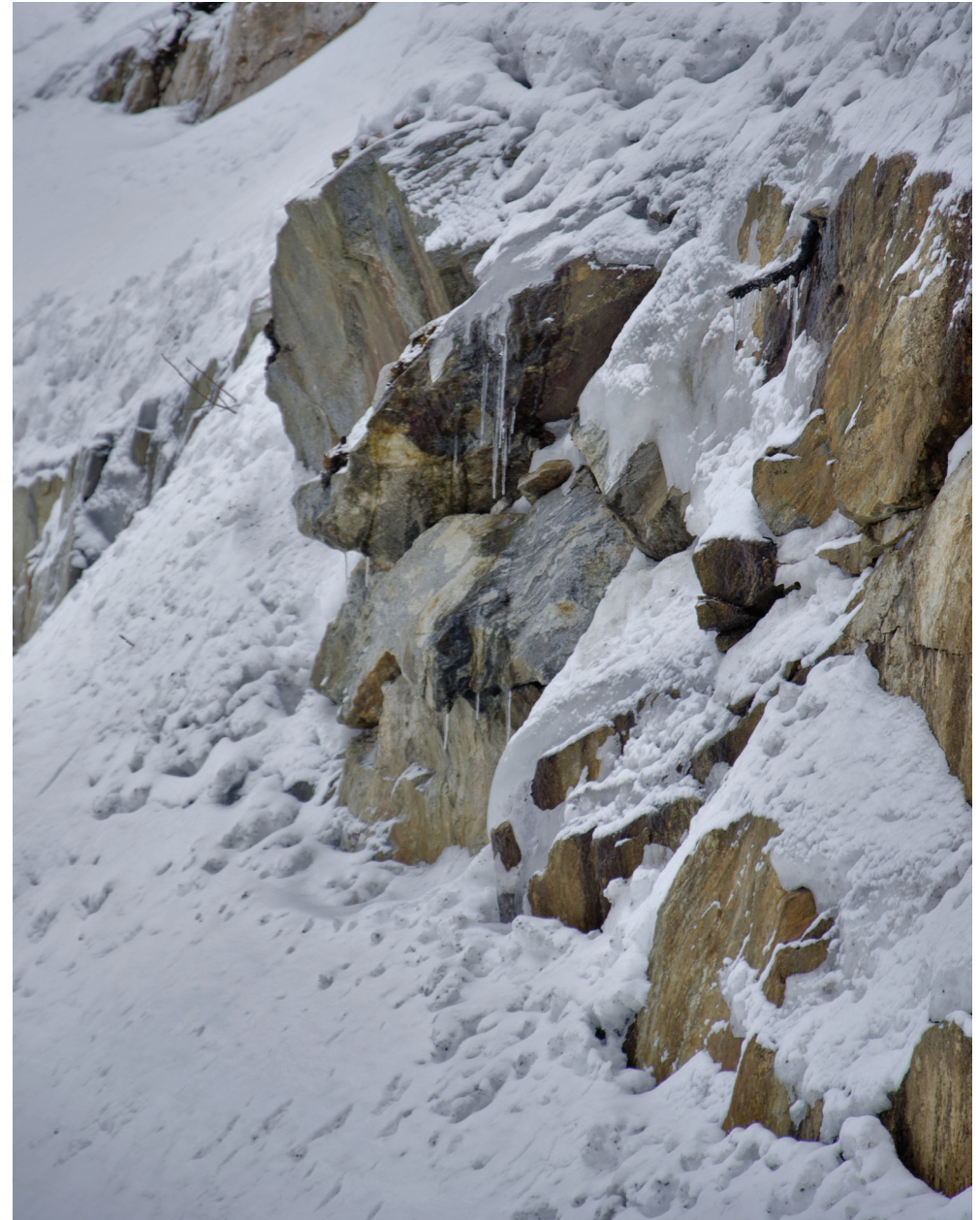
## CONTEXTUAL MATERIALS

The architecture in this part of the country is often traditional and simple, therefore the primary materials often reflect the surrounding materials in this area: wood and stone.

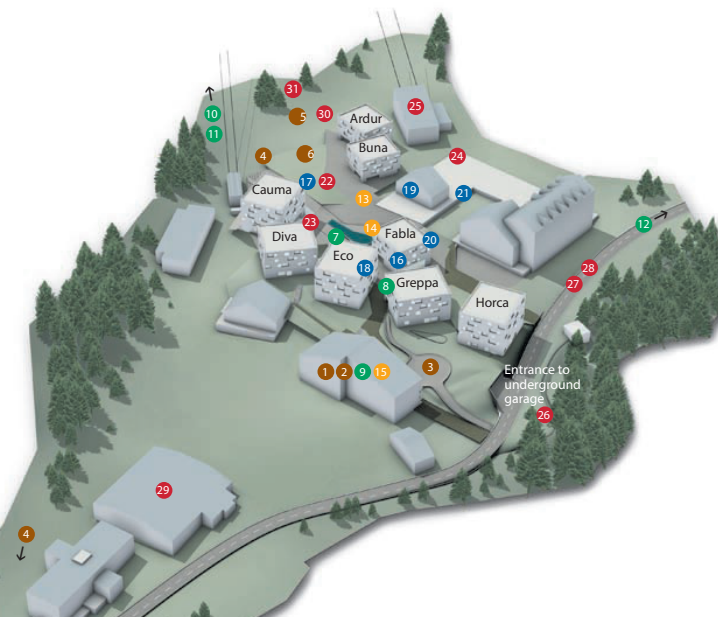
As mentioned earlier when describing the typologies, the main material used in the area is wood from pine trees. Pine trees are covering the whole area, making this material easy and cheap to obtain, and also giving it a contextual and historical value.

Often when elevating the base of a building, stone and dirt are used; in this area the primary stone type is granite, which gives this material the same qualities as the pinewood. Because of the geographic location, summer and winter bring two extra materials, snow and grass. Grass is often used on the roofs, ensuring a tight connection, whereas snow is a more dynamic, almost random material that either hides or reveals.

*This project will take inspiration from the contextual materials; Pine-wood, granite, grass and snow.*



ill 3.12 - Gautefall - Granite rock



ill 3.13 - Rocksresort - Overview

- rocks resort
- 1 Check-In rocksresort & signinalhotel
- 2 signinalhotel
- 3 Circular drive
- 4 Bike Pump Track
- 5 Bike Skill Area
- 6 Fun Area
- rocks restaurants
- 7 Nooba – pan-Asian cuisine
- 8 Grandis – Ustria da V in
- 9 Ristorante Camino
- 10 Tegia Larnags
- 11 Tegia Curnius
- 12 Stalla – Alp Nagens
- rocks bars
- 13 Piazza Caf fè & Panini
- 14 Il Pup
- 15 Camino Bar/Lounge
- rocks shops
- 16 Intercoiffeur Gauch
- 17 Amalgan
- 18 Garage Fashion Stor e
- 19 Meini Sport
- 20 Bakery Romana
- 21 Volg – Supermarket
- rocks service
- 22 Bike hire
- 23 rocksresort estate agency
- 24 Mountain Rail T icket Office
- 25 Crap Sogn Gion cable car
- 26 Post Bus stop
- 27 Flims Laax Falera Shuttle stop
- 28 Nagens Shuttle stop
- 29 Freestyle Academy
- 30 Meeting Point Ami Sabi Summer W onderland
- 31 Crèche with playground



ill 3.14 - Rocksresort - Apartment interior



ill 3.15 - Rocksresort - Exterior space

## CASE STUDY: ROCKSRESORT

Rocksresort is located in the area Laax in Switzerland and is the leading freestyle winter resort. Rocksresort takes its name and identity from the 40-million-year-old quartzite stone used as building material. The stone is mined from the local quarry then cut and stacked forming the eight freestanding cubic structures, all placed around a central square, the resort consists of holiday apartments, shops, restaurants and bars. Throughout the design the use of local material are used, the interior captures the surroundings using warm wood together with light colors creating an inviting atmosphere. But as breathtaking and different as the design is, what sets Rocksresort apart from the traditional thinking of ski resorts in Europe is the fact that the whole area is owned by one guy, Reto Gurtner, he owns both lifts, ski school and all the apartments this is often only seen in the United States and Canada, by doing so it allows him easier to brand the resort and fill beds during off-peak seasons because the he has the control of the free apartments. It also improves the service level. as an example: No need for buying lift tickets, because the lift ticket is already embedded in one's room key. (Rocksresort, 2013)

### Building Facts

Owner: Reto Gurtner

Year of Construction: 2007-2011

Architect: Domenig Architekten

Location: Laax, Switzerland

Number of apartments: 122

Apartment types: 2-3-4 bedroom apartments between 55-120m<sup>2</sup>

Facilities: bars, shops, restaurants, wellness, bike track, ski slopes, indoor bike arena

Apartments strategy: Shared ownership (useable 3 weeks during peak season)

Materials: Oak, Limestone, Concrete and Quartzite stone.



ill 3.16 - Rocksresort - Bath



ill 3.17 - Rocksresort facade



ill 3.18 - Rocksresort - Bedroom



ill 3.19 - Rocksresort Materials



# RECAPTULATION

RECAPTULATION  
VISION  
SPATIAL PROGRAM

## RECAPTULATION

*This section summarizes the knowledge gained through the analysis phase and emphasizes key parameters and design goals creating a foundation for the design phase.*

### *Organization*

*A resort for biathlon users has shown to differ from the typical hotel layout, professional users seek quality in staying in groups often in family rooms of four, but the resort should also be suitable for amateur and cross country skiers seeking the same connection to the arena and the wildlife.*

### *Social interaction*

*An important parameter for the professional users showed to be the social connection, therefore this social aspect has become a clear defining parameter for the overall resort design, this is a parameter that separates this typology from the ordinary hotel.*

*The resort should create a variety of social spaces, giving space for both group, couples and single to interact*

### *Training environment*

*The existing hotel showed to offer a series of training and wellness facilities, instead of separating the new complex these functions should instead become a binding factor in the area creating a connection between alpine and biathlon users generating activity in the whole area. Furthermore the new facility should accommodate the necessary maintained facilities (workshop, storage spaces).*

### *Contextual relation*

*After visiting the site the use of contextual material became a clear inspiration, the use of granite and the typical pinewood together with the periodic materials: snow and grass should define this project.*

### *Energy*

*The project aims to meet these new energy demands of Norway, influencing the design from the very beginning. Understanding the location and maximising the amount of solar gain and at the same time aiming for a compact and tight envelope.*



## VISION

The vision is to create a resort for biathlon users, to attract more summer guests fulfilling the overall strategy of Gautefall.

This resort will accommodate biathlon users, both professional and amateurs and ensure a pleasant training environment with focus on the social interaction between users.

The resort should connect with its context through form and material, and focuses on both physical and visual connection to the biathlon arena.

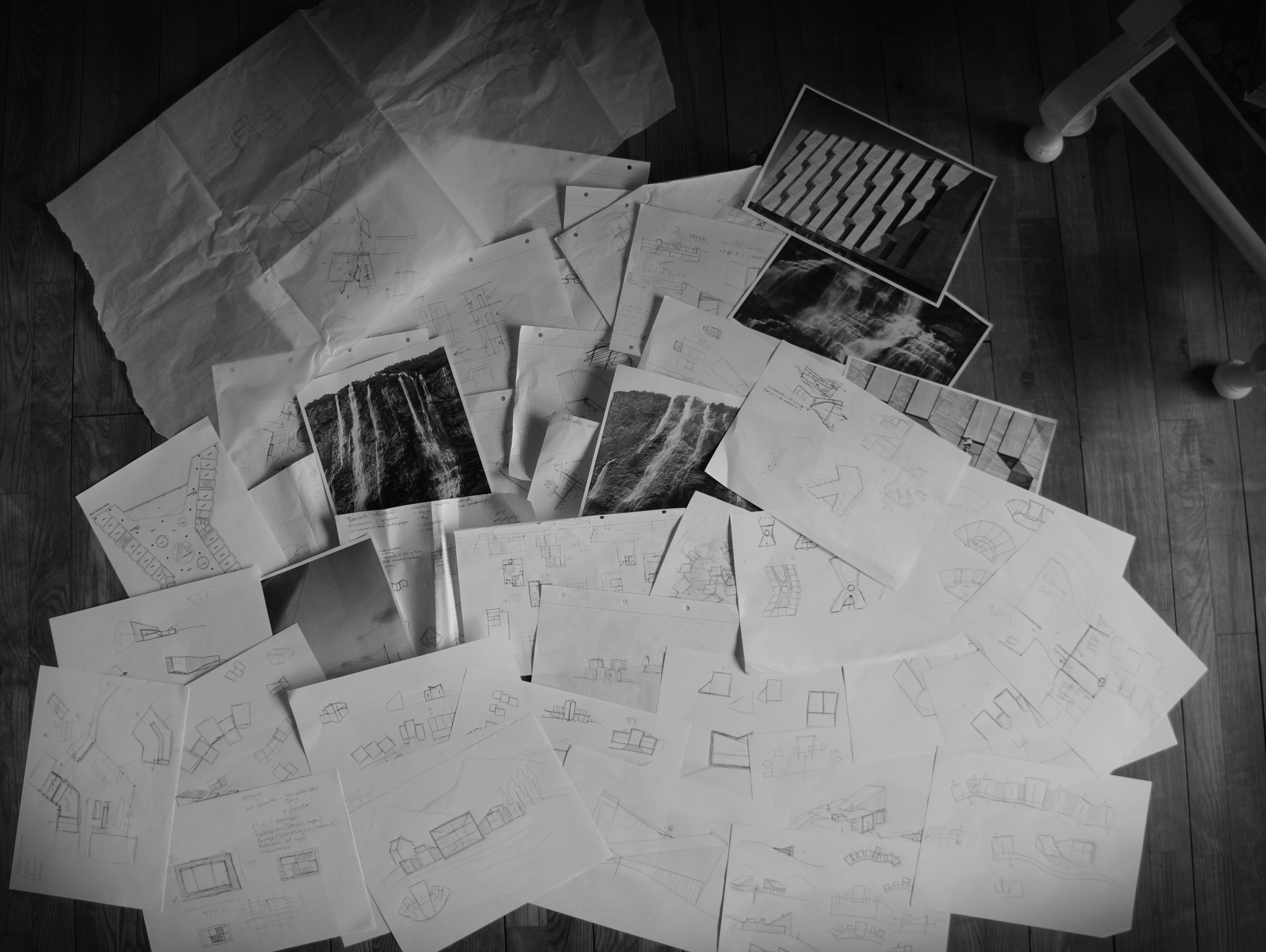
The resort should unite the area, and function both summer and winter becoming a landmark defining the area and the essence of the site.



## SPATIAL PROGRAM

*Combining the information gained visiting the site, talking to former manager and being in close dialog with both the Alpine manager and Biathlon manager a series of parameters has been observed this together with the vision of the project has determined a series of parameters which form the overall spatial program. Because this project is fictional this spatial program has been ever evolving together with the vision and concept of the project, but in order to understand the design process an overall final spatial program will be presented. Each facility and the size of it has been determined in close dialog with former manager and with the use of Neufert's (Neufert 2010)*

ROOM SPECIFICATION	USERS	COUNT	M <sup>2</sup> PER UNIT	AMOUNT OF USERS	ORIENTATION	SITUATED CLOSE TO
GUESTS						
Family rooms (4 person)	Guests	25+	50+	100-140	-	Social spaces
Two person rooms	Guests	20+	25-30	40-60	-	Social spaces
Suites	Guests	5+	50+	20-30	-	Social spaces
Outdoor public spaces	Guests and visitors	-	-	200+	Biathlon +	-
Indoor public spaces	Guests and visitors	-	-	200+	Biathlon +	Rooms and Lobby
Workshop for maintenance	Guests	1-2	50+	30+	Biathlon	Lobby + Outdoor
Dinning area	Guests and visitors	1	150+	100+	Biathlon	Lobby
Lobby	Guests and visitors	1	100+	50+	-	-
V.I.P area	V.I.P Guests	1	300+	50+	Biathlon	Isolated
Spectator space	Guests and visitors	1+	300+	200+	Biathlon	Lobby
Conference rooms	Guests	4+	50+	50+	-	-
Changing room	Guests	1-2	50+	50+	-	Workshop + Outdoor
ADMINISTRATION						
Office space	Staff	4+	25-30	40-60	-	Social spaces
Meeting room	Staff	1	50+	20-30	-	Social spaces
Staff area	Staff	1	-	200+	Biathlon +	-
BUILDING SERVICE						
Kitchen	Staff	1-2	100+	5+	-	Restaurant + Public space
Deposit	Staff	-	200+	-	-	-
Technical room	Staff	-	100+	-	-	-



# DESIGN PROCESS

INTRODUCTION

FIRST STAGE - STATUS SEMINAR

SECOND STAGE OF THE DESIGN

FROM CONCEPTUAL IDEA TO FORM

ARCHITECTURAL CONCEPT

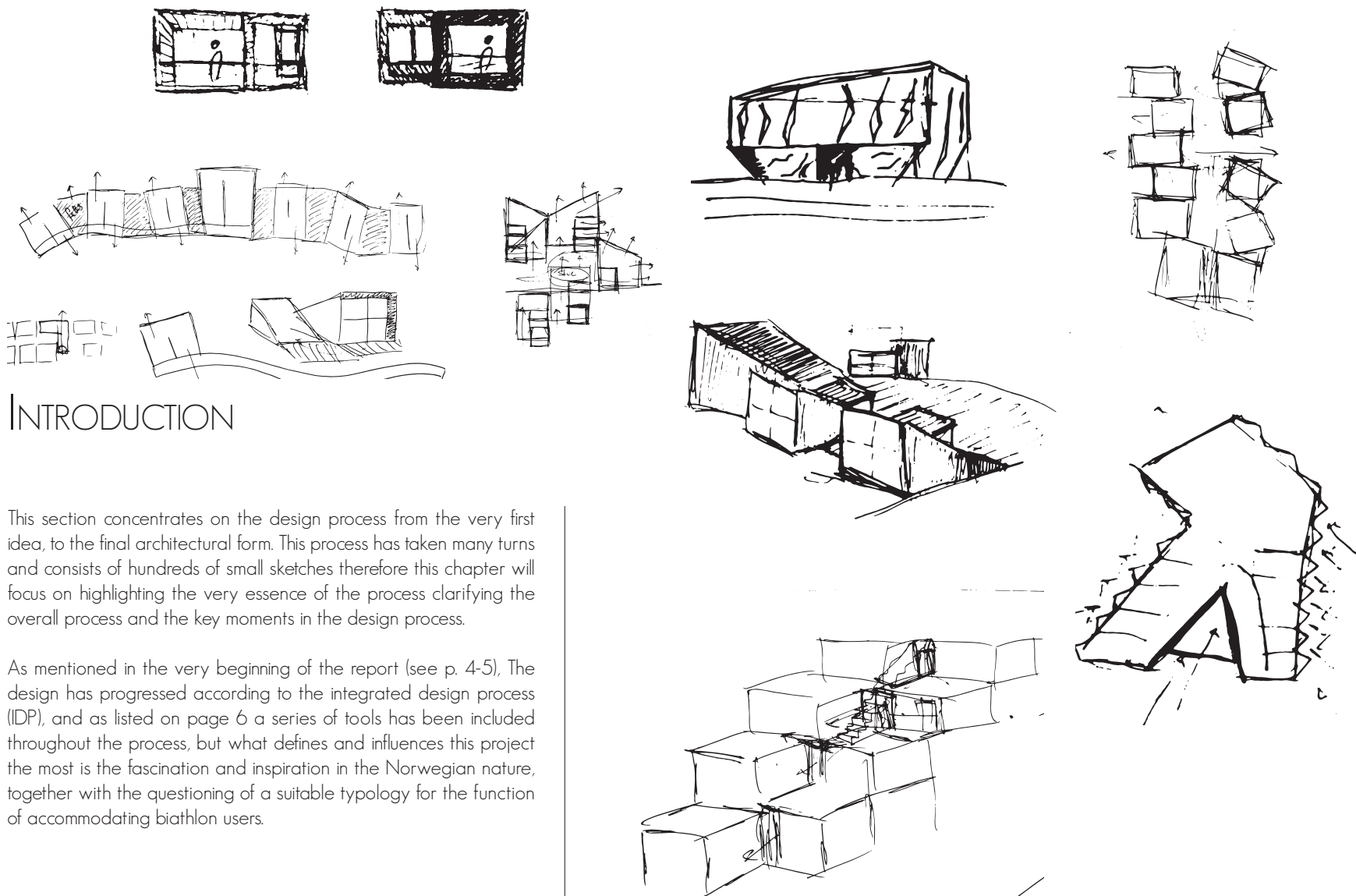
SOCIAL GATHERING SPACES

MATERIALS

FACADE PRINCIPLE

VENTILATION

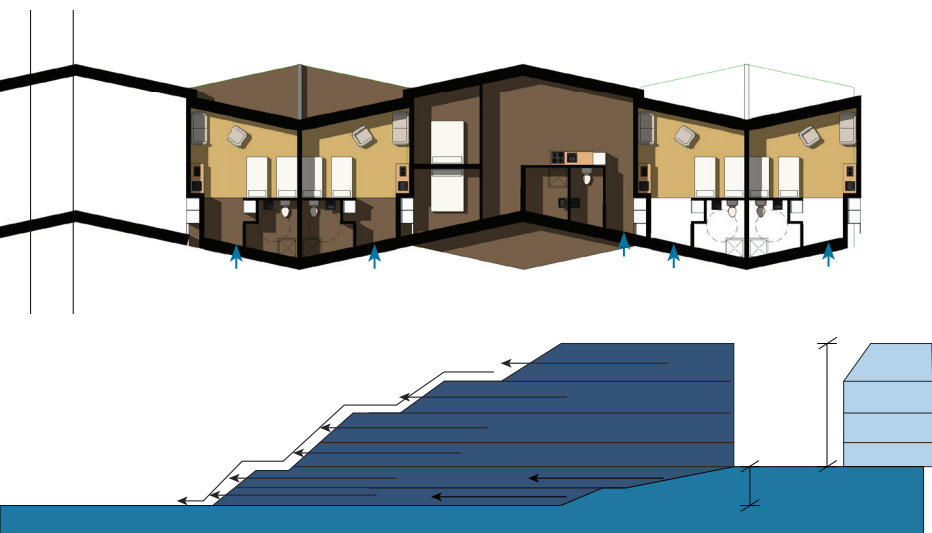
FIREPROOFING



## INTRODUCTION

This section concentrates on the design process from the very first idea, to the final architectural form. This process has taken many turns and consists of hundreds of small sketches therefore this chapter will focus on highlighting the very essence of the process clarifying the overall process and the key moments in the design process.

As mentioned in the very beginning of the report (see p. 4-5), The design has progressed according to the integrated design process (IDP), and as listed on page 6 a series of tools has been included throughout the process, but what defines and influences this project the most is the fascination and inspiration in the Norwegian nature, together with the questioning of a suitable typology for the function of accommodating biathlon users.



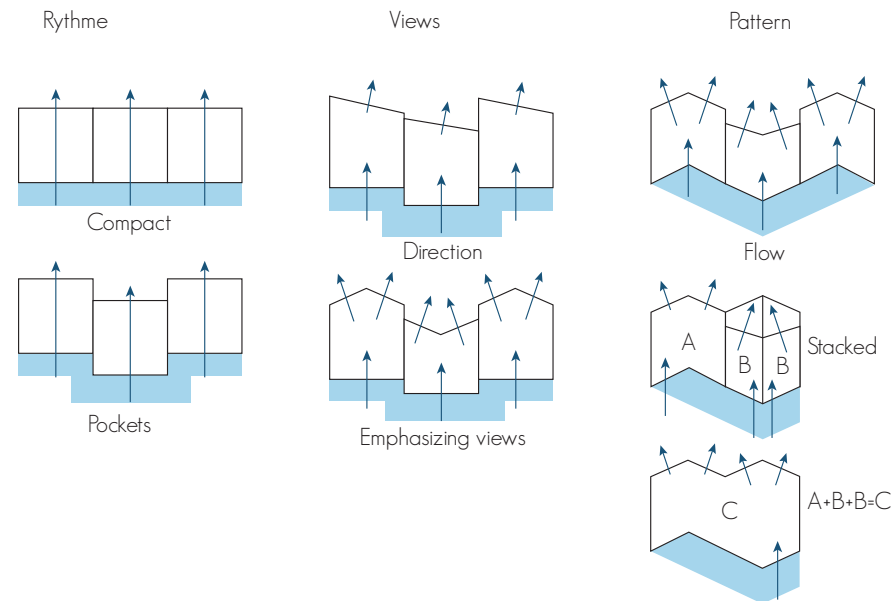
## FIRST STAGE - STATUS SEMINAR

Accessibility became a guiding design parameter in the beginning of the project, inspired by the existing hotels lack of this quality. Accessibility was clarified through the concept of being able to ski directly to the entrance of ones accommodation.

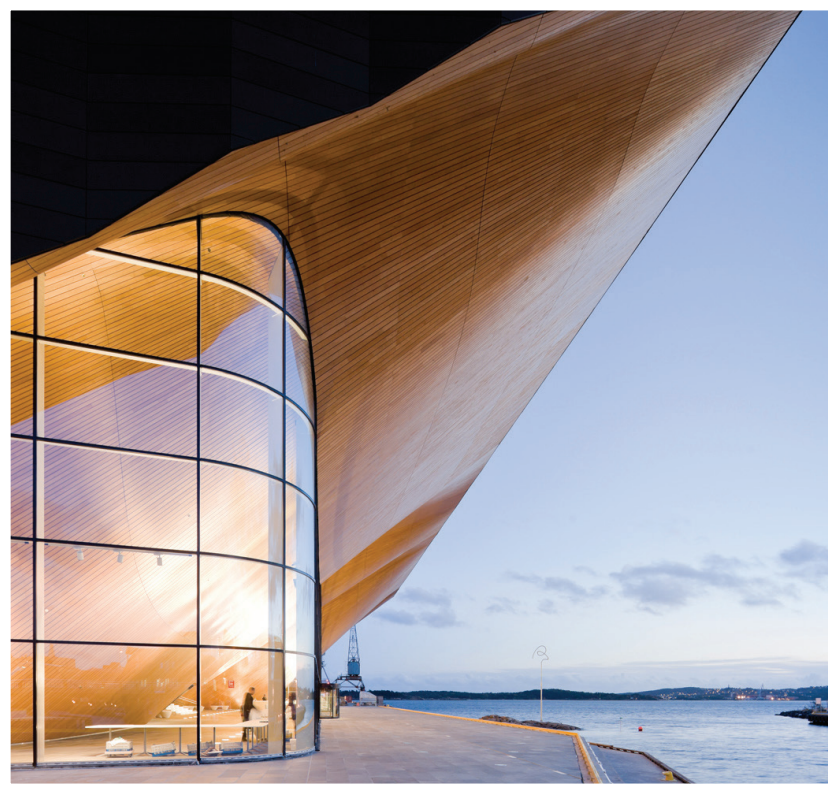
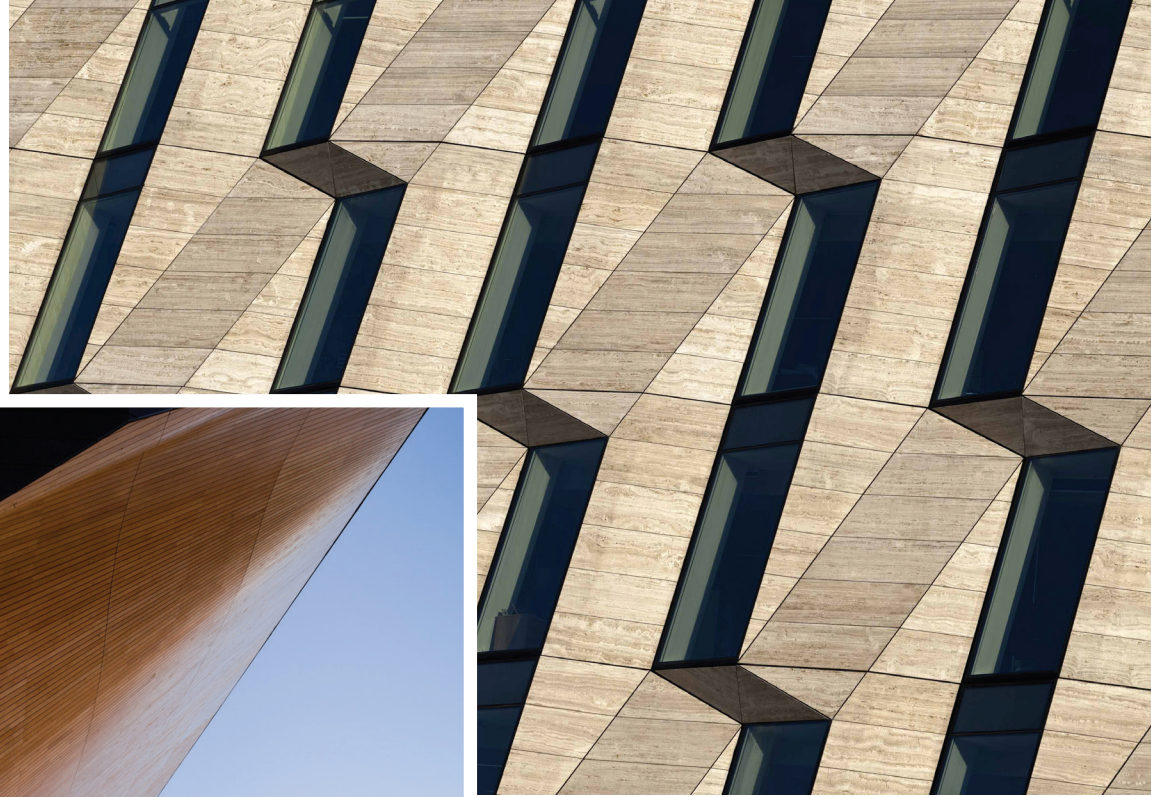
The design seek inspiration in BIG's playfulness in the projects 8-tallet and Koutalaki ski village, the idea of using the roof as an access route, this let to a series of designs. In the same period of the design process, successfully contact was made to people with insight and knowledge in the Norwegian biathlon field (see p. 38) this resulted in a hierarchy change in the design parameters, suddenly the social aspect became important.

The design at the given moment was designed to be 100% accessible by ski, which meant the users had the possibility of never to interact socially, therefore the first concept of accessibility was dropped and instead the social aspect should become a key parameter in the design process.

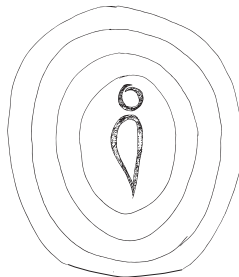
The design presented to the status seminar did however show a series of qualities, a clear inspiration in the Norwegian mountain type



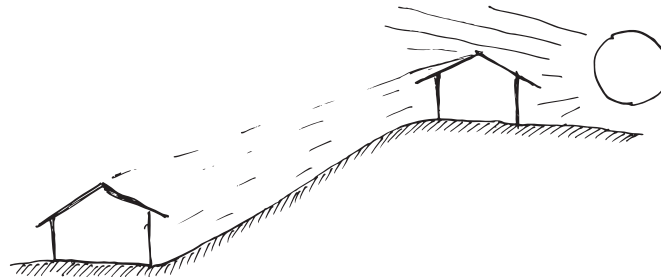
known as "fjeld" the green sloping landscape punctured by sharp granite rocks. The inspiration in these granite rocks reflecting light on its sharp rough surface. This fascination led to the use of sharp modules representing the diversity of rocks. Also the use of the existing landscape, use the qualities of the sloping landscape become a familiar element in the landscape but at the same time become a landmark for the area. These qualities were continued to the next stage of the design process.



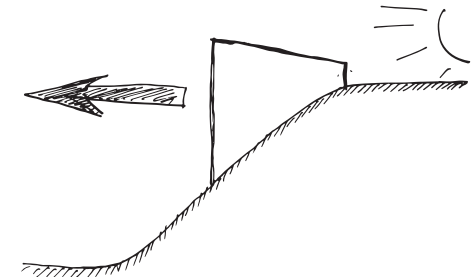




ill 5.01. Gradient between private and public.



ill 5.02. Building low-rise on the site creates shadow filled areas during winter.



ill 5.03. Build the inverse to the mountain creates view and better solar exposure.

## SECOND STAGE OF THE DESIGN

The collage on page 52-53 shows some of the inspirations to the design, the granite mountains and caves, the way light is reflected on its surface, the contrast between hard and soft, warm and cold and man becoming an element between these harsh but beautiful structures. In the search of transferring some of these natural elements into architecture a series of reference project where found. the project shows a way to create a link between nature and architecture, create some of the same feelings and contrasts, also the case study from earlier of Rocksresort in Laax showed through simple form to create a clear and strong reference to the quartz rocks. Together with this fascination arose a series of practical unanswered questions;

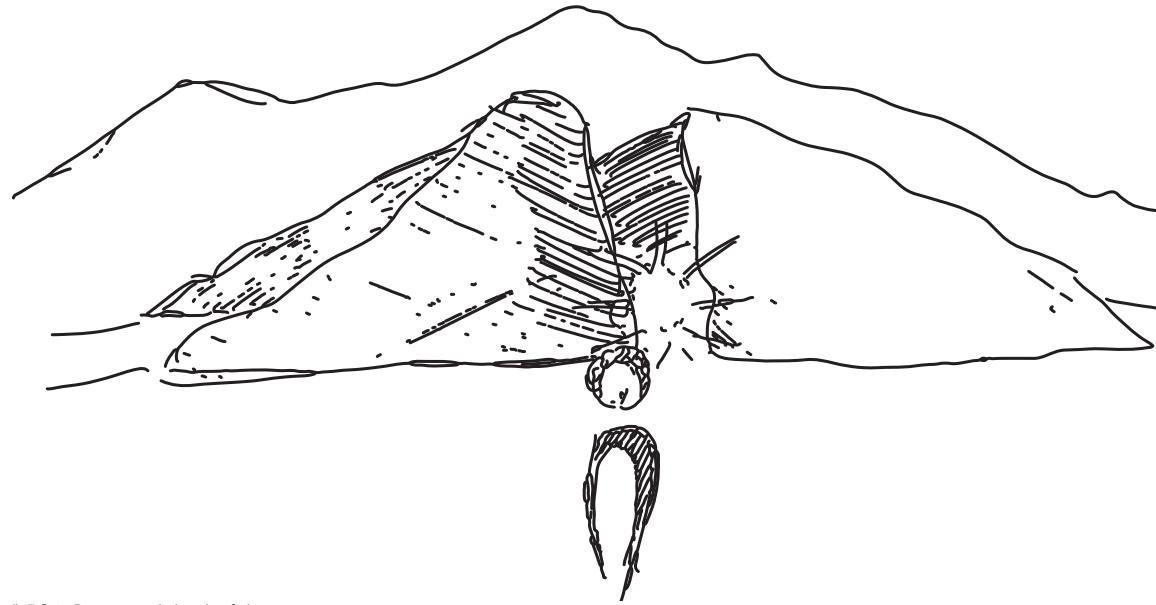
- How should the social aspect be included?
- What is the primary quality of the resort?
- and how should it relate to the existing hotel?

A clear quality in sharing facilities with the hotel but the direct connection between biathlon athletes and families was questioned, the scenario of screaming children dinning together with professional athletes was seen as something to prevent. This influenced the idea of a gradient between private and public, the biathlon users should be

able to interact sociality in small and larger group but also being able to isolate themselves, energizing for a tournament.

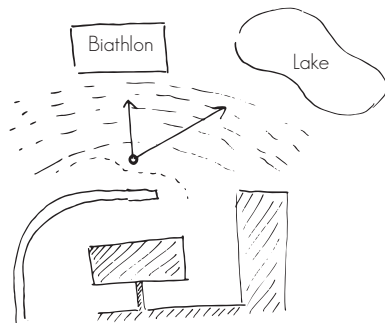
This meant the new resort should be an individual building only connected to the hotel by the choice of sharing public facilities, architectural the idea of using the Norwegian "fjeld" as inspiration also separated the new building from the existing, it was chosen to separate the two and let the new building become an element in itself. In this task of design accommodations for athletes the idea of seeing the building as a refuge, a place to relax after a demanding day in nature, in this idea of creating a refuge the idea of a cave in the mountain emerged, seeking comfort from the harsh Norwegian weather.

Continuing the search for a form, the given site showed that because of the sloping landscape it became difficult to gain solar exposure if the buildings where to be distributed on the site ill 5.02. Instead an inverse form showed to increase the amount of solar exposure and at the same time create larger surface facing the biathlon area ill 5.03.

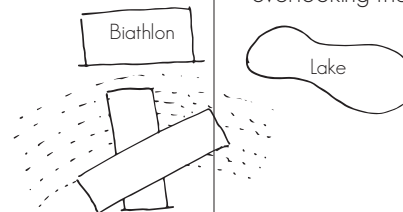


ill 5.04. Conceptual sketch of the mountain

The next stage of design process showed to be very difficult, finding an overall form for the resort. After a series of different designs a conceptual sketch showed to define the essence of the inspiration from the mountain, this sketch ill 5.04. simple but clear showed to capture the inspiration and had now to be transferred into architecture and at the same time relate to the site and context. Therefore the process went from working in conceptual sketches to a top down



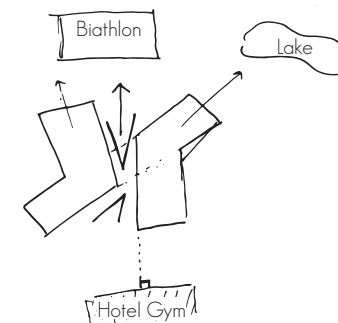
ill 5.05. Relation to context



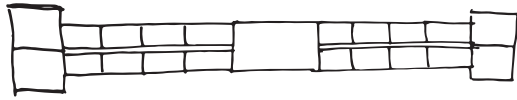
ill 5.06. From views to form

process creating a relation to the surround context.

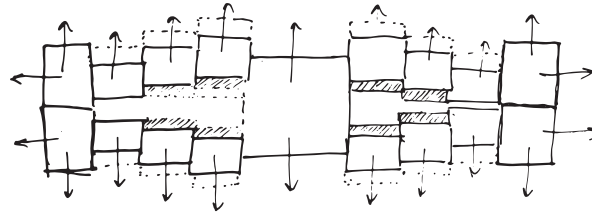
The most important relations to the resort is the biathlon arena and the lake, therefore these became primary orientation point as seen on ill 5.05. Started by placing two intersecting blocks giving the shape of an x, these were then separated to create center but still keeping the relationship between them, then by orientating one of the blocks to the hotel gym, the void between the two blocks became a cave element, first narrowing in and then opening up and overlooking the biathlon area.



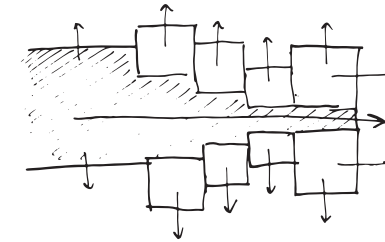
ill 5.07. Splitting the form, relating it to its context.



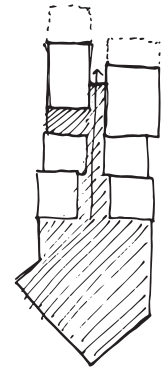
ill 5.08. Simple layout with a central social space



ill 5.09. Creating diversity



ill 5.10. Ensuring a fire exit, and creating a guided view



ill 5.11. adding social pocket

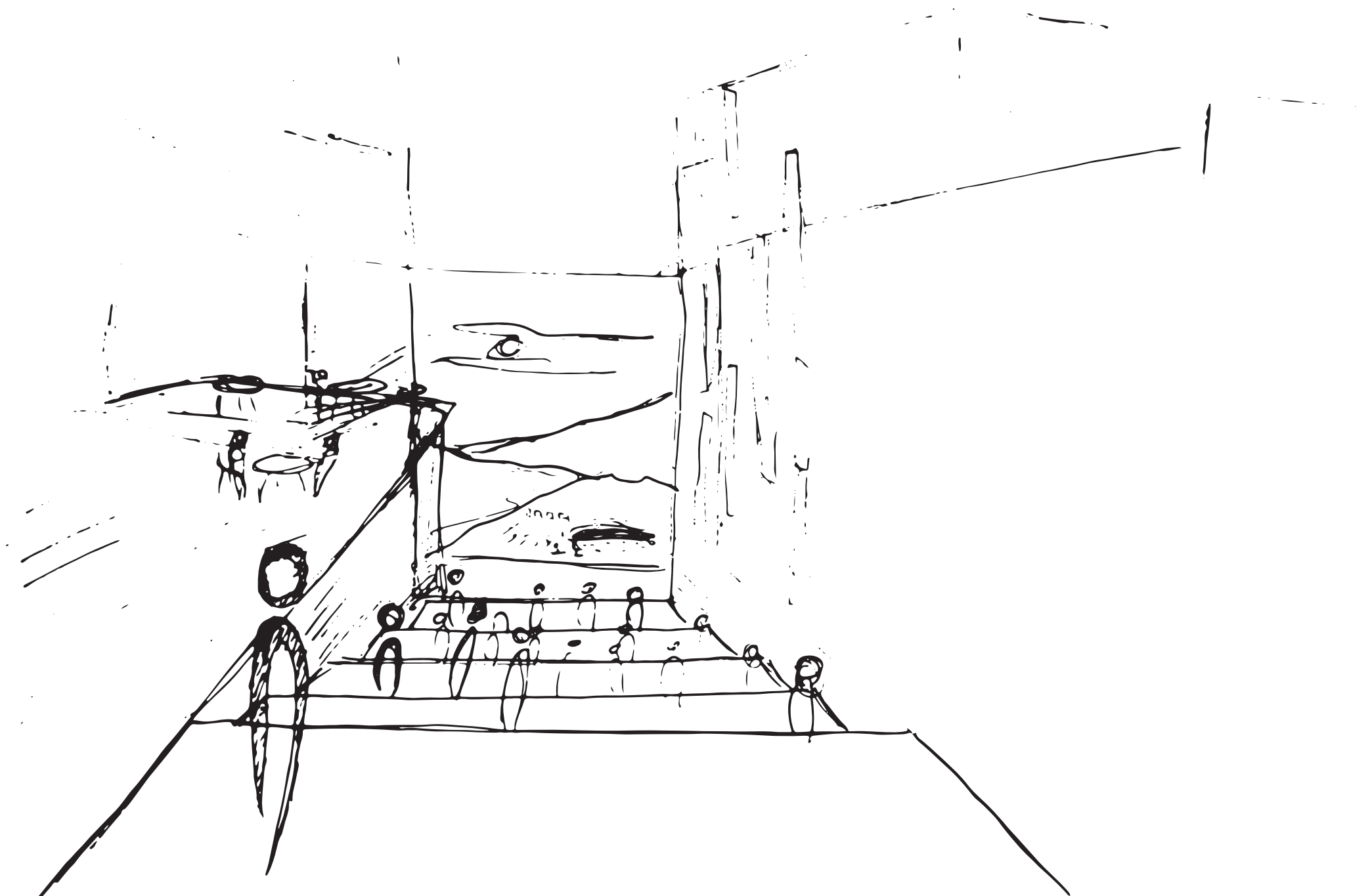
## FROM CONCEPTUAL IDEA TO FORM

Transforming the conceptual idea of a mountain into an architectural form suitable for accommodating two hundred athletes, the use of modules showed suited for the task, after a series of different shapes the simple shape of a square proved to be controllable and still producing a strong architectural shape. A series of different reference project (p. 52) shows that when adapting a simple geometric module to an overall dynamic shape, this often emphasis the underlying shape and creates a strong visual and readable design.

This stage of the process became a constant shift between working in plan and in 3D, evaluating on flow, volume and facades, as part of this process the illustrations above shows step by step how the design evolves. Starting with an ordinary hotel layout consisting of double rooms and four larger family rooms at the ends, adding a social space in the center giving the possibility for social interaction(ill. 5.08). The next illustration shows how by pushing in and out the module, smaller semi private spaces starts to emerge in front of each module by doing so the possibility of balcony's starts to appear. After a series of different layouts the one on ill 5.09. showed to create a gradient between the small corridors to the large and open social space, this

feeling showed similarities to the cave opening i a mountain (p. 53). This inspiration of moving through a mountain cave became influential for the ongoing design. Separating the family rooms ill 5.11. a framed view directly towards the lake or the biathlon course was created.

As mentioned the social gradient of privacy became an important design parameter and together with the feeling of moving through a mountain, placing a small social pocket on each corridor gave the layout more diversity and also influenced the overall shape by giving the facades a three dimensional depth furthermore this also gave the family balcony's a more private character.



ill 5.12. Conceptual sketch experinsing the void between the two mountain peaks.

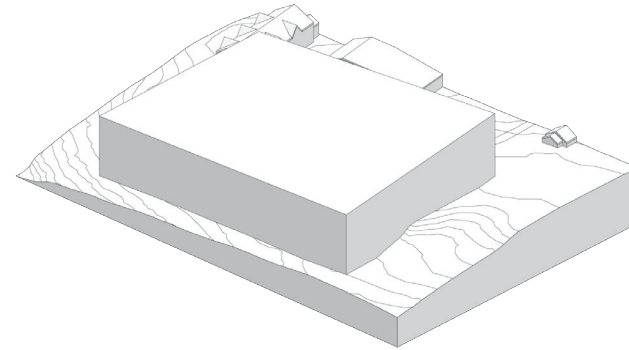
## ARCHITECTURAL CONCEPT

Taking deep inspiration in the contextual landscaping of the site, the goal of adapting to the context ignited a spark idea of capturing the form and essence of a mountain.

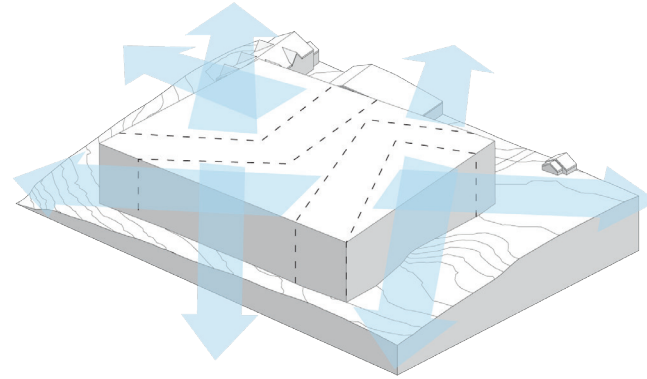
The powerful and iconic image of the mountain together with feeling of walking in between two mountains and suddenly the view breathtaking panoramic view of the site overlooking the biathlon arena.

This feeling and the visual strength of the mountain became form generating principles, through 3D models and sketches an overall architectural idea started to emerge.

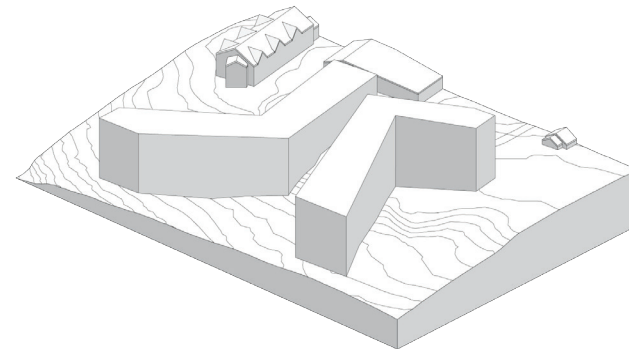
This chapter seeks to represent a chronological step by step design process of the overall architectural concept. Simplifying the process to clarify the conceptual idea.



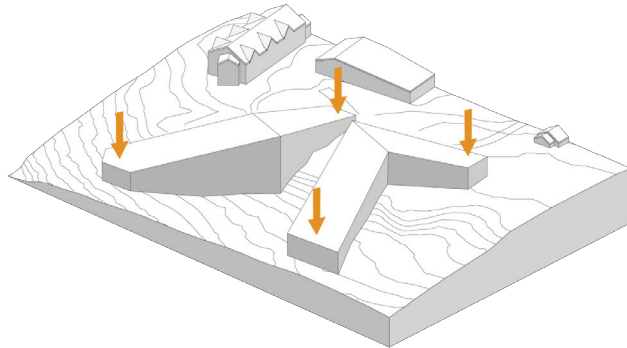
1. Starting out by playing a rectangular volume in the landscape



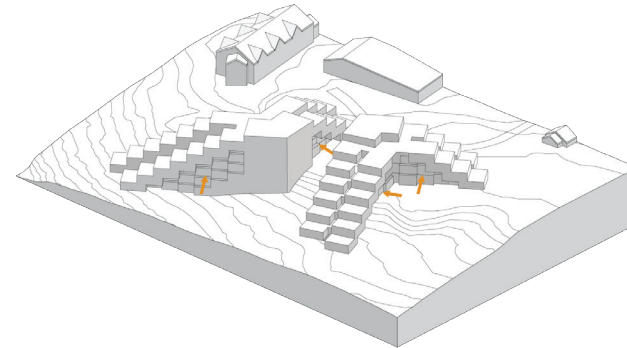
2. Cutting the volume, allowing views



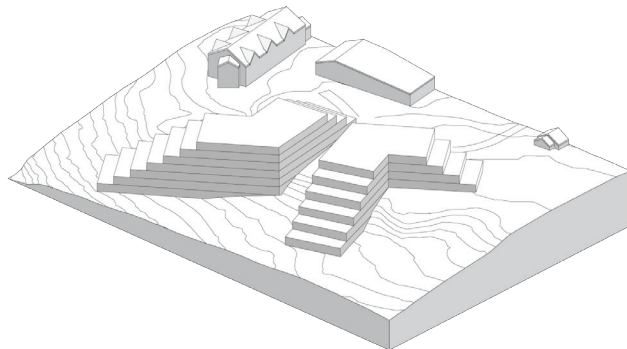
3. A new form emerges



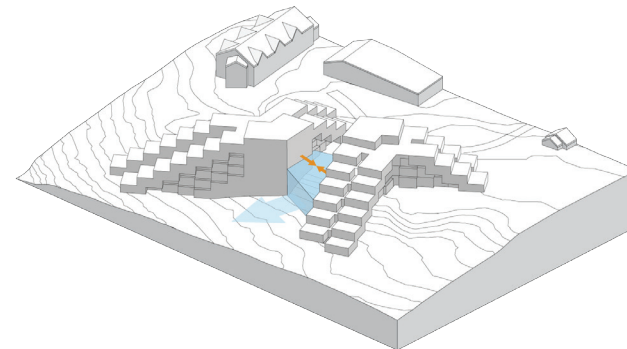
4. Pushing down on the edges, letting the form follow the contours and increasing the solar exposure.



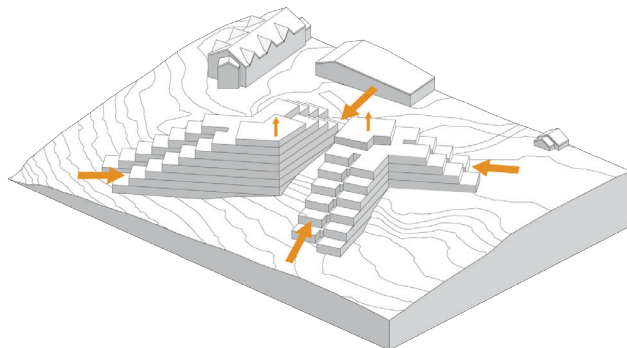
7. Pushing in the facades, preventing overheating and creating similarities to a hill side.



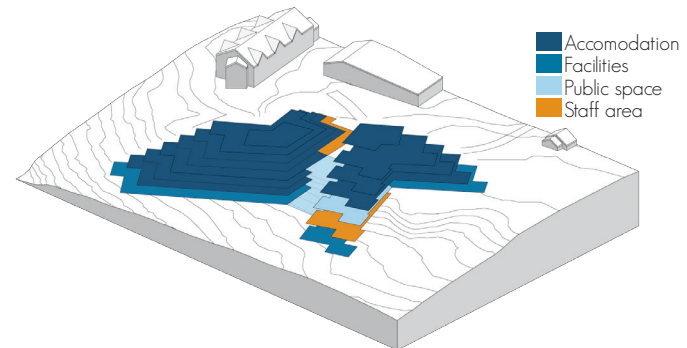
5. Simplifying the form by adapting to rectangular modules



8. Physical connecting the two building by a transparent atrium.



6. Creating diversity by pushing the modules creating private spaces.

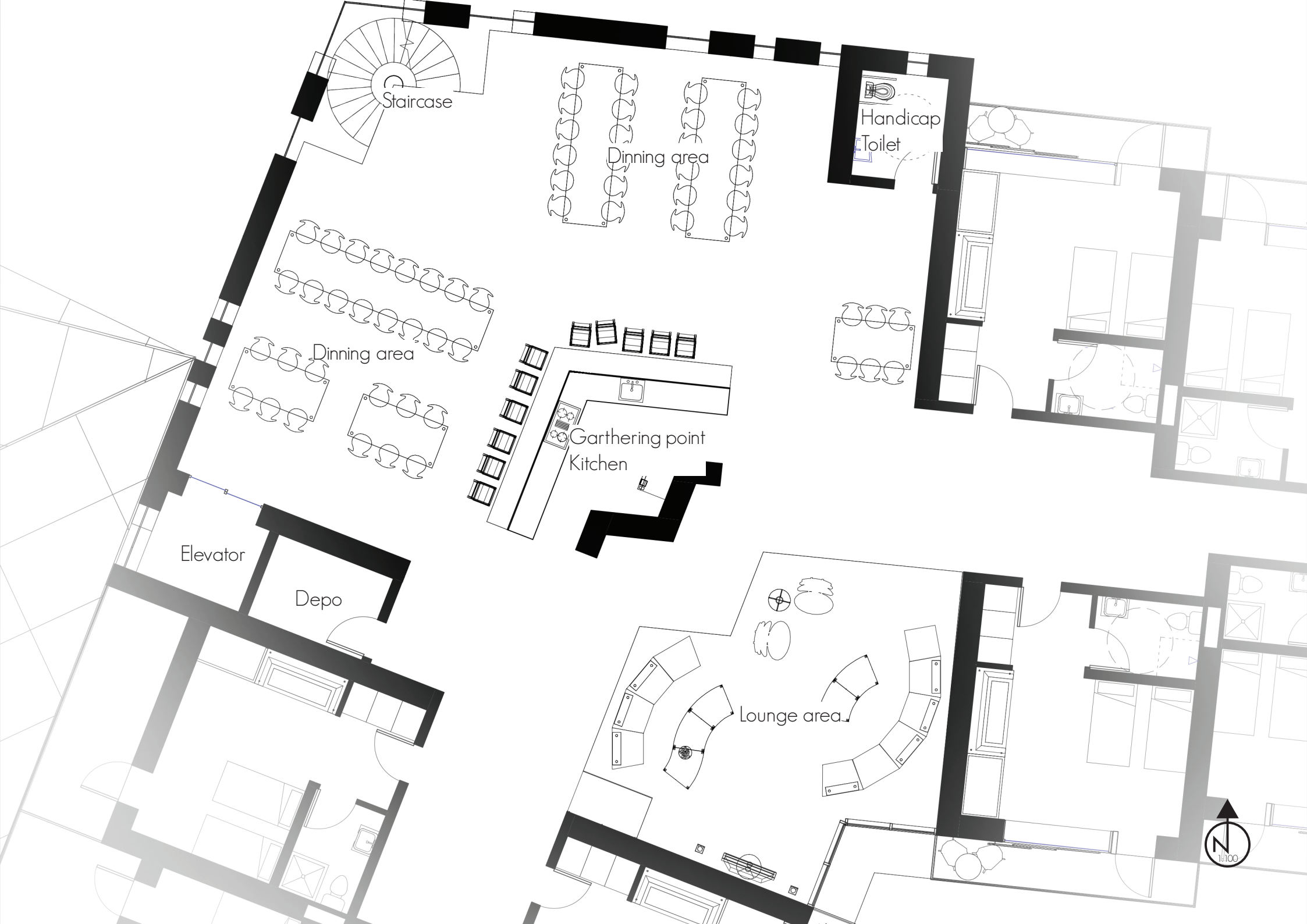


9. Defining the overall layout of the building.

## SOCIAL GARTHERING SPACES

The social aspect became an important parameter throughout the design, as mentioned on page 56 each floor shares a large social space placed in the center of each floor. The social space consists of a kitchen, being the central gathering point on each level, a lounge area, separated by the flow by adding a single step giving possibility for relaxation and social interaction with others on the floor. On the opposite site of the kitchen are two dining areas giving the possibility for different group to dine separately or together. The space also provides a handicap toilet and a small depot suitable for bed linen. The floor is then connected to the rest of the building using either the staircase or elevator.

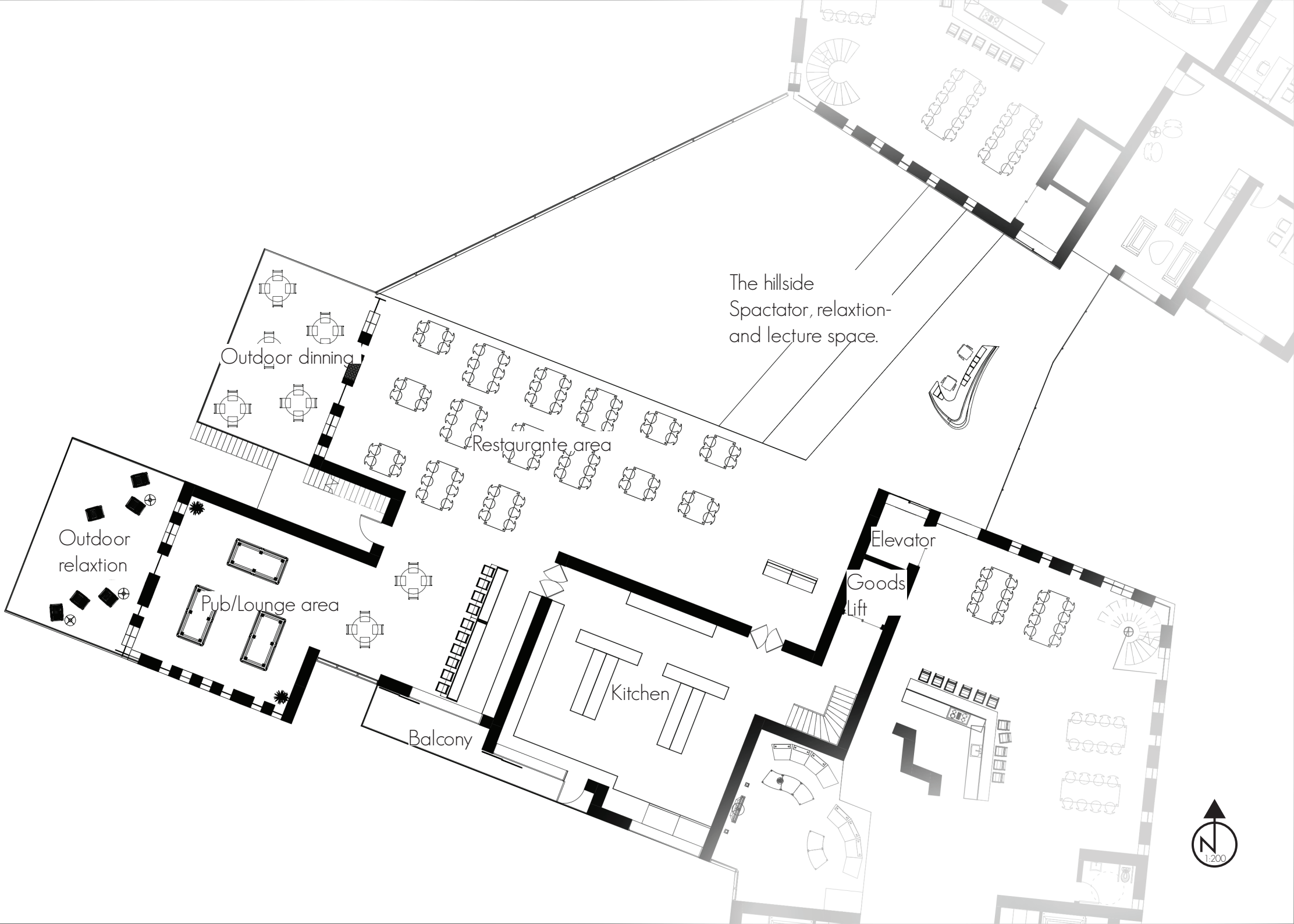
These social gather spaces are places so that every time a guest leaves or comes to floor the person passes through the space, creating possible interaction between guests.



## LOBBY AND PUBLIC AREA

The idea of sharing facilities with the existing hotel, influenced the ground floor on the resort. Instead of becoming an individual and private facility, the ground floor is seen as a public space. The space in-between the two mountain peaks creates a flow where nature is free to pass through. The space between the two buildings lets the contours of the landscape continue creating a hillside suitable for viewing the ongoing activity on the biathlon arena, and simply just sitting on small mountain blocks enjoying the both vertical and horizontal panoramic view. The hill side is connected to the restaurant area and lounge area, all spaces open for the public crowd.

The lobby area also becomes the interaction point between the two building and the area connected to all of the resorts facilities.





ill 5.1. Stacked granite veneer, model Charcoal from Norstone

## MATERIALS

From the very beginning the use of granite and pinewood defined the project, the hard, sharp, rough and reflecting granite together with the soft and warm pinewood showed to be a beautiful combination. Through the design phase the granite material went from being an inspiration into becoming an obsession, the idea of a naturalistic mountain covered in rough granite reflecting its context and withstanding the thought Norwegian climate became the obsession. Emphasizing the choice of material a strong contrast was made by choosing the warm pinewood, this also ensured a diversity between the outside and inside of the building.

The clear image of the granite mountain resulted in finding the right treatment of the granite rock, but even though granite is easy to come by in Norway the price is still very high and the thick granite blocks together with the aim for 2020 standards meant that instead of using solid granite blocks instead a cheaper and thinner version was chosen. Granite cladding boards or known as stacked stone veneer. These prefabricated boards are fast and easy to install and ensures the possibility for a tight and well insulated structure.



ill 5.2. Pinewood together with the rough granite rock, seen at Rocksresort in Laax



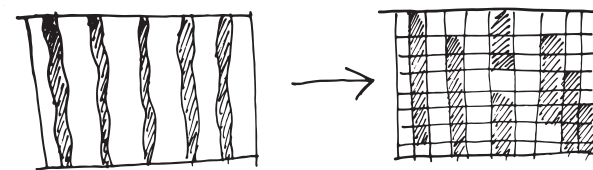
ill 5.3 -The waterfall called Seven Sisters in Norway.

## FACADE PRINCIPLE

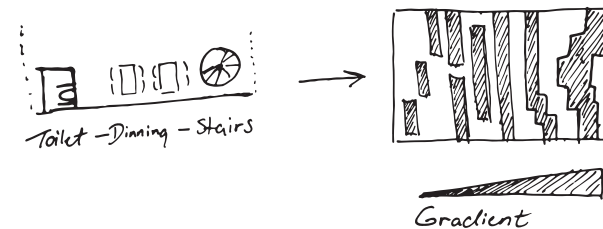
Continuing the fascination of the granite mountain, the facades thought deep inspiration from ice and water on the sharp granite rocks. The reflection from the water giving a strong visual effect combining something very soft and dynamic with the sharp and static mountain.

In the transition of transferring the image above into architecture, the water/ice element was transferred into a window system on the facades, where glass represents the reflecting water or ice, giving the facades a more dynamic appearance.

When cutting into the granite surface, the warm pinewood starts to appear in this case the window frames are made in pinewood.



ill 5.4 Making the dynamic water adapt to a simple system relatable to the modules.



ill 5.5. The principle should adapt to its use, creating a gradient in the public areas from semi closed to open.

## VENTILATION

The building uses mechanic ventilation during winter and natural ventilation in the summer period, the ventilation strategy is shown on the next page, revealing inlets and outlets. The air vents are following the corridors where it is possible to lower the ceiling height, the vents are then continued to central placed kitchen element and the depot. The same system is used on each floor where the air vents continue vertical up to the roof floor where the technical area is located. In order to prevent large ventilation tubes passing each other, the outlet tube is defined as the largest, because it not only ventilates the rooms but also the toilet. The inlet tube is instead divided into two smaller tubes, so when passing the outlet tube the needed space is reduced.



ill 5.6. Window system on 2 person bedroom.

During summer the users control the amount of inlet air by opening or closing the windows in the facade. The facade is divided into a series of windows giving the possibility to control the amount of inlet air and also to prevent the case of burglars getting access through an open window ill 5.6.

The amount of air need to ventilate the individual module is shown in appendix



## FIREPROOFING

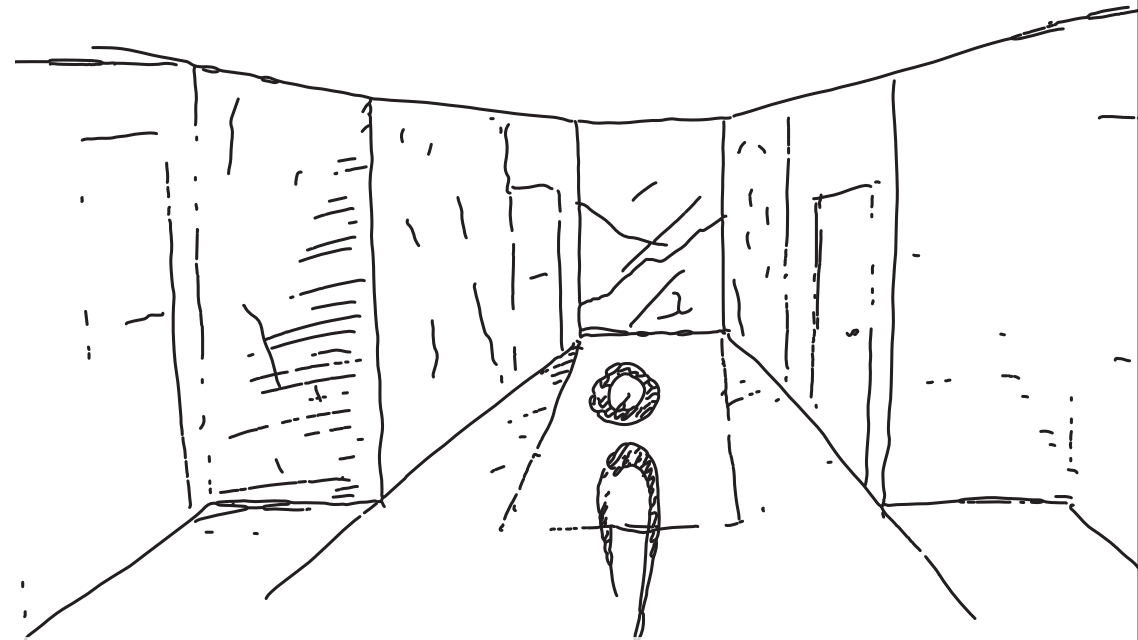
*This section concerns the considerations of fireproofing the hotel according to Danish Building Regulation, and how this has influenced the overall design.*

### *Category*

*According to Danish regulation Sbi - 230, the building is characterized as safety class 5. this safety class is defined as buildings used for overnight stay, where users are not familiar with the buildings escape routes (BR 2010, kap 5.1.1) this category also includes colleges, hostels, inns and guesthouses. Each safety class defines a series of regulations the building needs to fulfill according to Danish Regulations. This project will merely focus on the overall layout of the building to ensure the safety of its future users.*

### *Fire sections*

*The hotel is defined as safety class 5 and is consisting of more than 1 story, if the hotel then uses an automatic sprinkler system the maximum floor area of one fire section is 10.000 m<sup>2</sup> this means that each floor can be designed as one fire section.*



ill 5.7. - Direct views allowed from the corridor, defining an orientation and creating a link between building and context.

### Fire escapes

The fire strategy is shown on the next page ensuring a maximum of 25 meters from each module to the nearest fire exit. This maximum length of 25 meters, became a design parameter in the buildings maximum length, and in the process of integrating the fire exit as part of the conceptual form, as shown on p. 56





# PRESENTATION

9.1 SITE PLAN

9.2 FLOOR PLANS

9.3 ELEVATIONS

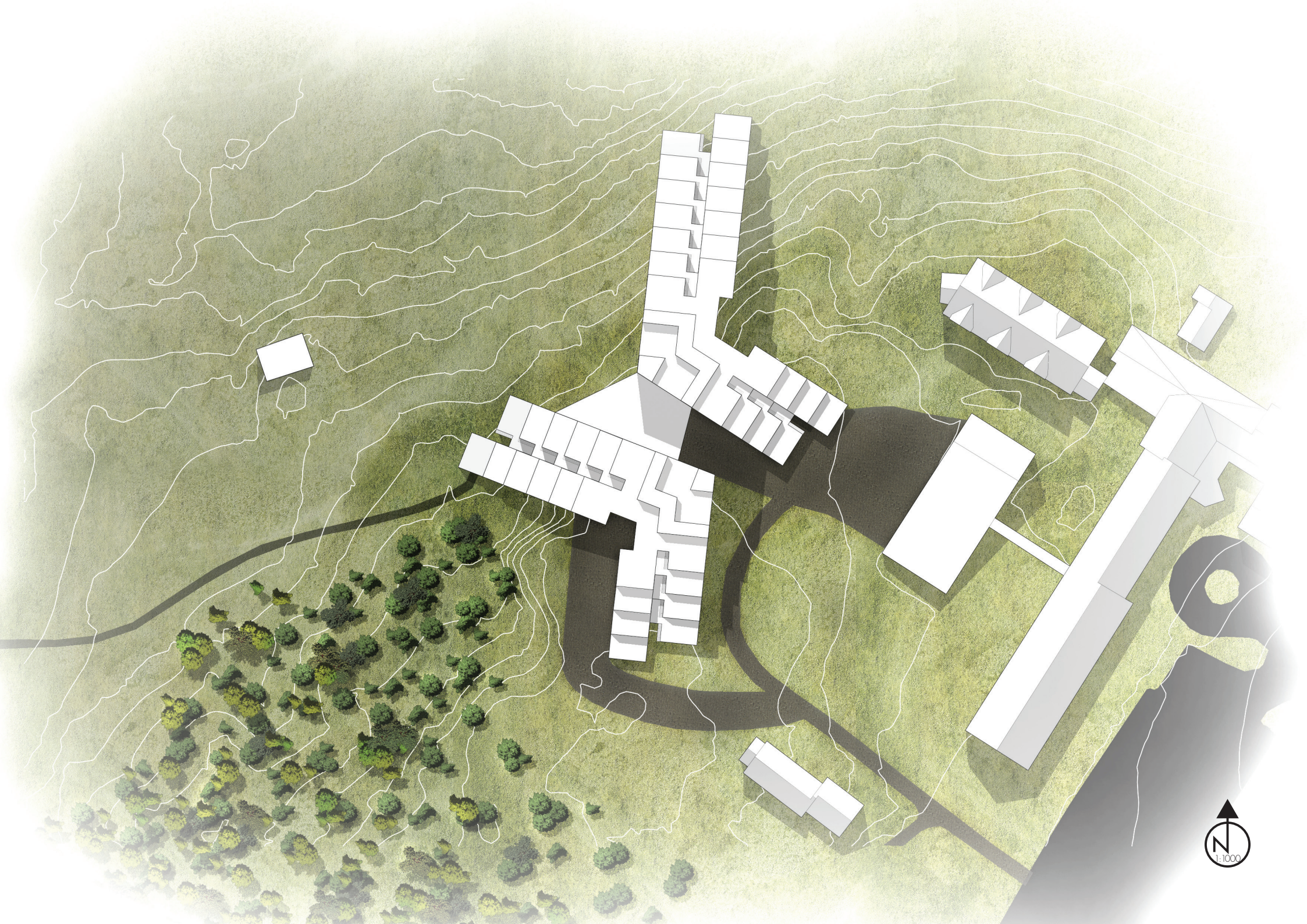
9.4 APARTMENT PLANS

9.5 SNOW RENDER

9.6 NIGHT RENDER

9.7 REFLECTION

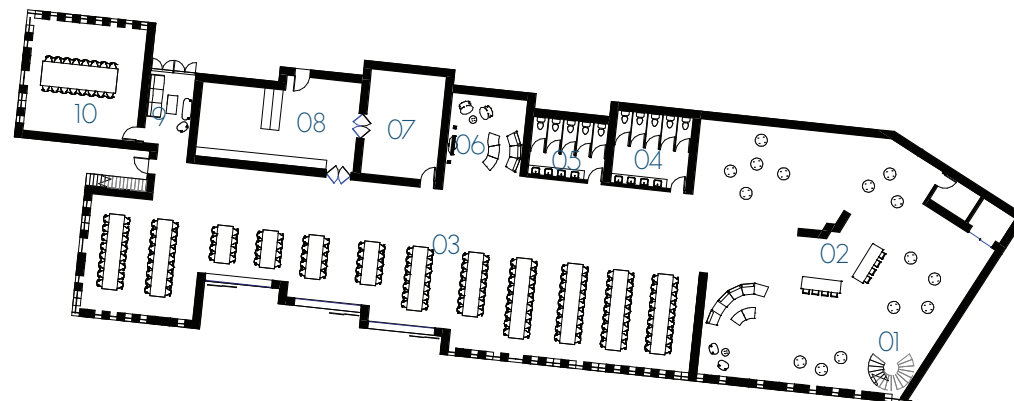
9.8 CONCLUSION



### -3 FLOOR - V.I.P AREA

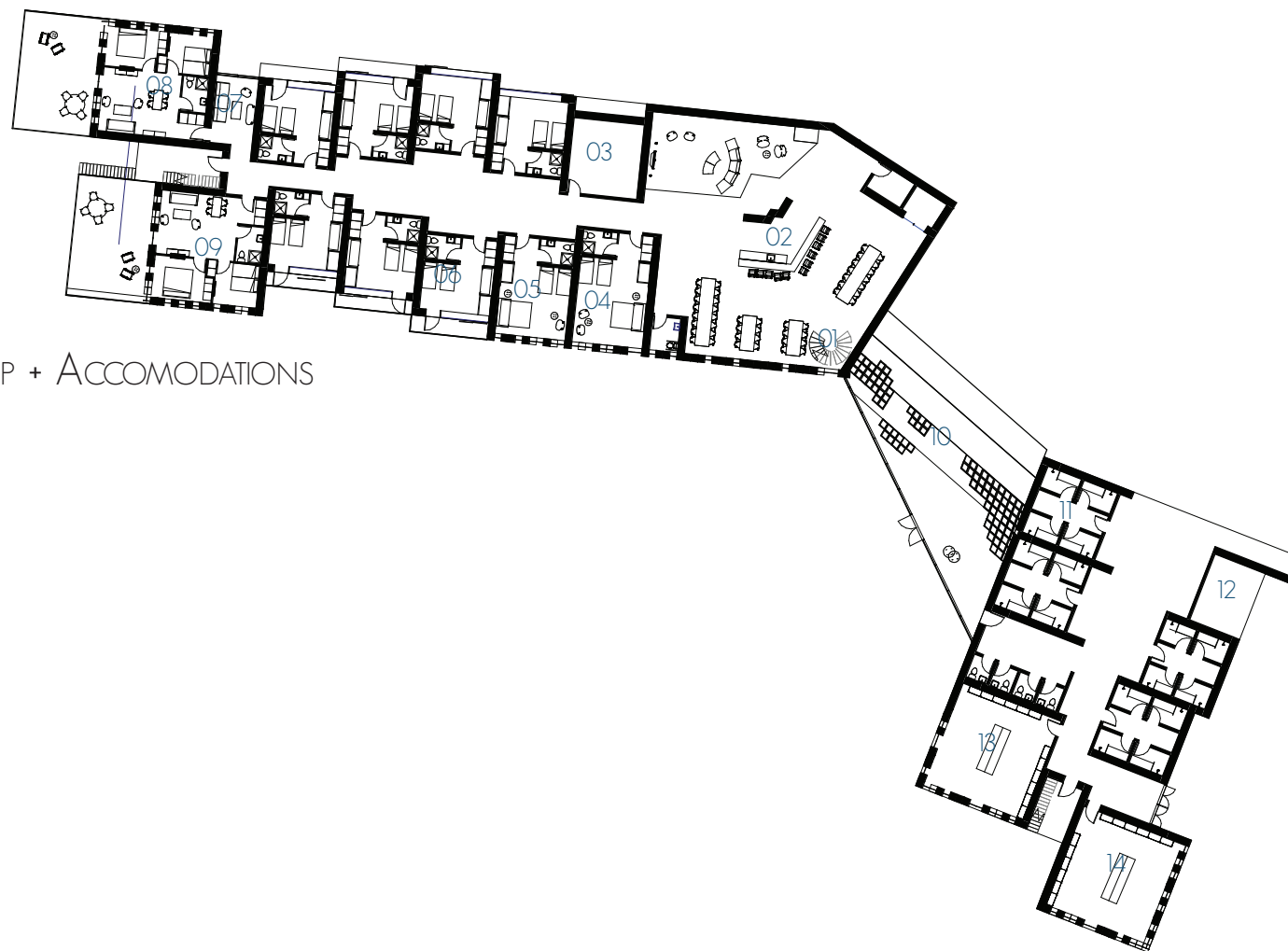
- 01 Stairs 10m<sup>2</sup>
- 02 Lounge 278m<sup>2</sup>
- 03 Conference area 426m<sup>2</sup>
- 04 Mens Toilet 24m<sup>2</sup>
- 05 Womens Toilet 19m<sup>2</sup>
- 06 Small TV area 29m<sup>2</sup>
- 07 Deposit 35m<sup>2</sup>
- 08 Kitchen 59m<sup>2</sup>
- 09 Waiting area 19m<sup>2</sup>
- 10 Conference room 59m<sup>2</sup>

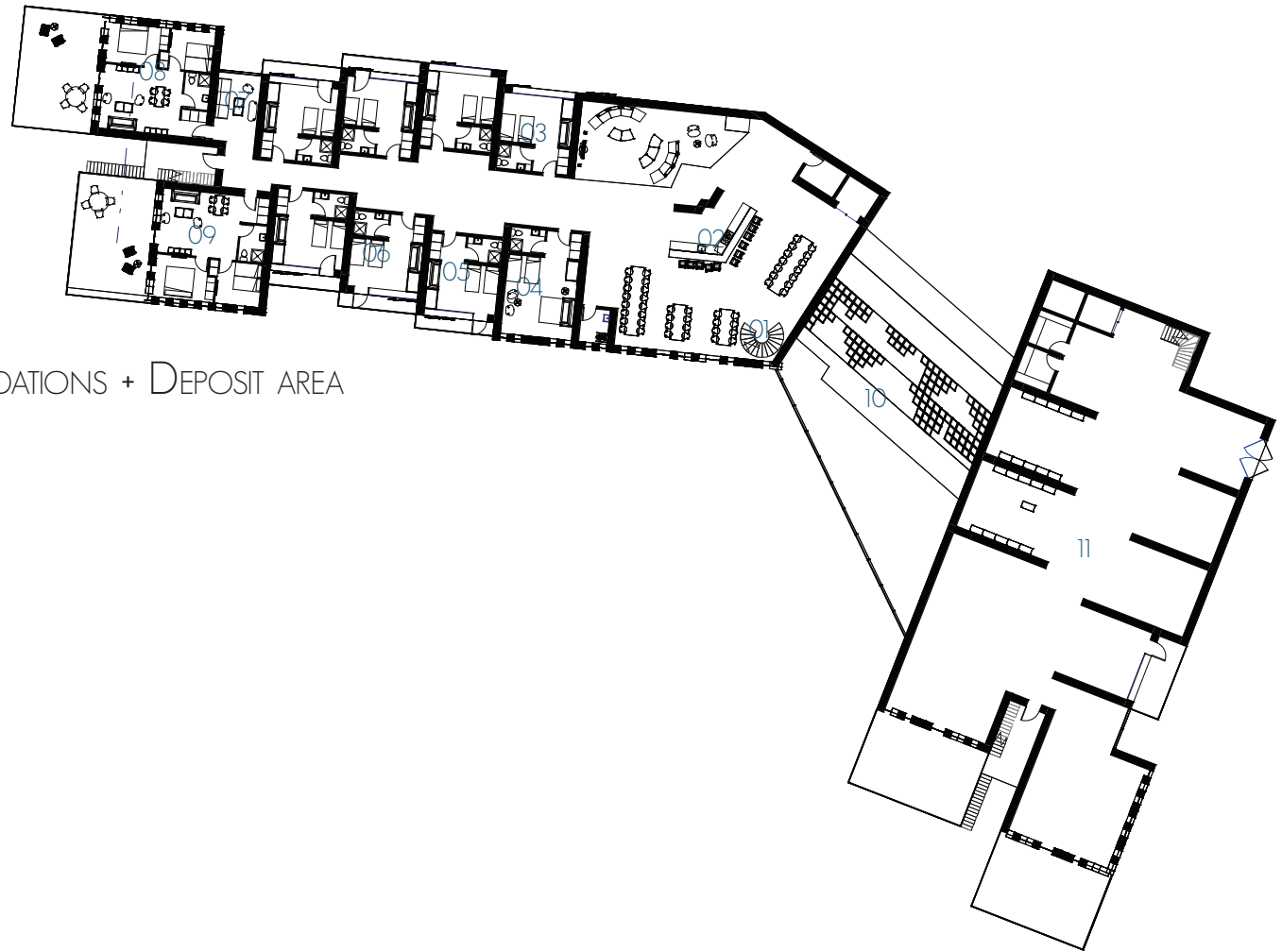
Area (Brutto - Heated): 994 m2



## -2 FLOOR - WORKSHOP + ACCOMODATIONS

- 01 Stairs 10m<sup>2</sup>
- 02 Social space 279m<sup>2</sup>
- 03 Deposit 27m<sup>2</sup>
- 04 3 person module 40m<sup>2</sup>
- 05 3 person module 35m<sup>2</sup>
- 06 2 person module 26m<sup>2</sup>
- 07 Social pocket 19m<sup>2</sup>
- 08 4 person module 56m<sup>2</sup>
- 09 4 person module 56m<sup>2</sup>
- Area (Brutto - Heated): 940m<sup>2</sup>
  
- 10 Part of the hillside 150m<sup>2</sup>
  
- 11 Locker room 11m<sup>2</sup>
- 12 Deposit 18m<sup>2</sup>
- 13 Workshop 56m<sup>2</sup>
- 14 Workshop 56m<sup>2</sup>
- Area (Brutto - Heated): 399m<sup>2</sup>





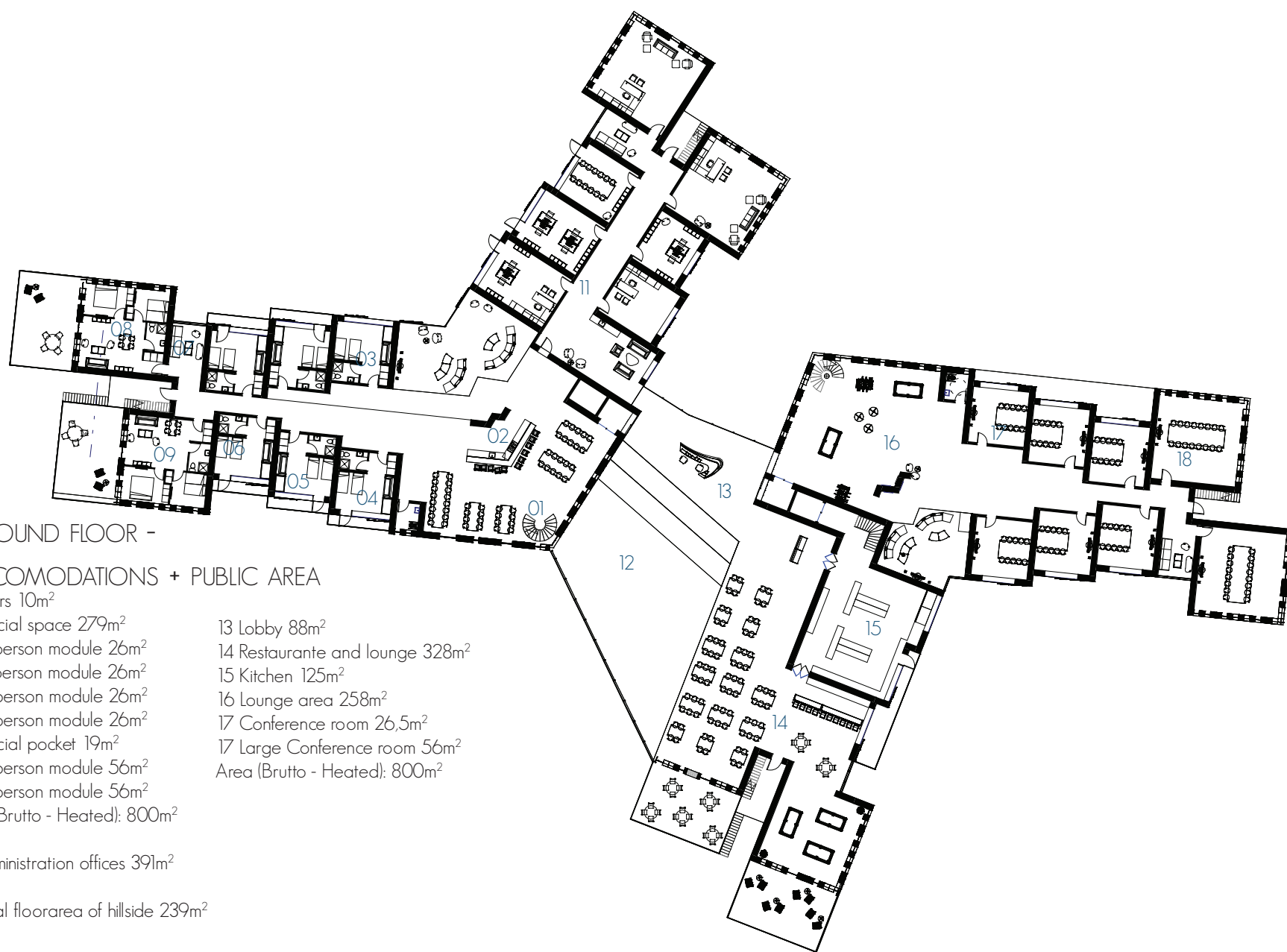
## -1 FLOOR - ACCOMODATIONS + DEPOSIT AREA

01 Stairs 10m<sup>2</sup>  
 02 Social space 279m<sup>2</sup>  
 03 2 person module 26m<sup>2</sup>  
 04 2 person module 26m<sup>2</sup>  
 05 2 person module 26m<sup>2</sup>  
 06 2 person module 26m<sup>2</sup>  
 07 Social pocket 19m<sup>2</sup>  
 08 4 person module 56m<sup>2</sup>  
 09 4 person module 56m<sup>2</sup>  
 Area (Brutto - Heated): 870m<sup>2</sup>

10 Part of the hillside 150m<sup>2</sup>

11 Deposit area 568m<sup>2</sup>





## GROUND FLOOR -

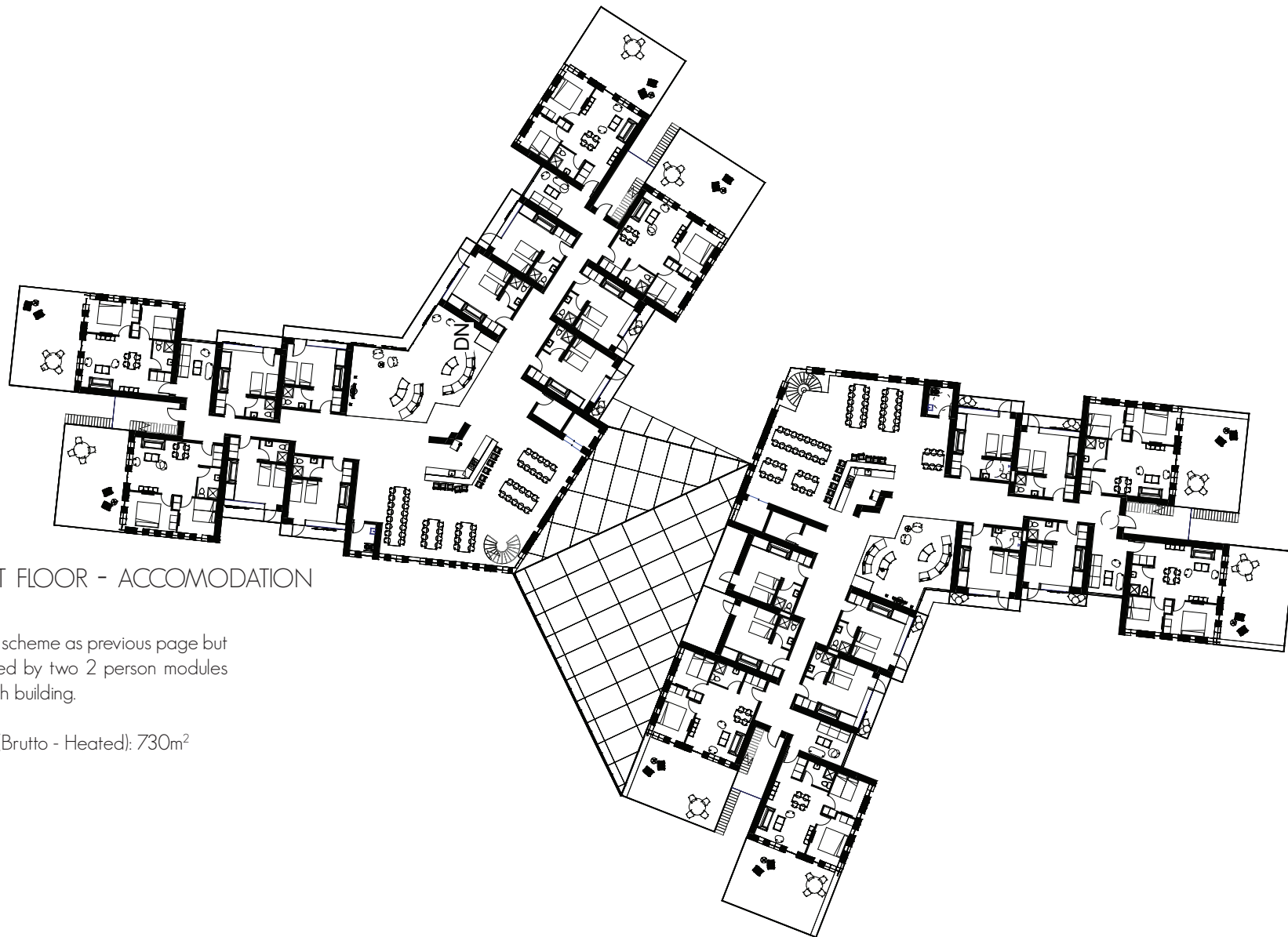
### ACCOMODATIONS + PUBLIC AREA

- 01 Stairs 10m<sup>2</sup>
- 02 Social space 279m<sup>2</sup>
- 03 2 person module 26m<sup>2</sup>
- 04 2 person module 26m<sup>2</sup>
- 05 2 person module 26m<sup>2</sup>
- 06 2 person module 26m<sup>2</sup>
- 07 Social pocket 19m<sup>2</sup>
- 08 4 person module 56m<sup>2</sup>
- 09 4 person module 56m<sup>2</sup>
- Area (Brutto - Heated): 800m<sup>2</sup>
- 11 Administration offices 391m<sup>2</sup>
- 12 Total floorarea of hillside 239m<sup>2</sup>
- 13 Lobby 88m<sup>2</sup>
- 14 Restaurante and lounge 328m<sup>2</sup>
- 15 Kitchen 125m<sup>2</sup>
- 16 Lounge area 258m<sup>2</sup>
- 17 Conference room 26,5m<sup>2</sup>
- 17 Large Conference room 56m<sup>2</sup>
- Area (Brutto - Heated): 800m<sup>2</sup>

## FIRST FLOOR - ACCOMODATION

Same scheme as previous page but  
reduced by two 2 person modules  
in each building.

Area (Brutto - Heated): 730m<sup>2</sup>

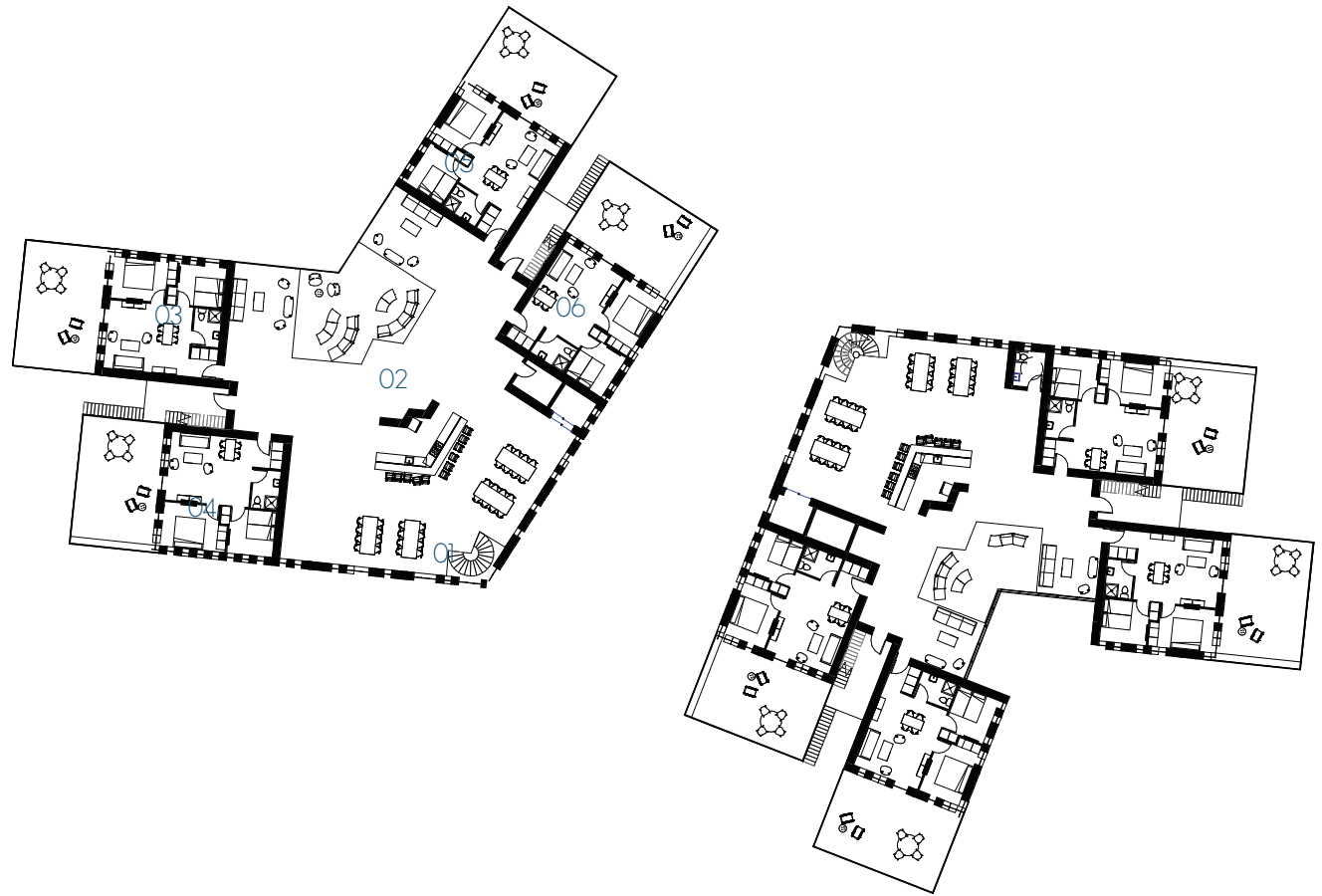


## SECOND FLOOR - ACCOMODATION

Same scheme as previous page but  
reduced by two 2 person modules  
in each building.

Area (Brutto - Heated): 630m<sup>2</sup>





## THIRDS FLOOR - SUITES

01 Stairs 10m<sup>2</sup>

02 Social space 279m<sup>2</sup>

03 4 person module 56m<sup>2</sup>

04 4 person module 56m<sup>2</sup>

05 4 person module 56m<sup>2</sup>

06 4 person module 56m<sup>2</sup>

Area (Brutto - Heated): 503m<sup>2</sup>

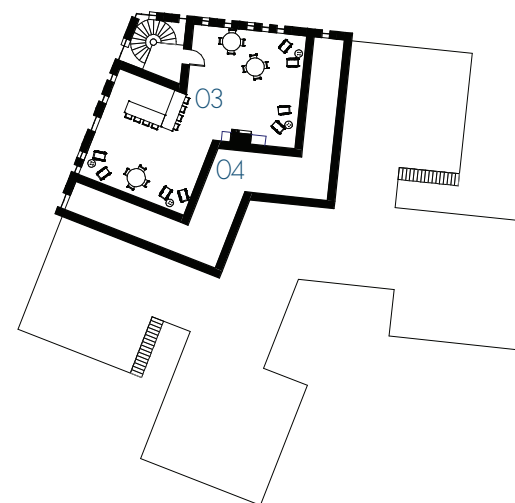
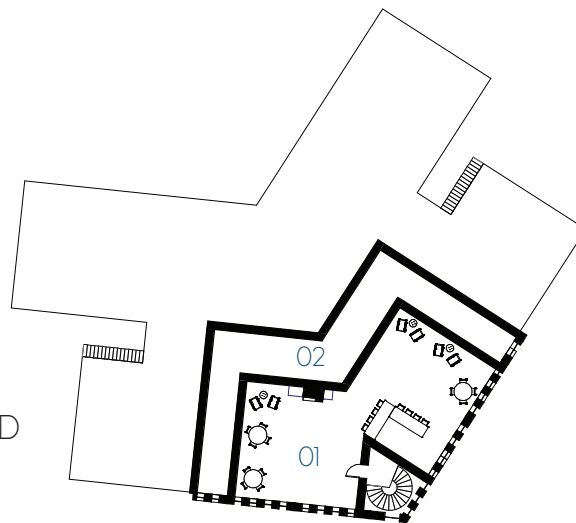
## TOP FLOOR - TECHNICAL AREA AND TERRACE

01 Terrace 140m<sup>2</sup>

02 Technical area 70m<sup>2</sup>

03 Terrace 140m<sup>2</sup>

04 Technical area 70m<sup>2</sup>

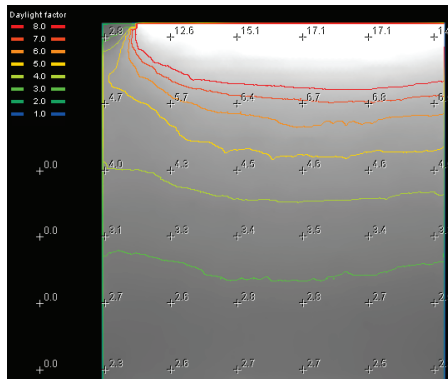




South elevation



North elevation



ill 5.5. 2 person bedroom with no overhang gives an average daylight factor of five.

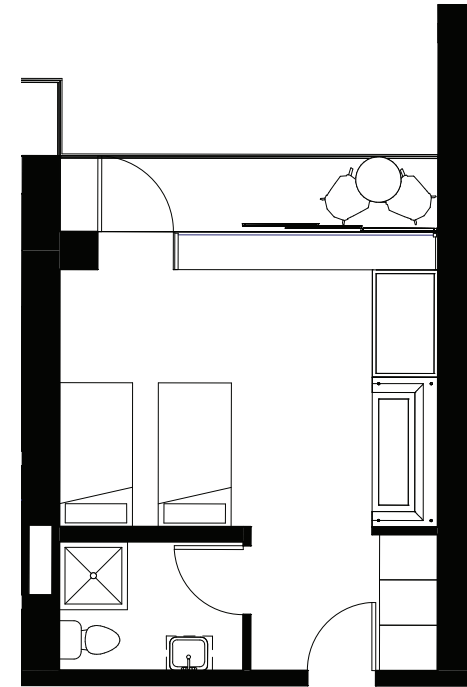
## MODULE FOR 2 PERSONS

The module suited for two persons is five times five point three, the room consists of a small entrance with good cabinet space to store clothes, weapon and equipment from the entrance the users has direct access to the small bathroom (4m<sup>2</sup>) designed according to the Norwegian Tek10 rules. The entrance has a direct view out of the window and a relation between in and out is creating by continuing the same use of materials and also by letting the panoramic window align with structural wall, making the wall a continuing element.

The bathroom forms a small niche suited for a sleeping area, either for a couple or separating the beds making the room suitable for two athletes. The room also has a sofa area where the guest can decide either to see television or enjoy the view, the rooms also offers the quality of a small balcony, suite for enjoying the weather or having a midnight smoke.

The large window area supplies the room with a daylight factor of five and in the case with a large overhang and modules on each side the daylight factor is two.

The large amount of windows increases the visual connection with

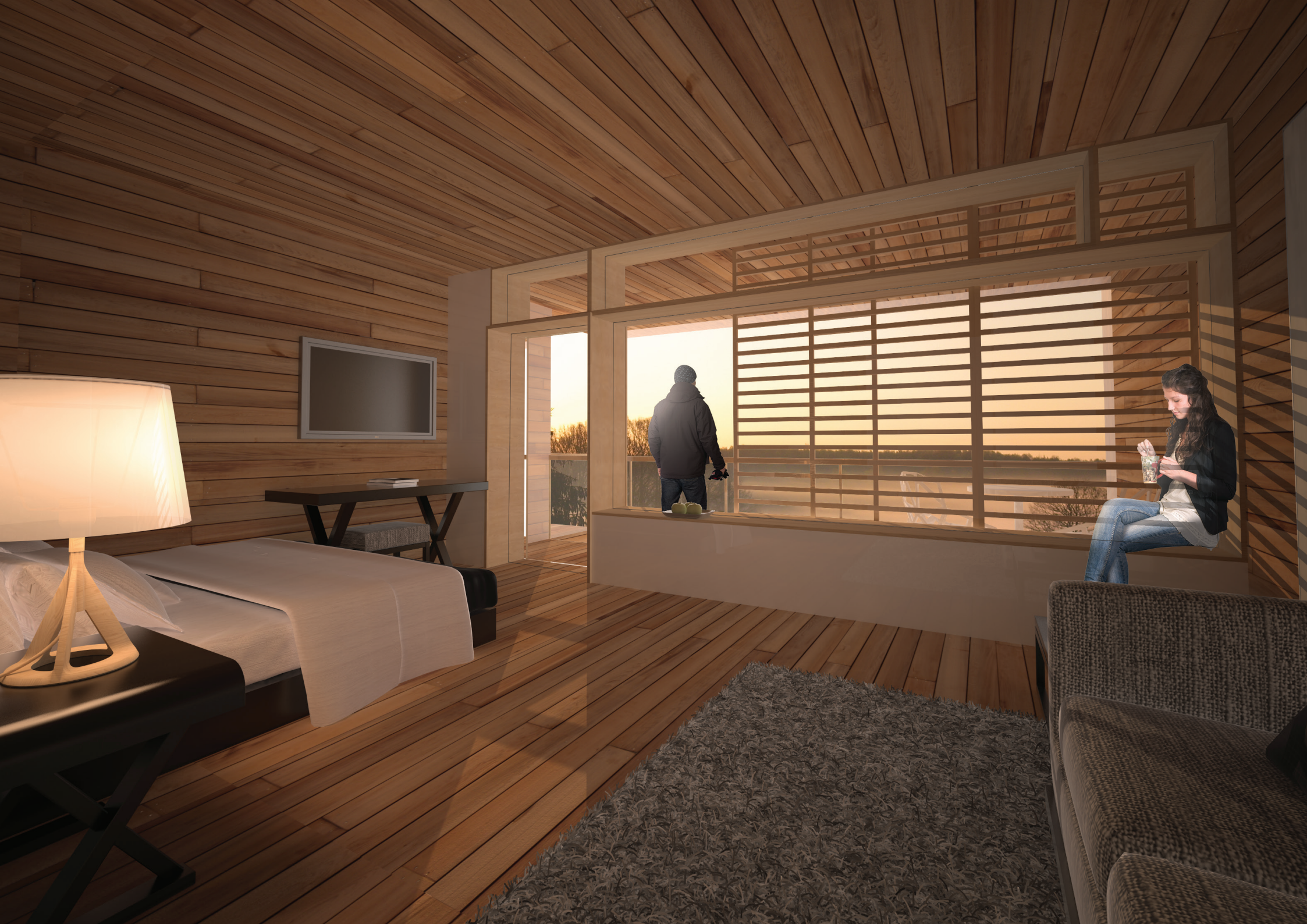


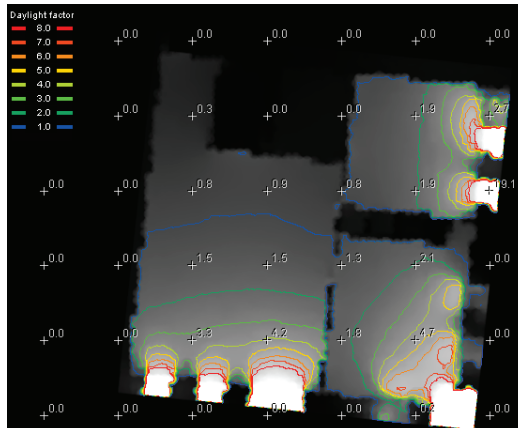
ill 5.6. Showing the final layout of two person bedroom.

the outdoor but also allows a high solar gain, which ensures the goal of reaching 2020 energy standards (see page 101)

The rendering on the next page shows the use of materials, using the warm pinewood to create a pleasant, modern but very Norwegian atmosphere, the rendering also shows the small feature of continuing the wall out on the balcony which frames the view and creates a relation between in and out. A design feature is also present in the use of window frame as a small seating area.

The room ensure that the rooms do not overheat the use of external blinds makes it possible to control the amount of light, but also becomes an architectural feature on the facade both open and closed. When closed the modules disappears enhancing the contrast between materials, and to saves money on heating unused rooms.





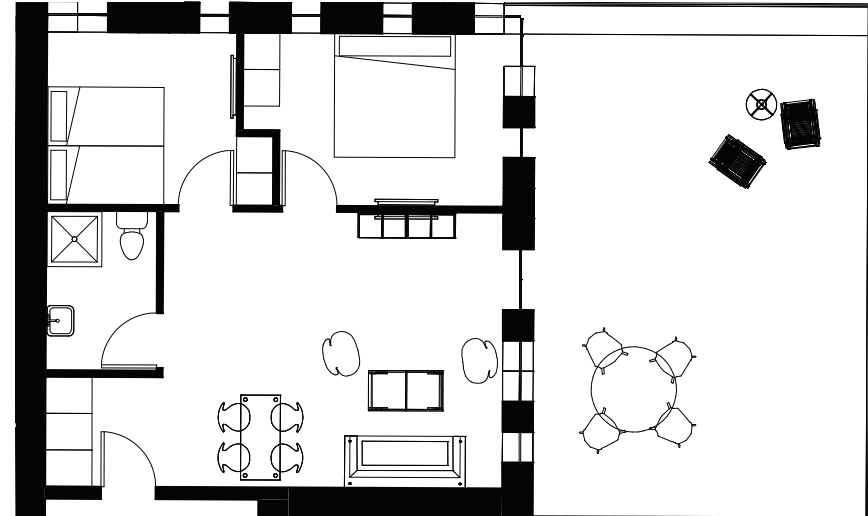
ill 5.7. 4 person bedroom with no overhang gives an average daylight factor of two point five.

## MODULE FOR 4 PERSONS

The module suited for four persons is seven point five time seven point five, the layout consists of two bedrooms, living room, bathroom and a small entrance. Again the entrance area offers cabinet space for one's equipment. The living room becomes the central space of the module suitable for relaxation and social interaction between the guests. The living room is connected to every room and removes the use for corridor, the layout consists of a small bathroom and two larger bedrooms, each with own cabinet space and again designed according to Norwegian TekIO.

Also the larger four person module has the feature of a balcony, but instead of a small balcony suitable for only short stay, these modules offers a large outdoor space overlooking the area.

Instead of reusing the materials and window system from the two person module, the four person module is primarily build in the more rough granite material, combined with the use of pinewood flooring and lighter plasterboard walls.



ill 5.8 - Showing the final layout of two person bedroom.

The rendering on the next page shows one of the two bedrooms overlooking the balcony, also in this case a connection between in and out is made by continuing the pinewood floor on to the balcony deck. The use of the heavy granite walls creating a connection to the overall architectural idea, and the feature of using wood in the window frames emphasizes the cuts in the hard granite rock and also reveals a soft and warmer core inside the granite mountain.











## REFLECTION

When reflecting upon the past four months what first comes to mind, is the communication with the people of Gautefall and the starting point for the project. The motivation for doing this project came from the interest in Norway through an internship and a future job opportunity I also had a deep insight in chosen site, and my dad was former hotel manager at the hotel, therefore I believed that the initial part of the process, understanding the site, defining a problem and starting the sketching phase would be very straightforward. But all the insight and all the inputs from the ones closest to me, proved instead to make this part of the process very difficult.

Looking back the project I chose should have a defined brief, where the design goals were predefined and all the CAD material was included.

Finally after endless nights of brainstorming the idea of creating a resort/hotel designed to accommodate biathlon users emerged, looking back the idea still seems valid but the amount of literature and knowledge regarding biathlon and accommodation for athletes in general showed to be very poor.

This became both the strength and weakness in the assignment, but because the project had its roots in a real problem, "How to attract more summer guests" the project was already defined in scale, this

resulted in the project escalating in size and suddenly becoming a 5000+ m<sup>2</sup> project.

The technical aspect chosen from the beginning of the project period was energy with the ambitious goal of reaching 2020 Danish standards. Because of the location in Norway a series of the evaluation and design tools taught through one's education was suddenly not useable, which influenced the overall design process.

Looking back the project should instead have used these tools and in the end reflected upon the results, instead of having to use Bsim throughout the design process.

When reflecting upon the end result and if one were to be given more time, the diversity of modules should have had one if not two iterations more, the modules showed to function single handed and also as part of a level, but the system was continued and used for a five thousand square meter building, at some point it could be questioned how optimum the same module was to accommodate four persons and then be reused as a workshop on the floor below.

## CONCLUSION

The aim of this project was to design a biathlon resort at Gautefall in the southern part of Norway. The resort had the ambitious goal of attracting more summer guests to the area and at the same fulfill the 2020 standards. The design showed capable in if not reaching the standards then being extremely close in doing so. This was a very ambitious goal when comparing the Danish weather to the Norwegian, the need for heating is much larger.

What intrigues the most about the project was the process of transferring a clear vision of a mountain into an architectural form, so fare people understand the architectural image.

Because the project was made in close dialog with people of the Gautefall and also people from the municipality of Drangedal. They have already show interest in the project and would like to be presented with models and presentation material.

The final architectural form showed capability in justifying the inspiration from the granite mountain, the design shows both form wise but also spatial references to the inspiration.

The final form shows qualities in functioning as a resort in Norway, the design implements both users´ needs and also tasks into consid-

eration in which way the building must function.



# APPENDIX

9.1 BSIM

9.2 SOURCES

9.3 ILLUSTRATIONS

# Bsim

Though the design phase, Bsim has been used both as an evaluation tool but also as a design tool. Because of the location in Norway the use of spreadsheets and BeIO did not give a honest result, therefore the primary evaluation and design tool became Bsim. Through the design process the use of Bsim together with Velux daylight visualizer became the primary tools.

This section will focus on evaluating on the final design, a model has been made of a full exposed double room, one with a large overhang and a family room, each model has then been orientated according to the different scenarios in the building layout.

## Double room - Bsim Input

### Ventilation:

Input 0,009 m<sup>3</sup>/s (equal an air changerate of 0,5)

Output 0,009 m<sup>3</sup>/s

Recovery unit 0,85

The system uses a VAV(Variable Air Volume) controle with a maximum factor of 5 according to maxiumum needed air changerate of 2,3

### Person

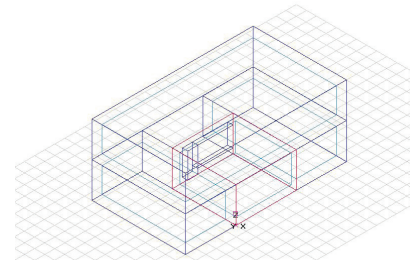
The acitivity level on the room is low, therefore equal to a met of 0,8 = a total heat gain of 0,144 kW for 2 persons. Because the users are primarily using the rooms for evening stay the time schedule is set: 80% from 24 -9, 0% from 10-16 and 100% between 17-23 all year around.

### Equipment

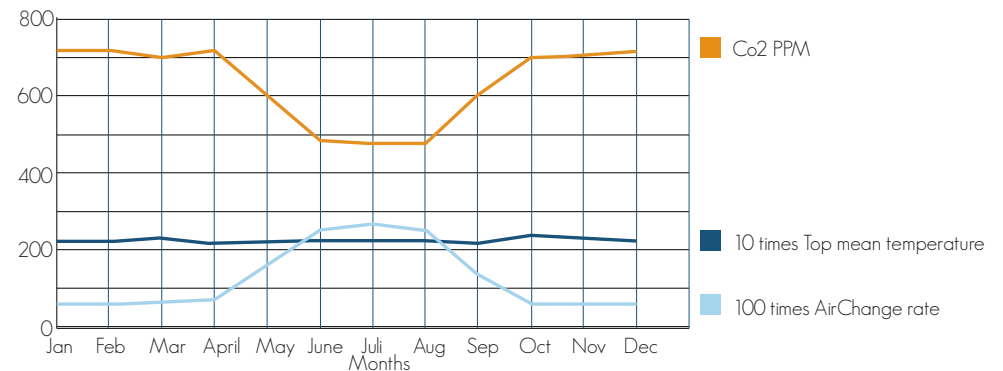
Heat load: 0,3kW, 75% from 7-9, 0% and 100% from 17-22 all year around.

Lights: i set according to Bsim standard value with a standard light controle. active in the winter months(Jan-april and sep - dec) 7-22 and summer (may - aug) 18-22

Heating: Max power 5kW with a set point of 22°C and active during Winter



ill. 7.1. Screenshot of the module defined in Bsim



The scheldule above compares the top mean temperature with the average air change rate and the Co2 measured in PPM. during an entire year, the average Co2 levels do not exceed the limits of 810PPM, the schedule also indicates that indoor temperature do not exceed the comfort level of 26°C furthermore the schedule shows that during the summer periode where the natural ventilation is active the Co2 levels start to fall.

This indicates that the quality of the indoor quality is OK, and the model is therefore suitable to determen the yearly energy consumption.

Norge	Sum/Mean	1 (31 days)	2 (28 days)	3 (31 days)	4 (30 days)	5 (31 days)	6 (30 days)	7 (31 days)	8 (31 days)	9 (30 days)	10 (31 days)	11 (30 days)	12 (31 days)
qHeating	185,45	62,86	39,39	8,21	0,00	0,00	0,00	0,00	0,00	0,00	1,02	19,23	54,75
qCooling	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
qInfiltration	-390,69	-53,40	-50,32	-48,34	-33,26	-20,97	-11,71	-10,16	-11,44	-20,58	-35,41	-44,33	-50,78
qVenting	-1368,17	0,00	0,00	0,00	-190,63	-216,09	-258,39	-249,69	-255,99	-197,39	0,00	0,00	0,00
qSunRad	1025,93	10,76	35,79	90,13	115,87	154,41	167,54	158,99	138,79	93,66	39,06	14,44	6,47
qPeople	788,40	66,96	60,48	66,96	64,80	66,96	64,80	66,96	66,96	64,80	66,96	64,80	66,96
qEquipment	903,38	76,72	69,30	76,72	74,25	76,72	74,25	76,72	76,72	74,25	76,72	74,25	76,72
qLighting	673,45	77,50	69,50	68,50	58,20	28,15	23,80	26,15	28,85	64,20	76,10	75,00	77,50
qTransmissi	-1420,39	-180,23	-168,73	-187,36	-89,23	-89,18	-60,30	-68,98	-43,90	-78,94	-146,73	-136,91	-169,91
qMixing	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
qVentilation	-397,35	-61,18	-55,41	-74,84	0,00	0,00	0,00	0,00	0,00	0,00	-77,72	-66,48	-61,72
Sum	0,00	0,00	-0,00	0,00	0,00	0,00	-0,00	0,00	0,00	0,00	-0,00	-0,00	0,00
tOutdoor me	6,2	-3,7	-4,8	-0,5	4,9	11,7	16,5	17,5	16,9	11,5	6,4	0,6	-2,4
tOp mean	22,4	22,2	22,2	23,0	21,5	21,9	22,5	22,6	22,5	21,9	23,7	22,8	22,2
AirChange/h	1,2	0,6	0,6	0,6	0,7	1,5	2,5	2,7	2,5	1,4	0,6	0,6	0,6
Rel. Moistur	33,4	25,6	24,0	24,7	27,2	34,2	42,2	48,3	47,4	40,3	33,0	28,0	26,2
Co2(ppm)	634,2	718,1	718,6	699,5	718,4	598,7	485,6	474,6	474,7	604,8	697,5	704,5	715,4
PAQ	0,4	0,6	0,6	0,5	0,6	0,5	0,3	0,2	0,2	0,4	0,4	0,5	0,6
Hours > 21	8632	744	672	744	611	727	720	744	744	718	744	720	744
Hours > 26	0	0	0	0	0	0	0	0	0	0	0	0	0
Hours > 27	0	0	0	0	0	0	0	0	0	0	0	0	0
Hours < 20	0	0	0	0	0	0	0	0	0	0	0	0	0
FanPow	102,60	17,06	15,40	18,37	0,00	0,00	0,00	0,00	0,00	0,00	17,69	16,93	17,16
HtRec	963,23	190,19	182,42	168,45	0,00	0,00	0,00	0,00	0,00	0,00	95,87	147,78	178,53
ClRec	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
HtCoil	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
ClCoil	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Humidif	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
FloorHeat	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
FloorCool	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
HeatPump	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
HeatPumpE	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

The schedule above shows an overview of the building performance, the key energy numbers from this schedule determine the overall energy consumption of the module. Q<sub>heat</sub> + FanPow + HtCoil + Domestic hotwater (which is not defined in Bsim)

This gives a total energy consumption 288kWh divided by the floor area + domestic hotwater (defined using beIO)

288kWh/26,5+5,3= 16,16kWh/m<sup>2</sup> per year

#### Family room- Bsim Input

##### Ventilation:

Input 0,02 m<sup>3</sup>/s (equal an air changerate of 0,5)

Output 0,02 m<sup>3</sup>/s

Recovery unit 0,85

The system uses a VAV(Variable Air Volume) controle with a maximum factor of 5

##### Person

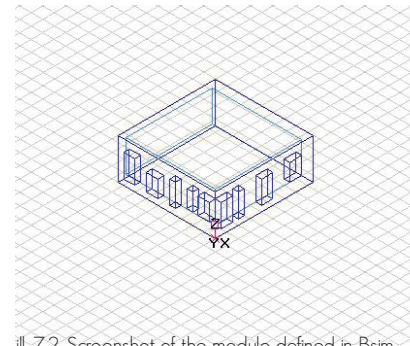
The acitivity level on the room is low, therefore equal to a met of 0,8  
= a total heat gain of 0,288 kW for 4 persons. Because the users are primarily using the rooms for evening stay the time schedule is set: 80% from 24 -9, 0% from 10-16 and 100% between 17-23 all year around.

##### Equipment

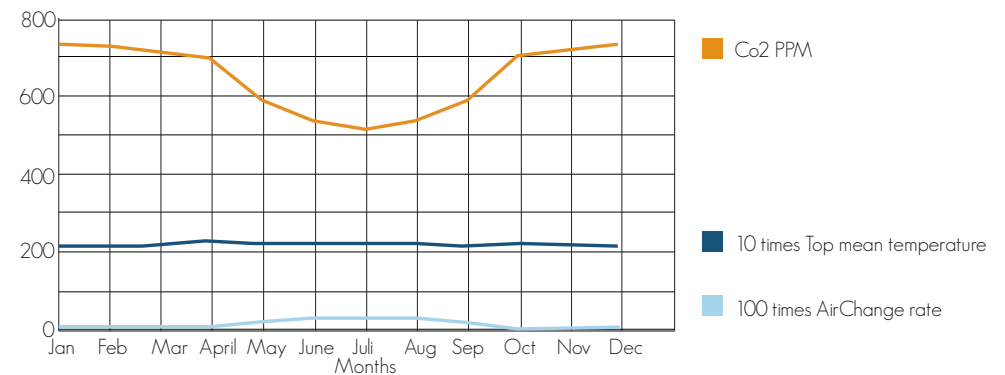
Heat load: 0,6kW, 75% from 7-9, 0% and 100% from 17-22 all year around.

Lights: i set according to Bsim standard value with a standard light controle. active in the winter months(Jan-april and sep - dec) 7-22 and summer (may - aug) 18-22

Heating: Max power 5kW with a set point of 22°C and active during Winter



ill. 7.2. Screenshot of the module defined in Bsim



The scheldule above compares the top mean temperature with the average air change rate and the Co2 measured in PPM. The same as for the double room the Bsim model is suitable to determine the overall energy consumption.

ThermalZone	Sum/Mean	1 (31 days)	2 (28 days)	3 (31 days)	4 (30 days)	5 (31 days)	6 (30 days)	7 (31 days)	8 (31 days)	9 (30 days)	10 (31 days)	11 (30 days)	12 (31 days)
qHeating	1033,06	217,22	196,29	134,89	28,89	35,80	0,00	0,00	0,00	32,60	40,96	142,35	204,07
qCooling	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
qInfiltration	-722,42	-98,74	-93,27	-87,89	-67,54	-39,81	-21,25	-18,32	-20,43	-38,87	-62,30	-80,36	-93,64
qVenting	-1477,36	0,00	0,00	0,00	0,00	-198,13	-357,52	-369,08	-357,35	-195,28	0,00	0,00	0,00
qSunRad	1155,58	22,48	61,59	102,33	129,19	154,42	164,80	157,55	146,81	107,38	61,99	35,81	11,22
qPeople	1576,80	133,92	120,96	133,92	129,60	133,92	129,60	133,92	133,92	129,60	133,92	129,60	133,92
qEquipment	2025,75	172,05	155,40	172,05	166,50	172,05	166,50	172,05	172,05	166,50	172,05	166,50	172,05
qLighting	561,40	77,50	68,30	68,70	57,70	0,00	0,00	0,00	0,00	64,60	72,90	74,20	77,50
qTransmissi	-3296,22	-458,01	-438,57	-413,60	-308,24	-166,00	-82,11	-76,11	-75,00	-173,49	-288,91	-374,43	-441,75
qMixing	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
qVentilation	-856,56	-66,43	-70,70	-110,40	-136,10	-92,24	0,00	0,00	0,00	-93,04	-130,61	-93,67	-63,36
Sum	0,03	-0,00	-0,00	-0,00	0,00	0,00	0,02	0,00	0,00	0,00	0,00	-0,00	-0,00
tOutdoor me	6,2	-3,7	-4,8	-0,5	4,9	11,7	16,5	17,5	16,9	11,5	6,4	0,6	-2,4
tOp mean	21,9	21,4	21,5	21,9	22,7	21,9	22,2	22,3	22,2	21,8	22,3	21,7	21,4
AirChange/h	1,4	0,6	0,6	0,6	0,6	1,8	3,0	3,5	3,2	1,4	0,6	0,6	0,6
Rel. Moistur	35,3	27,6	25,8	27,1	28,2	35,2	43,7	49,7	49,3	41,2	36,2	30,8	28,4
Co2(ppm)	651,4	734,7	731,0	716,3	699,5	592,5	539,2	519,9	537,2	589,9	702,1	720,3	734,5
PAQ	0,5	0,6	0,6	0,6	0,5	0,5	0,3	0,2	0,2	0,4	0,4	0,5	0,6
Hours > 21	7780	491	485	658	720	741	701	737	730	715	727	593	482
Hours > 26	12	0	0	0	0	0	6	6	0	0	0	0	0
Hours > 27	2	0	0	0	0	0	0	2	0	0	0	0	0
Hours < 20	0	0	0	0	0	0	0	0	0	0	0	0	0
FanPow	298,83	33,50	30,60	35,07	35,22	31,14	0,00	0,00	0,00	30,04	36,17	33,55	33,53
HtRec	2311,63	383,32	368,21	330,24	221,66	80,65	0,00	0,00	0,00	75,53	194,71	296,52	360,78
CIRec	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
HtCoil	98,06	29,02	19,97	6,08	0,00	0,14	0,00	0,00	0,00	0,20	0,87	11,70	30,09
CICoil	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Humidif	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
FloorHeat	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
FloorCool	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
HeatPump	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
HeatPumpE	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

The schedule above shows an overview of the building performance, the key energy numbers from this schedule determine the overall energy consumption of the module. Q<sub>heat</sub> + FanPow + HtCoil + Domestic hotwater(which is not defined in Bsim)

This gives a total energy consumption 1429kWh divided by the floor area + domestic hotwater(defined using bel0)

1429kWh/56,25\*5,3=30,7Wh/m<sup>2</sup> per year

Because electricity is the primary energy source in Norway therefore the primary energy factor is set to 1,0.

This results in the total energy consumption of the accommodations is (28 \* 30,7kW + 47 \* 16,16kW) / 75 = 21,5kW/m<sup>2</sup> per year

## SOURCES

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Arkitekten nr. 8, 2012 - Nordisk

Bjørn Runar, 2012: Drangedal fremtidsplan

Together with the use of old course material, but not used as direct reference.

E. Neufert, 2010 Architectural standards

## ILLUSTRATIONS

Unless otherwise is mentioned pictures and illustrations are my own

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