HOTEL NØ

SYNOPSIS

This project is based on a proposal project of a Hotel Design situated in Nørresundby Aalborg, Denmark.
The main focus of the project is to draw-up a motif complex of a hotel, whereby the complex owns several functions and services to be offered to the entire community as well as tourism and visitors. In all 69 guest rooms have been developed with restaurant and wellness facilities such as swimming pool, sauna, fitness centre, and massage therapy for the entire community.

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Historical Identity

Aalborg is the capital of northern Jutland, and what characterized the town is its historic relic of the past centuries. Specially during the industrial era, when the town harbor became the most vital intersection point between water-traffic and vehicular traffic , which within the first half of the twentieth century fortifies the town development in to a unique trading, and an important industrial city within the northern part of Europe.

One can evidently see today that because of globalization, most of the industries had left out the town leaving behind a trace of an empty building structures, which are all exposed within the city.

The plot is located within nørresundby between the bridge "mellem broerne". Towards the southeast side of the fjord, most of the abandoned industrial buildings along the perimeter of the water have been demolish to provide access for a new innovative development. Some of the new establish buildings are the Utzon Center and the student hostel, which is place close to the First Slot Hotel. And the other industrial buildings with good structural stability such as the NordKraft is under restoration into a Kultur hus as an addition, to expand the common activity area within the community, thereby improving the recreational and social lifestyle of the people.

The local municipality future plans for Aalborg as a whole is to make the surrounding environment more attractive and welcoming for the inhabitants there by structuralizing some of the specific places along the Limfjord, including the old industrial areas with new dwelling apartments and high rise buildings.

For the past few years the plot location was use as slaughtering house which was the first Aalborg Amts Anders-Svine slaughter during 1891 located within and as part of the industrial areas. The industries close down during the year 2004 leaving the landscape to its origin, with trees and devastated empty structures. For the sake of new innovation and development technologies, the area has been on a higher priority demands for development, and had drawn attention for various design proposal possibilities for the future.Moreover, as it is today most of the defunct surrounding structures are no longer available but only development and construction of new dwelling apartments and other activity centers.

Old slaughter house on plot

NordKraft building

Limfjord

New student hostel

ill. 001-04

Project description

This master thesis project is based on a proposal project of a Hotel Design situated in Nørresundby Aalborg, Denmark.

The main focus of the thesis project is to draw-up a motif complex of a hotel, whereby the complex owns several functions and services to be offered to the entire community as well as tourism and visitors. Thus providing the inhabitants with a unique milieu, a place of tranquil and tactile as a destination for both tourist and business guest in search of hospitality.

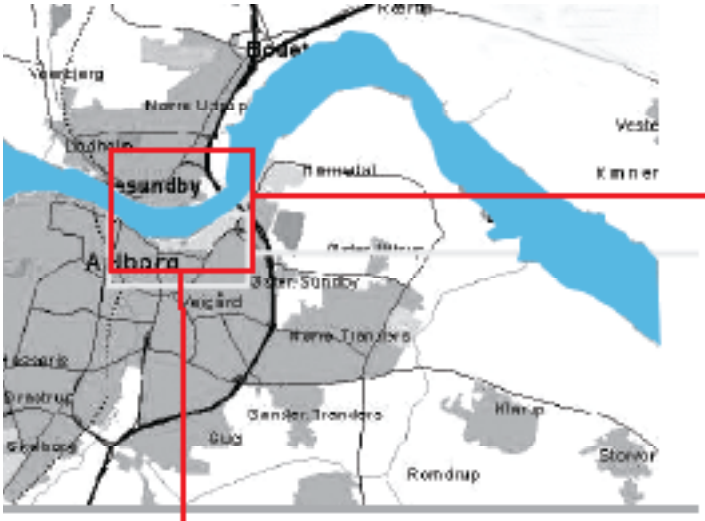
The plot was chosen purposely for the hotel complex due to its capabilities and nature of the site, with its alluring surrounding environment to the Limfjord, and also regarding the envisage perspectives from the local municipality about what should, and shouldn't be permitted on the site. According to the Aalborg municipality future perspectives of the area, the plot should only be use for the following purposes; offices, schools, clinics "*but not animal clinics*", shopping malls, hotel, restaurants, as well as other social services or recreational facilities that will cultivate much interest for community, thereby promoting and enhancing the living condition along the banks of the Limfjord.

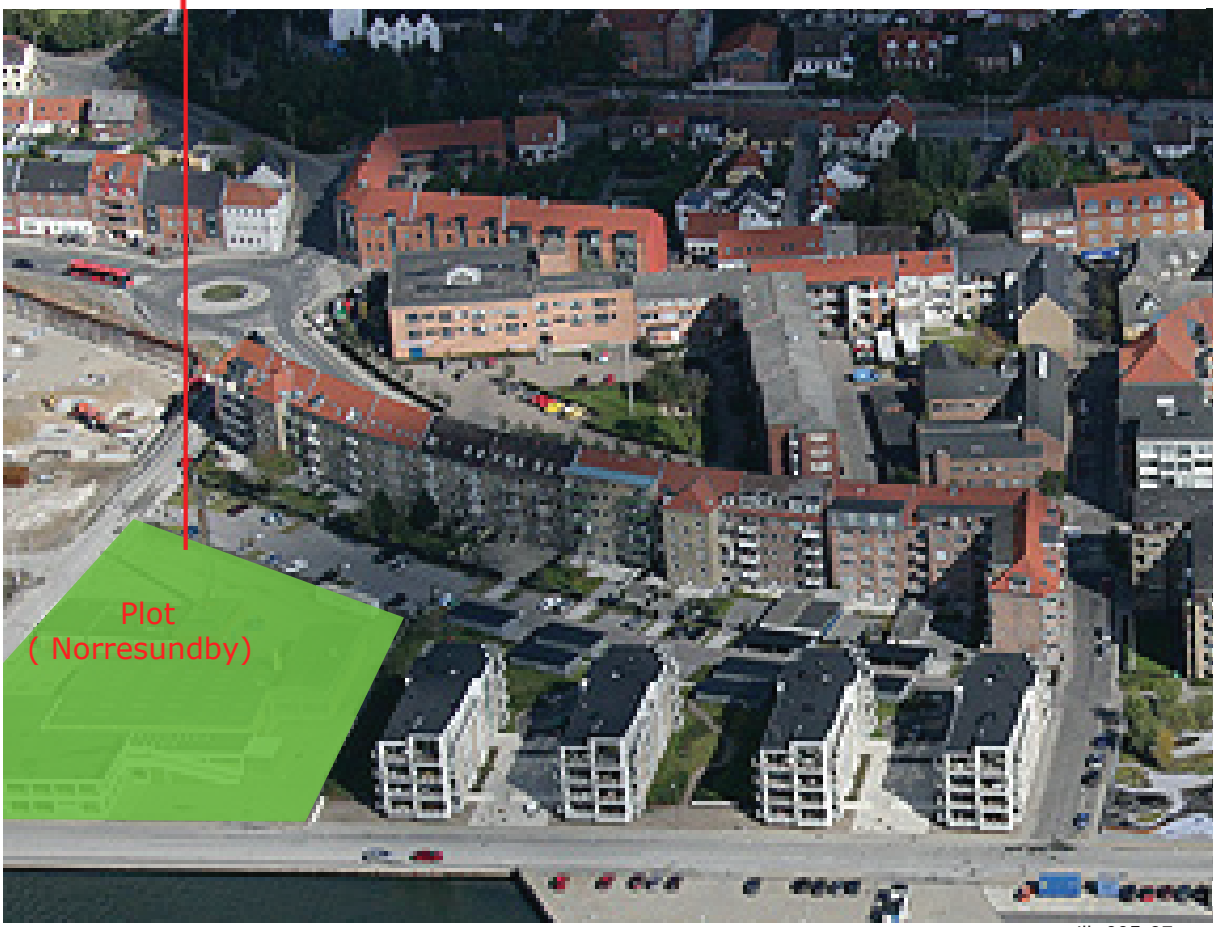
The total size of the plot is 5019 m2, and as observed to the local plan, a maximum of six-story high building structures should be build on the plot, and also demolishing of the existing structures are allowed if necessary.

It is also mention that a total build area of 5400 m2 should be occupied, as well as proving room for greenery.

For parking lots, it is determined that one parking space should be allocated to four individual rooms or apartments.

Plot location





ill. 005-07

PROBLEM FORMULATION:

WHAT COULD BE THE MAIN DEMANDS FOR A HOTEL COMPLEX WITHIN THE DOWN TOWN OF NØRRESUNDBY?

Methods and Approaches

The design approach would comprise of an integrated design process, and a sustainable way of approaching hotel designing, there by optimizing the interplay between the architectonic merit and its functional application and expressions. The indoor climate "ventilation", acoustics, statics analysis and construction management would be considered and dealt with as part of the design parameters.

The integrated Design Process involves the following design parameters:

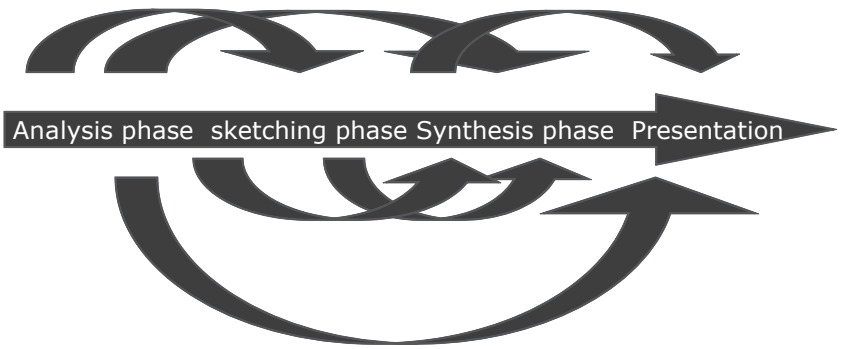
Problem formulation: Explanatory of the project idea or problems that requires much attention for better solutions.

Analysis phase: The site registration of genius loci, in relation to wind, sun topography of the terrain, functions, indoor climate and theories to give a profound understanding of the design parameters.

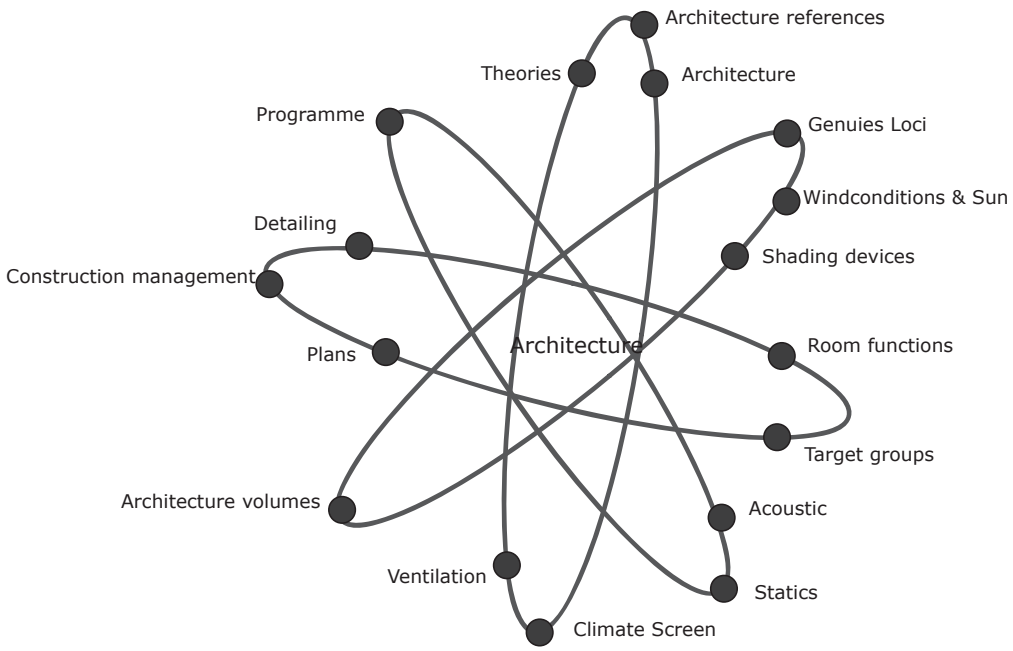
Sketching phase: This phase involves the architectural approaches in regards to the functional demands, testing of ideas, and the merits of evaluating solutions in different perspective and those that have the potential to fulfill the design criteria as determine in the Analysis phase.

Synthesis phase: The synthesis phase is where the building finds its form, and base on the various computation and optimization of the design parameters to achieve the design goal as stated in the Analysis phase of the program.

Presentation phase: The finish project is handover in report form, whereby an examination follows including digital presentation, models and an oral defending of report.
[Knudstrup, 2008]



Architecture As Integrated Design



ill. 008-09

In order to design a unique hotel concept that would be welcoming to suite the surrounding context of the area, a phenomenological approach of the Norwegian architect Christian Norberg Schultz, who admires and uses the term ” Genius Loci, and Genius Stabilitas“, expressing the atmosphere and the identity of the place.

In Christian Norberg Schulz’s opinion, to feel at home in a dwelling the occupant has to have a sense of participating and belonging, which implies that the user does not only dwell in the home, but lives together with other people in the urban space as well as public institutions. Architecture design intentionally for hospitality purpose should not only bring in innovative new building style but also preserve the local context of the area. It is of great important that a new dwelling adheres and respects the context, in that way the architecture style becomes more meaningful which ensures that the localities do not lose the identity of the place.
The possibility of local rooted modern architecture is for example Villa Mairea, which situated in the middle of Finish pine forest within the western part of Finland. The building was design by the famous Finish architect Alvar Aalto in the year 1937 to 1938.
[Norberg –Schultzs, 2002]
He then continues to states that these phenomenons are connection to the surrounding features, the atmosphere that is created in relationship between building and their surrounding environments are the main factors in determining the local spirits”Genius Loci“. It therefore an important factor to consider and notice the formation of the landscape and its Genius Loci within the surroundings. In this case, if the formation of the landscape and the spatial structures of the place are neglected without taken into consideration, the place might lose its value.

ill. 010-011

However, despite the inevitable fact that the change of characters of the place when transforming the actual place; it is pertinent that the local atmosphere relates to the history of the place in order to protect the present Genius Loci. *[Schultz 1978]*

Stabilitas Loci, meaning the identity of a place, which is considered as, features within the surrounding environment that with our perspective point of view has been situated at the exact location without change, and would continue to be there. A clear example of these Stabilitas Loci could be the surroundings around the water, as the landscape would maintain its characteristics independent of traffic and other disturbing elements. *[Schultz 1978]*

Working with the atmosphere and the identity of the place, one is also operating between the communication systems towards the individual present at the place. The theoretician Rudolf Arnheim states that, atmosphere exits in the relation between the genius loci of the place and the perception of the individual, therefore it is desirable to reach the point where by the individual are able to perceive the Genius Loci of the place. According to Arnheim point of view, where perception terminates, thought begins with the design intention been communicated.

[Arnheim1986]

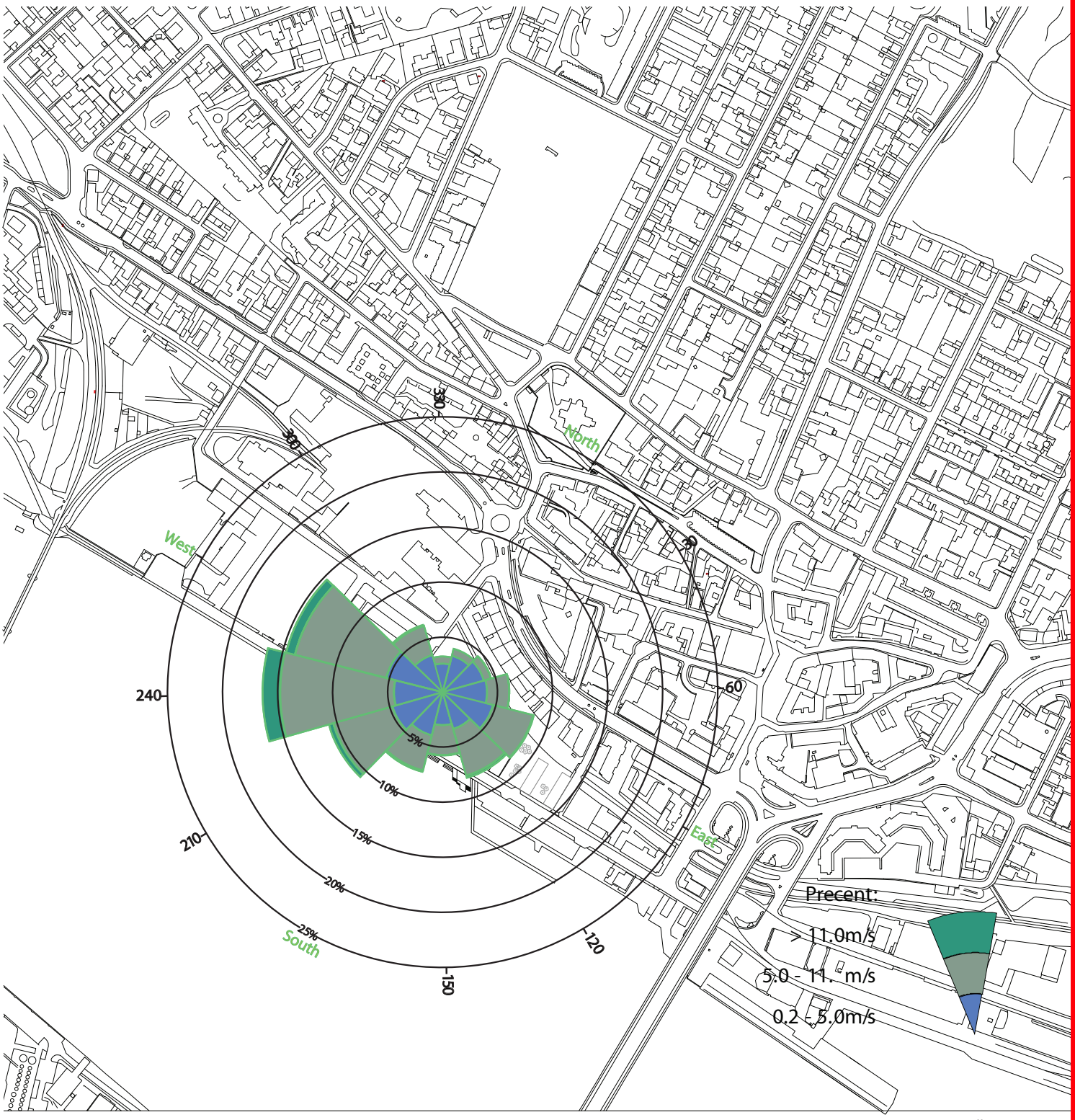
SITE REGISTRATION

WIND

Wind

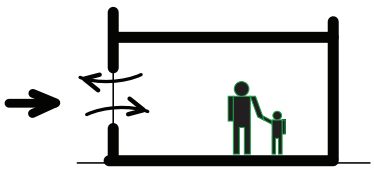
The plot location is mostly subjected to wind pressure most of the day, as it is situated close and open to the Limfjord. Most of the predominantly wind direction during the year occurs normally from the west, south-west and as well as the easterly part as shown with the wind rose of year ill.010

This creates different possibilities for natural ventilation as well as cooling the building in the summer. In this case, different types of ventilation strategies could be implemented, such as single sided ventilation, cross ventilation and, stack ventilation system. The ventilation strategy that would be use in the hotel complex is mechanical ventilation throughout the year to help maintain the room temperature, since most of the rooms will not be occupied but yet needs to be ventilated to avoid odour and other stale air from the rooms. Places such offices, reception area, and restaurant and bar should be able to be ventilated naturally through windows openings to promote good indoor climate if necessary during summer time, thereby reducing the energy use for the mechanical ventilation system.

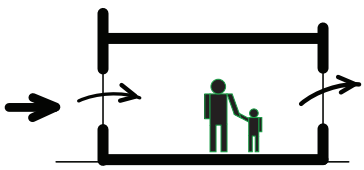

North
West
South
East
30
60
120
150
210
240
300
330
5%
10%
15%
20%
25%
Precent:
> 11.0m/s
5.0 - 11. m/s
0.2 - 5.0m/s

ill. 012

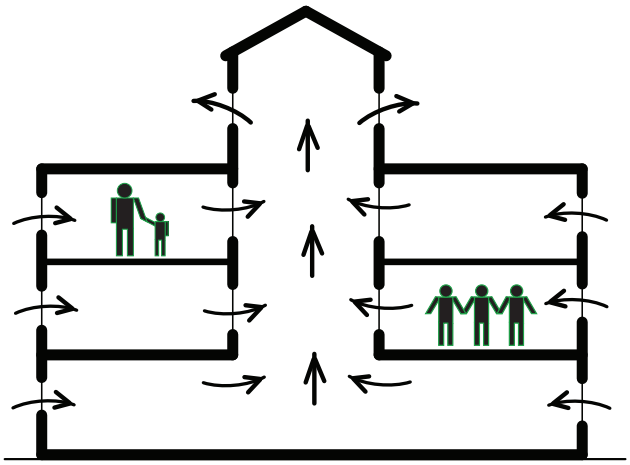
The following illustration shows how some of the earlier mention rooms could be naturally ventilated during summer without application of mechanical ventilation and it's also depends on various room locations. In this case the supply inlet and outlet air flow from the mechanical system is switch-off.



Single-sided ventilation



Cross-ventilation



Stack-effect system

Charateristic Aspect	Characteristic Parameters
Natural driving force:	Bouyancy
	Wind
Ventilation Elements:	Facade openings
	Chimney
	Atrium
	Wind towers
	Ventilation chambers
	Ventilation ducts
Ventilation Principle:	Single-sides
	Cross-ventilation
	Stack-ventilation
Heights of Building:	Low-rise
	Medium-rise
	High-rise

ill. 013-015


Summer Solstice
Equinox
Winter Solstice
West
North
South
May 21
Apr 21
Mar 21
Feb 20
Jan 21
Dec 21
Jun 21
Jul 21
Aug 21
Sep 22
Oct 21
Nov 21
Dec 21
240
210
150
120
90
80
60
50
40
30
20
10
20h
19h
18h
17h
16h
15h
14h
13h
12h
11h
8h
7h
6h
5h
4h

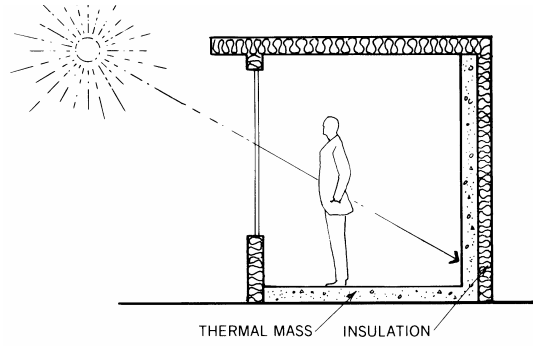
ill. 016

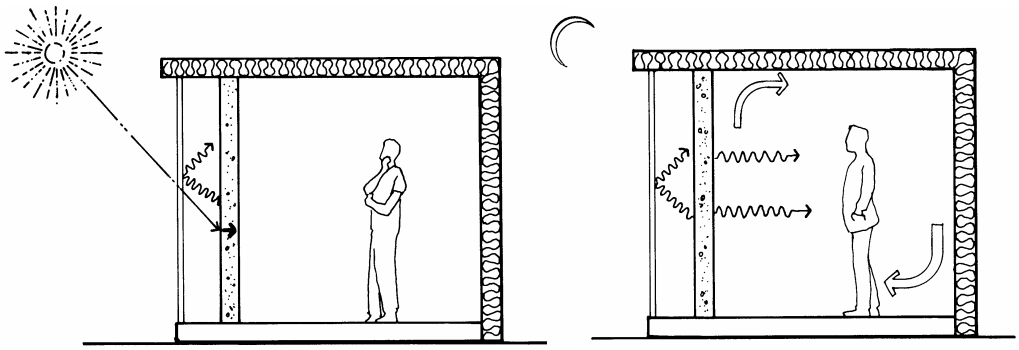
Sun

The plot is surrounded by adjacent building structures from west and east side leaving a clear and unobstructed exactitude view to the south, this implies that during winter whereby the sun altitude is very low, there is great possibility of utilizing the solar radiation from the sun for heating up the building. In addition to solar heating, the use of embedded energy material could be of an advantage in order to achieve a higher thermal mass into the building. Thermal mass can be defined as construction or furnished materials use in a building that has the potentials of absorbing or releasing heat from or into the interior space.
[Lechner, 2008]

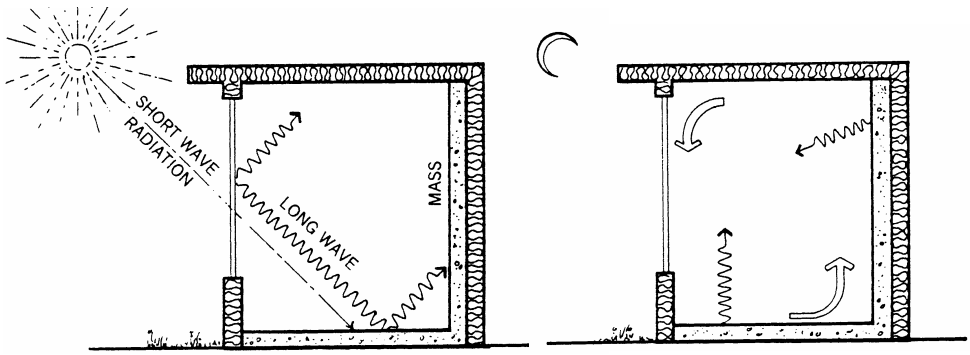
However, some of the neighboring buildings can create obstruction and shading for the morning sunrise and as well as view of the surrounding areas. This must be taken in to consideration in the room programming to allocate the individual rooms at the right places to overcome or minimize such shading of neighboring buildings.

In relation to this, an analysis is carried out to determine sun-shadows and shading of the plot in conjunction with the surrounding building structures, and as well as an existing two story high building shown on *ill. 020*

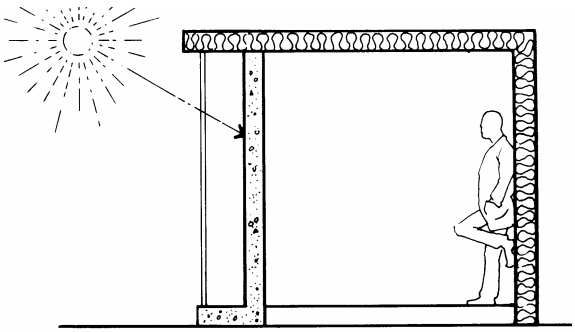




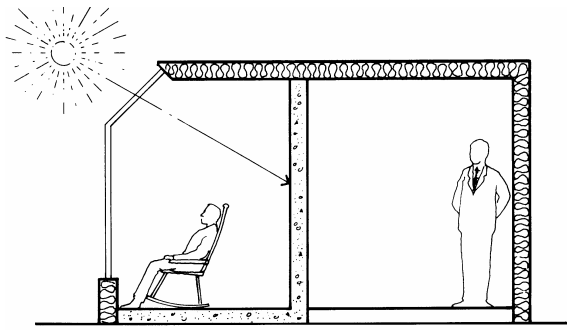
Heat storage principle of thermal wall storage system



Heat storage principle of direct gain system

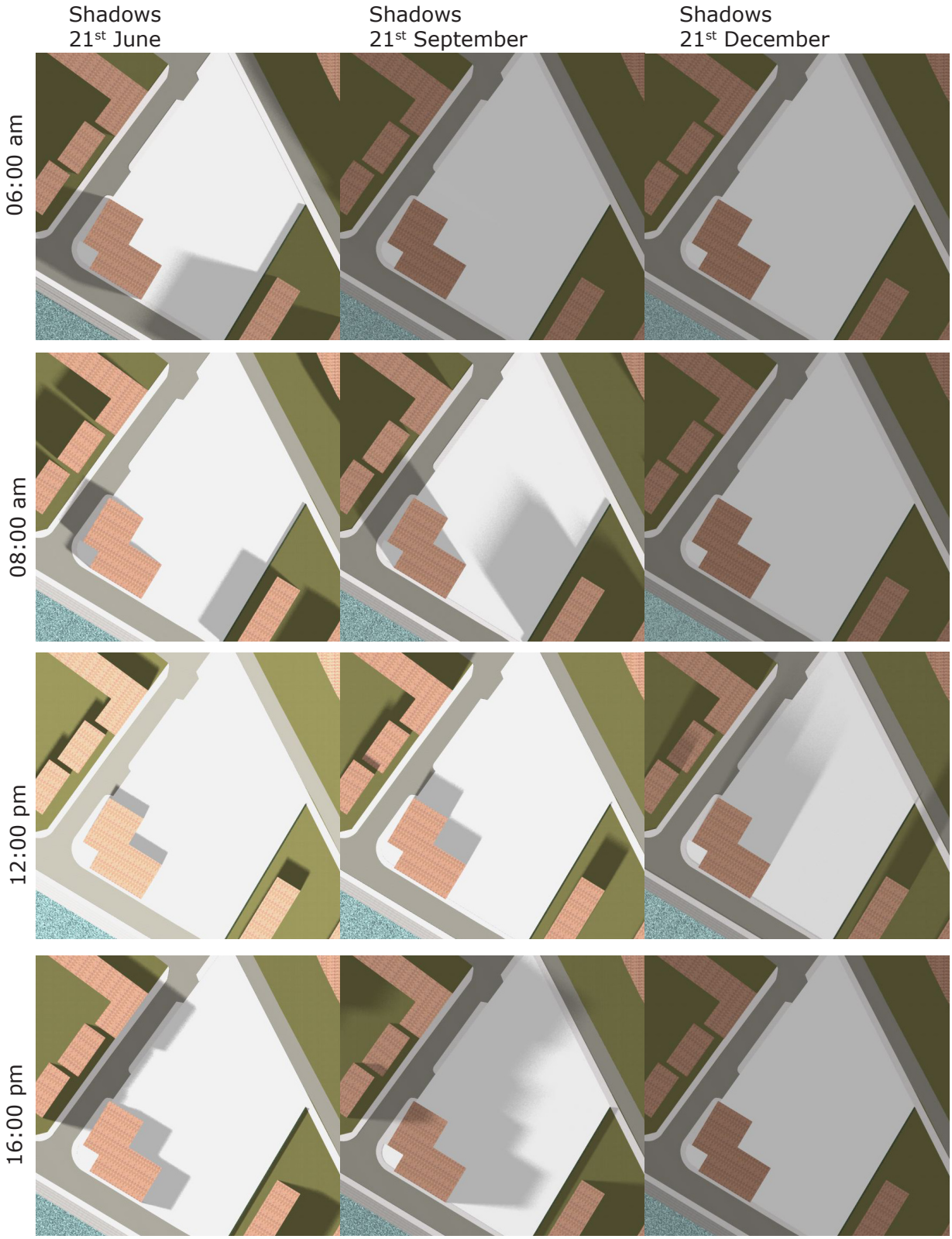


Principle of indirect solar gain systems



Principle of sunspace, remote solar & storage system

ill. 017-022


Shadows
21st June
Shadows
21st September
Shadows
21st December
06:00 am
08:00 am
12:00 pm
16:00 pm

ill. 034

Green area

The recreational and leisure greenery areas of Nørresundby are very few and dispersed. The local municipality and the inhabitants for the past few years had work hand in hand to help develop and fortify some of the recreational green areas along the Limfjord within Nørresundby district, which can be closely observed from the "Grønt Katalog".

The old rail way truck has been filled up with asphalt establishing pathways for easy access to pedestrian and bicycles, due to historical reasons its left un-dismantle and, as at now, the rail way-path serve as a link connecting the easterly greenery to that of the westerly leisure area close to the banks of the Limfjord.

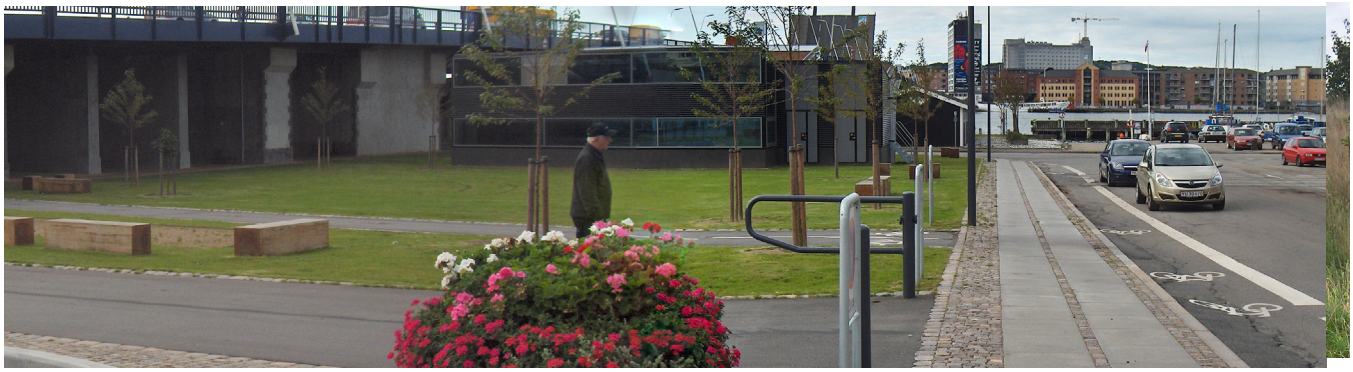
Lindholm strandpark provides much more recreational possibilities for the inhabitants within that premises, allowing families to paddle in the water and enjoying every bit of the wave force that is created by the wind, and the surrounding views within the area.

In between the new buildings facing the Limfjord and the old apartments block towards Vestergade, a new greenery area and a parking lots are under construction which would expand through the area connecting the smaller green spaces between the new buildings close to plot. According to the municipality plans for the area, there should be 30% greenery around dwellings and 15% for industrial areas. *[Aalborg Kommune, 2001]*

Skansenparken is one of the traditional leisure part located to the north of Nørresundby town square very close the site. The park is raise on top of the natural sloping landscape which provides the inhabitants with an exceptional view of the Limfjord, the surrounding towns, and as well as the town centres of Aalborg. During week days the place is very calm, and except on weekends that most people utilise the place for various activity purpose.

Old railway greenery (160 m east from plot (A))

Leisure area (150 m east from plot (B))



Leisure area (150 m east from plot (C))

Recreational area (180 m west from plot (D))

ill. 035-38

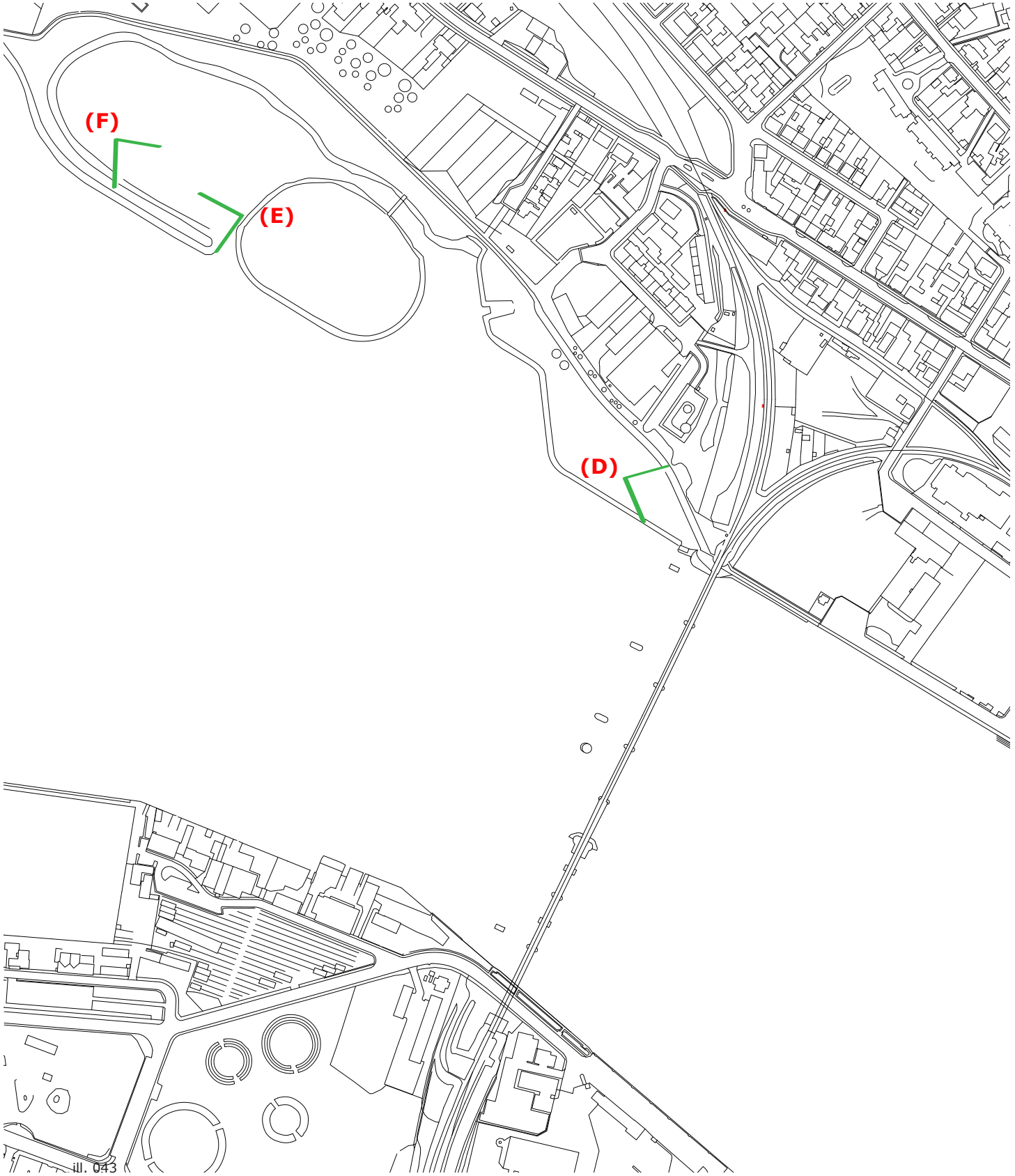
Recreational area (300-400 m west from plot (E)

Recreational area (300-400 m west from plot (F)

Skansenparken (G)

View from skansenparken (450-600 m north from plot (H))

ill. 039-042


(F)
(E)
(D)


(G)
(H)
(C)
(B)
(A)

Facts

The town of Nørresundby has different variety of functions to meet the desire daily needs and comfort of the inhabitant's. There are several mix building typologies which contain shops, companies, dwellings and public functions such as swimming facilities, schools, churches, day-care centres and local library etc. The town centre also serves as an arena for the community, whereby on every Fridays people buy and sale vegetable close to the street. It's also sometimes during the year there is a city-party whereby music and concert is held at the central square.

As it is today, although most of the industries and shops had left the area, there are still small shops and other form of trading located within the town centre, these shops and company offers services such as banking, books store, bicycle shop, shoes, clothing and others which make the place very remarkable for the entire community. An interview conducted to few of the inhabitants indicate that, most of the individual admires doing shopping within the centre without an attempt of crossing over the bridge to the city centre of Aalborg.

Along the limfjord within Nørresundby, the place is under vast development for shopping malls, various type of new storey apartment for the inhabitant, which would attract most of the elderly people as well as the young rich once, because of the location and the view of the water.
The community owns several cheap youth hotels which were recently establish, due to the difficulties in re-allocating residence within some part of the town, and 24 elderly residential home and activity centres.

Vegetable market

Nørresundby center

New shops & apartments

New apartments blocks

ill. 044-047

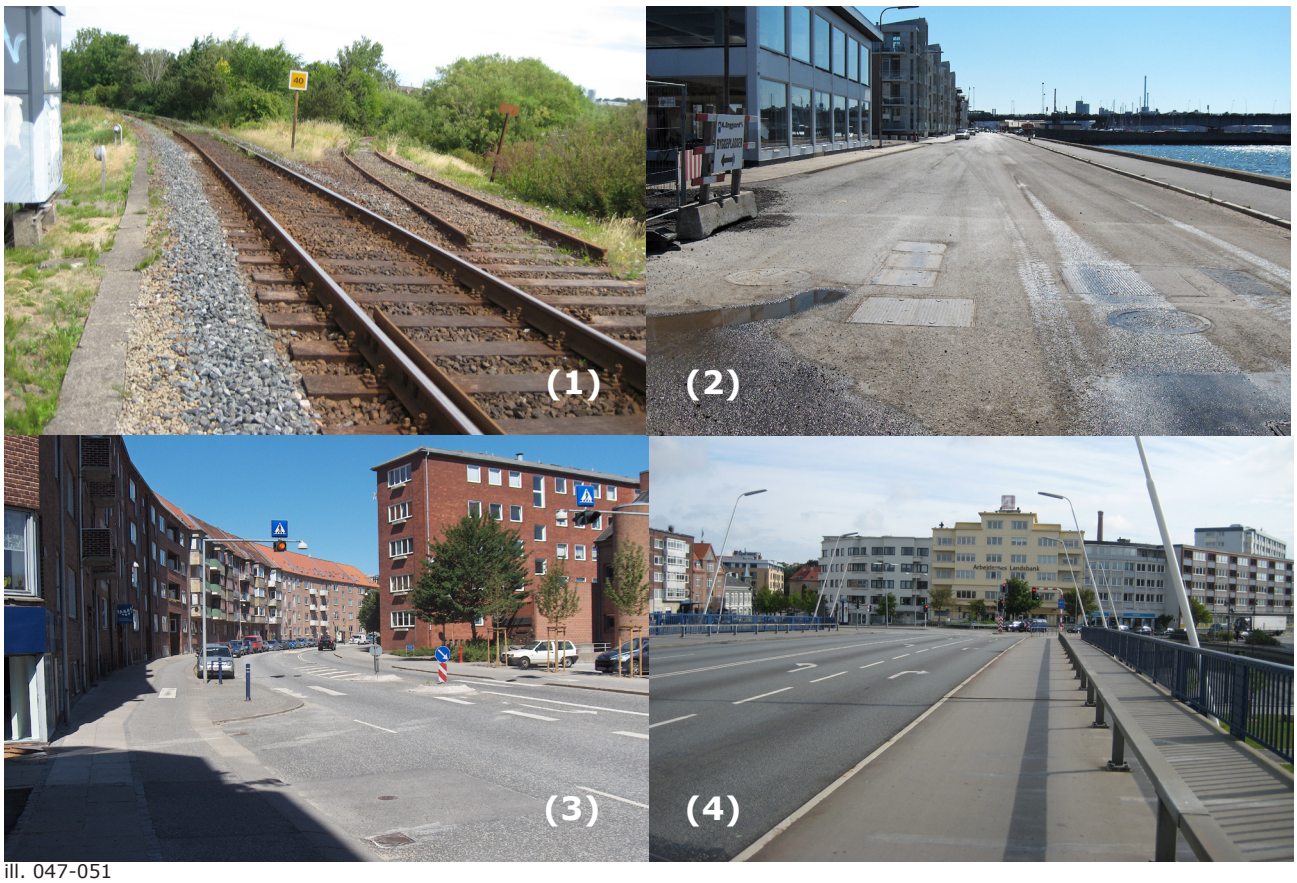
Access and flow

The main vehicular route to the plot from the town centre is through the Limfjordsbroen, the bridge splits the route into two main parts namely Østerbrogade and Vesterbrogade leading through the town centre of Nørresunby.

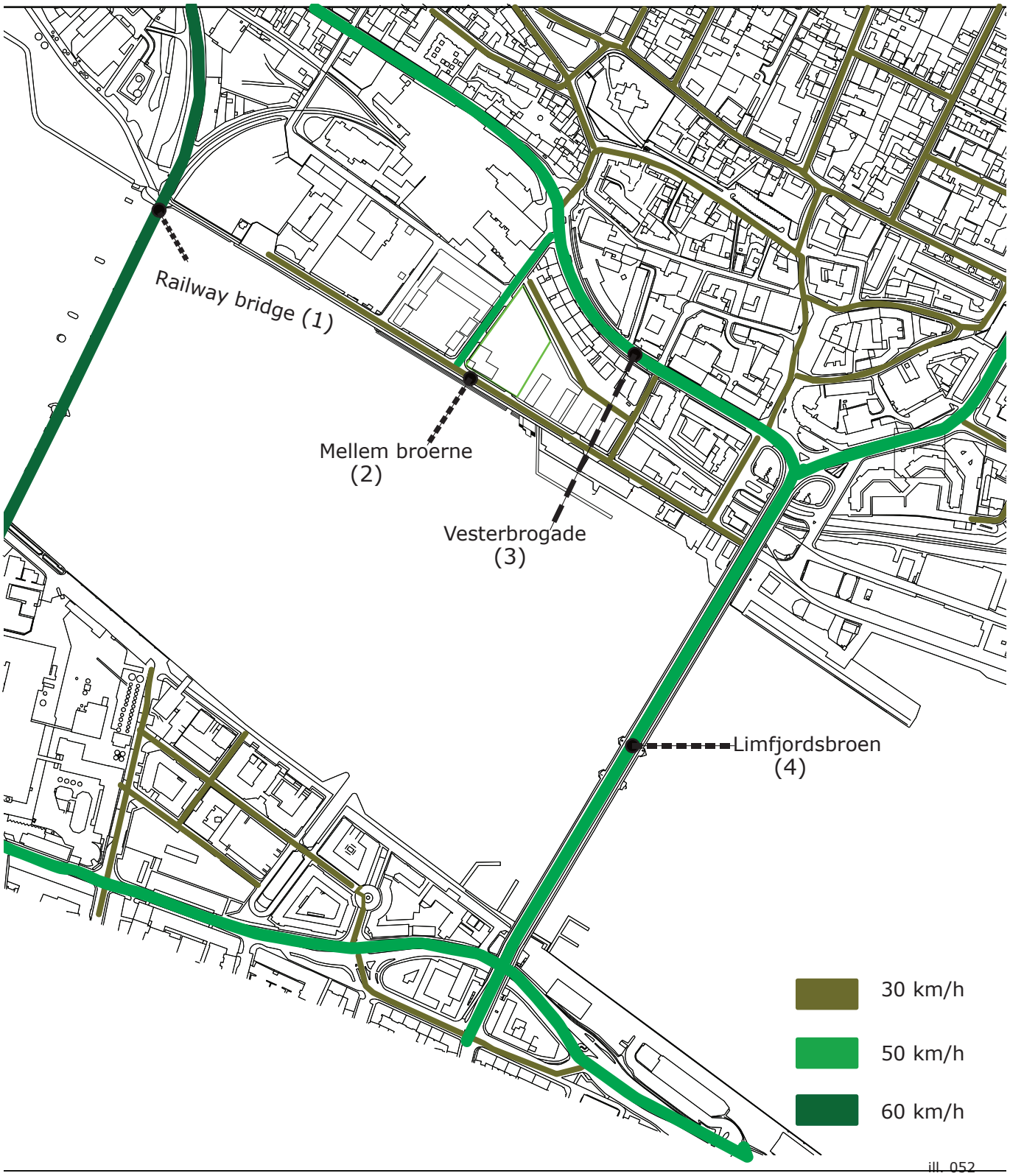
Vesterbrogade being the easiest connection to the plot,but with the heaviest thoroughfare creating a high density of fast pace vehicles, with a speed limit of between 50km/h to 55 km/h. This route creates a demarcation between the plot and Aalborg city centre. Due to the lack of attractions and few shopping malls, most of the people overtake the bridge to the city centre for other activities, except in the summer whereby due to the vast recreational areas along the banks of the Limfjord within Strandparken, and the marina that attracts most visitors.

The side road along mellem broerne, Strandgade and Slagtervej also makes it possible for the pedestrian walk, as well as bicycle for easy access to the site.

The positions of the following pictures are shown on ill. 036



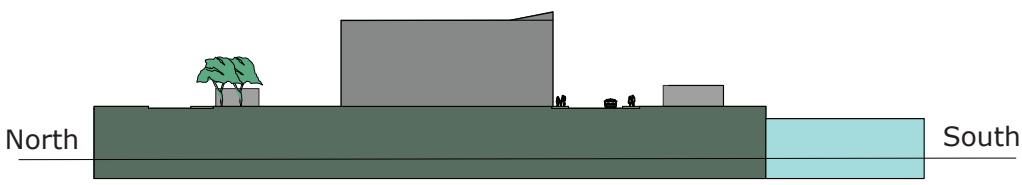
ill. 047-051


Railway bridge (1)
Mellem broerne
(2)
Vesterbrogade
(3)
Limfjordsbroen
(4)
30 km/h
50 km/h
60 km/h

ill. 052

Landscaping

The plot lies on flat artificial landscaping created for industrial purposes, which is about 1600 m above the Limfjord. This makes the plot to overcome flooding issues during extreme raining season. The town of Nørresundby is disperse with buildings on both sloping and hilly- landscape, and with the town rising from the sloping side behind it. Although Nørresundby is known for flooding which might be due to the hill located towards the north part of the plot "skansenparken," that might be the causes of erosion and draining of rain-water into, and along the Limfjord causing flooding of dwellings. In this case, the plot and the building could be raise to a certain level by re-creating the artificial landscape with greenery and common relaxation areas to enable over come future flooding possibilities of the building area.



Section through site

ill. 053-054

Hotel and its guests

Tourism is one of the world's fastest-growing industries and, because of this; hotels are becoming destinations for most travelers. Capital investments in leisure and tourism are exploding simultaneously every year.

Hotel design, is now a day's becoming an important market niche for most investors, because of its unique supplementation of wellness- functions, services and other facilities which meets the desire and demands of today's customers.

Live is most precious and important value for us, "live is not shot". People are living longer, an over weighing number of people take early retirement and with the advent of low cost travel, more and more people are devoting more and more of their time to travel, business travelers look for comfort, a convenient location and easy communications, whereas leisure travelers want their so-call holidays to be unique and unforgettable experiences. This implies that, hotel design must be acquainted with the necessary apparatus, and the wow effects that alert one's mind and excitement for being at place.

Every day, new concept of design arises within the design industry. For instance, sustainable and environmentally sensitive design, which is one of the growing demand criteria from customers that are concern with and values the earth's extinguishing resources.

"Eco resort and ecotourism" are the new phenomenon and approaches that it said to englobe design parameters in harmony, comfort, climate, materials, and the environment. As being environmental friendly can also lead to minimizing operating cost, and accountable for proving new challenging ways of live within our leisure spaces.

Hospitality projects "Hotel" are multipurpose lifetime experience, in which various design components need to be combined to enhance the living, and provide for a performing environment. Business, leisure, corporate and congress facilities, health and fitness, shops are all different activities which ought to be elegantly unified into one harmonious complex.

[Hotel Design by Otto Riewoldt 2002, & Creative Hotel Design]

In today's world, a good hospitality isn't complete without the presence of well-being facilities such as spa and other activities specially designed to cultivate the mind, "purification of mind", body and soul.

Business men, women and tourist who flock to so call five-stars retreats

are no longer just interest in paying for room suites but amidst with the luxurious milieus that associated with it. These are all considered as the ultimate desire for most businesspersons on the road today. When one look-critically, there are only few places one comes across in Aalborg-town that has the prerequisites to offer out to their foreign guest or visitors, which I guess is due to lack of space. Because, now a days, hotel designers have adopt a strategy which focuses on small and expensive hotels where guest can expect the best with an extra ordinary quality of services and facilities at their dispositions, which normally are mainly associated with other lavishly deco grand hotels. 'In a hotel, guest should find what they dream at home', said Conrad Hilton, one of the founders of the modern hotel industry within 1930,s.

This project is not only emphasizing on a good hospitality for the executive business travellers or resort for tourist destination, but also a state of purification "well-being" to engage the entire community to place where there is a possibility of shearing common interest and desire to help transform the social lifestyle of the people. In addition, this hotel must function effectively and offer a wide range of relaxation possibilities as well as easy access to other communication facilities.

The following list encompasses the design objectives.

Building type
Hotel Design

Indoor climate
To ensure good and a healthy indoor climate for the occupants, and to fulfill the "Indoor climate category B" from the CR 1792 standard "Ventilation for building design criteria for indoor environment". The principles would be apply, which implies that the indoor climate should not only provide a desire and a healthy environment for the design building, but also provide pleasant, overwhelming and comfort environment to reside. Obtaining a satisfying indoor climate is an issue as the indoor climate consists of variable factors that affect on human concentration and work efficiency due to the type of materials use for construction and the surrounding working environment in which the building is located. This variable number of factors, which are directly connected to the human dissatisfactory within a define space can be categories' as follows: daylight condition, thermal environment, indoor air quality and acoustic comfort within the building. However, it is of merit to consider the above factors as early in the design process in order to draw a concept, which has integrated indoor climate solution to meet and fulfill the functions of the design building.
The room temperature would be determine by the guidelines from DS 474, which state that the maximum 100 hours of 26 degrees Celsius per year and a maximum 25 hours of 27 degrees Celsius per year, which is normally around 22-24 digress Celsius approximately during winter and 20-22 degrees Celsius in summer time.

Atmospheric comfort
The requirements of the occupants for the air quality in a space are first that the health risk of breathing the air should be negligible and second that the air should be perceived to be fresh and pleasant rather than stale, stuffy and irritating *[CR1752]*
Humans perceive the surrounding air by two senses. The olfactory sense, which is sensitive to several hundred thousand odorants, and the general chemical sense, which is also sensitive to a large number of irritants in the air. The combination response of these two senses provides the human body with a perception of the surrounding air quality.
Most sensory pollutant load in the air is usually cause by those pollution having an impact on the perceived air quality, which comprise of the occupants and the building, including office machines, furnishing, carpet

and other ventilation systems.
It is important to realize that some harmful air pollutants are not sense at all, and the sensory effect of such pollutants are not quantitatively adhere to their toxicity. This implies that the perceived air quality is not a universal measure of an adverse health effects, but also true that when air quality is perceived as poor within a dwelling, is improve by removing pollutant sources and minimizing risk of health effect by increasing the ventilation air flow rate, which in this case a mechanical ventilation strategy would be of good use.

Lighting strategy
Windows should be orientated properly and if possible shaded to avoid overheating and solar radiation, which can course unfavorable living condition during summer, and must improve optimization of heat gains in winter. Living spaces must be provided with enough illumination of daylight with a minimum daylight factor4-5 %, and 2- 3% for other sensitive parts to enhance and support the aesthetics qualities of the area.

Sound-"Acoustics"
A reference to the SBI-Direction 172 would be use as a guide line for the necessary sound level to enable design good hotel, thereby combating the external traffic noise, neighboring properties sound source, and other install apparatus within the building. As protection against environmental noise is an essential demand for building design, it is important to ensure that installation devices such as mechanical ventilation systems are well protected with a desirable amount of insulation and built in such a way that noise perceived by the occupants in the building or people nearby is kept relatively at a level that will not cause a significant nuisance or an adverse effects, and would not disturb rest of the working environment. It is also implies to the entire building envelope, which must be as well insulated to avoid for instance impact and airborne sound sources, due to reverberation and other transmission sounds from staircase enclosures, swimming area, fitness room, and any other sound generating source, thereby improving the interior structure as well with the necessary acoustic materials to re-enforce any source of sound transmission into the building.

Outdoor space
There must be common and relaxation possibilities with view towards the Limfjord, this could be a roof terrace connected to a restaurant or bar to improve the visual quality and enhance the milieu of the place.

Material

The choice of building material must have a good aesthetic quality to withstand alternative weather conditions, and as well be of a patina and robustness in a sense of its life span. The material should as well serve it function as a structural member and adhere to the surrounding environment and be able to optimize in relation to embedded energy.

Architecture

Architecture is an emotional quality express by once sense of mind"*architecture as visual sensation*", the essence of great image and unmediated expressiveness is the most vital element of contemporary architecture. Buildings are thought and design, as unforeseen adventure for the human senses, imperious, entertaining and overpowering. According to the Swiss architect Jacques Herzog, one is much more concern with designing a building that arouse emotions, rather than a design that signifies other ideas. *[New hotel design, Otto Riewoldt 2002]*

Hotel and Civilization

During the ancient civilizations expansion across the globe, people traveled for religion, health, immigration, commence and, as well as education and recreational purposes. The first hotels were nothing more than private residence opened for the public, where by unfortunately most visitors had poor reputations during their stay. The inns and hotel buildings under the influence of the Roman Empire during the first centuries began catering for the businesspersons and travelers in an effort to encourage visitors and tourism.

In the 1980s, "hotel boom was generated by" innovative marketing and the development of specialized types of hotels, many combined with large-scale commercial complexes such as airports, conference centers, as well as vacation villages. Whereby in the 1990s, Mega casino themed hotel boom in Las Vegas and other parts of the world, which creates the most popular tourist and pleasure hunters destination.

Target group

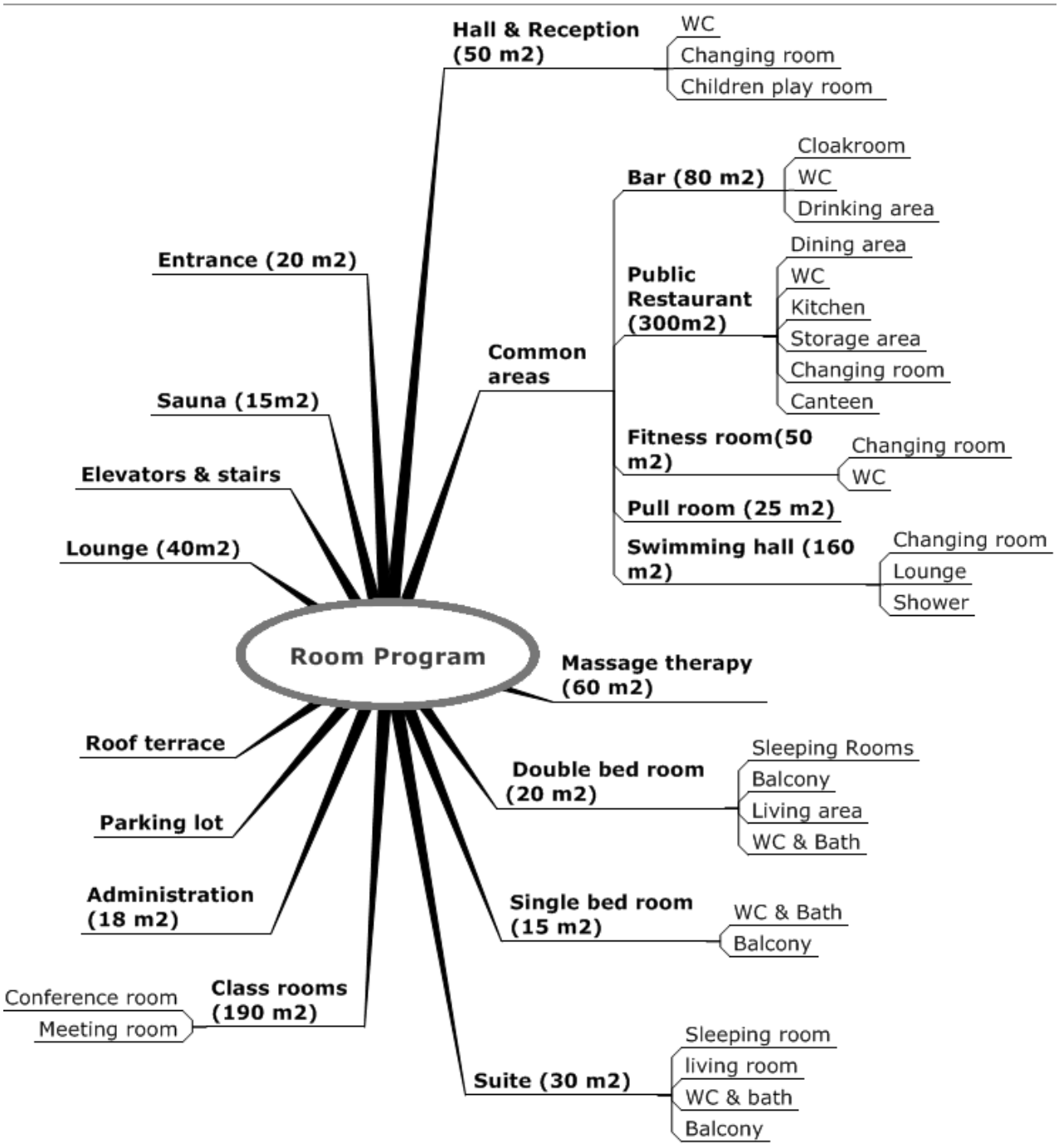
In this project, the considered target groups of people are mainly business and tourism for pleasure, which would give different varieties of room taste and arrangement in relation to sizes. The room furnishing must be adaptable, with easy convertible elements that would enable gusts to transform a sleeping space into a working room within a matter of seconds. This could be room in room concepts, where by mobile partition walls and built in kitchen are all part of the design, as it is for computers and telecommunication facilities. In this case, the room is a multifunctional area "part-time office" for relaxing, working and leisure as well as a place for business, recreation and fun.

In suite, or executive guest rooms must be attractive and well arrange. A family room for two adult and two children, and as well as a single bedroom with WC and bath for one person would be considered in the design.

There would be restaurants, bar, fitness, swimming, sauna as well as massage therapy room to enable the inhabitants within the community patronize or utilize the facilities and services at the place effectively.

Room diagram

The following accommodation schedule is design to serve as a guideline in the sketching phase with an estimated minimum room area, which ensures the possibilities of increase in room size when ever desire.



ill. 055

ROOM SHEDULE

Rooms	Area	Nr of people	Room height	Function	Light	Orientation	
Resception	80 m²	2	3-3.5	Enquiries	Artificial & Natural		
Executive suite	35 m²	2	2.5 m	Sleeping,Privacy & Relaxation	Natural & Artificial daylight	South	
Ensuite	30 m²	2	2.5 m	Sleeping,Privacy & Relaxation	Natural & Artificial	South	
Single bed room	15 m²	1	2.5 m	Privacy & sleeping	Natural & Artificial	North,West,East etc.	
Double bed room	20 m²	2	2.5 m	Sleeping,Privacy & Relaxation	Natural & Artificial	North,West,East etc.	
Restaurant	90-150m²	50	3 m	Eating & Social	Natural & Artificial	South	
Bar	60-80	35	3 m	Drinking & Social	Natural & Artificial	South	
Conference room	60-100m²	40	2.5 m	Meeting	Natural & Artificial	North	
Meeting room	40-60	20	2.5 m	Meeting	Natural & Artificial		
Swimming hall	60-160m²	25	3-4 m	Swimming & relaxation	Natural & Artificial	South-west	
Lounge	40-60	15	2.5-3 m	Relaxation	Natural & artificial		
Fitness room	50-80 m²	10	2.5-3 m	Training & social	Natural & Artificial		
WC & bath	5-30 m²		2.3-2.5m	Bath	Natural & Artificial		
Entrance	20-50 m²		2.5-3 m	Access Point	Natural & Artificial	North & South	
Kitchen	80-120	6	2.5-3 m	Cooking	Artificial		
Utility room	50-70 m²		2.5m	Storage & laundry	Natural & Artificial		
Roof terrace				Relaxation	Natural & Artificial		
Balcony & terrace	8-20m²			Relaxation	Natural & Artif.		

ill. 056

	Interior	View	Ventilation	Users	Sound	Flow
		Towards the fjord	Natural & Mech.	Hotel Guest & workers	58 dB	Connection to various rooms
	Doublebed, TV,chairs,Table, Wardrobe,WC & Bath	Panorama towards the Fjord	Mechanical	Hotel Guest	58 dB	Connection with living areas & easy access to outdoor area
	Bed,Chair,Table, TV, WC & Bath	Panorama view to the fjord & surronding	Mechanical Vent.	Hotel Guest	58 dB	Easy access to other functional rooms
	Bed,Chair,Table		Mechanical vent.	Hotel Guest	58 dB	Connection with kitchen & living area
	Bed,Chairs & Table		Mechanical vent.	Hotel Guest	58 dB	Easy access to wc & bath
	Tables & Chairs	Towards the fjord	Natural & Mech		Horizontal 52 dB Vertical 53 dB	Easy to access Wc
	Sofa, Table & Chairs etc.	Towards the fjord	Natural & Mech.	Hotel Guest & Community	Horizontal 60 dB Vertical 60 dB	Easy access to Wc & entrance
	Tables & Chairs		Mechanical vent.	Hotel Guest & Community	Horizontal 48 dB Vertical 51 dB	Easy to access Wc & restaurant
	Tables & Chairs		Mechanical vent.	Hotel Guest & Community	63 dB	
			Mechanical Vent.	Hotel Guest & Community		Easy access to Wc & corridors
	Chairs			Hotel Guest & visitors		Easy to be access from other buildings
	Training Equipments	Towards the fjord	Mechanical	Hotel Guest & Community	48 dB	Access to storage room,pool & Wc
			Mechanical Vent.	Hotel Guest & visitors	63 dB	Easy to access
			Natural & Mech. vent.	Hotel Guest & visitors	Horizontal 52 dB Vertical 53 dB	Easy access to reception
	Industrial equipments		Mechanical vent.	Workers		
	Refregerators etc.		Mechanical vent.	Workers		
		Panorama tothe surroundings	Natural vent.	Hotel Guest & visitors		Easy access from stairs & elevator
		Views to the	Natural vent.	Hotel Guest	58 dB	Easy access to living

Design Tools

Throughout the development of the entire project a number of design and calculation tools would be considered for use within the different phases as mention in the program. These tools are as follows:

Mind Manager: Is a visual tool for brainstorming and planning. The tool has the merits of synchronizing products to various work sheets such as Microsoft project, Microsoft PowerPoint, word and outlook etc.

Microsoft project: A project management software tool for scheduling various activity time plans with milestone, enabling an activity to be followed and carry out to meet the schedule time without delays.

Pen and Paper: These tools would be use during both sketching and synthesis phase, to enable evaluating of spatial and aesthetical solution that can be explored in 2D-dimension views such as plans arrangements, elevations and part-sections of the design building.

Foam Models and Cardboards: Both sketching and synthesis phase to help determine building volumes in relation to the built context, and as well as other spatial issues.

DiaLux: DiaLux is a daylight simulation programme use for estimating daylight factors within a define space, and also for designing artificial lighting for both interior and exterior environment. The software allows re-size of window openings while ensuring for suitable natural indoor lighting conditions, and as well as 3d-graphic representation of the design model illustrating different lux of lighting within the design geometry under investigation.

Sketch-up: A 3D visualization programme for quick modeling of a building envelops thereby illustrating the form concept of architecture, facades expression; site plans and outdoor spaces, and presentation of conceptual models. Its use depends on the individual users regarding to particular project at hand.

Graphic soft ArchiCad: This tool is virtual building software for 3D conceptual modeling of buildings and 2D drafting of plans and elevation. Good for final visualization and presentation of propose concept after sketching and detailing of the design projects.

AutoCAD: A tool for 2D plans elevation and detailing of building component and as well as 3D modeling.

Natural ventilation spreadsheet: This tool computes for window sizes and placement, ventilation strategies and airflow rate in relation to free circulation of natural ventilation.

Reverberation time-spreadsheet: A spreadsheet for analyzing sound absorption coefficient for a given material within a define space, thereby interpolating the average absorptions coefficient, as well as that of the absorption material.

24-hour average max & min temp spreadsheet:
The spreadsheet is use for interpolating indoor temperature variation depending on opening size and orientation, designing of airflow rate within built and un-build building structures.

Hotel landscapes are transforming with astonishing speed. Within a few years, a series of successful experiments had turn to reality with a wide ranging-trend, as can be observe from the United Arab Emirates Dubai and other places in the world. What was thought as theory and anticipation in the first survey of contemporary hotel design has nowadays become a standard in both commercial and conceptual terms. Such quantum leap in design architecture, quality and aesthetics is a vital response to demand of consumers.

[Hotel design, Albrecht Bangert, 2002]

Hotel buildings can be categorize in to five major types: luxury; resort; business/ convention; limited-service; and casinos. In order to be successful, hotel projects require well-planned scheme, design and construction. Each category puts emphasis in different area in design based on guest expectations and services provided.

Luxury hotels

As travelers, income increases, they are willing to pay a higher price for luxury accommodations. These guests expect to get personal attension and services during their stay. Such services may include bartenders, personal butlers, and business cards. For business related services, the customer may expect to be offered a business size desk at a special seating place, direct line communications.

Luxury hotels are usually located in either an urban or resort setting and provide the guest with the best services the area has to offer. A successful hotel conveys the best aspect of the city and captures the essence of the metropolitan location. For example, First Slotshotel Aalborg, although it's not that luxury but invites guest to experience the city's historic heritage a luxurious up scaling setting.

In order to fulfill guest expectations, most luxury hotels put emphasis on sections of the hotel like the lobby, the food and beverage areas, and as well as the guest rooms. The key components of hotel design it its quality and attention to small details of the interior. For example, the use of fine bathroom fixtures and expensive materials such as natural stones, marble, and wood are examples of this component that most guest perceive as luxury.

Resort Hotels

Most resort hotels give lasting memory to guest by incorporating local surroundings and integrating local construction materials and finishes. Lobbies and public areas provide easy access to most outdoor activities.

An example of this type of easy access is evident by the Walt Disney Resort Hotel in Orlando, Florida.

Resort Hotels emphasize the site, public areas, and quest rooms. The resort hotel designer needs to provide guests with an experience that is both comforting and unique while remaining particular to the local area.

Business/ Conversion Hotels

Business/conversion hotels usually mix business with pleasure, making guest feel they have escaped from their normal office routines while still working and attending various kind of meetings.

This type of hotel makes work a pleasure experience for invited guest, and to do this they must promote a sense of well-being and active productivity.

These hotels provide elegance and comfort while incorporating high-tech amenities all in a resort like setting.

Limited service Hotel /motels

Limited service hotels normally focus on lodging. They are mainly inexpensive and relatively cheap proving a clean and well define lit-space. The guest rooms serve as the main source of income for these types of hotels, the guest room area makes up about 80-90 percent of the total building area.
Limited service hotels are simple in design and construction and mostly found or situated along roadside as motels.

Casinos

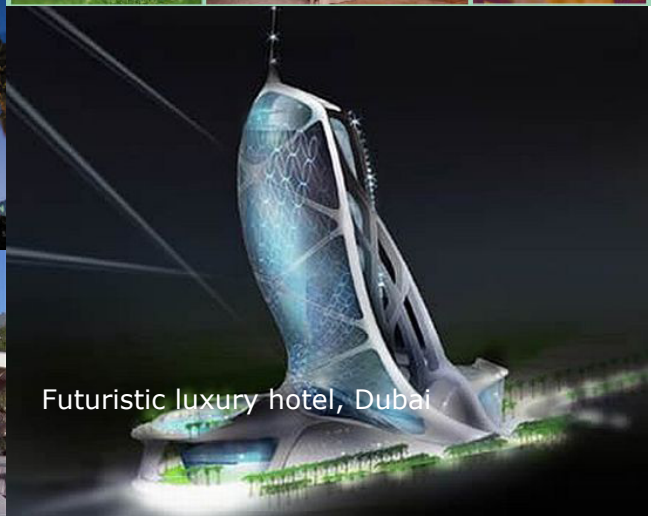
Casino hotels work purposely to attract guest and keep them in one place to make feel good while draining their pocket. Gambling has long been a part of human society, limited casino gambling is allowed in almost twenty-eight states in the United States. When compared, Aalborg is just located with few jackpots-clubs, which does not boost the marketing income for most of the club owners.
Casinos designer's needs to provide many amenities and good security, an example of this type of hotel could be the Mirage Hotel and Casino in Las Vegas, Nevada, which provides many different types of attraction and entertainment as well as gambling.

Resort Hotel, Las Vegas USA

Casino hotel, Las Vegas USA

Business Hotel Mexico

Super 8 motel, Arizona USA


Futuristic luxury hotel, Dubai

ill. 057-062

Hotels in Aalborg

Names	Standard	Type	Total	Distance
Scheelsminde Hotel & Gastronomi	****	Hotel	96 bedrooms	15 minutes drive from airport, & 10 minuts by bus from main train station
Fisrt Slotshotel Aalborg	***	Hotel	154 bedrooms 2 Junior suites	10 minutes drive from airport, & 3 minuts by bus from main train station
Helnan Phonix Hotel	****	Hotel	210 Bedrooms including suite	10 minutes drive from airport, & 3 minuts by bus from main train station
Prinsen Hotel	***	Hotel	37 Bedrooms	10 minutes drive from airport, & 5 minuts walk bus from main train station
Radisson SAS Limfjord Hotel	****	Hotel	188 Bedrooms	10 minutes drive from airport, & 3 minuts by bus from main train station
Quality Hotel Aalborg	****	Hotel	188 Bedrooms	10 minutes drive from airport, & 8 minuts walk from central train station
Aalborg Seamans Hotel	-	Hotel	54 Bedrooms	10 minutes drive from airport, & 3 minuts by bus from central train station
Scandic Hotel Aalborg	***	Hotel	101 Bedrooms	20 minutes drive from airport, & 15 minuts by bus from central train station
Cabinn	-	Hotel	250 Bedrooms	10 minutes drive from airport, & 3 minuts by bus from central train station
Hotel Hvide Hus	****	Hotel	198 Bedrooms	10 minutes drive from airport, & 3 minuts walk from central train station
Park Hotel Aalborg	****	Hotel	81 Bedrooms	100 meters from the railway station & 10 minuts drive from airport
Hotel Chagall Aalborg	***	Hotel	20 Bedrooms	10 minutes drive from airport, & 2-3 minuts by bus from the central railway station

ill. 063

Radisson SAS Limfjord Hotel

Helnan Phønix Hotel

Park Hotel Aalborg

Quality Hotel Aalborg

Hotel Hvide Hus

Hotel Chagall Aalborg

ill. 064-069

First SlotsHotel Aalborg

Prinsen Hotel

Scheelsminde Hotel

Aalborg Seaman's Hotel

Scandic Hotel

ill. 067-072

Hotel Hvide Hus

The Hvide hus hotel is a first class international hotel located in Aalborg next to the Aalborg Congress and culture center with a unique surrounding which serves as a recreational and leisure areas. The fifteen storey high hotel contains different size of deluxe rooms and suites with 198 rooms excluding bar, restaurant, fitness and conference centers.
The structural component made of concrete with an external cladding of white and grey wall tiles. The perimeter balcony of the building provides shading as well as private relaxation areas for the individual guest rooms. From the entrance to the reception, the room opens up to the bar, which has transparent partition wall constructed of timber and glass infill panels, this allows guest to have the first and an immediate impression of the area.

ill. 073-078

Radisson hotel

The hotel is five-storey floors with 188 quest rooms of deluxe and suites with fully equipped direct-dial phone, TV, pay TV ,mini-bar, restaurant, fitness, sauna, and ten deferments conference and meeting rooms which can accommodate 260 delegates in total . It situate at the center town of Aalborg close to the proximity of the limfjord with great panoramic view to the water when gazed from the back.The structural construction is of concrete with lightweight external cladding of steel plates.

ill. 079-082

Church Hotel

This hospitality church hotel is one of the five stars hotels today, which has worn the soul of many people because of its historical background. It is a monumental fifteenth century gothic monastery situated in the city center of Maastricht within the Netherlands.
The church has been restored in to a five star-luxury hotel whereby antiquity and modern innovation ingenuity are uniquely interwoven, to provide a glory sensation of unity and comfortness, as well as preserving the genius loci of the place.
The former nave of the church now houses the reception, the lobby, three lounge areas, and a wine bar, and with a breakfast area located on attractive mezzanine former choir space, which offers a perfect and marvelous view to the city.
The church is house with sixty different kinds of room types of which each has its own appeal, and provided with internet connection, air condition, and screen television to meet the desire comfort at home.
[Kruisheren Hotel Maastricht, Netherlands]

ill. 083-085

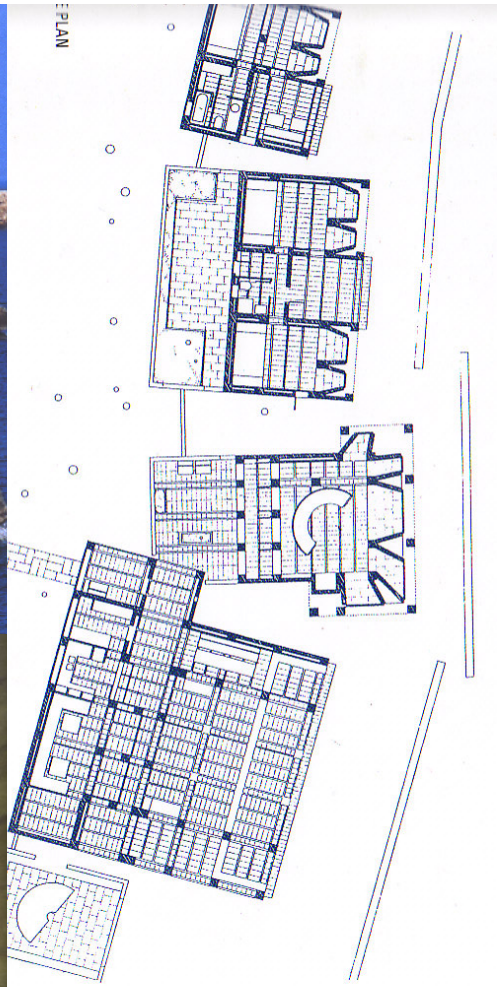
Can Lis

Can Lis is situated in the southeast corner of the island Mallorca in an area called Colonia del Silencio.
The house is inspired by the Islamic building methods and the traditional Nordic architecture.
The building is located on a unique site and they are individually oriented, even though it faces the sea. The house is design with exceptional surrounding views and, with a forest to the north and a deep cliff going into the Mediterranean to the south.
Actually, Can Lis is not one house but four individual homes including a separate guesthouse, which are linked by various courtyard and walls.
The materials used are basic local sandstone from the island, which are common in Majorca. The moulded block walls are 80x40 cm dusty, butter-coloured ashlar sandstone, and Catalan terracotta roof covering.
One could say that the house is made in the same way as buildings in north Europe because of the basic standard materials, but the materials used on Can Lis fits to the surroundings and lets the house fall in to the landscape as the cliff falls from the forest.
The narrow gardens to the north give shadow and shelter from the sun. The gardens relates to the forest as well as the relations from the inside and the outside. Inside, the house opens up with the views in different directions relating to the deep blue water, which gives the overall impression of the design layout and the sense of it connecting the blue sky, sea and the green forest.

To emphasize on the view, the window is frameless and mounted on the outside surface of the wall, so one could observe the view like living pictures hanging on the wall that admits light into the interior.

Light is another important factor in the house. A combination of the strong sun and the homogeneous materials of the sandstones give sharp shadows, which underline the shape of the building. The openings in the thick walls emphasises the interplay between light and shadow, which illuninates the interior but at the same time avoids direct sun light.

The experience of Can Lis is very dramatic when moving from the narrow gardens from the back to the open endless views over the blue sea to the south.
[Can Lis by Jørn Utzon, 1971]



The building is integrated into the forest on top of the cliff, it adapts to the surrounding environment with bright daylight into the living area.

ill. 086-087

Falling water

The most remarkable things about this falling water building structure are the dominant balconies forming a dramatic element of the house that stretches out over a thirty-inch waterfall. The house is locate in Pennsylvania USA and design by one famous architect Frank Lloyd Wright during the year 1935 to 1937.A house that doesn't even appear to stand on a solid ground.

As Frank Lloyd Wright observed and surveys the nature of the landscape, it gives him the possibility and enthusiasm to utilize the major natural features of the site. The building is sight within the outcropping of the rocks, where a small stream of waterfalls over a series of edges. That encourages him to protrude the reinforced concrete cantilever balconies dramatically out over the stream.

In order to observe the waterfall clearly, one must go outside, below the house to explore the classical view of what architecture is all about.

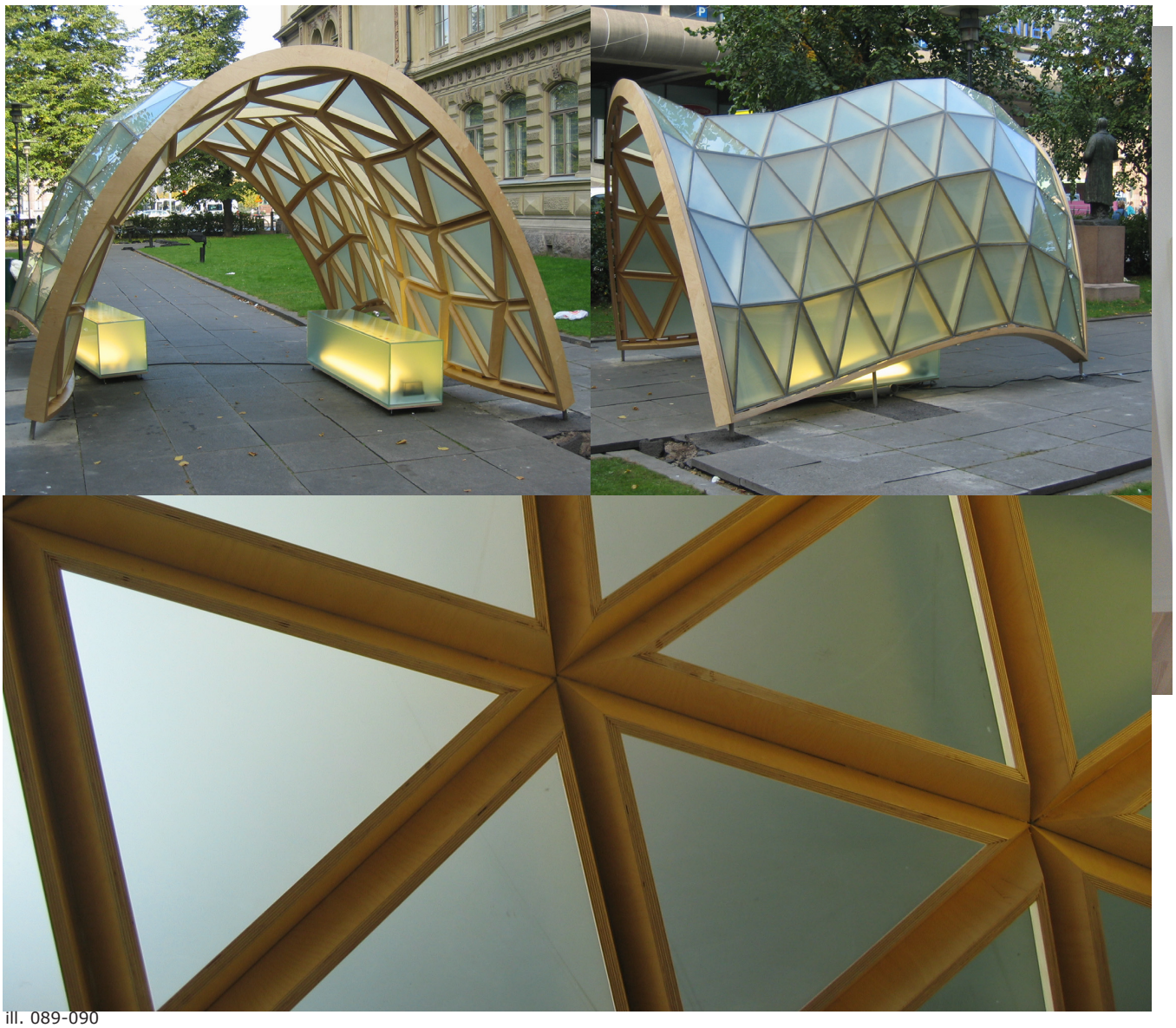
A cultural historian Lewis Munford asses the waterfall, and he end up saying Wright "create a dynamic multidimensional composition that made Le Corbusier's building seems flat cardboard compositions".

[Falling Water, Frank Lloyd Wright, USA 1935-37]

ill. 088

The glass pavilion

The pavilion is one of the exhibition work hosted in Helsinki 2005, which was design by finish architect student Teemu and Antii Lehto. The actual construction structure is made of pressurelised veneer-plywood, which is trim into a precise triangular shape to form the organic structure. The infill glass panels are accurately cut to fit the determine position and glued together in special way to counteract and, with stand some of the structural movement. To help fortify the structure, tension cable are place along the perimeter of the shell which acts as beam function and transfers both the vertical and the horizontal loads in the steel foots of the pavilion. Whats remarkable about this pavilion is the structural formation and proportion of the entire element compositions. Its stretches about 2.3 m in length and 2.1 m in height. *[Helsinki 2005]*



ill. 089-090

Residential complex

This newly multi-terrace and family housing complex is situated at Sofiehøj-Hasseries Aalborg. The buildings are place and allocated precise on the site due to the individual surrounding views observed to the Lymfjord.

The structure is emphasized by the qualities enroll on the facades where by both light and heavy structural elements coincides , this elements creates a balance between massive and open architecture and enhance the aesthetics of the facade expression.

The building is constructed with an attach earth cooling pipes which cools the building and ensure environmental indoor comfort during summer. Mainly the exposed sun terrace is directly accessible from common areas, which also ensures good views to the surroundings landscape. Design by architect *[Kjaer and Richter A/s, 2004-2005]*

ill. 091-092

The ”damen” is newly design low energy housing recently built on an open terrain at Lystrup Øst. It is a Sustainable Housing Project being practice in Europe, and sponsored by the European Union. For ringagårdens community, it is the first energy house to be experience in the town and by the occupants. The situation of the buildings gives a wide range of view to the nearest vicinities around Århus.
The entire building is constructed of a well-treated prefabricated tree elements transported from Germany, which according the tenants or the inhabitants although the material is already treated to withstand the Danish weather, the surface colour will be change or painted silver grey.
The various room arrangements and the entire building was design by a German architect Herzon+Partner, which symbolizes their first building to be realized in Skandinavien.
The façade windows are constructed are of two layers of energy saving glazing type facing south to admit enough daylight and heat gain within winter, and a movable shading device constructed of tree and steel gratings. The windows towards the north are also low energy type with three-layer glazing. The ceiling is attach with special thermo sheeting plates to help main good indoor and atmospheric comfort.
[SHE-Project, 2007.Danmark]

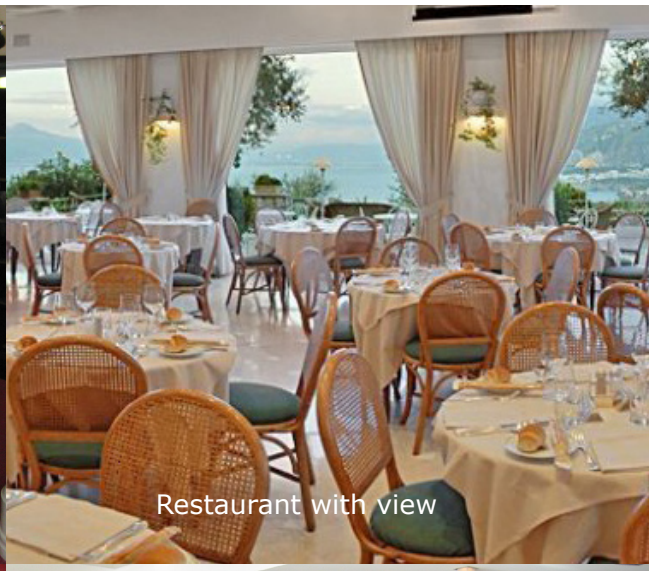
ill. 093-094

NRGI Headquarters

The NRGI headquarters is an office building situated at Århus, which is design as an energy efficiency building by the architect Schmidt Hammer Larsen. The structural elements are of concrete and steel with an external cladding of aluminum plates. The entire room of the structure is computerized and monitored to improve the indoor temperature, activity level, and living conditions within the individual rooms to suite the occupant. The triangulated design of the façade window openings and the adjustable automatic skylight admits day light, which gives clear and long sight contact. The structure is set out and place at its special coordinate acting as shading of the sun there by avoiding overheating.

ill. 095-097


Restaurant without view


Restaurant with view


Bar


Guest waiting room

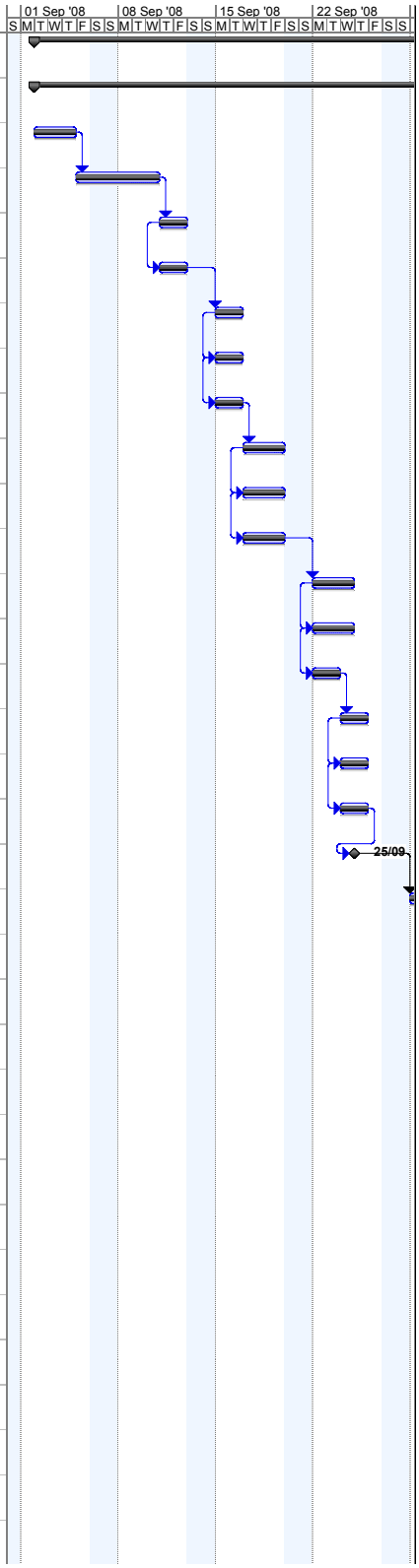

Large opening to admit dayligt


Relaxation & open view to the sea

ill. 098-103

PROJECT TIME SCHEDULE

ID	Task Name	Act. Start	Act. Finish
0	Project Time Schedule	Tue 02/09/08	NA
1	Site analysis	Tue 02/09/08	Tue 30/09/08
2	Context model	Tue 02/09/08	Thu 04/09/08
3	History	Fri 05/09/08	Wed 10/09/08
4	Leisure areas	Thu 11/09/08	Fri 12/09/08
5	Functions	Thu 11/09/08	Fri 12/09/08
6	Infrastructure	Mon 15/09/08	Tue 16/09/08
7	Project description	Mon 15/09/08	Tue 16/09/08
8	Problem formulation	Mon 15/09/08	Tue 16/09/08
9	Methods & approaches	Wed 17/09/08	Fri 19/09/08
10	Wind rose	Wed 17/09/08	Fri 19/09/08
11	Sun	Wed 17/09/08	Fri 19/09/08
12	Sun & shadow studies	Mon 22/09/08	Wed 24/09/08
13	Landscape	Mon 22/09/08	Wed 24/09/08
14	Design perspectives	Mon 22/09/08	Tue 23/09/08
15	Target group	Wed 24/09/08	Thu 25/09/08
16	Room program	Wed 24/09/08	Thu 25/09/08
17	Case studies	Wed 24/09/08	Thu 25/09/08
18	Finish program	Thu 25/09/08	Thu 25/09/08
19	Program correction	Mon 29/09/08	Tue 30/09/08
20	Sketching phase	Tue 07/10/08	NA
21	Sketching	Tue 07/10/08	NA
22	Models	Thu 09/10/08	NA
23	Plans	Mon 13/10/08	NA
24	Calculations	Fri 17/10/08	NA
25	Status seminar	Thu 06/11/08	NA
26	Design phase	Thu 06/11/08	NA
27	Plans	Fri 07/11/08	NA
28	Calculations	Thu 13/11/08	NA
29	Sections	Thu 20/11/08	NA
30	Facades	Fri 21/11/08	NA
31	3D-visualization	NA	NA
32	3D models	NA	NA
33	Finish report	Tue 16/12/08	NA



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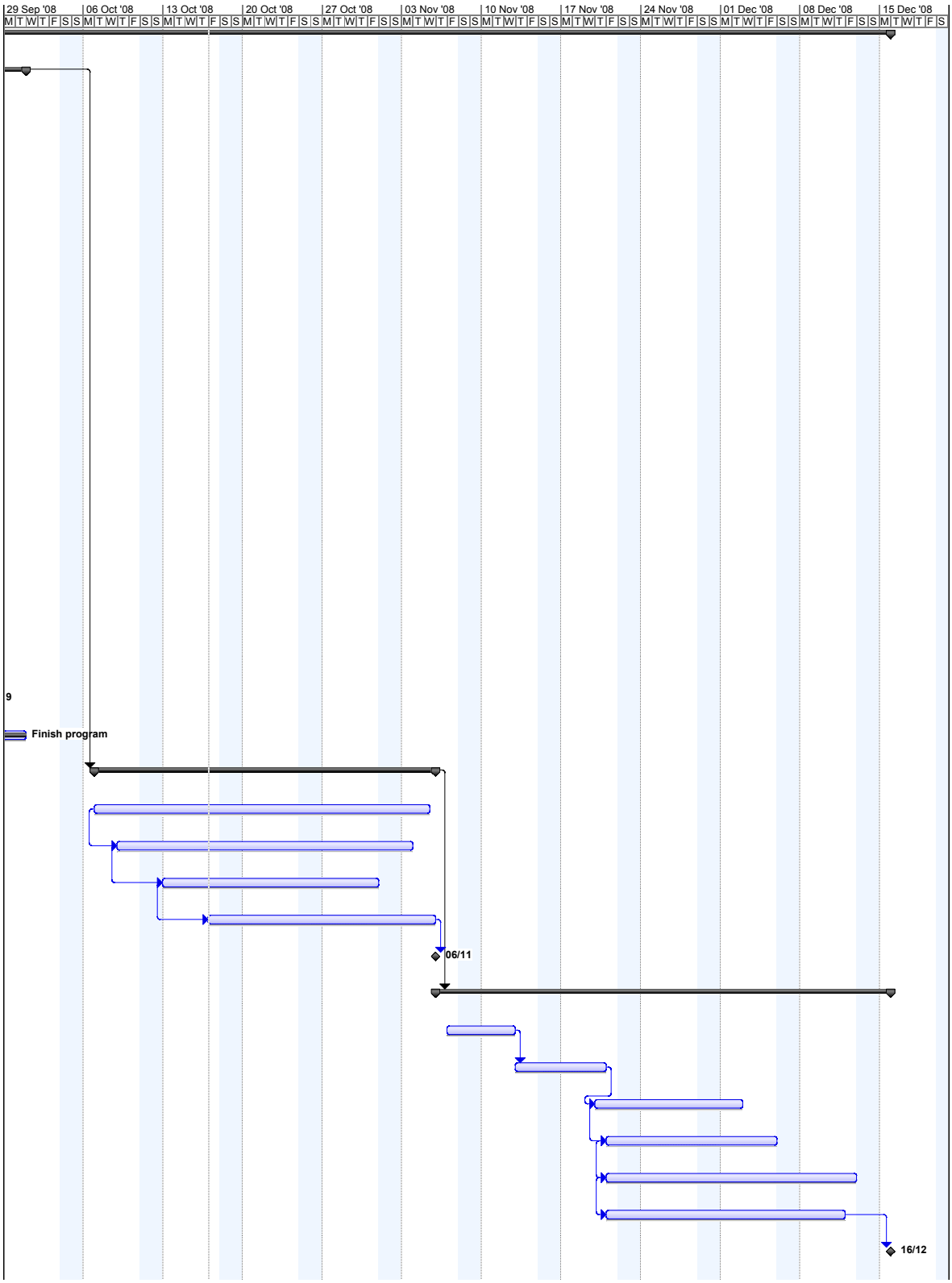
29 Sep '08
06 Oct '08
13 Oct '08
20 Oct '08
27 Oct '08
03 Nov '08
10 Nov '08
17 Nov '08
24 Nov '08
01 Dec '08
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9
Finish program
06/11
16/12

Sewer-Pipe Hotel

Hotel for hospitality has takes different form of shape from street camping to luxury abodes, which in all rely on the basic interest of the individual within specific time and place.

A sewer pipe hotel might not be your dream destination, but it attracts many people just for the fun and the great experience of the overnight stay.

The Pipe hotel is located in Austria on flora environment along the Danube River. The structures is constructed of robust concrete drainpipe with a ventilation opening at the upper most part of it, and are astonishingly well equipped. The pipe weighs 9.5 tones, which makes it gravitational stable, so that even those who nap or sleep restlessly need no fear about the hotel room running of in the night due its shape. The room contains electricity, an internet connection, a double bed, cotton sleeping bags and a woolen blanket. The other amenities such as shower, toilet, mini-bar and cafe' are located within the surrounding public space. The hotel is finance by pay as you wish method, which gives great hospitality opportunity for most people who finds themselves within the vicinity.

[DasParkHotel Ottensheim, Austria]

ill. 105-106

Introduction
In the following chapters the hotel is being presented through a perspective virtual form of 3D rendering visualization.Only few selected rooms are presented on plans and sections.
The rooms are as follows:

- Elevations
- Part elevations
- Reception area
- Common share spaces
- Internet work stand
- Guest rooms for Family
- Guest room for Single
- Guest room for couple
- Restaurant
- Swimming hall
- Sun-bathing terrace
- Conference hall
- Plans
- Sections

ill. 107

MASTER PLAN

ill. 108


Mellem Broerne
Mellem Broerne

West facade,out of scale

Part facade west, out of scale

ill. 109-110

South facade, out of scale

Part facade South East, out of scale

ill. 111-112

North facade, out of scale

ill. 113-114

Reception:
On arrival to the hotel one enters through the north main entrance into an open reception area. At the reception there is a waiting seating design chair, and to far end towards the entrance consists of internet work stand where mail could be check by the guest. Each floor has its own common network stand and relaxation space with a view towards the water located to the south orientation of the hotel.

Reception

ill. 115-116

From the reception one enters the first floor which has a seating for relaxation with view towards the water, on the same floor behind the two couples leads to the restaurant.

ill. 117-118

ill. 119

The guest room's are of the same square meters, each room can be occupied by either couples or single, except the family guest rooms which is design with a door place in between the partition wall creating a direct link to the nest room. In this case the door can be close and use as for couple or single bedroom. For more detail of the family room see the attach plan drawings.

ill. 120

Restaurant interior view

Restaurant exterior view, summer time

ill. 121-122

ill. 123

The hotel is design with wellness facilities such as sauna, swimming pool, fitness centre, sunbathing roof terrace to engage the entire public for the use of the place.
The roof terrace can be access from either corridor or through the guest night-club and from the swimming hall.

Sun-bath terrace

Conference hall

ill. 124-125

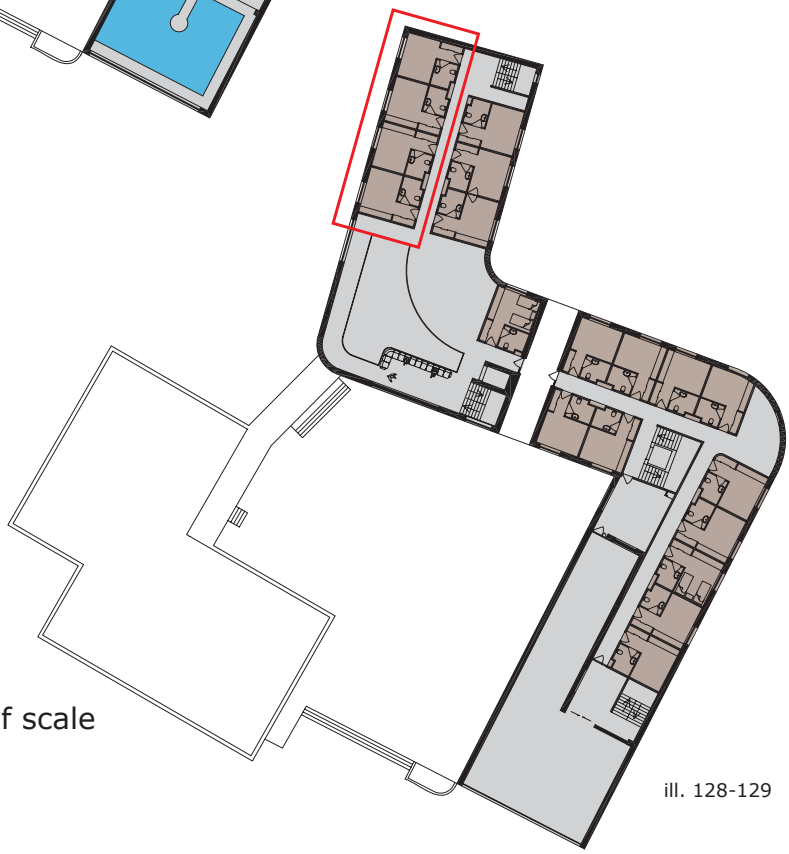
Room layout

Ground floor

Second & third floor

ill. 126-127

Ground floor, out of scale

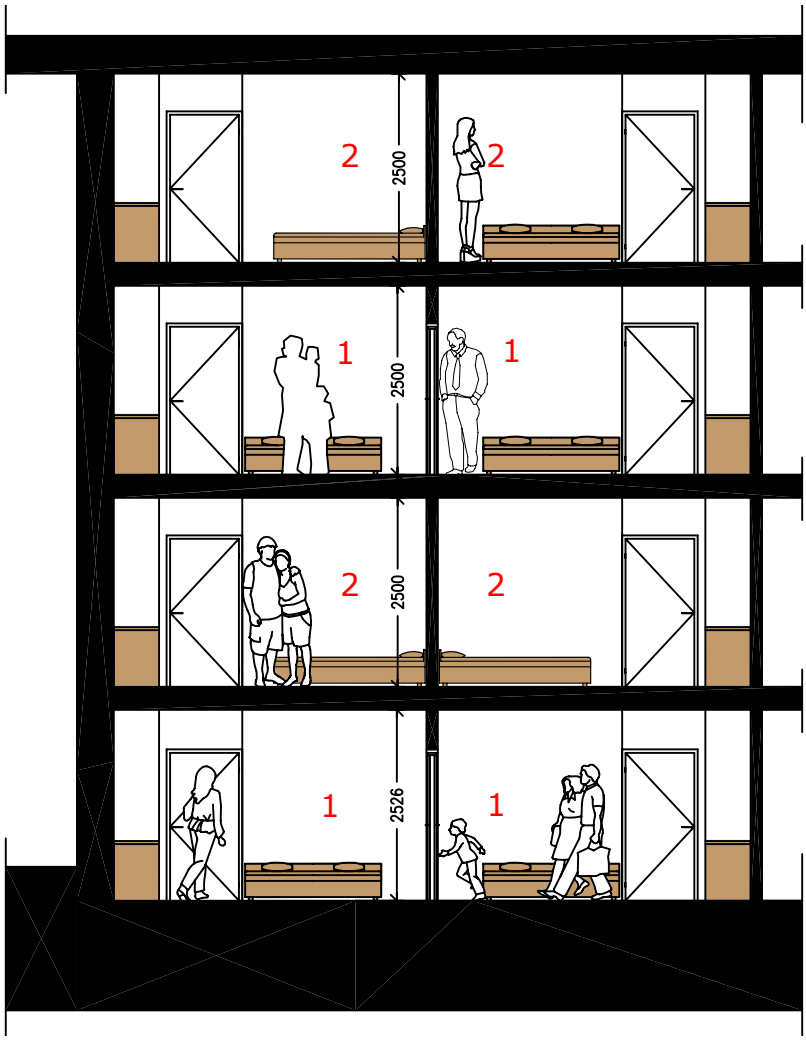


Second floor, out of scale

ill. 128-129

Floor plan 1:100

ill. 130



ill. 131

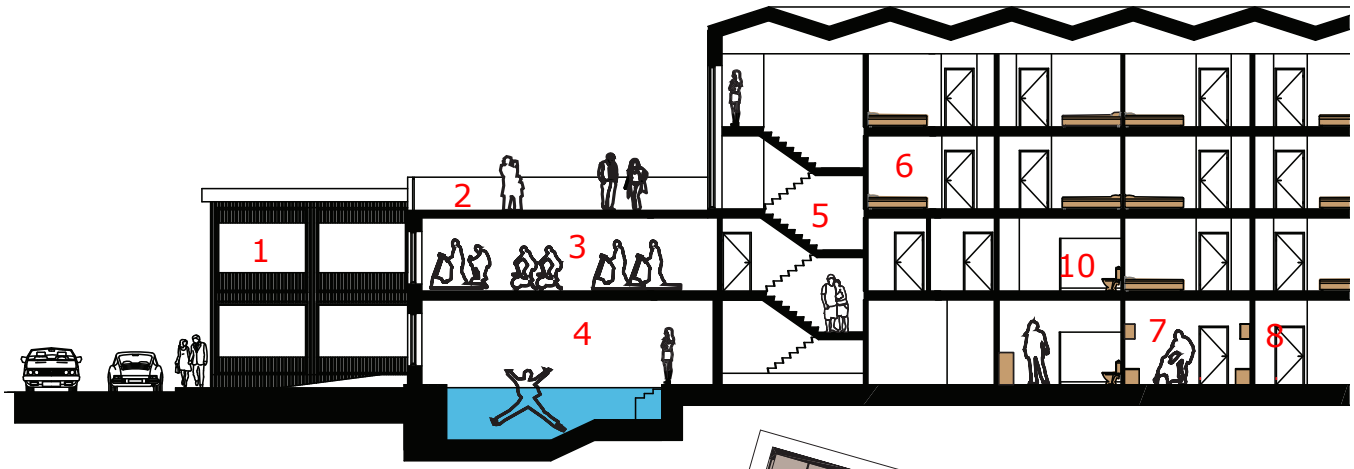
Section A-A, 1:100

The plan and the section illustrate various room arrangements and how the family guest room is put together with an access partition door, and also indicating construction ceiling heights

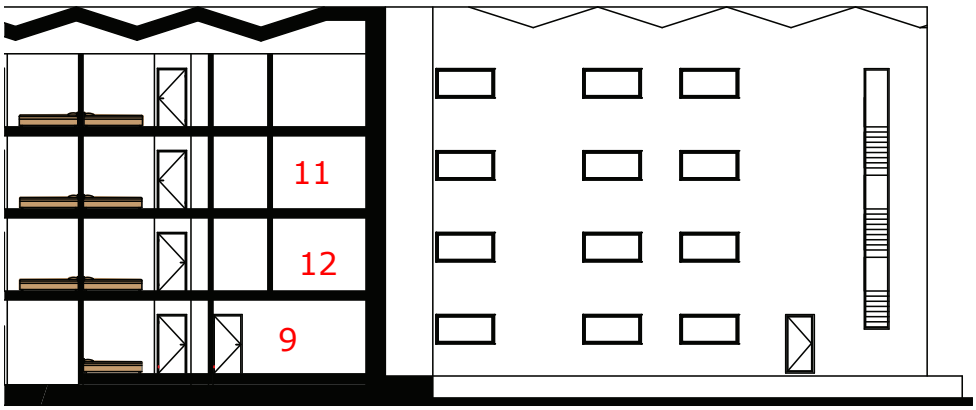
- 1: Family bedroom
- 2: Couples and Single bedrooms

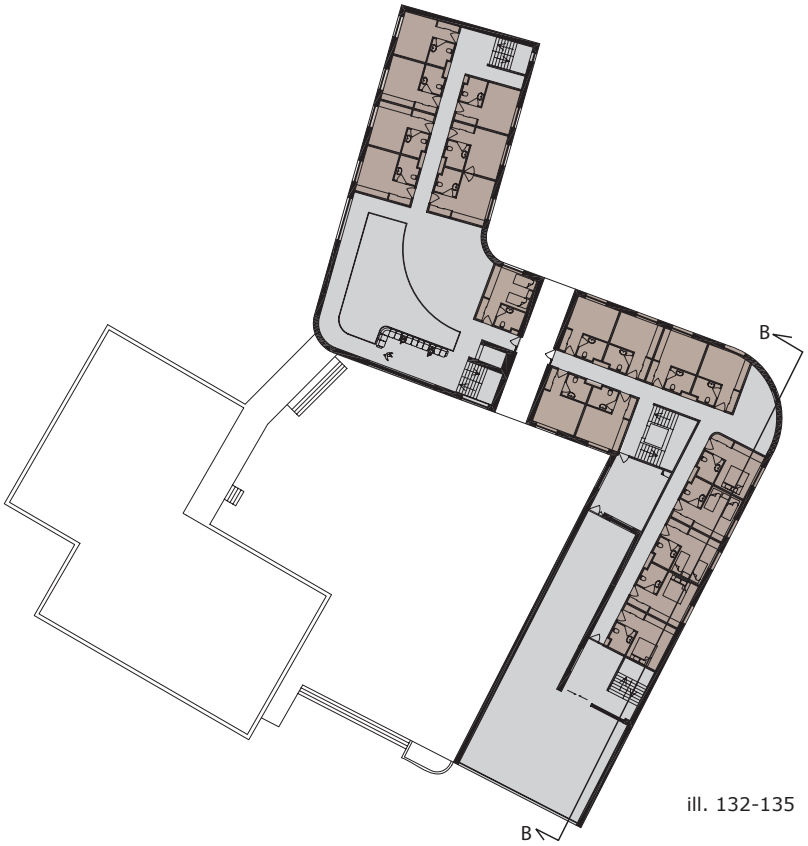
Section B-B

- 1 – Restaurant
- 2- Roof terrace
- 3- Fitness
- 4- Swimming pool
- 5-Staircase
- 6-Guest rooms
- 7- Changing room
- 8-Sauna
- 9-Service room
- 10-WC
- 11-Meeting
- 12-Storage room



Section B-B & Plans, out of scale





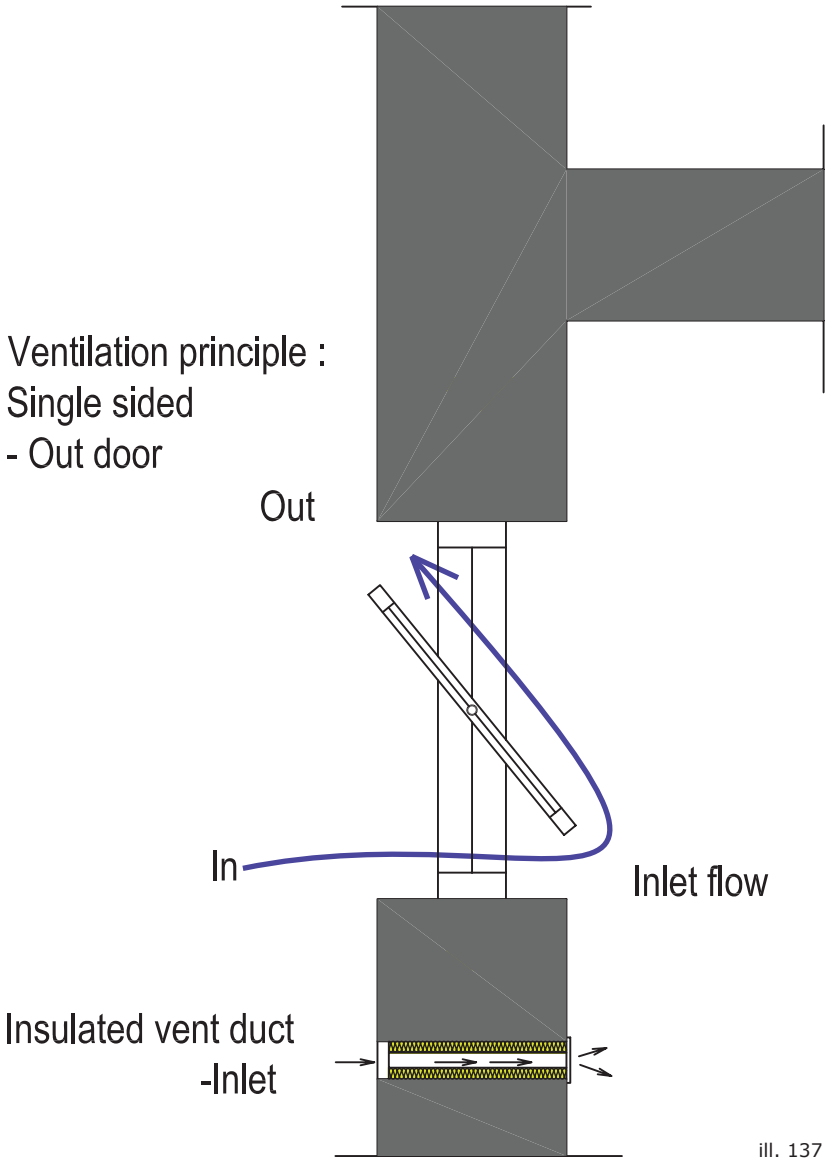
ill. 132-135

VENTILATION

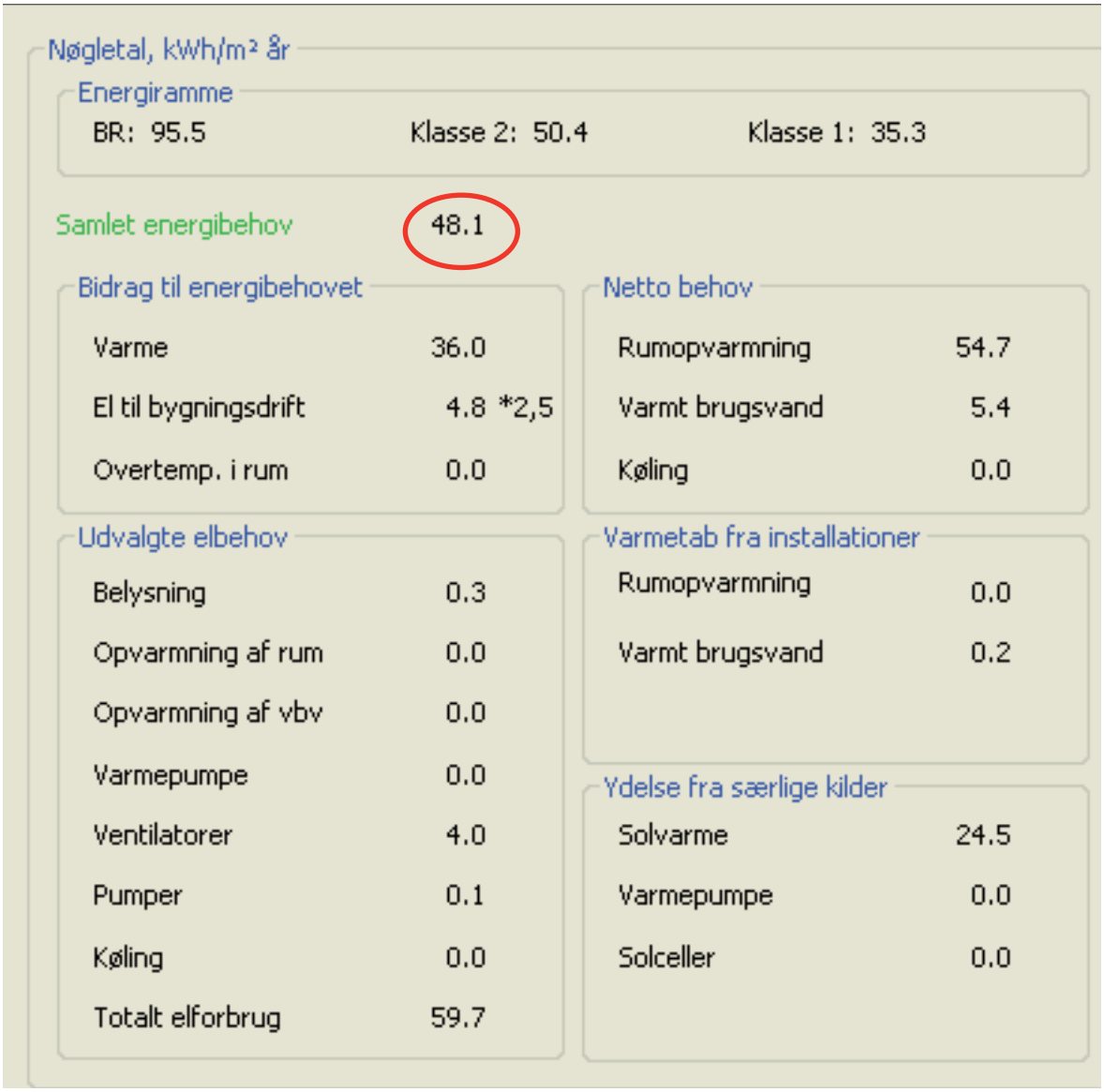
Ventilation strategy:
The main ventilation strategy is mechanical ventilation; this is use for the purpose of enabling the guest rooms to be well ventilated during period that the rooms are empty before arrival of a guest to avoid odour in the rooms. Natural ventilation is only possible at the summer time with the mechanical ventilation system turn-off. In this case the guests have full control of the ventilation openings either through the main windows or vent ducts fixed to the facade wall under each window as illustrated with the drawing *[ill.137]* below. Due to the size of the window opening which is 2m x 1m place horizontally "pivot-window", the opening of the window is control automatic with a trigger switch by the guest to their desire or angle of inclination. For rooms which are not occupied in the summer time, cleaners of the hotel can be inform to open the vent ducts to allow air in to the rooms.

The swimming area is ventilated mechanically, since the temperature around the pool is kept within 28-29 degrees Celsius.

ill. 136


Ventilation principle :
Single sided
- Out door
Out
In
Inlet flow
Insulated vent duct
-Inlet

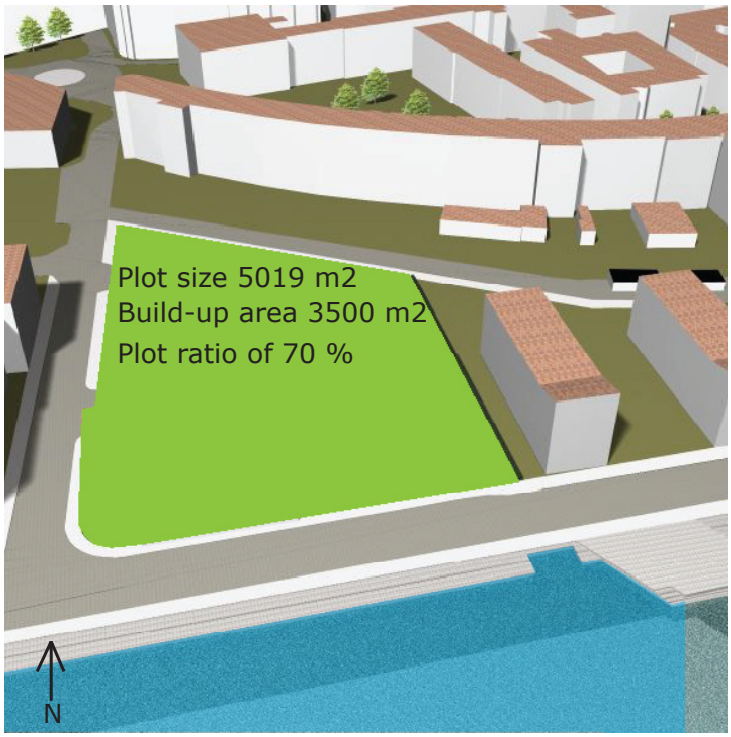
ill. 137



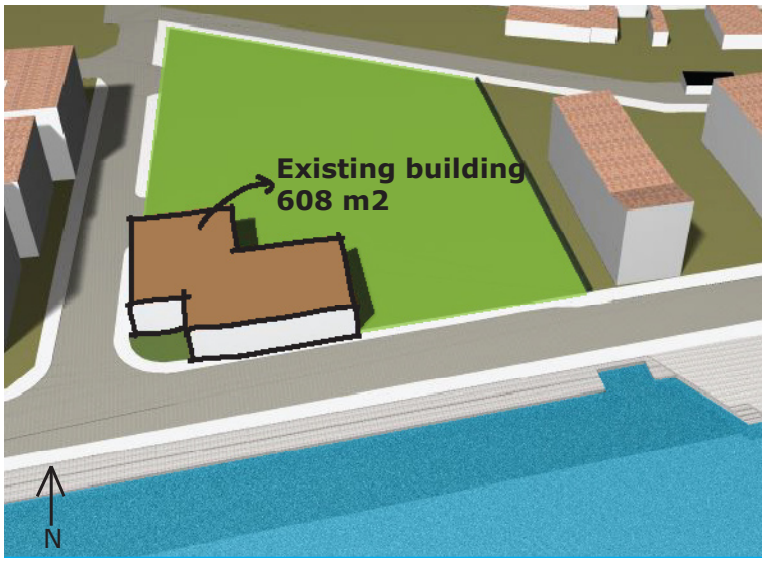
Energy simulation result

ill.138

Plot :

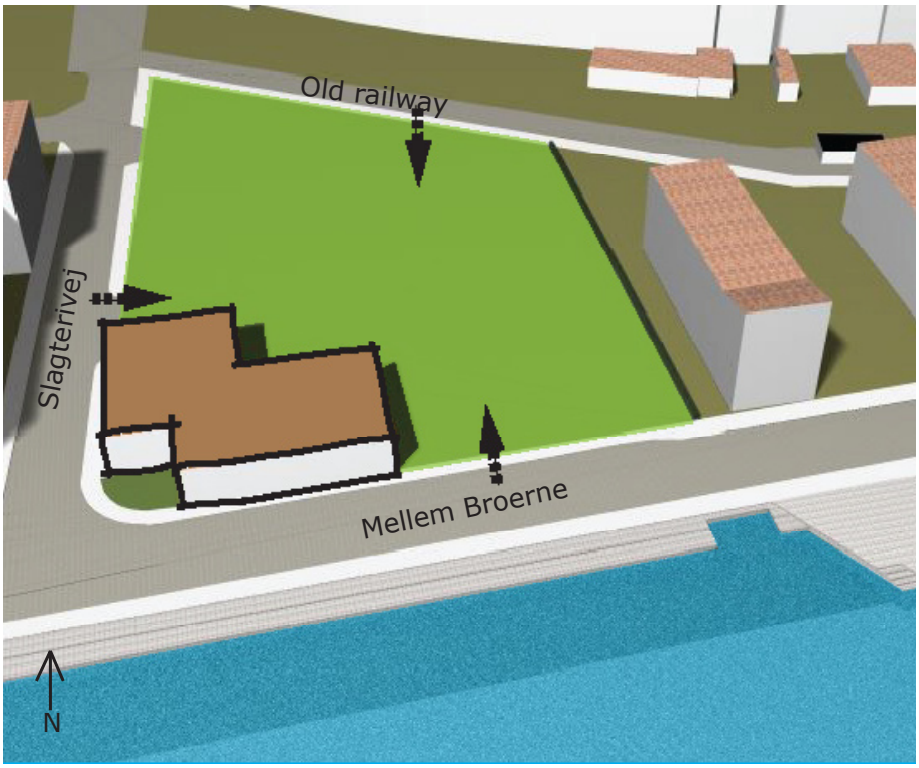


During the programme phase a build up area of 3500 m2 with a plot ratio of 70% was design, but this has change during sketching and designing of the building.

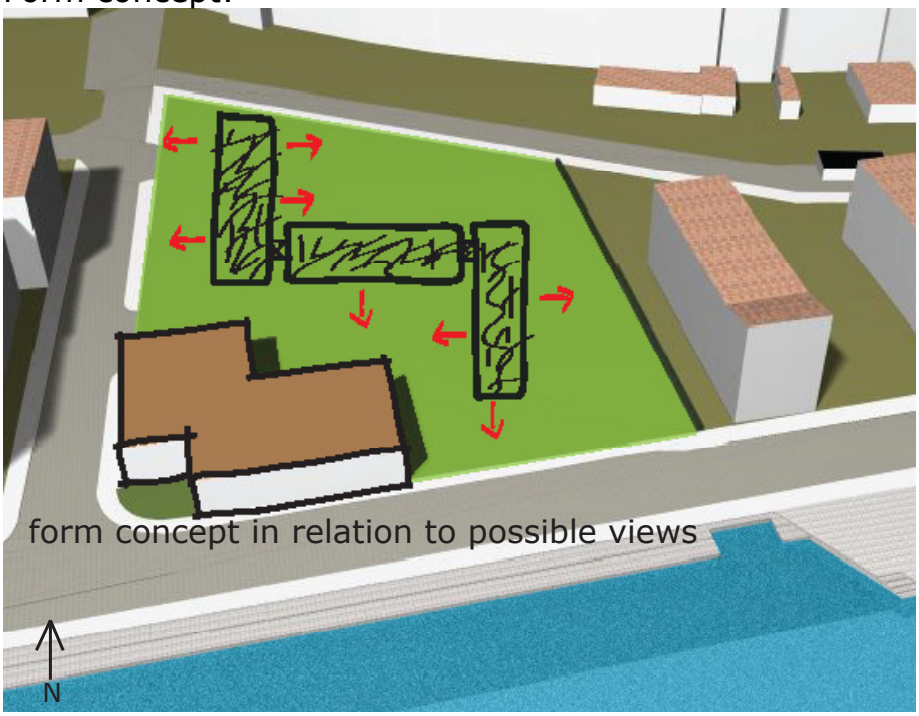


ill.139-140

Access:



Form concept:



ill.141-142

Sketching:

ill.143

form concept,considering possible access, relazation and parking posibilities.

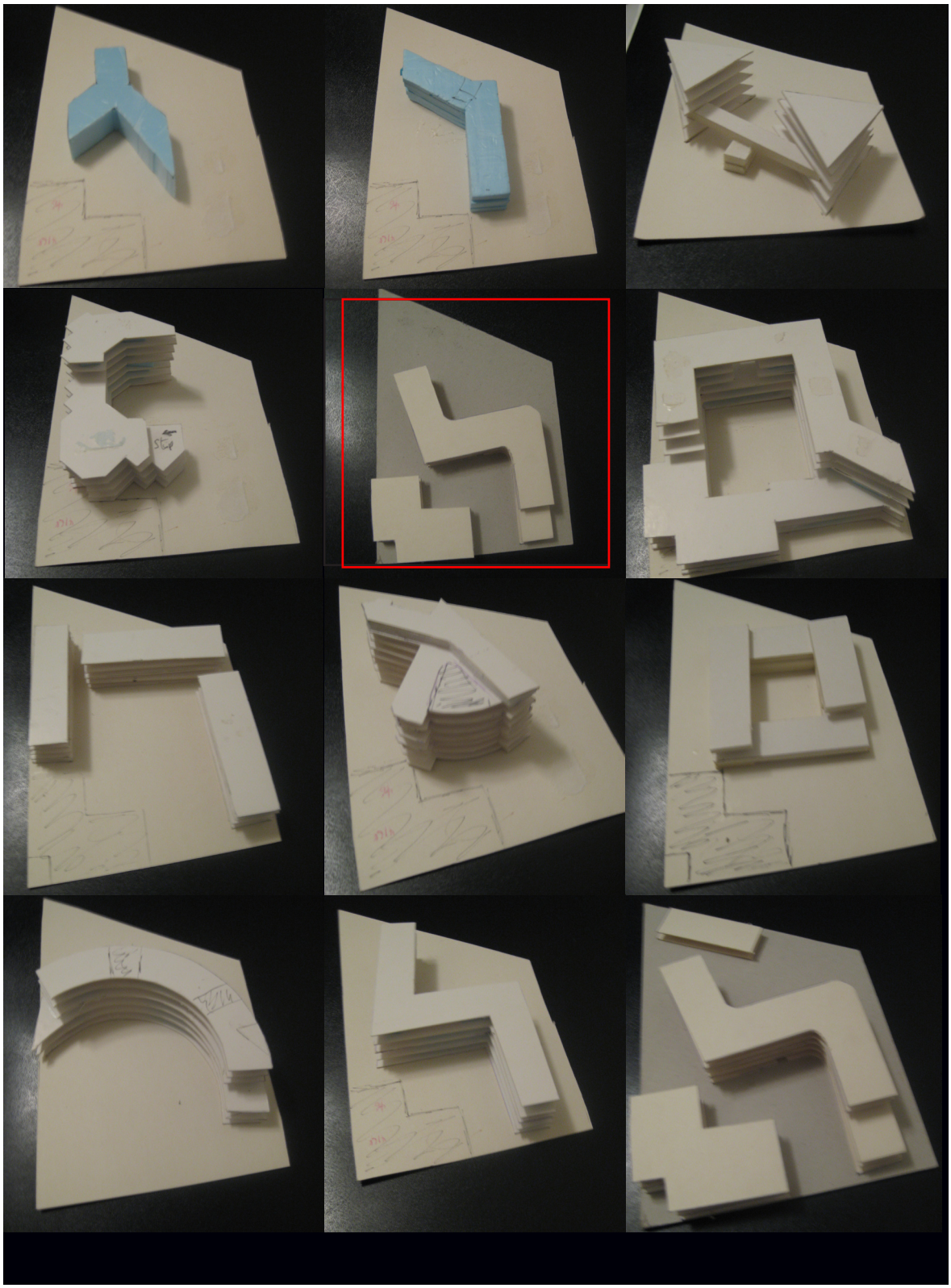
New dwellings & leisure zones:

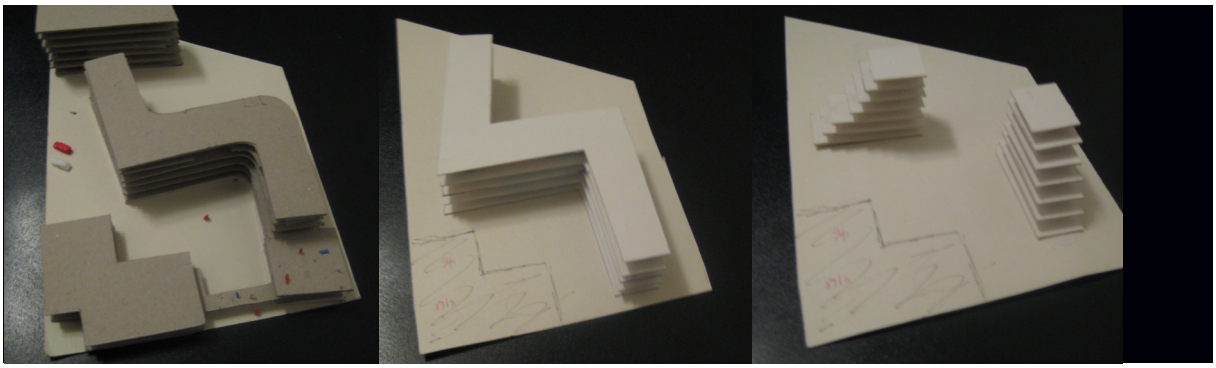
ill.144

Future leisure zone1& 2

During the sketching phase, the surroundings of the plot is considered in relation to views and easy accessibility to the leisure zones and greenery area by the hotel guest and as well as the neighbouring people without demarcating the plot as a private area, there by creating circulation through the building.

CAD-MODELS





Sketching phase models

ill.145-160

In general regulation for public indoor swimming pool design according to the (DS477 Code of Practice for swimming pools), pg-5 & 6.

Entrance-changing room-toilet-shower-swimming hall

-Swimming hall changing room should be 0.75-1.25 m2 pr. person and not less than 0.4 m2 pr. person with a minimum ceiling height of 2.75 m in relation to the indoor climate.

-Floor slope of 10 ‰ gradient
-Sauna and steam bath should have a slope directed towards door, and should be place in such a way that one get through the shower before entering into the swimming area.
-Sauna of 0.2 m2 pr. person with room area not less than 15 m2 and not more than 30 m2.
-Ceiling height of minimum 2.4 m for sauna

- Shower room of 0.5 m2 pr. person
- WC by experience indicates that 1WC pr. 40 persons and 1 Urinal pr. 80 men or 2 WCs plus one urinal in the men's room.
- A minimum 2 toilet in the ladies room

Teaching swimming pool
-Water area (m2) pr. person: 2.5 m2
-recommended pool area minimum 50 m2
-Pool depth (m) <1.5 m

Steam water pool
-water area (m2) pr. person : 2.5-4.5
-recommended pool area not less than 30 m2
-Pool depth (m) :< 1.5 m

Children pool
-Water area (m2) pr. person: 2.5
-Water depth (m): < 1.5

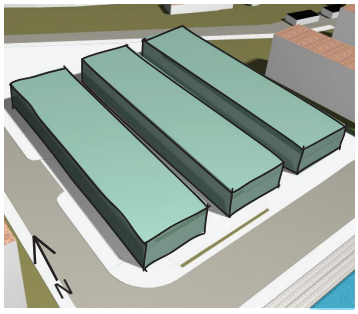
Volume studies: (Investigation-One)

This analysis illustrates a volume study of building on the site to help investigate the effects of different position of windows as well as orientations and storey height of the structure in relation to energy consumption. In all two different types of investigation is carried out (investigation One &Two). In investigation two is a one unite building volume derive from sketches base on investigation one illustrations. In this case a Monthly Average spreadsheet is use to compute for the necessary energy consumption for both buildings.
To avoid different shapes and forms for the analysis and to maintain the same data, the building length and width remain unchanged for investigation one, except for investigation two whereby the lengths varies in relation to building orientation on the plot. The window openings are of the same measurement for both investigations with a variable height difference of one meter and two meters.
A total build up area of 5400 m2 and a plot size of 5019 m2 is use for the investigation which includes parking area and all other functions with a plot ratio of 108 percent. In this case the architecture qualities of the area are not interested but good orientation of the building and size of windows.

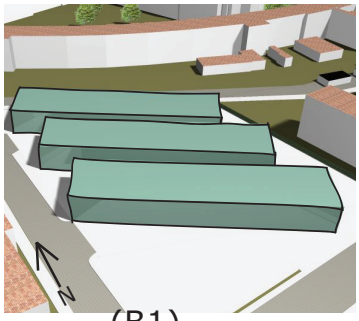
The following are the main data use for the calculation:
160 apartments of 30 m2 each
2 people per apartment, and a total of 320 people in all
Time in use for people load:
168 hours per a week
320 people from 00:00-09:00
160 people from 09:00-17:00
320 people from 17:00-24:00
Daylight factor of: 2-5%
Activity level: 1,2 met
Time and effect of lighting:
0%, 00:00-06:00
20%, 06:00-07:00 and 23:00-24.00
100%, 07:00-09:00 and 17:00-22:00
40%, 09:00-17:00 and 22:00-23:00
Other loads from technical devices: 300 W/per hour

When look at the end results of the analysis, the best orientation of the window opening is C1 as illustrated bellow with a heating demand of 23.4KWh/m2 and a cooling of 36.9 KWh/m2 which could be minimize by the use of proper shading device place either external or internal. The building is oriented towards north and south direction with the windows openings facing north and south. In this case, it implies that smaller windows orientation toward north facing and bigger openings towards south facing direction to help optimize solar gain in to the building during winter in a form of thermal mass, there by minimizing the energy consumption use in winter.
As the building illustration B1 orientation in regards to the energy consumption seems quite okay, a second investigation was carried out with both form and orientation integrated in the design as a one unit volume studies. The results are illustrated with the monthly average spread sheet below.
The figures achieve is base on the window to floor area ratio used, as well as the construction material, which is concrete slab with wooden floor and a lightweight concrete wall. These structural members are assumed to have a heat capacity of 80 Wh/Km2.
A ventilation air change rate of 0.5 h^(-1) is assume and considered as part of the input values in the spread sheet calculation.

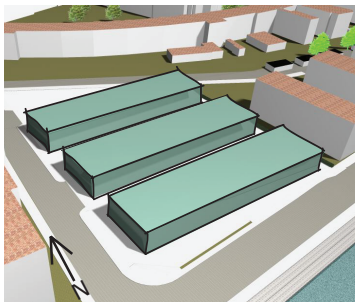
To conclude, the investigation indicates that the energy consumption obtain although is above the low energy class -1 for domestic dwellings could be use and later optimize with BE06 in the design phase.



(A1)



(B1)

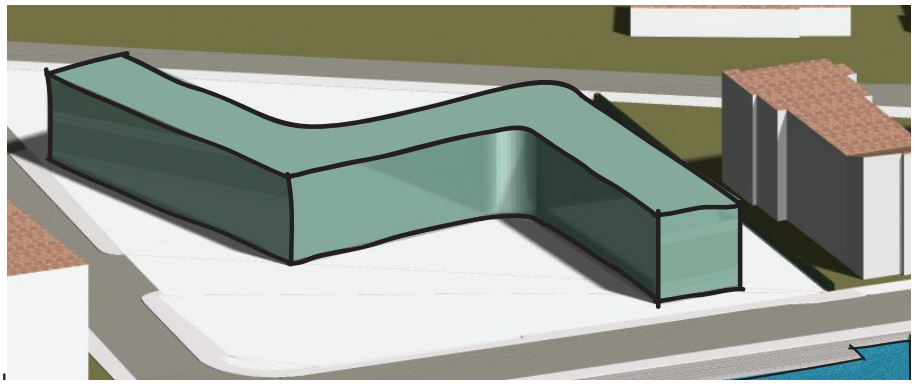


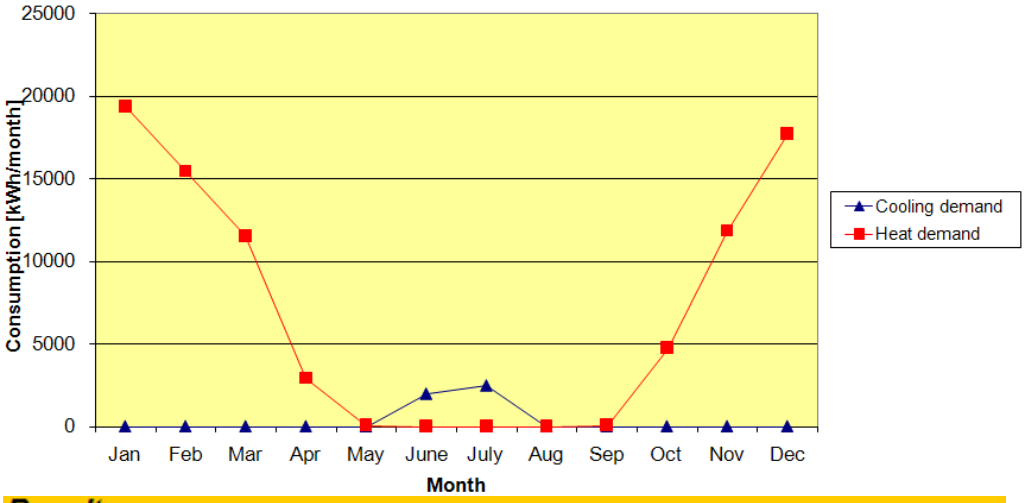
(C1)

Building Dimensions	Orientation	Nr. of volume	Suface one volume	Window 2m high	Window 1m high	Energy use
A1)						
L=60 W=15 H=6	North/South	3	North/South: 90 m2 East/west: 360 m2	West: 710.4 m2	East: 355.2 m2	Heating: 35.7 KWh/m2 Cooling: 38.1 KWh/m2 Total: 73.8 KWh/m2
B1)						
L=60 W=15 H=6	NW/SE	3	NE/SW: 360 m2 NW/SE: 90 m2	Southwest: 710.4 m2	Northeast: 355.2 m2	Heating: 33.1 KWh/m2 Cooling: 18.3 KWh/m2 Total: 51.5 KWh/m2
C1)						
L=60 W=15 H=6	West/East	3	North/South: 360 m2 East/West: 90 m2	South: 710.40 m2	North: 355 m2	Heating: 23.4 KWh/m2 Cooling:36.9 KWh/m2 Total: 60.2 KWh/m2

ill.161-163

Volume studies: (Investigation-Two)





Result	(2m high window)
Energy consumption for heating pr m² floor area, kWh/m² år	62.1
Energy consumption for cooling pr m² floor area, kWh/m² år	3.3
Total energy consumption pr m² floor area, kWh/m² år	65.4

Result	(1m high window)
Energy consumption for heating pr m² floor area, kWh/m² år	50.1
Energy consumption for cooling pr m² floor area, kWh/m² år	0.0
Total energy consumption pr m² floor area, kWh/m² år	50.1

For comparison	
Energy frame, dwellings	71.6 kWh/m² år
Low energy class 2	51.2 kWh/m² år
Low Energy class 1	35.8 kWh/m² år

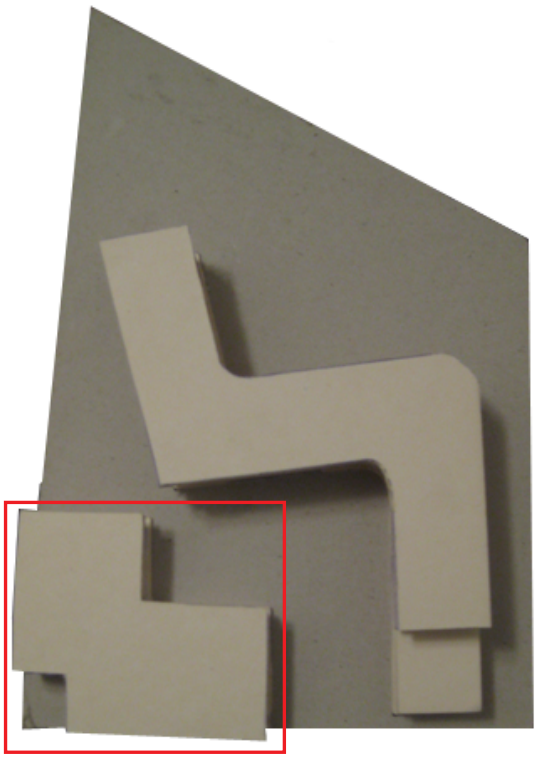
ill.164-165

Day lighting:

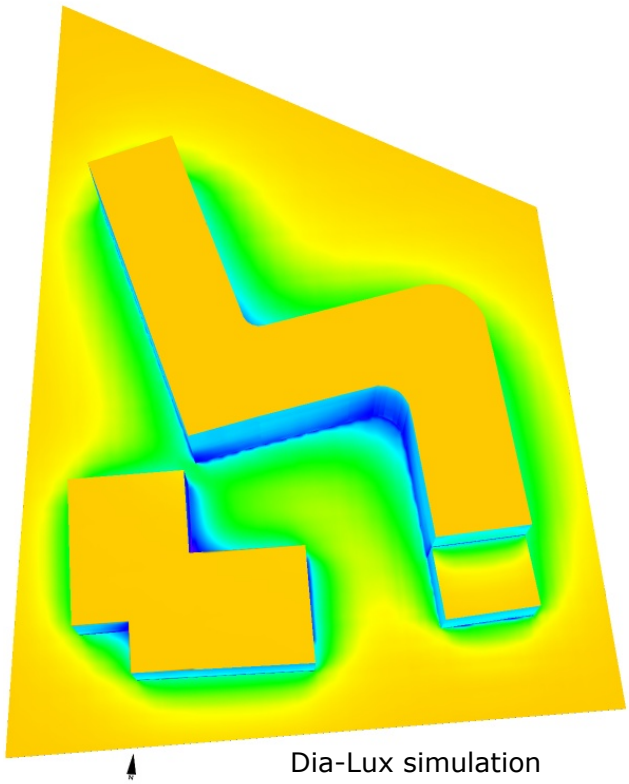
The first investigation of daylight is carried out in a plan perspective for the entire plot in a daylight simulation software Dia-Lux. In this case, one of the existing buildings on the site with the design organic shape of the building which would be detail later in the project was examine.

In this perspective, the idea is to simulate the lighting and its shading effect of the existing building to that of the new building. The direct sun or the daylight obtain from the atmosphere to the surface of the earth is over 20,000 lux, but with this investigation the lux is set to 15,000 lx with an overcast sky use for the simulation which means the day light intensity would be the same in all areas. Later in the design process for the purpose of integrated design as mention in the report earlier on, a detail investigation of the building interior "guest rooms" day lighting would be examine as well to check various size of windows in relation to window to floor ratio and day light quality of the various guest rooms .

For further optimization of the daylight qualities in the rooms, Be06 energy simulation software would be use as part of the investigation with Dia-lux to help calculation and determine the correct type of windows with efficient indoor lighting quality. A minimum lux of 200 lx would be enough for the guest rooms.



Cad- model investigation with
existing building marked in red.

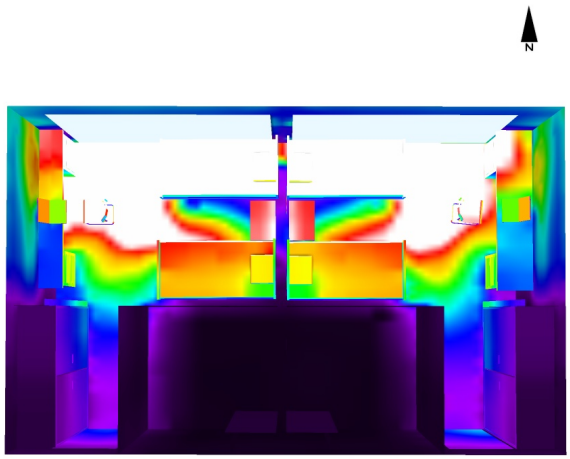


Dia-Lux simulation

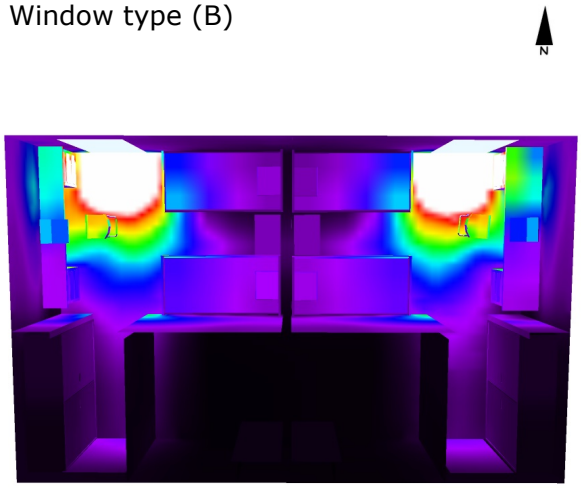
ill.166-167

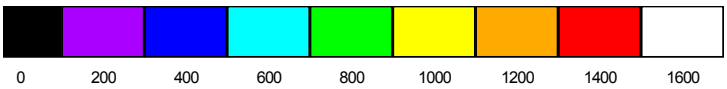
Day lighting:
To investigate if the daylight within the guest rooms is enough without the use of artificial lighting, two of the guest rooms facing north orientation is taken under investigated, this is because mostly north facing windows are assume to admit less daylight in rooms as compare to south facing openings. To ensure a correct output simulation of the software Dia-Lux, an overcast sky is chosen with the lux set to1600 lx and a simulation point of 750 mm which is above a height of a working desk.
A grey-concrete surface material with a floor covering of light parquet flooring is use for the simulation, although surface reflectance of architectural materials count a lot in terms of indoor lighting, white surface would be appropriate for more distribution of light in to the rooms.
For this investigation, different window types were considered with different orientations but as mention before only the north facing openings are illustrated.
The opening of the window type (A1) sizes are of 2m x 3.5m to 21 m2 floor area, which gives almost 100% natural daylight into the rooms. The other two window type (B) and (B1) are 1m x 2m to the same room area but place vertical and horizontal to the same room floor area. It would be optimal to have 100% daylight from outside into the rooms but due to other parameters for the design of the hotel, this is not possible .These parameters such as the architectonic quality of having the whole façade as transparent. It is evidently clear that, in terms of privacy for the hotel guests, big windows would not be advisable although it gives ultimate day lighting for the rooms.
The best window from this investigation as can be seen from the illustration is the horizontal placing window type B1, which gives much lux of daylight reflection into the deeper end of the room than a French door type of windows place vertical. The various lux of light within each room is attach to indicate the amount of lux obtain for the investigation, at least 200 lux for the sleeping rooms.
The bath rooms are excluded since it is place close to a corridor and has no window to it, this implies that artificial lighting would be used for such rooms.

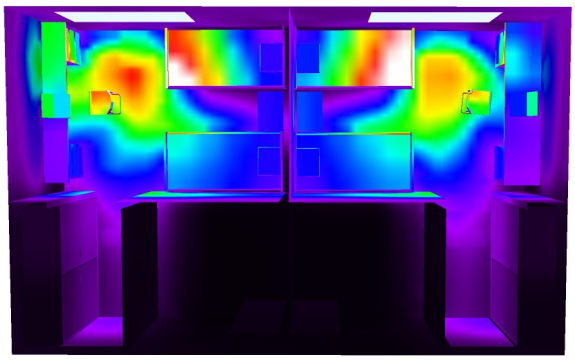
Window type (A1)



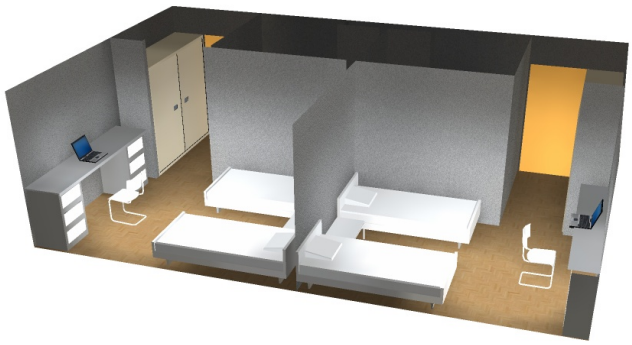
Window type (B)







Window type (B1)



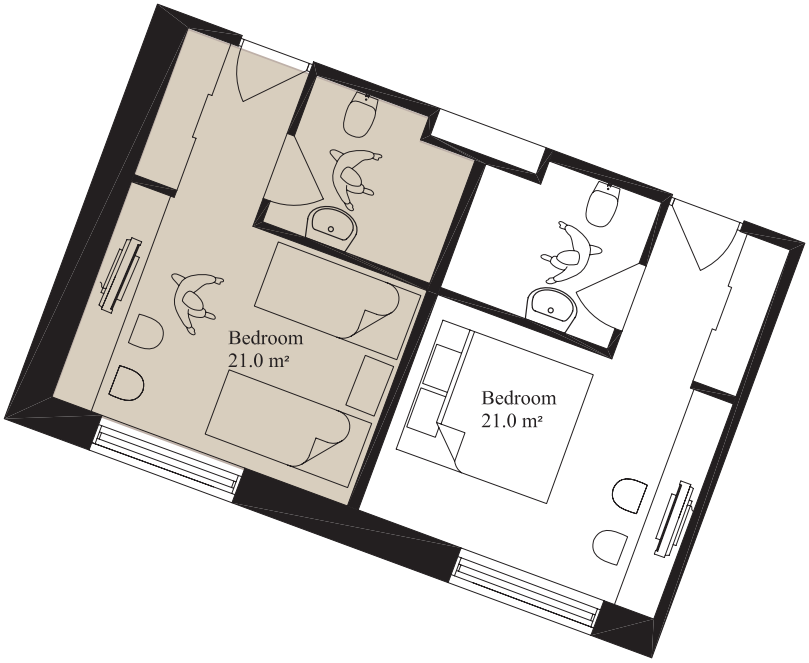
Day time experience

ill.168-171

24 –hour average temperature simulation:
A satisfactory atmospheric comfort demands good ventilation strategy either natural or mechanical. In relation to the design investigation, two rooms with the same floor area of 21 m2, but different window dimension is carried out for the most southern part orientation of the building which is assume to be the warmest part of the building and an atrium. This is carried out with the 24-hour average spread sheet to determine the indoor temperature of the building. The following illustrations show the input value for the various rooms including calculated u-values, room area, window sizes, air change rate and the output average temperatures obtain for the various room investigations
As a result one could clearly see from the spread sheet that the average temperatures achieve are below 27 degrees Celsius which was expected average temperature require for the investigation.
In combination of day lighting and ventilation strategy as investigated, the result indicates that it would be appropriate to use the two meter square window area for detail designing of the project. Since the bigger windows admits more daylight into the room and but would not be appropriate in relation to energy consumption of the building. One could consider shading devises to reduce the effect of the direct sun light into the rooms, but in this investigation only internal shading with curtain blinds is taken into consideration.
Unite characteristic:

Double Bedroom: 21 m2
: 2 Occupants
Thermal capacity:120 Wh/Km2
Usage hours: 168h/week
Indoor design temperature 20°C
Air change rate: 1.6 h^(-1)
Window size: 2 m2
U-value:

Wall: 0.1W/m2K
Roof: N/A-room above
Floor: 0.1W/m2K
Window: 1.1W/m2K



Guest room investigated 2 m2 window.

Guest room investigated 7m2 window.

ill.172-173

København		
Month:	August	
Average outdoor temperature, max. 24-	15.9	°C
Average ground temperature, t,ground:	8	°C
Calculation of internal heat gain, Φi:		
Gain pr. m²:	5	W/m²
Number of hours with gain:	24	pr. 24-hour (døgn)
Number of m²:	21	m²
Internal heat gain, Φi:	105	W
Calculation of solar gain, Φs:		
Window area, north:	0	m²
Window area, east:	0	m²
Window area, south:	2	m²
Window area, west:	0	m²
g-value	0.6	
F(beta)	0.9	
f(shade)	1	
f(shadow)	0.7	
f(glas)	0.9	
Reduction factor, Fsun	0.340	
Solar gain, average 24-hour, north:	1322	Wh/m² pr 24-hour
Solar gain, average 24-hour, east:	2565	Wh/m² pr døgn
Solar gain, average 24-hour, south:	3344	Wh/m² pr døgn
Solar gain, average 24-hour, west:	2525	Wh/m² pr døgn
Soalr gain, Φs:	94.80	W

Guest room investigated 2 m2 window.

Calculation of transmission loss, Bt:		
Area of outer wall (- windows):	38.72	m²
U-value, outer wall	0.1	W/m²°C
Roof area	0	m²
U-value, roof	0.1	W/m²°C
Window area	2	m²
U-value, windows	1.1	W/m²°C
Specific transmission loss, Bt:	6.072	W/°C
Floor area	21	m²
U-value, floor	0.14	W/m²°C
Specific transmission loss, B,floor:	2.94	W/°C
Calculation of ventilation loss, Bl:		
Air change rate	1.6	h-1
Room volume	52.5	m³
Ventilation flow:	0.0233	m³/s
Density of air	1.2	kg/m³
Specific heat capacity:	1006	J/kg°C
Specifc ventilation loss, Bl:	28.168	W/°C
24-hour average temperature:	20.65	°C

ill.174

København		
Month:	August	
Average outdoor temperature, max. 24-	15.9	°C
Average ground temperature, t,ground:	8	°C
Calculation of internal heat gain, Φi:		
Gain pr. m²:	5	W/m²
Number of hours with gain:	24	pr. 24-hour (døgn)
Number of m²:	21	m²
Internal heat gain, Φi:	105	W
Calculation of solar gain, Φs:		
Window area, north:	0	m²
Window area, east:	0	m²
Window area, south:	7	m²
Window area, west:	0	m²
g-value	0.6	
F(beta)	0.9	
f(shade)	1	
f(shadow)	0.7	
f(glas)	0.9	
Reduction factor, Fsun	0.340	
Solar gain, average 24-hour, north:	1322	Wh/m² pr 24-hour
Solar gain, average 24-hour, east:	2565	Wh/m² pr døgn
Solar gain, average 24-hour, south:	3344	Wh/m² pr døgn
Solar gain, average 24-hour, west:	2525	Wh/m² pr døgn
Soalr gain, Φs:	331.81	W

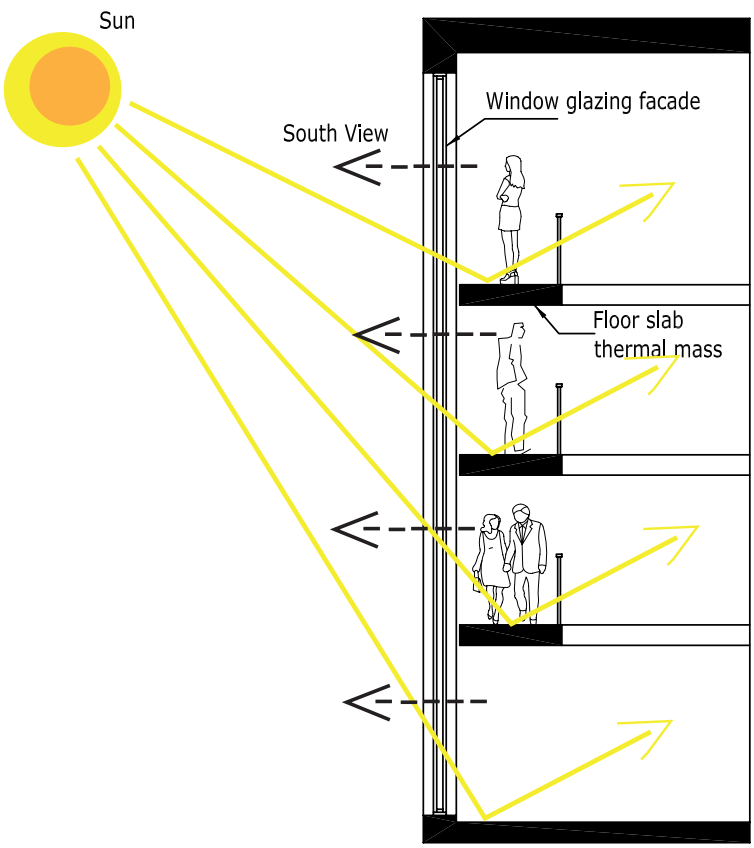
Guest room investigated 7m2 window.

Calculation of transmission loss, Bt:		
Area of outer wall (- windows):	38.72	m²
U-value, outer wall	0.1	W/m²°C
Roof area	0	m²
U-value, roof	0.1	W/m²°C
Window area	7	m²
U-value, windows	1.1	W/m²°C
Specific transmission loss, Bt:	11.572	W/°C
Floor area	21	m²
U-value, floor	0.14	W/m²°C
Specific transmission loss, B floor:	2.94	W/°C
Calculation of ventilation loss, Bl:		
Air change rate	1.6	h-1
Room volume	52.5	m³
Ventilation flow:	0.0233	m³/s
Density of air	1.2	kg/m³
Specific heat capacity:	1006	J/kg°C
Specifc ventilation loss, Bl:	28.168	W/°C
24-hour average temperature:	25.59	°C

ill.175

Thermal mass:
In other to utilise the sun not only as energy source for the solar cells, part of the south facades is design as large glazing area including the main stairwell area purposely to serve as thermal mass principle of warming up the building during winter. In this way the solar radiation of the sun is admitted through the glazing window and absorbed by floor slabs during the day, and at night the sun heat accumulated within the thermal mass floor slab and the walls material are release in to the entire building there by reducing the energy consumption supply by electrical apparatus and other heating radiators etc.
Other than thermal mass, the area serves as a common relaxation with a view towards the Limfjord and as well as walk-way for the hotel guest, by avoiding external shading device to the facades, the slab act as shading and prevents direct sun to the common areas.

The illustration below shows a common section principle of how the application is applied and the use of the area.



ill.176

Thermal comfort atrium:
To ensure that the atrium is not overheated during summer time, an investigation of the indoor climate concerning thermal comfort for the hotel guest is carried out for the entire four-story floor area of the atrium with 24-hour average spread sheet. This investigation is to main the average room temperature not to exceed 27 degrees Celsius, to avoid unfavourable thermal comfort within the atrium and the common share spaces from the reception area to the fourth floor.

The following are unite input use for the computation.
Unite characteristics:
West window area: 21 m2
South window area: 70.22 m2

U-value:
Window: 1.1W/m2K
Wall: 0.1W/m2K
Floor: 1.4W/m2K
Roof: 0.1W/m2K

Ventilation:
Air change rate:1.6 h^(-1)
Time of use: 24hr

Area:
Floor area: 191 m2
Roof area: 191 m2
Volume : 1910 m3
Height : 10 m

To conclude the analysis, it indicate that the average temperature obtain as illustrated with the spread sheet within the atrium is 21 degrees Celsius which is below the required demand of 27 degrees Celsius as set in the DS 474,Code for Indoor Thermal Climate. It implies that the require demand set in the design parameter is meet and therefore provided the targeted Category B level aim for during the investigation.

København		
Month:	August	
Average outdoor temperature, max. 24-	15.9	°C
Average ground temperature, t,ground:	8	°C
Calculation of internal heat gain, Φi:		
Gain pr. m²:	5	W/m²
Number of hours with gain:	24	pr. 24-hour (døgn)
Number of m²:	500	m²
Internal heat gain, Φi:	2500	W
Calculation of solar gain, Φs:		
Window area, north:	0	m²
Window area, east:	0	m²
Window area, south:	70.22	m²
Window area, west:	21	m²
g-value	0.6	
F(beta)	0.9	
f(shade)	1	
f(shadow)	0.7	
f(glas)	0.9	
Reduction factor, Fsun	0.340	
Solar gain, average 24-hour, north:	1322	Wh/m² pr 24-hour
Solar gain, average 24-hour, east:	2565	Wh/m² pr døgn
Solar gain, average 24-hour, south:	3344	Wh/m² pr døgn
Solar gain, average 24-hour, west:	2525	Wh/m² pr døgn
Soalr gain, Φs:	4080.14	W

Calculation of transmission loss, Bt:		
Area of outer wall (- windows):	230.33	m²
U-value, outer wall	0.1	W/m²°C
Roof area	191	m²
U-value, roof	0.1	W/m²°C
Window area	94.92	m²
U-value, windows	1.1	W/m²°C
Specific transmission loss, Bt:	146.545	W/°C
Floor area	191	m²
U-value, floor	0.14	W/m²°C
Specific transmission loss, B,floor:	26.74	W/°C
Calculation of ventilation loss, Bl:		
Air change rate	1.6	h-1
Room volume	1910	m³
Ventilation flow:	0.8489	m³/s
Density of air	1.2	kg/m³
Specific heat capacity:	1006	J/kg°C
Specifc ventilation loss, Bl:	1024.778667	W/°C
24-hour average temperature:	21.22	°C

ill.177

Acoustic:

Main staircase investigation:
The calculation of the reverberation time of the main staircase is taken into consideration to determine the reverberation time "echoes" and to ensure that the sound created within the stairwell does not cause disturbance to the guests living close to it or the users of the stairs.
The reverberation time of the staircase is calculated for the entire 4 stories building which serves as the main access to the hotel guest rooms. In this case the reverberation time should not exceed 1.3 second within a frequency band of between 500-3150 Hz, due to the reason that it serves more than four different rooms. According to BR 95 §9.2.3. The reverberation time is the time taken to reduce a given airborne sound source with 60 dB.
The investigation of the reverberation time comprises of two charts up to clarify the construction in regards to area of the stairwell enclosure, materials and absorption coefficiency.
The first investigation indicates that the reverberation time is to long without application of acoustic sound reducing material to the surface, where as the second chart for the investigation shows how much sound reducing material is use to decrease the reverberation time under 1.3 seconds.
The absorption coefficient of the material are set up according to the ultimate difference frequency bands and also is assume that the stair is being used by at least two adult walking on the stairs to create the sound effect.
This calculation is based upon Wallace Clement Sabines formula from 1898 which is use for the reverberation time investigation.

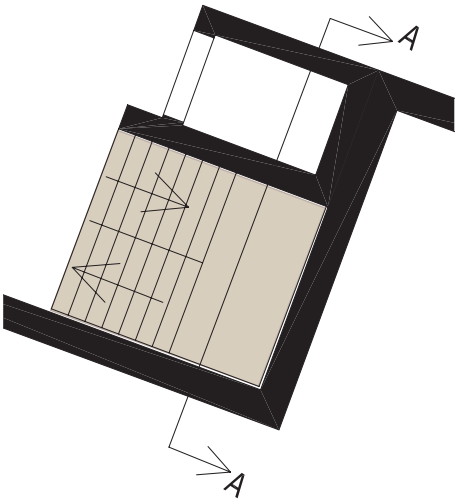
The acoustic boards are design in such way to be integrated under to the staircase and as well as the ceiling part of the stairwell enclosure. The dimensions of the acoustics boards are as follows: 900x 2800 cm of three lays comprising of 300x2800 cm fixed close to each other. The main boards are Tectopanel Corridor F30, Quadril Q1, from danoline which is fixed to a 45mm lath battens and 45mm mineral wool.

Sabine's formula:
In this investigation, the absorption in the air is not taken in consideration, because it has almost no influence on the result. Furthermore the stairwell enclosure is not warmed up, which implies that the relative humid in the air will never be constant.

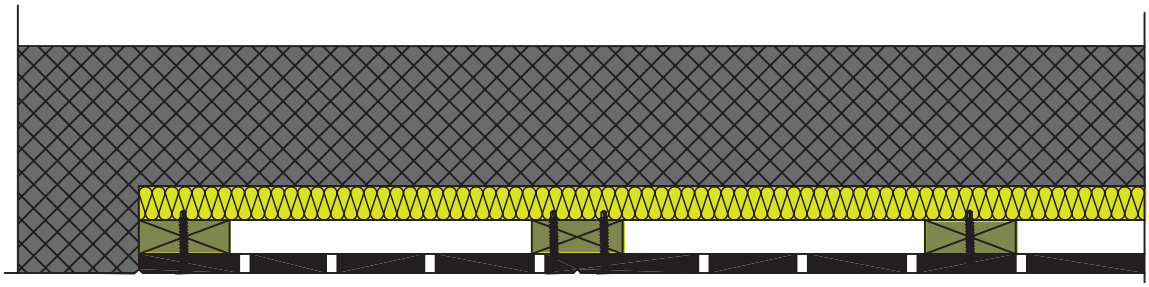
The following shows the symbols used in the calculation.
Reverberation time
V= volume
S= area of absorbent surface
a= Absorption coefficient for absorbent materials
n= number of objects or people
A= the absorption coefficient for the object
m= the absorption in the air, depending on the relative humid in the air

Sabine's formular:

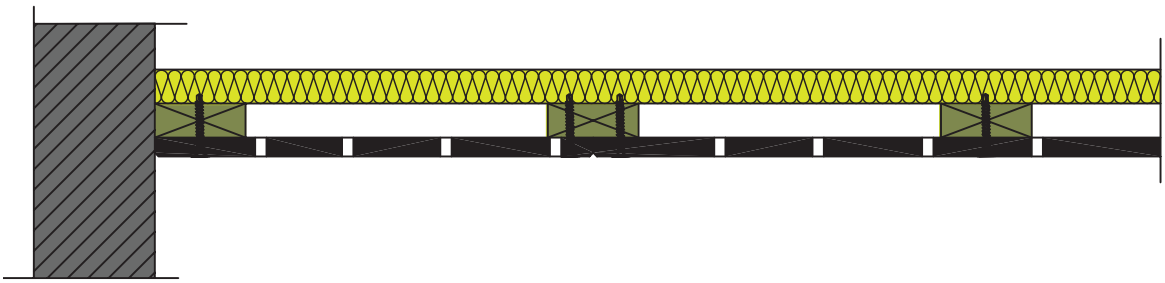
$$T_{Sab} = 0.161\frac{V}{A} = \frac{0.161 * V}{(\sum a * S) + (\sum n * A) + (4 * m * V)}$$



Section of stairs A-A



Integrated acoustic board to stairs



Integrated acoustic board to ceiling

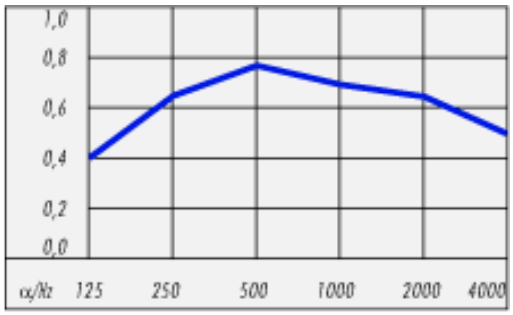
ill.178-180

Result 1:
Without acoustic board

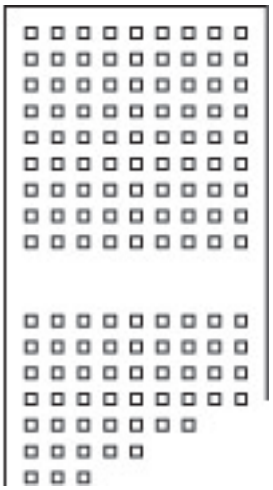
Frequency band:	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz
Reverberation Time:	3.0	4.7	4.0	3.4	2.7	2.8
(Time in seconds)						

Average:	
Reverberation time	3.43333

To reduce the reverberation time to the require demand of 1.3 second, a Tectopanel Corridor board F30,Quadril Q1, manufacture from Danoline fixed to 45mm mineral wool is used.
A graph of the acoustic board absorption coefficient used in the calculation is shown below.



α	0,40	0,65	0,75	0,70	0,65	0,50
Hz	125	250	500	1000	2000	4000



ill.181-182

Result 2:

With acoustic board

Frequency band:	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz
Reverberation Time: (Time in seconds)	0.9	0.7	0.6	0.6	0.7	0.8

Average:	
Reverberation time	0.71666

See appendix, for more detail of the absorption coefficient of the various surface material used in the calculation,

The first investigation shows that the reverberation time is to long without sound reducing material.

Revabretion time Plain surface absortion					
Surface types	**Materilas**	**Area**	**125 Hz**		
		S(m^2)	α	Sα	
Floor	Concrete	18.2	0.01	0.182	
	Carpet	0	0	0	
Roof	Plaster board	18.2	0.01	0.182	
Windows	Glass	27.16	0.04	1.0864	
Stair case sides (2)	Concrete painted	86.9	0.1	8.69	
		0	0	0	
Objects and people		**Amount**	**Sα/stk**	**Sα**	
People adult		2	0.25	0.5	
0		0	0	0	
Air absorbtion					
v/ 50% RF		**Volume** [m3]	**125 Hz** m	mV	
		196.56	0.3	58.968	
Total absorption				10.6	
Revabration time	T=(0,16*V)/((Σα*s)+(Σn*A)+(4*m*V))			**3.0**	

	250 Hz		500Hz		1000Hz		2000Hz		4000 Hz	
	α	Sα	α	Sα	α	Sα	α	Sα	α	Sα
	0.02 0	0.364 0	0.04 0	0.728 0	0.06 0	1.092 0	0.08 0	1.456 0	0.1 0	1.82 0
	0.02	0.364	0.02	0.364	0.03	0.546	0.04	0.728	0.05	0.91
	0.04 0.05 0	1.0864 4.345 0	0.03 0.06 0	0.8148 5.214 0	0.03 0.07 0	0.8148 6.083 0	0.02 0.09 0	0.5432 7.821 0	0.02 0.08 0	0.5432 6.952 0
	Sα/stk	**Sα**	**Sα/stk**	**Sα**	**Sα/stk**	**Sα**	**Sα/stk**	**Sα**	**Sα/stk**	**Sα**
	0.3 0	0.6 0	0.38 0	0.76 0	0.42 0	0.84 0	0.45 0	0.9 0	0.45 0	0.9 0
	250 Hz		**500Hz**		**1000Hz**		**2000Hz**		**4000 Hz**	
	m	mV	m	mV	m	mV	m	mV	m	mV
	0.4	0.16	0.5	98.28	0.5	98.28	0.5	98.28	0.4000	78.624
	0.4	6.8	0.5	7.9	0.6	9.4	0.7	11.4	0.7	11.1
		4.7		**4.0**		**3.4**		**2.7**		**2.8**

ill.183

The calculation chart below shown how much acoustic sound reducing material is used to decrease the reverberation time to less than 1.3 seconds.

Revabretion time Plain surface absortion					
Surface types	**Materilas**	**Area**	**125 Hz**		
		S(m^2)	α	Sα	
Floor	Concrete	18.2	0.04	0.728	
	Carpet	0	0	0	
Roof	Plaster board	18.2	0.01	0.182	
Windows	Glass	27.17	0.04	1.0868	
Stair case sides (2)	Concrete painted	86.9	0.1	8.69	
		0	0	0	
Sound reduction material	Acoustic boars, stair & ceiling	56.6	0.4	22.64	
Objects and people		**Amount**	**Sα/stk**	**Sα**	
People adult		2	0.25	0.5	
		0	0	0	
Air absorbtion					
v/ 50% RF		**Volume**	**125 Hz**		
		[m3]	m	mV	
		196.56	0.3	58.968	
Total absorption				33.8	
Revabration time	T=(0,16*V)/((Σα*s)+(Σn*A)+(4*m*V))			**0.9**	

	250 Hz		500Hz		1000Hz		2000Hz		4000 Hz	
	α	Sα	α	Sα	α	Sα	α	Sα	α	Sα
	0.04	0.728	0.07	1.274	0.06	1.092	0.06	1.092	0.07	1.274
	0	0	0	0	0	0	0	0	0	0
	0.02	0.364	0.02	0.364	0.03	0.546	0.04	0.728	0.05	0.91
	0.04	1.0868	0.03	0.8151	0.03	0.8151	0.02	0.5434	0.02	0.5434
	0.05	4.345	0.06	5.214	0.07	6.083	0.09	7.821	0.08	6.952
	0	0	0	0	0	0	0	0	0	0
	0.65	36.79	0.75	42.45	0.7	39.62	0.65	36.79	0.5	28.3
	Sα/stk	**Sα**	**Sα/stk**	**Sα**	**Sα/stk**	**Sα**	**Sα/stk**	**Sα**	**Sα/stk**	**Sα**
	0.3	0.6	0.38	0.76	0.42	0.84	0.45	0.9	0.45	0.9
	0	0	0	0	0	0	0	0	0	0
	250 Hz		**500Hz**		**1000Hz**		**2000Hz**		**4000 Hz**	
	m	mV	m	mV	m	mV	m	mV	m	mV
	0.4	0.16	0.5	98.28	0.5	98.28	0.5	98.28	0.4000	78.624
	1.1	43.9	1.3	50.9	1.3	49.0	1.3	47.9	1.2	38.9
		0.7		**0.6**		**0.6**		**0.7**		**0.8**

ill.184

Conclusion:
Through out the project most of the decision has been taken in respect to the municipality desire and look of the area to the near future, where by the design building should not restrain the public utilization of the place but rather be of a place with social and common share space to enable attract the community to the area.
To ensure that the building and the surrounding areas are not determine as private property for the community but an open circulation space, the hotel is design in connection to the surrounding leisure zones to enable the public and the neighbouring people to get access through and around the hotel to their nearest places, and also to involve the public use of the place, there is wellness centre for health care and as well as the restaurant which is open for the entire community and not only for the guest of the hotel.

For the guests of the hotel, there are two parking lots with the main parking area place to the north side of the building which serves as the main entrance to the hotel, and in all there are approximately 28 parking spaces where by the municipality demand one parking lot for every four guest rooms.

In all there are 69 guest rooms of which have the same room area in a unit form. One unit contains WC and bath, bed and a working desk. For family with two children can share two units combine as one, with an access door to both sides of the room.
Couples and single have the same room unit with double bed, but depends also on the type of bed place within each room.

Concerning the energy consumption of the hotel, the main aim was to achieve low energy standard which is fulfil in the design of the project.

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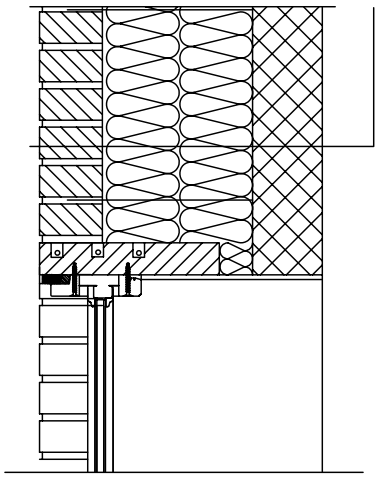
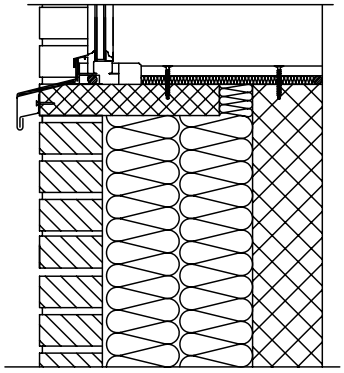
Details : 1:10

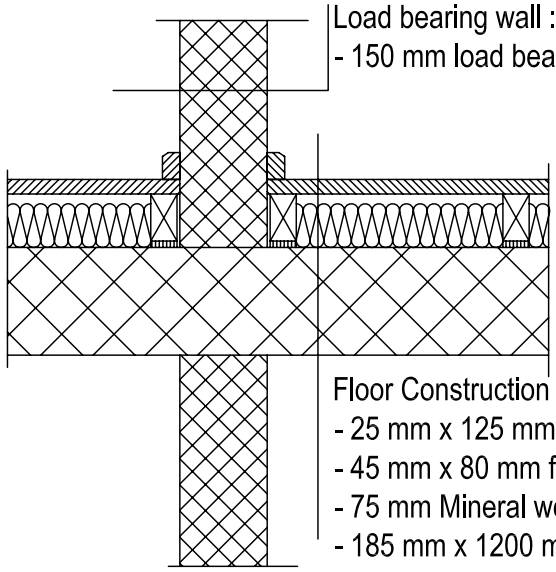


Top window:
External wall Detail
- 54 mm x 108 mm Brick wall
-258 mm Mineral wool insulation
- 120 mm Prefabricated concrete element.
- Wall ties at 300 mm centers

BR-95 DEMAND	COMPONENT
SOUND R'w ---	55 dB
L'n,w	
FIRE -------	BD-60
U-VALUE 0.14 W/m²K	0.20 W/m²K



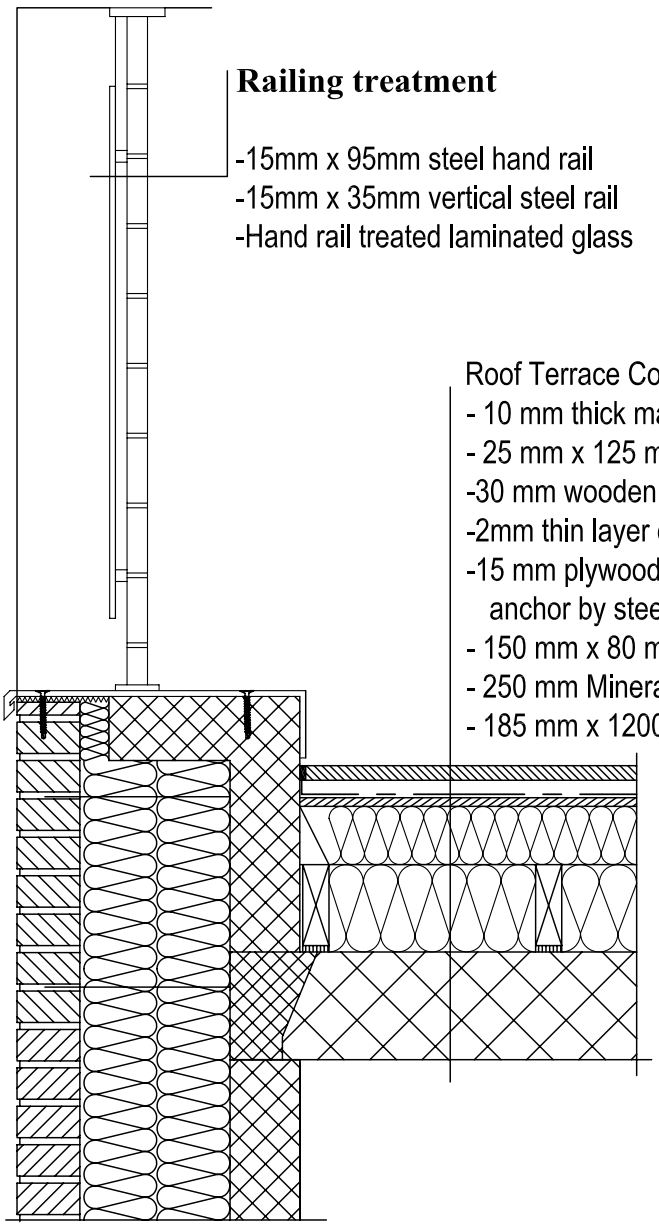
Bottom window:
External wall Detail



Load bearing wall :
- 150 mm load bearing partition wall

Floor Construction :
- 25 mm x 125 mm parquet flooring
- 45 mm x 80 mm floor joist at 400 mm centers
- 75 mm Mineral wool insulation
- 185 mm x 1200 mm hollor precast concrete slab.

ill.185



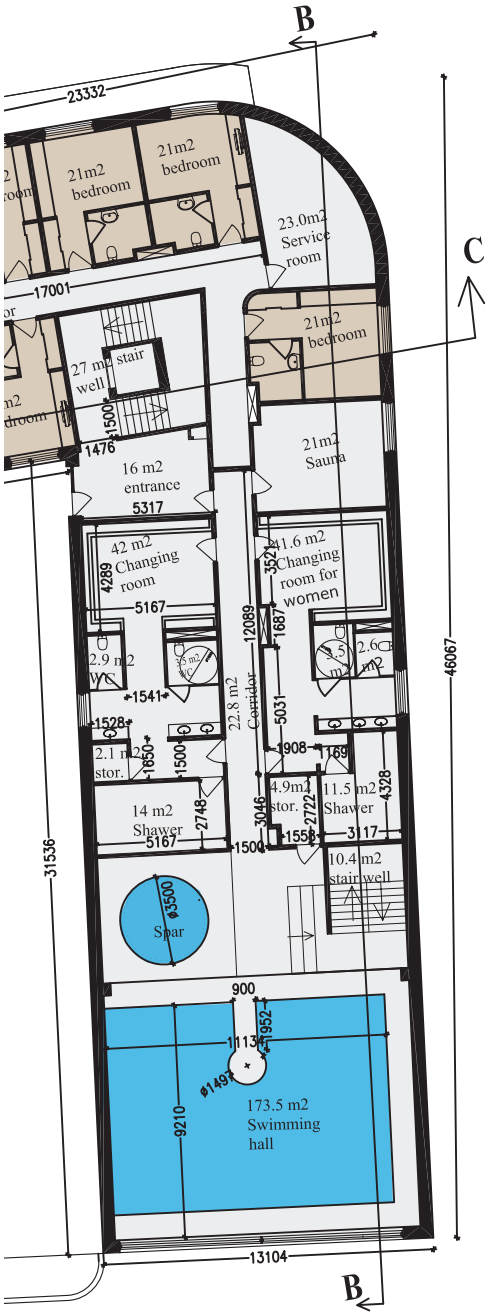
Railing treatment

-15mm x 95mm steel hand rail
-15mm x 35mm vertical steel rail
-Hand rail treated laminated glass

Roof Terrace Construction :
- 10 mm thick mastic sealant inbetween wall & floor board
- 25 mm x 125 mm floor boarding
-30 mm wooden batten
-2mm thin layer of bitumenus felt
-15 mm plywood fixed to 100 mm timber joist
anchor by steel angle cleat
- 150 mm x 80 mm floor joist at 400 mm centers
- 250 mm Mineral wool insulation
- 185 mm x 1200 mm hollor precast concrete slab.

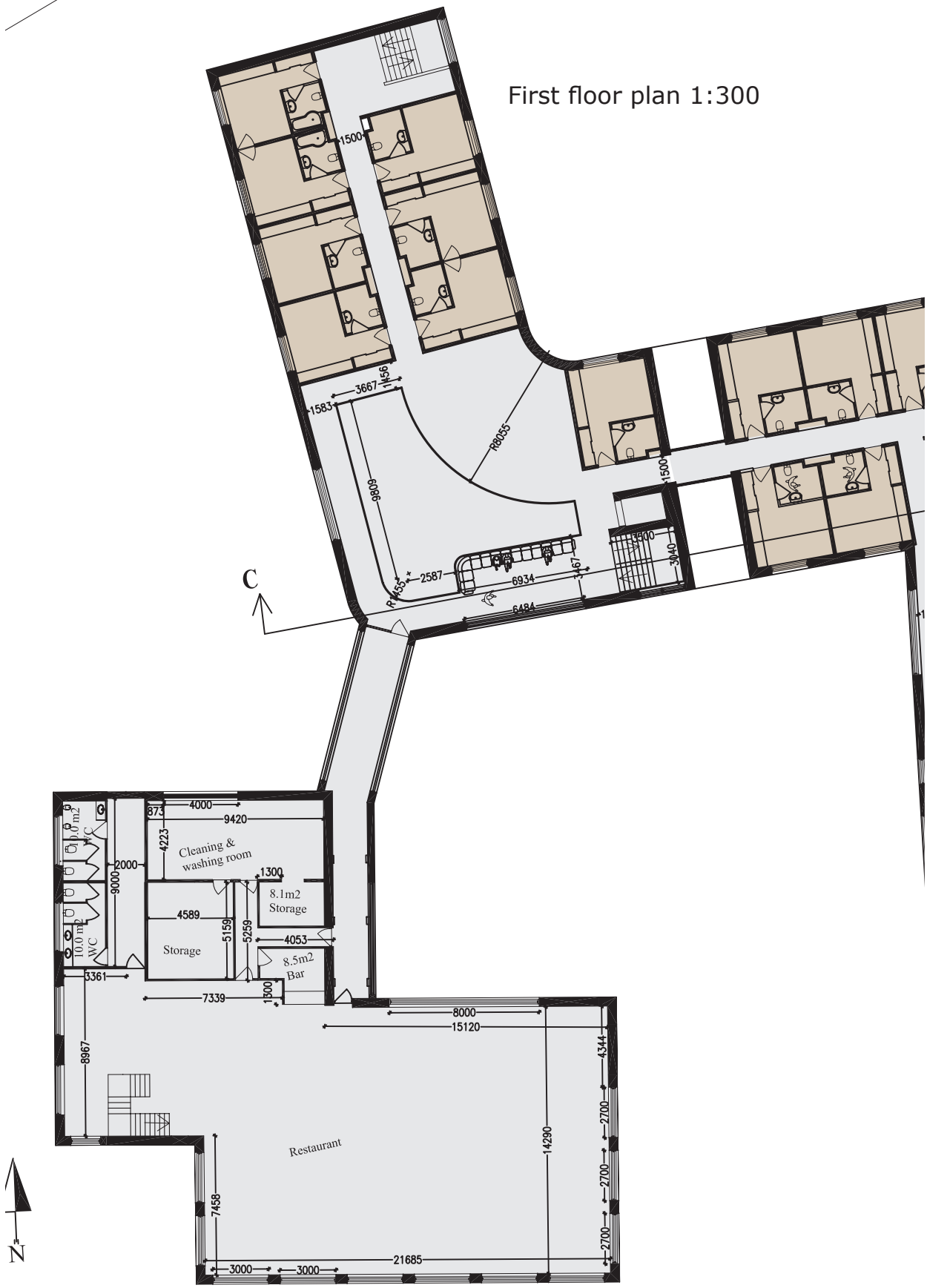
ill.186

Ground floor plan 1:300


B
23332
21m2 bedroom
21m2 bedroom
23.0m2 Service room
C
17001
21m2 bedroom
27 m2 stair well
1500
1476
16 m2 entrance
5317
21m2 Sauna
42 m2 Changing room
4289
5167
41.6 m2 Changing room for women
3521
12089
1687
2.9 m2 WC
1541
1528
2.1 m2 stor.
1650
1500
22.8 m2 Corridor
5031
1908
1169
2.6 m2
3.5 m2
46067
4.9m2 stor.
11.5 m2 Shawer
4328
14 m2 Shawer
2748
3046
2722
1558
3117
5167
1500
10.4 m2 stair well
31536
Spar
ø3500
900
1952
1113
ø1497
9210
173.5 m2 Swimming hall
13104
B

ill.187

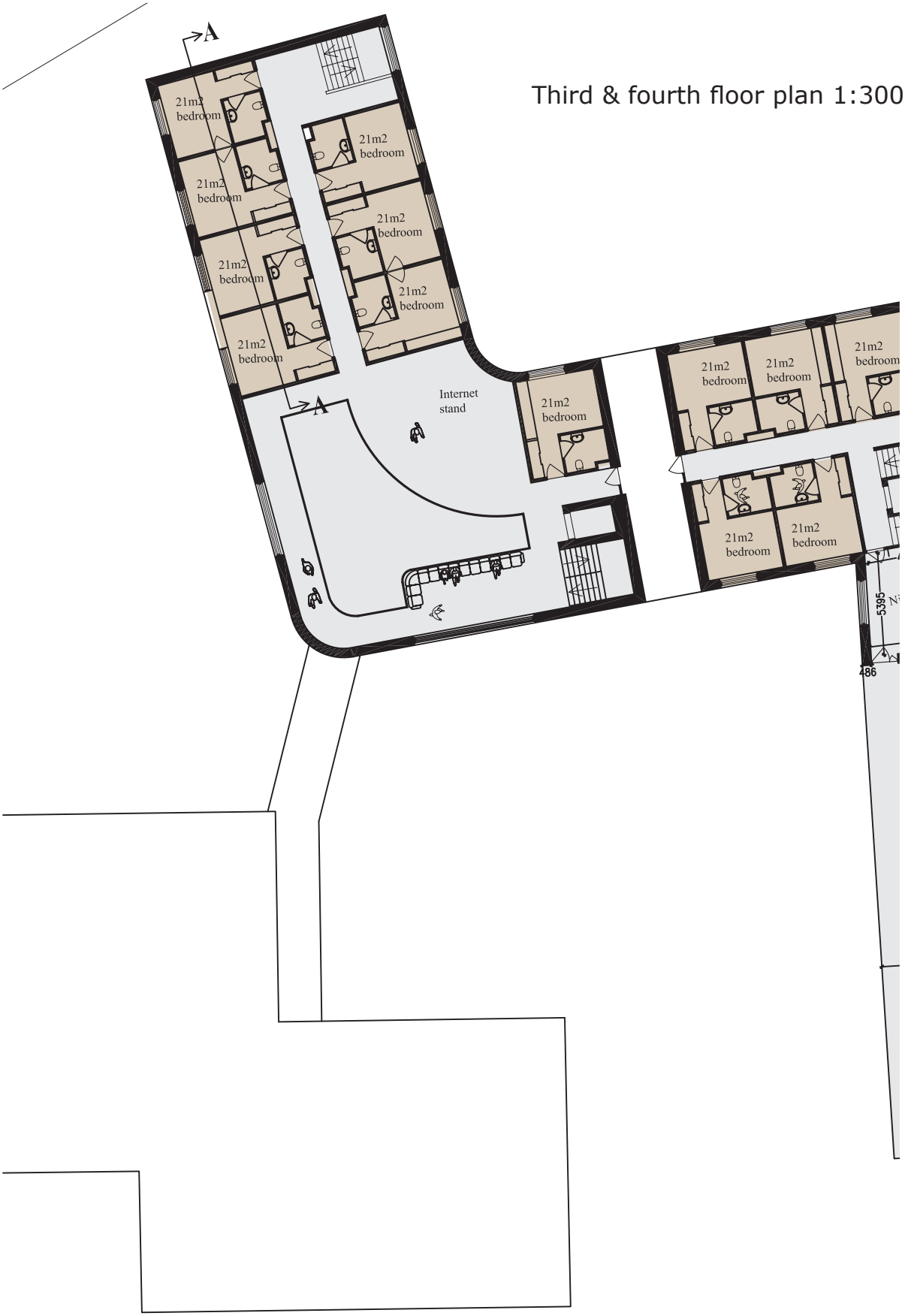
First floor plan 1:300

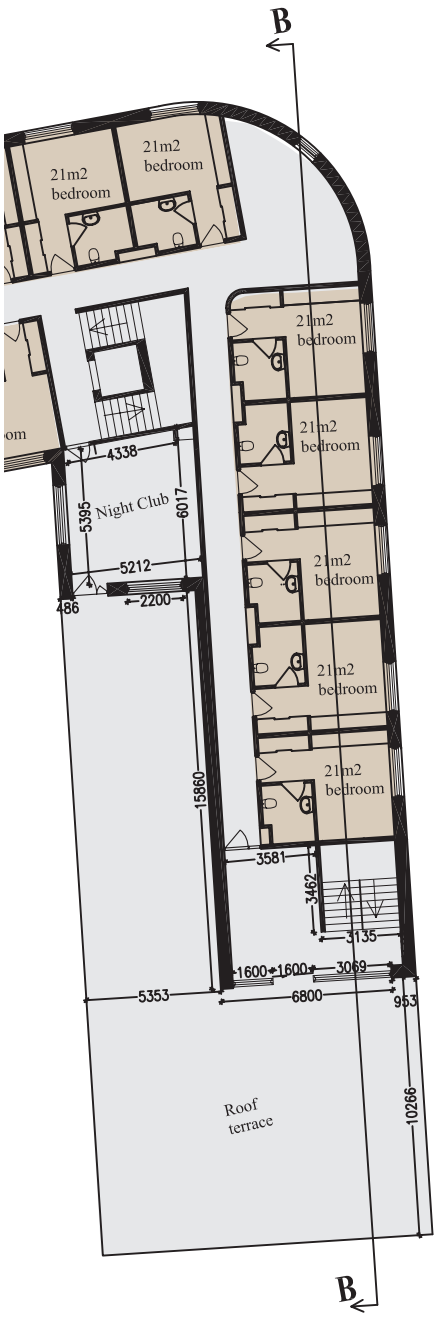



B
Meeting room
C
2803
2547
Massage therapy
7467
1500
1684
1408
1750
2014
2140
4279
1616
1412
2140
1590
2140
1508
3463
700
2100
1854
storage
2133
1500
2994
storage
2012
2994
1500
Conference room
7774
7521
1500
Fitness room
10116
12134
B

ill.188

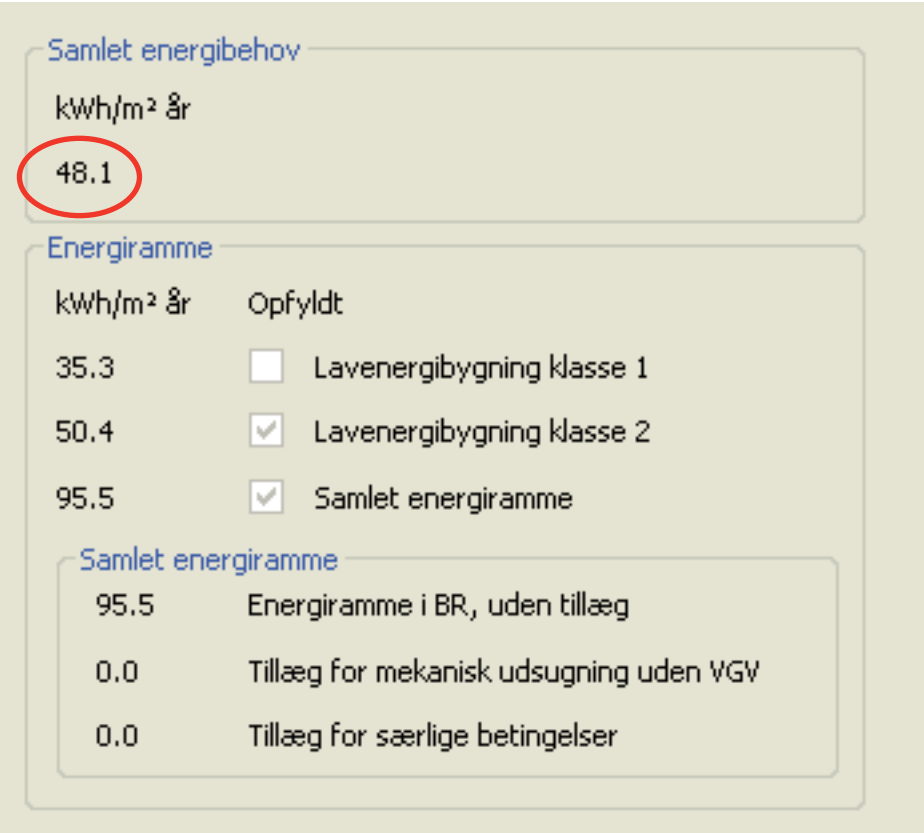
Third & fourth floor plan 1:300




B
21m2 bedroom
21m2 bedroom
21m2 bedroom
21m2 bedroom
21m2 bedroom
21m2 bedroom
21m2 bedroom
Night Club
4338
5395
6017
5212
2200
486
15860
3581
3462
3135
1600
1600
3069
5353
6800
953
Roof terrace
10266
B

ill.189

The following illustration show the various input values use for the energy simulation in BE06.
On the roof, solar cells are installed as part of the roof construction at an angle of 18 degrees oriented directly towards south southwest on a total roof area of 900 meter square.
The u-values of the doors and windows are 1.1 and 0.8 depending on a particular door or window type location which can be seen from the output sheet. The final energy consumption obtain as compared to the various energy classes it is below the energy frame Class 2 which is 50.4 kWh/m2 a year.



ill.190

Hotel Design Energy Simulation	
BBR-nr	
Ejer	
Adresse	

Bygningen	
Bygningstype	Andet
Rotation	0.0 deg
Opvarmet bruttoareal	4294.0 m²
Varmekapacitet	120.0 Wh/K m²
Normal brugstid	168 timer/uge
Brugstid, start - slut, kl	0 - 24

Beregningsbetingelser	
Betingelser	BR: Aktuelle forhold
Tillæg til energirammen	0.0 kWh/m² år

Varmeforsyning og køling	
Grundvarmeforsyning	Kedel
Elradiatorer	Nej
Brændeovne, gasstrålevarmere etc.	Nej
Solvarme	Ja
Varmepumpe	Nej
Solceller	Nej
Mekanisk køling	Nej

ill.191

Rumtemperaturer, setpunkter	
Opvarmning	20.0 °C
Ønsket	23.0 °C
Naturlig ventilation	24.0 °C
Køling	25.0 °C

Dimensionerende temperaturer,	
Rumtemp.	20.0 °C
Udetemp.	-12.0 °C

Ydervægge, tage og gulve					
Flade	Areal (m²)	U (W/m²K)	b	Dim.Inde (C)	Dim.Ude (C)
Wall north	484.0	0.10	1.000		
Wall south	470.0	0.10	1.000		
Wall east	745.0	0.10	1.000		
Wall west	750.0	0.10	1.000		
Roof	1140.0	0.10	1.000		
Floor	1140.0	0.15	0.700		
Ialt	4729.0	-	-	-	-

Fundamenter mv.					
Linjetab	l (m)	Tab (W/mK)	b	Dim.Inde (C)	Dim.Ude (C)
External wall foundation	233.0	0.03	1.000		
Around windows	516.2	0.03	1.000		
Around Doors	18.0	0.03	1.000		
Roof	233.0	0.15	1.000		
Ialt	1000.2	-	-	-	-

ill.192	Vinduer og yderdøre

Bygningsdel	Antal	Orient	Hældn.	Areal (m²)	U (W/ m²K)	b	Ff (-)	g (-)	Skygger	Fc (-)	Dim. Inde (C)	Dim Ude (C)
North facade	3	nv	90.0	4.8	0.80	1.000	0.50	0.48	North window	0.80		
North facade	32	nv	90.0	64.0	0.80	1.000	0.50	0.48	North window	0.80		
South facade	12	s	90.0	28.0	1.10	1.000	0.50	0.60	South facade window 3rd floor	0.80		
South facade	1	s	90.0	1.6	1.10	1.000	0.50	0.60	South facade window 4th floor	0.80		
South facade	2	s	0.0	22.7	1.10	1.000	0.50	0.60	South facade window 4th floor	0.80		
West facade	16	sv	90.0	32.0	0.80	1.000	0.50	0.48	West window	0.80		
West facade	1	sv	90.0	3.0	0.80	1.000	0.50	0.48	West window	0.80		
East facade	26	ø	90.0	54.0	0.80	1.000	0.50	0.48	East windows 1st floor	0.80		
South facade	1	s	0.0	27.2	1.10	1.000	0.50	0.60	South facade window 1st floor	0.80		
South facade	1	s	90.0	70.2	1.10	1.000	0.50	0.60	South facade window 2nd floor	0.80		
South facade	3	sv	90.0	19.0	1.10	1.000	0.50	0.60	South facade window 4th floor	0.80		

South facade	2	sv	90.0	6.0	1.10	1.000	0.50	0.60	South facade window 4th floor	0.80		
East facade	1	ø	0.0	7.0	1.10	1.000	0.50	0.66	East windows 1st floor	0.80		
	0		0.0	0.0	0.00	0.000	0.00	0.00		0.00		
	0		0.0	0.0	0.00	0.000	0.00	0.00		0.00		
	0		0.0	0.0	0.00	0.000	0.00	0.00		0.00		
	0		0.0	0.0	0.00	0.000	0.00	0.00		0.00		
	0		0.0	0.0	0.00	0.000	0.00	0.00		0.00		
	0		0.0	0.0	0.00	0.000	0.00	0.00		0.00		
Ialt	101	-	-	4537.7	-	-	-	-	-	-	-	-

Skygger					
Profil	Horisont (°)	Udhæng (°)	Venstre (°)	Højre (°)	Vindueshul (%)
Default	90	0	0	0	5
East windows 1st floor	90	0	0	0	5
East windows 2nd floor	90	0	0	0	5
East windows 3rd floor	90	0	0	0	5
East windows 4th floor	90	0	0	0	5
South facade window 1st floor	90	0	0	0	5
South facade window 2nd floor	90	0	0	0	5
South facade window 3rd floor	0	0	0	0	5
South facade window 4th floor	0	0	0	0	5
West window	90	0	0	0	5
North window	0	0	0	0	5

ill.194

Ventilation

Ventilationszone	Areal (m²)	qm (l/s m²), vinter	n vgv (-)	ti (° C)	El-VF	qn (l/s m²), vinter	qi,n (l/s m²), vinter	SEL (kJ/m³)	qm,s (l/s m²), sommer	qn,s (l/s m²), sommer	qm,n (l/s m²), nat	qn,n (l/s m²), nat
Swimming hall	197.0	5.07	0.80	18.0	Nej	0.00	0.10	1.0	5.07	4.78	0.00	0.00
Changing room	102.0	0.50	0.80	18.0	Nej	0.00	0.10	1.0	0.50	0.50	0.00	0.00
Fitness room	123.0	7.70	0.80	18.0	Nej	0.00	0.10	1.0	0.50	7.60	0.00	0.00
	0.0	0.00	0.00	0.0	Nej	0.00	0.00	0.0	0.00	0.00	0.00	0.00
Guest room	1742.0	0.00	0.80	18.0	Nej	0.00	0.10	1.0	0.00	3.00	0.00	0.00
Toilet	42.0	0.35	0.80	18.0	Nej	0.00	0.10	1.0	0.34	0.34	0.00	0.00
Office	21.0	3.30	0.80	18.0	Nej	0.00	0.10	1.0	0.50	0.50	0.00	0.00
Conference	58.0	1.70	0.80	18.0	Nej	0.00	0.10	1.0	0.50	3.00	0.00	0.00
	0.0	0.00	0.00	0.0	Nej	0.00	0.00	0.0	0.00	0.00	0.00	0.00

Internt varmetilskud				
Benyttelseszone	Areal (m²)	Personer (W/m²)	App. (W/m²)	App,nat (W/m²)
Fitness room	123	4.0	6.0	0.0
Swimming hall	197	4.0	6.0	0.0
Guest rooms & low activity areas	1742	1.5	6.0	0.0
Office	21	1.5	6.0	0.0
Corridors	458	1.5	6.0	0.0
Service room	23	1.5	6.0	0.0
Bar	29	1.5	6.0	0.0
Meeting room	23	1.5	6.0	0.0
Storage	138	1.5	6.0	0.0
Live guard & storage(swimming area)	12	1.5	6.0	0.0
Sauna	21	4.0	6.0	0.0
Massage room	27	4.0	6.0	0.0 ill.195

Toilet	42	1.5	6.0	0.0
Changing room	102	1.5	6.0	0.0
Reception area (including play & waiting room)	178	1.5	6.0	0.0
Stair well enclosure (3-stair wells)	202	1.5	6.0	0.0
Launge	34	1.5	6.0	0.0

Belysning											
Belysningszone	Areal (m²)	Almen (W/m²)	Almen (W/m²)	Belys. (lux)	DF (%)	Styring (U, M, A, K)	Fo (-)	Arb. (W/ m²)	Andet (W/ m²)	Stand-by (W/ m²)	Nat (W/ m²)
Swimming hall	197.0	0.5	1.0	300	3.00	A	0.30	0.0	0.0	0.0	0.0
Fitness room	123.0	0.5	1.0	300	3.00	M	0.50	0.0	0.0	0.0	0.0
Conference hall	59.0	0.5	1.0	200	3.00	K	0.50	0.0	0.0	0.0	0.0
Changing room	81.0	0.5	1.0	200	2.00	U	0.50	0.0	0.0	0.0	0.0
Reception	12.0	0.5	1.0	200	2.00	M	0.20	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0	0.00	U	0.00	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0	0.00	U	0.00	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0	0.00	U	0.00	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0	0.00	U	0.00	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0	0.00	U	0.00	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0	0.00	U	0.00	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0	0.00	U	0.00	0.0	0.0	0.0	0.0

Andet elforbrug	
Udebelysning, el-effekt	180.0 W
Særligt apperatur, brugstid	600.0 W
Særligt apperatur, altid i brug	6000.0 W

Ill. 196

Mekanisk køling	
Beskrivelse	Mekanisk køling
Kølevirkningsgrad	2.00
Forøgelsesfaktor	1.50
Dokumentation	

Varmefordelingsanlæg		
Opbygning og temperaturer		
Fremløbstemperatur	60.0 °C	
Returløbstemperatur	45.0 °C	
Anlægstype	2-streng	Anlægstype

Pumper			
Pumpetype	Pnom	Fp	Beskrivelse
Konstand drift året rundt	0.0 W	0.00	
Konstant drift i opvarmningssæson	0.0 W	0.00	
Tidsstyret drift i opvarmningssæson	75.0 W	0.60	Behovsstyret pumpe
Kombi-pumpe (konst. i opvarmningsæson)	0.0 W	0.00	

Varmerør					
Rørstrækninger i fremløb og returløb	l (m)	Tab (W/mK)	b	Udekomp (J/N)	Afb. sommer (J/N)

Varmt brugsvand	
Beskrivelse	Varmt brugsvand
Varmtvandsforbrug, gennemsnit for bygningen	100.0 liter/år pr. m²-etageareal
Varmt brugsvand temperatur	55.0 °C
Individuelle elvandvarmere	Nej

ill.197

Varmvandsbeholder	
Beholdervolumen	100.0 liter
Fremløbstemperatur fra centralvarme	60.0 °C
El-opvarmning af VBV	Nej
Solvarmebeholder med solvarmespiral i top	Nej
Varmetab fra varmtvandsbeholder	2.3 W/K
Temperaturfaktor for opstillingsrum	0.0

Varmetab fra tilslutningsrør til VVB			
Længde	Tab	b	Beskrivelse
2.0 m	0.2 W/K	0.00	Varmerør 1"

Ladekredspumpe	
Effekt	50.0 W
Styret	Ja
Ladeeffekt	10.0 kW

Cirkulationspumpe til varmt brugsvand	
Effekt	0.0 W
El-tracing af brugsvandsrør	Nej

Rør til varmt brugsvand			
Rørstrækninger i fremløb og returløb	l (m)	Tab (W/mK)	b
Horizontal pipe	2.0	0.03	1.000
Verctical pipe	2.0	0.03	1.000

ill.198

Vandvarmere	
Elvandvarmer	
Beskrivelse	Elvandvarmer
Andel af VBV i separate el-vandvarmere	0.0
Varmetab fra varmtvandsbeholder	0.0 W/K
Temperaturfaktor for opstillingsrum	1.00
Gasvandvarmer	
Beskrivelse	Gasvandvarmer
Andel af VBV i separate el-vandvarmere	0.0
Varmetab fra varmtvandsbeholder	0.0 W/K
Virkningsgrad	0.5
Pilotflamme	50.0 W
Temperaturfaktor for opstillingsrum	1.00

Kedel	
Beskrivelse	Good condensation gaskedel
Brændsel	Gas
Nominel effekt	28.0 kW
Andel af nom. effekt til VBV produktion	1.0

Nominelle virkningsgrader				
Last	Belastning	Virkningsgrad	Kedel temp.	Korrektion

ill.199

Fuldlast	1.0	0.96	70.0 °C	0.001 -/°C
Dellast	0.3	1.05	35.0 °C	0.001 -/°C

Tomgangstab				
Last	Belastning	Tabsfaktor	Andel til rum	Temp. dif
Tomgang	0.0	0.005	0.75	30.0 °C

Driftsforhold	
Kedeltemp, min	0.0 °C
Tempfaktor for opstillingsrum	0.00
Blæsereffekt	150.0 W
El til automatik	7.0 W

Fjernvarmeveksler	
Beskrivelse	Ny fjernvarmeveksler
Nominel effekt	16.0 kW
Varmetab fra veksler	1.5 W/K
VBV opvarmning gennem veksler	Ja
Vekslertemperatur, min	0.0 °C
Tempfaktor for opstillingsrum	0.00
Automatik, stand-by	5.0 W

Anden rumopvarmning	
Direkte el til rumopvarmning	
Beskrivelse	Supplerende direkte rumopvarmning
Andel af etageareal	0.0
Brændeovne, gasstrålevarmere og lign.	

ill.200

Beskrivelse	
Andel af etageareal	0.0
Virkningsgrad	0.4
Luftstrømsbehov	0.1 m³/s

Solvarmeanlæg	
Beskrivelse	Nyt solvarmeanlæg
Type	Kombineret

Solfanger			
Areal 900.0 m²	Orientering sø	Hældning 18.0 °	Varmetabskoefficient 3.5 W/m²K
Skygger	Horisont 0.0 °	Venstre 0.0 °	Højre 0.0 °

Rør til solfanger	
Længde 35.0 m	Varmetab 0.17 W/mK

Effektiviteter	
Start 1.0	Veksler 1.0

El	
Pumpe i solfangerkreds 50.0 W	Automatik, stand-by 100.0 W

Varmepumpe	
Beskrivelse	Ny varmepumpe
Type	Brugsvand
Andel af etageareal	0.0

Eldrevet varmepumpe		
Art	Rumopvarmning	VBV
Nominel effekt	0.0 kW	0.0 kW
Nominel COP	0.00	0.00
Rel. COP ved 50% last	0.00	0.00

Test-temperaturer		
Art	Rumopvarmning	VBV
Kold side	0.0 °C	0.0 °C
Varm side	0.0 °C	0.0 °C

Type		
Type	Rumopvarmning	VBV
Kold side	Jordslange	Jordslange
Varm side	Rumluft	-

Diverse		
Type	Rumopvarmning	VBV
Særligt hjælpeudstyr	0.0 W	0.0 W
Automatik, stand-by	0.0 W	0.0 W

Varmepumper tilknyttet ventilation		
Type	Rumopvarmning	VBV
Temp. virkningsgrad for VGV før VP	0.00	0.00
Dim. indblæsningstemp.	0.0 °C	-
Luftstrømsbehov	0.00 m³/s	0.00 m³/s

Solceller	
Beskrivelse	Nyt solcelle anlæg

Solceller		
Areal 0.0 m²	Orientering s	Hældning 11.0 °
Horisont 0.0 °	Venstre 0.0 °	Højre 0.0 °

Diverse	
Peak power 2.000 kW/m²	Virkningsgrad 0.00

ill.202

Aalborg University-Architecture & Design
Franklin Akagah Andersen
10th –Semester 2008-ARK-s

Project Summary:
The project contains a presentation of 69 guest rooms for four storey hotel building with wellness facilities such as swimming pool, Sunbathing roof terrace , fitness, massage therapy and a conference hall, build up in a total area of 4294 m2 excluding restaurant attach to the hotel. For the guest of the hotel, there are two parking lots with the main parking area place to the north side of the hotel which serves as the main arrival entrance to the building. There are 28 parking spaces of which one parking lot is allocated to four guest rooms.
The hotel is design as active building with solar cell installs as part of the roof construction for hot water heating and also active thermal mass for heating up some part of the building during winter time.
The master plan of the site as well as 3D-Cad modelling ,energy simulations and investigation carried out during the sketching phase are included to have an over view of the project .