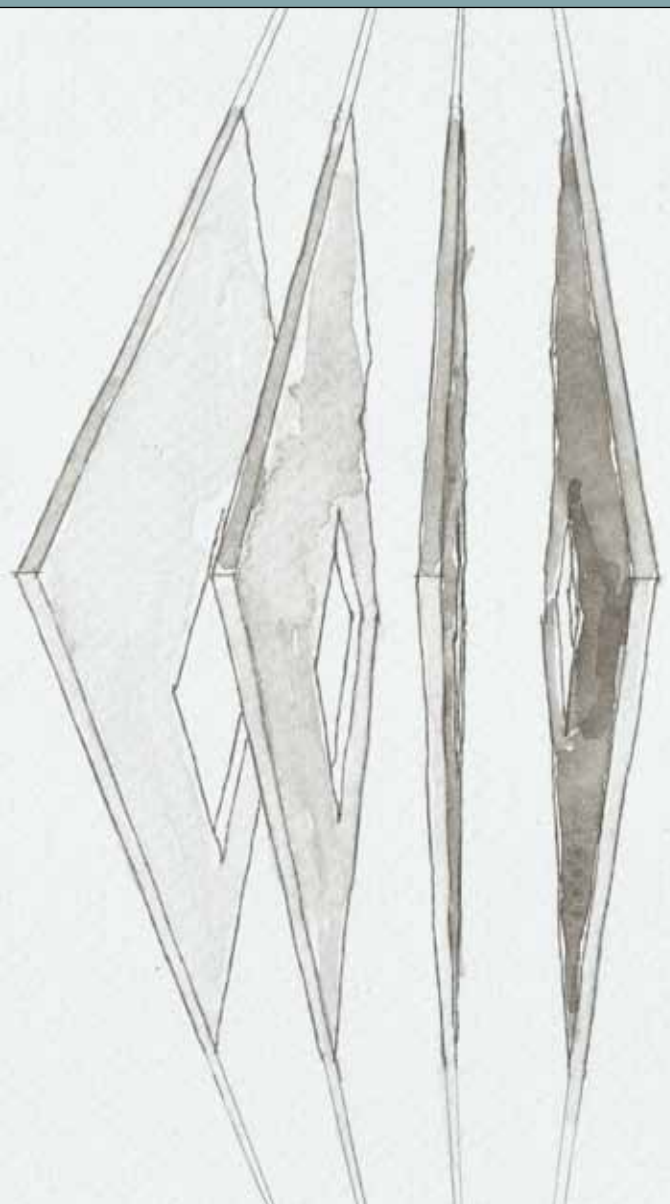
HGSD 05°16E 59°24N

NEW CITY LIBRARY

BODIL UDSTUEN HOVDEN, MA4-ARCH17, 2012, ARCHITECTURAL DESIGN, AALBORG UNIVERSITY DEPARTMENT OF ARCHITECTURE, DESIGN & MEDIATECHNOLOGY



HGSD 05°16 E 59°24 N
NEW CITY LIBRARY

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Department of Architecture, Design and Media Technology
Architectural Design

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Synopsis
In this report the design of the new city library to the port city of Haugesund, situated on the coast of southern Norway is development and presented. The site is situated on a corner of an old city block and the footprint is dense and controlled by the three surrounding streets. The library is developed with the intention of bringing new life and a new function to the city centre. It should be a new social platform and a pulsating house situated by the town hall square among some of the city's most significant buildings. The design is to contain all the functions of a modern library. The building must furthermore set a new sustainable example for the city and obtain the energy demands for 2020.

Bodil Udstuen Hovden

INTRODUCTION

HGSD 05°13E 59°23N is the final master thesis project by Bodil Udstuen Hovden specializing in architecture from the department of architecture, design and media technology, at Aalborg University.

The project task is to design a new sustainable city library to the expanding port city of Haugesund, situated on the coast of southern Norway. The project is not a part of a competition or a planned project.
The library is developed with the intention to bring new life and a new function to the city centre. It should be a new social platform and pulsating house situated by the town hall square among some of the city's most significant buildings of the city. The design is to be aesthetical, functional and should contain all the functions of a modern library.

This new city library is furthermore to be designed as a low energy building and the goal is to stay within or under the demands of a 2020 building. The demand for a public building by 2020 is to stay within a maximum energy consumption of 25 KWh per heated square meter per year.

CONTENT

PROJECT SUMMARY

IN DANISH

HGSD 05 ° 13E 59 ° 23N er et master projekt skrevet af Bodil Udstuen Hovden, med speciale i arkitektur fra Institut for Arkitektur, Design og Mediateknologi, ved Aalborg Universitet.

Opgaven er at designe et nyt og bæredygtigt bibliotek til havnebyen Haugesund, beliggende på vestkysten af det sydlige Norge. Byen er en livlig by med cirka 45.000 indbyggere og med en omgivende befolkning på cirka 100.000.
Projektet er ikke en del af en konkurrence eller et planlagt projekt, men lavet til denne master opgave.

Med det nye biblioteket ønskes der at bringe nyt liv og en ny funktion til byens centrum. Huset skal være en ny social platform og et pulserende hus beliggende ved rådhuspladsen blandt nogle af byens mest markante og vigtigste bygninger såsom Rådhuset og domhuset. Designet skal være funktionelt og skal indeholde alle de funktioner et moderne bibliotek kræver. Biblioteket skal endvidere udformes som et lavenergibyggeri, målet er at holde projektet inden for eller under kravene til en offentlig 2020 bygning. Kravet for energi forbruget ved en offentlig bygning i 2020 kravene, er et maksimalt energiforbrug på 25 kWh pr opvarmede kvadratmeter per år.

Rapporten som anvender den overordnede metode ”integreret design” beskriver projektets udvikling og begynder som defineret i teorien om integreret design med analysefasen hvor biblioteket, brugeren og området undersøges. Her efter kommer design og skitsefasen hvor designet udvikles igennem an antal udviklings processer og udvælgelser. Nærmere bestemt ved metoden beskrevet af Steen Agger hvor ideer og koncepter udvikles for på ny at blive kombineret og herefter yderligere udviklet, for på den måde at opnå et bedre løsningsforslag.
Efter denne fase følger detaljeringsfasen, her bliver designet specificeret og udviklet til et højere detaljerings niveau. Til sidst kommer selve præsentationen af projektet samt en konklusion og en refleksion over resultatet.

Det endelige resultat er en bygning som gennem funktionel intuitiv indretning tillader den besøgende at gå på opdagelse op igennem den roterende atriumbaserede midterakse. For til sidst at ende på bygningens grønne tag med udsigt ud over den nærliggende havn og de omkringliggende hustage.

METHOD

THE INTEGRATED DESIGN METHOD

The overall method used for the project is the integrated design process created by Mary-Ann Knudstrup [Knudstrup, 2005] as this is the model of preference at Architecture & Design. The integrated design process is a tool in a project that seeks to combine the technical, aesthetical and practical solutions throughout the process and project.
By implementing the aesthetic and technical aspects early in the process one establishes a greater base to make qualified choices and decisions throughout the course of the project from. It also ensures that the finalized project meets the goals and demands listed at project start.

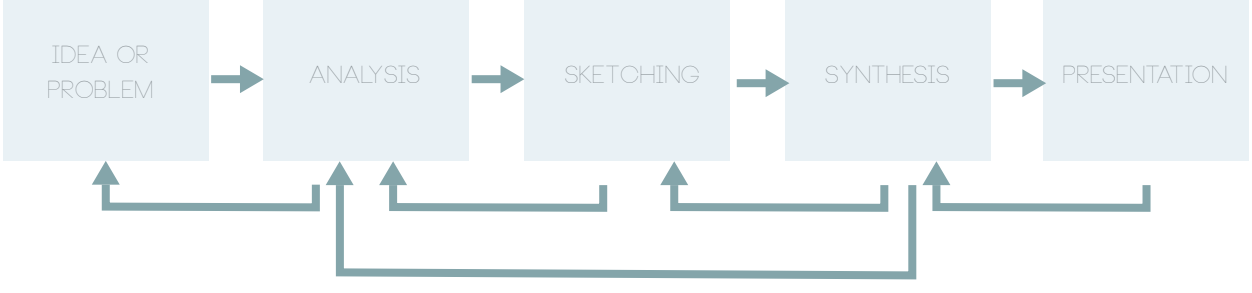
The process is divided into four different phases. It consists of: an analysis phase, a sketching phase, a synthesis phase and finally a presentation of the project outcome. The design process works as seen in the figure below, with one step forward in the process one always move a step back to analyze the result. After several of these processes the result will be an integrated design.

In the analysis phase a mapping of the project site is made and an analysis over what the library is and offers is also made. During the sketching phase a range of methods will be used, such as manual sketching, 3D computer drawing and physical models. Throughout the process, the design will be evaluated with calculations and the technical simulation programs BE10, Bsim and Velux daylight Visualizer.

When the design is completed, the synthesis phase will detail anjd complete the design. Thereafter the final design proposal is presented.

The following will briefly describe two theoretic methods used in the analysis and sketching phases.
Serial vision
Serial vision by Gordon Cullen is an analyzing tool for the site and the surrounding area. One walks prespecified routes through the area and takes pictures or sketches as many pictures one can. Afterward you analyze the pictures and find interest points and hidden aspects of the area. Through using this tool one gets a deeper understanding and perspective on the area or site. [Cullen,1971]

Sketching systemizing
Sketching systemizing method by Steen Agger is in its essentials made out of three phases. The first phase is a free sketching phase where all ideas good and bad are equal. The following and second phase is based on the first phase. But now the focus is to identify potential in the previously made sketches and to try and combine ideas into new even better ones. The third and final phase is all about specifying the new and better ideas from phase two. By using this method one lets the ideas work together to form better integrated solutions. [Agger, Steen, 20.02.12]



ANALYSIS


A
OSLO I DEMRING
IVO ANDRIĆ PASJAENS BESKERINNE
DUCK CITY
vita andersen
MANDEL
LARS ANDERSEN | VÆRINGENE

HAUGESUND

LONGDITUDE 05°16´04 E LATITUDE 59°24`49 N

Haugesund is a town and municipality situated on the rough but beautiful west coast of southern Norway. The town is a small municipality of about 72 square kilometres with nearly 45.000 inhabitants and a surrounding population of about 100.000. [Haugesund.kommune.no]

The city was once a big herring fishing city, and is now a large shipping and offshore supply town. There is still some herring production in the city, but it is not the city's main enterprise anymore. The city and region is now big within the oil, gas, offshore business and shipping.

Haugesund is a city with a pulsating cultural life, a beautiful coast line and large natural areas. The city is also home to national cultural events such as the annual Norwegian film festival "Amanda prisen" and Norways largest jazz music festival called "Silda-jazzen with the biggest international jazz musicians held every august. These are the two biggest cultural events of the city but furthermore the city has a great theatre and an expanding music community.

The city has big potential for cultural growth but the city is in lack of places and physical facilities for the population to evolve. The younger generations feels left out of the city picture and many youth clubs has shut down and lack a place to go in the hours after school. The city library today is not a place that attracts this group. The library does not have a central place in the city centre. The city core of Haugesund have had some difficult years with closing of stores and a downfall in visitors, losing a battle to big shopping centres and industry areas outside the city centre.

This is one of the reasons why it is decided to design a new library for the population of Haugesund. Not being just a library where one can read and loan books, but a place where the visitor young or old can unfold in a range of ways either with books, games, good conversations, relaxation and all the other things a new and modern library should be able to offer. This new library should also be the new social platform and a heart to bring the city centre new a new pulse.


HAUGESUND


THE BUILDING AREA


THE BUILDING SITE
N

THE LIBRARY

WHAT?

Knowledge is might
-Francis Bacon

To fully understand the library, the functions and its place in the mind of the users, a closer look at the library as an institution is made. There are many types of libraries, the small local libraries, the big city libraries and in the libraries situated in schools or institutions. Cut to the core, a library is a place to find read and lend books home. But the library is also a place to seek advice from the librarians, surf the internet, play, interact and study. A library is often divided into different areas or departments such as a children's department an adult department and a study hall or study areas. There are also areas for music, films and games. But the library has, as an institution in the last ten years experienced a big growth and transformation and is getting a stronger grip of the townscape. The book "biblioteket i byudviklingen- oplevelse, kreativitet og innovation" appoints the library to be an important cultural, social and creative public space where all ages, cultures and interests can meet. [Rasmussen, Jochumsen, Skot-Hansen,2011].
The library is the city knowledge bank. A place one can come to evolve, explore, learn and to meet other people. But the libraries have over the last ten years undergone a revolution. It is no longer "just" a place where you come, loan a book, read or ask for guidance by a librarian.
Multimedia has over the last years become a huge part of the society and everyday activities. This means that a large part of the library needs to be updated to accommodate the new trends and technologies so that the library is able to keep up with the user. The digitalization of the library has also changed the way we use the library. The user can now also search the libraries database from the comfort of his own home for the book he needs, order it and go down and get it at the local library the next day.
The opening hours are also changing, as the visitors are requiring longer opening hours. People are working longer hours, studying more, part time or full time, and the hours of the day never seem to be enough. Many libraries have therefore open 24 hours a day, such as the new big library in Malmö city in Sweeden. The library has also changed into a more social building where people meet and for example have a cup of coffee or maybe the cafe is well known for the best piece of cake in the city.

To understand the modern library, three cases over different types of newer libraries have been made.
The cases are Peckham library in London, Openbare Library in Amsterdam and Seattle public library in Seattle, USA. These have been chosen because of the difference in design and that I found these three solutions inspiring.


FRUGT
HAVEN

CASE #1

OPENBARE BIBLIOTHEEK
AMSTERDAM, NETHERLANDS

Opened in July 2007
Architect: Jo Coenen

Openbare Bibliotheek in Amasterdam opened in july 2007 and is a popular and well visited library. The library is open 7 days a week and has about 2.5 million users each year. Focusing on the modern library interior, former Dutch state architect Jo Coenen has created a library were he introduces organic shapes and untraditional light sources and gives the library a playful vibe and vibrant interior. Round shelves arranged as small book islands or clusters creates small private rooms of sanctuary. The library is divided on seven floors and is a sustainable building, winning the price 'Most Sustainable Public Building in Amsterdam' in 2008.

The buildings sustainable features is for example solar panels, sustainable materials, waste control and long term energy storage systems to mention some.
The many comfortable and diverse seating groups and furniture gives the user a broad choice and invites the user to stay and read.

[www.iamsterdam.com]
[www.mab.com]

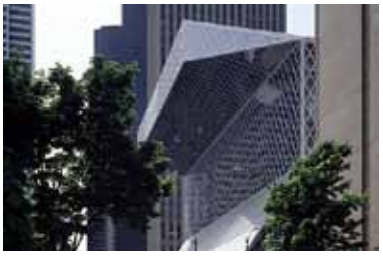
CASE #2

SEATTLE PUBLIC LIBRARY
SEATTLE, USA

Opened in may, 2004
Architect: Rem Koolhaas OMA

The public library situated on a sloping Seattle site, between two streets allows the user to enter the library from street level on both sides of the iconic library building. Koolhaas introduces two significant features in the building, he creates a dynamic crystallized and unusual exterior and interior but he also plays with the conventional use of the systemization of the books and literature. A conventional library would have the books on different levels, whereas Koolhaas has made a continuous spiral spanning over the four floors allowing the user to browse though the entire library collection in one continuous motion.
“The stacks, arranged along a continuous spiral ramp contained within a four-story slab, reinforce a sense of a world organized with machine-like precision.”
-Nicolai Ouroussoff, Los Angeles Times
The Building despite being very modern also has a “living room” for users to read in, a café, an auditorium, a “mixing chamber” or a reference desk for users to attain assistance from library staff concerning research, the library has about 400 public computers and automatic book sorting.

[www.arcspace.com]



CASE #3

PECKHAM LIBRARY
PECKHAM, LONDON

Opened in march, 2000
Architect: Alsop & Stormer

On the plaza at the junction of Peckham Hill Street and Peckham High Street in south-east London, Peckham library was opened on March 8, 2000. The area of Peckham is one of the most ethnically diverse areas of the UK, and the new library was built as a step in the plan to revitalize the area. The building won the Stirling Prize in 2000.
The architects Alsop & Stormer has designed a building that combines strong form, vivid color. The building is shaped as a big L, upside down resting on seven thin columns and with a big red sphere on top, locally called the tongue. The tongue works as a sun shade for the top floor and is also a part of the natural ventilation system. The building has no mechanical air-conditioning so it relies on the passive cooling and natural ventilation of this system.

The north facade of the building is a full glass façade with a grid of clear and vividly colored glass. The different colored glass gives a nice combination of natural light and colored light in the different rooms.
On the top and fourth floor where the library is situated the architect has designed three raised rooms that they call “pods”. They are raised and therefore leave free space underneath for use by both the library staff and visitors. The space has room for many visitors, and the library is used by about half a million visitors a year.
The unusual shape and painted copper cladding in contrast to the tinted and clear glass facade gives this library a unique expression. The playful use of opened and closed rooms in the library room is intriguing and the local community evolves in the building. The bold design with the sustainable ideas of no mechanical ventilation is cleverly designed, but does not work optimal in the summer months, where the indoor thermal comfort can be poor.

[www.galinsky.com]
[www.southwark.gov.uk]

OUTPUT

These three libraries are very different from each other, but all three are popular and well visited in their community. These cases have inspired me in different ways. At Openbaare in Amsterdam the use of the untraditional shelves and the utilization of the atrium area for seating and reading are good and I want to incorporate these ideas in the further process. From the library in Pecham, London I find the exterior expression interesting when I visited. The backside with the beautiful color tinted glass made an impact as you moved up the building and by each step the light had a different color. The mix of tinted glass and copper is something I also will have in mind when developing my library concept. Regarding the Seattle public library its iconic shape struck me. The building is recognizable and playful. The idea of the spiral shaped bookshelf reaching through the building is inspiring and the idea will be in the back of my head as I design the new Haugesund city library.

THE LIBRARY

WHY?

In Haugesund there is one main city library but previously there were many small libraries around in the districts, in a so called district house. The main library is situated in the outskirts of the city centre and is designed by a local post-war architect David Sandved who designed the building both exterior and interior, but also all the furniture. Before the building was built in 1967 the main library has been located in a range of different places in the city.

As a child I did not read many books, but loved to look at pictures and listen to stories. The local district house library I went to as a child in the early 90´s was a square semi dark room with rows of books, and miniature wooden furniture we could sit on and read. This has been my perspective on a child's department in a library for many years, and years ago it was how they often were. But over the years the district libraries has closed and the main library is the one left in Haugesund besides libraries in the learning institutions.

The library in Haugesund has over the last few years experienced an increase in the amount of visitors and out loans; this is a consequence of great staff effort with good initiatives and branding of the library. Especially the children's department is popular, and the vibrant staff arranges many events and fun activities in the library. But the library is in general used by all age groups, and has functions for all. But the interior of the library can feel dark and the atmosphere a bit gloomy. On the opposite page you can see some pictures of the library today.

Functions
The library is a building that contains many different functions.
Functions of the city library have today:
-An adult section
-Children's section
-Youth section
-Study hall
-Computers with internet
-Printing opportunities
-Toilets
-Local history
-Reading space

Why design a new library in Haugesund?
The reason I want to design a new city library for Haugesund is because the library and its great staff could with this new building and more space offer the city a new range of services, activities and thereby cultural growth. As mentioned earlier, the library is a knowledge bank and could be a cultural and creative scene for the city, if it had the right environment. The old library has a dark feel to it and a sleepy atmosphere. The city centre and the library in general need a boost of energy and a new pulsating meeting point. A new and modern library in a new and more central site of the city will be a push in the right direction for a new and more social city centre.

THE USER

WHO AND WHY?

To be able to design the library a user also has to be settled. I have talked to citizens of Haugesund of different ages and interests and asked what they would want and wish for in a new library.
The user of the library is the general population of Haugesund, as it is a public building and a function open for all.

Through conversations with friends and family it is clear that all age groups would have great joy of a new library, but they also have different interests and needs. The need for the user of the library depends as mentioned earlier on the age and interest. To illustrate the different needs I have chosen six different users with different needs to represent the average users of the library.

Merete 23 years, student

"I wish the city had a study hall away from the university college, where i can focus. But also a place to work both in groups and alone. A café where you can have a cup of coffee and have a chat vith friends could also be nice"

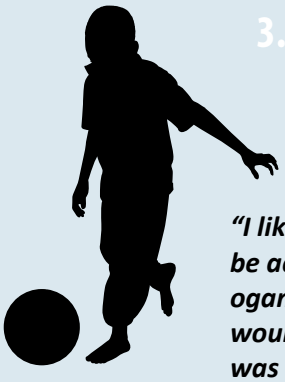
Amalie, 14 år
8. grade

" I love fantasy books and all books in general. It could be nice to have a library where i could meet others interested in the same genre as me, and talk about it, like a little club or something"

Linn & Jørgen, mom and child

"We would go to the library more often if there were a place to play for the children but also a place where the parents could meet. If there were a room for the small children, it could also be a great place for maternity groups to meet, and a place where the small children could explore their senses. "

Casper 8 years, 3. grade



"I like to play and be active, but videogames are cool to. It would be cool if there was a place I could play games I do not have at home"

Olaf 64 years, Retired school teacher

"After my retierment i have missed a place to spend time during the day. A library with a good local history department could be nice, and a place for where I can meet other people and be social"

Emil 6 years, 1. grade

"I would like to have a place to play and listen to stories.... its cool if they do voices or maby a puppet show"

THE LIBRARY

FUNCTIONS

The library is a building that has a lot of practical functions and services. The librarians have many tasks, and needs to have a practical work environment. For example the book needs to get from A to B, from the shelf to the user, and when the user delivers it back it needs to go from the user and back on the shelf. Modern libraries has a computerized sorting machine for the books, the machine sorts the books onto trolleys, but loading the books onto a trolley and to put the books back on the shelves again are still the librarians task. So the sorting machine has to have a central placement in the building so that the work process of getting the books out is as smooth as possible. There also needs to be space for the trolleys and for the staff to move around in the library comfortably. It should also be a building where the visitors easily can find what they need and navigate between the different sections. There should therefore be signs and direction markers so that the visitor easily finds their way, and the architecture should enhance this.

Functions in the new library

In the new library I want to focus on the meeting between the library and the visitors but also the meeting among the visitors. It should be a place for both casual and planned meetings. Adding a café to the library service can attract visitors, be a nice social spot, and serve as the heart of the building.

The new building should also contain a bigger and more creative children's section. Children are the future, and there are generally a lack of places where a child can come to explore their imagination and senses. But when focusing on the children it is important to focus on the parents as well. They could enjoy comfortable seating arrangements, spacious enough for a baby stroller, and a café with baby food and a proper nursing room to mention some examples.

The students of the town also lack a proper study hall and a good workplace away from the different institutions. The older children, the teens should also get a part in this new meeting place. In general the new library should be a welcoming and inviting building and a place the visitor wants to come, stay and enjoy the facilities.

The new library should contain these functions

-Children's section
-Youth section
-Adult section
-Study section
-Study hall
-Café
-Multimedia center
-Print and copy area
-Local history section
-Lounge area
-Self checkout
-Group study rooms
-flex area for lectures, concerts ect.
-Storage
-Staff facilities
-Toilets
-Nursing room
-Outdoor recreational area
-Computerized sorting machine
-Technical room

ROOM PROGRAMME

FUNCTIONS

	Functions	m2	Ligth	lux	Room higth	Comfort temp	ventilation
Service funtions	**Entrance**	30	Daylight	200	3m	22	Hybrid
	Check in/out	30	Daylight	200	3m	22	Hybrid
	Info	20	Daylight+artificial	200	3m	22	Hybrid
	Café	70	Daylight	200	3m	22	Hybrid
	Kitchen	20	Daylight+artificial	200	3m	22	Mechanical
	Toilet	50	Artificial	100	3m	22	Mechanical
	Nursing room	10	Artificial	100	3m	22	Mechanical
Library functions	**Childrens dep**	300	Daylight+artificial	400	3m	22	Hybrid
	Youth dep	200	Daylight+artificial	400	3m	22	Hybrid
	Adult dep	600	Daylight+artificial	400	3m	22	Hybrid
	Study hall	200	Daylight+artificial	400	3m	22	Hybrid
	Group rooms	50	Daylight+artificial	400	3m	22	Hybrid
	Local history	70	Daylight+artificial	400	3m	22	Hybrid
	computer area(s)	50	Daylight+artificial	400	3m	22	Hybrid
Staff functions	**Storage**	500	Artificial	100	3m	20	Mechanical
	Offices	100	Daylight+artificial	200	3m	22	Hybrid
	Lunch room	30	Daylight+artificial	100	3m	22	Hybrid
	Cleaning rooms	15	Artificial	100	3m	20	Mechanical
	m2 total	2345					

THE SITE

HAUGESUND AND EXISTING CONDITIONS

The project site is located in the city centre of Haugesund, with the town hall, the city's central square, the town hall square as the nearest neighbors. The site is a section of an old city block, where the buildings are no longer used for commercial purposes and the buildings are in slight decay. The site is surrounded by other city blocks on every side but to the east where the town hall square is situated.
The site is centralised in the core of the city and many people race by every day. The city is as earlier mentioned a vibrant port city, and the waterfront is a pulsating pier with restaurants, pubs, cafes and hotels.
In this following analysis I will take a look at the block and register the buildings from the different views. I will also focus on the town hall square and the buildings surrounding it, to discover the buildings the library will be a part of.
I will also take a closer look at the traffic, the flow and the different functions that is surrounding the site. And finally the micro climate, wind and sun will be analyzed.


BJØRN LARSEN

THE SITE

THE BLOCK- VIEWS TOWARDS THE SITE

To get a deeper understanding of the site and the area I have made a serial vision inspired registration over the area. Serial vision is a registration tool developed by Gordon Cullen, where you take pictures while walking a given route through an area. The output is a broader understanding of the area and the way you see and perceive the site.
Here are six different views towards the site. As the building site is located in such a dense urban setting the views from the different streets are very different depending on the surrounding buildings. In view 1 you see how the site looks from the court house, and how the site is on a central corner of the area. The views 2,3,4 and 6 show that the streets on either side of the site have different expressions and more or less pulse. View 6 is the street that leads up to the pedestrian walking street which shows on the facades and the pulse of people and cars. When you look at view 5, the view from the town hall, you see the big square and the nice placement of the site on the corner of the square.

The full Serial visions can be seen on the cd.


1

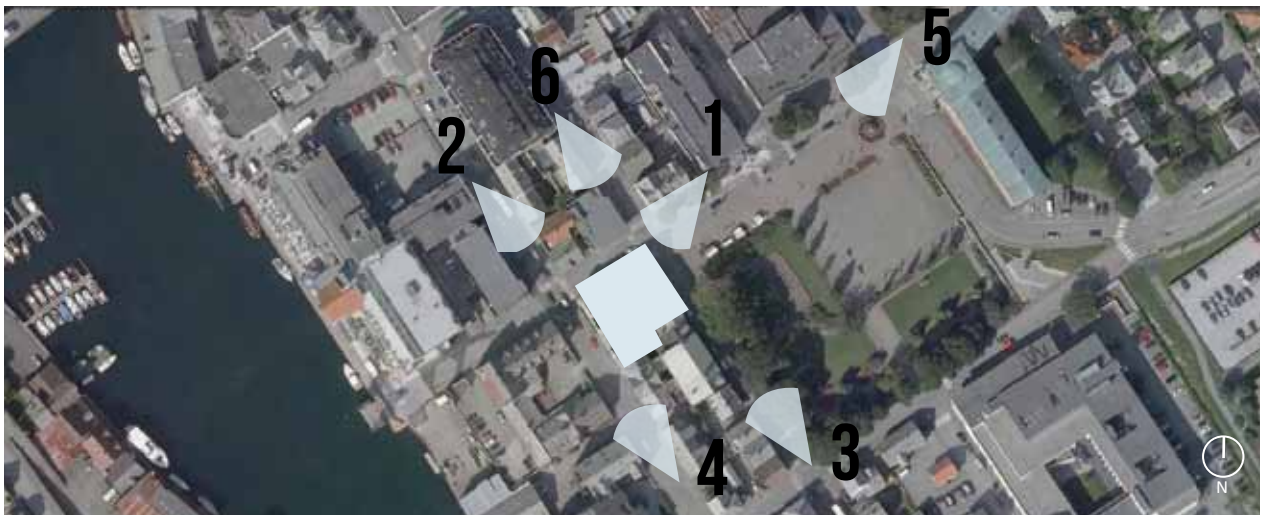

2


3


4


5


6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THE SITE

SURROUNDING ARCHITECTURE AND SIGNIFICANT BUILDINGS

When exploring the area it is important to have a look at the surrounding architecture and the significant buildings in the area. The area is home to some of Haugesunds most important buildings such as the town hall, the university college, and the courthouse and concert house. On these pages pictures of these significant buildings will be shown.

The architecture around the square is very monumental and massive. Buildings 1 to 6 are all built in heavy and massive materials. Only the new extension to Maritim hotel has a mixture of concrete and wood facade, probably inspired by the other old wooden houses in the city centre. So when designing this new library on this central corner site of the big square one need to keep in mind that the building will add a new facade to the square, and that it will have all these significant buildings to work with and interact with.

The court house

"Festiviteten" Concert house


3
The town hall

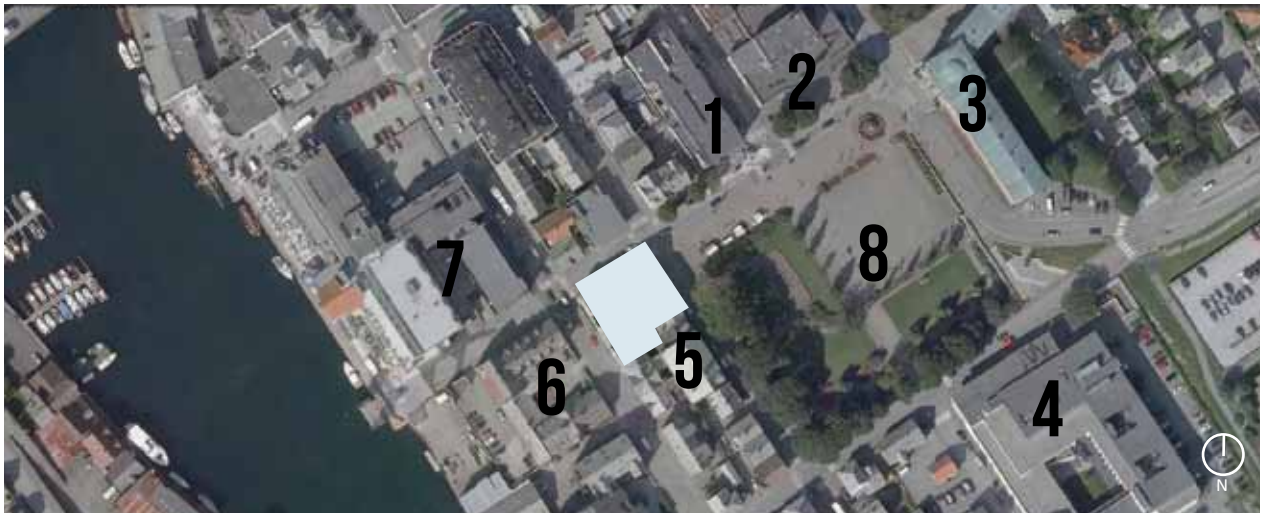

4
HSH University College


5
KFUK-KFUM Sqouts house


6
Gamle slaktehuset activity house


7
Rica Maritim Hotel


8
Town hall square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MAPPING

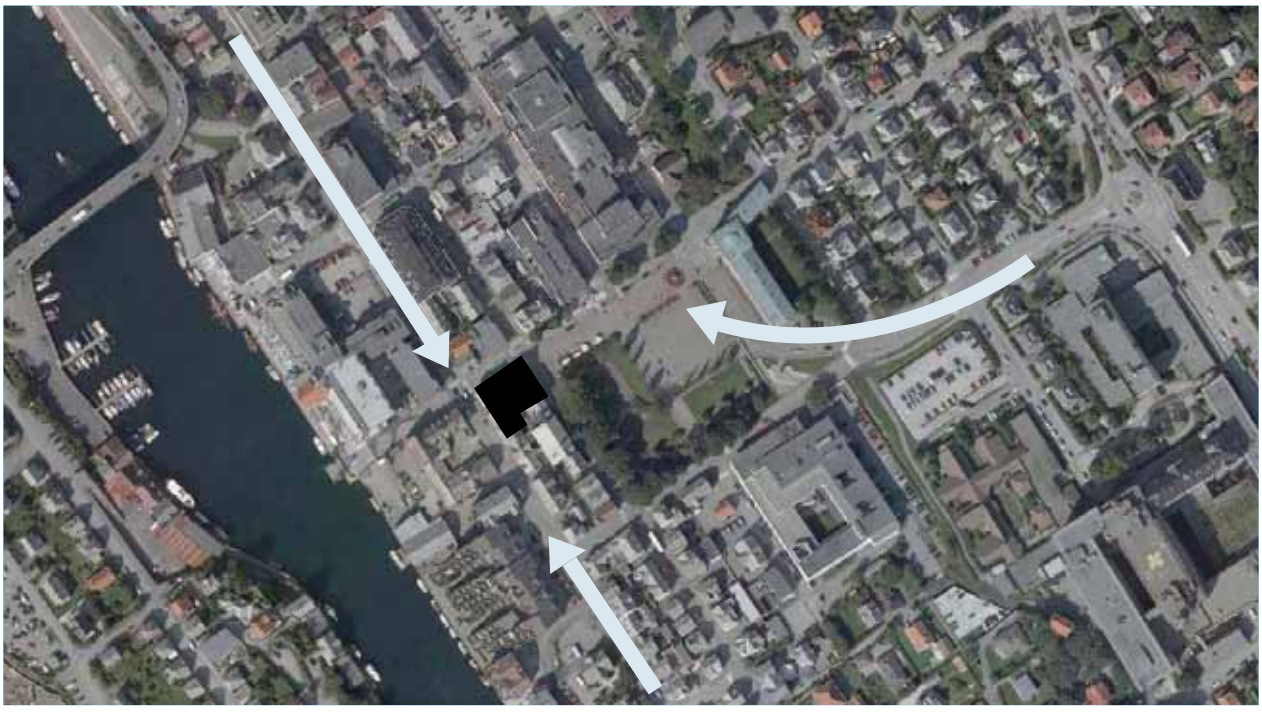
TRAFFIC AND ACCESS

Traffic
The streets and blocks of the inner city are designed as a square grid dating back to the 1850 when the city was founded. The site is located between the historical streets called Haraldsgata and Strandgata. Haraldsgata surpasses to the pedestrian shopping street one block further north and is a popular street in the city. Strandgata is the street that follows the waterfront all the way through the inner city and many restaurants and shops are situated along this street. Also many cars and pedestrians follow this street through the town.

The region is big, and allot of people commune from the surrounding areas and therefore many cars run through the city every day on the way to and from work. On the little island called Risøy one of Haugesund´s largest companies Aibel are situated, a company that builds equipment for the oil and gas industry, and all the about 4000 workers needs to cross the city centre and the bridge “Risøybroa” to get to work. So Strandgata and Karmsundsgata are heavily trifurcated every day. The town also has a shopping centre called “Markedet” and a pedestrian shopping street that draws many visitors and thereby many cars.

Access
The site and the surrounding area have three primary access roads. The site is accessible from all the sides of the city, as it is in the heart of the town. Haraldsgata, Strandgata and Karmsunsgata are streets that have connections to the whole city. Strandgata from the south is a way in from the southern part of the city, and Strandgata from the northern part of the city. Karmsundgata is the main traffic road through the city.


SKÅREGATA
KARMSUNDSGATA
KNUT KNUTSEN OAS GATE
HARALDSGATA
LITLASUNDGATA
STRANDGATA



N

MAPPING

FUNCTIONS AND CULTURE

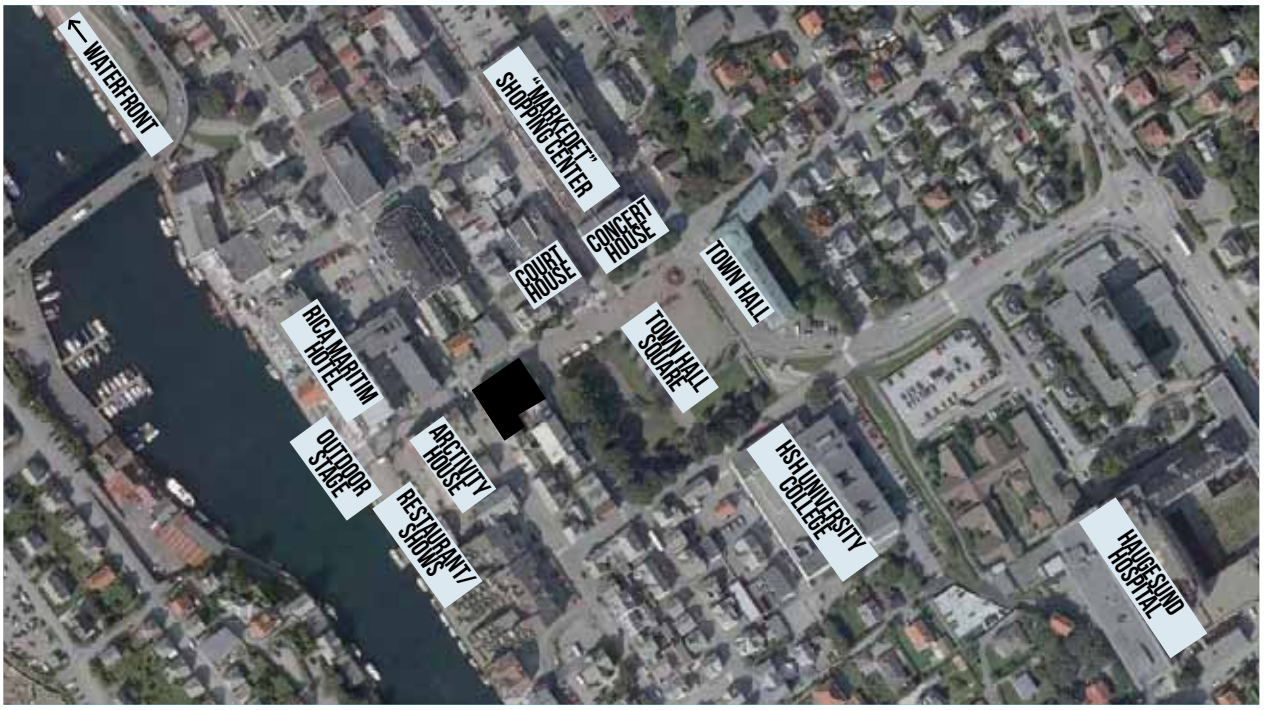
Functions
As earlier mentioned this part of the town holds many of the key functions of the city. The town hall is located right across from the site, a very special building, painted pink, and well known for its colour and classical architecture. Also the University college is situated just south/east of the town hall square called HSH, høyskolen Stord/Haugesund. This school offers both bachelor and master degrees in various fields, including information and communication technology, safety management, health sciences, and marine studies.

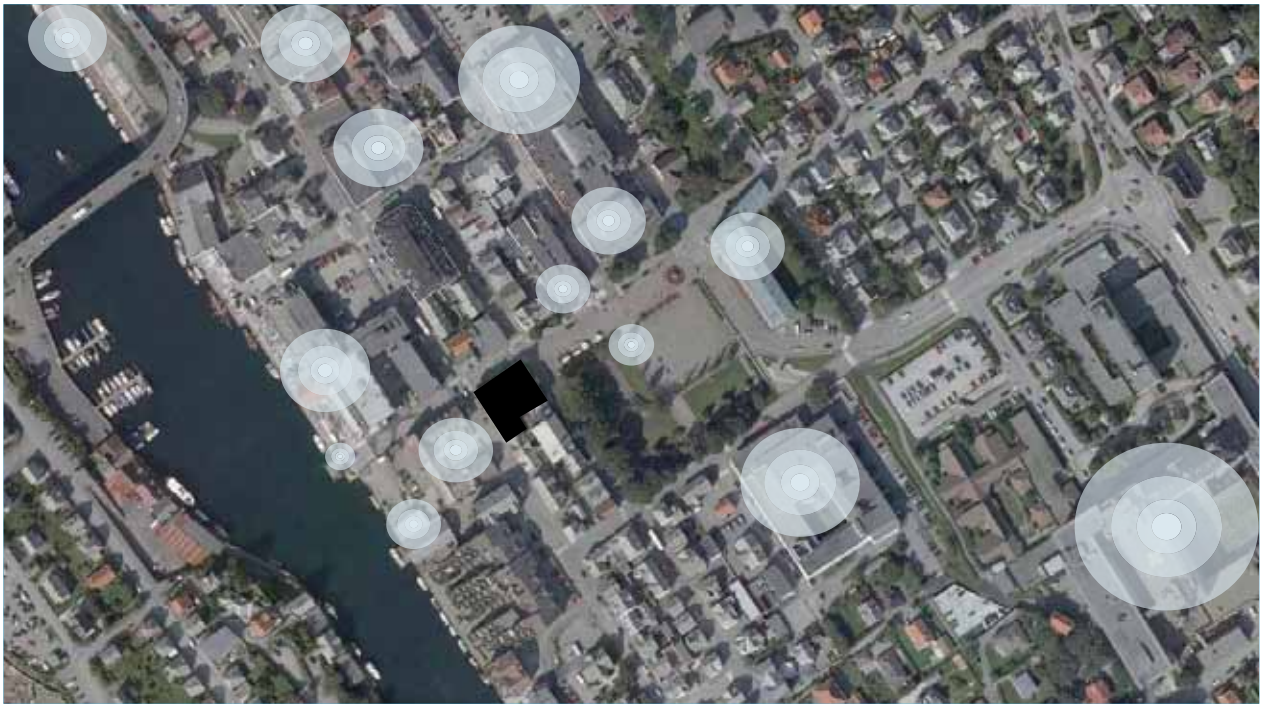
The school has about 3000 students from the whole country. On the opposite side of the town hall square "Festiviteten" the cities concert and theater hall is situated. The new courthouse was finished last year and is situated between "Festiviteten" and the building site. The hospital is also very near right south of the town hall. The waterfront is just North West of the site and the newly modernized hotel, Rica Maritim where many conferences and events are held is on the next corner.

There are also different shops, cafes and restaurants in the area. There is also a shopping center "Markedet" and the pedestrian shopping street.

Culture
The area surrounding the site has different cultural services and activities. The main cultural services are the concert hall, the town hall, and the new outdoor stage by "Smeasundet". Rica maritime Hotel is a popular conference and event hotel which also has a panorama cinema which shows spectacular nature films from the area. The old butcher house is also a popular activity house called "Gamle slaktehuset" this house has cultural and creative activities for both young and old.

The waterfront is furthermore an area in the city that draws a lot of visitors to all the different cosy cafes and bars. Many of these main cultural attractions in the city are situated around the site and in a line down and towards the main pier. This draws a line from the town hall past the site and down to the waterfront creating a strong cultural axis or a cultural spine of this part of Haugesund. And the new library will be a strong and welcomed supplement to this axis.


← WATERFRONT
"MARKEDET" SHOPPING CENTER
CONCERT HOUSE
COURT HOUSE
TOWN HALL
TOWN HALL SQUARE
RICA MARITIM HOTEL
OUTDOOR STAGE
ACTIVITY HOUSE
RESTAURANT / SHOWS
HSH UNIVERSITY COLLEGE
HAUGESUND HOSPITAL



N

MAPPING

MICRO CLIMATE

Wind
The wind diagram is analyzed to see how the wind speeds and wind directions are at the site. The wind at the site has an impact on the use of natural ventilation, potential outdoor areas and turbulence around the building. The four different wind roses show the wind speed throughout the year parted into seasons. As seen on the illustration the dominant wind comes from south, south-East most of the year. But in June-August; the summer months the dominant wind comes from the north-west.

As Haugesund is a city by the West coast the winds can be strong and often unreliable, but these wind roses has to be taken into consideration when design the building, especially when designing a building which will take use of natural ventilation.

Sun
Daylight and sunlight is an important factor when designing a low energy building and when designing in a Nordic context, because of the shorter days. The sun path diagram illustrates the suns path through the sky during each season. By reading the diagram you will be able to see where sun is and the angle of the sun throughout the year. I have chosen to take a look at the months July, March, October and December to see the position and angle of the sun.
The sun has the following angle in the sky in the following months

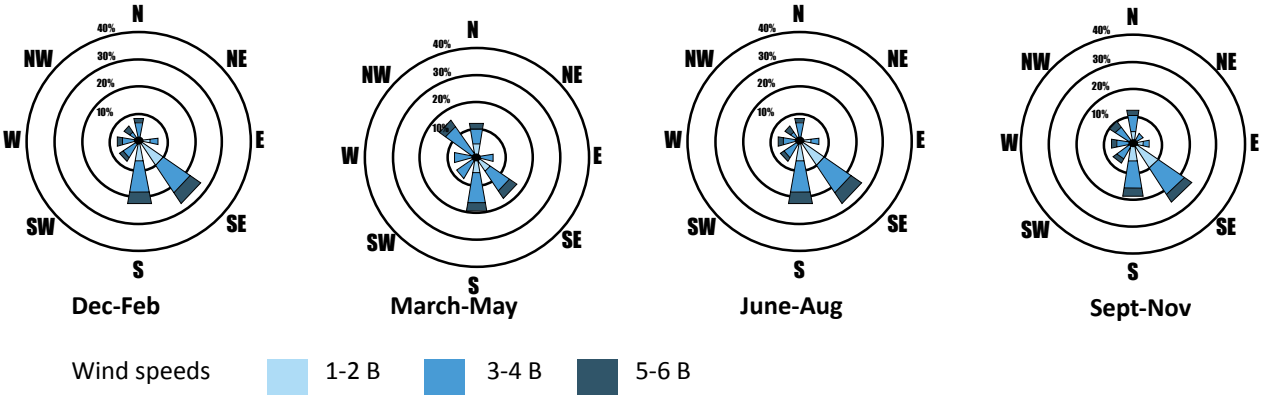
July:
At 09.00 am – 40 degrees
At 13.00 pm – 50 degrees
At 16.00 pm – 33 degrees

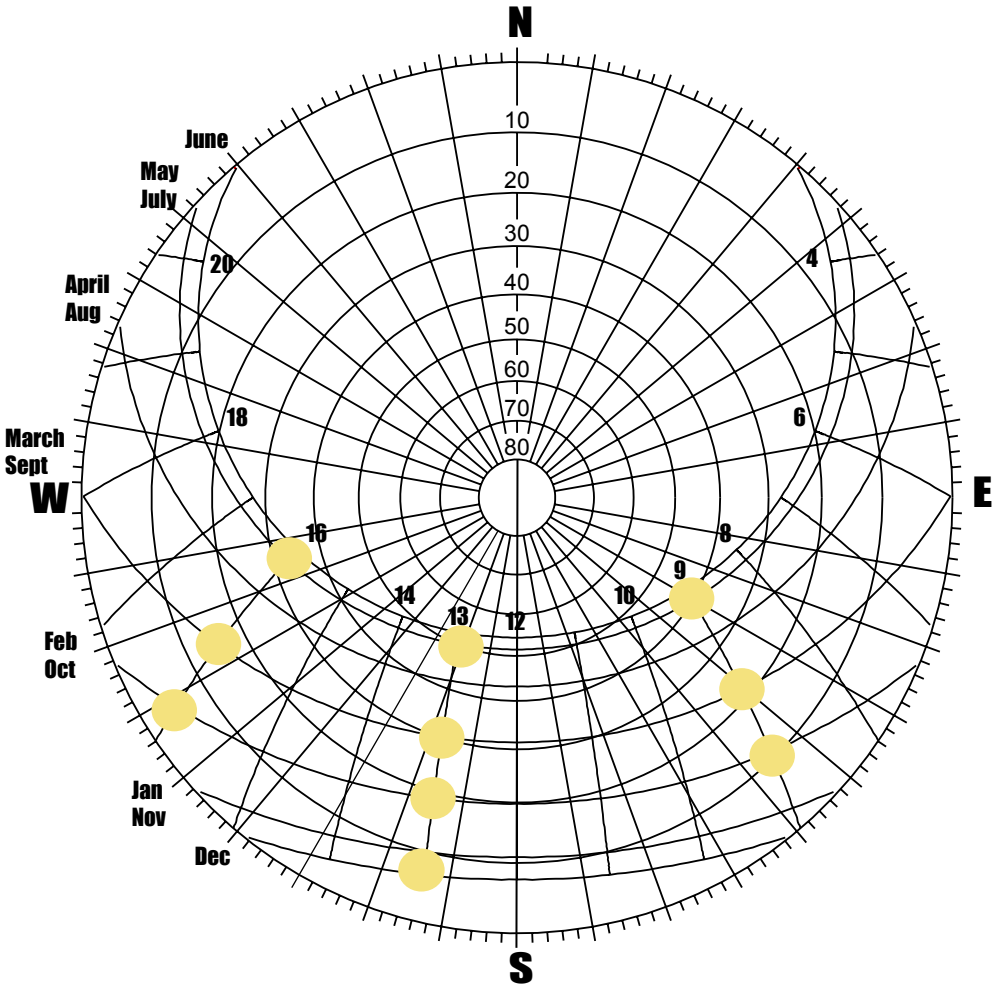
March:
At 09.00 am – 23 degrees
At 13.00 pm – 30 degrees
At 16.00 pm – 15 degrees

October:
At 09.00 am – 7 degrees
At 13.00 pm – 18 degrees
At 16.00 pm – 12 degrees

December
At 09.00 am – 0 degrees
At 13.00 pm –8 degrees
At 16.00 pm – 0 degrees

As the reading shows, the hours the sun can be utilized during the winter months are short, and the angle of the sun is low and December is the month with the least sun and a very low angle on just 8 degrees at the highest. It is in the winter months from October to February it is most important to utilize the passive sun heat, as these are the cold and most energy consuming months concerning heating. Therefore it is important to design the building so that there are windows that can capture the sun even when the sun is so low that there is a chance the surrounding buildings are blocking it. And in the summer months where there are the highest amounts of sunlight it is important to be able to keep the heat of the sun out of the building by designing either exterior or interior solar shading.


N
NE
E
SE
S
SW
W
NW
40%
30%
20%
10%
Dec-Feb
March-May
June-Aug
Sept-Nov
Wind speeds
1-2 B
3-4 B
5-6 B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SUSTAINABILITY

SUSTAINABLE INITIATIVES AND GOALS

The world we live in is controlled by our dependents on energy. But many of the energy sources we rely on today damages and pollutes our environments, some will even run out at some point. This can be done by using renewable energy and the research and the progress in the area of renewable energy is rushing ahead – thankfully. But even if the calendar says the year 2012 we still have a long way to go both on the technical side, but also on the personal part. Money is a big factor as many sustainable features are more expensive than traditional buildings.
But the countries are taking their part of the responsibilities and mange has climate targets. In the European Union the energy goals for the year 2020 was set back in 2008. The goal is that 20% of the unions total energy supplies is to be renewable energy. Norway also has it as goal to be carbon neutral already in 2030. [www.fornybar.no]
There are many goals and targets to work towards and many demands to obtain and the building industry has a big part of the responsibility by building energy sufficient buildings. This next part of the analysis will therefore contain the sustainable initiatives that I will take use of to achieve the demands.

Energy optimization

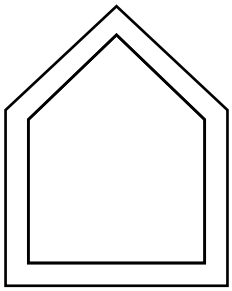
The new library is to be designed as a low energy building. In order to design a building with the lowest possible energy consumption and heat loss, the design process must merge with the technical aspects.
The main demand the building should achieve is the Danish 2020 demands for a low energy public building. The demand is a maximum energy consumption of 25 kWh/m2/year. In order to design a building with this consumption maximum, the design will be controlled against different theories and technical solutions and building techniques.

Reduce heat loss

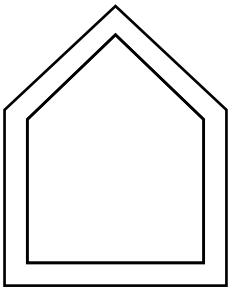
To reduce the heat loss from the building it is important to design a compact and air tight building envelope. It is important to make the right choices when designing the joints between the different building parts, such as windows, doors and walls to reduce the thermal bridges. Thermal bridges are parts of the building where heat can escape the building through gaps or via materials with poor insulation properties. The U-value is important when one is aiming to reduce a buildings heat loss and to design an energy efficient building. It is furthermore beneficial for the buildings overall energy consumption to have a good ratio between the building envelope and the building volume. It is also a good idea to part the different zones of the building into zones with different indoor climate demands.

U-Values

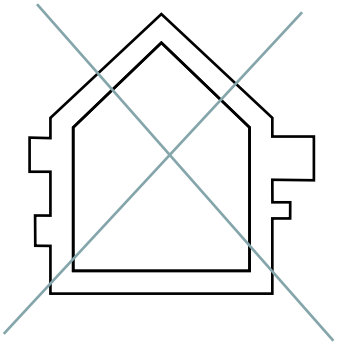
The u-value is the value that measures the insulating ability of a construction or a construction part. The lower the U-value a construction has, the lower the heat loss will be. The building envelope, the windows, doors and fundaments are building parts that needs to have the lowest possible U-value. The drawing on the next page show areas of the building envelope and where it is important to focus on the U-values and joints. [www.rockwool.dk]

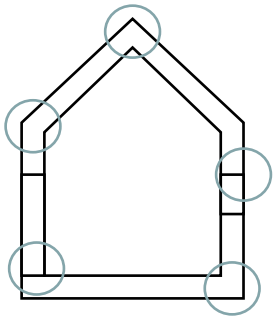


Maximum energy consumption
25 kWh/m2/year

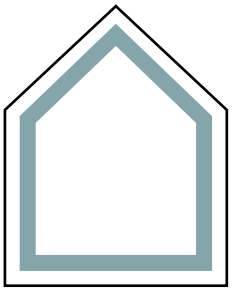


Dense building volume

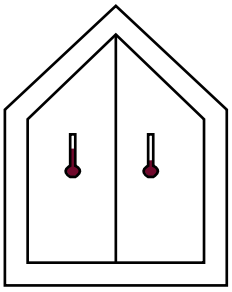




Thermal bridges and U-values



Insulation



Building Zoning

SUSTAINABILITY

SUSTAINABLE INITIATIVES AND GOALS

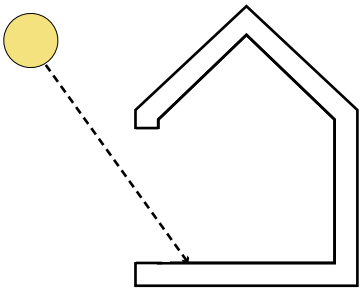
Passive solar heat
Another important aspect of a sustainable building is to design the building so that it can use of the passive solar heat. A big part of the buildings energy consumption is often on heating and cooling. So a design that can utilize the sun in different ways can reduce costs on cooling and heating. But since solar heat also can create overheating in a building in summer time, it is also necessary to design solar shading for the summer, and the possibility to open this shading up during the winter, where the sun is needed for heating. Therefore it is important to bare the orientation of the windows in mind.

Thermal mass
Thermal mass is another tool to use when utilizing the passive solar heat. Some materials can accumulate heat and then release the heat when the heat source in this case the sun is gone. Meaning that if a material mass is exposed to the sun during the day, the material mass will release this heat during the night or after the sun is gone. In other words, it will absorb the heat when the surroundings are warm, and release it when the surroundings are cooler. Thermal mass can thereby help balance the indoor temperature. The materials have to be exposed to direct sunlight to be most effective.

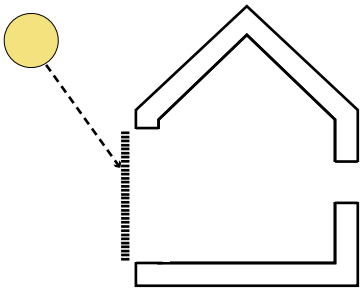
Mechanical and natural ventilation
To prevent heat loss, an energy efficient building is often based on a mechanical ventilation system with heat recovery, but natural ventilation can also be used in combination with the mechanical system. Natural ventilation however is driven by the natural forces of the wind and thermal buoyancy and do not use energy. In theory this is a good solution but in praxis it can however be hard to control and it is also mostly used in the summer months where the air temperature is warmer. [indeklimaportalen.dk]
By using a hybrid ventilation system, where both natural and mechanical ventilation is used, part of the energy consumption for the can be lowered. The wind will always be there and can be a big contributor for a good indoor climate if the design allows it. If natural ventilation is incorporated into the design of the facades and window openings and eventual air shafts, the building can be ventilated naturally during of the year.

Water cooling/heating
As an extra parameter, given the location close to the sea, water-cooling is introduced as a possible initiative. By letting the water cool (summer) and heat (winter) the inlet air to the building through for example a heat pump or mechanical ventilation system, the energy needed for heating and cooling can be lowered.

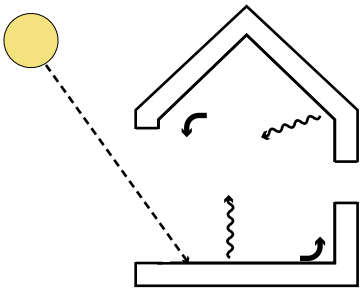
Solar cells
Solar cells produce electricity directly from sunlight. They can be integrated into the building design by placing them on the roof and facades of a building or they can be used as a sunshield. Solar cells are a non-polluting source of energy. When designing a sustainable building, solar cells are a good system to utilize the solar radiation and minimizing the energy demand.



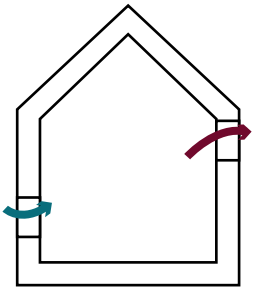
Utilize passive solar heat



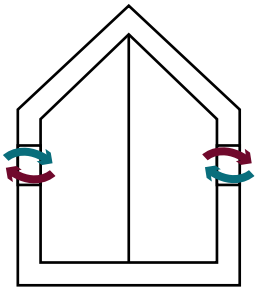
Design external solar shading



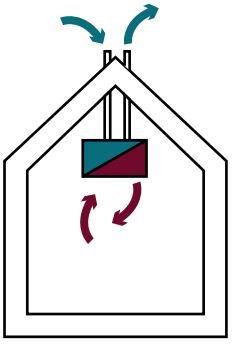
Utilize thermal mass



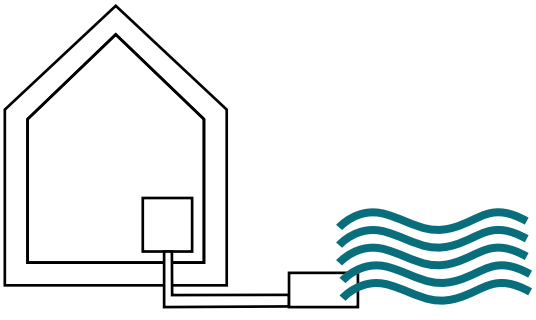
Natural ventilation



Single sided natural ventilation



Mechanical ventilation with heat recovery



Utilize seawater for heating and cooling

LIGHT

ARCHITECTURE AND DAYLIGHT

Among all the studies of natural causes and reasons
Light chiefly delights the beholder
Leonardo da vinci

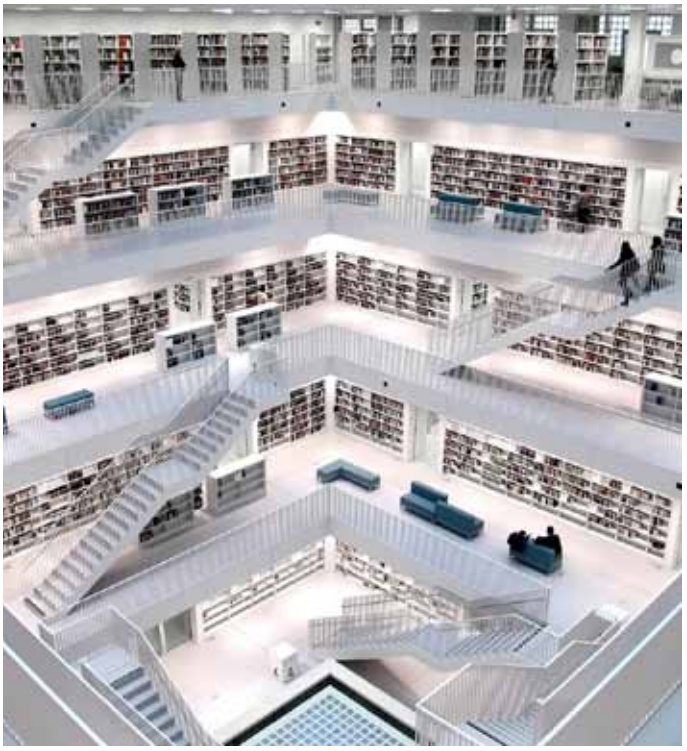
Architecture is light. Without the presents of light, and especially shadow, which would not exist without light, architecture would be none existent in the form we see it today. The playful dialogue between light and shadow is what intrigues the eye when looking at architecture. Light, or absence of light, can transform a space in each season, each day, each hour, and each moment. Light defines zones and boundaries and expands and accentuates rooms. But there is a fine balance between over illuminating a room and creating this dialogue between light and shadow. Shadow creates perspective and enhances shapes, while an over illuminated room can seem bland and flat.

When designing a library the demands natural daylight are high, because of both the huge demand of a good light for reading and working but also because the shelves and books absorbs a lot of light. But it is, as mentioned earlier, important for sustainable reasons to have good daylight this can furthermore bring down the use of artificial light.
But light can be many things. It can be practical, atmospheric and dramatic.
I have found some inspirational pictures of how light can be utilized both practically and more atmospherically. These will be an inspiration throughout the design process where I wish to create a building that takes use of the natural light in both the practical and artistic way.

DESIGN

EXPRESSION AND MATERIALS

Building materials can like light be used in different ways and for different reasons. Materials have a color, a texture or lack of texture, a smell or maybe a pattern. The surrounding buildings mainly use wood, concrete and stone surfaces. But there are also old slate and copper roofs in the area. On the next page some inspirational photos of different types of materials and architectural expressions can be seen. I am very inspired by the use of wooden lamellas and glass facades, and how you can mix these. Lamellas have the ability to move and change the expression of the building and façade. Glass can be clear, frosted or colored and ad a lot of different expressions to a façade.



DESIGN CRITERIAS

OUTPUT FROM ANALASYS

To summarize on the analysis phase the outputs attained, is divided into different design parameters to be used in the further process development. The design parameters are further divided into the aesthetic/functional and technical parameters of the project.

Aesthetic and functional parameters

- The buildings architectural expression is to be designed from the inside out; with main focus on the shifting functional demands for the library and the user.
- Materials, daylight and the buildings aesthetics should create an exciting architectural, functional and spatial experience.
- The building sites urban block setting gives the buildings outer shape a clear boundary to work with.
- The library should function as a meeting point for groups of all ages and be a building pulsating with knowledge and inspiration.
- The building should keep and underline the axis in the urban setting, this being the axis running from above the town hall and down to the waterfront and outdoor stage.

Technical parameters

- The building should obtain the 2020 energy demands for a public building.
- The building should utilize natural daylight both to lower the energy consumption but also to create a beautifully lit building.
- The design should incorporate renewable energy such as solar cells.
- The placement of functions within the building should be placed by the need for light, shadow, wind and sun to utilize these in the best way.
- The buildings heat consumptions and energy demand is to be lowered by designing a dense and optimized building envelope.
- The building sites close relation to the sea is to be utilized by using a “water to water” heat pump for room heating and the buildings hot water.

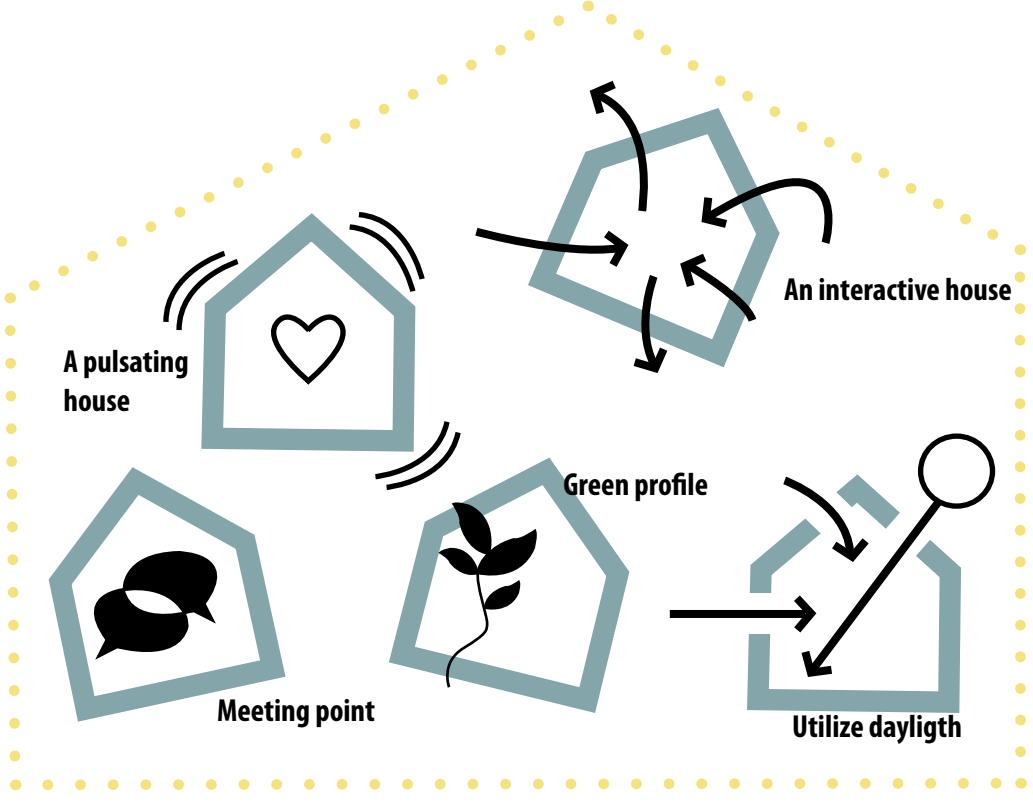
VISION

PROBLEM STATEMENT

The aim for this project is to design a city library for Haugesund that will provide a new meeting place and social space for the city. The building has a central site in the city on the edge of the city's central square and should be an open, welcoming and pulsating building. The building should also be a sustainable, energy efficient and should set an example of an energy efficient public building.

The architectural appearance of the building should attract and intrigue the people walking by. It should respect the surroundings in the dense city block, but at the same time induce the area with something new and exciting. The building is to be the new heart that sits on the cultural axis in the area and connects the cultural activities.
The light in the building should not only be used for lightning and passive solar heat, it should also be an architectonical and artistic part of the design. The light in the library should furthermore be practical and atmospheric.

Problem statement
How can I design a sustainable and vibrant social library for the general population of Haugesund,that can obtain the desired functional and social qualities, and at the same time obtain the aesthetical and technical aspects that this sustainable public building demands.



SKETCHING PROCES

ROOM DIAGRAM

THE FUNCTIONS

In the following section of the report the sketching phase will be presented. Through the sketching process a range of different designs, sketches and models have been produced, this report only showcase the main ideas and key development. The designs and drawings have been evaluated against the technical parameters as well as the aesthetical parameters throughout the design phase to ensure that the design matches both to the design parameters and the vision for the building.

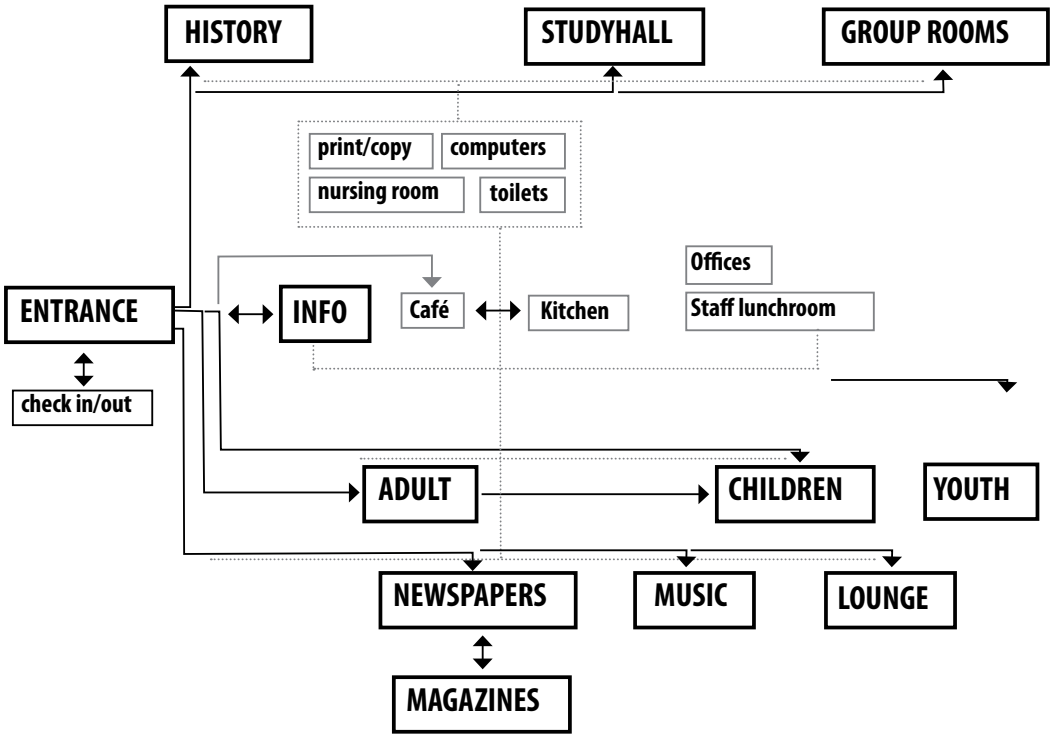
Room diagram

The sketching phase starts with sketching out different layouts of the library functions. This investigation is a supplement to the analysis. To show the outcome of this investigation a room diagram is made. Here the different functions and the different relations between them are visualized. Some functions need to be connected, some would function best with a connection but can do without, and some functions do not need a direct connection at all. The internal organization of the building is an important factor for the success of the final design.

Looking at the diagram it is clear that many of the functions in a library relates to one another and needs to be connected. The staff needs to have easy access to information from offices and storage, but they also need to be close to the elevator to move around with book trolleys.

The Children´s section should be close to the adult section so that parent and child can be in the library together and at the same time find books in their own section.

The café and social area should have a central placement to function as a heart and gathering point of the building, it is also beneficial to have it in close relation to the information desk and the entrance. The study hall should furthermore be placed on a different floor than the children´s section so that potential noises do not disturb the students this is also an important factor for local history.

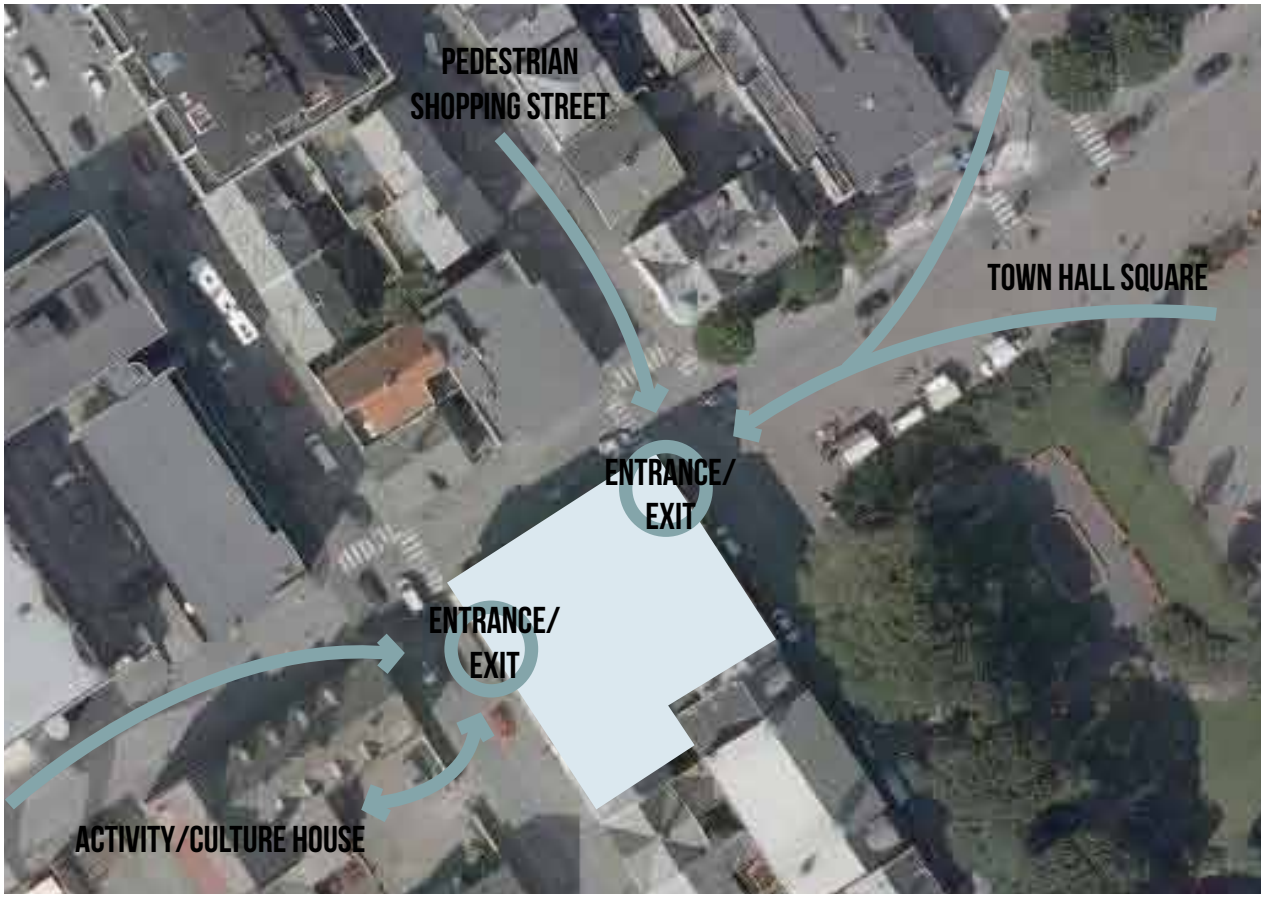


FLOW AND ACCESS

ENTRANCE AND EXIT

The building site's central placement on the west corner of the town square gives the site more than one entrance point. A lot of the library visitors will come from the town square, the University College and the shopping center "Markedet" and the parking facilities found here.
Haraldsgata, the city's pedestrian shopping street would also be a place where visitors will come from.
The second area of entrance is on the other side of the building site. From the street Strandgata and the harbor, there is another connection to the activity house across the street. The activity house and the new library are both cultural and public buildings containing functions that can complement each other. So with these thoughts in mind the building should be a building with two entrance and exit points as seen on the illustration below.

This makes the building feel more open and accessible. The axis through the building is thought to create a new indoor urban street within the library. The ground floor of the building should feel as a part of the outdoor space and an area where every visitor feels invited into, even just to walk through.

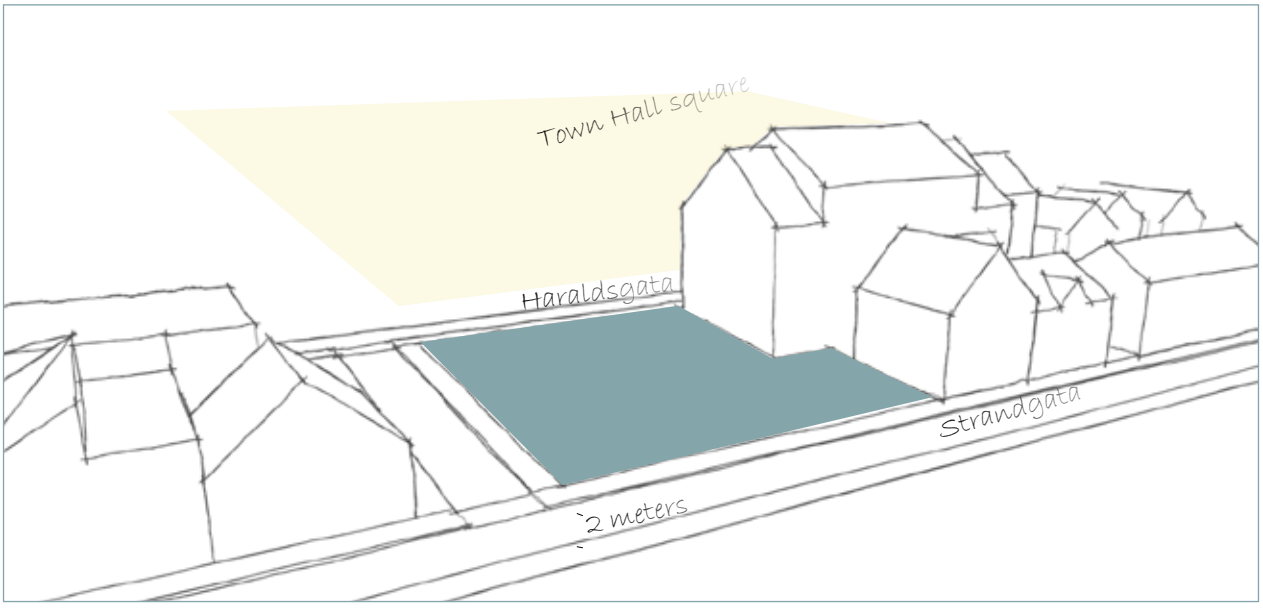


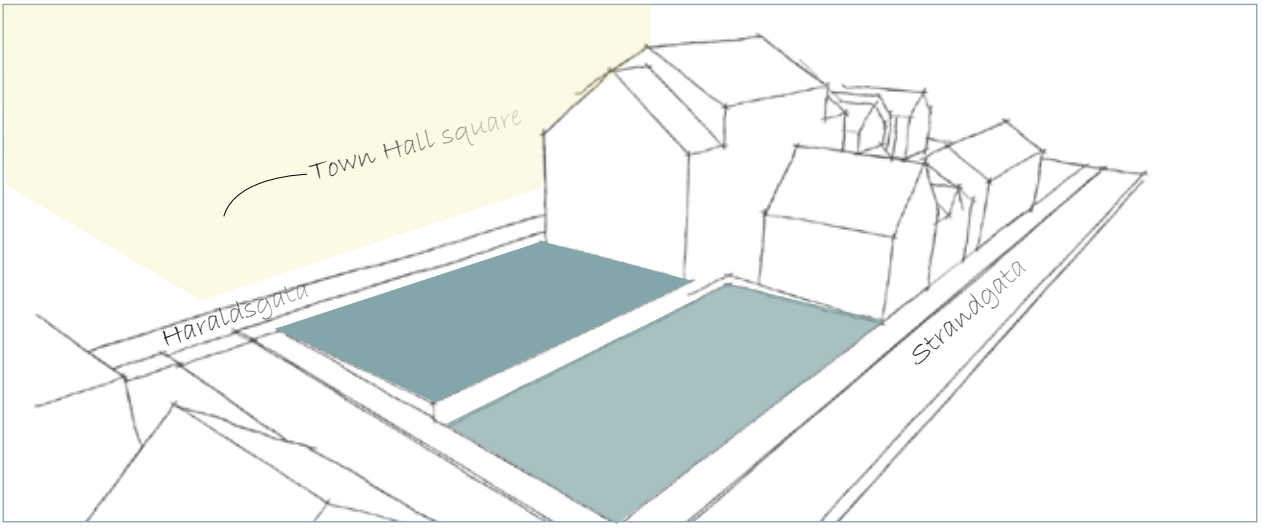
THE SLOPING SITE

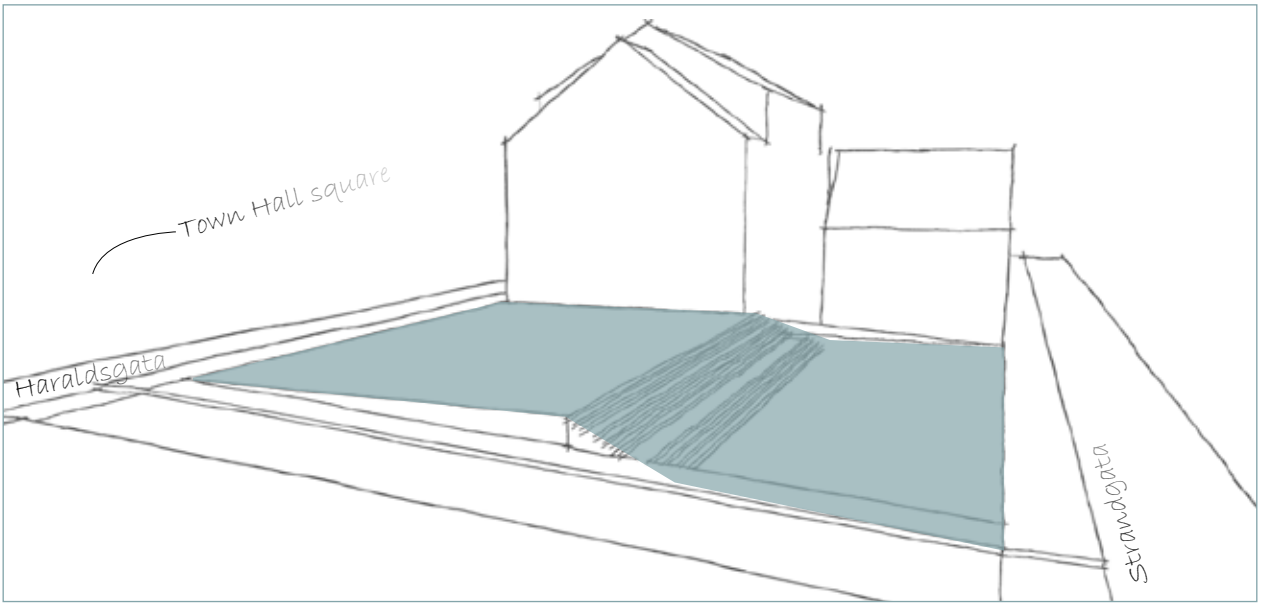
LEVELS

The site for the new library is central but it is also situated in a hilly city therefore the site slopes down towards Strandgata and the harbor. The height difference between the top of the site by Haraldsgata and the lowest part by Strandgata is 2 meters.

Because of the difference in height it is chosen to divide the site in two, dividing through a line approximately in the middle of the site as seen on the illustration on the top of the next page. This creates a ground floor with a shifting floor and ceiling span of two meters. Therefore a solution on how the ground floor can be one floor again is to be found. This is done by creating a wide staircase from one side of the building to the other. This gives the library a ground floor that is coherent and works as one accessible floor. The staircase is also designed as a seating opportunity for visitors, on one side to create an area for lectures, readings and concerts. And on the other side to create diversity in the room, and ad dimension through the use of an ever shifting architectural element driven by the user attaining a range of different uses of the staircase.




Town Hall square
Haraldsgata
Strandgata


Town Hall square
Haraldsgata
Strandgata

THE STOREYS

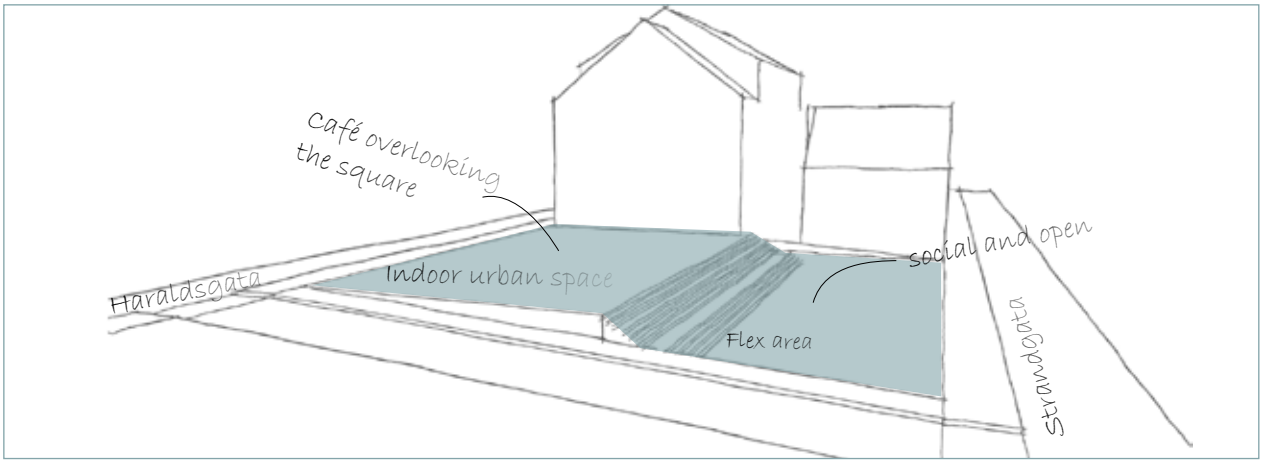
FUNCTIONS

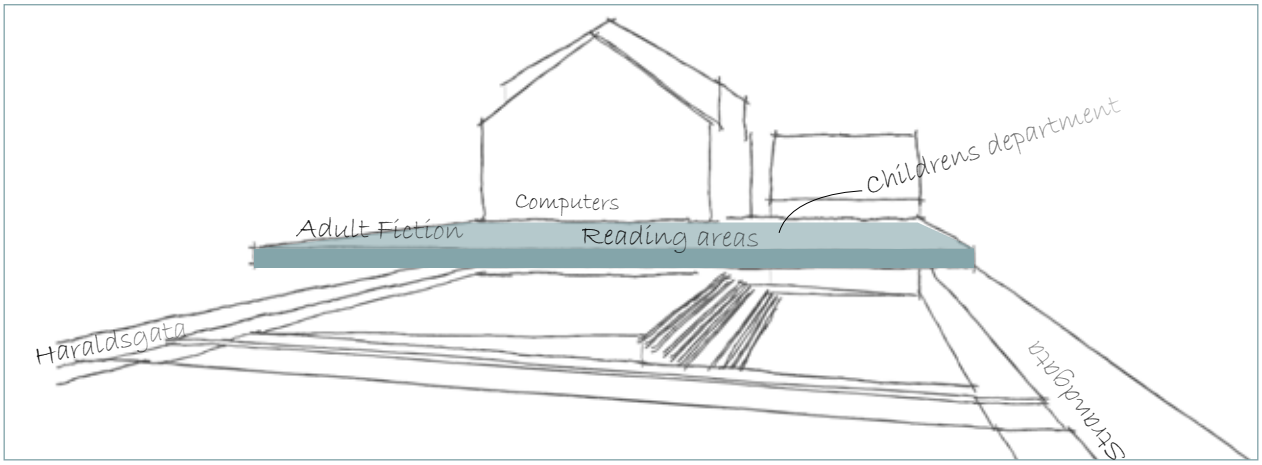
After the room diagram and the levels in the ground floors are solved the focus moves on to getting a specified idea of the floors of the building and how the functions will be divided on these.

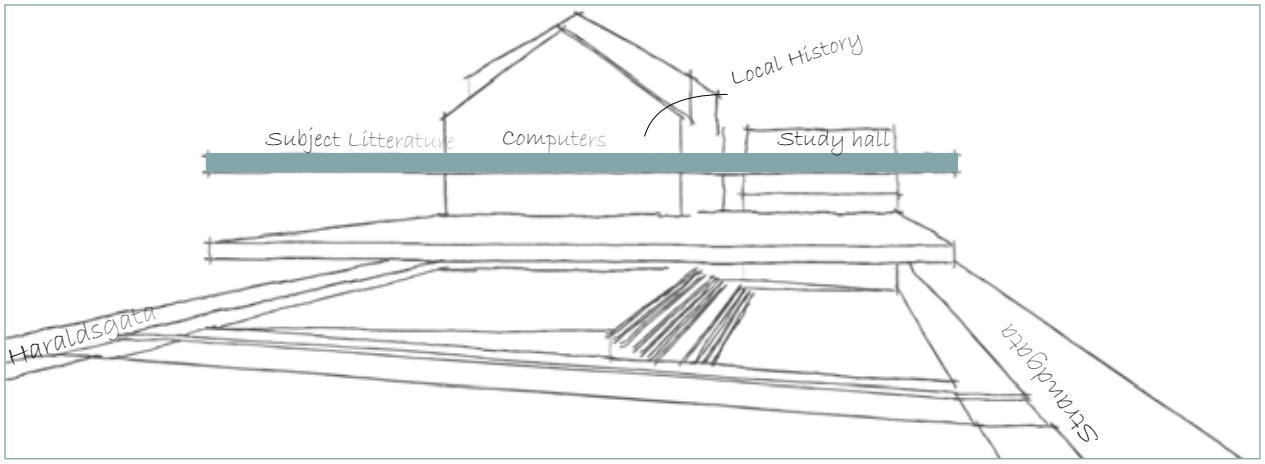
Through the ideation process the idea emerged that the different floors in the building should have different functions. The ground level as mentioned contains the social and open floor with the newest books, café, information and a place where one can deliver back book or loan them. The level should also include a flex area for reading, lectures, a concert or an area for a school class to gather.

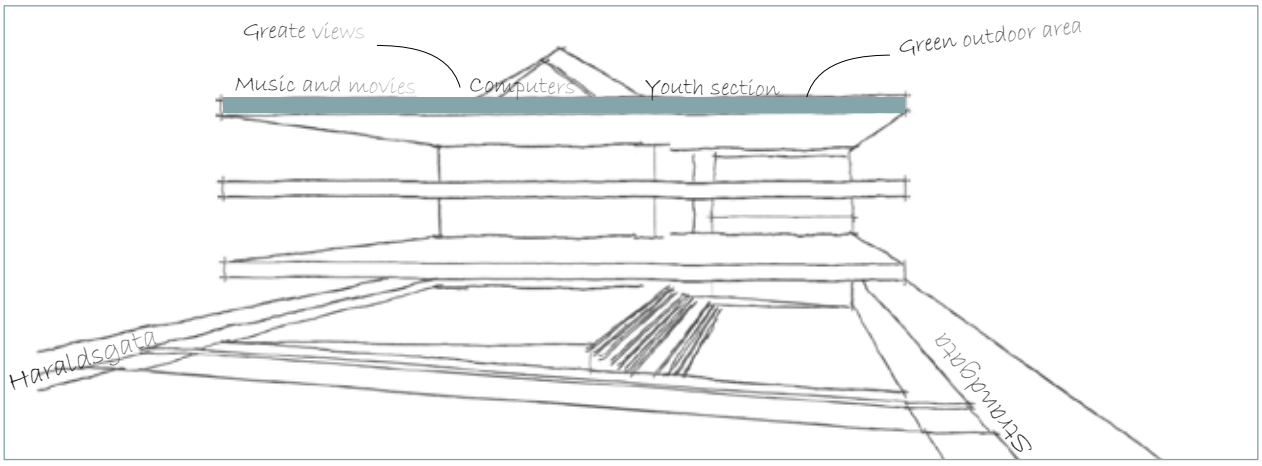
On the first floor the adult and children's section is placed. Based on the analysis it has been decided that it is practical to have these two sections on the same floor so that for example a child and parent can look for different books, but still be able to maybe see and hear each other. On the next level, the second floor, the more specialized sections such as a study hall, local history and subject literature is situated. This means that floors gets more specialized the further up in the building the visitor move. On the third and last floor the books for the youth and a lounge area is placed along with a film and a music section.

The third floor is therefore a recreational level with the youth, music and movies on the one side, and the green recreational outdoor area on the other. The top floors has the nicest views of the city and harbor so it should be a nice area to visit and enjoy the view either while listening to some music or while enjoying a cup of coffee and a new book on the rooftop grass. So the building floors move from social and open on the ground floor, to more specialized, and then go back to a recreational, social level at the top.




Childrens department
Computers
Adult Fiction
Reading areas
Haraldsgata
Strandgata


Local History
Subject Litterature
Computers
Study hall
Haraldsgata
Strandgata


Greate views
Green outdoor area
Music and movies
Computers
Youth section
Haraldsgata
Strandgata

SKETCHING DEVELOPEMENT 1

TWO ARCED ATRIUMS

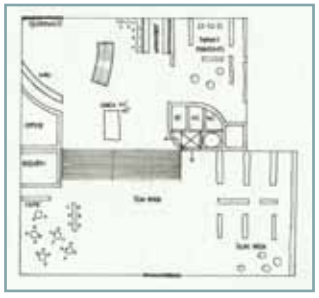
After the functions has been divided onto the different levels of the building, the work with the internal organization in detail starts. During the analysis phase the importance of having a natural lit building was established. This has been an important parameter when sketching and designing different floor plans. Early on in the process the idea to work with atriums in different shapes emerged. An atrium has the ability to draw light into a building from for example the roof, and can also work as an air chimney to help the natural ventilation through thermal buoyancy.

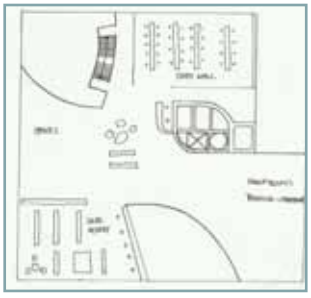
In this phase of the sketching the atrium is drawn as organic shapes with two atriums, one by the two different entrance and exit points.
This worked fairly well when considering solely the light in the building if there also where windows in the roof of the atriums. The organic shape would however take up a large part of the building square meters. The two atriums also made the organization of the building difficult.

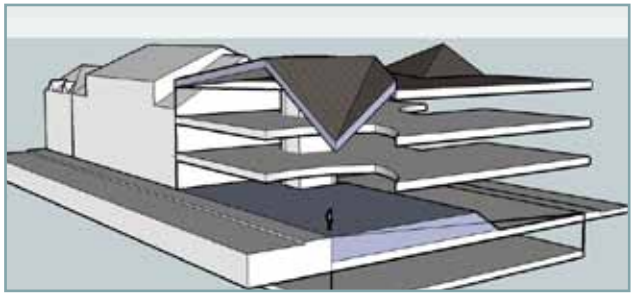
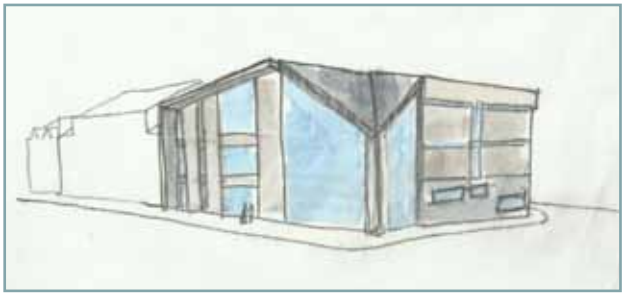
During this phase the building shape and depth gave the idea to start working with a utility core situated in the middle of the building to the southern wall which is the darkest area of the building volume. The core is thought to contain bathrooms, shafts for ventilation, cleaning rooms and a fire escape. Meaning the core has both a practical use but can also work as a load bearing element in the structure of the building.

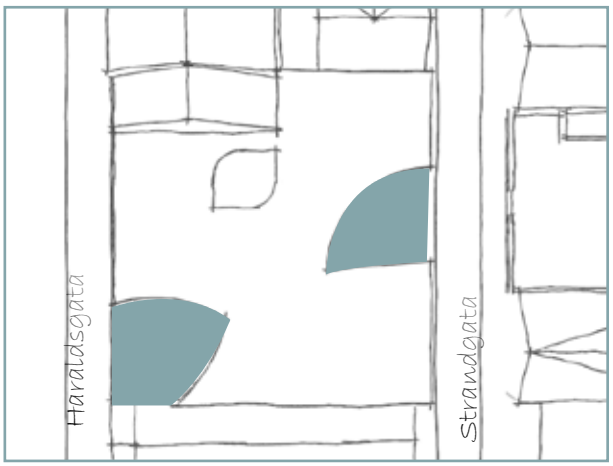
The idea of using an atrium to draw daylight into the building is maintained and moved further in the design process, the two organic atriums however did not live up to the practical demands for the building. The idea of the core solves problems by utilizing the darkest area of the building shape with functions that do not need natural daylight, it can furthermore be used as a load bearing structural element.

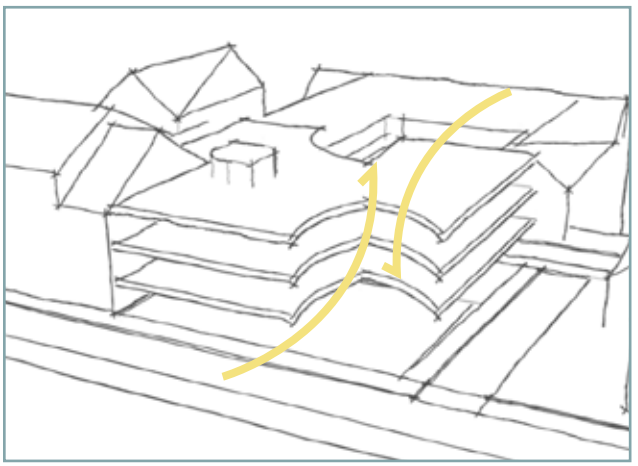
Different sketches of the internal organization in this phase are seen below.

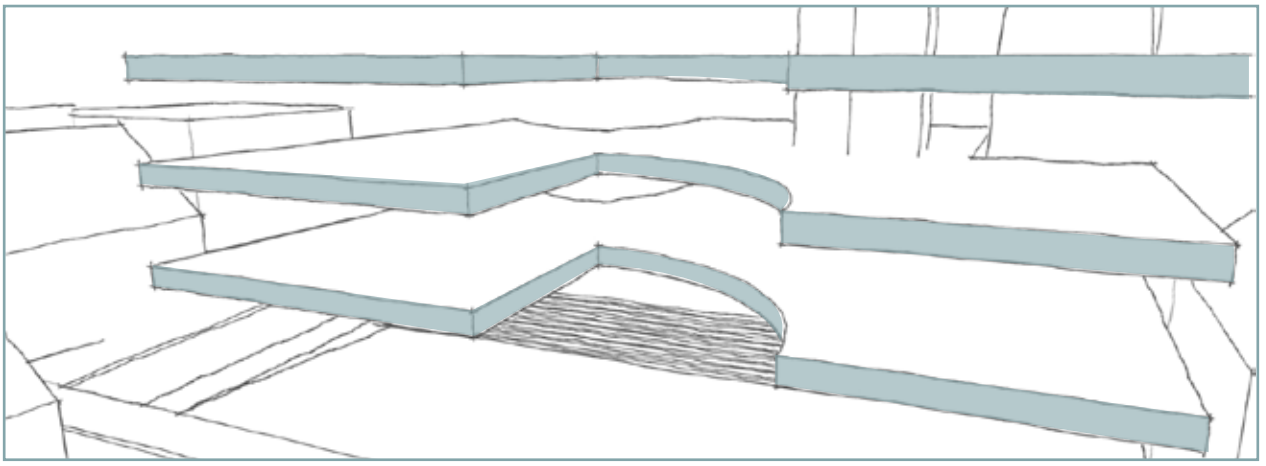


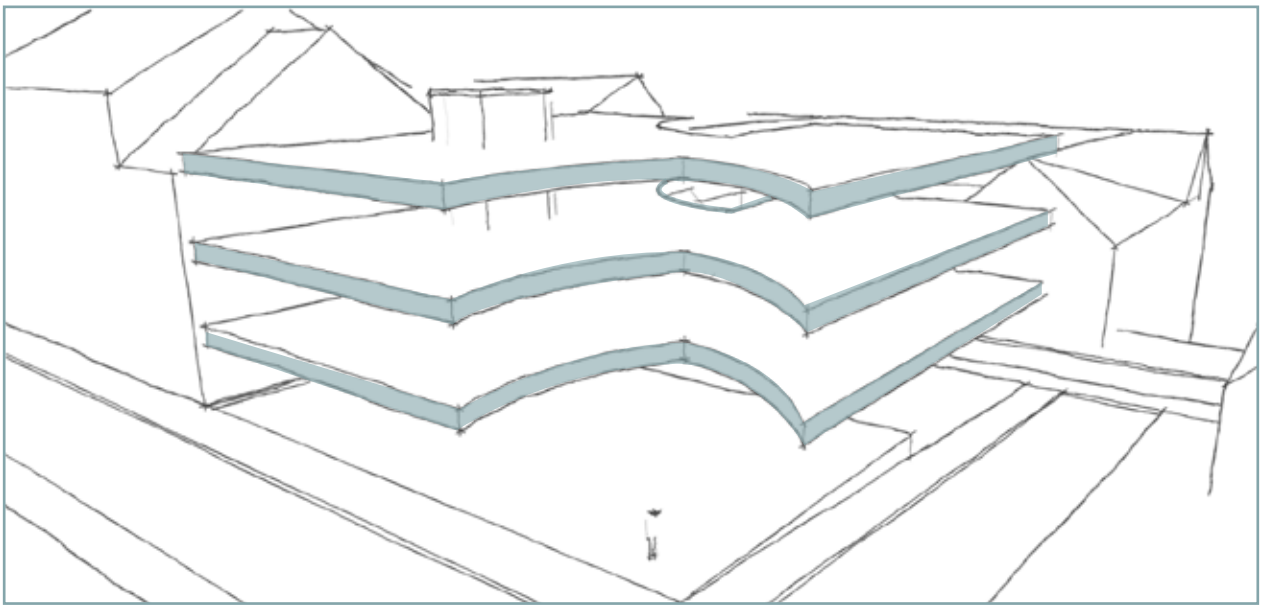



Haraldsgata
Strandgata







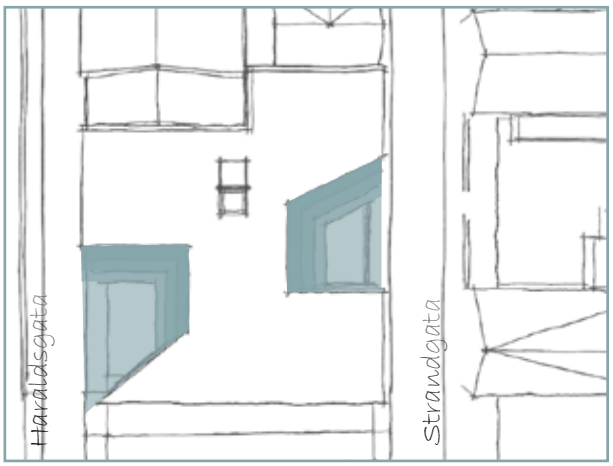
SKETCHING DEVELOPEMENT 2

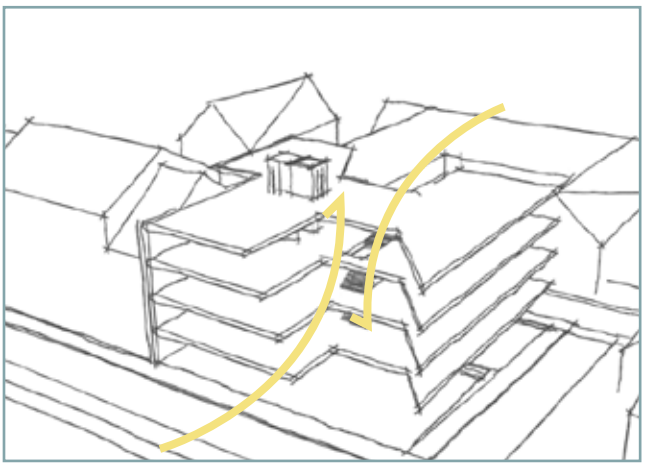
TWO GEOMETRICAL ATRIUMS

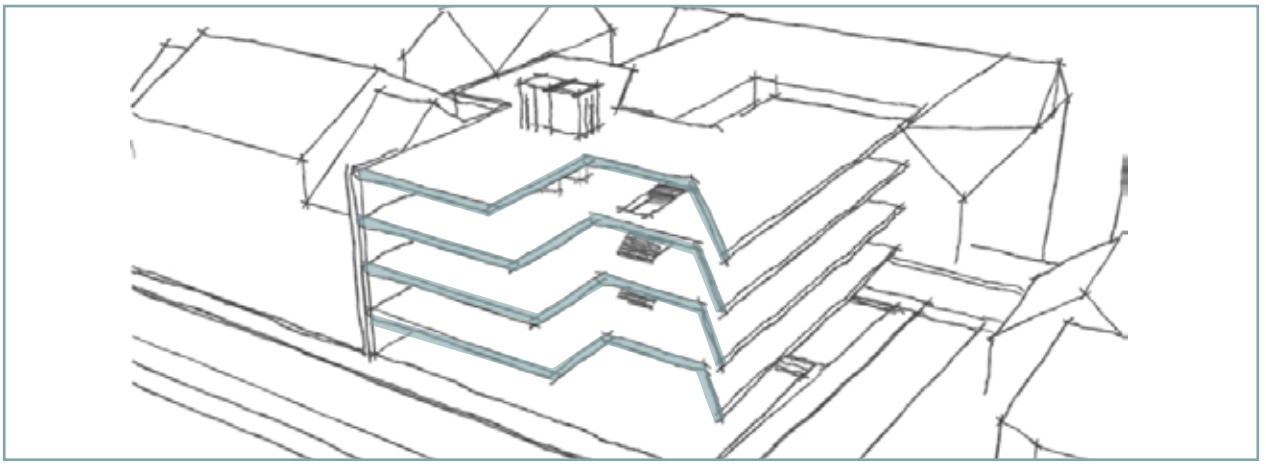
Based on the previous phase the work with the atrium as a tool to bring daylight into the building continues. In the following the organic shapes are developed into geometrical or more crystalline shapes. However this development did not solve the initial space issue since the atriums still take up to much space within the building.

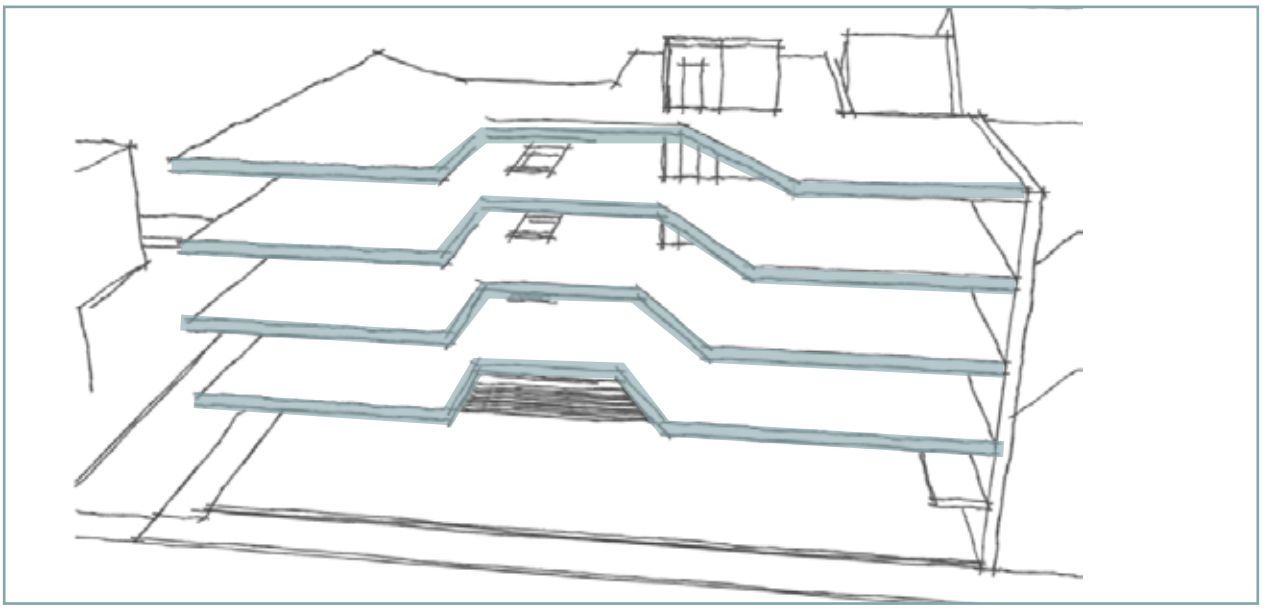
The core is also in this design proposal placed in the middle of the building of to the southern wall.
From this phase the crystalline shapes of the atriums are extended into the next phase.

Different sketches of the internal organization in this phase are seen below.


Haraldsgata
Strandgata







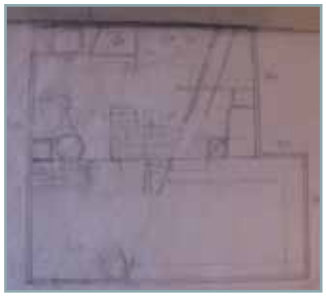
SKETCHING DEVELOPEMENT 3

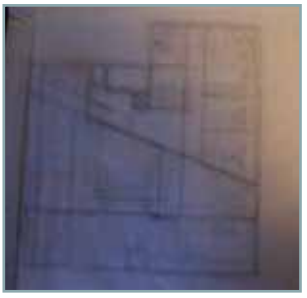
ONE CENTRAL ATRIUM

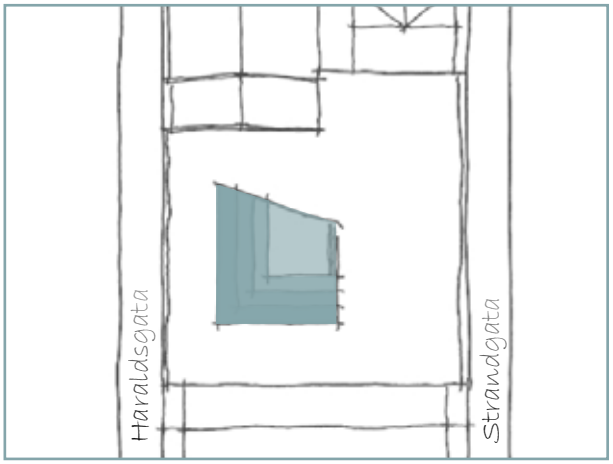
As a consequence of the two previous sketching phases this third design proposal is based on three aspects. The first is the need for light in the center of the building. The second aspect is that the user should have the ability to intuitively move about in the building. And the third aspect being the utility core situated in the darkest area of the building body.

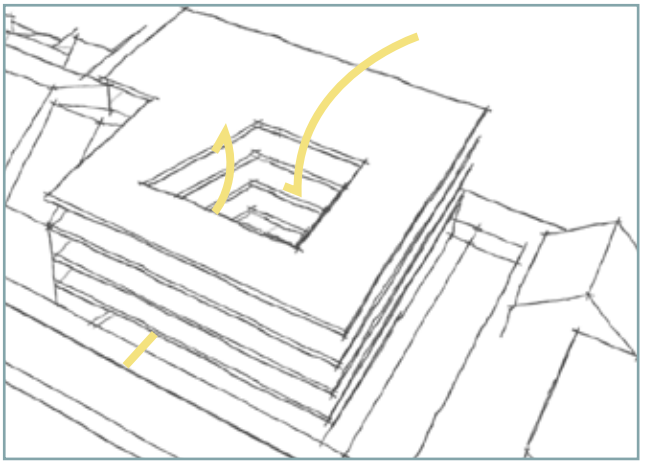
The two previous design proposals lacked the amount of square meters the buildings organization needed. This third design proposal with one central atrium seen on the next page releases more space and gives the building volume and floors a more intuitive layout. This central atrium will with the installation of a roof window be able to draw a fair amount of daylight into the middle of the building.

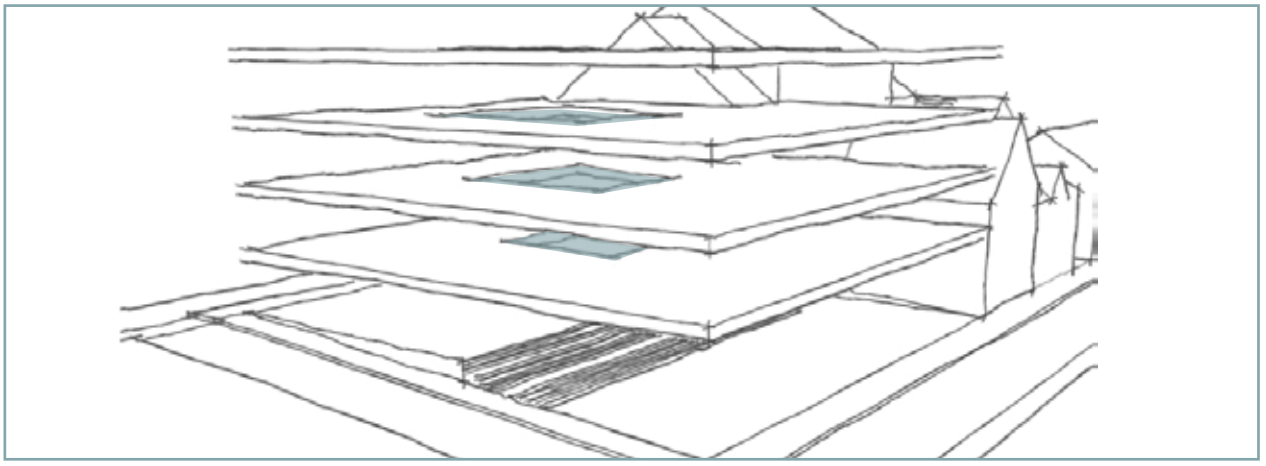
Looking at the top left illustration on the next page the retracted levels in the atrium retracting in two directions by every storey, giving the atrium an even bigger effect of a light funnel can be seen.
The atrium also gives great opportunity to work with the staircases as a sculptural as well a practical aspect in the building.

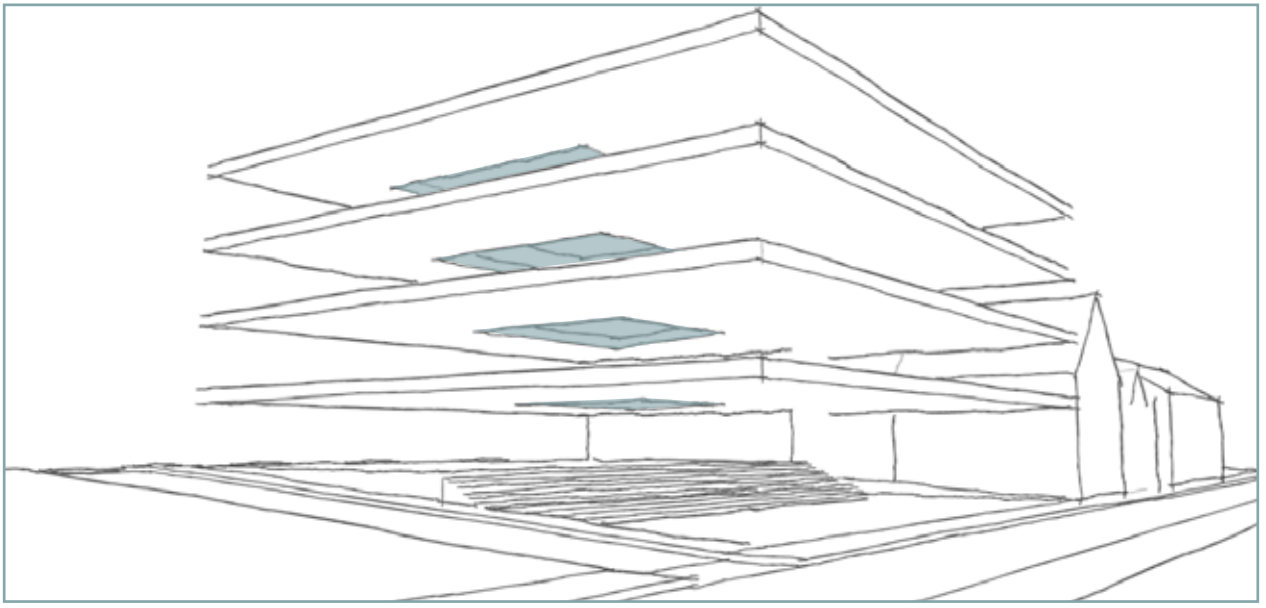



Haraldsgata
Strandgata







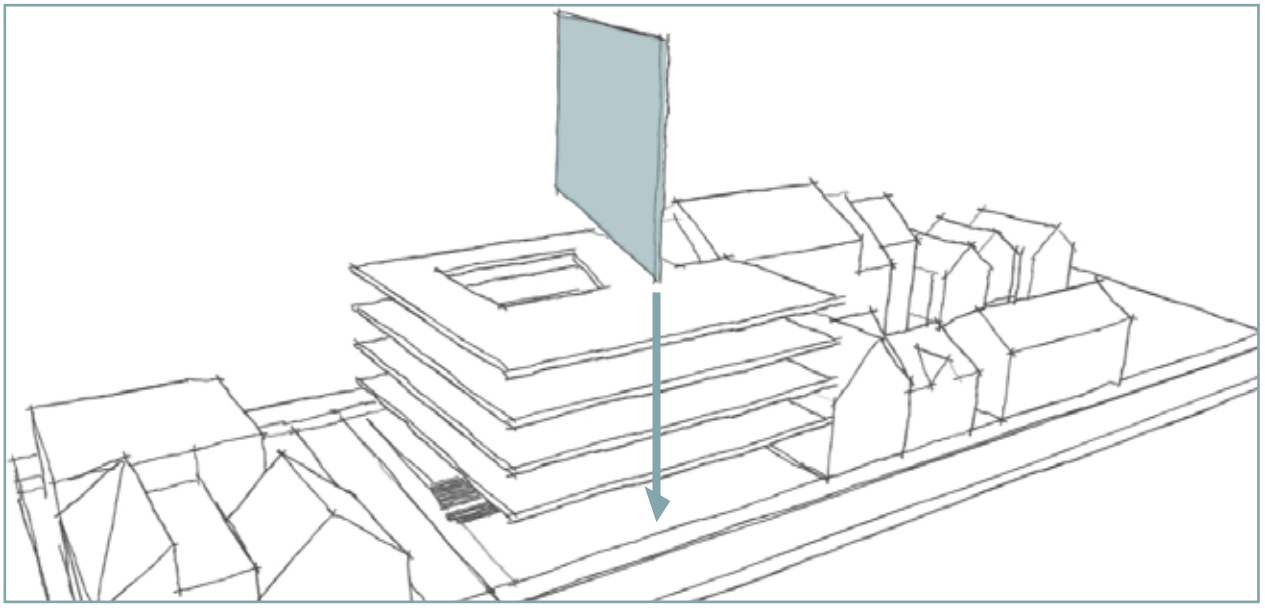
SKETCHING DEVELOPEMENT 4

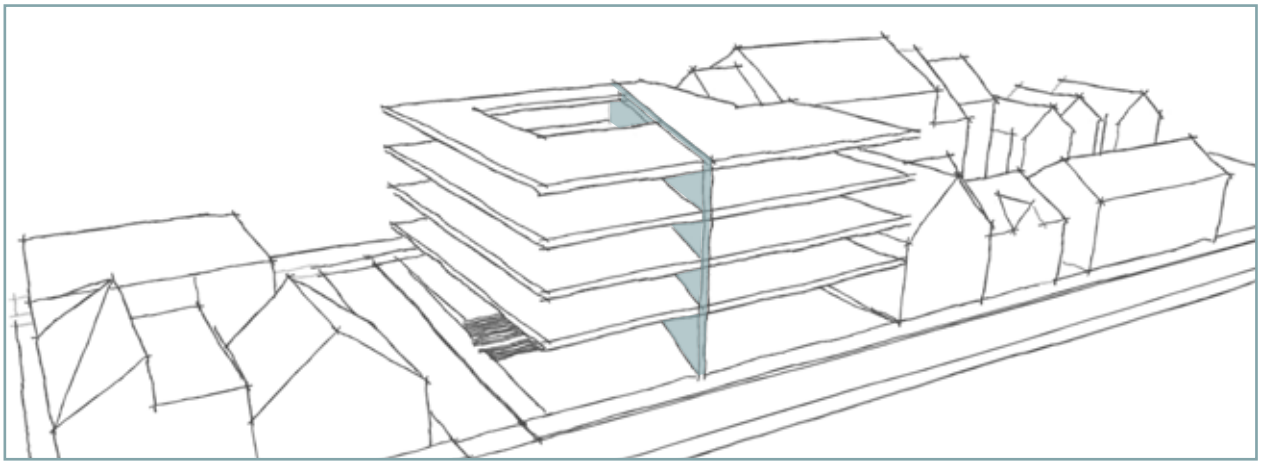
THE WALL

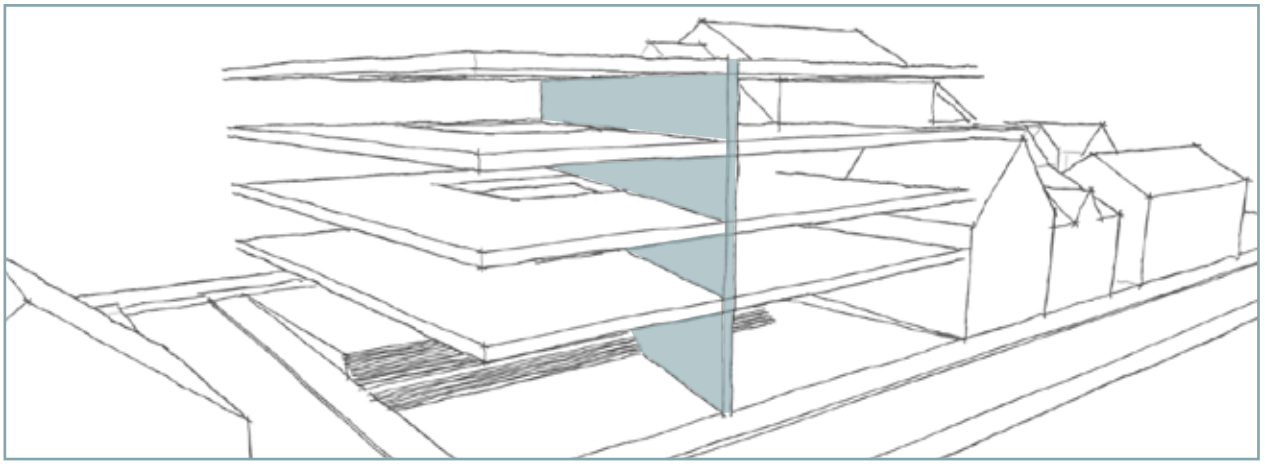
By this stage the overall shape of the building and atrium is settled. But the building volume is big and the different levels need to have the possibility to have some division within the floor. With basis in one of the sides in the atrium a line was drawn from one wall to the other and extruded. This wall runs from top to bottom of the building and from the east to the West wall. The wall is skewed and follows the atriums angle and opens up to the east towards the town square.

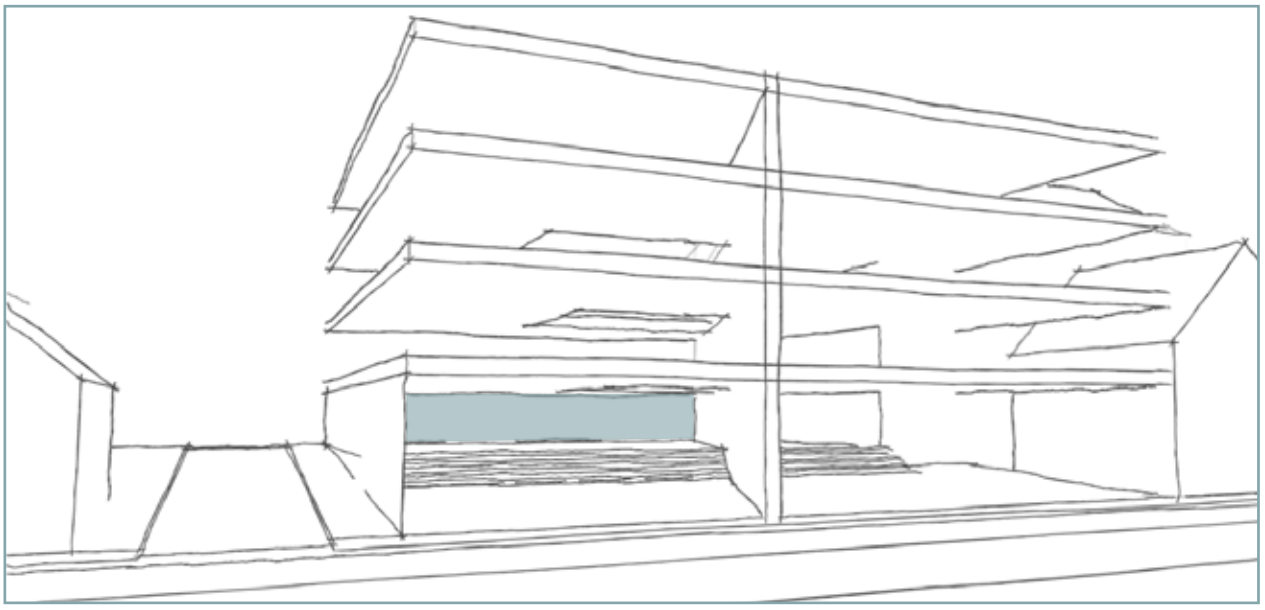
In the ground floor this skewed wall gives the visitors entering the library from Strandgata a feeling of a building opening up to the square. This will intrigue the visitor and draw him into the building.

Generally the idea is to keep the library room as open as possible to create a spacious and illuminated building. But some functions need to be separated from the rest of the library room. The study hall needs to be retracted so that the room is quiet. A play room for the children is also that is closed in some way to avoid disturbing the other visitors would also be preferred. Staff offices and kitchen for the café will need to be closed off from the rest of the building by the same reasons as the above. The skewed wall creates a subdivision of the building that is divided into a main library room and a secondary room/area. The secondary room/area will contain offices, the utility core, playroom for the children´s section and the study hall.









FLOOR PLANS

THE INTERNAL ORGANIZATION AND DAYLIGTH

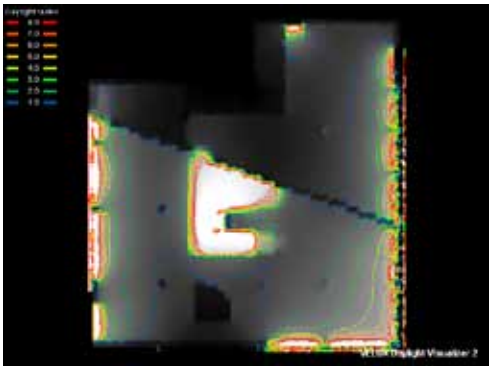
The following shows the final organization of the functions within the different floors. There is also a daylight factor from Velux daylight Visualizer 2 that shows the daylight quality within the different floors, the figures below are visualizations for the month of March.
The ground floor contains the information desk, the check in & out, the café and kitchen, wardrobe, offices and the flex area. The daylight factor shows a good daylight factor overall spanning from 8% to 1%.

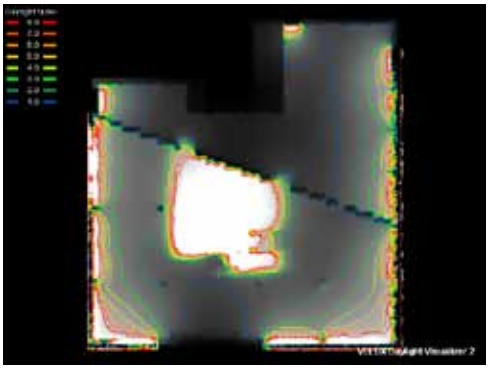
The first floor contains the adult fiction and the children's section of the library. The main library room is wrapped around the atrium. The daylight factor in this space is good spanning from 8% to 3% in the areas where the layout of the plan is meant for reading. The same applies for the second floor. This level is for the study hall, local history and subject literature.

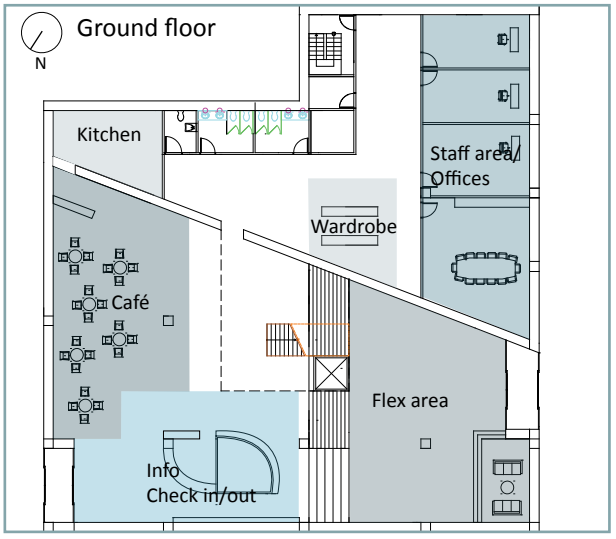
In the top floor designed for music, film and the youth the daylight factor also spans from 8% to 2%.

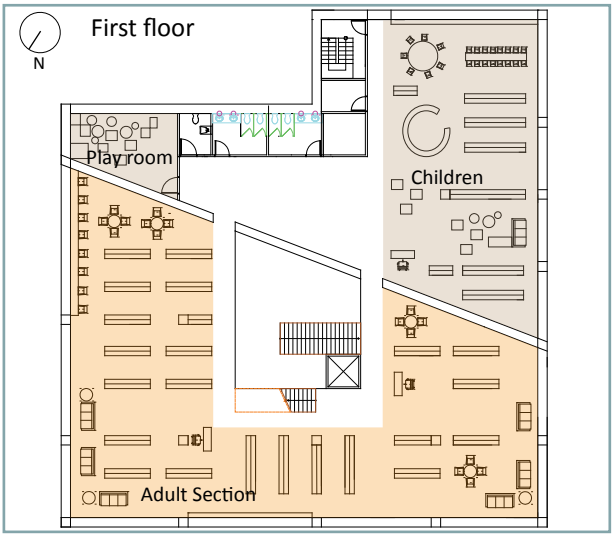
On all floors the area behind the skewed wall where the utility core is situated the daylight factor is approximately on 1%. This is a low value for reading or working, but since this is a transit area the change in daylight factor will work as a contrast while moving through the building. As mentioned in the analysis, light and shadows are two parameters which must both exist to create versatile architecture.

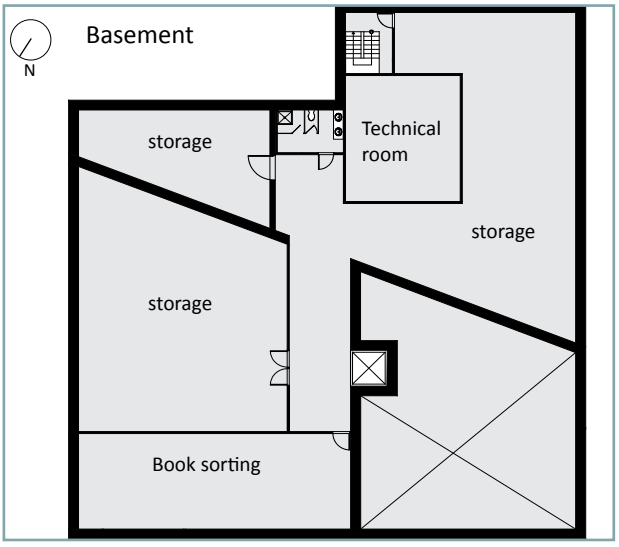
In the technical section of the report the daylight conditions are further detailed with visualizations of the months March, July, October and December is shown.

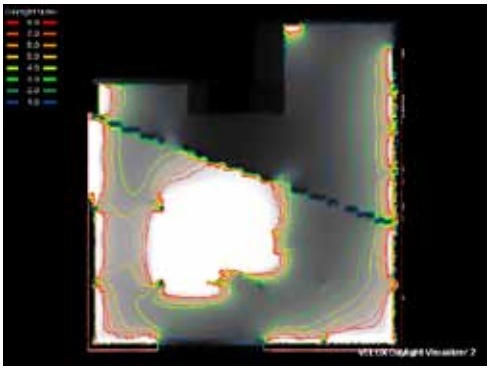


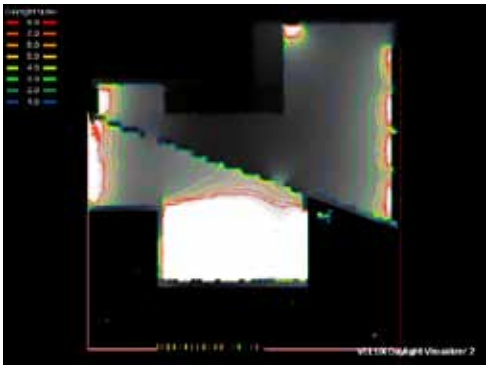


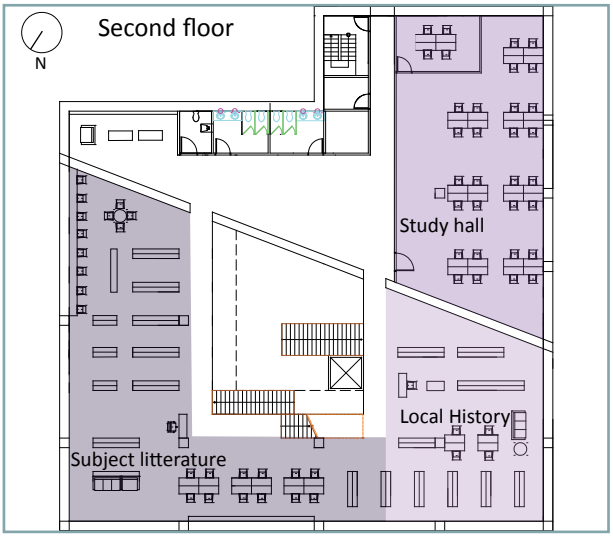


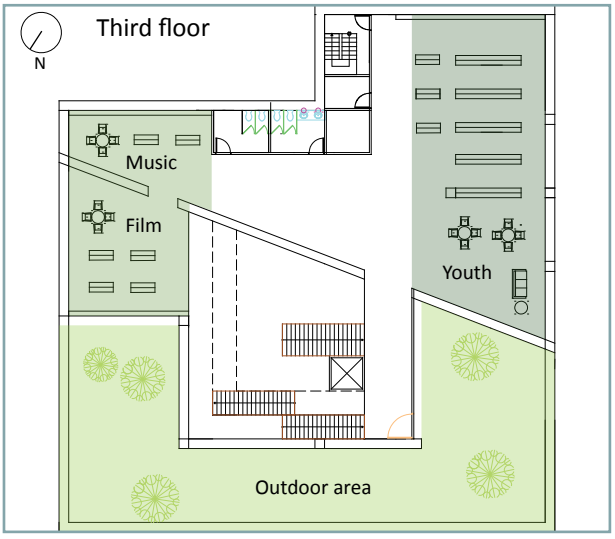



N
Basement
storage
Technical room
storage
storage
Book sorting






N
Second floor
Study hall
Local History
Subject litterature


N
Third floor
Music
Film
Youth
Outdoor area

BUILDING VOLUME

THE ROOF AND FACADE

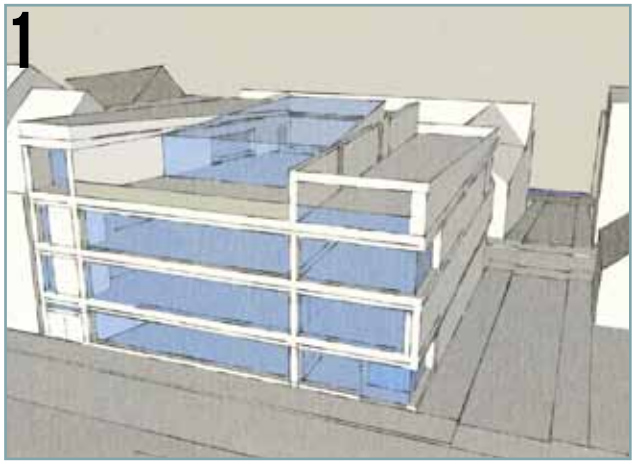
Throughout the design process different exterior expressions have been designed. Common design parameters for all the facades are to create an open facade to the east and west. The top floor should contain a green roof area and solar cells for energy production.

The first example the façade consists of window bands and a green roof. The façade is an open glass façade to the west and east and closed to the north and south. There is a big roof window above the atrium to draw light into the middle. The facades daylight quality is examined with Velux daylight Visualizer 2 and the result is that the façade solution does not have the desired daylight factor throughout the building. Therefore this example is discarded.

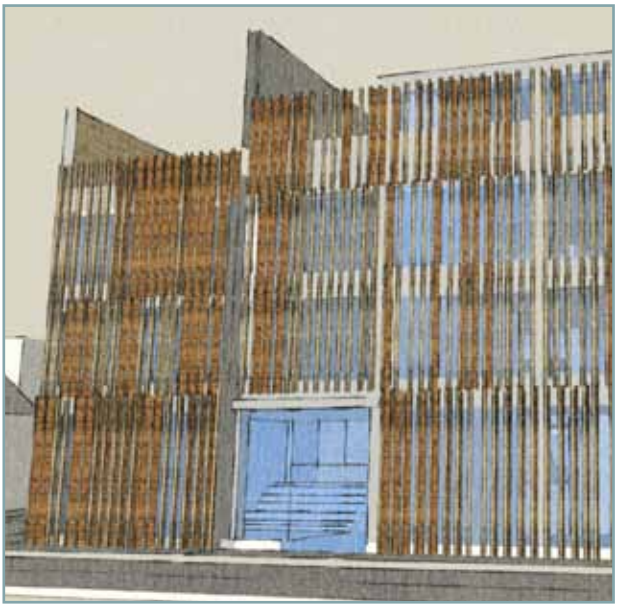
In the next example a translucent glass wall on the east façade opening up to the square is tested. On the west façade moving wood lamellas creates a living and changing façade in great contrast to the open glass façade to the east. The west façade is also the façade with the largest amount of solar radiation, so the lamellas work as solar shading but also has an architectural expression. This façade proposal is interesting and inspiring with the wood lamellas on the West façade, but the east façade seems bland and uninteresting.

The third exterior expression is based on the skewed wall from the interior. This also works as a factor in exterior expression of the building and facade. The façade emphasizes the division inside the building. The main library room stands out as a big glass cube with both clear and frosted glass, while the secondary room is closed off with wooden lamellas. The roof of the third floor is tilted with an angle of 10 degrees to make it optimal for solar cells. This creates a high peak of the roof that seems inharmonious to the rest of the building volume. The sharp division of the building volume is also inharmonious to the function of the building.

The last and fourth illustration shows a sketch of the final façade proposal. The façade is a merger between the idea of a glass façade from number three and the lamellas from number two and three. While designing this last façade a new factor has entered the design process. This glass façade will function as a double glass façade. A double glass façade can work as extra insulation in the winter and help the natural ventilation system in the summer. The way the façade works will be described in the technical section of the report.




2




3


4

TECHNICAL


USIKK
SISK A-G
SSISK H-Q
SSISK R-Å
PERA/BALLETT A-Ø

TECHNICAL ASPECTS

GENERAL

In the following section the technical aspects of the project will be accounted for. The technical aspects are the indoor climate demands, the ventilation strategies and the energy consumption of the library. Construction details and the U- values for the different construction parts are made in Rockwool Energy a programme from Rockwools homepage, also known as builddesk.
The daylight factors are calculated by the programme Velux daylight Visualizer 2.

Furthermore an indoor climate simulation calculating co2 levels and average indoor temperatures in the main library room has been simulated in the programme B-sim.

The buildings energy consumption is calculated using BE10.

The ventilation rate, double facade of the building is also presented in technical section of the report.

All the technical documents are also found on the cd.

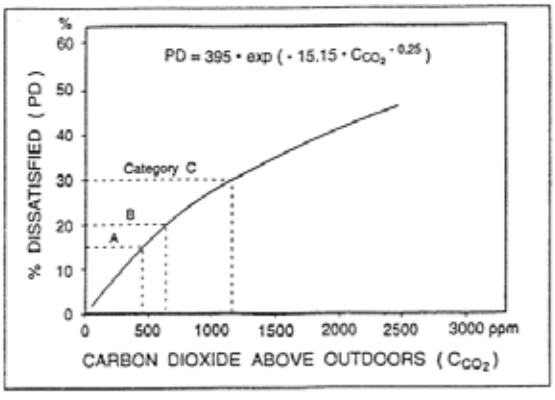
Table A.5 — Three categories of perceived indoor air quality

Category	Perceived air quality		Required ventilation rate[1]
	dissatisfied %	dp	l/s × olf
A	15	1,0	10
B	20	1,4	7
C	30	2,5	4

[1] The ventilation rates given are examples referring exclusively to perceived air quality. They apply only to clean outdoor air and a ventilation effectiveness of one.

Preceived indoor air quality [DS 1752]

The building is set to be a category B building from DS 1752 [DS 1752] where there can be up to 20 % dissatisfied users and thereby the required ventilation rate of 7 l/s



NOTE The curve shows the perceived air quality (% dissatisfied) as a function of the carbon dioxide concentration above outdoors. It applies to spaces where sedentary occupants are the exclusive pollution source and is based on the same data as Figure A.7. The concentration of carbon dioxide outdoors is typically around 700 mg/m³ (350 ppm) (see Table A.9).

Carbon dioxide above outdoors [DS 1752]

Regarding C02 the demands are still decided by category B and th maximum C02 concentration above outdoor concentration (outdoor is 350ppm) is 650 ppm.

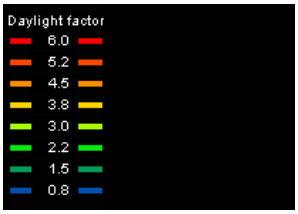
VELUX DAYLIGTH VISUALIZER

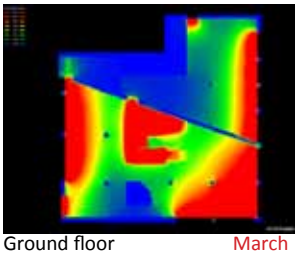
DAYLIGHT FACTOR

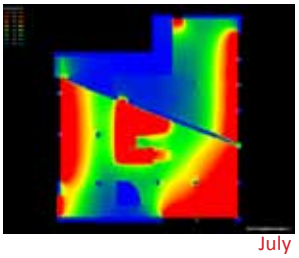
Velux Daylight Visualizer 2 is a daylight simulation tool developed by Velux and can be downloaded from their website. The programme works in two ways. Either one can draw a building from scratch or import a building geometry from a 3D programme directly into the programme. For exampleone can import a model from Google sketchup, give the model materials and location and then proceed with the daylight simulations. This makes the programme easy to use as a sketching tool for daylight conditions of a design through the process of using a 3d modelling programme as Google sketchup. Since the new library should have the best possible daylight conditions the programme has been used throughout the design process as an important tool when assessing a design proposal.

The program has been a beneficial sketching and documentation tool. But the one thing to question from a scientific standpoint is that you cannot get qualified documentation on how the calculations are made, as you can from for example DialEurope, another daylight calculation tool.

But even with knowing this the program was chosen because it is easy to use and deploy throughout the project and has lead to a building design developed correlating to the daylight quality.




Ground floor March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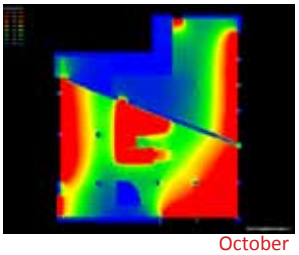
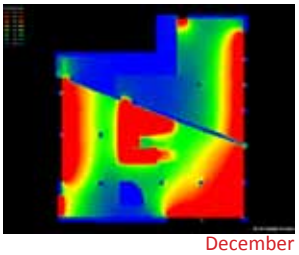

October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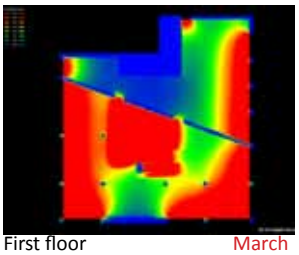
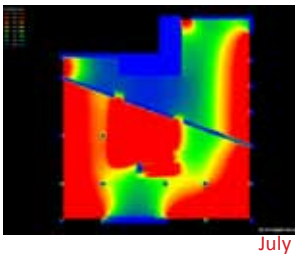

First floor March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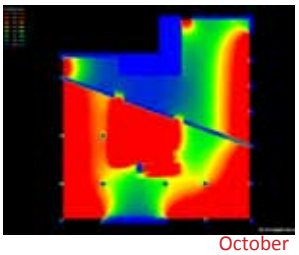
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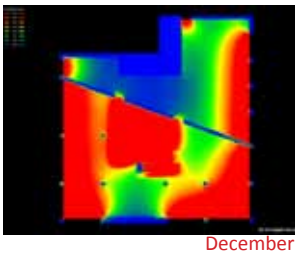
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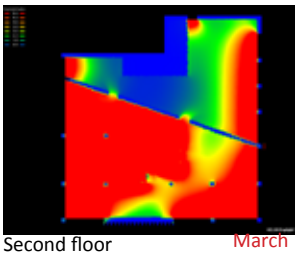
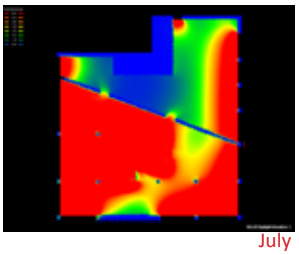

Second floor March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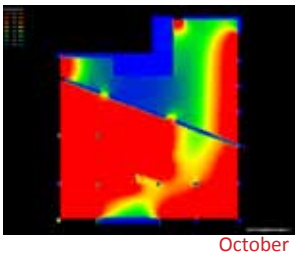
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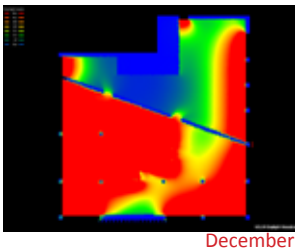
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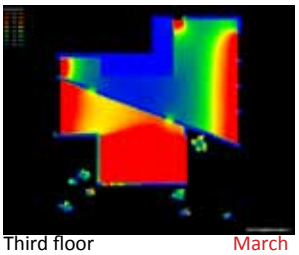
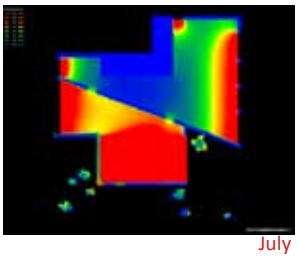
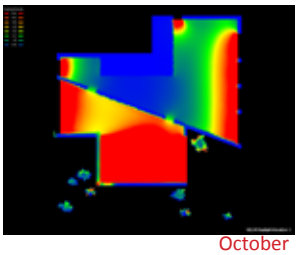
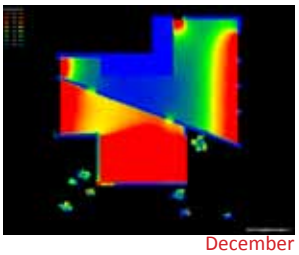

Third floor March


July


October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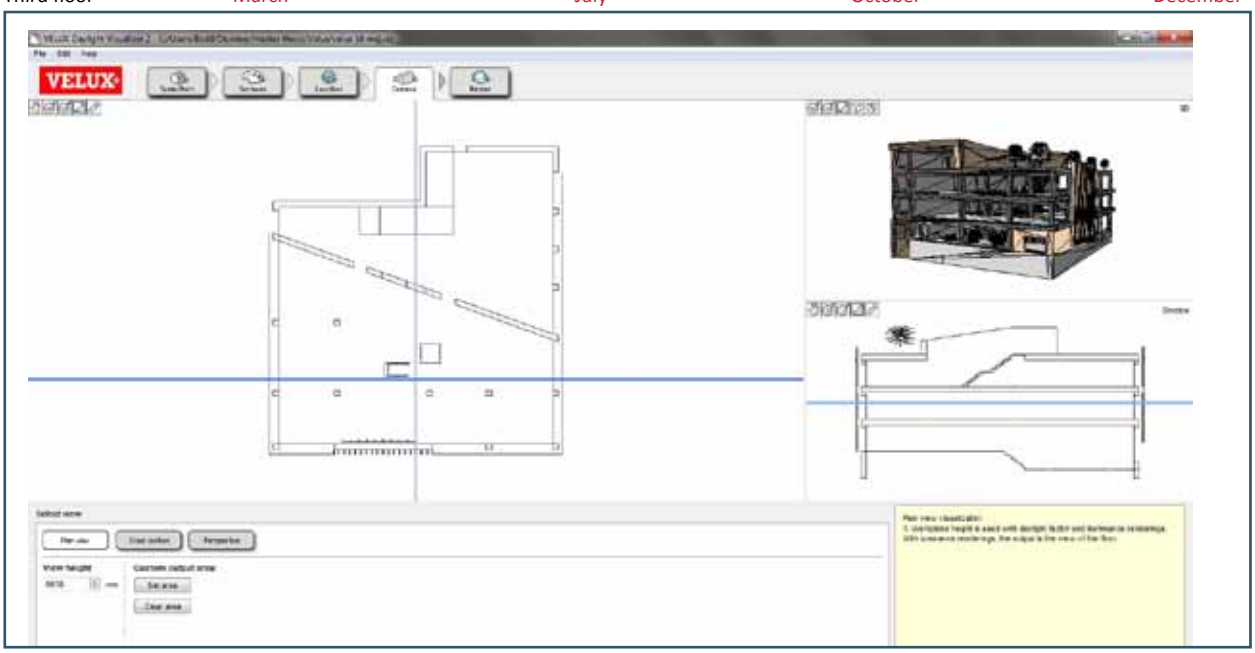


VENTILATION

NATURAL AND MECHANICAL

The library operates with different strategies for the ventilation. The building uses both mechanical and natural ventilation. When designing a building with natural ventilation it can be difficult to predict the effect because of the changes in weather conditions. The library is thought to operate with hybrid ventilation, which exploits the benefits from both natural and mechanical ventilation. Hybrid ventilation is a two part system that adjusts the ventilation mode and need according to the weather conditions.
The mechanical system in the building has a heat recovery efficiency of 85 % where a heat exchanger is located between the inbound and outbound air flow minimizing the heat loss from the system and building by reusing the exiting heat to heat the entering cold air.

Summer strategy
The atrium in the middle of the building is designed to be an air chimney utilizing the thermal buoyancy. However in summertime the buoyancy forces are lower because the smaller difference between outdoor and indoor temperature compared to the winter season. Therefore there are openings in the facade of the building to bring in fresh air and utilize the wind. The openings in the facade and top of the atrium are distributed at both sides ensuring good possibility for cross ventilation. This natural ventilation system works as shown in the double facade spread.

Night cooling
The building will also be utilizing night cooling of the building. The lower air temperature during the night is used to remove the heat from the atrium and building by allowing some of the windows in the natural ventilation system to be open during night. Furthermore the building consists of concrete which has a high thermal mass and can accumulate both heat and cold. The mass in the building will store heat during the day and releases it through the night ensuring stable temperatures without extra operating costs.

Mechanical ventilation
The mechanical ventilation operates with mixing ventilation. The ventilation rate is calculated as seen on the next page. The library is set to a category B building from DS 1752 [DS 1752] and the minimum air change is 7 litres/second per person. The calculation was done in the different zones with this demand, but the temperature was too high and the air quality to poor. Therefore different values per square meters were tested in calculation and the air quality and temperature in the building was found sufficient with 7 l/s per person plus 05 l/s per square meters. This airflow for the different zones can be seen calculated marked with green. The calculated values were then used in both Bsim and Be10. Both of which can be found on the cd.

Haugesund Library	Kitchen	core	library	studyhall 1	offices	Basement
area (m2)	42	240	2205	170	128	620,42
volume (m3)	126	2880	1794	510	384	1550
people	2	4	200	32	20	7
lighting (lux)	200	100	400	200	200	200
INDOOR CLIMATE						
Covering insulating power, summer [clo]	0,7	0,7	0,7	0,7	0,7	0,7
Covering insulating power, winter [clo]	1	1	1	1	1	1
THERMAL COMFORT						
Optimal operativ tem. Summer[degreeds]	23-26	23-26	23-26	23-26	23-26	23-26
Optimal operativ tem. Winter [degrees]	20-24	20-24	20-24	20-24	20-24	20-24
AIR QUALITY						
Admissible co2 level indoor air(ppm)	660	660	660	660	660	660
CO2 concentration outdoor air [ppm]	350	350	350	350	350	350
Total admissible co2 level	1010	1010	1010	1010	1010	1010
CO people load (l/h*person)	38	76	3800	608	380	133
Sensory pollution load (olf/occupant) (Gc)	1,2	1,2	1,2	1,2	1,2	1,2
Sensory pollution load building (olf/m floor)	0,1	0,1	0,1	0,1	0,1	0,1
Total Sensory pollution load (olf)	1,3	1,3	1,3	1,3	1,3	1,3
Air quality, category B, 20% (dp) (Cci)	1,4	1,4	1,4	1,4	1,4	1,4
Out door air quality (dp) (C0)	0,1	0,1	0,1	0,1	0,1	0,1
ventilation efficiency	1	1	1	1	1	1
ventilation rate						
7 l /s per person	14	28	1400	224	140	49
2 l/s per m2	84	480	4410	340	256	1240,84
7l/s+2l/s	98	508	5810	564	396	1289,84
/m2	2,3333	2,1167	2,63492	3,317647	3,09375	2,078979
7 l/s per person pr m2	0,3333	0,1167	0,63492	1,317647	1,09375	0,078979
1 l per m2	42	68,3	2208	170	120	682
7 l/s pr person + 1 l/s m2	1,3333	0,4013	1,63628	2,317647	2,03125	1,178234
0,5 l/s per m2	21	120	1102,5	85	64	310,21
7 l/s pr person+ 0,5 l/s pr m2	0,833333	0,616667	1,134921	1,81764706	1,59375	0,57897876
SCENT NUISANCES						
10*(Gc/Cci-C,0)*(1/ℰV)	7,5714	8,2857	8,28571	8,285714	8,285714	8,285714
h-1	0,2163	0,0104	0,01663	0,058487	0,077679	0,019244
per m2	0,180272	0,034524	0,003758	0,0487395	0,06473214	0,01335501
CARBON-ACID GAS						
Q=(q-10^3)/(n*V) + C						
n=q*10^3 /(Q-C)*V	0,464	0,0406	3,25873	1,834087	1,522436	
	0,662829	0,01015	0,088673	0,64732499	0,71364183	

BE 10

CALCULATING THE ENERGY CONSUMPTION

Be-10 is as mentioned earlier a calculation program to resolve the buildings energy consumption. As the library is to comply with the energy demands for 2020 it should have an energy consumption of maximum 25 kWh/m2/year.
When calculating on a building where the use of the house is beyond normal cases one can incorporate a supplement to the energy frame for example for long usage hours, lightning needs, ventilation requirements and water consumptions. The library has higher operating hours on 84 hours a week and also a high lightning demand, but there will not be calculated with supplements in this calculation.

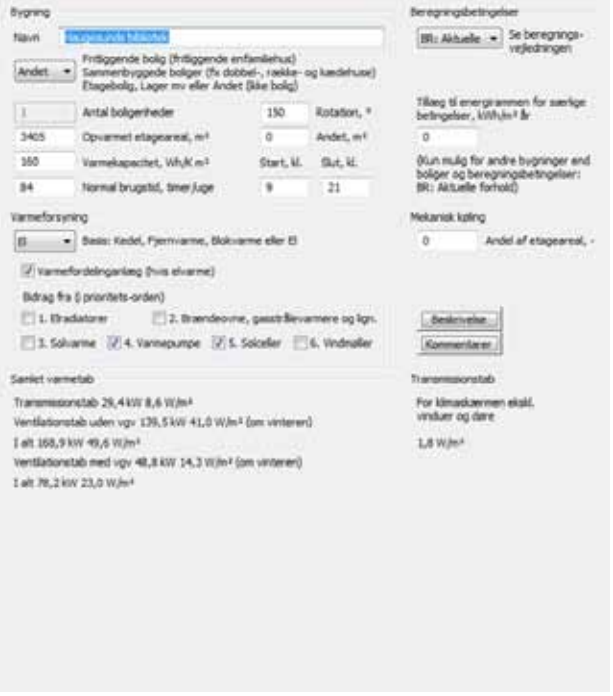
To be able to calculate the energy consumption for the library different systems and values needs to be put into the programme. The following are entered into the calculation.

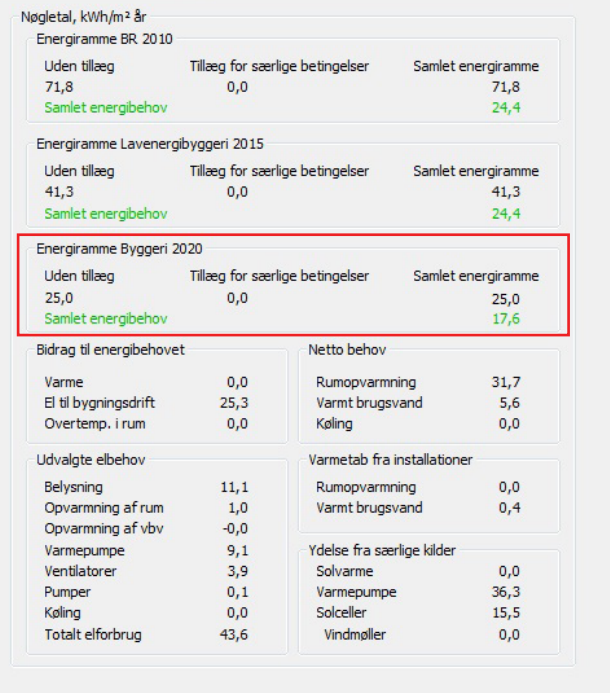
-The building envelope and windows and doors with shadows
-Transmission losses
-Internal heat gain
-Lightning
-Ventilation
-People load
-Hot water
-Heat pump
-Solar cells

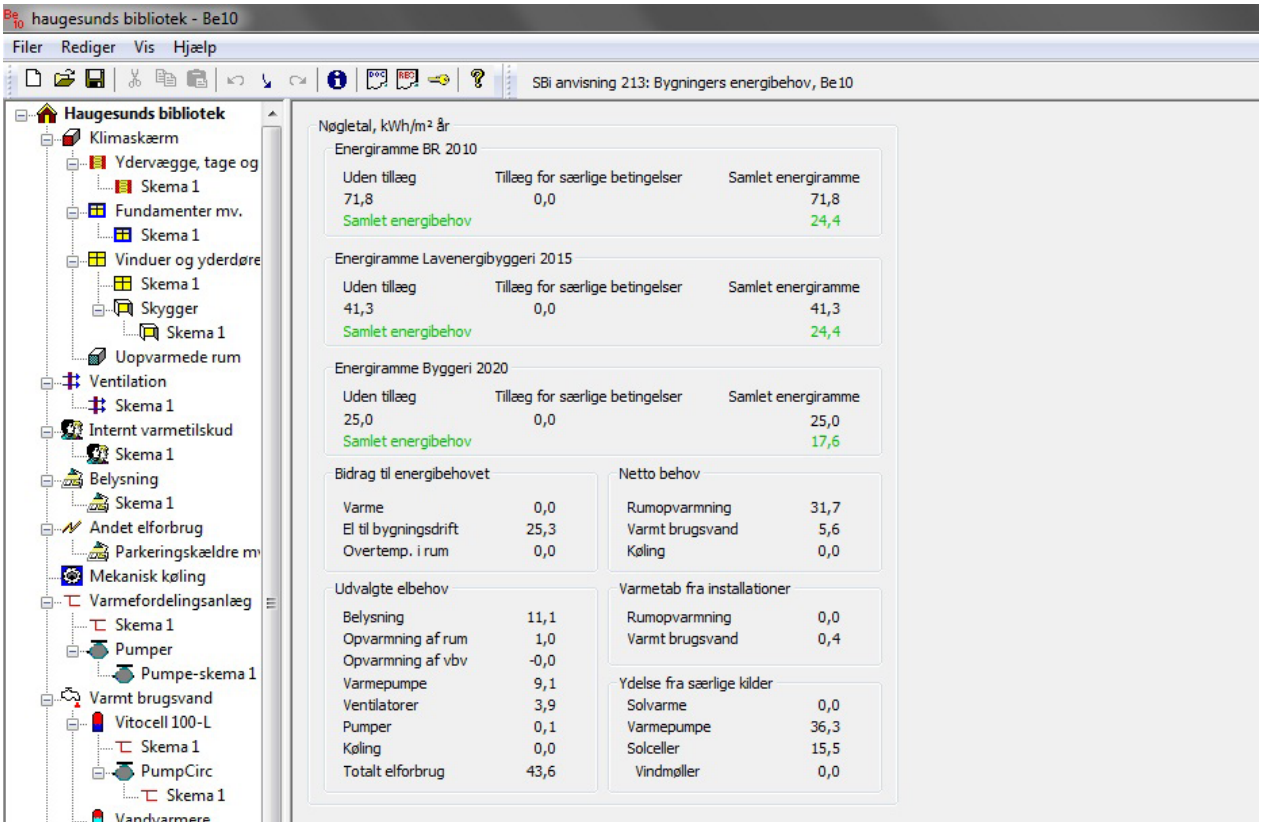
As seen in the diagram to the right the library energy consumption is under the maximum consumption for a 2020 public building. The building reaches the goal due to the energy production from the solar cells on the roof. Without the solar cells the building has an energy consumption of 45, 5 KWh/ per square meters heated floor area which do not qualify to the 2020 demands.

As seen in the diagram from BE 10 energy consumption for building operation, heating and lightning have the largest posts.
To reach the goal of a low energy building through the calculations the main focus has been to bring these three down. Regarding lightning it has been important to work with the placement and the sizes of the windows versus the need for artificial light in the library. Regarding the artificial light the library is through to use LED lightning throughout the building. Regarding the energy consumption for building operation it has been important to work with the mechanical ventilation to minimize the power consumption for this system. This is achieved by for example utilizing natural ventilation in the summer months.

The goal has been from the start of the process to design a building that obtains the 2020 demand of maximum 25 kWh/m2/year. This is in this project obtained by designing a building with a compact building envelope, by making qualified choices regarding the design throughout the process and by incorporating solar cells into the design.




Nøgletal, kWh/m² år
Energiramme BR 2010
Uden tillæg
Tillæg for særlige betingelser
Samlet energiramme
71,8
0,0
71,8
Samlet energibehov
24,4
Energiramme Lavenergibyggeri 2015
Uden tillæg
Tillæg for særlige betingelser
Samlet energiramme
41,3
0,0
41,3
Samlet energibehov
24,4
Energiramme Byggeri 2020
Uden tillæg
Tillæg for særlige betingelser
Samlet energiramme
25,0
0,0
25,0
Samlet energibehov
17,6
Bidrag til energibehovet
Varme 0,0
El til bygningsdrift 25,3
Overtemp. i rum 0,0
Netto behov
Rumopvarmning 31,7
Varmt brugsvand 5,6
Køling 0,0
Udvalgte elbehov
Belysning 11,1
Opvarmning af rum 1,0
Opvarmning af vbv -0,0
Varmepumpe 9,1
Ventilatorer 3,9
Pumper 0,1
Køling 0,0
Totalt elforbrug 43,6
Varmetab fra installationer
Rumopvarmning 0,0
Varmt brugsvand 0,4
Ydelse fra særlige kilder
Solvarme 0,0
Varmepumpe 36,3
Solceller 15,5
Vindmøller 0,0


haugesunds bibliotek - Be10
Filer Rediger Vis Hjælp
SBi anvisning 213: Bygningers energibehov, Be10
Haugesunds bibliotek
Klimaskærm
Ydervægge, tage og
Skema 1
Fundamenter mv.
Skema 1
Vinduer og yderdøre
Skema 1
Skygger
Skema 1
Uopvarmede rum
Ventilation
Skema 1
Internt varmetilskud
Skema 1
Belysning
Skema 1
Andet elforbrug
Parkeringskældre m
Mekanisk køling
Varmefordelingsanlæg
Skema 1
Pumper
Pumpe-skema 1
Varmt brugsvand
Vitocell 100-L
Skema 1
PumpCirc
Skema 1
Nøgletal, kWh/m² år
Energiramme BR 2010
Uden tillæg
Tillæg for særlige betingelser
Samlet energiramme
71,8
0,0
71,8
Samlet energibehov
24,4
Energiramme Lavenergibyggeri 2015
Uden tillæg
Tillæg for særlige betingelser
Samlet energiramme
41,3
0,0
41,3
Samlet energibehov
24,4
Energiramme Byggeri 2020
Uden tillæg
Tillæg for særlige betingelser
Samlet energiramme
25,0
0,0
25,0
Samlet energibehov
17,6
Bidrag til energibehovet
Varme 0,0
El til bygningsdrift 25,3
Overtemp. i rum 0,0
Netto behov
Rumopvarmning 31,7
Varmt brugsvand 5,6
Køling 0,0
Udvalgte elbehov
Belysning 11,1
Opvarmning af rum 1,0
Opvarmning af vbv -0,0
Varmepumpe 9,1
Ventilatorer 3,9
Pumper 0,1
Køling 0,0
Totalt elforbrug 43,6
Varmetab fra installationer
Rumopvarmning 0,0
Varmt brugsvand 0,4
Ydelse fra særlige kilder
Solvarme 0,0
Varmepumpe 36,3
Solceller 15,5
Vindmøller 0,0

BSIM

SIMULATING THE INDOOR CLIMATE

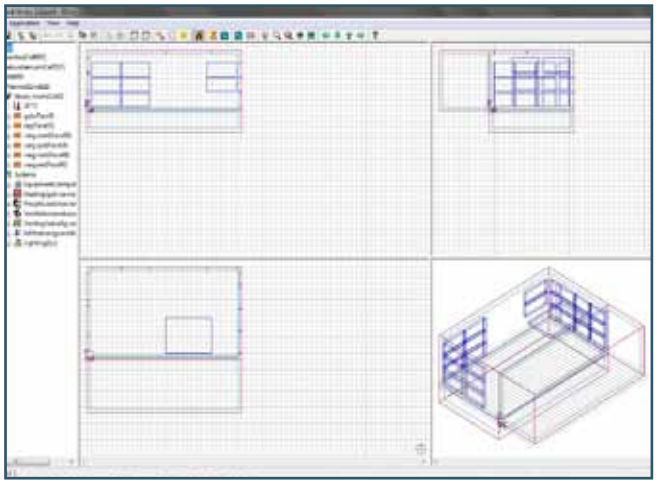
BSim is used to simulate the indoor climate of the main library room. The factors to look at when simulating the library room is the temperature regarding thermal comfort, the co2 level and air change.
The library room is simplified because the programme works best with regular shapes, and all surfaces needs to “see” each other. The materials are made in the DB editor to be similar to the constructions from Rockwool energy. The site is set to Copenhagen and not Haugesund, Norway. This is because the program only holds the climate file for Copenhagen, Denmark. So there is a chance the results would be a bit different if the correct weather data existed. So this has to be taken in consideration when looking at the results.
The simulation process consists of four stages; modeling the room, making and entering the materials and constructions in the DB Editor, then the site is set and finally the systems within the room needs to be programmed.
The different systems active in the room is activated and the values are typed into the programme.

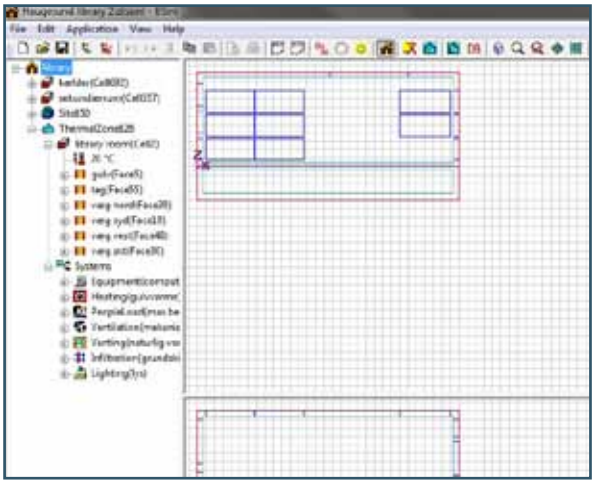
The different systems active is:

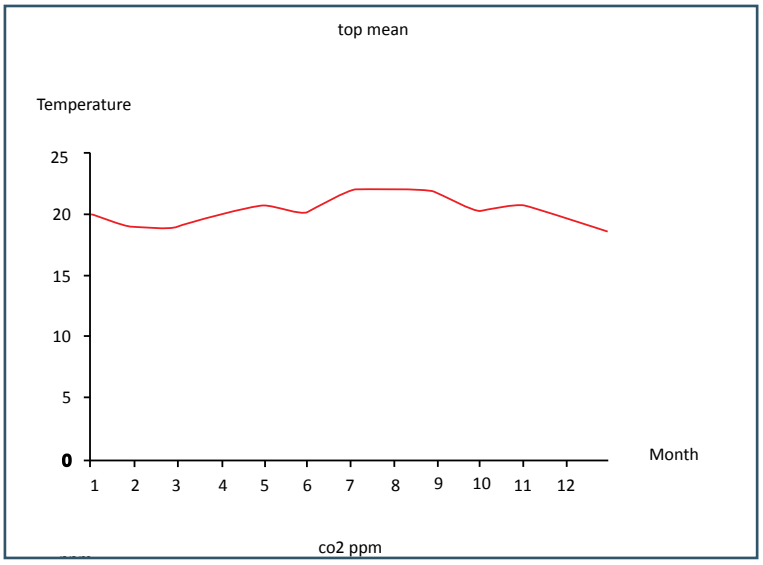
-Heating
-Infiltration
- Lighting
-People Load
-Ventilation
-Venting

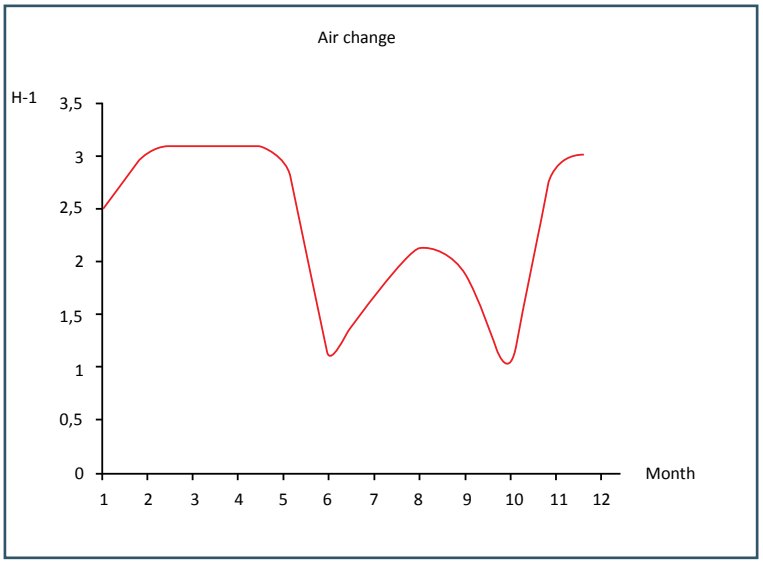
People load of the library is set high to 200 visitors, the opening hours of the library is set to 09-21 throughout the week. The air change is set to 1,3 l/s per square meters. Natural ventilation is activated for the summer months being May to September.

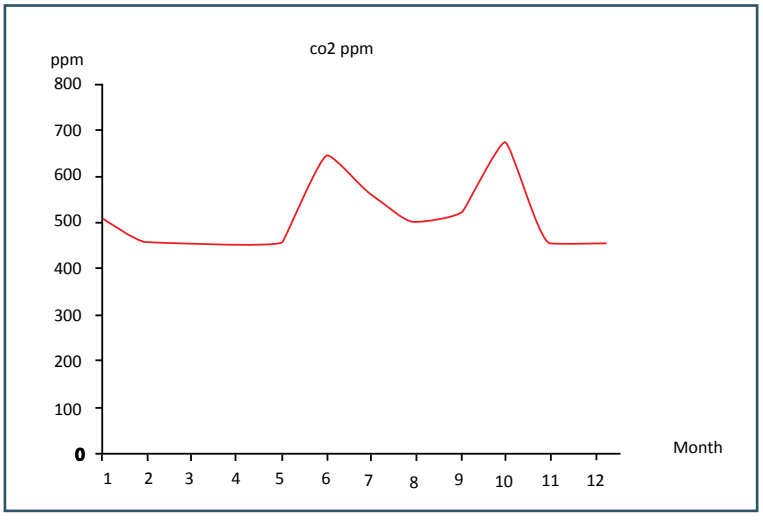
As seen in the graphs on the next side, the library room has a good indoor climate.
The room temperature should never be higher than 26 degrees and the CO2 level never higher than 1010 ppp (660 ppm + 350 ppm).
The graphs shows that the average values of thermal comfort, CO2 level and air change is satisfactory for the building.
The temperature in the library is between 20 and 23 degrees all year but is a bit low in months 1-3. This could be helped by increasing the heating in these months, and because the energy consumption is below the maximum, the extra amount for heating will not break the energy consumption.






top mean
Temperature
25
20
15
10
5
0
1 2 3 4 5 6 7 8 9 10 11 12
Month
co2 ppm


Air change
H-1
3,5
3
2,5
2
1,5
1
0,5
0
1 2 3 4 5 6 7 8 9 10 11 12
Month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Month

DOUBLE FACADE

PRINCIPLE

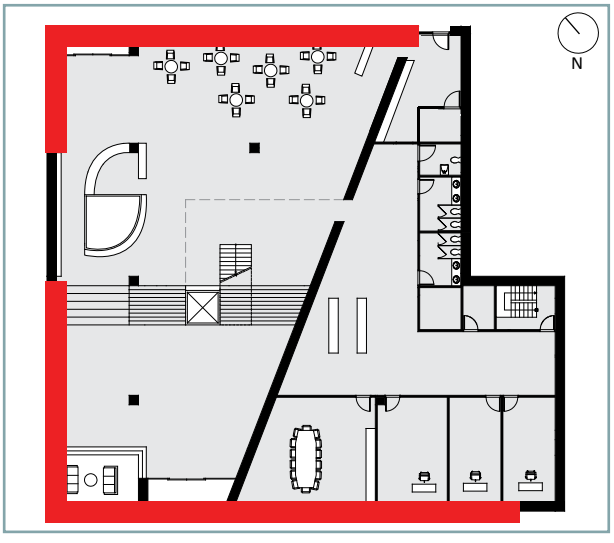
As mentioned in the sketching phase, the facade of the building are for some of the facade designed as a double glazed facade. The sections of the facades that has this system is marked with red on the figure below.
The double facade works in two ways. It helps to cool down the building by utilizing the cool wind in the summer and
By closing up and storing the sun heat in the winter.
On the opposite side the two different scenarios is illustrated.

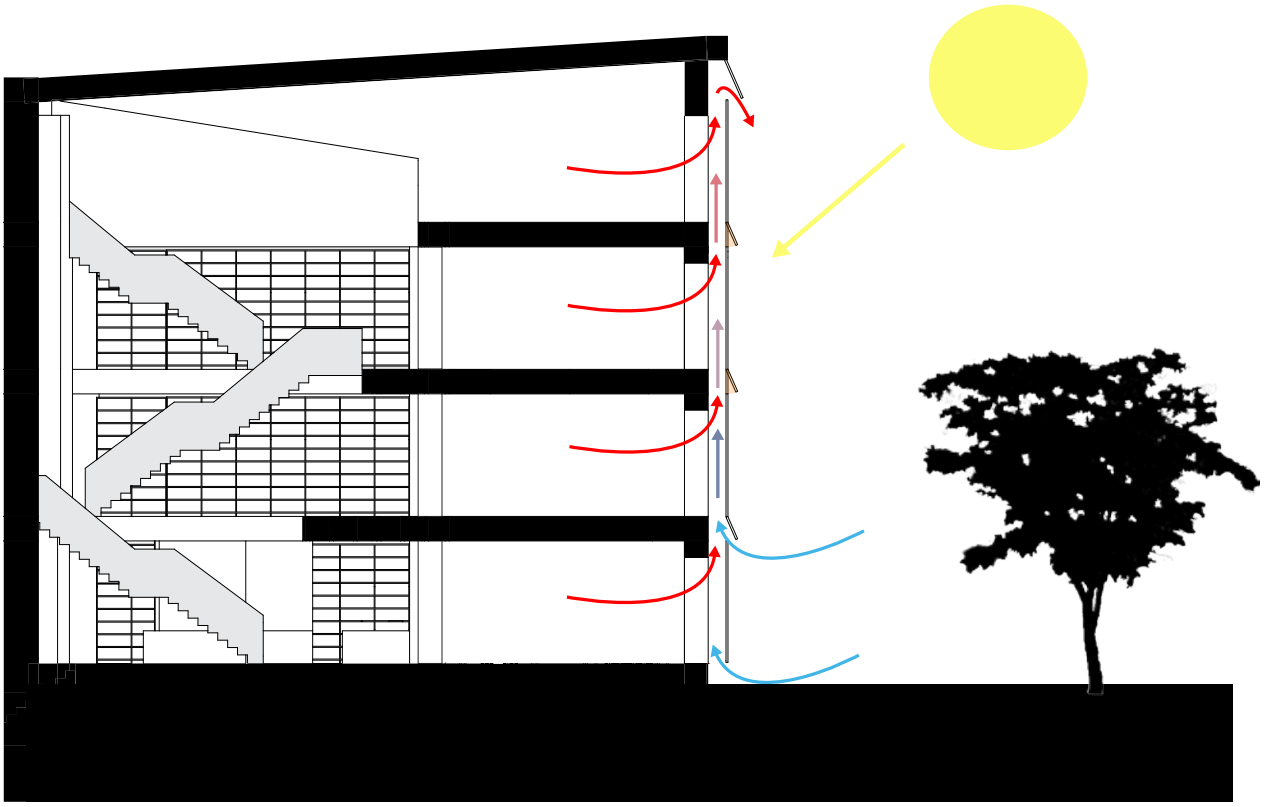
On the top the system for summer is shown. In the summer one opens areas of the outer glass facade and let the cool air and wind in. You also open the windows in the top of the room so that thermal buoyancy and the wind help the warm air out of the building through the openings in the outer glazing.

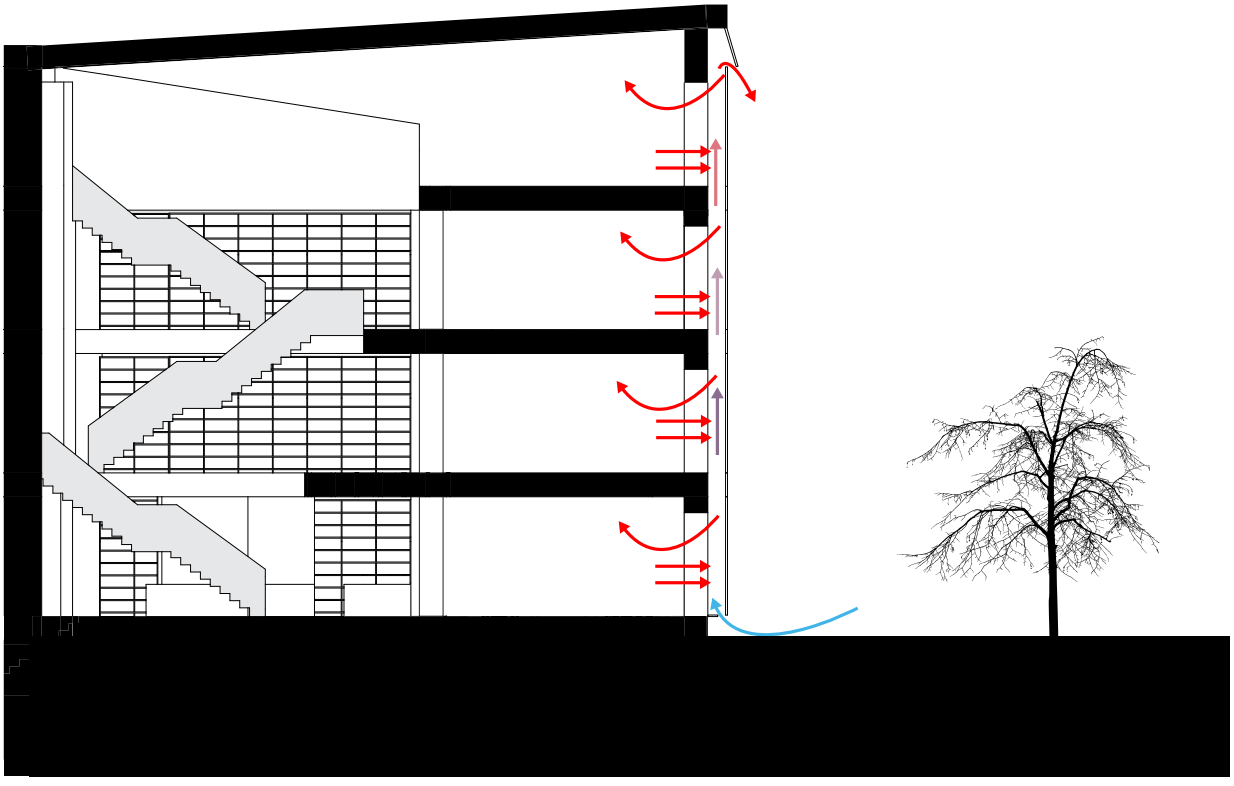
In the winter the facade works in the opposite way. In winter when it is cold and especially in the north one needs optimal utilization of the solar heat. Therefore in winter the openings in the double glazing are minimal or totally closed. This way the solar heat will be trapped between the two layers of glass and can the work as an extra insulation. As seen on the illustration the heat from the building will also accumulate in the facade and the heat loss from the building is minimized.

But the double facade can also be a negative factor for the building. It can for example make it to hot in the summer as not enough cool air is added to the space, meaning the building would be over heated. But in the case of this library the openings in the roof window over the atrium will also allow hot air to escape the building. But ways to help the double facade is installing different tools such as water to cool the air further.

But the specific efficiency of the facade is different from building to building.



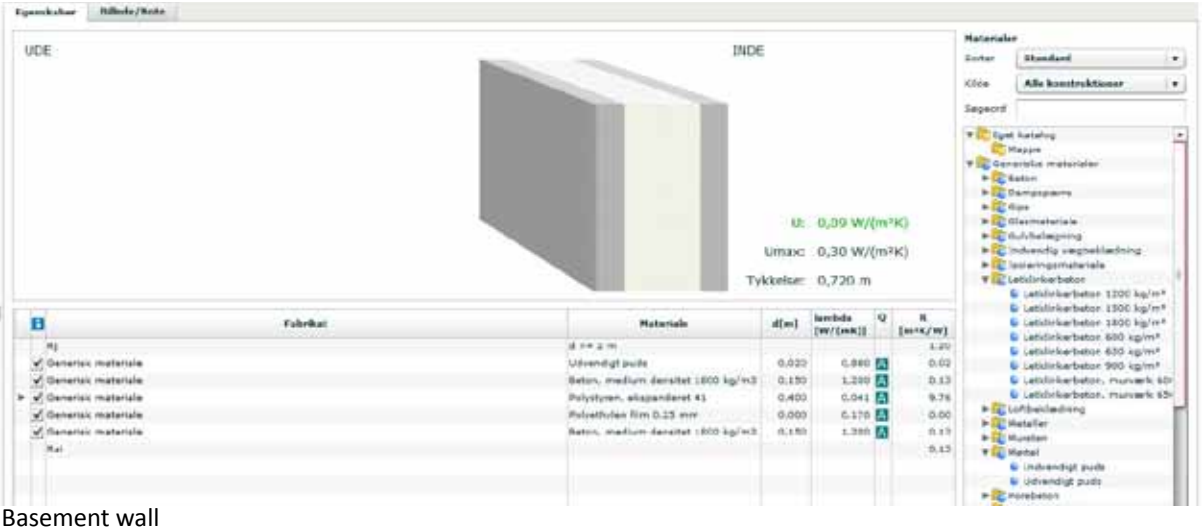




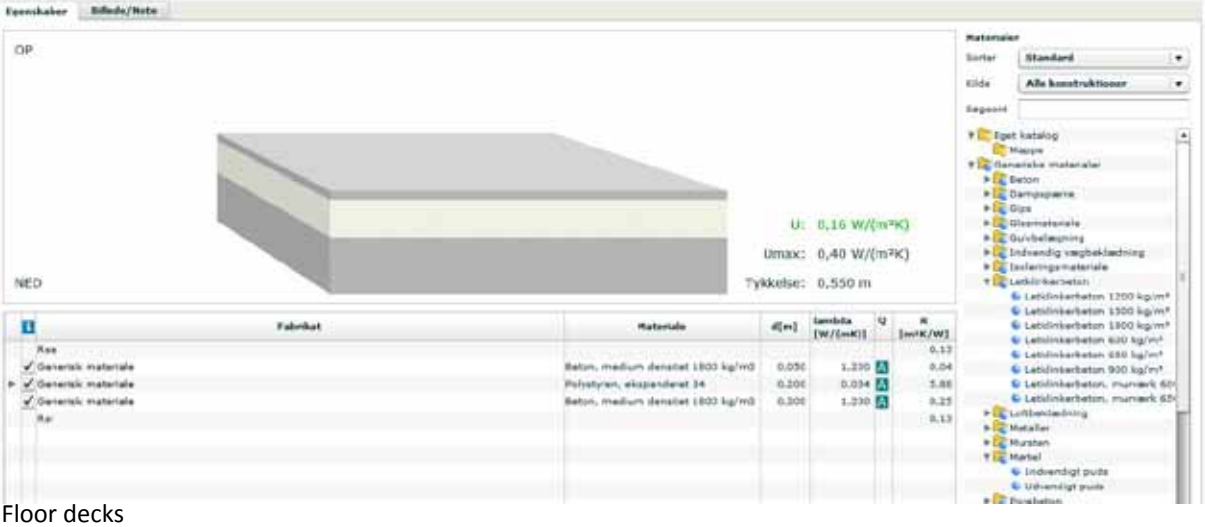
BUILDING ELEMENTS

ROCKWOOL ENERGY U-VALUE

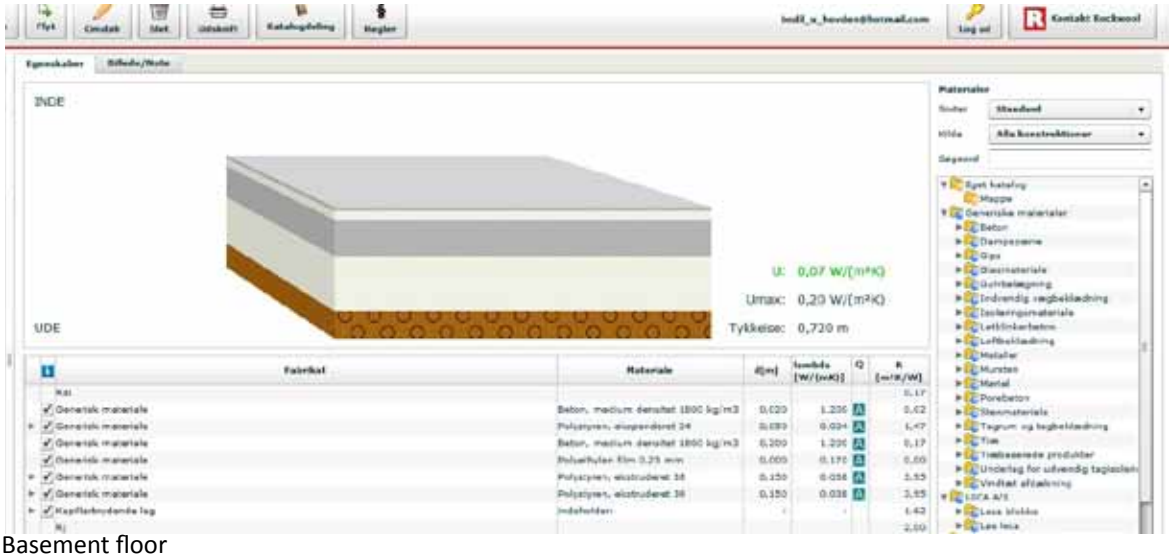
The following spread shows the building illustrations of building elements and the U-values found for them. The U-values and constructions are built up in the online programme Rockwool u-value calculator.



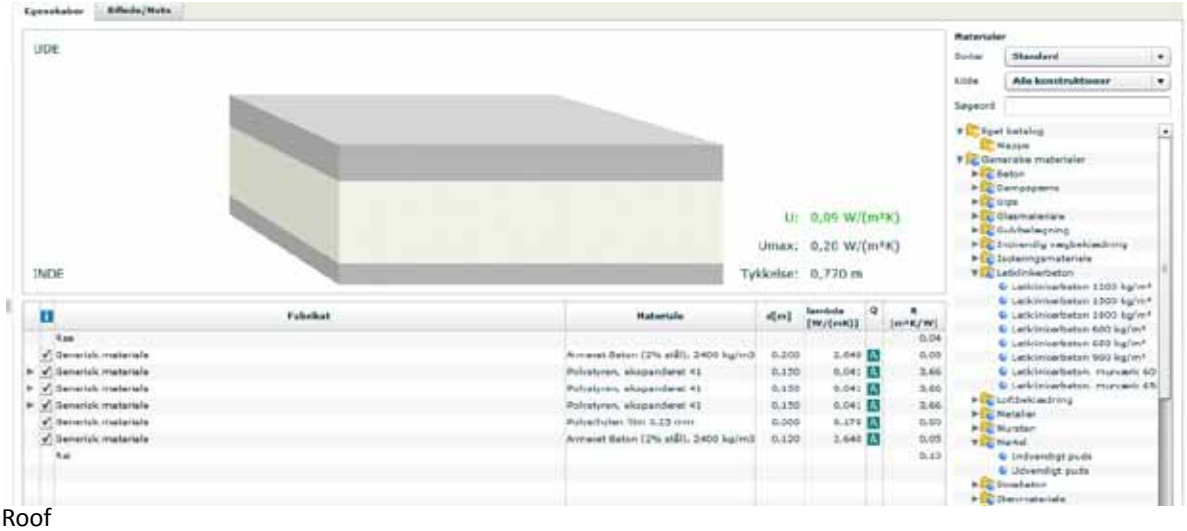
Basement wall



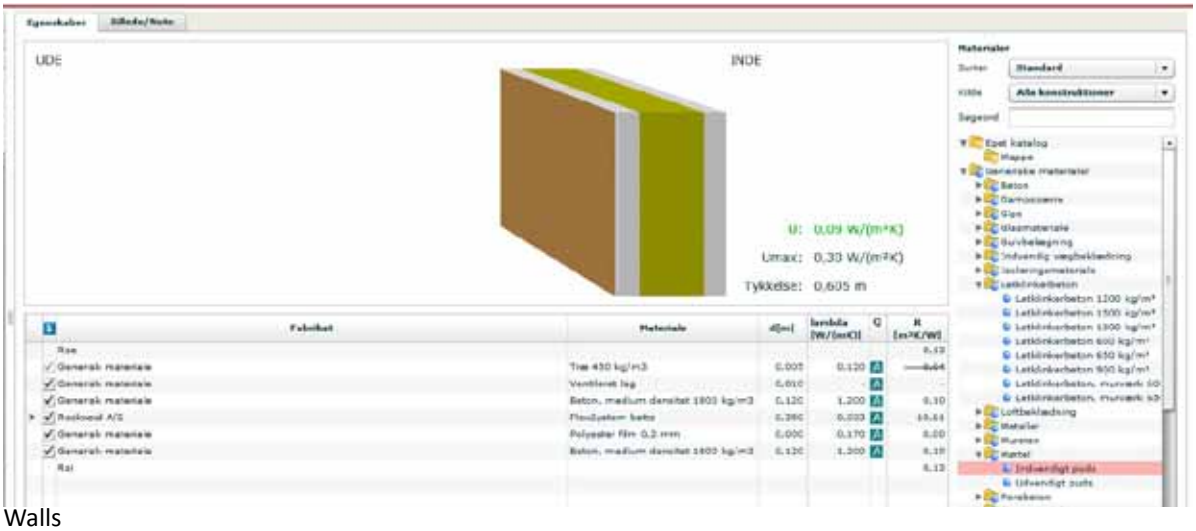
Floor decks



Basement floor

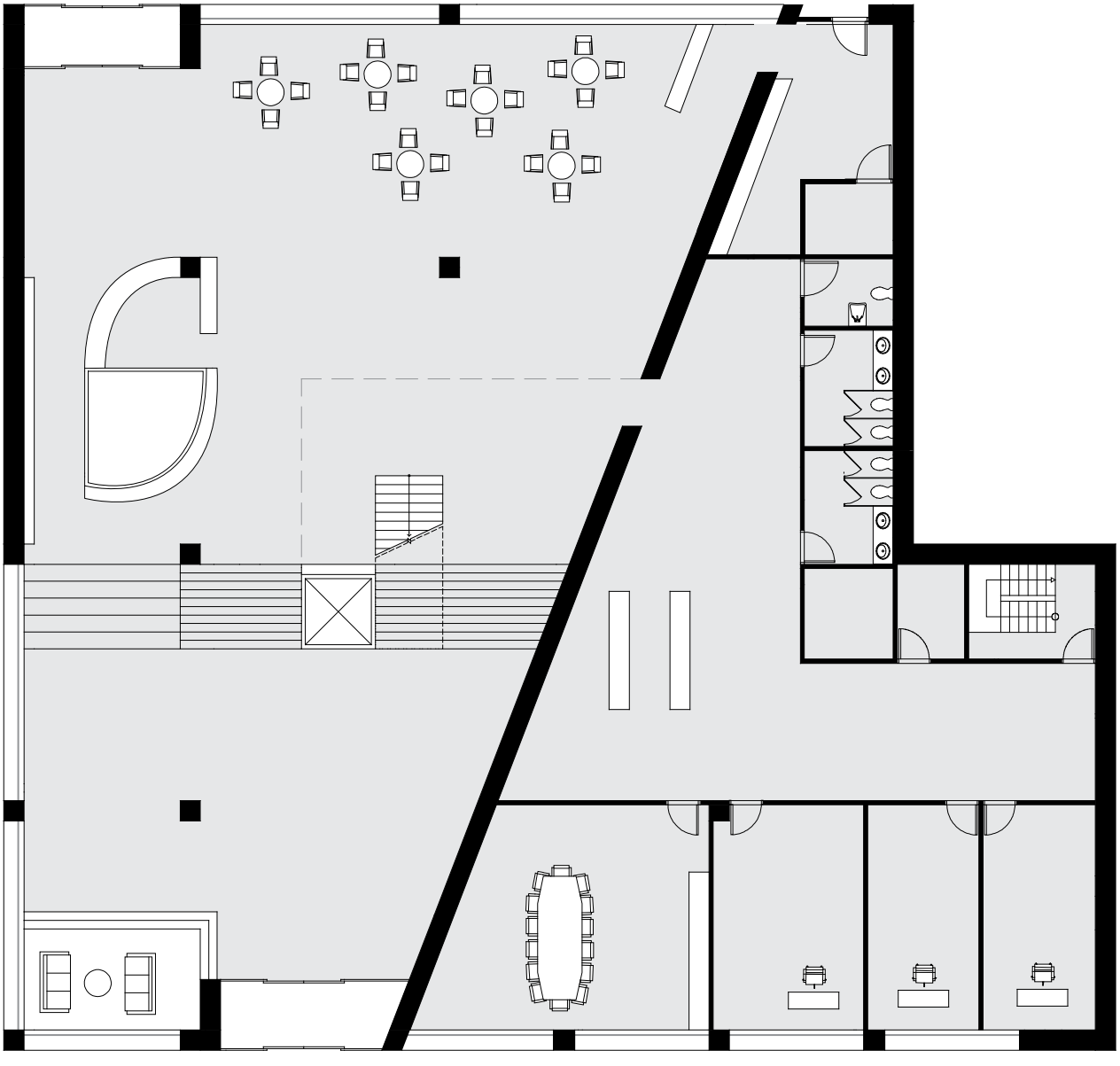


Roof



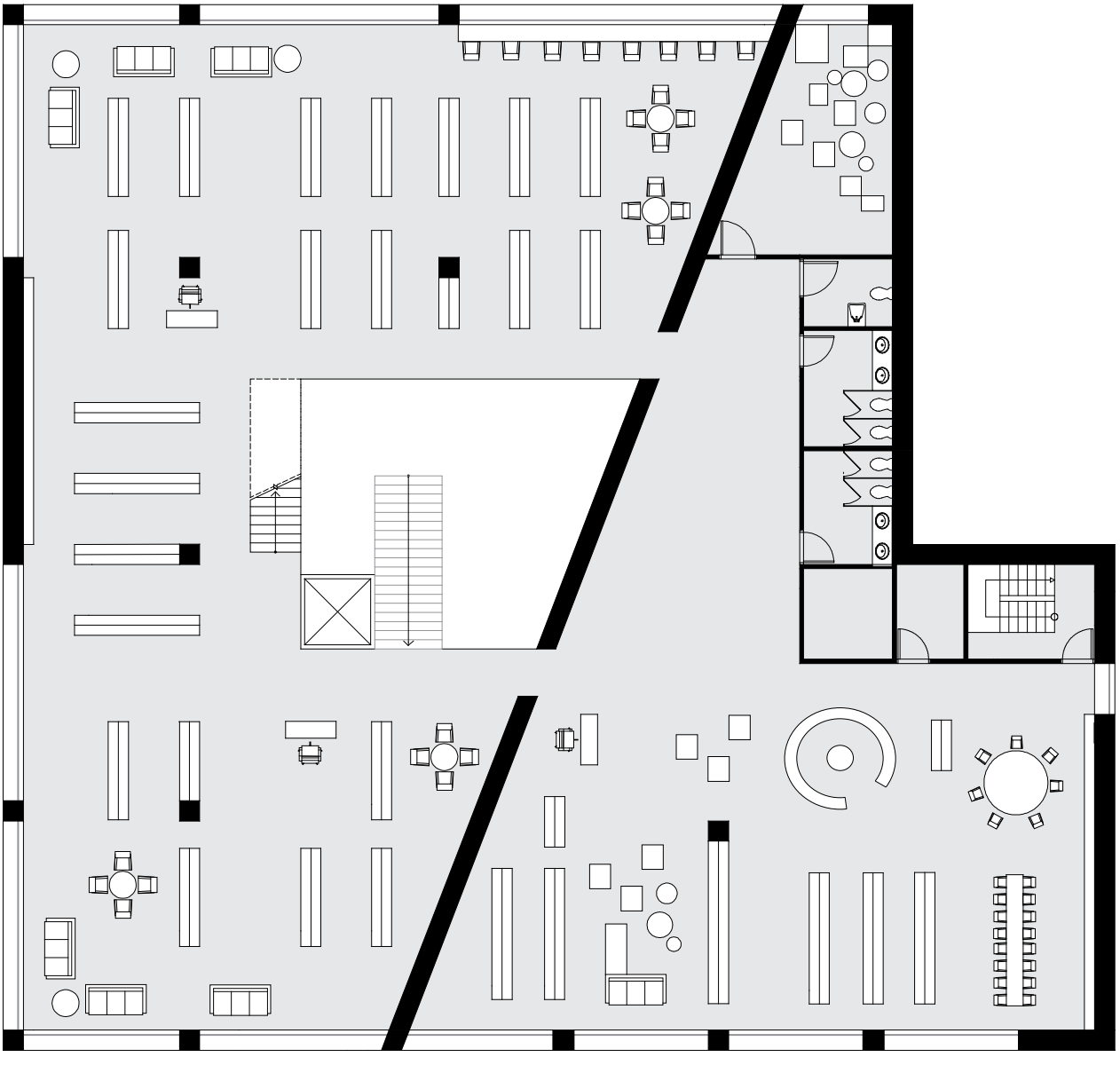
Walls

PRESENTATION



GROUND FLOOR 1:200

N



FIRST FLOOR 1:200

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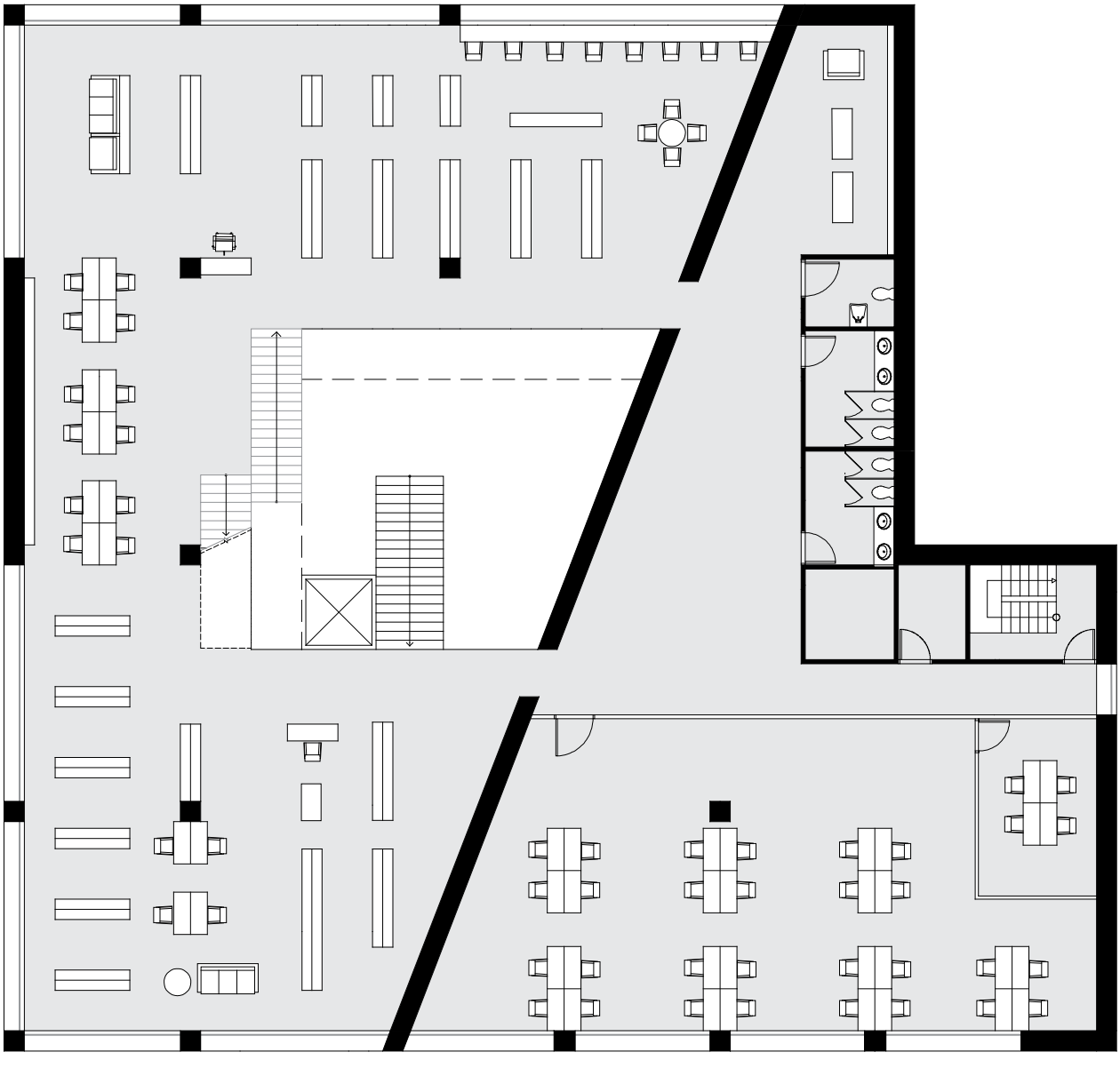

SECOND FLOOR 1:200

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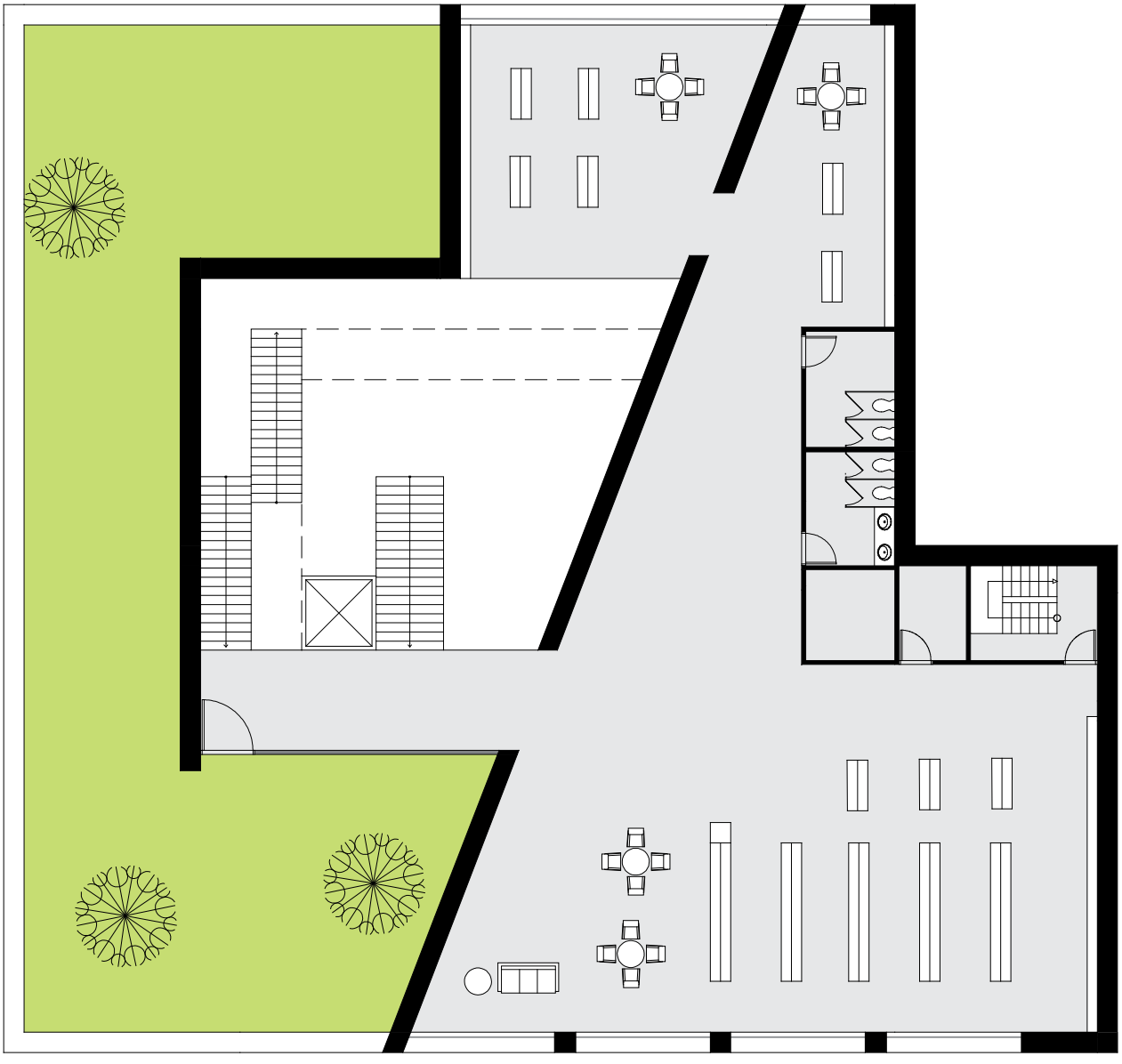

THIRD FLOOR 1:200

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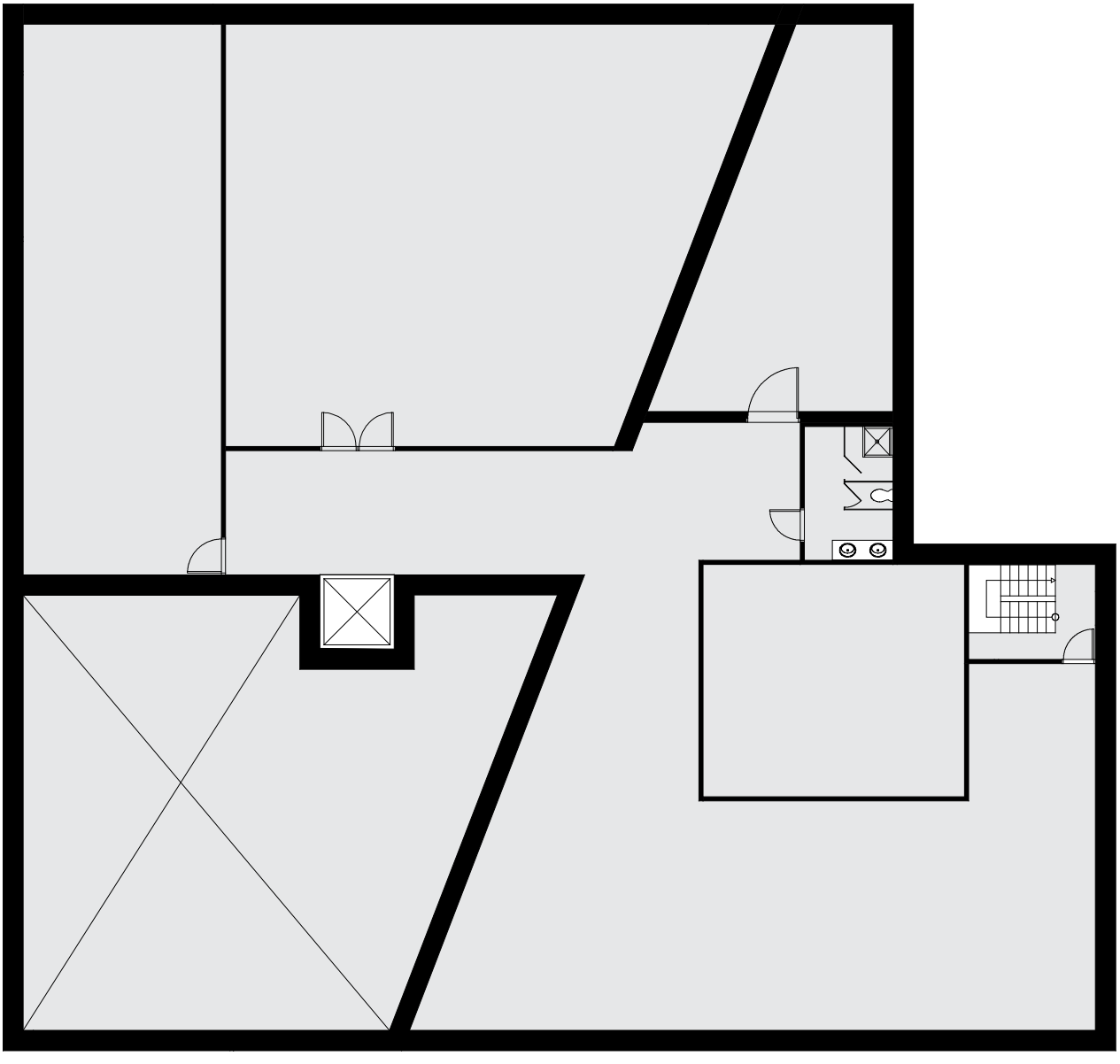
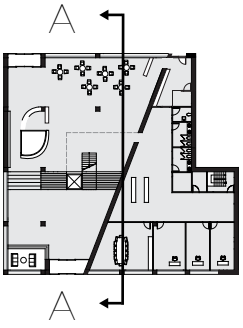
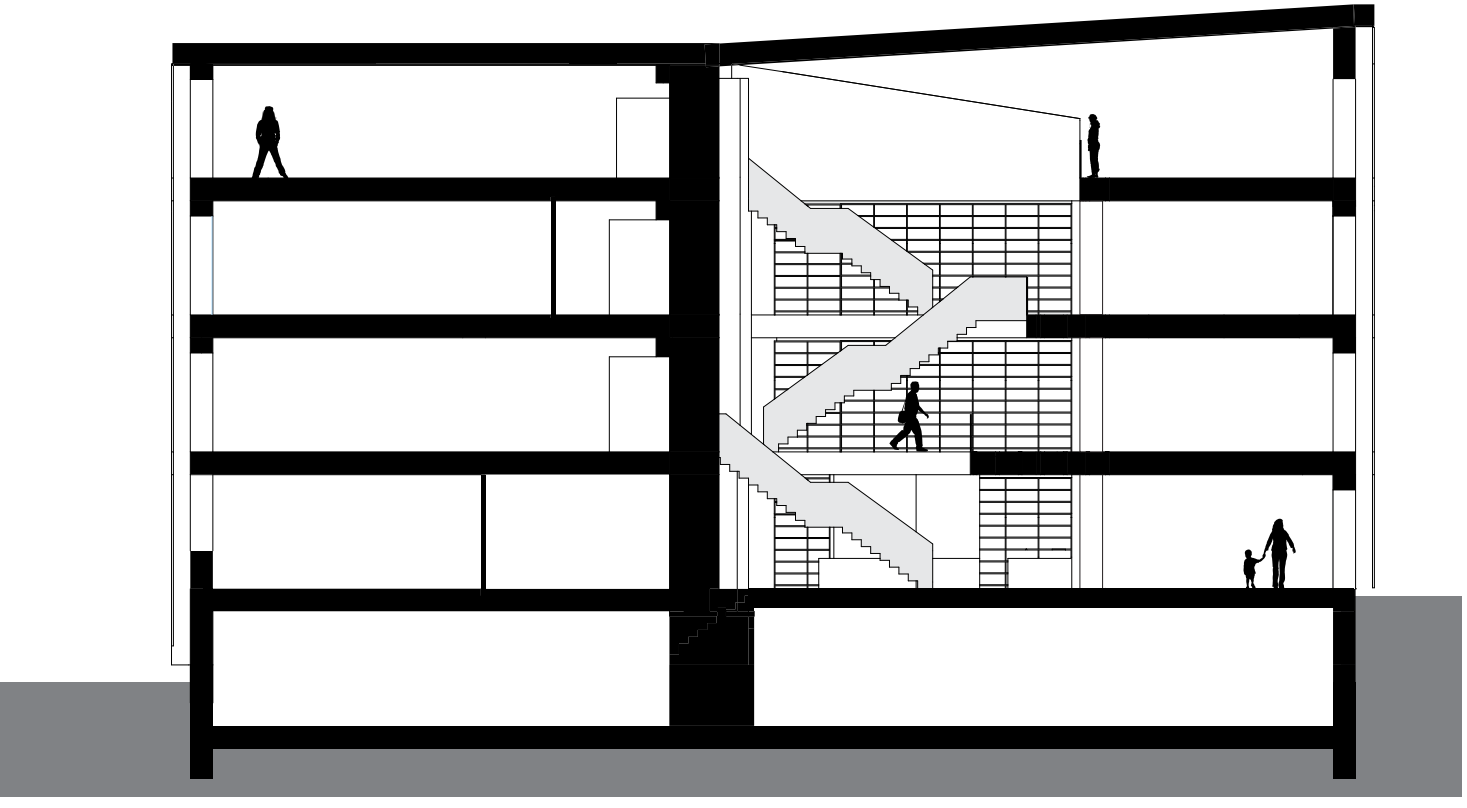


BASEMENT FLOOR 1:200

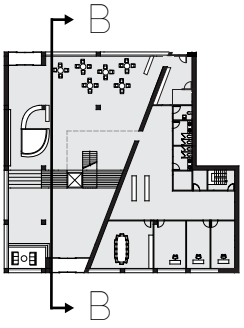
SITE PLAN 1: 1000

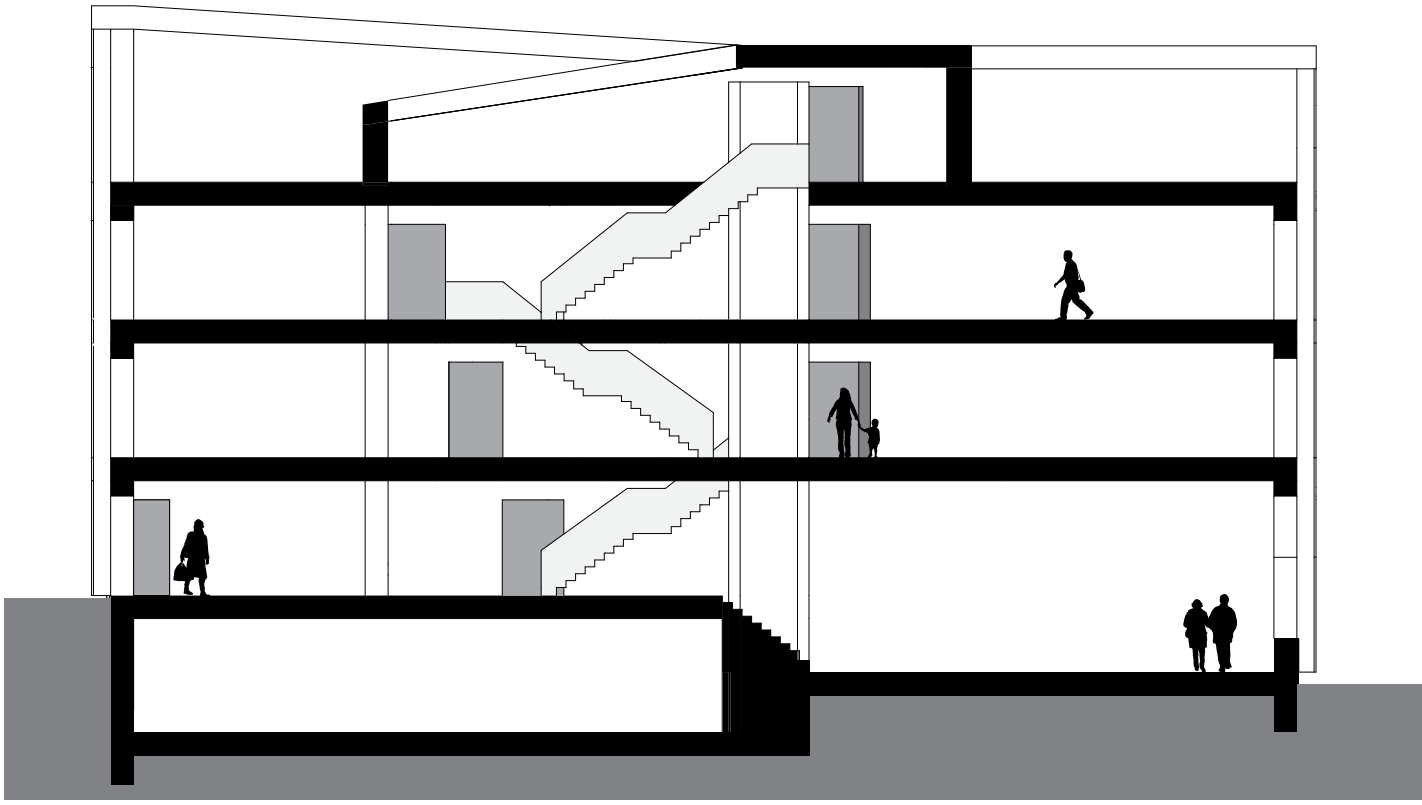
N



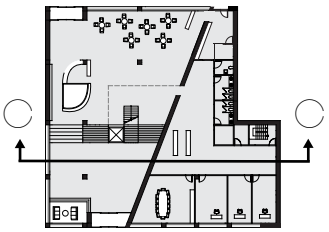


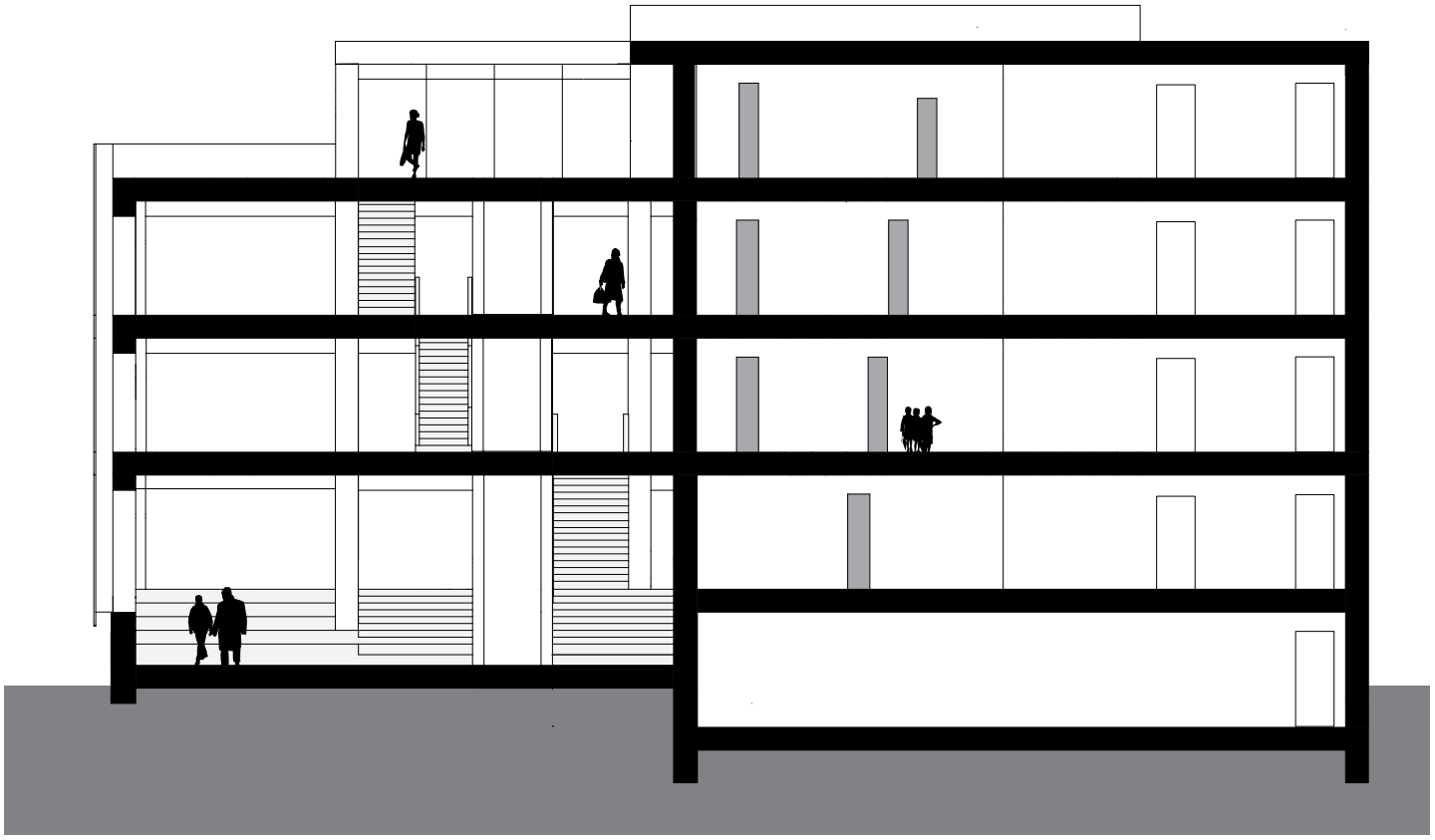
SECTION AA



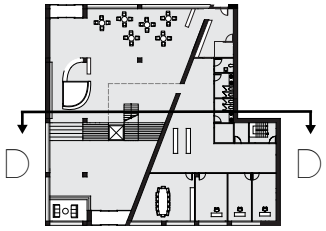


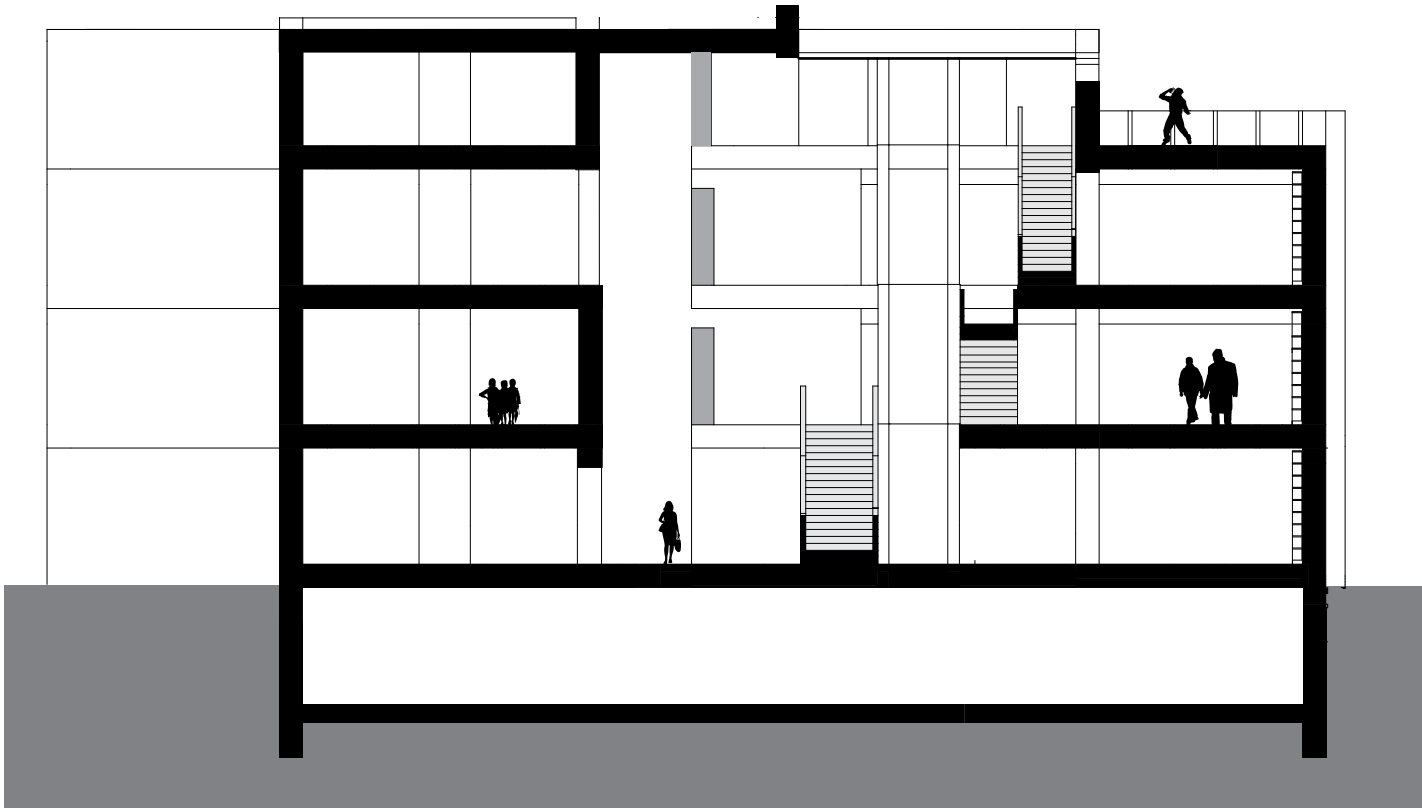
SECTION BB





SECTION CC



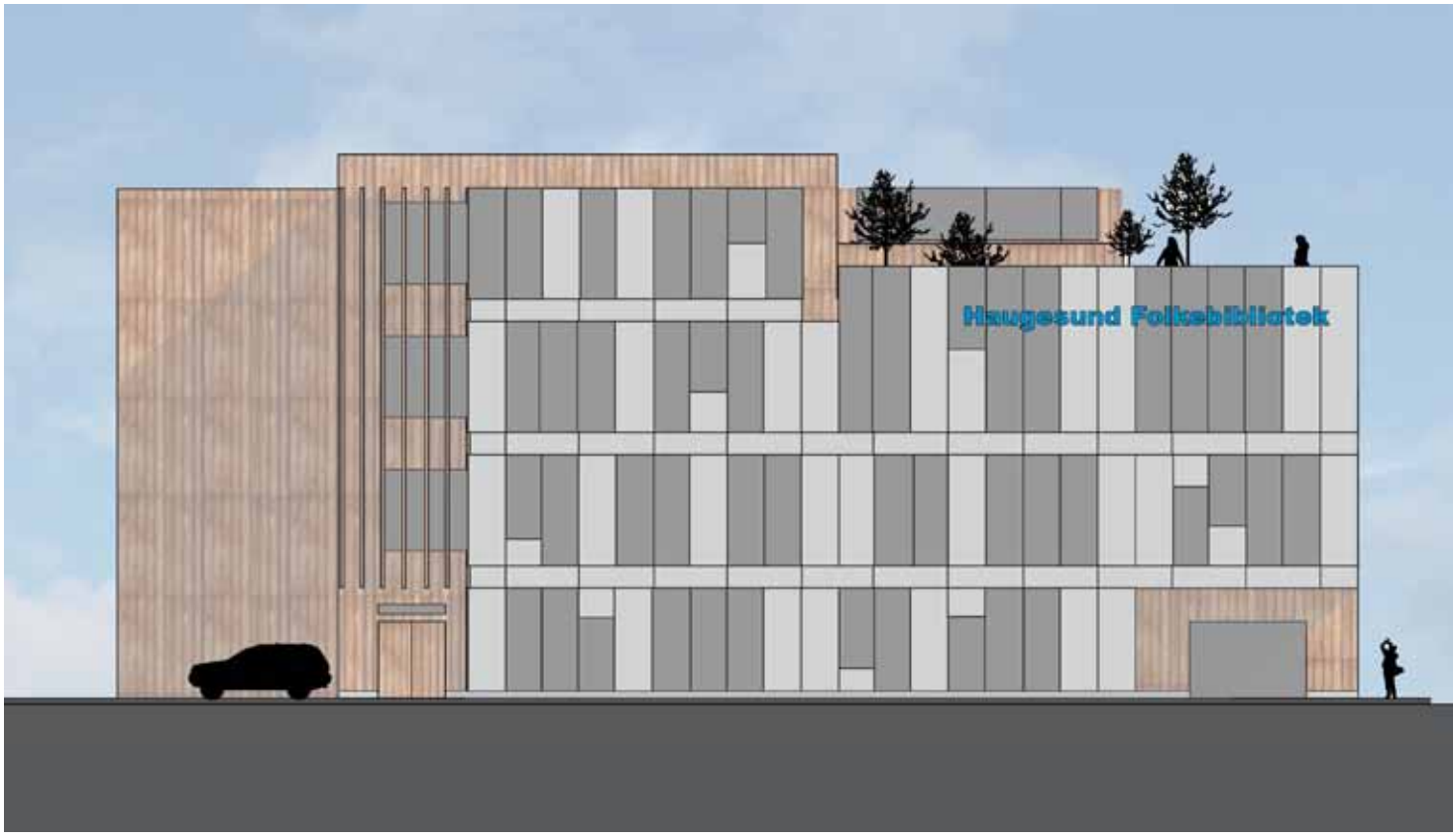


SECTION DD

ELEVATION NORTH 1:200

ELEVATION WEST 1:200

ELEVATION SOUTH 1:200



ELEVATION EAST 1:200

Perspective view towards the new library from the courthouse. The view shows the buildings dialouge with the square and the surrounding townscape.

Perspective view towards the new library from the hill down to the harbour and the outdoor stage. The view shows the unique pink town hall in the background.

Wiew towards the new library from Maritim hotel by the harbour


Haugesund Folkebibliotek

Perspective view over the atrium showing the different levels and the way the ligth falls into the atrium from the big roof window.

Perspective view over the cafe and entrace area. the ligth pours down and enhances the atrium area and the glass facade towards the town square illuminates the café area.

CONCLUSION

The project focuses on creating a new library that can bring a new social platform and pulse to the city centre of Haugesund. The visitors approaching or walking past the building can follow the movement and life within the building through the translucent façade. The open and smooth glass façade stands in contrast to the old wooden town houses and the newer and massive concrete buildings such as the court house and the University College. The building will reflect sunlight and mirror the surrounding townscape and threes, adding a new dimension to the town square. The reflection of the building will therefore change with the season and the movement of the city. The wood lamellas gives the building a more tactile expression and brakes up the façade.

When entering the building from the square and Haraldsgata one first pass through two double glass doors and enters the open entrance area with the café and the information desk at the front. The design of the entrance area is designed to be simple and give the visitor a simple overview over where to go to find what one seeks, if it is a book, a computer or a comfortable chair.

Both the staircase and the elevator that brings the visitor further up into the building is one of the first things the visitor see when entering the building, together with the information and the café area.
When one moves into the atrium, the spiral of the staircases and retreating floor decks meeting the skewed wall becomes visible and one is bathed in the daylight from above. The retracting of the floor decks will invite the visitor to move upwards in the building and towards the light.

In the flex area in the opposite side of the ground floor the usage will be shifting. It can be used for exhibitions of art, artwork made in the children´s department, contain the newest books and magazines or a portrait of an author. The area has a suitable size and the wide staircase allows both the possibility for transit and for seating. The staircase is ideal for gatherings for a lecture, small concerts or a school class on a field trip to the library. The staircase therefore works in three ways; it leads the visitor entering from the Strandgata up and into the building leading the eye to the open facade facing the town square but also up to the open and light atrium and further up into the building.

The atrium being such a light area in the middle of the library will from both sides of the building work as an eye catcher and attract the visitor into the building. The atrium,the retracting floor decks and staircases give the desired effect to the building set in the start of the project. It creates a building that is interesting and that intrigues the visitor to explore the different floors and draws the much needed daylight into the middle of the building. The atrium and the roof window also have a positive effect on the indoor climate by passive means as it works as an air chimney for thermal buoyancy and natural ventilation. Creating a building that can improve the air quality in the building is important when designing a sustainable building. The designed library contains these factors as well as the double facade system to further improve the air quality and to keep a stabile room temperature. The last sustainable factor in the building is the installation of the solar cells on the roof which produces enough energy to keep the energy input needed at a minimum.

The plan layout of the building is intuitive and practical. Every floor has the utility core with toilets, a combined handicap toilet and nursing room, cleaning room and a fire escape. The first floor is divided between adult fiction and children's literature with play areas. The seating throughout the plans is mostly placed by the windows so the visitor can utilize the best possible daylight and enjoy the view of the city.

On the second and specialized floor with study hall, subject literature and local history the same intuitive layout is used, with the shelves wrapped around the atrium and rotated with the light so that they do not bock the incoming daylight. On the top floor the visitor can when moving up the last staircase catch a glimpse of the lush green roof terrace overlooking the harbour, the city roofs and the town hall square. The youth department overlooks the activity house and the harbour and have close relation to the music and film section facing the square.

The Library does with its translucent and reflecting glass facade reach the goal to bring new life and movement to the town square and city centre. The ground level is open and accessible from two different streets and creates a new indoor urban area. The building body underlines the existing axis from the town hall to the harbour.
The building organization is intuitive and the staff is visible in the building and always ready to help. The library design has also achieved the goal of obtain the 2020 demands for energy consumption. This requirement is met by making qualified choices throughout the process regarding construction and solar cells, and by including passive approaches to achieve a better indoor climate.

REFLECTION

In this following section I will run through and clarify some of my considerations made during the project and the reflections done by the end of the project is discussed.

The project focuses as mentioned on creating a library that can bring a new social platform and a new pulse to the city core of Haugesund. But does the city need a new library?

The need of a new library will at this stage be a personal opinion and the opinions of friends and family in Haugesund as the municipality or media have not discussed the topic. But in the beginning of the process when the idea of designing a library emerged, family and friends were positive to the idea and were of the same conception as me, that a new library would attract more visitors than the existing.

For a library to attract visitors it must be up to date and provide the visitors both young and old with pleasant and interesting physical frames and a good variation of functions. The existing library has a limited number of computers and shows signs of growing out of its frames. If a new library was built, it is my belief that many people who currently not uses the library would takes the trip down there and explore and use the new setup.

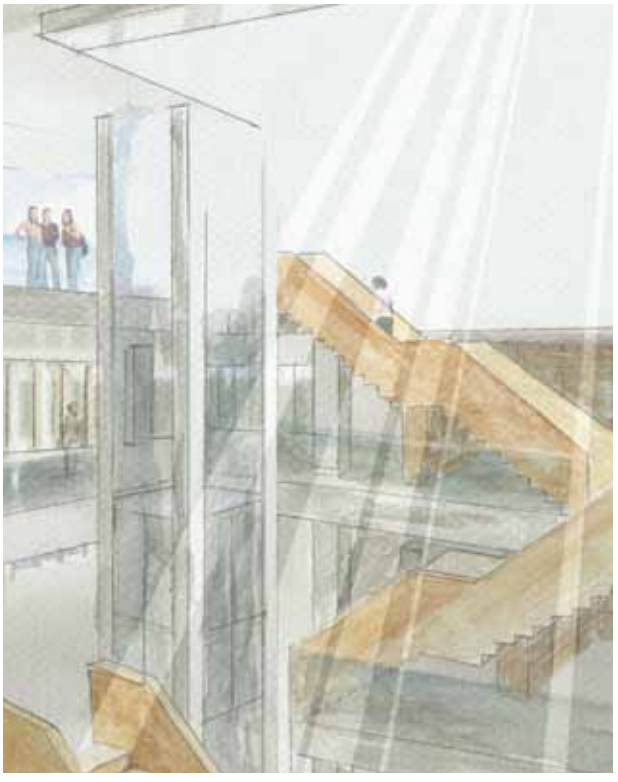
The site and size of the library is also another factor, if the building is to be a success. The site is central and has good visibility in the townscape. The point where one can be critical is if the site is too small and therefore the library is too small as the maximum number of floors is defined by the surrounding buildings. But how would one determine the maximum or minimum size of a library in a town of this size. It is in my belief that the new library designed is of a reasonable size for the city.

The architectural expression of the exterior of the building has from the start been greatly determined by the shape of the site. This is the first project I have worked on where the shape in this way is pre-defined. In the beginning of the design process I made a lot of different sketches for the exterior expression. As the buildings walls were set, the sketches mostly dealt with the shape of the roof and the meeting between roof and wall. Early on I played with the modern interpretation of a saddle roof. However the modern saddle roof is popping up, all over the architectural scene and this made me doubt the originality of the idea and it was therefore discarded, even though I liked the expression very much. It was at that point when the idea was discarded, that the idea of a “green” roof or roof terrace originated. I am very fond of the idea of the green roof and terrace, the final building gives the library an edgy and different expression, which I like. But looking back at the process, I would have liked to try the idea of the modern saddle roof again. When the floor plan shape and atrium was found to investigate what it could have developed into. It could maybe have had some influence on the final outcome.

If the design process had been completed faster leaving me with more time for the detailing and synthesis of the project, there are some parts I would have used some more time on. Such as the detailing of the basement level of the library. The basement is as you can see in the presentation not furnished. The basement contains the storage, a book sorting room, shower and toilet for staff and technical room.
Also he subject of the double façade I find very interesting but the subject is difficult to prove and to calculate the real effect of the system because of the complexity of the system. But as the system entered the process fairly late the double façade is not calculated in the calculations except for the g-value for the windows where the light penetrates to layers of glass.

One other subject I would have liked to design further if I had the time is the natural ventilation. The natural ventilation has not been calculated separately only in Bsim but the principle is illustrated and described in the report.

Regarding the final design I find myself pleased and happy with the outcome. I think the building fits in and adds a new aesthetic to the area, while respecting the surround buildings.
Another factor I am pleased with is the utilization of the daylight. The goal of the project was to design a building that utilizes daylight for both sustainable and aesthetical reasons. The daylight factor is sufficient in the main library rooms, but it is lower in the area around of the utility core. This can be both positive and negative. In the analysis I describe the desired effect with daylight. It is my conviction that light and shadow are the two main factors which creates shape and architecture. An over lit room is not the best solution. The shifting between light and darker sections of a building creates diversity and shapes emerge. By creating this division I think that the simple shape of the building becomes a more exiting and stimulation space.



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All remaining illustrations are own illustrations.