Mosque in Nordic context

Mahtab Aslam

Title page

Project title:	Mosque in Nordic context
Project group:	AD10_ARK 22_2010 Architecture & Design, Aalborg University
Project period:	01.02.2010 - 22.06.2010
Publishing numbers:	5
Pages:	123
Main supervisor:	Associate Professor Peter Mandal Hansen
Technical supervisor:	Associate Professor Poul Henning Kirkgaard

Mahtab Aslam

Table of content

Intro

The process and presentation report is one of two booklets made for presenting this project. The booklet one contains an analysis report [program] and booklet two contains the process and the presentation part of this project.

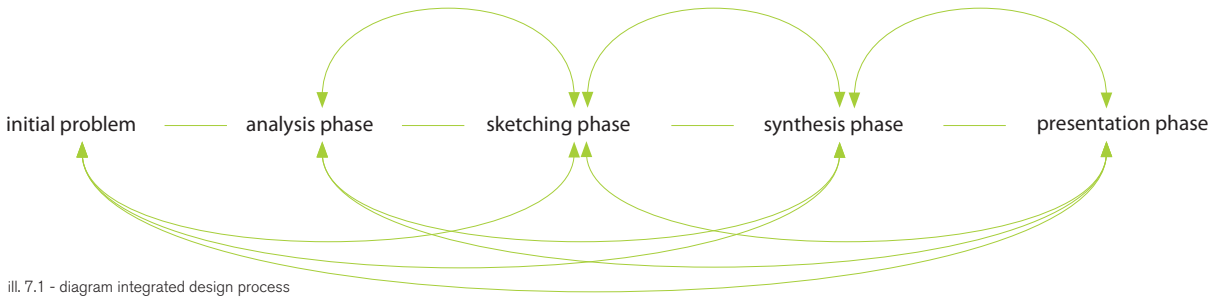
The project, mosque in a Nordic context, is aiming for the design of a contemporary mosque and cultural centre designed in the Nordic and especially the arctic North Norwegian context of Tromsø. To achieve this goal a vision was formed in the program saying;

>> The vision for this project is to design a mosque with a community centre that could function as a gathering place for Muslims and non-Muslim citizens of Tromsø. The traditional Islamic mosque typology will be reconsidered with a notion of finding a contemporary framework that could provide the sacred and spiritual facilities of a mosque designed in a Nordic context for future generations. Hereby, the design will hopefully contribute to a discussion of the future mosques and Islamic centres. <<

On the basis of the formed vision, this project will start the conceptualization to find the desired architectural concept and design for this project.

Method

The integrated design process (IDP) is intended to be used as the method to develop this project. The method contains of four main phases; Program phase, sketching phase, Synthesis phase and Presentation phase. IDP characterized the project where architectural strategies and technical principles come together to a whole. The IDP is an interactive process where all the different phases interconnect and relate to each other.



ill. 7.1 - diagram integrated design process

Process

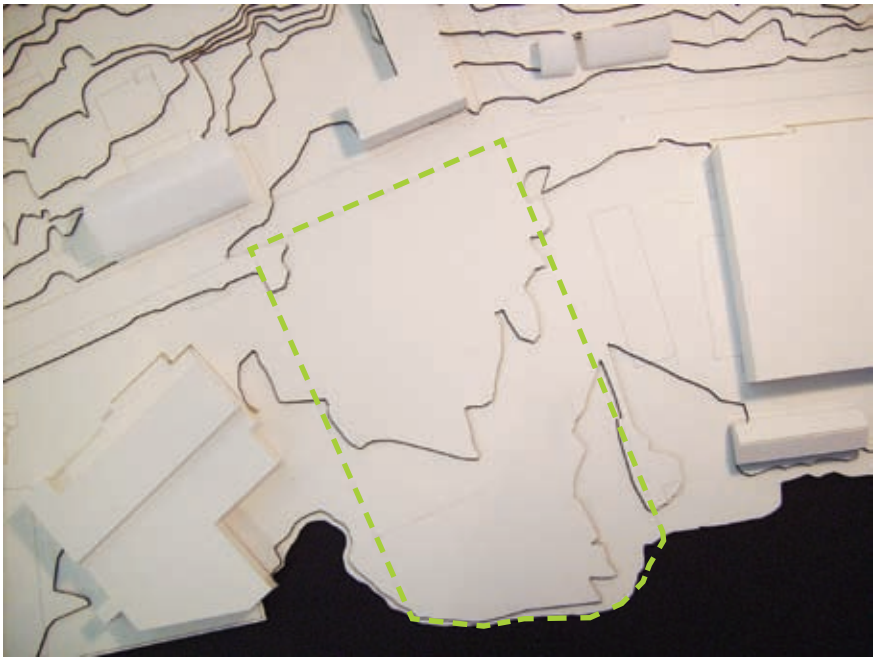
The following chapter contains a description of the sketching phase. The process will be presented in a linear order to create an overview of the work during this phase. The starting points for this phase are the analysis made in the program, the municipality plan, and the vision for this project.

Volume study

The purpose behind this volume study is to get an overview of the total building volume in relation to the room program presented in the program phase and the available site area. Squared blocks representing a volume of 100 m2 in one storey and a size of 10 m x 10 m are used to discover the conceptual relationship between the site and the necessary building volume.
According to the information available from the municipality, the maximum allowable plot ratio is 75 % of the site. The rule is not mentioned in the municipality plan but is confirmed by the Tromsø commune.

Total size: 8842 m2
Plot ration: 75 %
Total allowable build area: 6631 m2

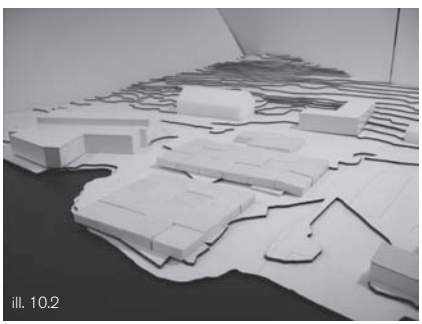
Approximate building volume to be applied to the site according to the room program is 3900 m2.



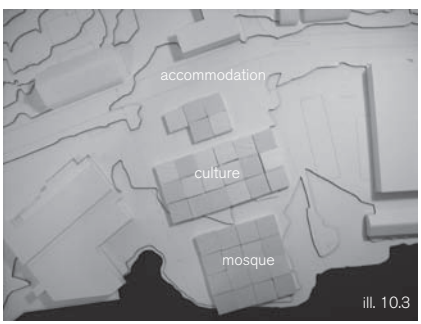
ill. 10.1 - proposed site for the project.

Iteration 1

Illustration10.2 and ill. 10.3 shows the total building volume distributed on the site as 1 storey. The volume covers up a large area of the site and does not leave much space for outdoor public space as intended in the program.



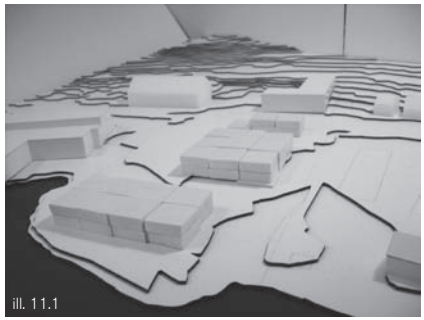
ill. 10.2

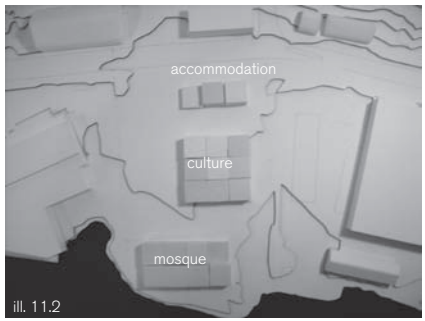


ill. 10.3

Iteration 2

Illustration 11.1 and ill. 11.2 shows the total building volume distributed on the site in 2 storeys. The volume covers up a smaller area than iteration 1, and gives a greater possibility to organize outdoor spaces.

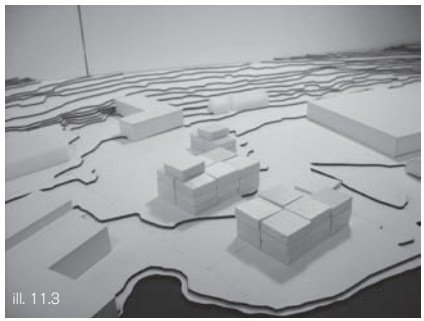

ill. 11.1

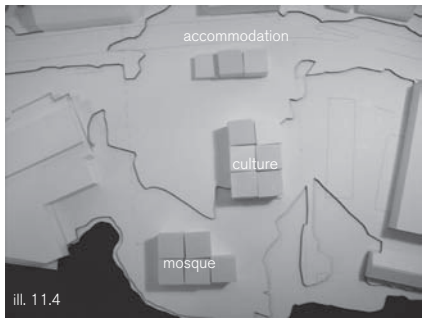


ill. 11.2

Iteration 3

Illustration 11.3 and ill. 11.4 shows the total building volume distributed on the site in 3 storey and partly 4 stories. The volume covers up a smaller are area on the previous iterations. The organization gives a lager freedom to organize attractive public spaces.


ill. 11.3



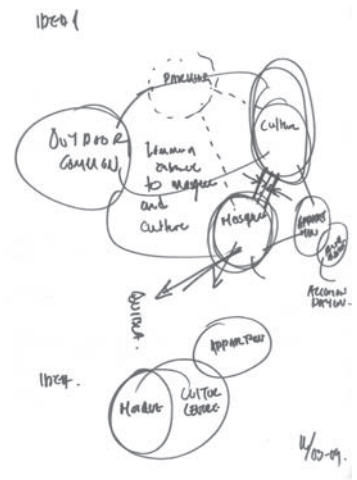
ill. 11.4

Sub conclusion

The volume study has discovered the relationship between the volume needed for the functions in relation to the site. The study gives a rough idea about how the volume should be distributed on the site and which height should be considered for the design. Iteration 3 is seen as a suitable way of organizing the volume since this organization creates the best possibility because the footprint is not occupying too much of the plot. This study is further supporting parameter in the early design phase.

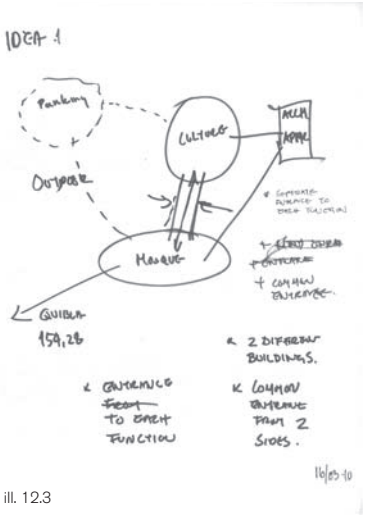
Initial sketching

The analysis, the vision, and the design parameters together with the volume study are the starting point for the conceptualization of this project. The initial sketching phase is seen as a phase for free sketching where various ideas are sketched either as diagrams, plans or perspectives. The proposals presented are related to the above mentioned criteria generating architectural ideas for how to relate the building complex to the site and context.



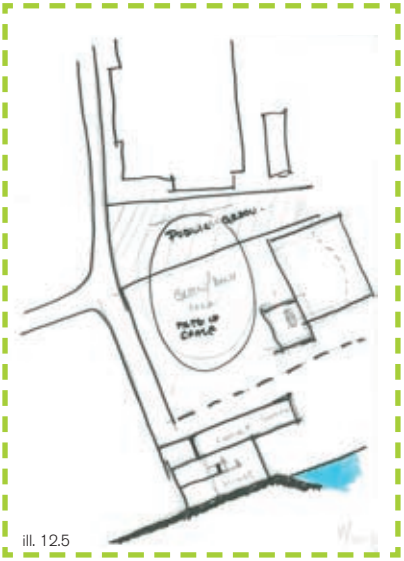
ill. 12.1

ill. 12.2

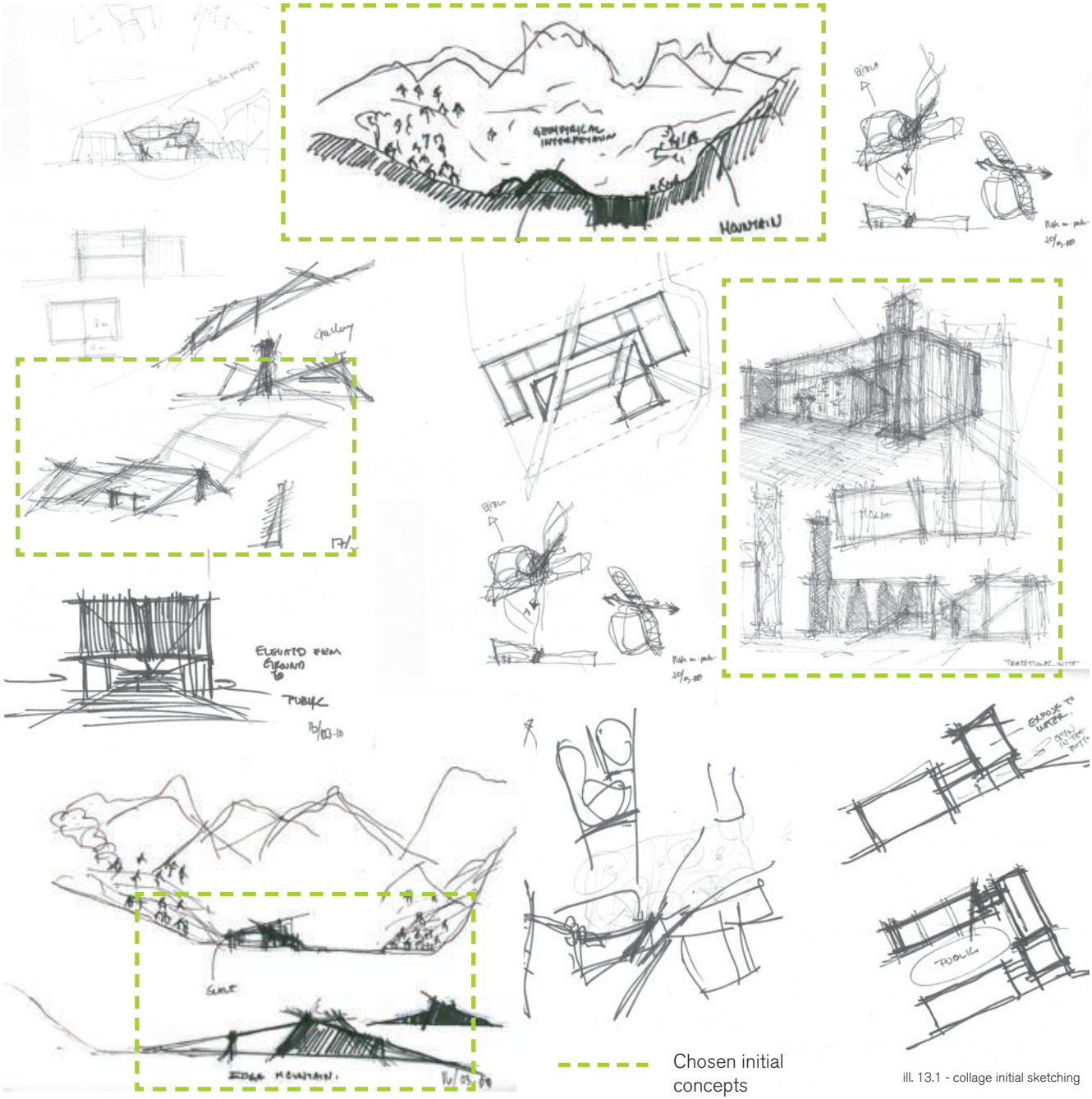


ill. 12.3

ill. 12.4



ill. 12.5

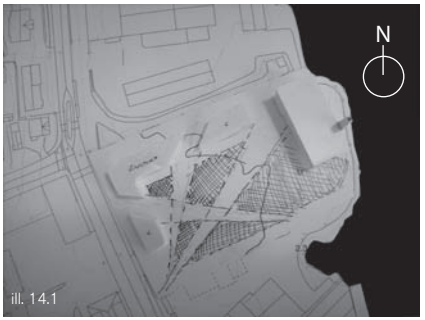


Chosen initial concepts

ill. 13.1 - collage initial sketching

Initial concepts

The initial concept is a continuation of the previous step with initial sketching. Five initial concepts are picked from the previous phase for further development, and to discover the architectural form and the relation to the context. This step focuses on visualizing the architectural form through sketches and physical models to get an idea of building scale and atmosphere created on the site.

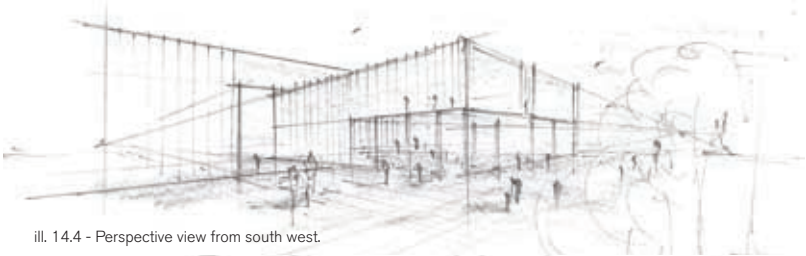


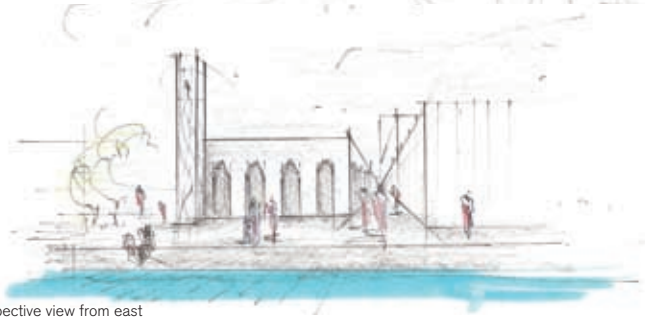
ill. 14.1

Initial concept 1

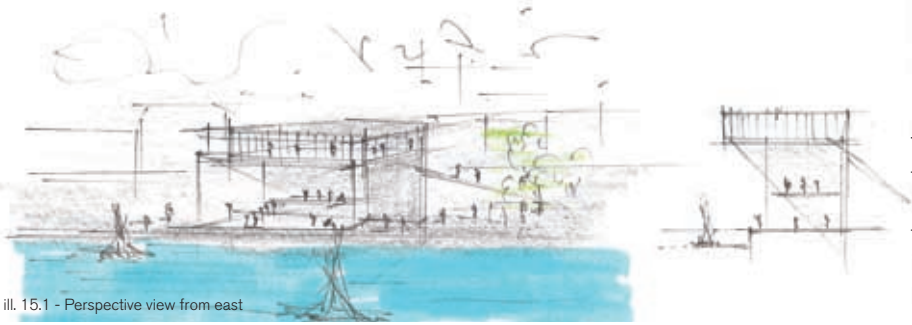
The initial concept 1 is inspired by the fragmented industrial context adjacent to the site. The building volumes are separated as individual buildings representing different heights. The largest volume is placed closest to the shoreline and elevated from the ground to open a view to the fiord. The shape illustrated has a reference to Islamic architecture with arches ill.14.5, and minarets and a large staircase under the elevated mosque building ill.14.4.


ill. 14.2


ill. 14.4 - Perspective view from south west.


ill. 14.5 - Perspective view from east


ill. 14.3

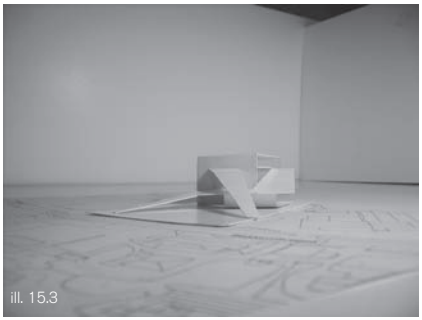


ill. 15.1 - Perspective view from east

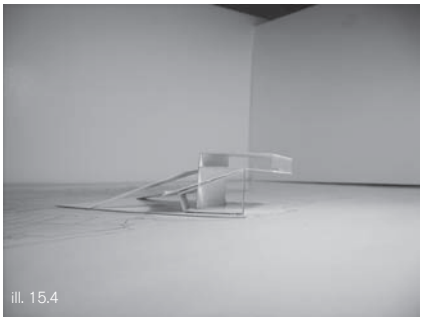
Initial concept 2

The initial concept 2 is an abstraction to the existing context. The building is cantilevered out to the fiord with cultural functions placed on the top floor. The mosque is placed in the lower parts of the complex.

ill. 15.2

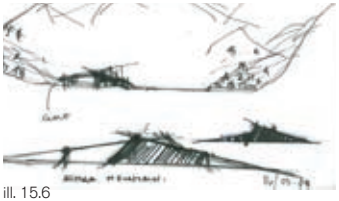


ill. 15.3



ill. 15.4

ill. 15.5 - Perspective view from south west.

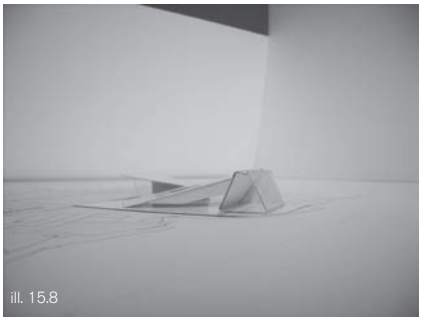


ill. 15.6

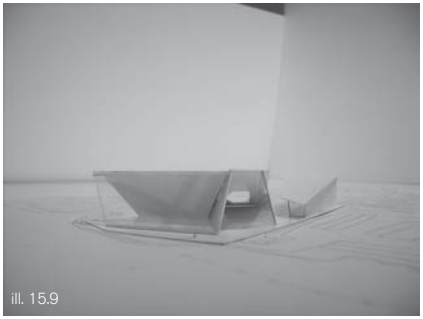
Initial concept 3

The initial concept 3 is inspired by the landscape crafting a building typology on the site. The volumes are separated from each other representing different functions. The central building allows the pedestrians to walk on the building creating an urban quality for the town.

ill. 15.7



ill. 15.8

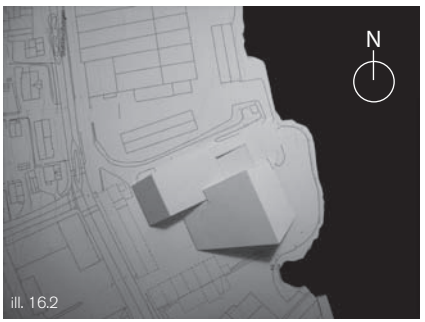


ill. 15.9

Initial concept 4

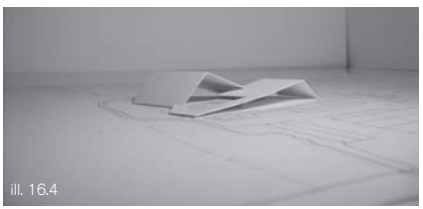
The initial concept 4 is inspired by the landscape crafting a building typology on the site. The building volumes are connected and physically communicate with each other. The building allows the pedestrians to interact with the building complex and provides an urban quality to the town.

ill. 16.1 - Perspective view from south west

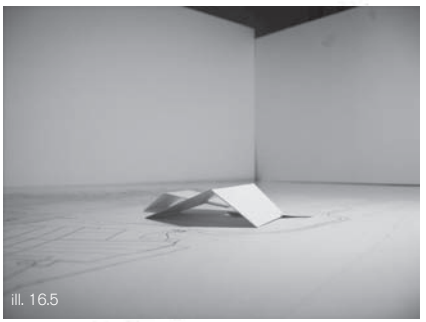


ill. 16.2

ill. 16.3



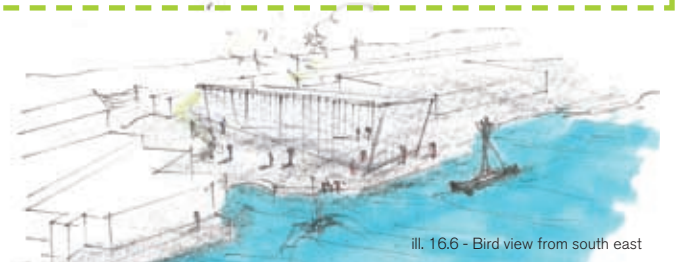
ill. 16.4



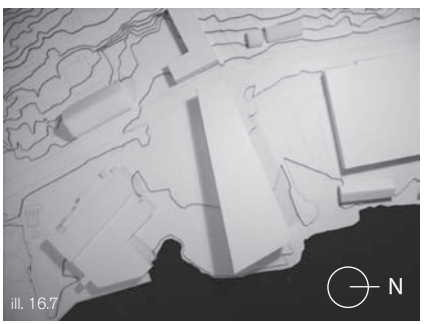
ill. 16.5

Initial concept 5

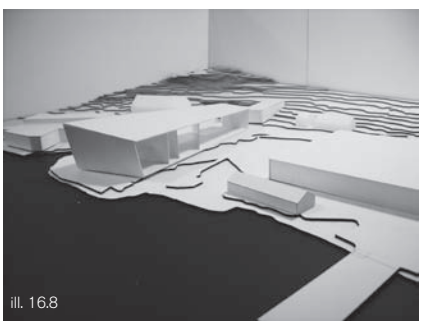
The initial concept 5 is contextually related to the large scale industrial buildings in the area where all functions are communicating with each other in one large volume.



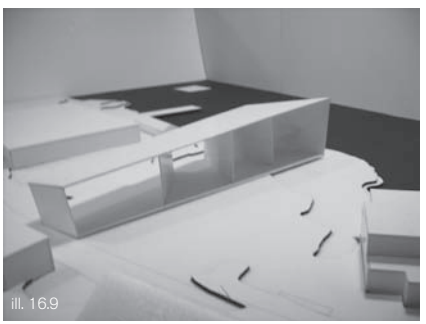
ill. 16.6 - Bird view from south east



ill. 16.7



ill. 16.8



ill. 16.9

Sub conclusion

The initial concepts represent different architectural qualities. Reflecting back on the analysis and the vision, one of the main criteria for this project is to design an Islamic community centre and mosque reflecting the context and the spirit of the place. The strongest characteristic of Tromsø is the arctic landscape and it is intended that this characteristic should be reflected in the architectural expression of this project.

Initial concept 4 is chosen to be further developed on the basis of the arguments mentioned above. The proposal represents qualities inspired by nature and the strong appearance of the mountain landscape. The building typology allows the public to interact with the building shape creating an urban quality in the town.

ill. 17.1 - Perspective view initial concept 4 from north east.

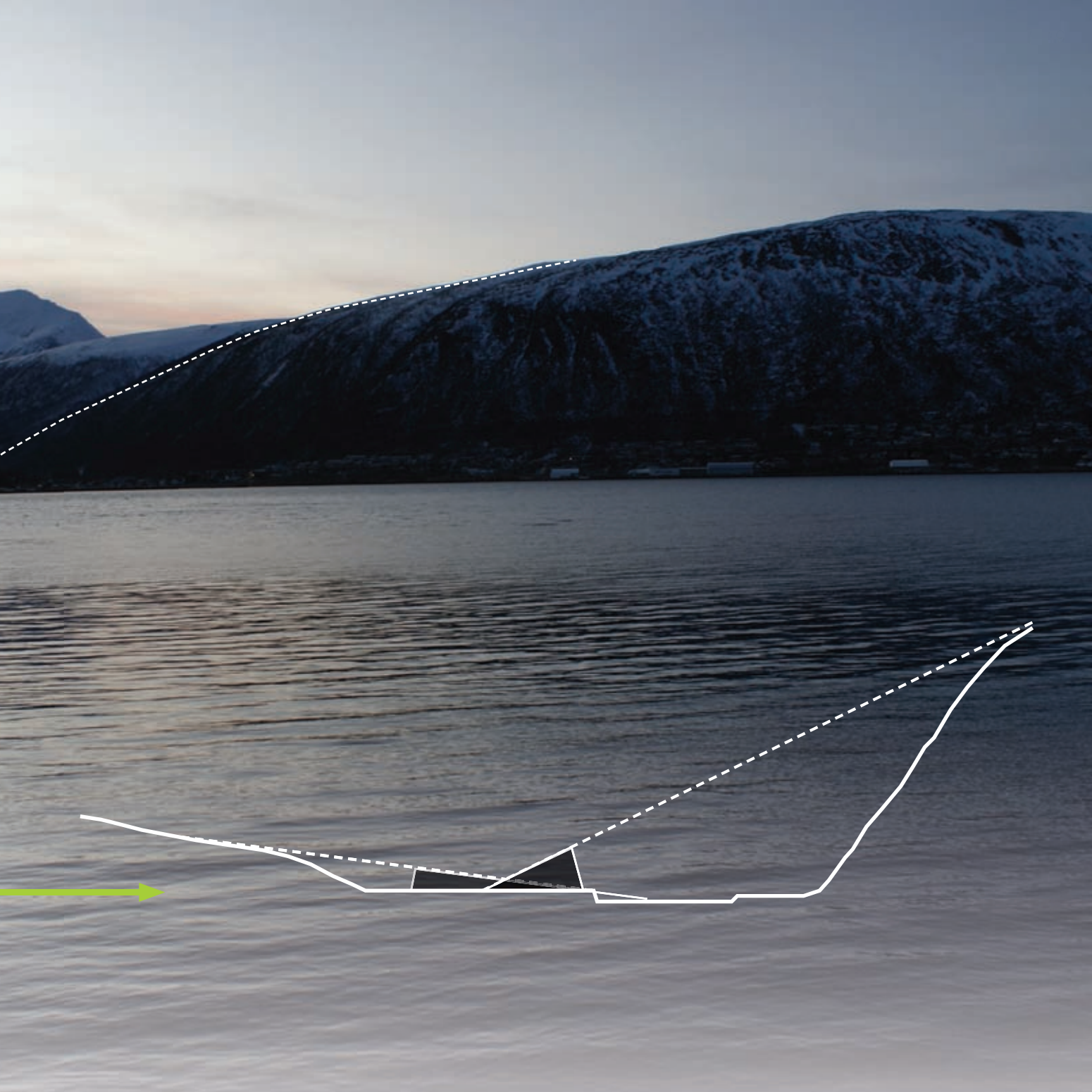
Architectural concept

The architectural concept for “mosque in a Nordic context” is inspired by the strongest characteristics of Tromsø, the nature and the strong edgy lines of the arctic mountain landscape of Tromsø. The inspiration picture is showing the edgy mountain peaks surrounding the site and the island of Tromsø.

Concept lines

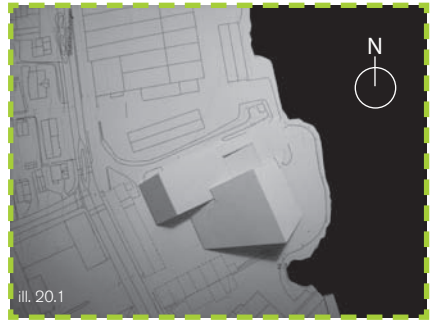
The site is placed in a valley-like landscape with taller mountains to the east and a lower mountain landscape to the west. The concept is to take the lines of this mountain silhouette and create an interpretation of the mountain landscape on the site. ill.18.1

ill. 18.1 - Concept diagram



Concept development 1

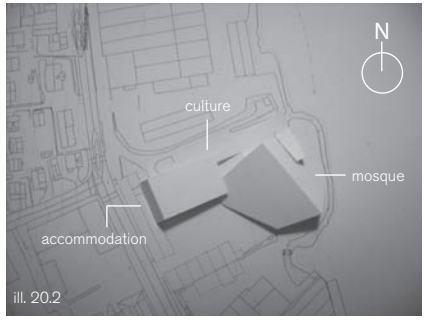
Based on the chosen concept, the shape has been reconsidered and articulated to find a suitable architectural composition for the functions placed on the site. Two new proposals have been made representing different qualities but still inside the chosen frame.



ill. 20.1

Proposal 1

The first proposal is working with the same shape as the chosen concept. The functions are placed as illustrated in ill. 20.2. The functions are placed in the volumes representing different spatial and architectural qualities. An important factor to consider in this stage is the direction of the mosque facing Mecca.



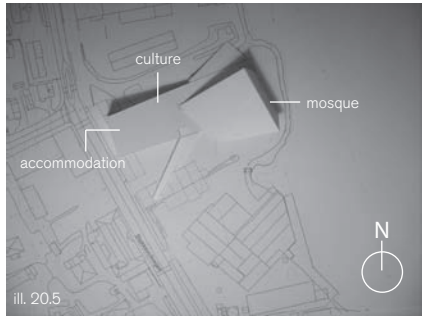
ill. 20.2


ill. 20.3


ill. 20.4

Proposal 2

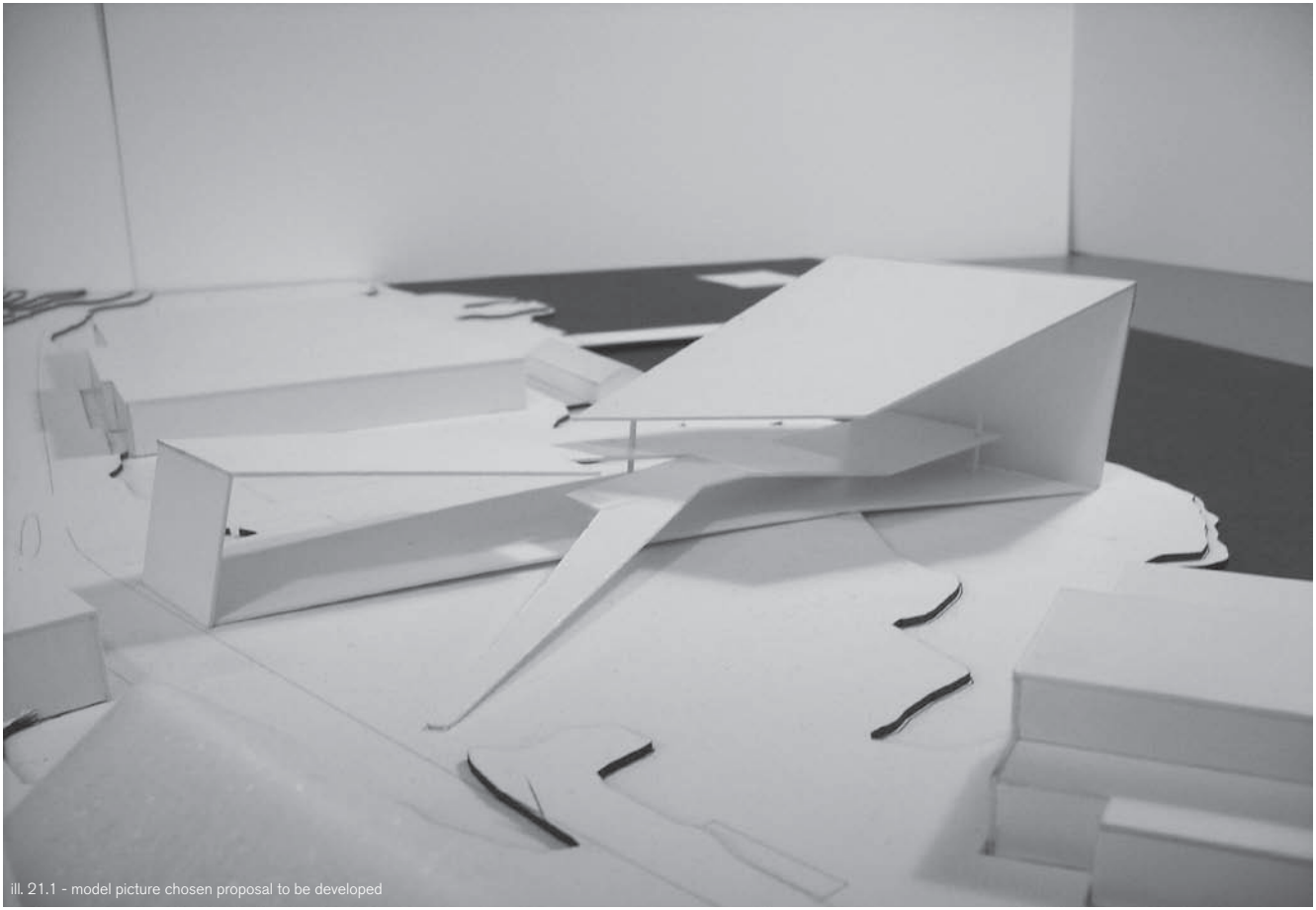
The second proposal is also based on the chosen initial concept and represents the same qualities as described in proposal 1. This proposal adds a ramp element ill.20.8 which leads the pedestrians on to the building complex.



ill. 20.5


ill. 20.6


ill. 20.7



ill. 21.1 - model picture chosen proposal to be developed

Sub conclusion

The second proposal is chosen as the architectural shape to be developed. The building complex is seen more as a building typology than a building mass on the site. The typology interacts with the town by providing an urban quality to the citizens of Tromsø.

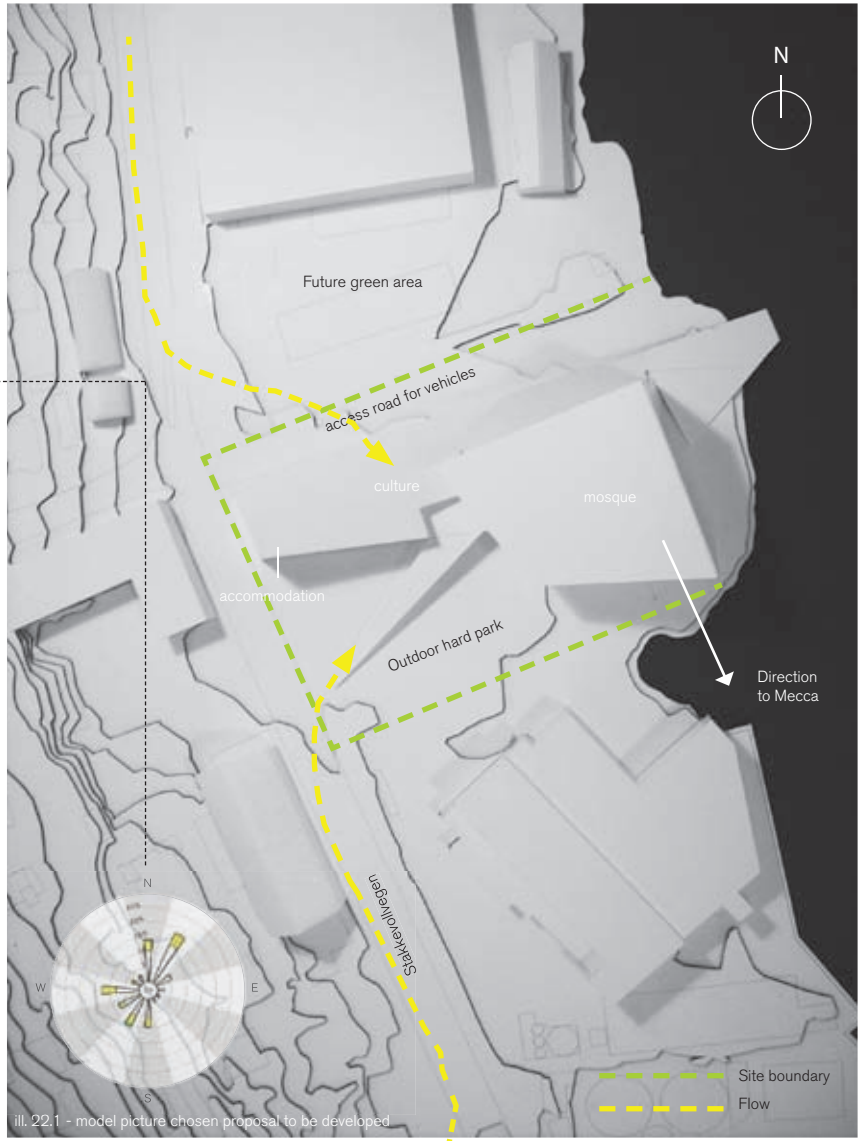
Composition on site

Different parameters have affected the architectural composition and the placement of the building volume on the site. The climatic considerations such as wind and sun, as well as the municipality demands for heights of the building towards the street to the west and east are also affecting the placement.

Considering the analysis made on the climatic parameters such as wind, it is possible to see that the dominating wind direction in the summer period is from north and north-east in the summer period. Therefore, placing the building close to the northern site boundary, a natural shelter is created to the south where the outdoor public areas are thought to be placed.

The placement and the architectural composition is also creating an inviting access to the site from the city centre in the south. The main flow of pedestrians will also be from this direction.

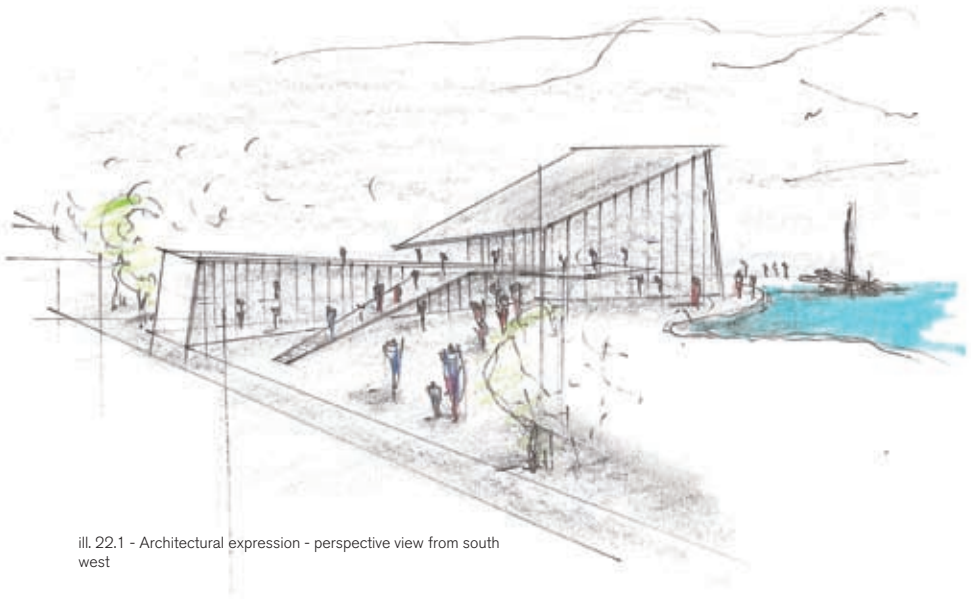
The municipality plan has formed guidelines that affect the design. The building height has a limitation of maximum 15 m towards the west and a maximum of 21 towards the fiord to the east [program, 18]. The natural choice for the placement of the mosque has been to the east. The height allows the design of spaces with bigger room height which creates a spatial, architectural quality and strengthens the sacred feeling in the space. The south-eastern direction to Mecca has been the parameter deciding the orientation of the mosque.



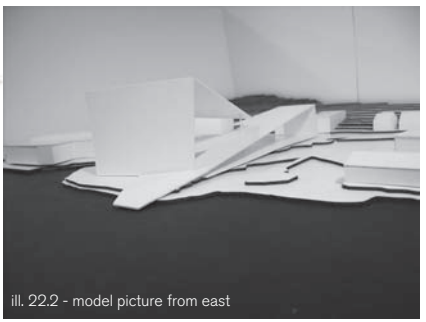
ill. 22.1 - model picture chosen proposal to be developed

Architectural expression

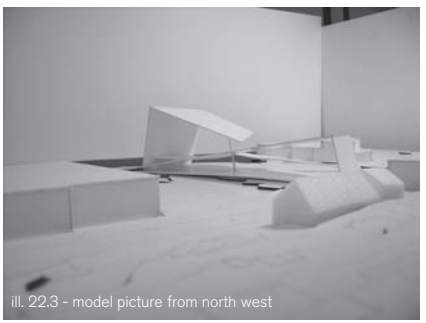
This step focuses on the architectural expression of the chosen proposal to be developed. The investigation has been done by sketching and physical model study. The purpose of this step is to find the desired expression and right architectural proportions of the building typology. The functions are still placed as clusters in the different parts of the building complex, and will be detailed further after this step.



ill. 22.1 - Architectural expression - perspective view from south west

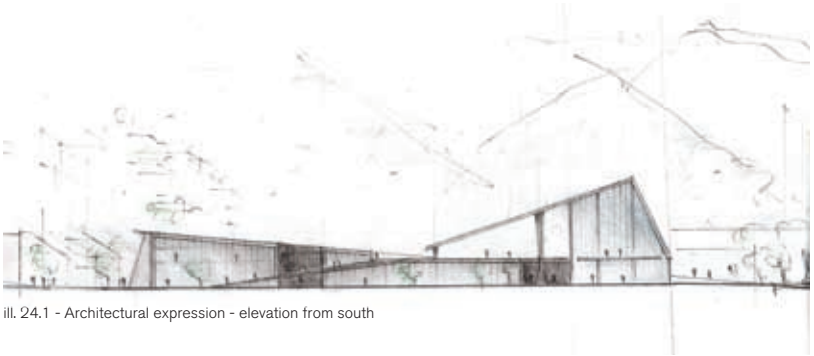


ill. 22.2 - model picture from east

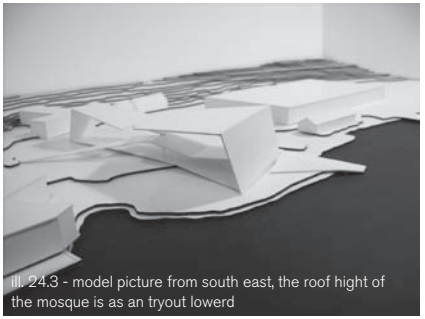


ill. 22.3 - model picture from north west

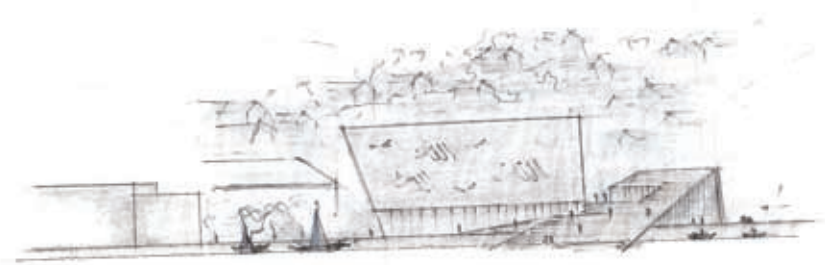
The shape of the building is supposed to communicate the difference in the functions. The tall building will be used as the sacred mosque space, marking the importance in function by the scale. The scale is underlying the difference between the secular culture function and the sacred function of the mosque.



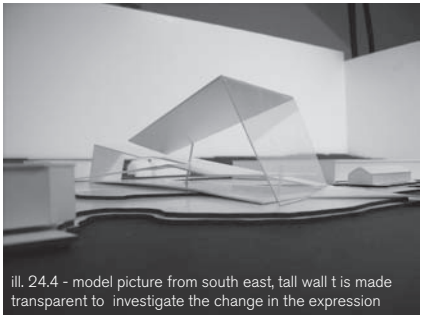
ill. 24.1 - Architectural expression - elevation from south



ill. 24.3 - model picture from south east, the roof hight of the mosque is as an tryout lowerd



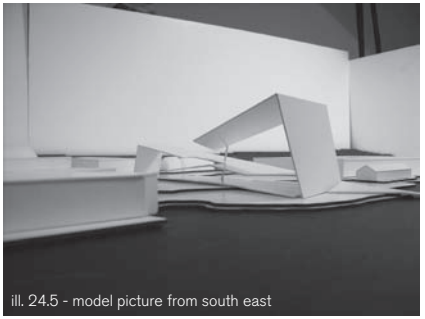
ill. 24.2 - Architectural expression - elevation from east. The tall mosque facade needs to be articulated to improve the aesthetic quality



ill. 24.4 - model picture from south east, tall wall t is made transparent to investigate the change in the expression

Sub conclusion

This investigation discovers two main things to be worked with: the big building volume is not working within the proportions, and the shape is thought to communicate the message of a landscape. Studying the east facade ill. 24.2 is visualizing the problem. The proportions have to be reconsidered and also communicate with the functions inside the buildings. The cantilevered roof as illustrated in ill. 24.1 is also calling for reconsideration. The next step in this process will be to investigate and arrange the internal functions by finding a system to control the aesthetic, structural and functional qualities of this complex and meeting the criteria as described in the program. A new proposal will be presented later in process solving the absence of aesthetic quality discovered in this study.

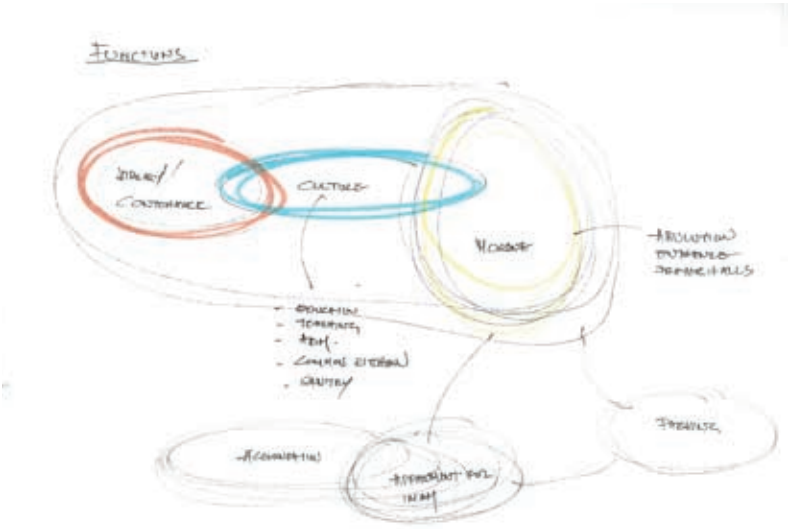


ill. 24.5 - model picture from south east

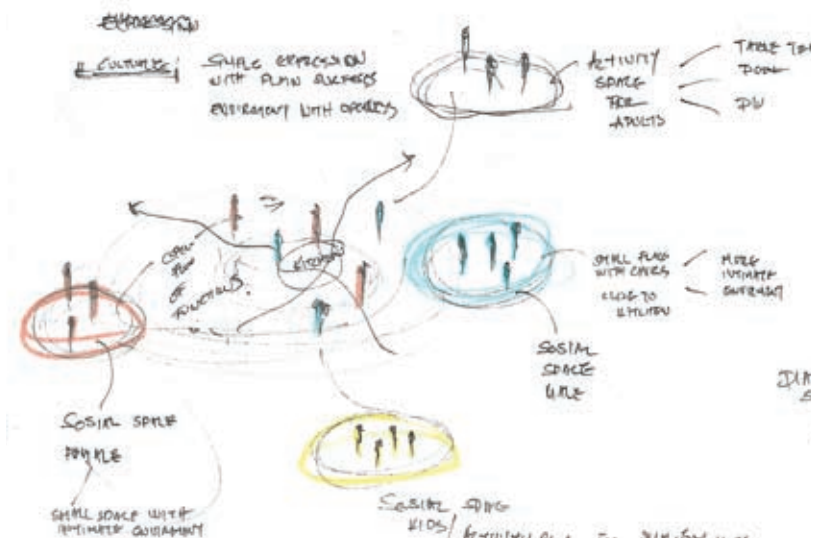
Concept development 2

Organizing functions

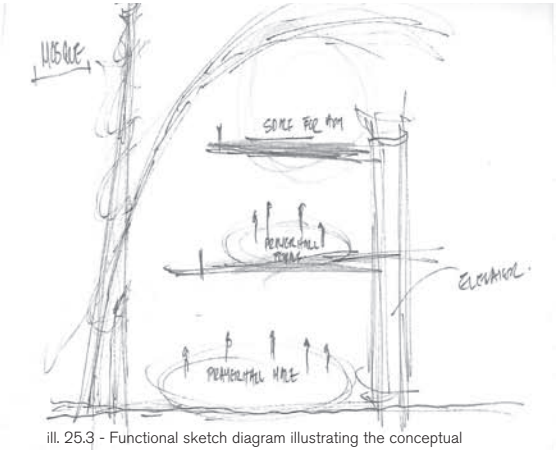
This first initial step in the process starts with focusing on the functional organization in the building complex. Reflecting the vision for the project, the complex should provide the sacred function of a mosque, and function as a gathering place for Muslims and non-Muslim citizens of Tromsø.
The cultural functions are in this complex physically separated from the sacred mosque space. The reason behind this is to prevent the sacred function from coming in conflict with the secular cultural activities.
The organization of the flow will work with this task so the functions can interact with each other in a natural way.



ill. 25.1 - Functional sketch diagram illustrating the functional connection between the different spaces.



ill. 25.2 - Functional sketch diagram illustrating the conceptual organization of the cultural functions, it's important to keep in mind the segregation issue in Islam. A challenge in this project will to design flexible spaces that both works as open public spaces and as segregated zones.



ill. 25.3 - Functional sketch diagram illustrating the conceptual organization of the mosque space. The functions are segregated with the prayer hall for males on the ground floor and prayer hall for females on a gallery on the first floor. Administratin functions for the mosque is planned on the top floor of the mosque.

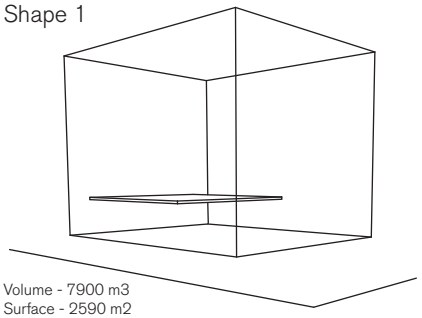
Initial acoustic

This initial investigation is made to get an idea of the relationship between the building shape for the mosque and the reverberation in the space. The reverberation time is an important factor to consider in order to determine the experience of the acoustic quality in the space. This initial investigation could be used as an supporting parameter in the further design phase. Two basic shapes will be tested to determine the difference in the reverberation time and give an answer of the relationship between the shape, surface area, volume of the shape and the reverberation time. According to the writings from Prof. Dr. Mutbul Kayili [FSTC] the recommended reverberation time for mosques should lay between 1,4 seconds and up to 2,1 seconds depending on the volume of the space.

Sub conclusion

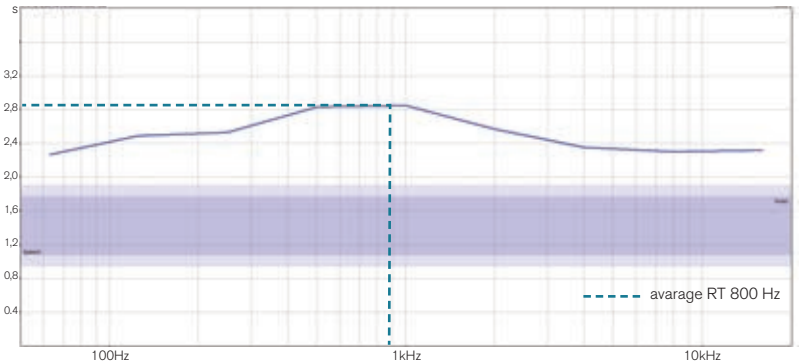
The initial investigation discover that the difference in the shape has an effect on the reverberation time of the space. According to the analysis made the shape 2 ill. 26.1 gives the lowest reverberation time and should be considered in the early design phase. Further detailing of the acoustic will presented later in this report with more accurate analysis.

Shape 1



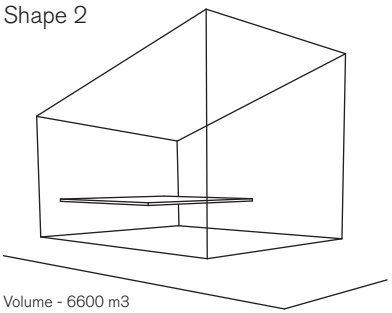
Volume - 7900 m3
Surface - 2590 m2
Reverberations time - 2.3 - 2.9 s.

ill. 26.1 - diagram building shape 1

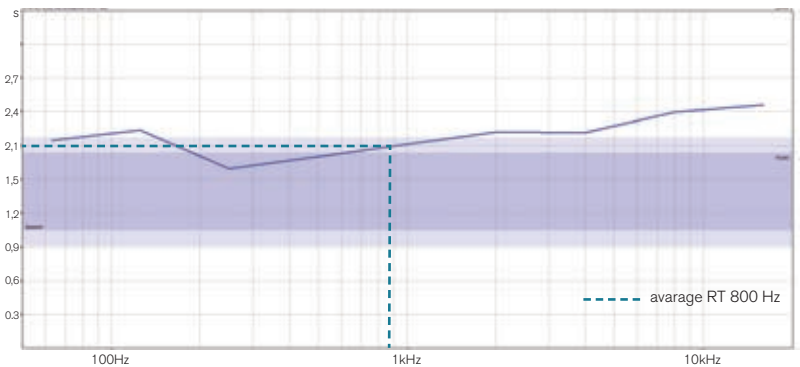


ill. 26.2 - diagram reverberation time for building shape 1

Shape 2



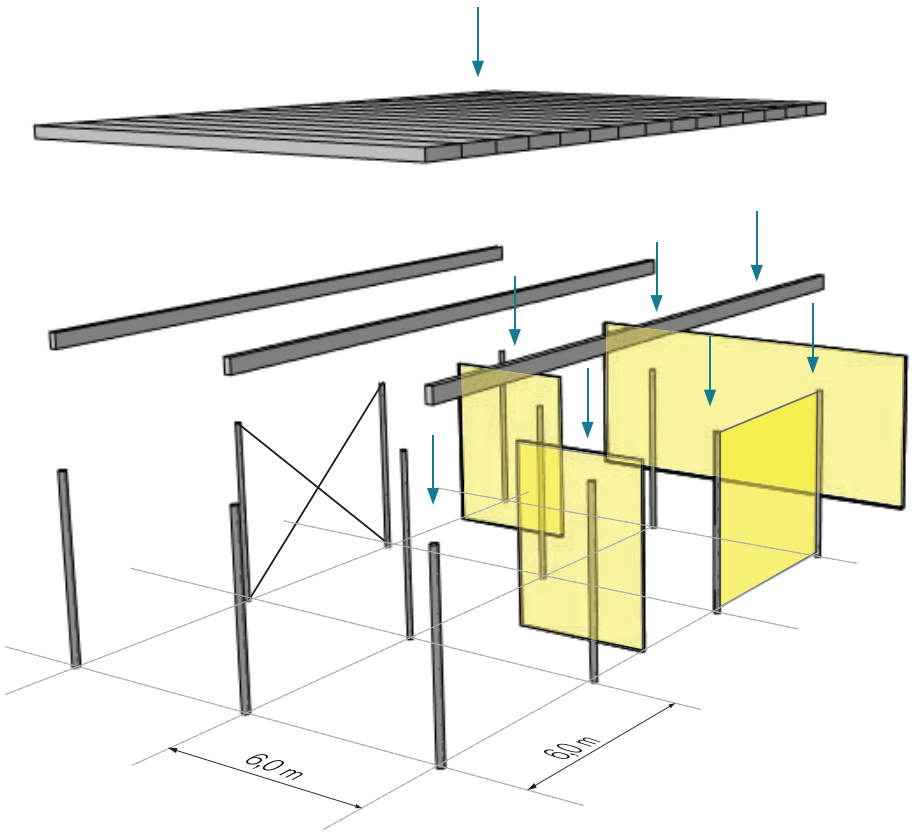
Volume - 6600 m3
Surface - 2300 m2
Reverberations time - 1,8 - 2,1 s.



ill. 26.4 - diagram reverberation time for building shape 2

Initial construction principle

A simple structural system of load bearing columns and beams carrying prefabricated concrete slabs has been proposed for the building complex. The system is based on a modular grid of 6 m x 6 m. The advantage seen with this system is the possibility of creating constructions with rather slim dimensions. The architectural advantage with the system is the possibility of creating a structure with a light expression.



ill. 27.1 - diagram model, initial construction principle

Distribution of forces

The vertical forces from the roof or storey partition, which are both working as plates in this structural system, are transferring the forces to the beams and down by the load bearing columns. The horizontal forces on the facades are taken by either share walls or the wind bracing between the columns.

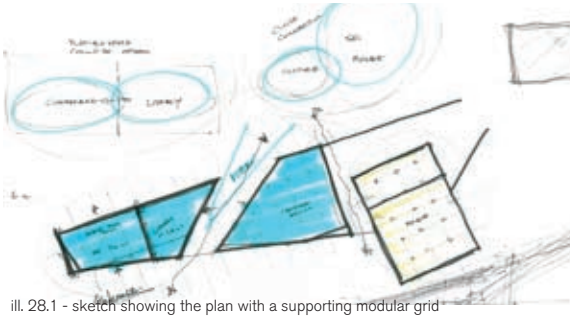
vertical force

shear walls

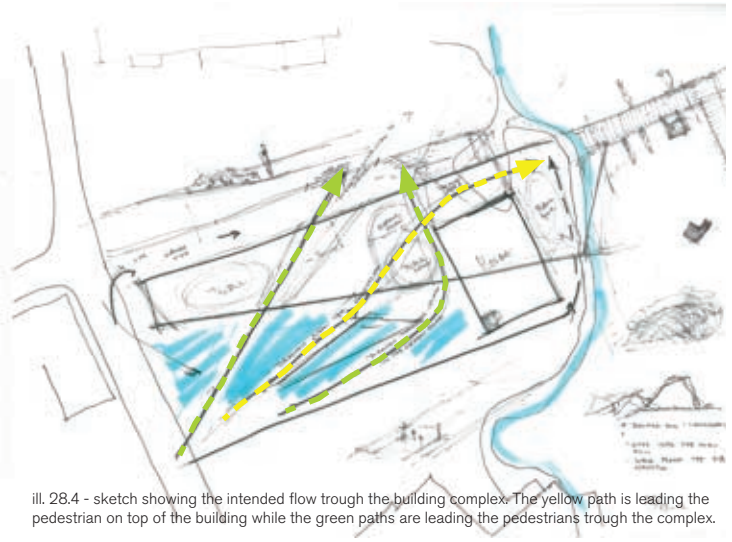
wind bracing

Initial organization sketching

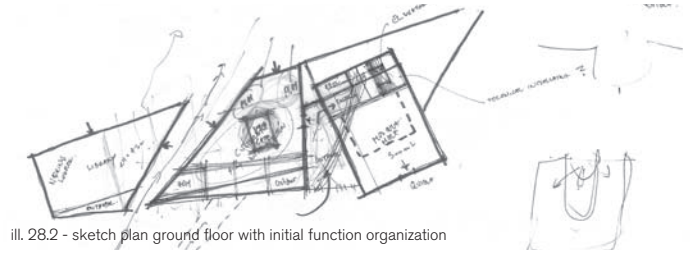
In this phase the overall organization of the functions was made to discover the functional space requirement according to the room program. Initial considerations for controlling the shape by using a modular grid ill. 28.1 were introduced. General consideration of the flow ill. 28.4 and ill. 28.5 for pedestrians was considered in this step.



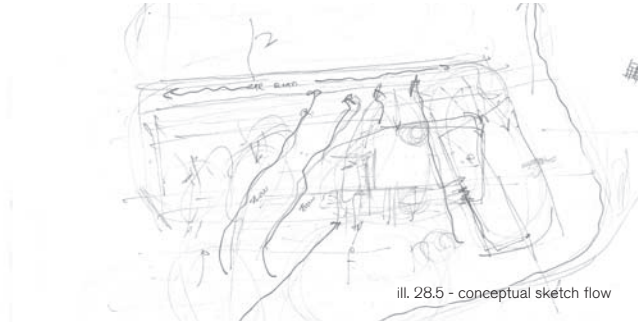
ill. 28.1 - sketch showing the plan with a supporting modular grid



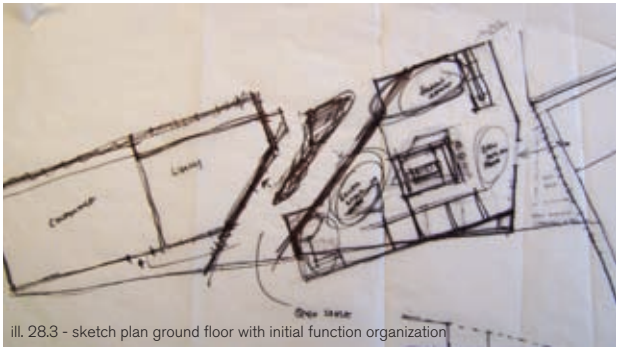
ill. 28.4 - sketch showing the intended flow trough the building complex. The yellow path is leading the pedestrian on top of the building while the green paths are leading the pedestrians trough the complex.



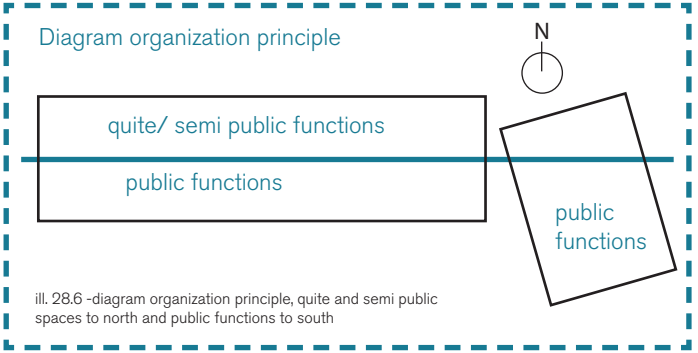
ill. 28.2 - sketch plan ground floor with initial function organization



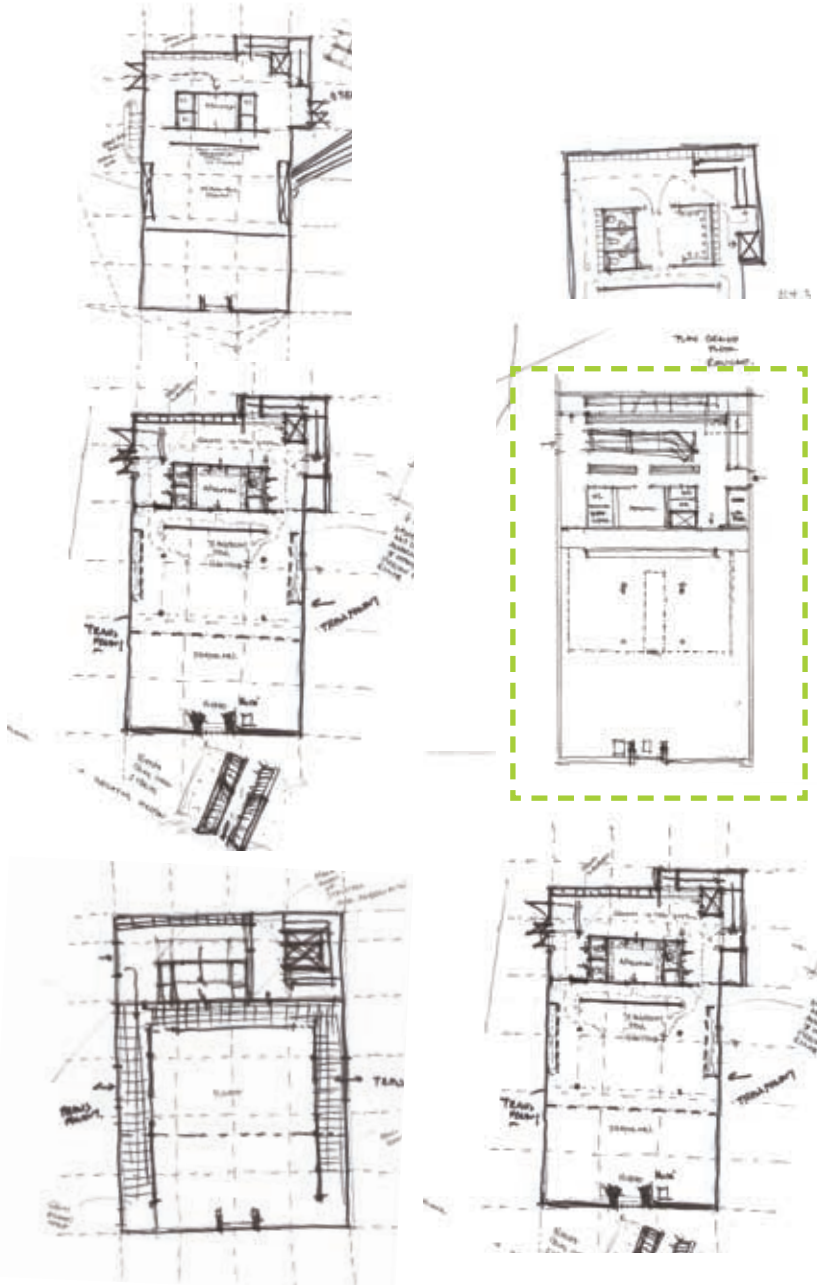
ill. 28.5 - conceptual sketch flow



ill. 28.3 - sketch plan ground floor with initial function organization



ill. 28.6 -diagram organization principle, quite and semi public spaces to north and public functions to south

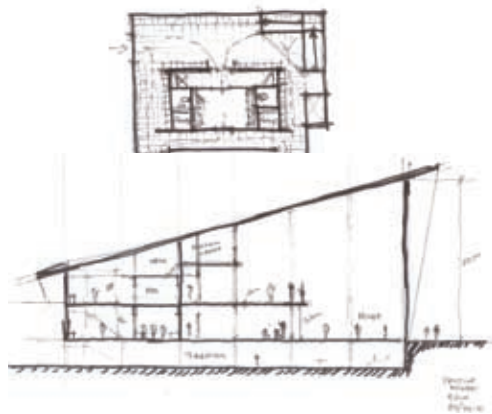


Initial sketching mosque

In the following chapters, initial sketches of different proposals will be presented for each functional part of the building complex. The process will be documented with plans and end up with a proposal which was presented for the midway critique for the thesis project.

Different plan proposals of the mosque space have been made reflecting the functional parameters from the room program. The plans are designed as a rectangular shape with the entrance area and ablution spaces in the rear part of the building. The quiet and semi-public spaces are arranged as illustrated in diagram ill. 28.6 in the previous chapter.

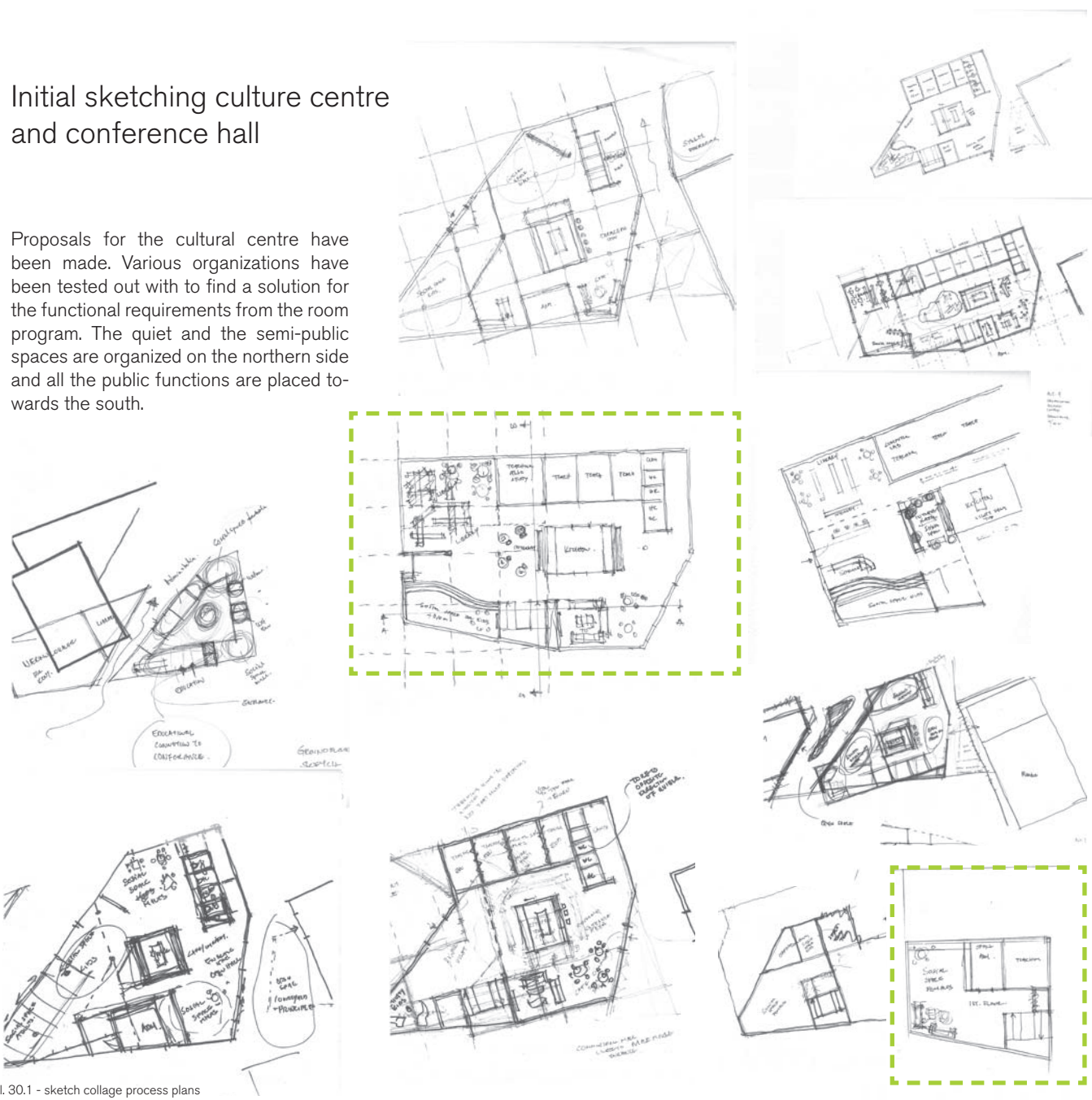
Some of the important parameters in the planning have been to consider and organize the flow from the profane space to the sacred space based on the architectural experience.



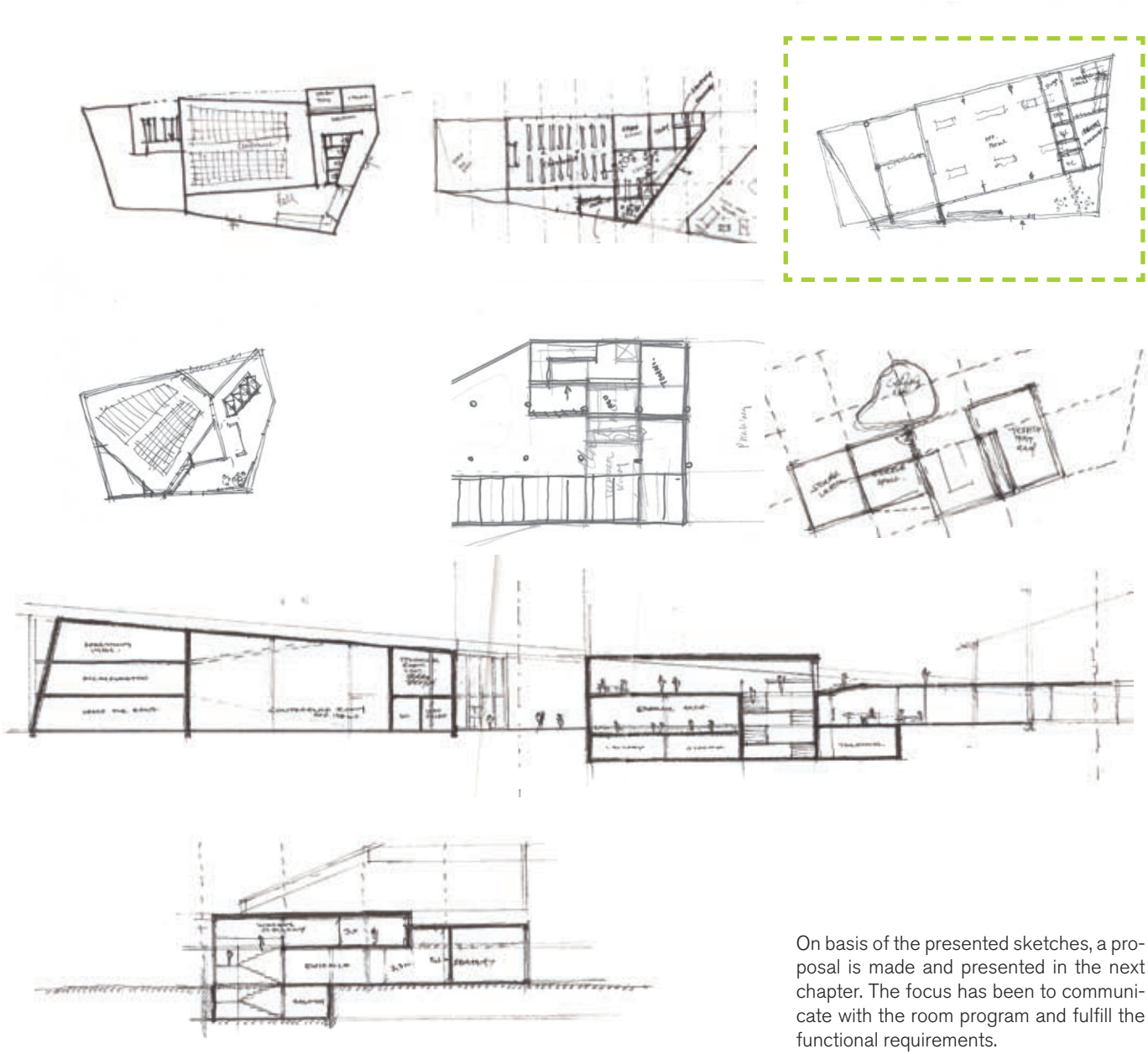
ill. 29.1 -sketch collage initial sketching mosque

Initial sketching culture centre and conference hall

Proposals for the cultural centre have been made. Various organizations have been tested out with to find a solution for the functional requirements from the room program. The quiet and the semi-public spaces are organized on the northern side and all the public functions are placed towards the south.



ill. 30.1 - sketch collage process plans



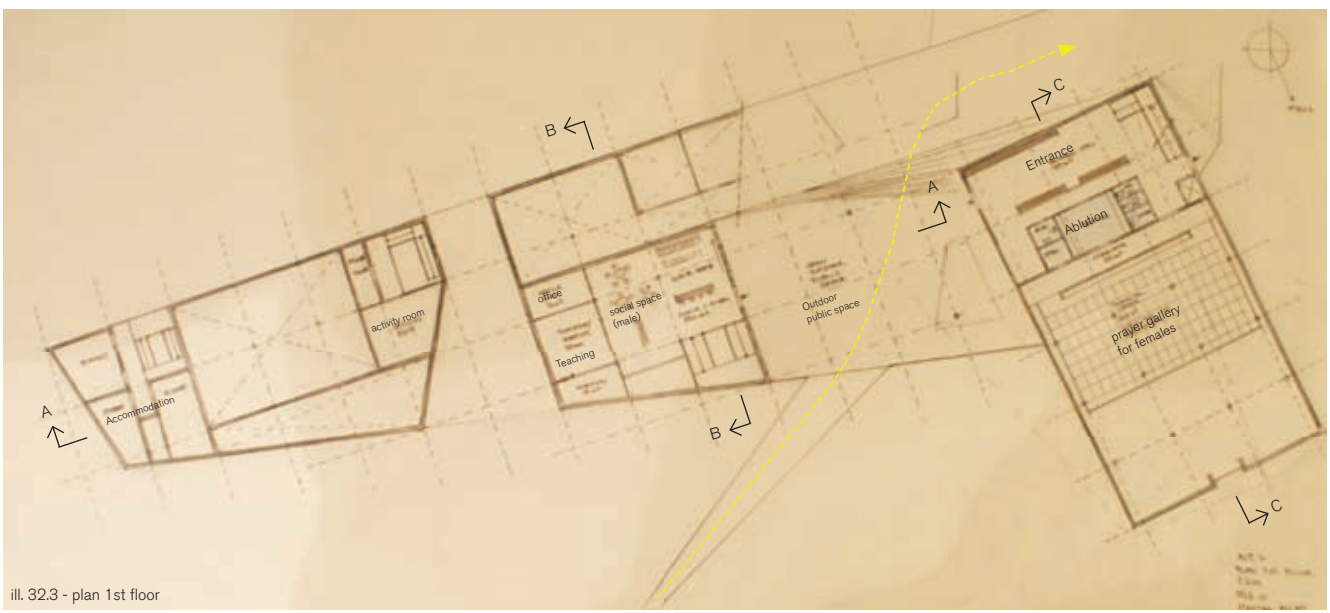
ill. 31.1 - sketch collage process plans and sections

On basis of the presented sketches, a proposal is made and presented in the next chapter. The focus has been to communicate with the room program and fulfill the functional requirements.

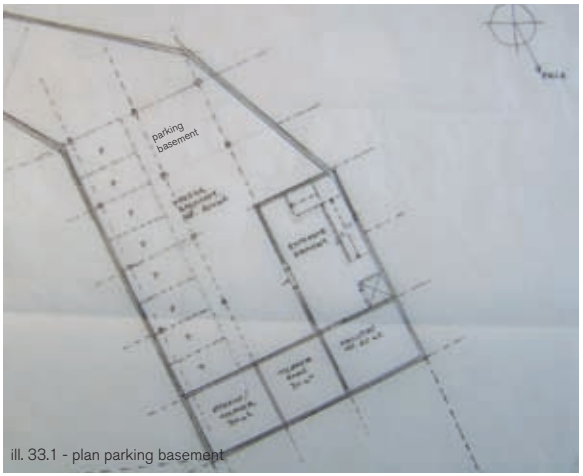
Design proposal 1

ill. 32.1

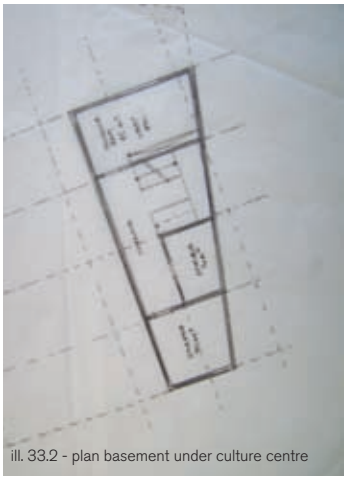
ill. 32.2 - plan ground floor

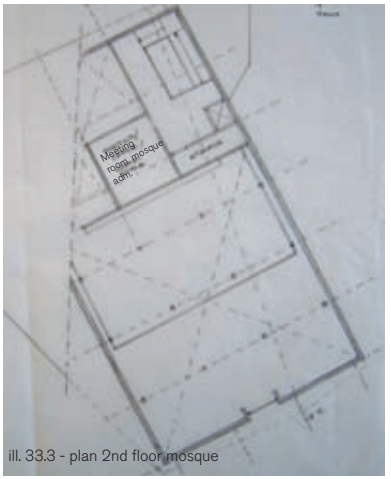


ill. 32.3 - plan 1st floor

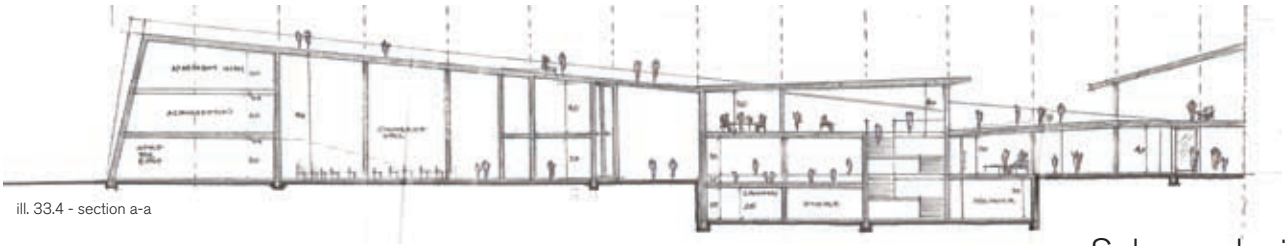


ill. 33.1 - plan parking basement


ill. 33.2 - plan basement under culture centre

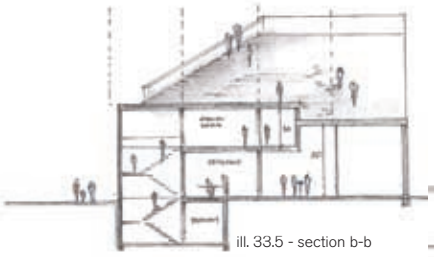


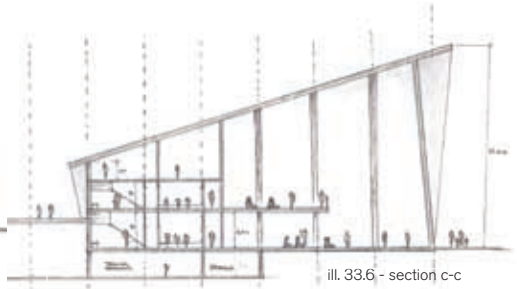
ill. 33.3 - plan 2nd floor mosque


ill. 33.4 - section a-a

Sub conclusion

The design proposal presented is meeting all the functional requirements in the program, but the organization becomes too functional and rigid, and does not provide the desired architectural experience in the interior spaces. The outer deconstructed shape of the complex is not communicating with the interior space. The structural system with the modular grid is also creating a limitation focusing too much on the structural system. The whole organization should be reconsidered to achieve the architectural qualities based on experience and creating a link between the outer shape and interior spaces.

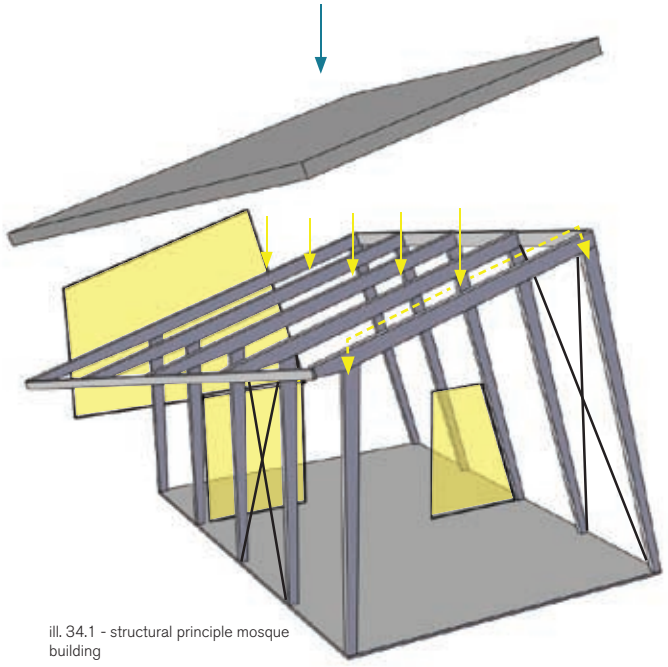

ill. 33.5 - section b-b


ill. 33.6 - section c-c

Concept development 3

Revised construction principle

The investigation of the structural system for this detailing is divided in two parts;
The first part is illustrating the structural system as diagrams to visualize the structural idea. The second part is focusing on calculations of steel columns. This calculations together with estimated sizes of concrete slabs. This results will be presented in the end of this report as appendix.

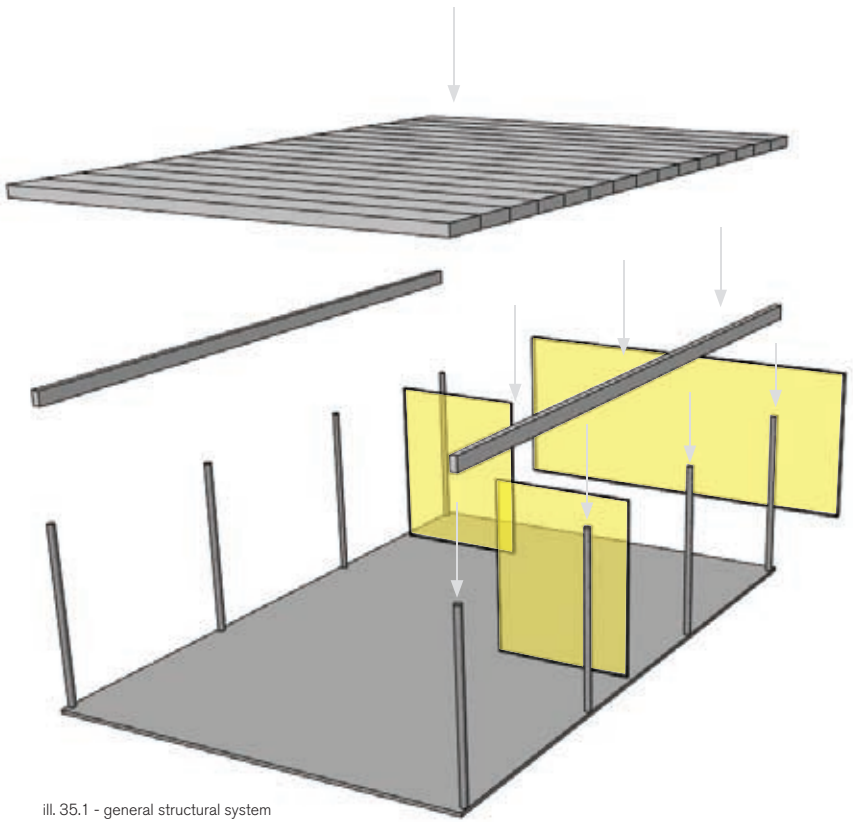


ill. 34.1 - structural principle mosque building

The load bearing system for the mosque building is designed as steel portal frames transferring the vertical load ill. 34.1. Wind bracing and share walls are taking the horizontal forces and stabilizing the structure.
The structural system provides architectural and spatial qualities to the mosque space by allowing the space to stand out without columns.

It has been decided that the steel beams for the portal frames will be designed as a lattice girder to be able to construct the roof overhang without column support. The girders are not calculated for this conceptual project but designed with reference to the opera house in Copenhagen, ill. 34.2 which is using a similar system and a free overhang of 40 m. The possibility to solve the overhang without column support is therefore not seen as a problem.

ill. 34.2 - Opera house Copenhagen, illustation showing big frestanding



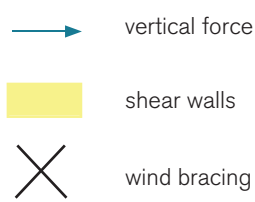
ill. 35.1 - general structural system

The overall load bearing structure for the building complex consists of load bearing steel columns and beams with prefabricated hollow slabs used for storey partition and the roof structure ill. 35.1, except in the mosque building. The building typology and shape allows this effective system to be applied to the design.

The dimension of the prefabricated concrete slabs has been estimated by using dimensioning tables provided by the manufacturer of the elements. [contiga.no]. The result of the estimation are presented in the appendix

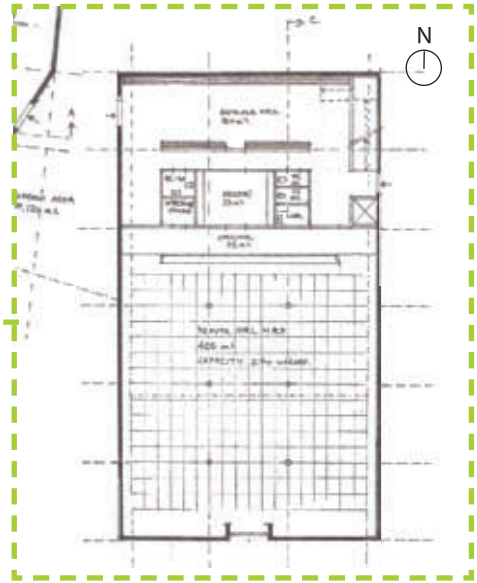
Distribution of forces

The vertical forces from the roof or storey partitions, both of which are working as plates in this structural system, are transferred to the beams and down by the load bearing columns. The horizontal forces on the facades are taken by either share walls or the wind bracing between the columns.



Sketching design proposal 2 - mosque

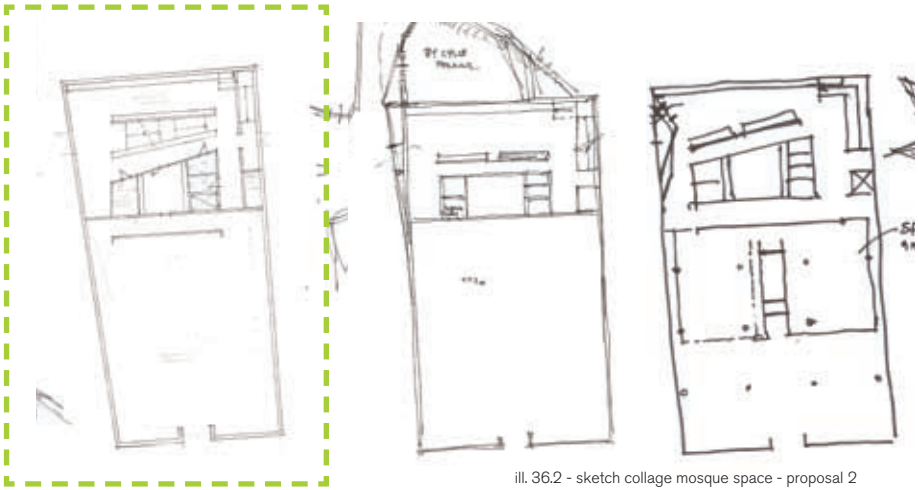
Based on the conclusion made for the sketch proposal in concept development 2, a new sketching phase started. The focus this time was to create interior space with a more dynamic flow. The interior shape organization should still meet the functional demands as planned in the program, but it should also reflect the exterior shape. The new proposal for the load bearing system allows forming spaces with a more flexible layout.
Using the qualities of functional organization from development 2, this iteration is aiming for an interior organization based on architectural experience of being in the space.



ill. 36.1 - proposal plan concept development 2

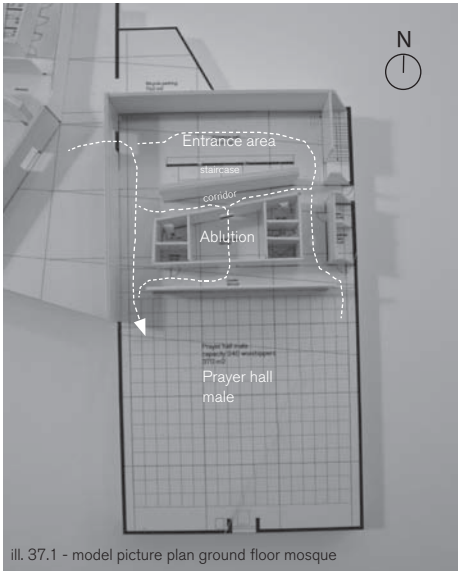
Organization ablution and mosque space

The interior space of the mosque has been detailed further from concept development 2 ill.xx. Focus has been given to the entrance and the connected ablution space. The rigid, straight organization of the walls in the space has been broken up in this proposal. The staircase up to the women's gallery on the first floor has been placed more centrally in the entrance area, separating the entrance space from the ablution and sanitary functions. The idea behind the deconstructed straight walls has been to create an architectural experience in the paths, where the walls are creating a perspective in the space.



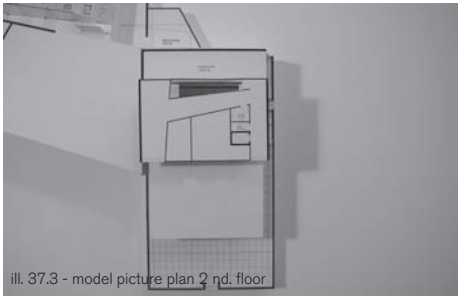
ill. 36.2 - sketch collage mosque space - proposal 2

Evaluation physical model mosque



ill. 37.1 - model picture plan ground floor mosque

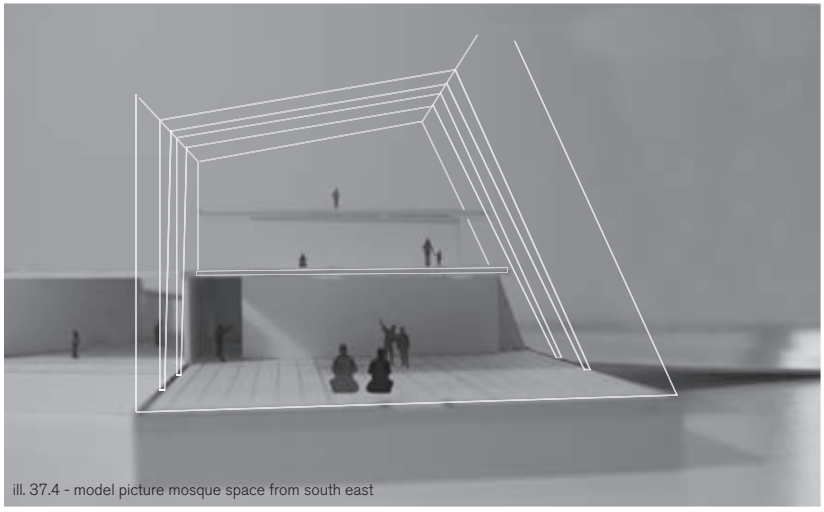

ill. 37.2 - model picture plan 1 st. floor mosque


ill. 37.3 - model picture plan 2 nd. floor

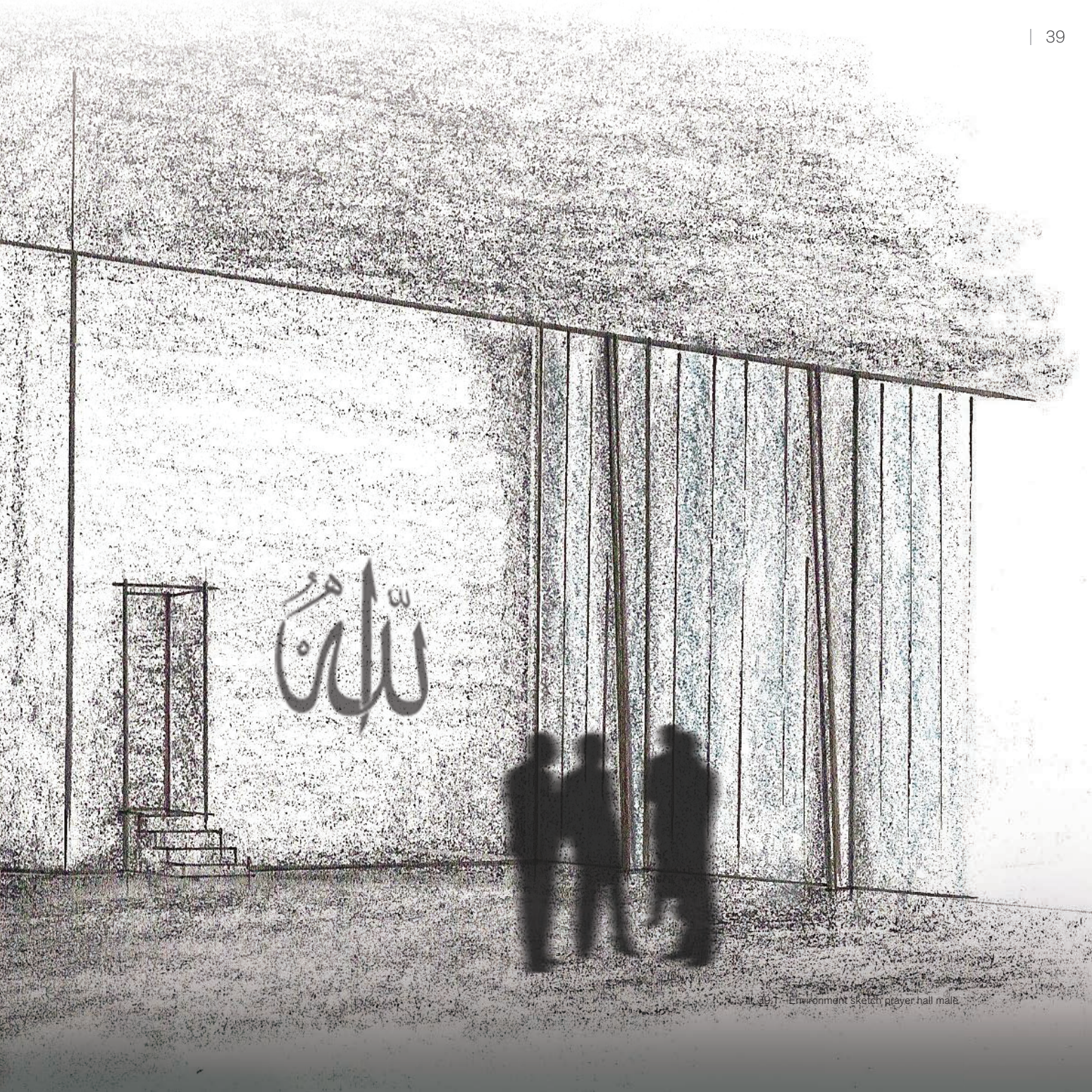
A physical model was made to evaluate the spatial quality of the organization.

The model discovers that the entrance space becomes unclear in its organization and appears more closed than intended. The flow is working, but the paths become undefined. The central staircase becomes too monumental in character and does not have a direction with a clear destination. The tilted wall communicates with the outer shape and fulfills the functional demands in the room program, but the organization should be reconsidered for the entrance area to strengthen the transition from the secular to the sacred space.

The sacred mosque space is rearranged by replacing the structural system as illustrated in the chapter for a revised construction principle. The perception of the space is more calm and open with improved architectural, spatial and functional qualities. The physical connection between the worshippers and the imam is improved since no columns are blocking the view. The direction towards Mecca, which is seen as on of the most important criteria in a Mosque, is also fulfilled in the design. While entering the sacred zone the direction is marked with the mihrab, also called prayer niche in the quibla wall.


ill. 37.4 - model picture mosque space from south east


كل من عليها فان

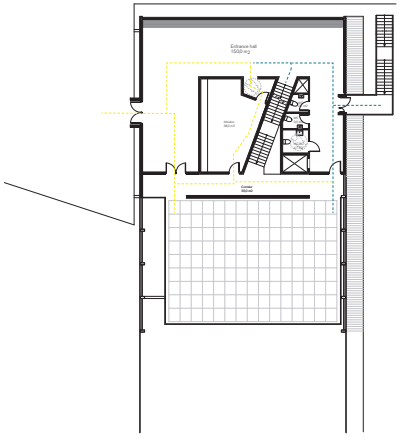


Ill. 20.1 - Environment sketch prayer hall male

Re developed entrance area mosque

A re-arranged proposal for the space is designed ill. 40.2 based on the conclusion made in the evaluation of the physical model.
The spaces are re-arranged to create a hierarchy in the entrance area. The main entrance is from the west, and appears more open while the secondary entrance area, with sanitary facilities, is smaller in layout. The proposal is working with an additional parameter which gives indirect access to the ablution space. The staircase to the women's gallery ill.40.1 is slicing through the space and leading the user directly to the prayer space on the first floor.
The organization corresponds with the functional demands in the room program and the intended atmospheric and architectural qualities are seen as achieved.

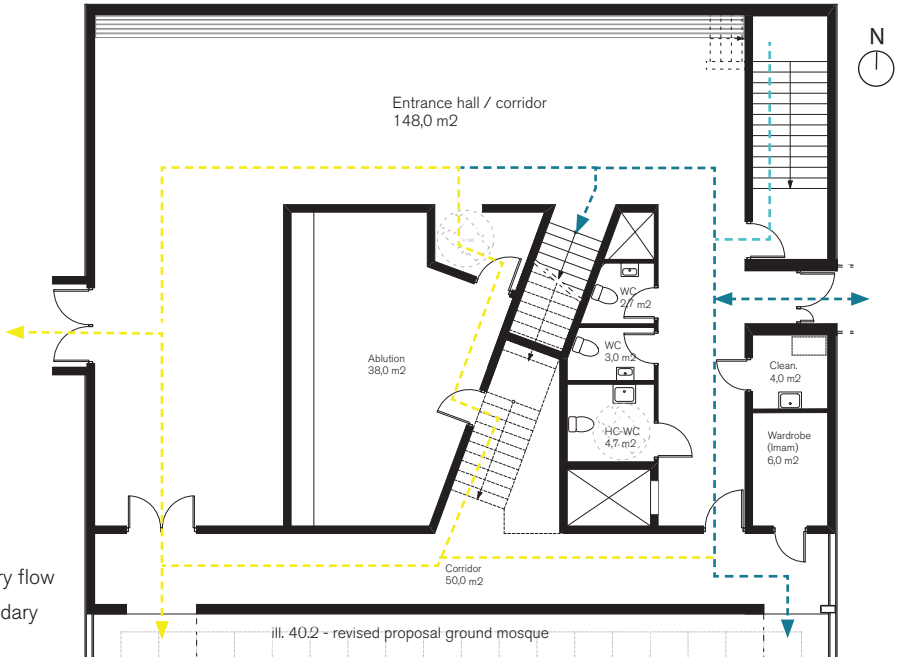
ill. 40.1 - design proposal ground floor mosque



ill. 40.2 - revised proposal 1 st. floor mosque

primary flow

secondary flow



ill. 40.2 - revised proposal ground mosque

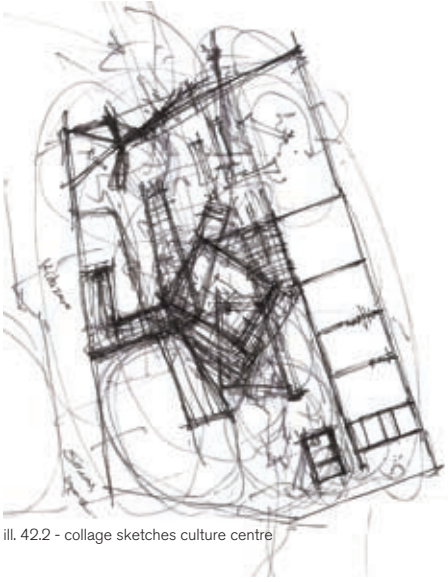
ill. 41.1 -conceptual idea, access stair to 1 st floor slicing trough the space

Sketching design proposal 2 - culture centre

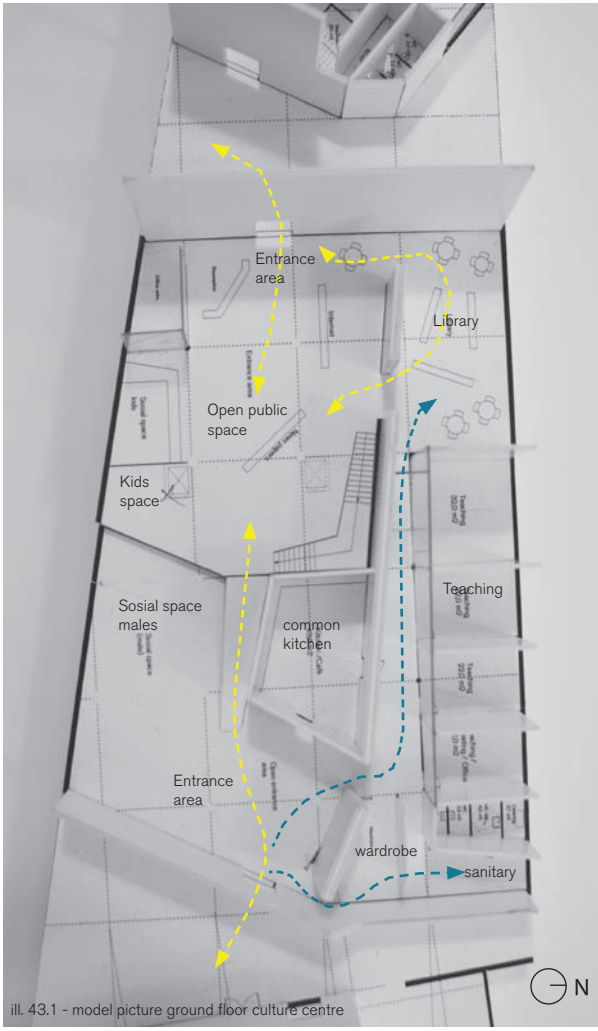
Organization culture centre ground floor

The interior space of the culture centre has been reconsidered with the notion of breaking up the rigid, straight organization of the spaces. The focus is based on creating spaces based on experience with architectural and spatial qualities, and creating coherence between the outer shape and the interior spaces. Qualities such as the placement of functions found in the proposal 1 ill. 42.1 will be adapted to the revised proposal.

ill. 42.1 - proposal plan ground floor culture centre concept development 2



ill. 42.2 - collage sketches culture centre



ill. 43.1 - model picture ground floor culture centre

Evaluation physical model culture centre

The new proposal is based on the same organization principle as proposal 1 ill. 42.1, where the quiet and semi-public spaces such as the library space, teaching spaces, and sanitary spaces are placed towards the north.
The functions in the new proposal ill. 43.1, are separated by a load bearing, heavy wall defining paths within the deconstructed, simple geometry. The new proposal is working with two levels on the ground floor. The level difference is solved with a ramp. Introducing difference in levels is creating a dynamic in the space and separating the individual spaces.
The idea also has a reference to the outer shape of the building where part of the roof space is used as ramp.

primary flow

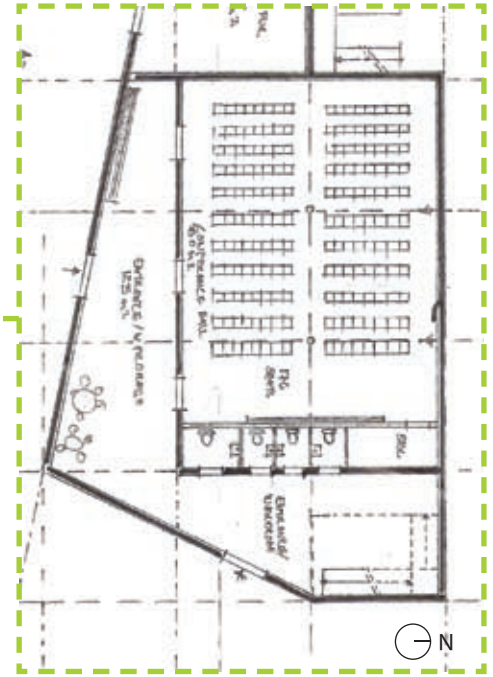
secondary flow

ill. 43.2 - model picture culture centre from south

Sketching design proposal 2 - conferance hall

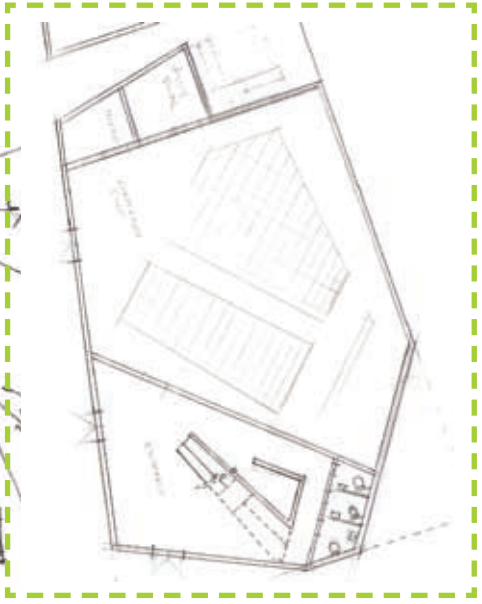
Organization conference hall and activity space

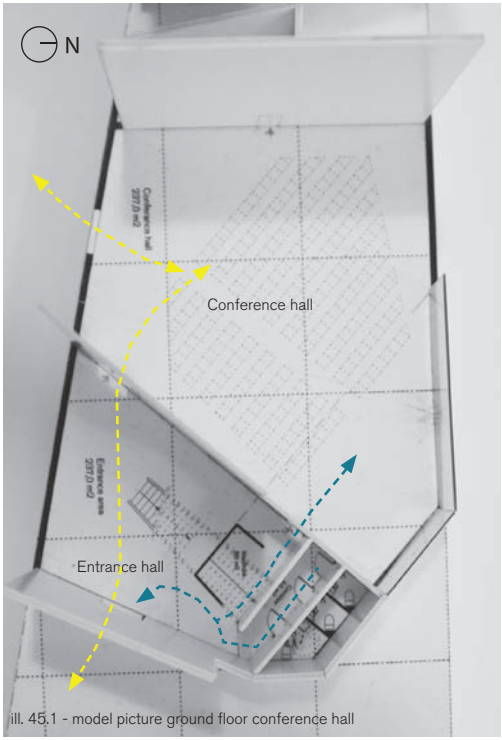
The proposed conference hall and adjacent functions will be reconsidered to achieve the desired spatial experience of being in the space. The rigid, straight organization will be reconsidered in the development process beside the already mentioned parameters in the previous chapters.



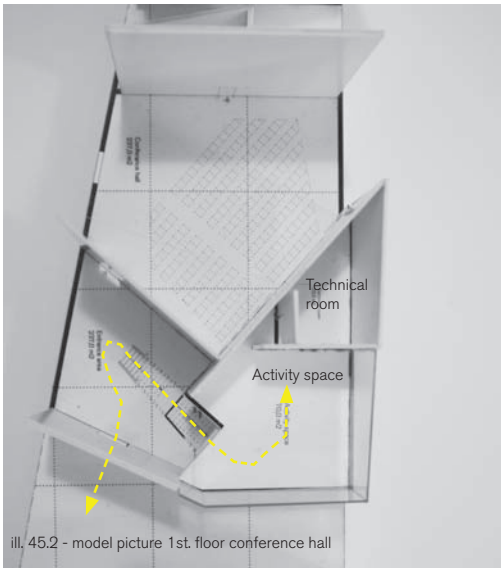
ill. 44.1 - proposal plan ground floor conference hall concept development 2

ill. 44.2 - collage sketches conference hall





ill. 45.1 - model picture ground floor conference hall



ill. 45.2 - model picture 1st. floor conference hall

Evaluation physical model culture centre

The new proposal has been developed by deconstructing the straight shape. One leading additional parameter has been to create an experience in the space beside the functional demands, which were fulfilled in the previous proposal. The whole direction of the seating in the conference hall is rotated towards northeast with a view to the fiord. Since Tromsø experiences midnight sun in the summer period, the organization will give a nice view to the sunset.

The intention of giving the organized space improved architectural qualities is seen as fulfilled.

primary flow

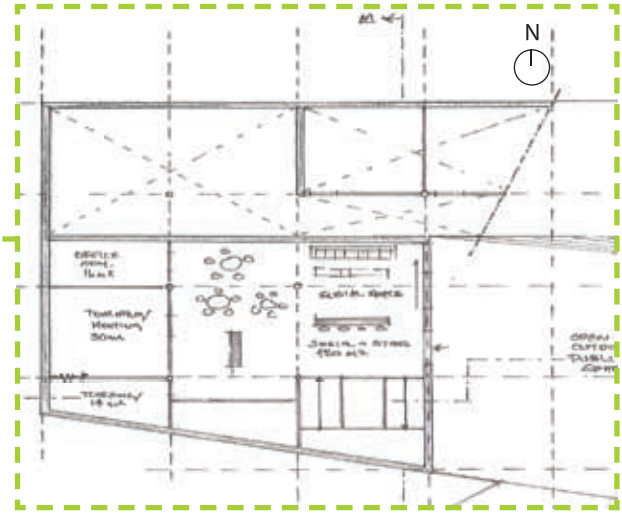
secondary flow


ill. 45.3 - model picture culture centre from south

Sketching design proposal 2 - 1 st floor culture centre

Organization culture centre 1st floor.

The criteria mentioned earlier for the organization of the ground floor is also repeated on the 1st floor.

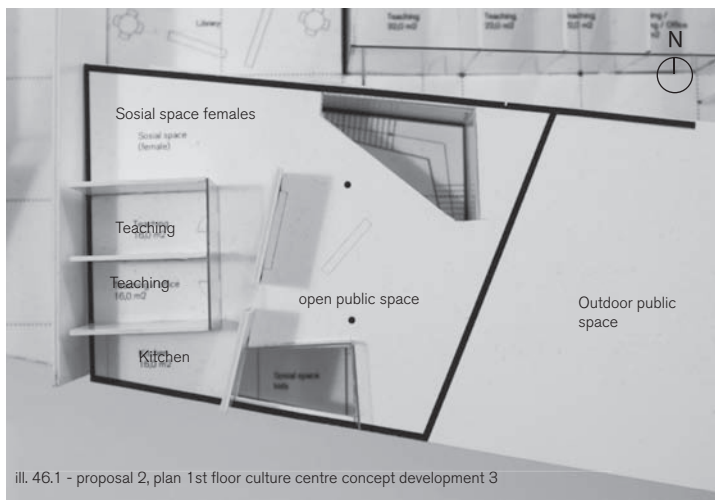


ill. 46.1 - proposal plan 1st floor culture centre concept development 2

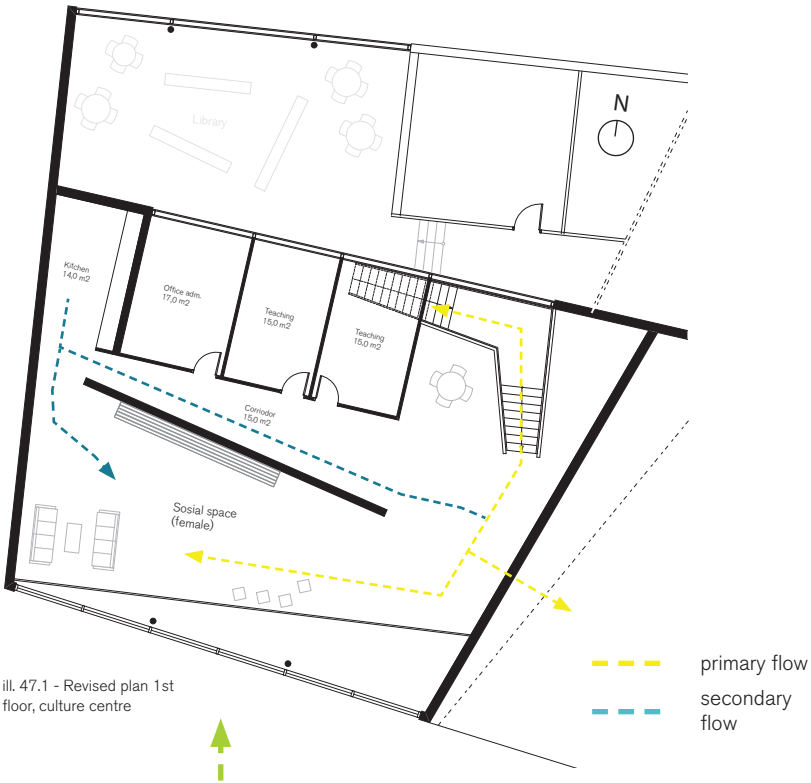
Evaluation physical model culture centre1 st floor

The new proposal for the 1st floor is working with the zoning principle as on the ground floor. The semi-public and teaching spaces are here separated with a division wall marking the boundary between public and semi-public functions.

The organization principle is working in the layout, but the placement of function has not followed the principles of placing the semi-private and quiet functions towards the north. The arrangement of the spaces should therefore be reconsidered.



ill. 46.1 - proposal 2, plan 1st floor culture centre concept development 3



ill. 47.1 - Revised plan 1st floor, culture centre

Re-developed plan 1st floor

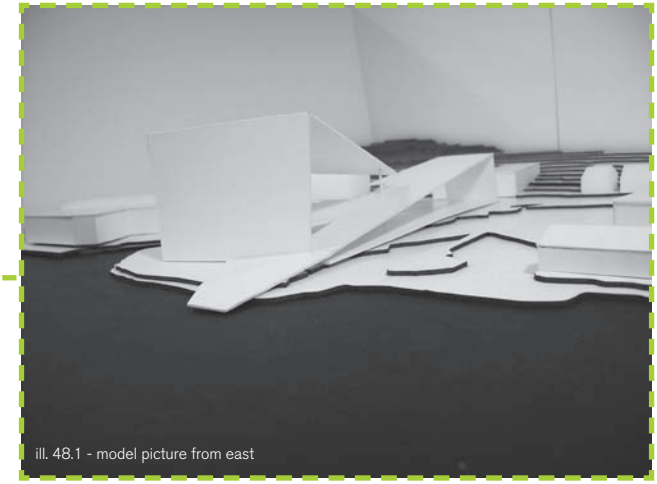
A re-arranged proposal for the space is designed ill. 47.1 based on the conclusion made in the evaluation of physical model. The zoning is now matching the principle used for the zoning of the spaces. The functional, spatial and architectural demands for the space are seen as achieved in the presented proposal.

Sub conclusion

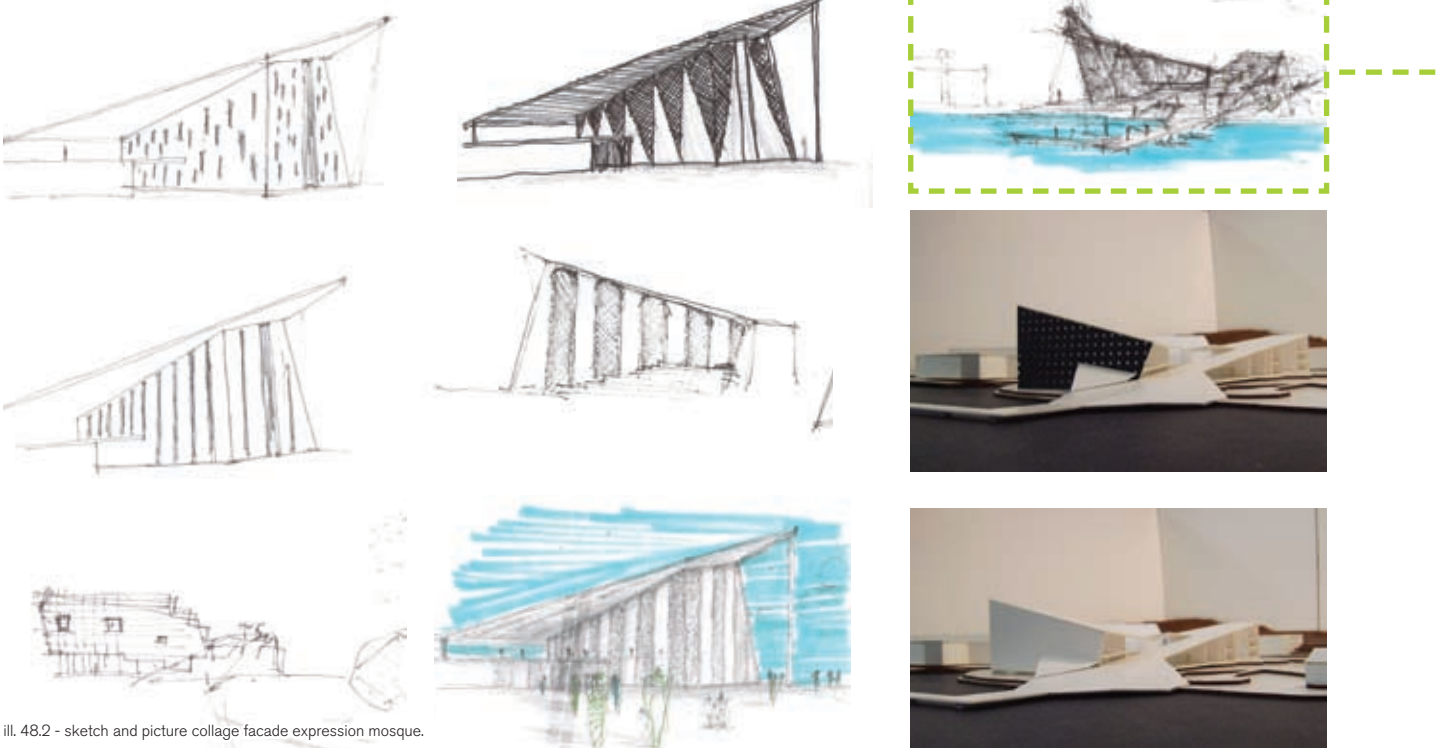
Concept development 3 has focused on developing the project to improve the interior spaces by rethinking the straight and simple layout from concept development 2. The qualities of functional organization were adapted to the new proposal, but the spaces were redesigned to achieve the desired spatial and architectural qualities of being in the space. As a result of this, the interior spaces are now communicating with the outer building shape.
It could be concluded that most of the space has achieved the intended goal except the entrance area in the mosque and 1st floor in the culture centre. The plans here need to be reconsidered

Architectural expression and exterior building materials

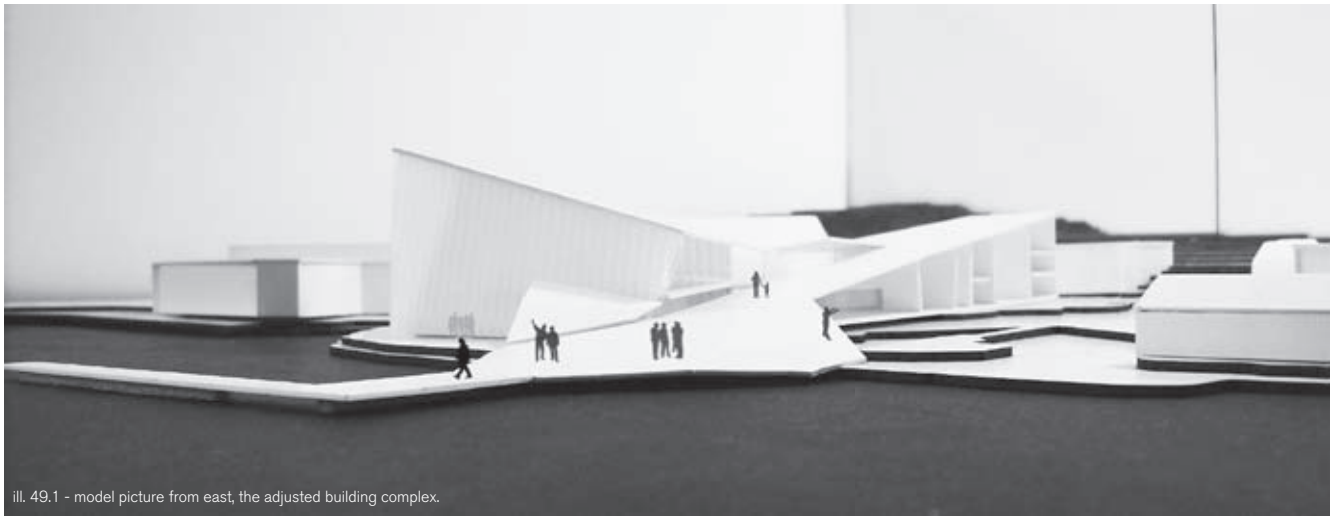
The following chapter will introduce the development of the exterior expression of the mosque volume. The investigation is only focusing on the expression of the mosque since this was the volume not meeting the aesthetic qualities in the composition. Based on the conclusion made in the chapter for architectural expression in concept development 1, this iteration will present the reconsidered proposal of the architectural expression of the building complex.



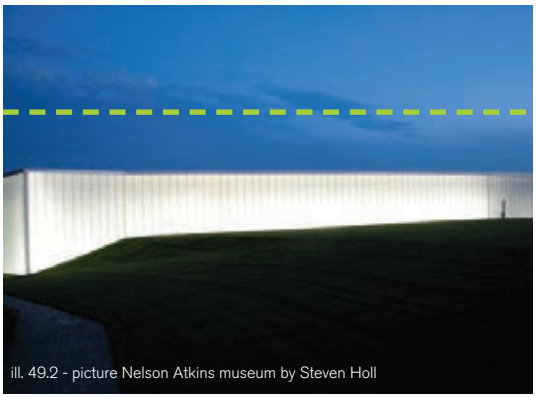
ill. 48.1 - model picture from east



ill. 48.2 - sketch and picture collage facade expression mosque.



ill. 49.1 - model picture from east, the adjusted building complex.



ill. 49.2 - picture Nelson Atkins museum by Steven Holl

ill. 49.3 - picture Nelson Atkins museum by Steven Holl

Exterior expression

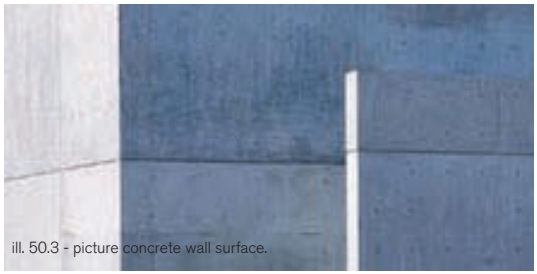
The exterior building shape of the mosque volume is adjusted by reducing the height and breaking the straight line of the existing proposal as shown in ill. 49.1 The volume is now communicating more with the idea of the building complex as a landscape silhouette. The chosen material for the facade wall exposed towards the fiord is polycarbonate. The expression of the wall is a simple and calm facade where the material and light will create the desired expression. The material is chosen with the metaphor that the god (Allah) is the light of world according to Islam. The house of god, by using this material, is lighting up the surroundings when it's dark and creating an architectural quality for the exterior surrounding spaces.
Picture ill. 49.2 and ill. 49.3 is given as a reference to the intended exterior expression of this project.

Materials exterior surfaces

The exterior expression is aiming for simplicity in material use. Only a few materials with a bright and light expression will be applied to the building complex. Materials intended to be used are: polycarbonate, ill.50.1, glass, and concrete on the walls. The concrete surface should stand out with its natural grey color and a smooth surface. The ramp and the roof surface of the culture center will be paved with granite as illustrated on the pictures ill. 50.2. The outdoor public square will have granite paving as well, but with a more red color to create a contrast between the constructed landscape and the actual landscape.
It is decided that the roof material for the mosque is zinc in grey color ill.50.4. The choice of this material for the roof is marking the difference between the sacred and the secular space, and creating a contrast to the granite paved walking area.


ill. 50.1 - picture Nelson Atkins museum by Steven Holl


ill. 50.2 - picture granite surface - opera house Oslo


ill. 50.3 - picture concrete wall surface.


ill. 50.4 - picture shows the idea of roof covering in zinc

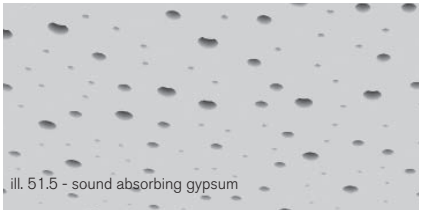
Materials interior mosque

ill. 51.1 - material combination poly carbonate and concrete as intended in the mosuqe walls

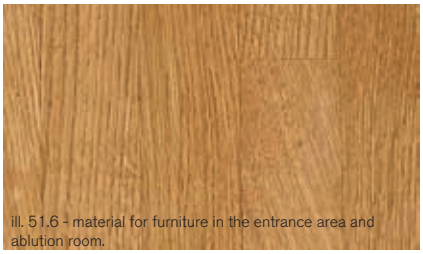
ill. 51.2 - material combination poly carbonate and concrete as intended in the mosque walls

ill. 51.3 - floor covering with red carpet and lines indicatiing the rows for worshippers

ill. 51.4 - material composition the entrance and ablution space



ill. 51.5 - sound absorbing gypsum



ill. 51.6 - material for furniture in the entrance area and ablution room.

The interior spaces aim for a simple expression similar to the exterior material use.

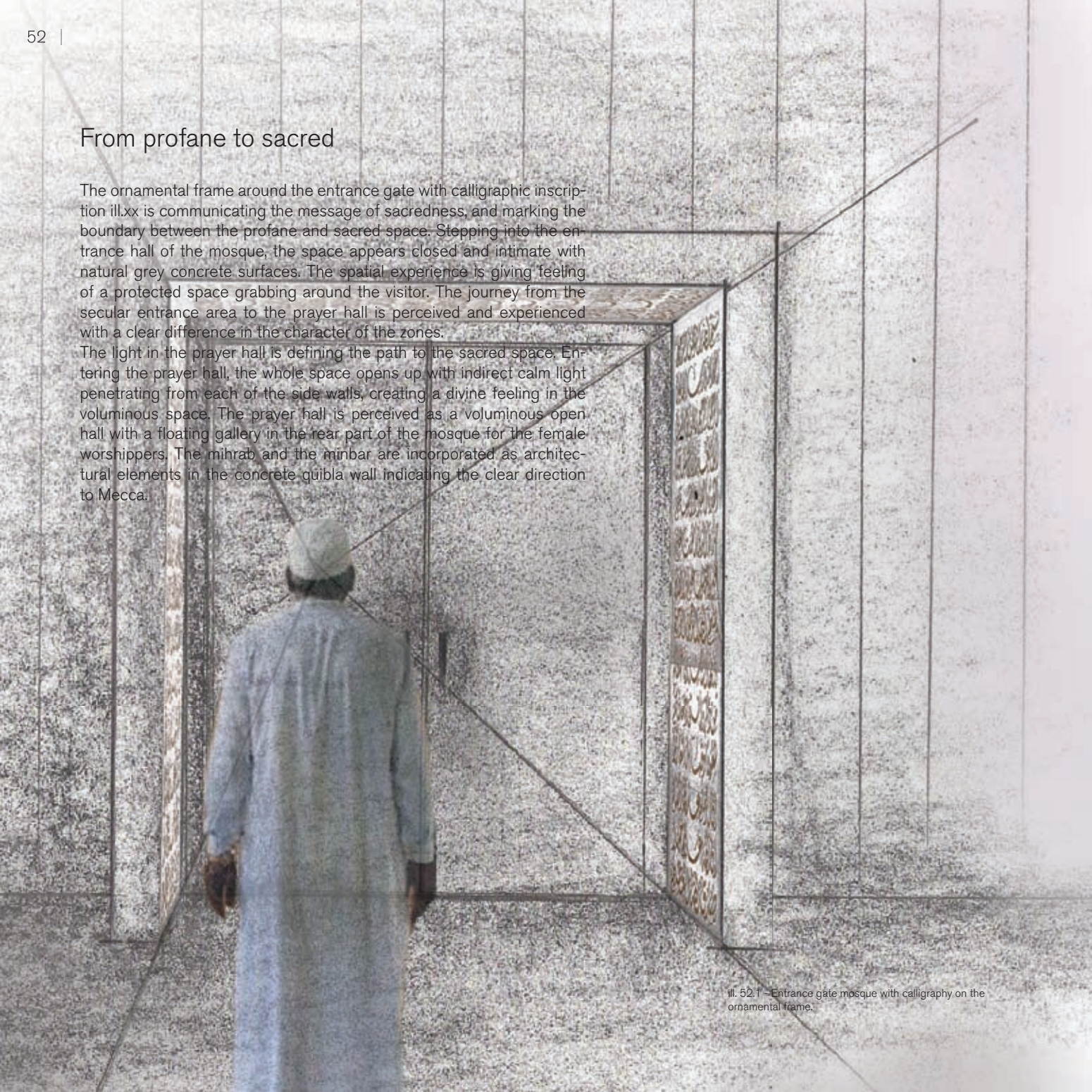
The mosque space is designed with polycarbonate walls on the sides, and with concrete on the wall facing Mecca. The materials create a bright expression in the space, with light penetrating through the translucent polycarbonate walls. The concrete surfaces are designed with a grey, natural concrete color, ill. 51.1 and ill. 51.4, and a smooth surface. The floor surface will be covered with a red carpet ill. 51.3 to bring a more soft environment to the space and to create a contrast to the bright polycarbonate walls and the solid concrete walls.

The roof and rear wall of the mosque will be covered with resonance absorbing gypsum ill. 51.5. The design of this material is seen as giving a functional and aesthetic quality to the space.

The entrance area in the mosque will be entirely of concrete ill. 51.4, with oak furniture ill. 51.6 to create a contrast to the solid surface.

From profane to sacred

The ornamental frame around the entrance gate with calligraphic inscription ill.xx is communicating the message of sacredness, and marking the boundary between the profane and sacred space. Stepping into the entrance hall of the mosque, the space appears closed and intimate with natural grey concrete surfaces. The spatial experience is giving feeling of a protected space grabbing around the visitor. The journey from the secular entrance area to the prayer hall is perceived and experienced with a clear difference in the character of the zones.
The light in the prayer hall is defining the path to the sacred space. Entering the prayer hall, the whole space opens up with indirect calm light penetrating from each of the side walls, creating a divine feeling in the voluminous space. The prayer hall is perceived as a voluminous open hall with a floating gallery in the rear part of the mosque for the female worshippers. The mihrab and the minbar are incorporated as architectural elements in the concrete quibla wall indicating the clear direction to Mecca.



ill. 52.1 – Entrance gate mosque with calligraphy on the ornamental frame.

ill. 52.1 - Access path from the dark profane entrance space towards the voluminous and bright prayer hall.

Outdoor space

Reflecting back on the program guidelines made for outdoor spaces, the architectural concept, and vision formed for this project, the whole building complex and the outdoor space is seen as a public area ill. 55.1.

>> The vision for this project is to design a mosque with a community centre that could function as a gathering place for Muslims and non-Muslim citizens of Tromsø <<

It is important for this project to look broader than this vision and not only see interior space as public but the entire site as public. Designing the whole site as a large urban public square, the intention in the vision is seen as fulfilled.

As described in the program, [Program, outdoor space] the proposed site is the starting point for the transition area connecting the existing city centre in the south to the university area in the northern part of the town. Designing the proposed site with the quality of town related spaces, the area will bind the existing town centre with the future transition area and function as a merging point between the existing and new city extension.

ill. 54.1 - Bertel Thorvaldsens square, Copenhagen. Large urban public space in the town.

ill. 54.2 - Bertel Thorvaldsens square, Copenhagen

ill. 54.3 - Public space on the roof of the Opera House in Oslo - Norway

Materials

The simplicity in material use is also reflected in the design and material choice of this square. The solid red granite pavement lies as a quiet surface, and is a contrast to the building complex which is communicating the message of the landscape on the site. The simplicity of the square is giving the space the special character of large open spaces where the architecture is allowed to stand out.

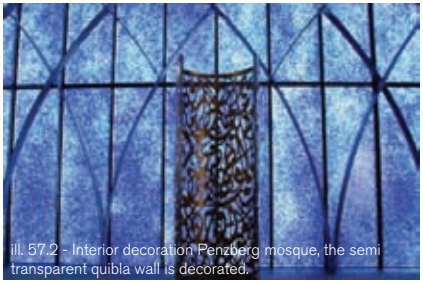
location plan

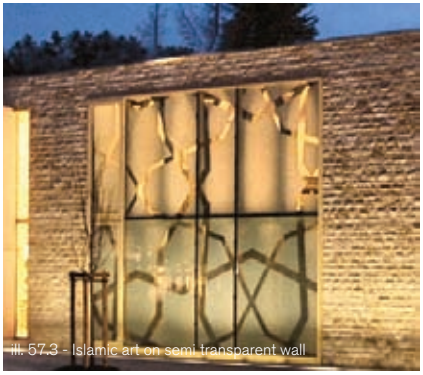
ill. 55.1 - Location plan, scale 1:1000

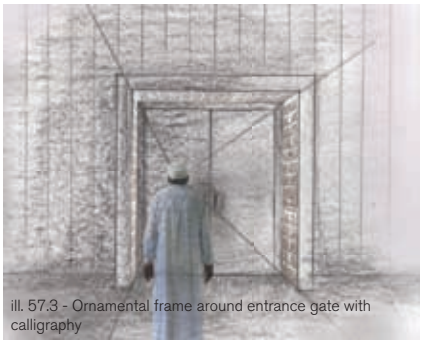
infrastructure on site

ill. 56.1 - Location plan with flow diagram
scale 1:1000


ill. 57.1 - Art installation of polycarbonate foiled with from inside


ill. 57.2 - Interior decoration Penzberg mosque, the semi transparent quibla wall is decorated.


ill. 57.3 - Islamic art on semi transparent wall


ill. 57.3 - Ornamental frame around entrance gate with calligraphy

Ornamentation and decoration

The ornamentation consideration has been kept on a conceptual level and only reflects a way of dealing with the task. “Mosque in a Nordic context” is focusing on designing a contemporary mosque and cultural centre designed in the Nordic and especially north Norwegian context.
The research made in the program phase discovers that ornamentation and decoration connected to mosque design is culturally related to Islamic traditions, and not a theological demand.

The possibility of applying ornamentation has been considered. Parts of the polycarbonate wall could be made totally transparent on parts of the facade where screening with Islamic art or calligraphy could be applied. Different colors of polycarbonate panels with foil screening ill. 57.1, ill. 57.2 and ill. 57.3 is showing the possibility lying in the material.

The architecture of this project has been focusing on designing this complex for future generations but it is also important to respect the present user group and their expectations for a mosque tied to traditions. The possibilities for ornamentation as explained above could answer some of these expectations.

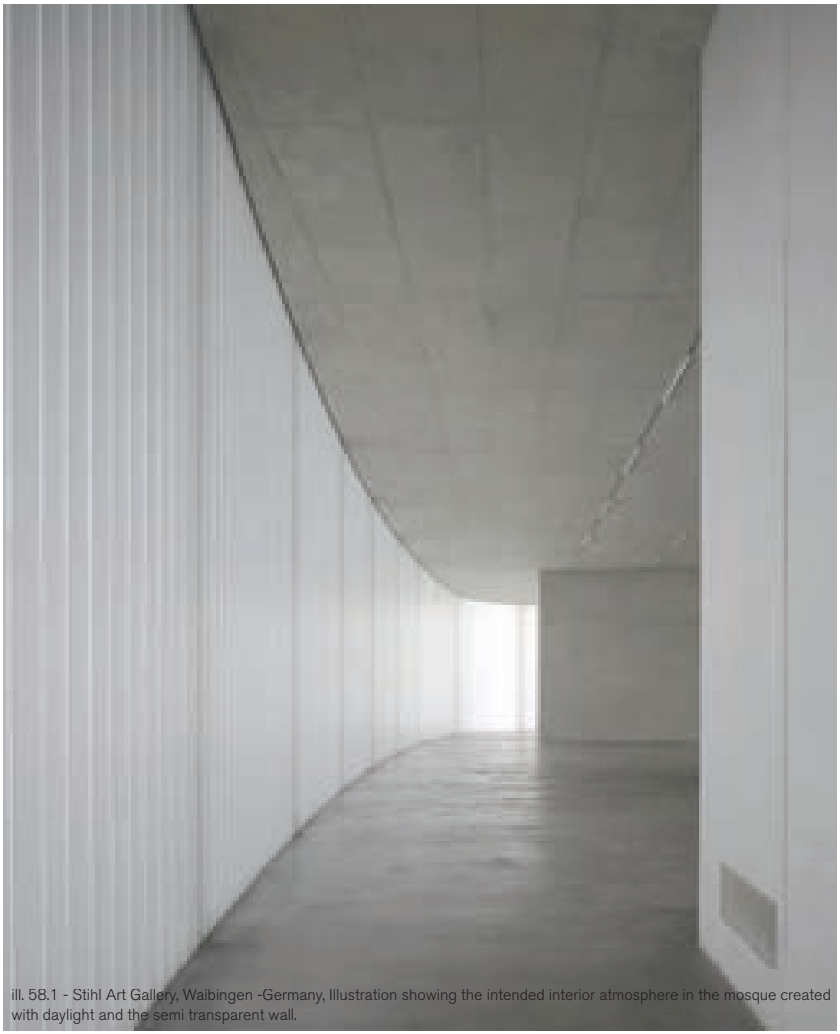
The ornamentation and decoration in this project is intended to reflect simplicity. The only visual ornamentation outside the mosque designed for this conceptual idea is the framing with calligraphy around the entrance gate ill. 57.4 and the mirhrab. The interior spaces are kept simple, as described earlier in the chapter; interior surfaces with simple, single color carpet on the floor and calligraphy on the quibla wall, as well as decorated and incorporated features such as the mihrab and minbar reflecting the Islamic traditions. The idea for the design is tied to the notion that the activity and the people are forming and creating the identity of the mosque.

Daylight

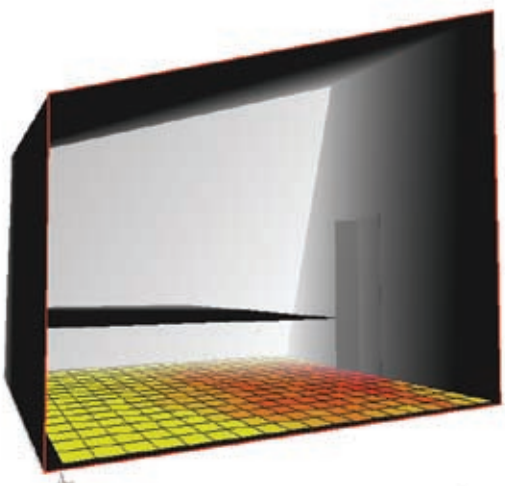
A general rule for the design has been to design with the possibility of receiving high amounts of natural daylight to the interior spaces. The building facades have been designed with large transparent windows or semi-transparent polycarbonate surfaces to achieve this goal.
Daylight creates welfare, energy, and gives inspiration. Daylight gives a better intensity than the artificial light and has the phenomenal capacity to reflect colors naturally. To grasp this quality and adapt it to the design will bring an architectural quality to the space.

The following writing in this chapter will only reflect the daylight in relation to the planned mosque space.

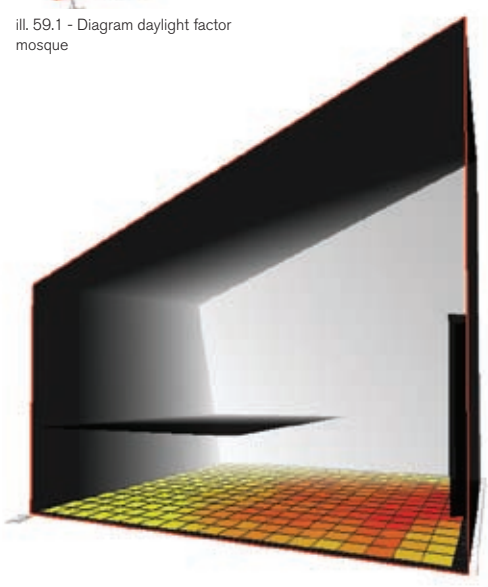
The planned design of the mosque with polycarbonate walls towards the east and west facades will create excellent daylight conditions in the prayer hall with indirect, calm light creating atmospheric and architectural qualities in the space. The material has been chosen to reflect the natural daylight conditions of Tromsø. During the summer period, Tromsø experiences a bright period with 24 hours of sunlight. The interior space will, in this period, receive natural daylight the whole day. The idea also supports a sustainable approach with no need of artificial lighting in the bright periods of the year in Tromsø.



ill. 58.1 - Stihl Art Gallery, Waibingen -Germany, Illustration showing the intended interior atmosphere in the mosque created with daylight and the semi transparent wall.



ill. 59.1 - Diagram daylight factor mosque



ill. 59.2 - Diagram daylight factor mosque

The technical daylight simulation made in the program Ecotect proves the fact that the chosen material on the east and west facades transmits a large amount of light into the mosque space. The daylight factor in the prayer hall is between 14,3 % to 26,3 %, which supports the argument that artificial light is not needed during the bright periods of the day.

Acoustics

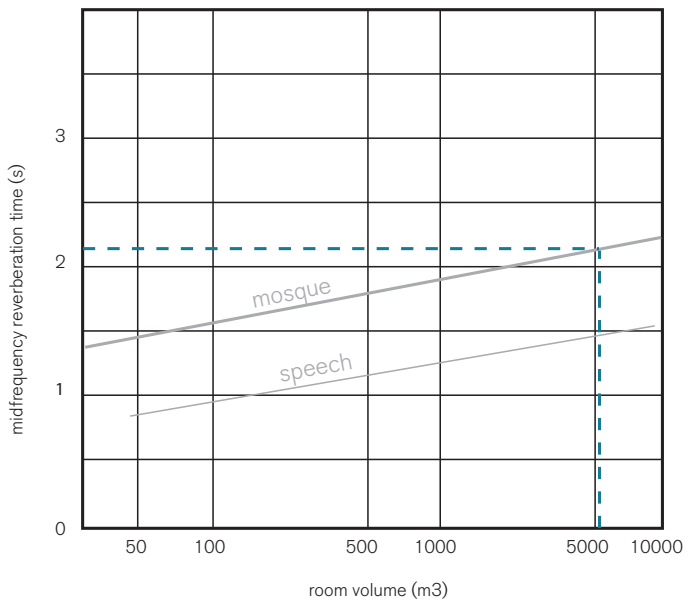
In the development of this project an important parameter is to design a mosque space optimized for achieving a divine aesthetic quality. This includes considering the sound quality in the space. The investigation presented in the following chapter is based on a notion that the acoustic design is an integrated part of the overall design to achieve the architectural expression of the interior mosque space. The technical aspects are, in this process, used as tools to achieve the intended acoustic quality and the desired expression in the mosque space.

Criteria

Reverberation time of a room is dependent on the room volume and the given surfaces in the space. To provide a mosque space with acoustic qualities as mentioned earlier and optimized to achieve a divine aesthetic quality of sound, values for reverberation time will be longer than the reverberation time for normal conversation. According to the writings from Prof. Dr. Mutbul Kayili [FSTC] the recommended reverberation time for mosques should lay between 1,4 seconds and up to 2,1 seconds depending on the volume of the space ill. 60.1. As a compromise, to avoid clarity problems, the reverberation time will lay closer to 1,4 seconds.

Room acoustic

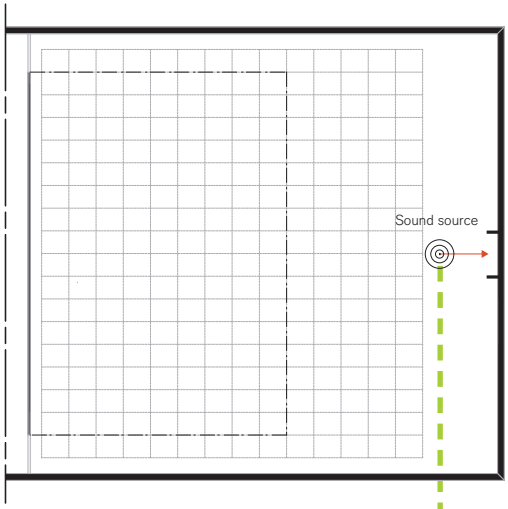
Acoustics is the understanding of sound and sound waves, their emergence, distribution and perception. Typical room acoustics is related to the quality of sound and how this is experienced by the listener. The parameters to be integrated in this investigation are the reverberation time and the distribution of the sound in relation to the specific function of the room. The reverberation time, RT60, is the most important criteria for the room acoustic of a mosque space. This figure describes the required time for reflections of a direct sound to decrease by 60 dB below its original level.



ill. 60.1 - Diagram showing reverberation time in proportion to the room volume an function

Room shape

It has been chosen to work with a shoe box room shape for the mosque space. The shape is a result of the developed architectural concept for this project and a consideration of the most preferable shape used for house of worship, which is usually square or rectangular shape. People are supposed to stand shoulder to shoulder during their praying act and the chosen shape is seen as optimal for the function. The floor in the mosque space should, according to the theological reasons, have no slope and appear flat. The mentioned reasons are also underlining the fact that a mosque space should appear as a space without hierarchy.



ill. 61.1 - Diagram plan of mosque space designed after shoe box principle

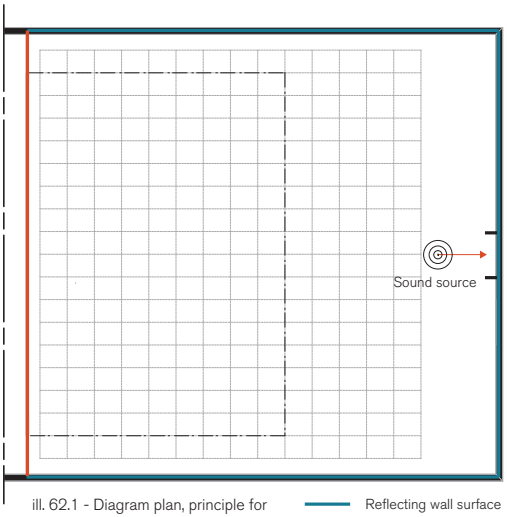
Sound source in mosque

The aural speech in a mosque during a prayer is performed by an imam leading the prayer facing the wall in direction of Mecca. Worshippers following the prayer normally occupy the rows behind the imam. The recitation is normally done by the imam standing inside a prayer niche also called mihrab. The mihrab is often used to reflect the sound to the audience behind.

ill. 61.2 - Picture showing a congregation praying behind imam

Walls

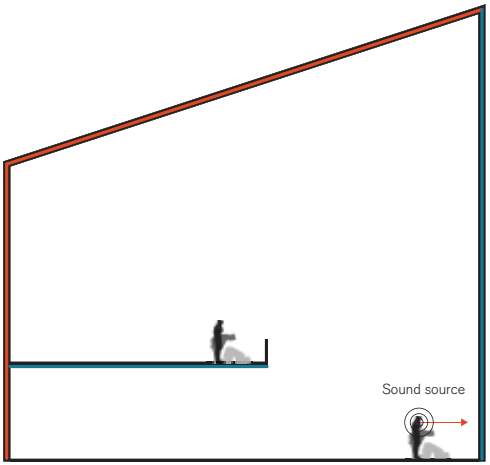
The materiality of the rear wall in the space must be considered to avoid the risk of Hass effect. If the rear wall in the room is reflecting the sound and is more than 9 meters away from the sound source, the imam leading the prayer and the worshippers occupying the front rows in the space will risk experiencing echoes, because the difference between the direct and reflected sound will be more than 0.5 ms (17 m). To avoid this effect, it is important to consider the materiality of the rear wall and choose materials with a high absorption coefficient to avoid reflection from this wall.
The side walls are useful to reflect the sound and should therefore be designed with an appropriate material that has a low absorption coefficient to be able to reflect and distribute the sound.



ill. 62.1 - Diagram plan, principle for absorbing and reflecting walls

Room height

Room height is an essential parameter concerning the room acoustic. The mosque space is designed with a tall ceiling height to give the space the intended architectural, atmospheric and sacred feeling. This shape creates challenges in terms of acoustic requirements. In high rooms there is a risk of echoes because of the long path the reflected sound travels before it reaches the listener; this affects the comprehension of the direct sound. If the distance between the direct and reflected sound is more than 17 meters the listeners will experience the sound as echo.



ill. 62.2 - Diagram section, principle for absorbing and reflecting walls

Method

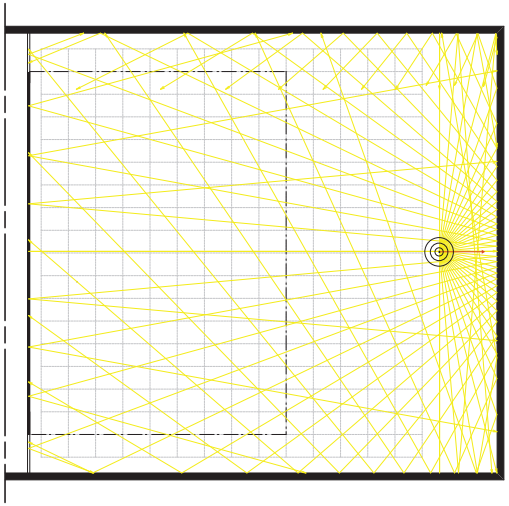
The following analysis has two main objectives: to determine the sound distribution in the mosque space by studying the reflection paths, and to design a room with reverberation time suitable for a mosque. As previously mentioned in the initial research, the mosque space should have a reverberation time between 1,4 to 2,2 seconds.
The analysis made for this research is done by using the Autodesk software Ecotect. The initial geometry of the mosque is designed in the cad software VectorWorks and imported as a 3D model into Ecotect where the materials are assigned to the different surfaces. The following steps will visualize the result of the sound distribution both horizontally and vertically in the space, together with a graphical illustration of the reverberation time. A spread sheet is used to calculate the reverberation time manually. The purpose behind this step is to compare the result from the manual calculation with the result from Ecotect. This result will be presented in the appendix.
Several steps have been made in this process but only two iterations will be presented, where the second result is seen as final.

ill. 63.1 - Picture sound absorbing gypsum

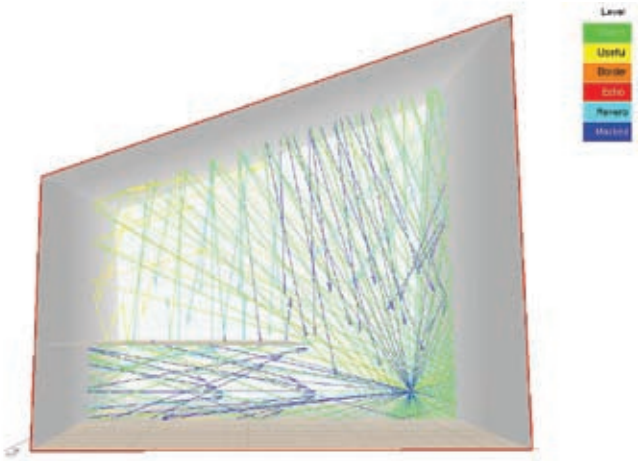
Iteration 1

Sound distribution

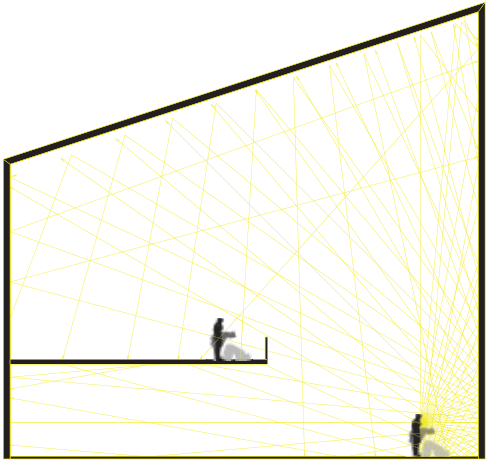
The first trial result in Ecotect shows a good and even sound distribution both horizontally ill.64.1 and vertically ill. 64.3 in the prayer hall. The sound permeates the whole space. The distribution of the sound towards the rear part of the hall could be improved to achieve better reflections to the audience in the rear of the prayer hall.



ill. 64.1 - Diagram plan, horizontal sound distribution in the mosque



ill. 64.2 - Diagram perspective of mosque showing the sound distribution in the mosque with the colors representing type of reflections.



ill. 64.3 - Diagram section, vertical sound distribution in the mosque

Reverberation time

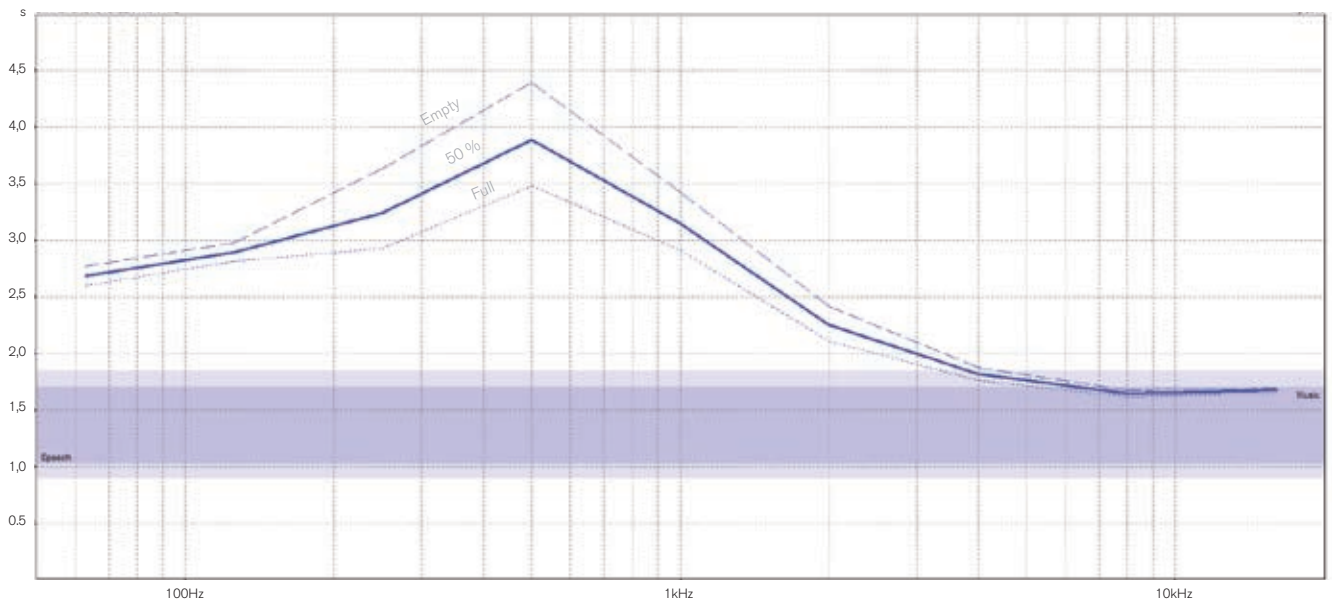
FREQ.	EMPTY RT(60)	50% RT(60)	FULL RT(60)
63Hz:	2.77	2.68	2.60
125Hz:	2.98	2.89	2.81
250Hz:	3.63	3.24	2.93
500Hz:	4.39	3.89	3.48
1kHz:	3.43	3.15	2.91
2kHz:	2.41	2.25	2.11
4kHz:	1.87	1.81	1.76
8kHz:	1.68	1.65	1.62
16kHz:	1.69	1.67	1.65

ill. 65.1 - Diagram showing reverberation time in the frequency range between 63 Hz to 16 kHz. The relevant frequency to consider will be between 250 Hz to 2 kHz.

Ill. 65.3 shows the graphical result of reverberation time from the analysis generated in Ecotect with the chosen surface materials described in ill. 65.2. The result shows that the reverberation time is in too high in the whole range and especially in the low frequency area with a reverberation time up to 3.7 seconds. A space designed with these properties will create a clarity problem in the room and will not be suitable as a mosque space. To lower the reverberation time, the materials chosen especially for the rear wall and ceiling should be reconsidered to achieve a reverberation time between 1.4 – 2.2 seconds.

Equivalent absorption area	Material	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Floor	Concrete slab carpeted	0.02	0.06	0.15	0.40	0.60	0.65
Ceiling	Framed plaster ceiling suspended	0.57	0.73	0.67	0.52	0.30	0.18
Window area	Translucent polycarbonate	0.14	0.09	0.02	0	0	0
Rear wall	Framed plaster board	0.57	0.73	0.67	0.52	0.30	0.18
Quibla wall	Concrete render	0.10	0.07	0.02	0.02	0.02	0.03

ill. 65.2 - Table showing material distribution to surfaces

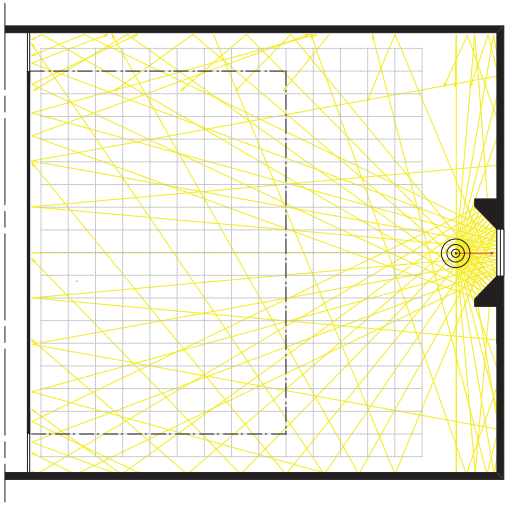


ill. 65.3 - Diagram showing the graphical illustration of the reverberation time in mosque

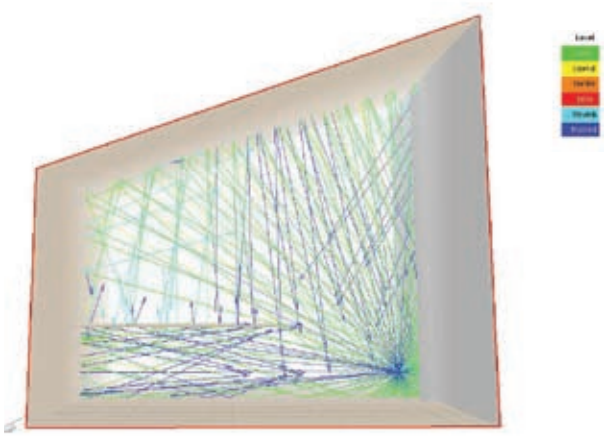
Iteration 2

Sound distribution

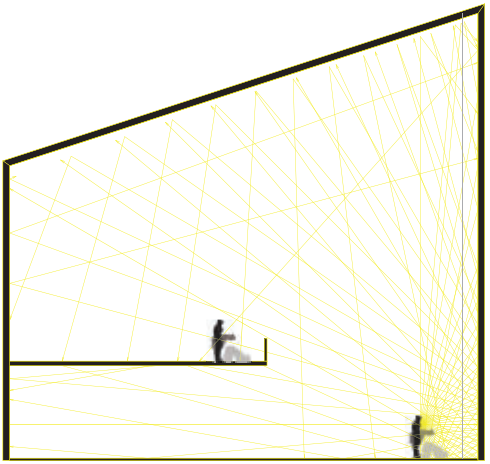
The final geometry shows that a prayer niche also called a mihrab is added to the design of the room. A mihrab is seen as one of the most important component parts of the mosque, indicating the direction of Mecca. The purpose behind adding this feature is to integrate this component part of the mosque to the architectural and the acoustic design of the mosque. The mihrab is providing a sacred quality to the space and functional quality as a reflector of the sound.
The sound distribution in the mosque space, using the mihrab as reflector, shows an improved horizontal sound distribution ill.66.1 in the rear part of the prayer hall. The front part gets a smaller reflection but is seen as acceptable because this area is close to the sound source. The vertical sound distribution ill. 66.3 is not significantly changed and is seen as good.



ill. 66.1 - Diagram plan, horizontal sound distribution in the mosque



ill. 66.2 - Diagram perspective of mosque showing the sound distribution in the mosque with the colors representing type of reflections.



ill. 66.3 - Diagram section, vertical sound distribution in the mosque

Reverberation time

FREQ.	EMPTY RT(60)	50% RT(60)	FULL RT(60)
63Hz:	1.62	1.58	1.55
125Hz:	1.65	1.62	1.59
250Hz:	1.47	1.39	1.32
500Hz:	1.54	1.46	1.39
1kHz:	1.59	1.52	1.45
2kHz:	1.61	1.52	1.44
4kHz:	1.51	1.46	1.42
8kHz:	1.60	1.57	1.54
16kHz:	1.62	1.59	1.57

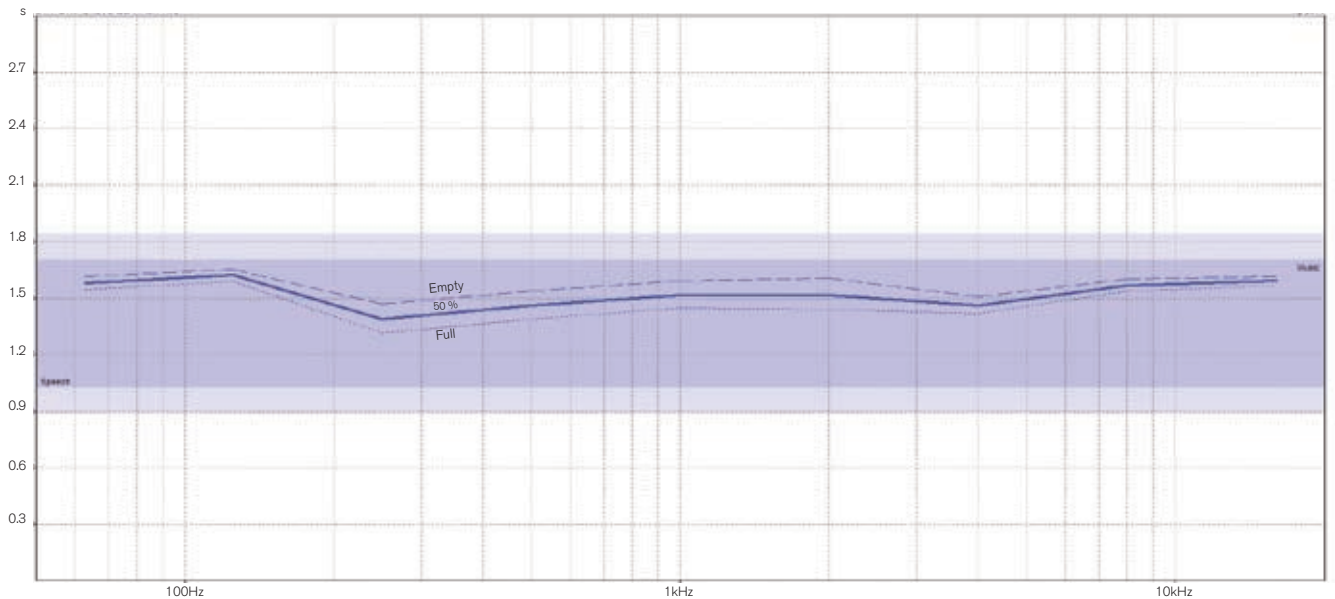
ill. 67.1 - Table showing reverberation time in the frequency range between 63 Hz to 16 kHz. The relevant frequency to consider will be between 250 Hz to 2 kHz.

Ill. 67.3 shows the graphical declaration of reverberation time from a final analysis generated in Ecotect with the chosen surface materials described in ill. 67.2. Perforated sound absorbing gypsum is added to the rear wall and ceiling ill. 67.2. The system is functioning as resonance absorbers and is absorbing especially the low frequencies. The result gives a reverberation time between 1.4 to 1.6 seconds in the space, and is seen as an optimal reverberation time for a mosque, which is acoustically most concerned with speech and music. The sound distributed in this space with this reverberation time will provide the intended atmospheric sound quality to the space.

Manual calculation made in the spread sheet [Appendix 1] gives a reverberation time result of 1.6 seconds, and corresponds with the result from Ecotect.

Equivalent absorption area	Material	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Floor	Concrete slab carpeted	0.02	0.06	0.15	0.40	0.60	0.65
Ceiling	Acoustic ceiling, gyproc ringtone BIG	0.57	0.73	0.67	0.52	0.30	0.18
Window area	Translucent polycarbonate	0.14	0.09	0.02	0	0	0
Rear wall	Acoustic wall, gyproc ringtone BIG	0.57	0.73	0.67	0.52	0.30	0.18
Quibla wall	Concrete render	0.10	0.07	0.02	0.02	0.02	0.03

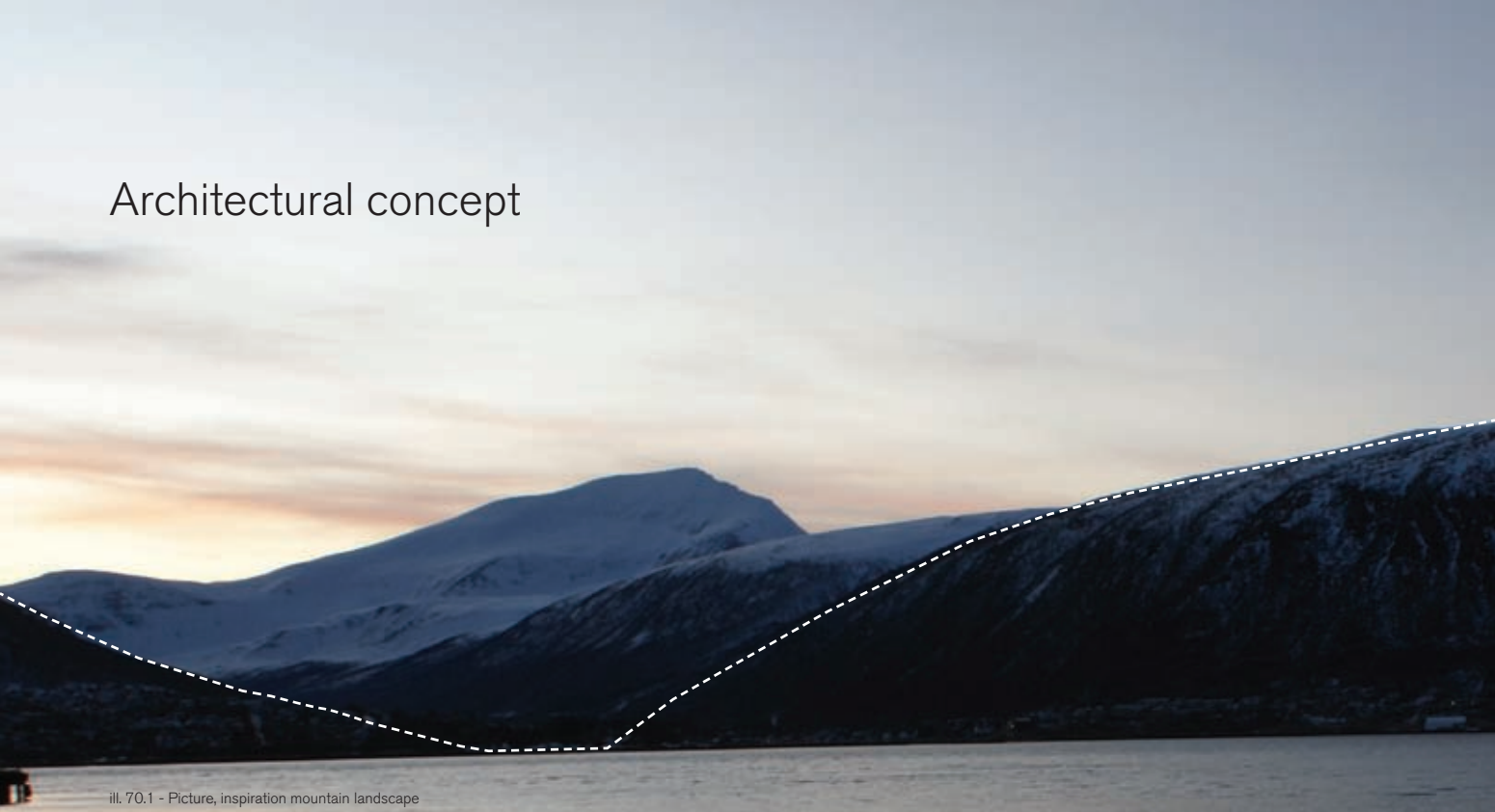
ill. 67.2 - Table showing material distribution to surfaces



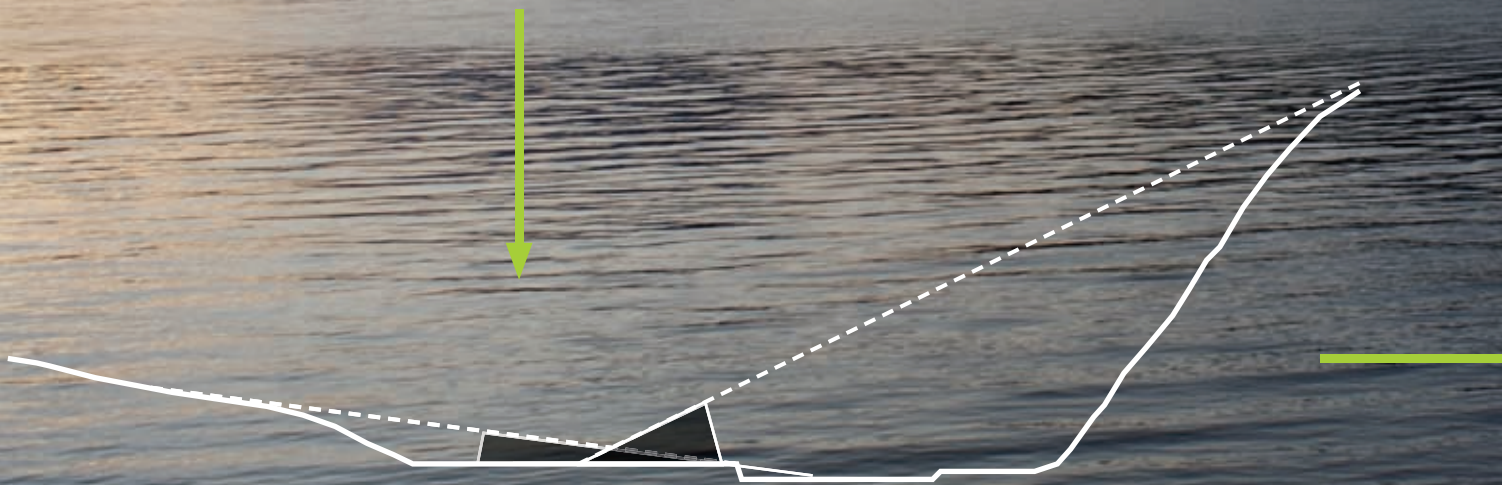
ill. 67.3 - Diagram showing the graphical illustration of the reverberation time in mosque

Presentation

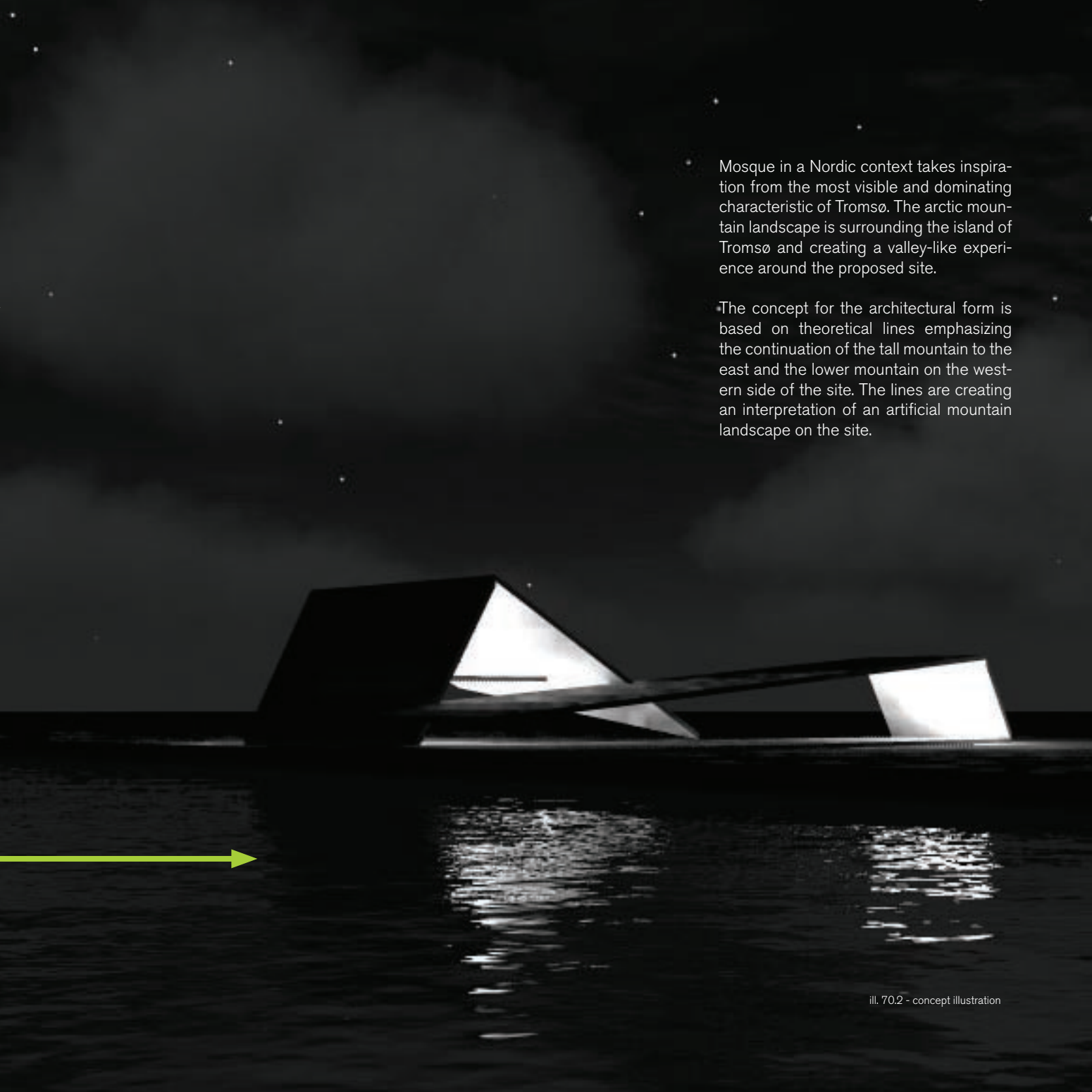
Architectural concept



ill. 70.1 - Picture, inspiration mountain landscape



ill. 70.2 - Concept diagram



Mosque in a Nordic context takes inspiration from the most visible and dominating characteristic of Tromsø. The arctic mountain landscape is surrounding the island of Tromsø and creating a valley-like experience around the proposed site.

The concept for the architectural form is based on theoretical lines emphasizing the continuation of the tall mountain to the east and the lower mountain on the western side of the site. The lines are creating an interpretation of an artificial mountain landscape on the site.

ill. 70.2 - concept illustration

Site location

The planned project will be located north from the arctic circle on a latitude of nearly 70 degrees, far north in Norway - Tromsø. The proposed site is situated in an old industrial area under redevelopment along the eastern harbour front of the town.

Location plan

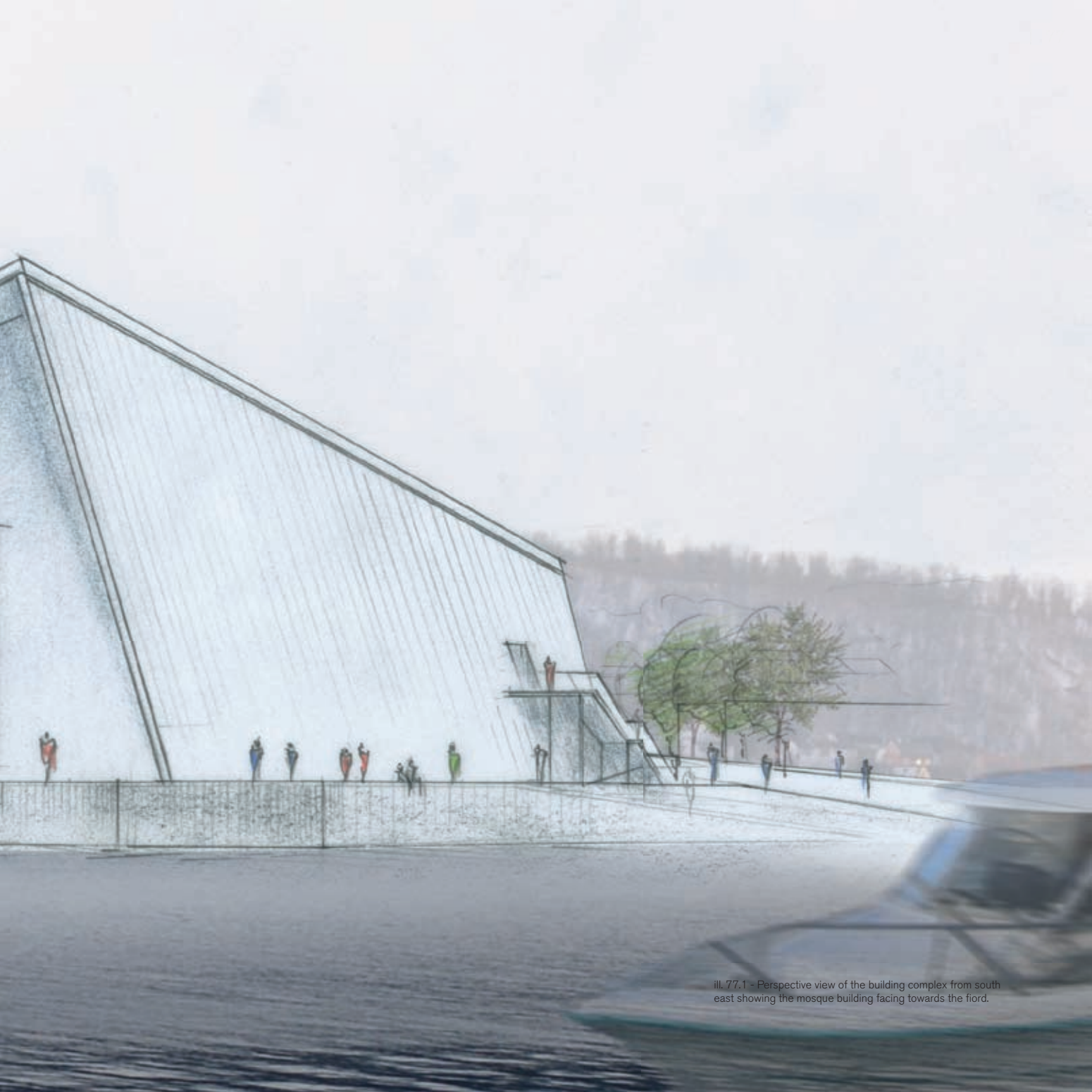
The planned building typology is arranged along the northern and eastern boundary to create an inviting gathering space for the citizens of Tromsø. A larger granite paved public square opens up the site and binds the existing town centre to the area by providing an urban quality.

The whole building complex works as a landscape typology with ramps leading pedestrians up to the public roof terrace and down to the shoreline to the east.

ill. 72.1 - Overview picture the Island of Tromsø

ill. 73.1 - Location plan, scale 1:1000

ill. 75.1 - Perspective view from south when arriving to the site. The site opens up with the public square creating an urban quality.



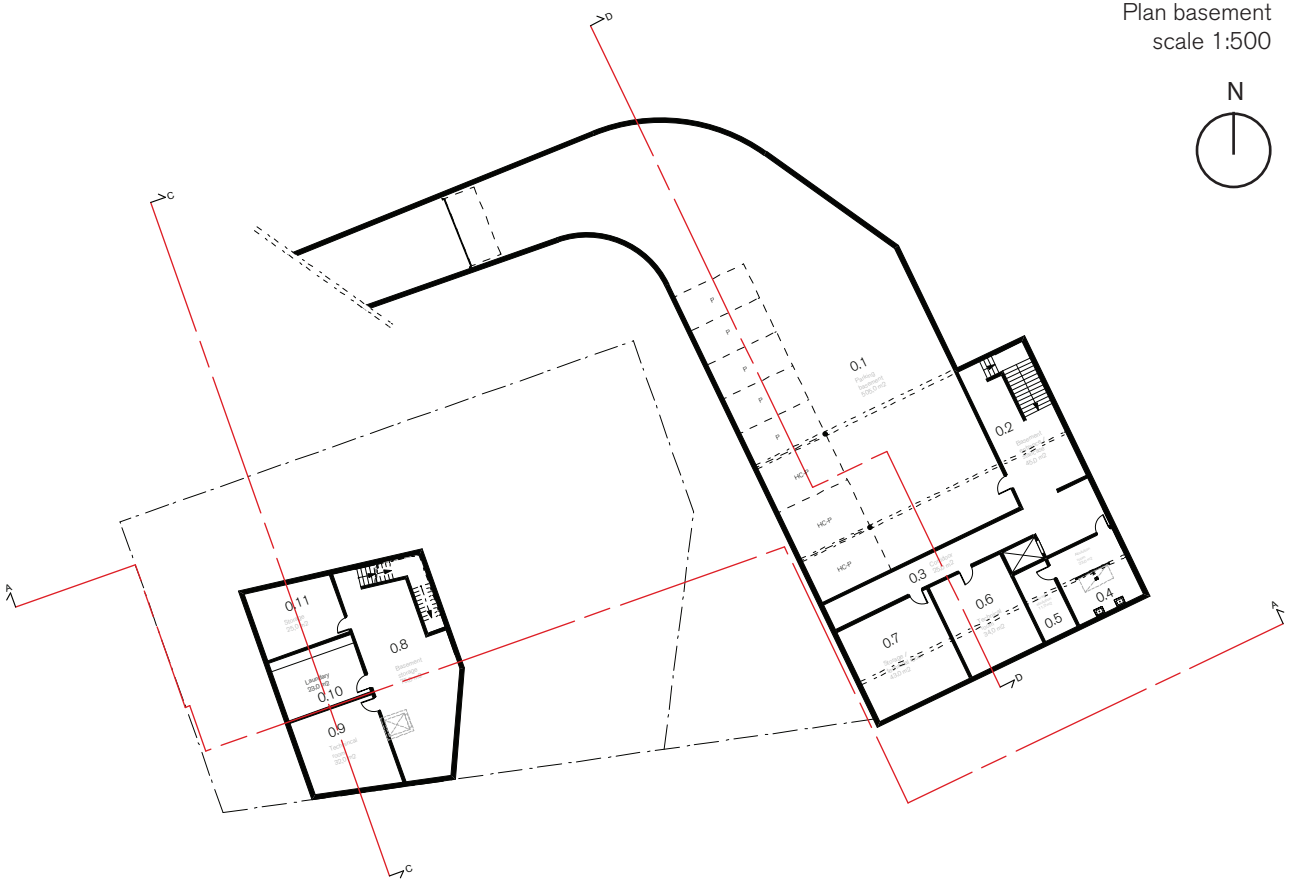
ill. 77.1 - Perspective view of the building complex from south east showing the mosque building facing towards the fiord.

Flow to the site

ill. 78.1 - location plan with site flow.

Functional organization

Plan basement
scale 1:500



Basement under mosque

0.1	Parking basement	505.0 m2
0.2	Basement entrance	45.0 m2
0.3	Corridor	25.0 m2
0.4	Ablution room	23.0 m2
0.5	Storage ablution	11.0 m2
0.6	WC 1	34.0 m2
0.7	WC 2	43.0 m2

Basement under culture

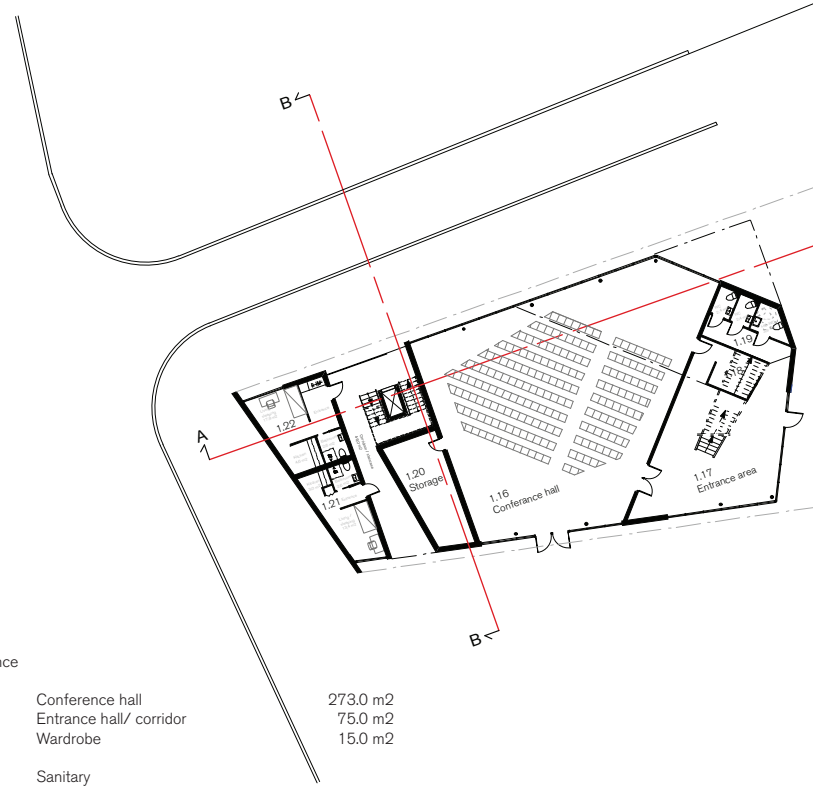
0.8	Basement storage	75.0 m2
0.9	Technical room	32.0 m2
0.10	Laundry	23.0 m2
0.11	Storage room	25.0 m2

Functional organization

The functions in the building complex are organized based on two principles ill. 76.1. The quiet and semi-public functions are placed towards the north, with the possibility of bringing in indirect light from the north. Public functions are placed towards the south, providing a view to toward the square.

The mosque space is tilted facing the direction of Mecca with the same principle for organization.

ill. 80.1 - Overview picture the Island of Tromsø



Room description ground floor

Mosque

1.0	Prayer hall male	370.0 m2
1.1	Corridor	50.0 m2
1.2	Entrance hall	148.0 m2
1.3	Ablution	38.0 m2
1.4.	Sanitary	
1.4.1	WC 1	2.7 m2
1.4.2	WC 2	3.0 m2
1.4.3	HC WC	4.7 m2
1.4.4	Cleaning room	4.0 m2
1.5	Staircase basement	12.0 m2
1.6	Wardrobe imam	6.0 m2

Culture centre

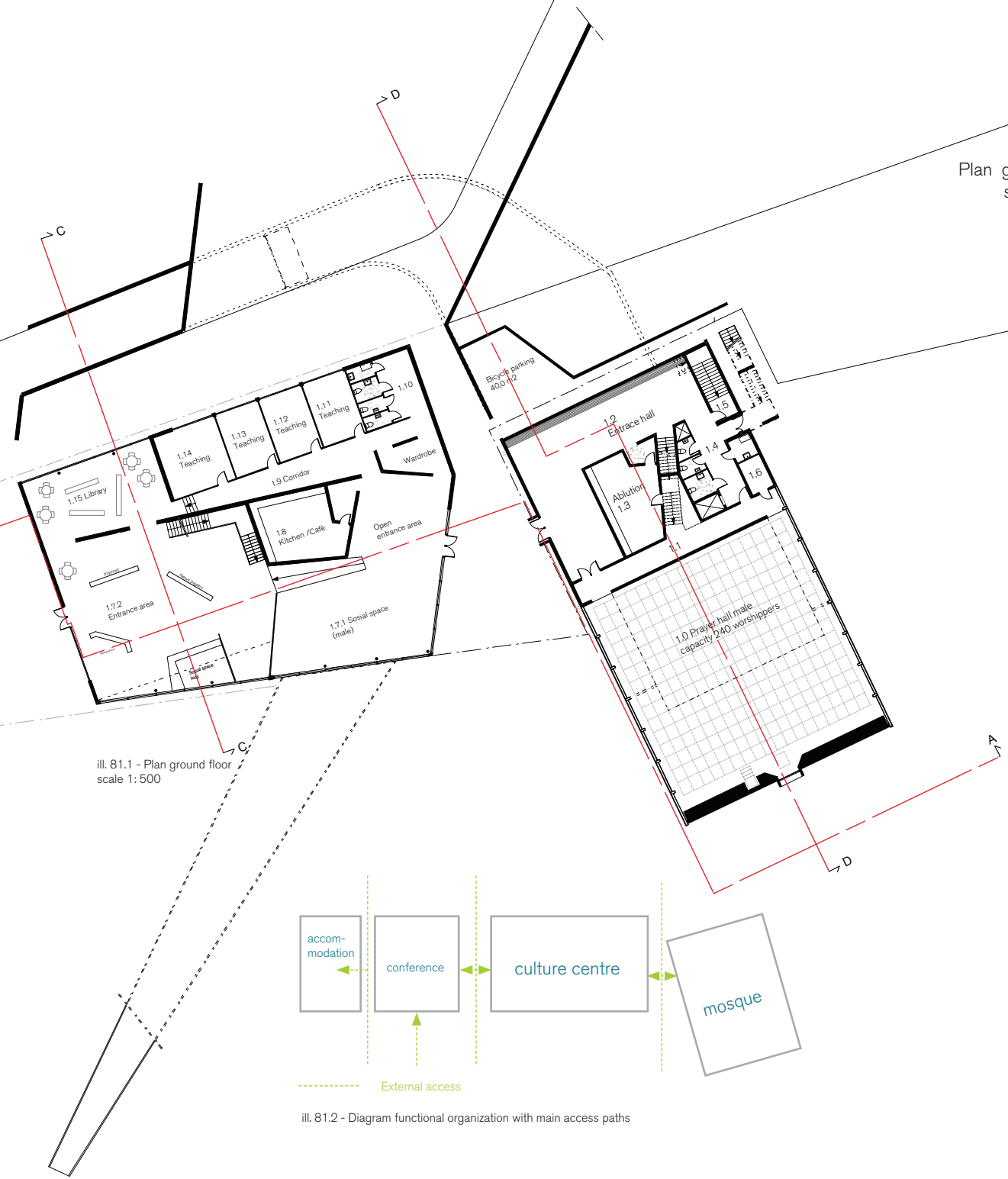
1.7.1	Common space 1 / entrance	185.0 m2
1.7.2	Common space 2 / entrance	250.0 m2
1.8	Kitchen	40.0 m2
1.9	Corridor/wardrobe	67.0 m2
1.10	Sanitary	
1.10.1	WC 1	2.7 m2
1.10.2	WC 2	2.9 m2
1.10.3	HC WC	4.6 m2
1.10.4	Cleaning room	3.7 m2
1.11	Lecture room 1	22.0 m2
1.12	Lecture room 2	22.0 m2
1.13	Lecture room 3	22.0 m2
1.14	Lecture room 4	32.0 m2
1.15	Library	75.0 m2

Conferance

1.16	Conference hall	273.0 m2
1.17	Entrance hall/ corridor	75.0 m2
1.18	Wardrobe	15.0 m2
1.19	Sanitary	
1.19.1	WC 1	2.6 m2
1.19.2	WC 2	2.6 m2
1.19.3	HC WC	4.0 m2
1.20	Storage	23.0 m2

Accommodation

1.21	Accommodation unit 1	20.0 m2
1.22	Accommodation unit 2	26.0 m2
1.23	Entrance area	46.0 m2



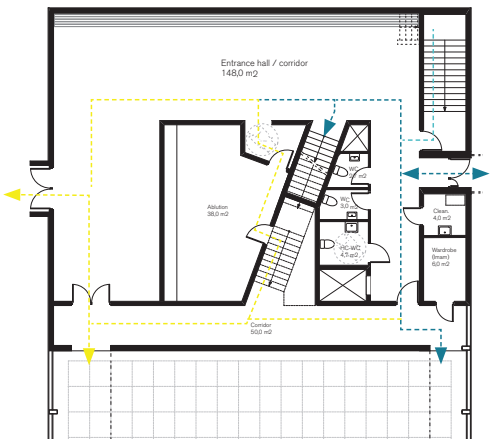
ill. 81.1 - Plan ground floor
scale 1: 500

ill. 81.2 - Diagram functional organization with main access paths

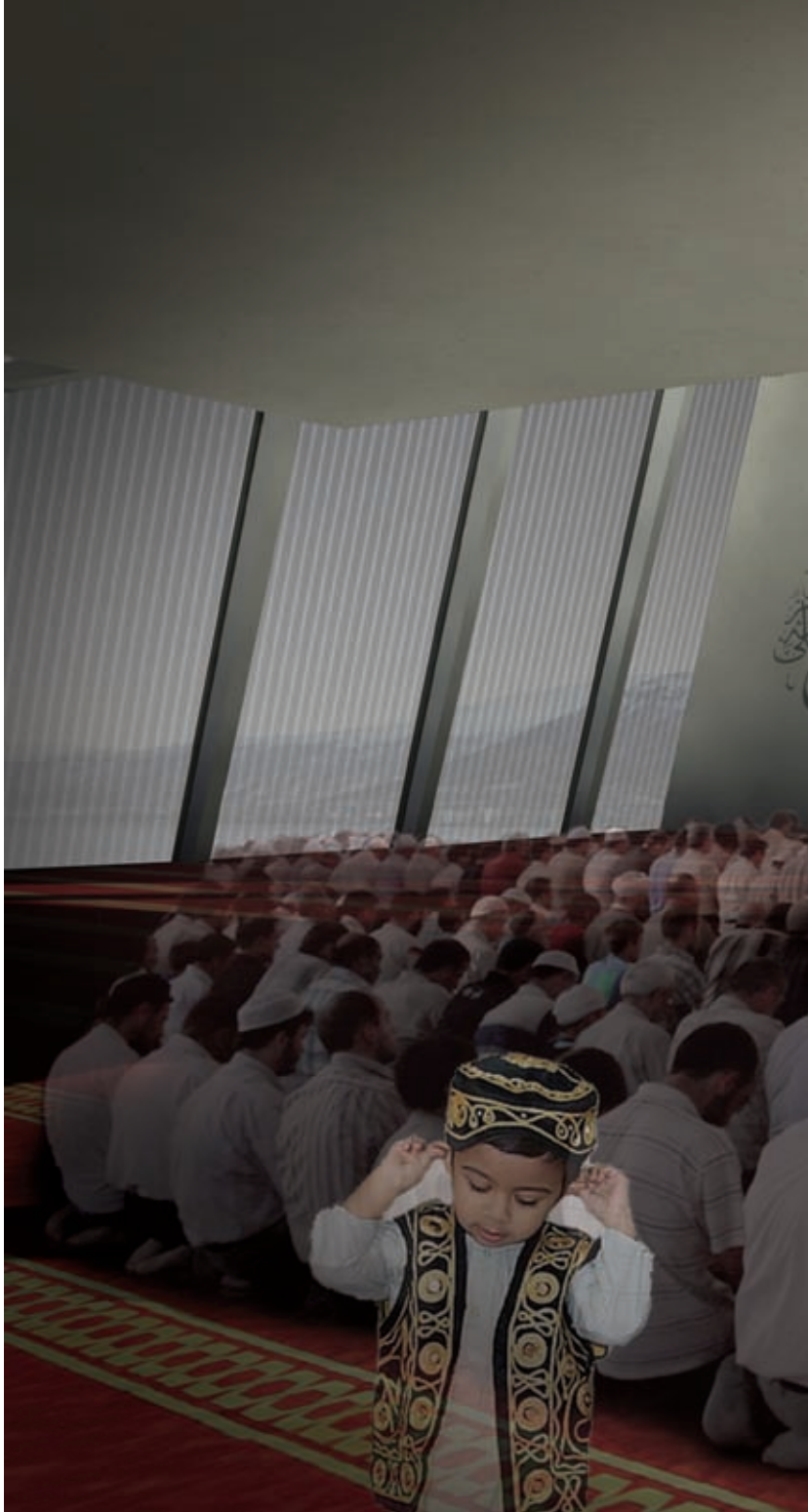
Expression sacred space males

The segregated prayer hall for males is placed on the ground floor with the public square through an entrance area. The flow is leading the user to the prayer hall in an organized way, marking the transition from the profane, with a dark and closed spatial experience, to the sacred. The soft carpet on the floor is marking the boundary between the secular and sacred space, with the mihrab and the quibla wall ornamentation as focal points indicating the clear direction to Mecca. While entering the sacred space, the prayer hall, the character of the space changes to a voluminous space creating a divine atmosphere. The external semi-transparent walls with the load bearing structure stand in contrast to the heavy quibla wall, dragging in soft and calm indirect light, and creating a play of light and shadow on the carpet floor.

The interior space is designed with a notion of simplicity reflecting Nordic architecture but still respecting the Islamic traditions by incorporating simple calligraphy, a mihrab, and a minbar as a part of the architectural design composition.



ill. 82.1 - Flow diagram mosque ground floor



ill. 83.1 - mosque space ground floor, view from south

Room description 1st floor

Mosque

2.1	Women's gallery (prayer space female)	176.0 m2
2.2	Corridor	50.0 m2
2.3	Entrance hall	157.0 m2
2.4	Ablution	40.0 m2
2.5	Sanitary	
1.5.1	WC 1	2.7 m2
1.5.2	WC 2	3.0 m2
1.5.3	HC WC	4.7 m2

Culture centre

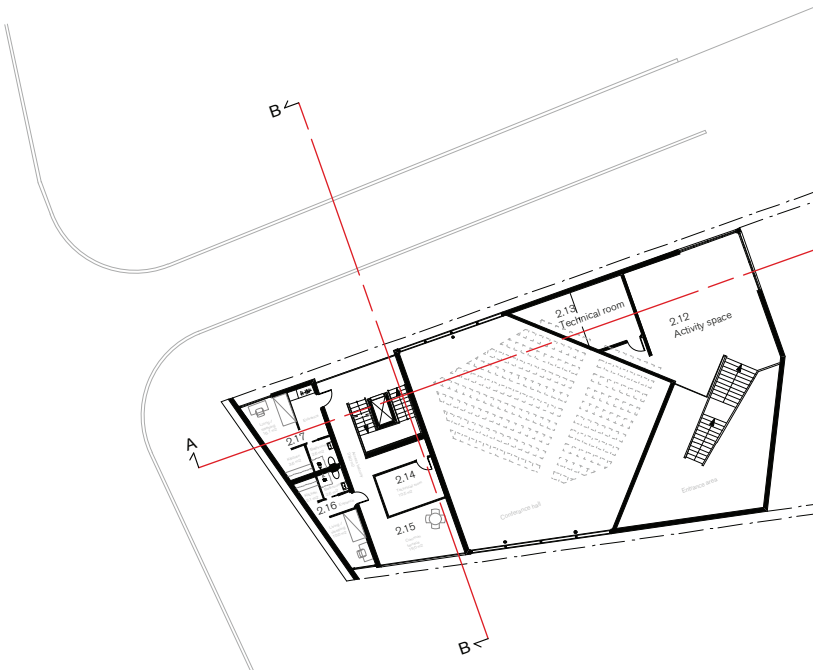
2.6	Common space (sosial space female)	152.0 m2
2.7	Corridor	15.0 m2
2.8	Kitchen	14.0 m2
2.9	Office adm.	17.0 m2
2.10	Lecture room 1	15.0 m2
2.11	Lecture room 2	15.0 m2

Conference

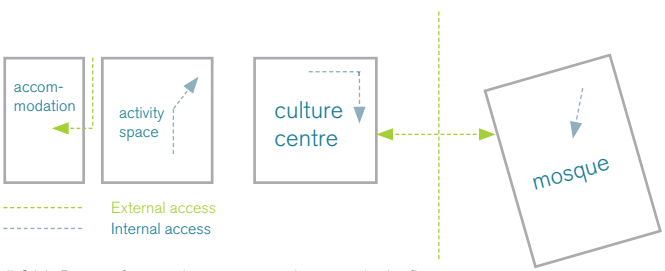
2.12	Activity space	70.0 m2
2.13	Technical room	23.0 m2

Accommodation

2.14	Technical room	10.5 m2
2.15	Common terrace	19.0 m2
2.16	Accommodation unit 3	16.0 m2
2.17	Accommodation unit 4	23.0 m2

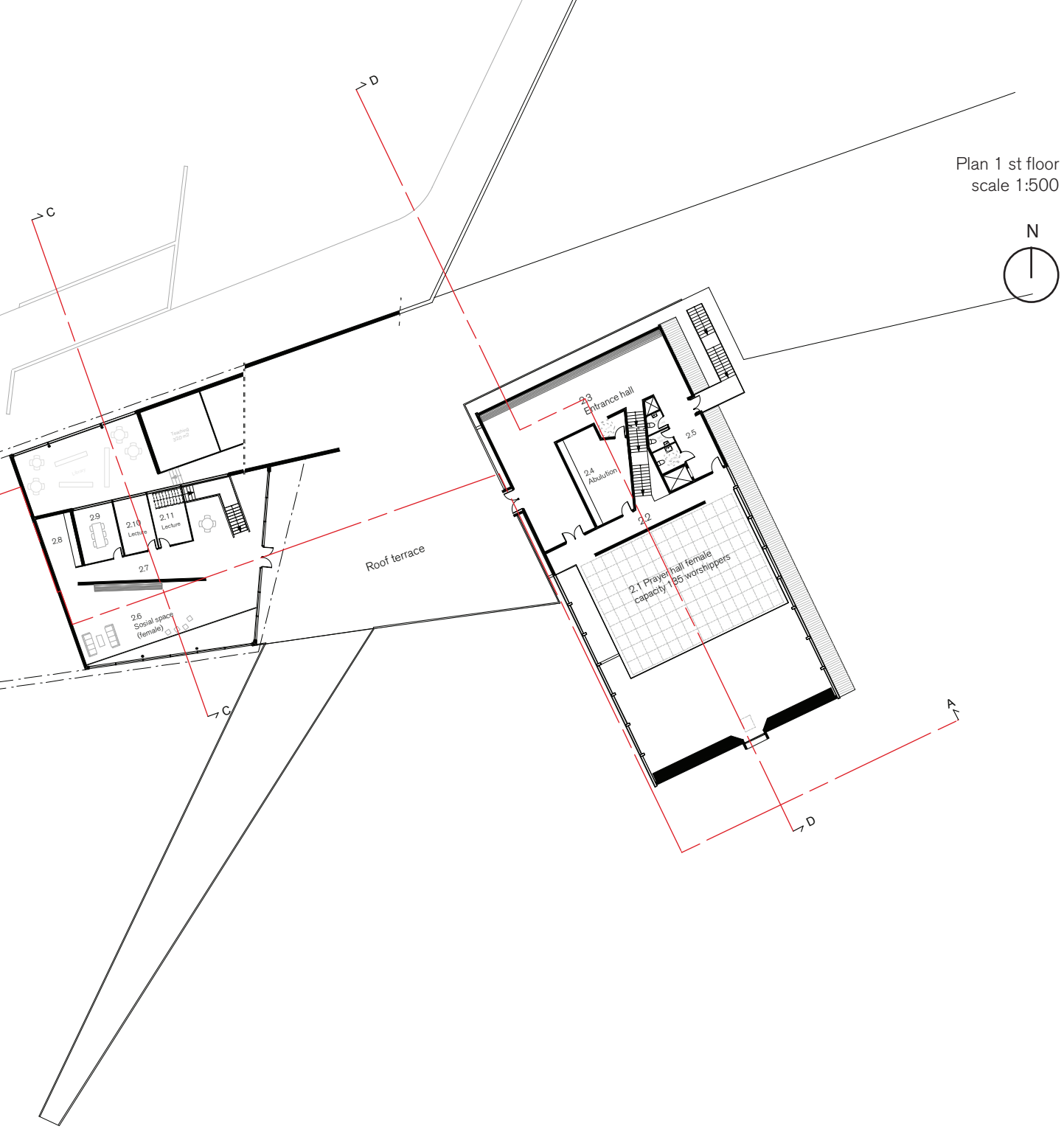


ill. 84.2 - Plan ground 1st floor - scale 1:500



ill. 84.1- Diagram functional organization with main paths 1st floor

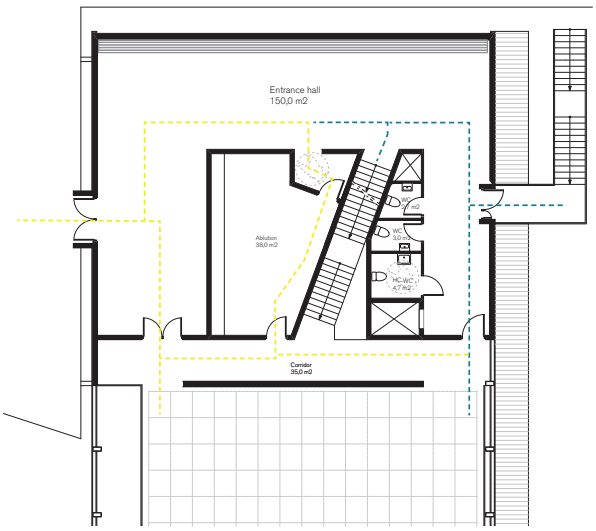
Plan 1 st floor
scale 1:500



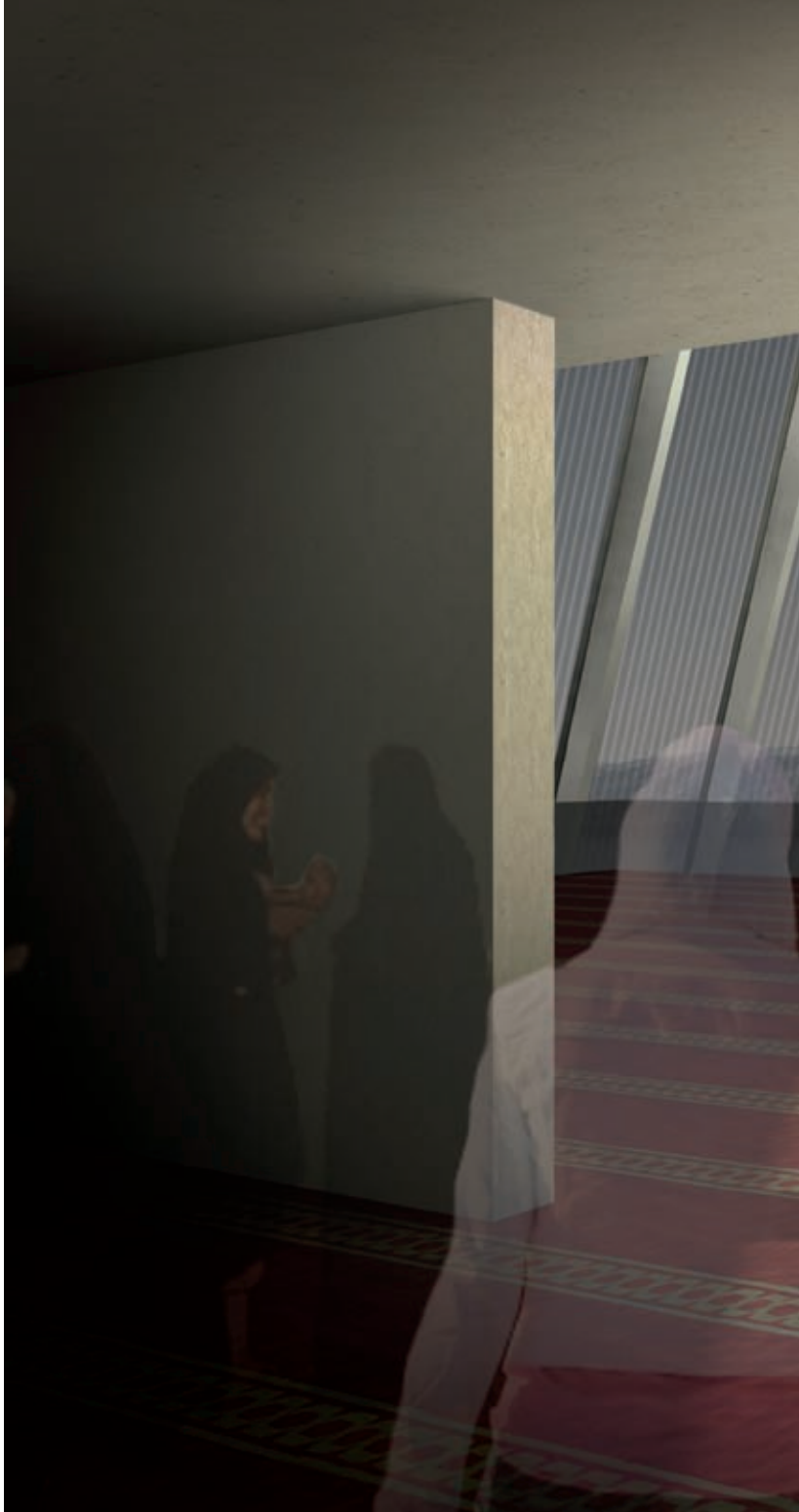
Expression sacred space females

The segregated prayer space for females is placed on a floating gallery in the mosque space with a main access from the roof terrace on the first floor. The praying space for women facilitates the same spatial, architectural and divine atmospheric qualities as the prayer hall for males. The notion with this organization is to provide a feeling of unity, and being part of the same society for both user groups. The organization is respecting the Islamic and theological demands for segregation in a creative way and at the same time dealing with the issue of discrimination.

The gallery in the mosque space gains the character of a floating element in the open voluminous space giving a feeling of something divine that holds up the gallery.



ill. 86.1 - Flow diagram mosque 1st floor



ill. 87.1 - women's prayer space, view from south

Room description 2nd floor

Mosque

3.0	Gallery visitors	130.0 m2
3.2	Meeting / office room	38.0 m2
3.2	Sanitary	
3.2.1	HC WC	4,6 m2
3.2.2	WC with shower	6.0 m2

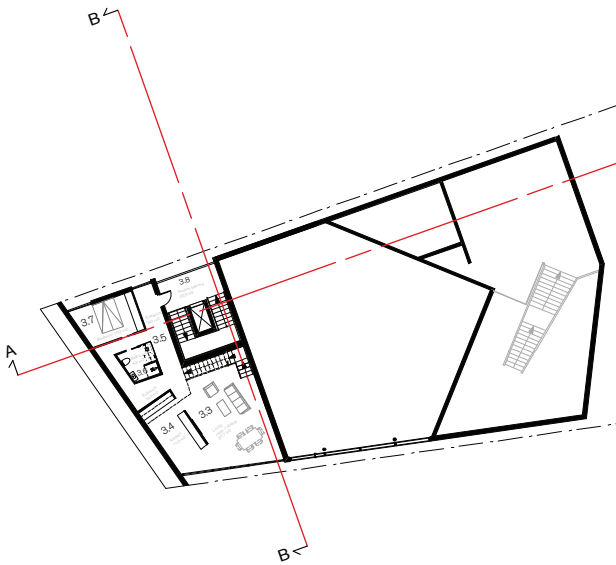
Accommodation for imam

3.3	Living / dining room	37.7 m2
3.4	Kitchen	11.0 m2
3.5	Entrance / hall	18.0 m2
3.6	Bathroom with laundry	4.3 m2
3.7	Master bedroom	10.2 m2
3.8	Access balcony	22.5 m2

Room description 3rd floor

Accommodation for imam

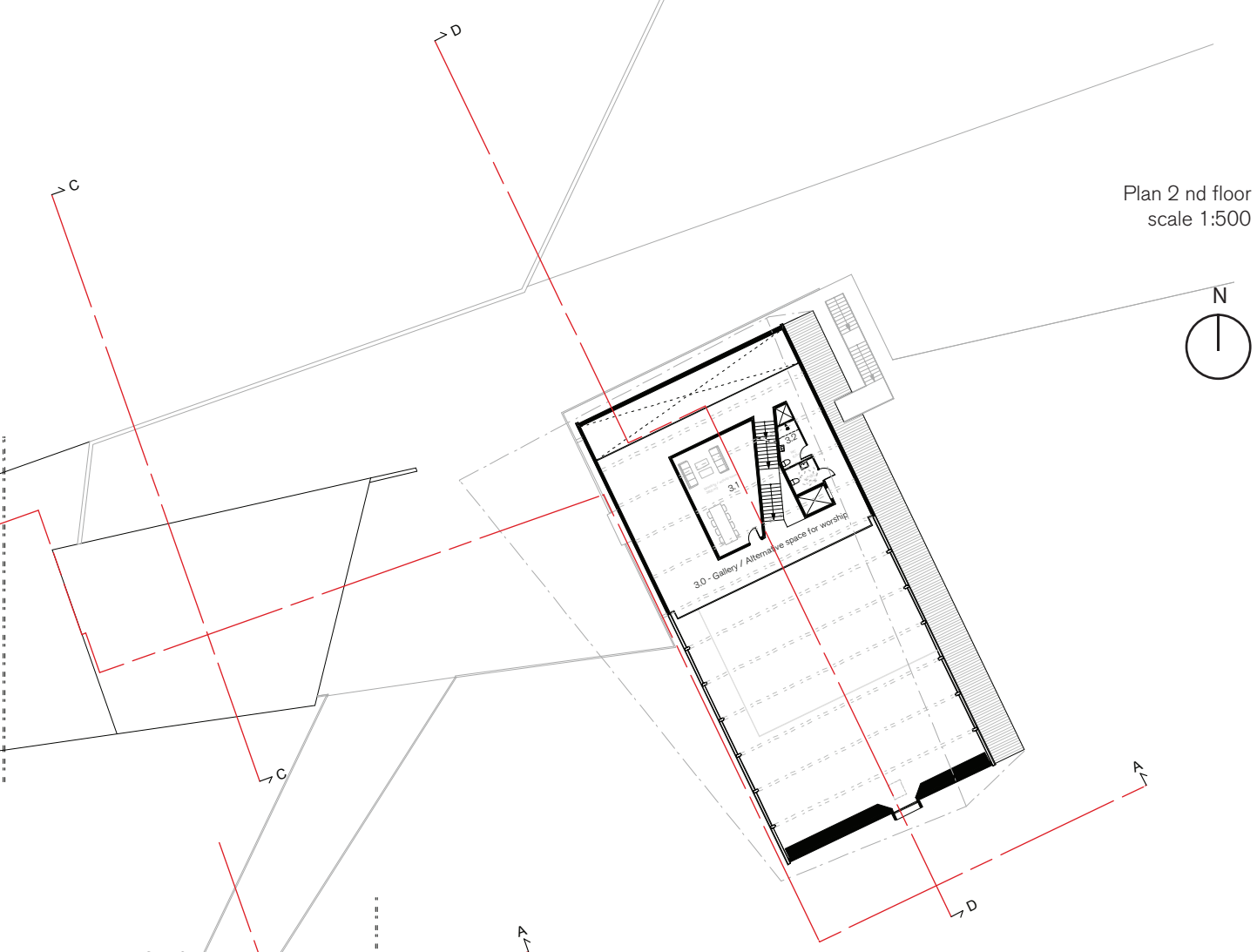
4.0	Balcony (outdoor space)	22.0 m2
4.1	Living / Corridor	12.7 m2
4.2	WC	2.9 m2
4.3	Bedroom 1	7.5 m2
4.4	Bedroom 2	8.2 m2



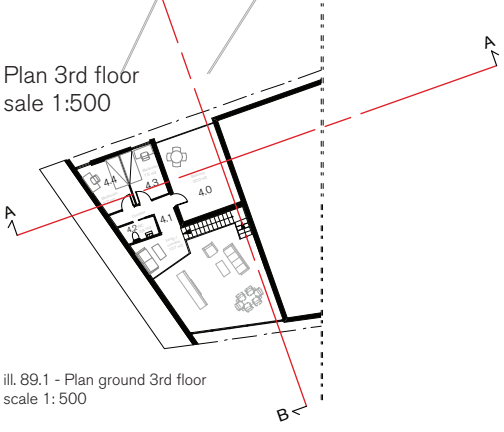
ill. 88.2 - Plan ground 2nd floor - scale 1:500

ill. 88.1- Diagram functional organization main paths 2nd floor

Plan 2 nd floor
scale 1:500



Plan 3rd floor
sale 1:500



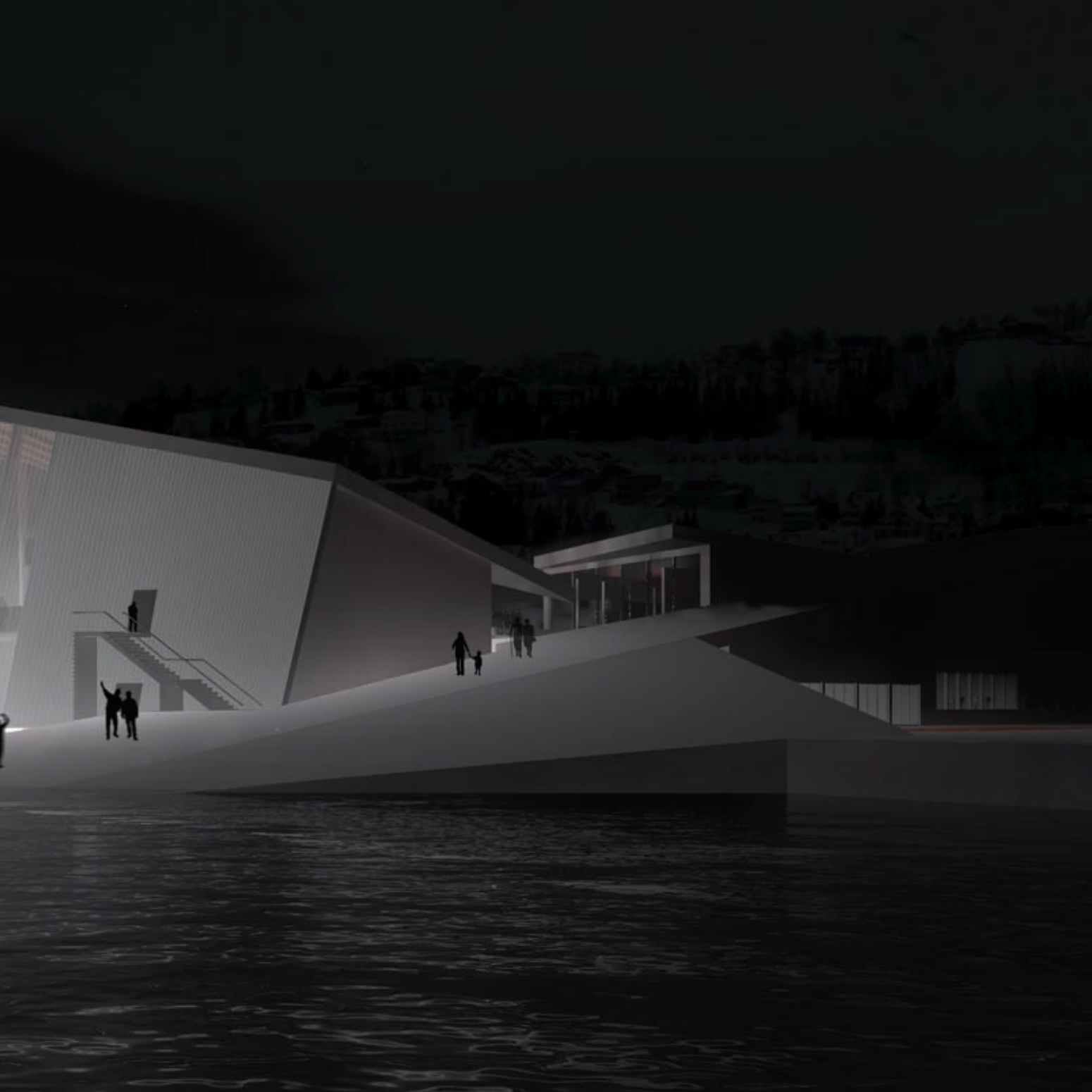
ill. 89.1 - Plan ground 3rd floor
scale 1: 500

ill. 89.2- Diagram functional organization main paths 3rd floor

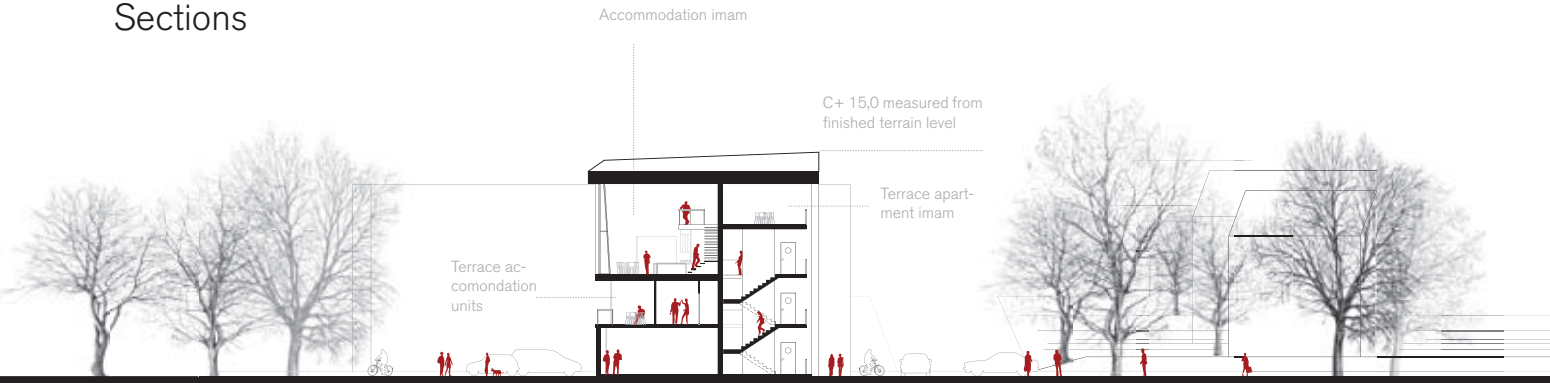
Exterior expression by night.

Tromsø, because of its location, experiences dark periods with no sunlight during the winter. The planned project with its design and material use is aiming to bring an architectural quality to the site. The building is merging into the context with the shape but is standing marking its own character with the metaphor of god/Allah's house lighting up the surroundings.

ill. 90.1 - Perspective view by night from north east, showing the mosque volume lighting up the surrounding.



Sections

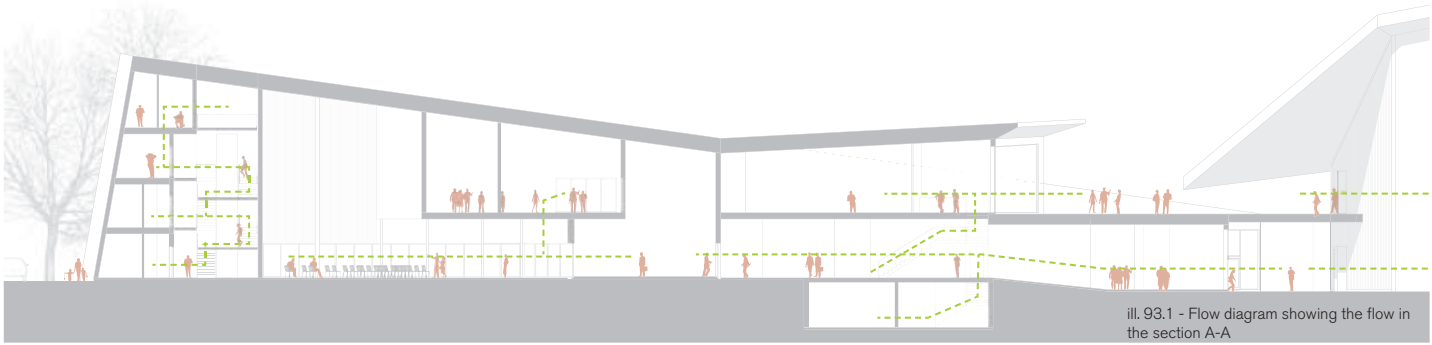


ill. 92.1 - Section B-B trough the accommodation part of the building complex

Section B-B, scale 1:500

Section A-A, scale 1:500

ill. 92.1 - Longitudinal section A-A showing the composi-tion trough the accommodation, conference and the cultre centre

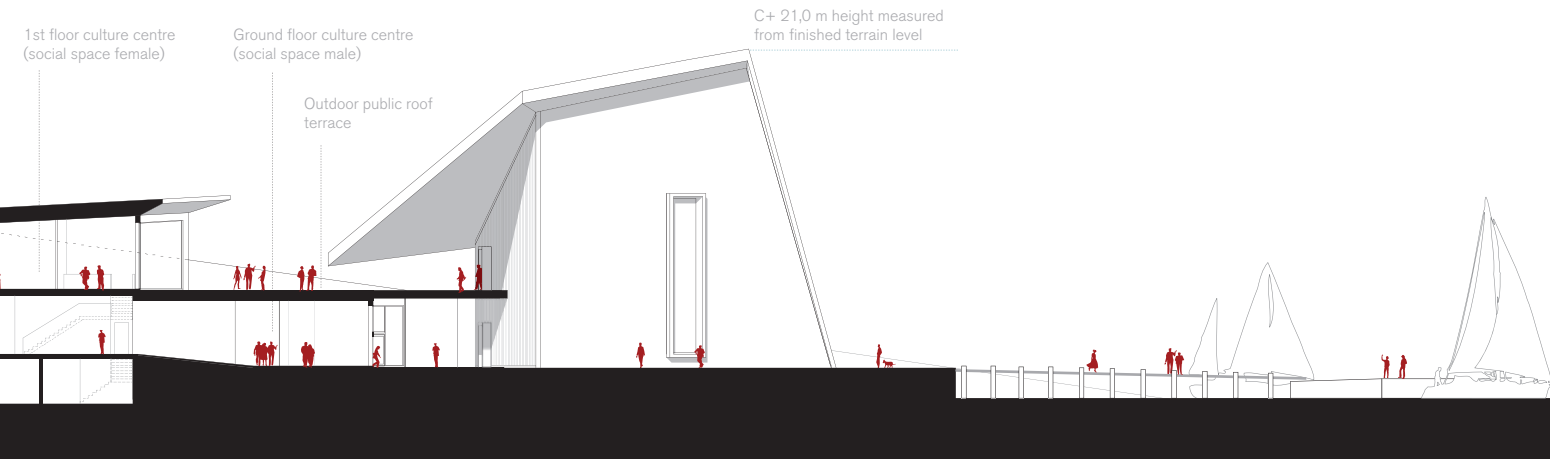


ill. 93.1 - Flow diagram showing the flow in the section A-A

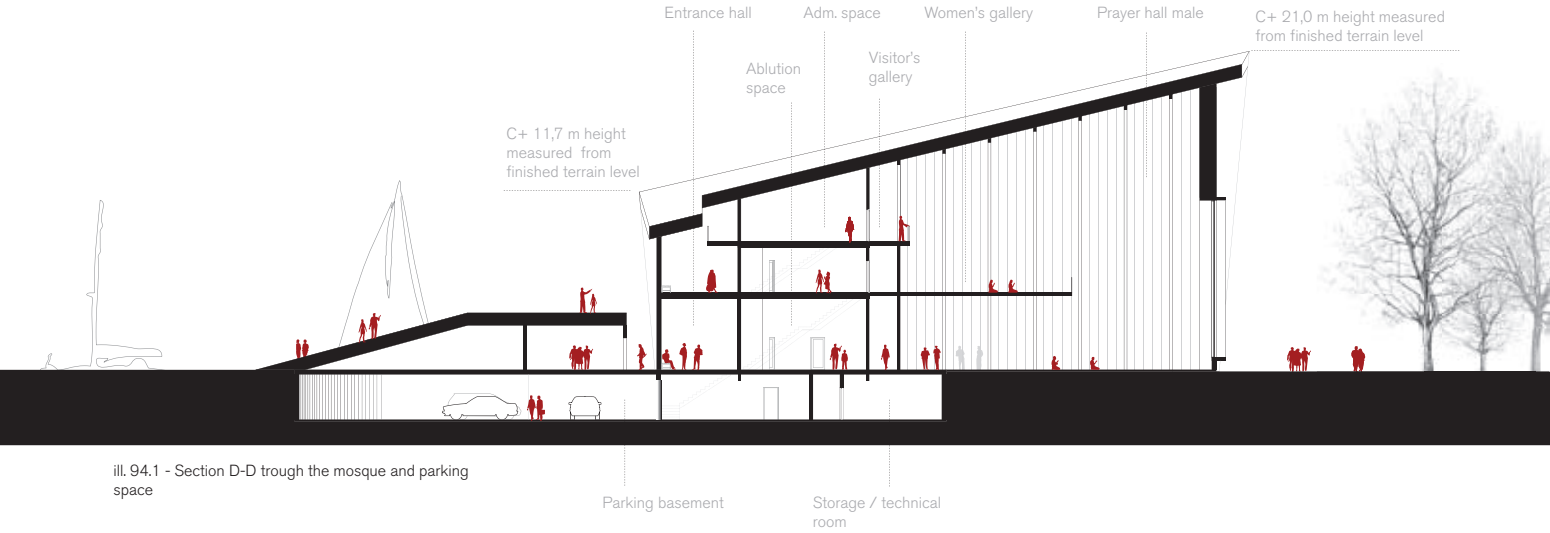
Flow diagram section A-A

ill. 93.1 - Flow diagram showing the flow in the section B-B

Flow diagram section B-B



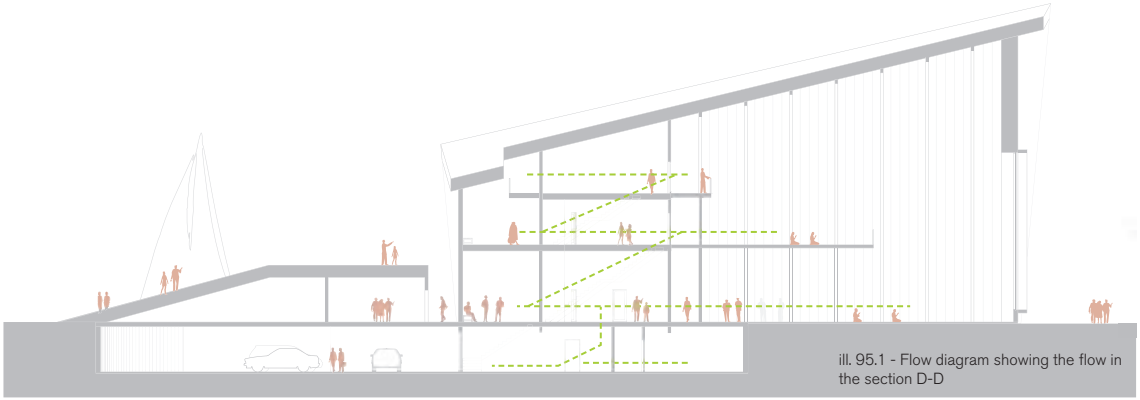
Section D-D, scale 1:500



ill. 94.1 - Section D-D trough the mosque and parking space

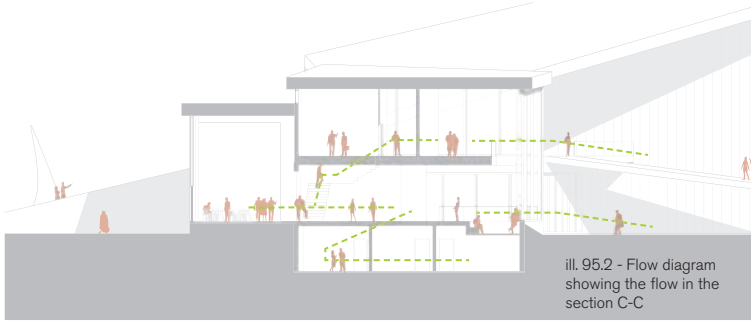
Section C-C, scale 1:500

ill. 94.2 - Section C-C trough the culture with library space



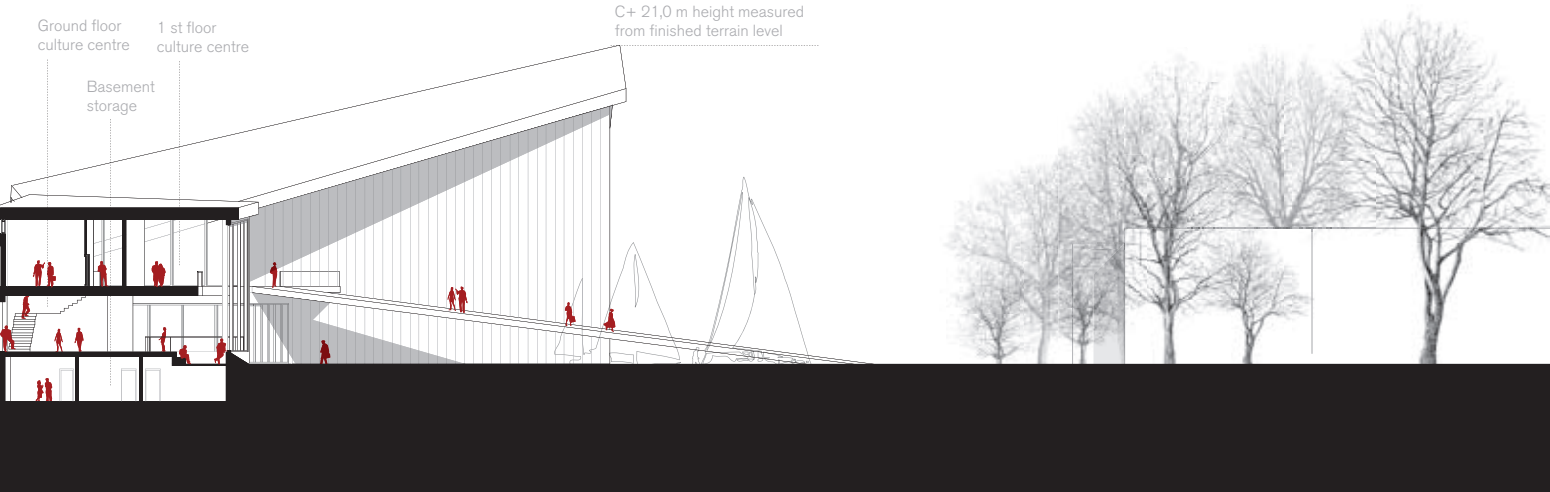
ill. 95.1 - Flow diagram showing the flow in the section D-D

Flow diagram section D-D

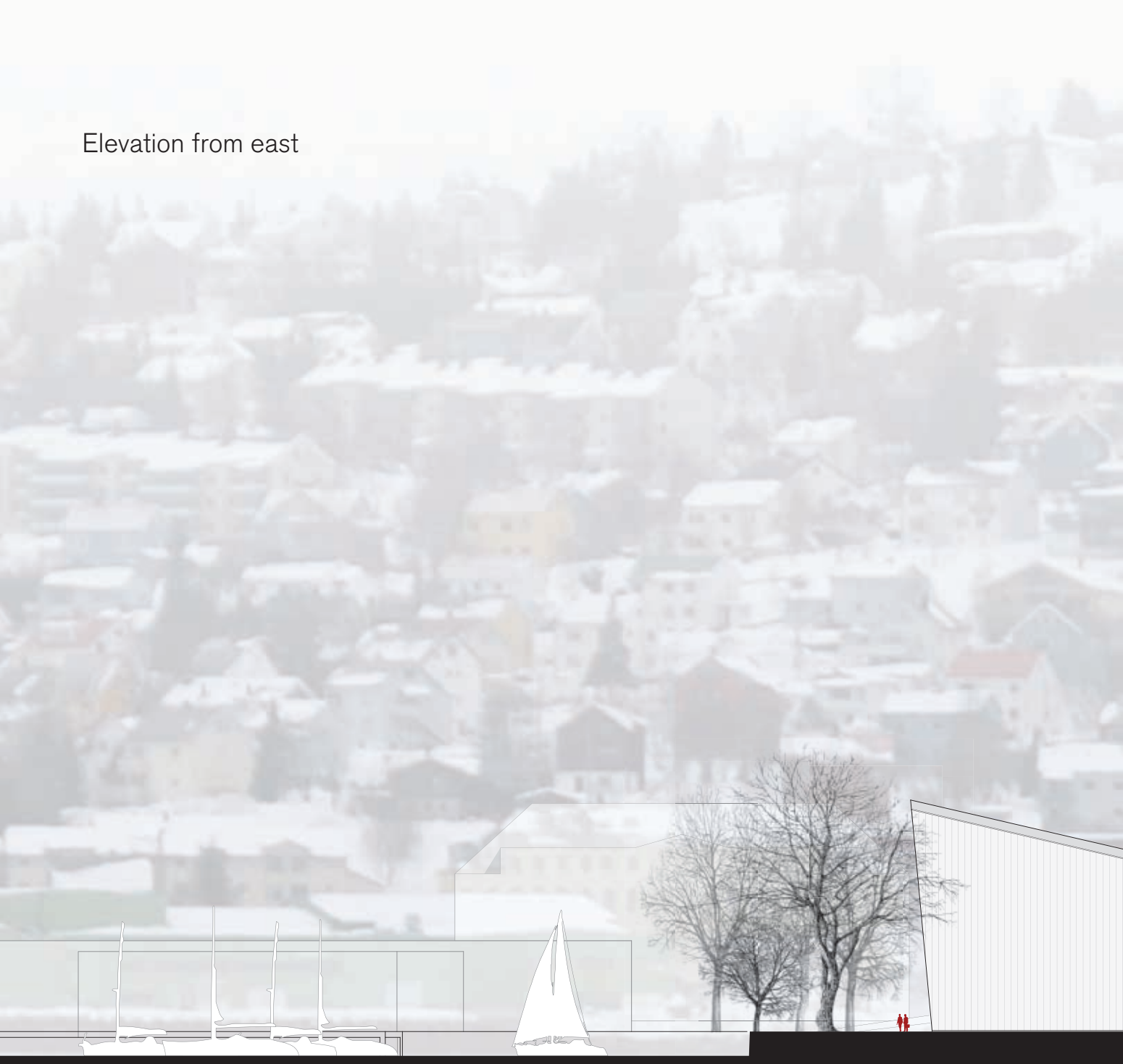


ill. 95.2 - Flow diagram showing the flow in the section C-C

Flow diagram section C-C



Elevation from east



ill. 96.1 - Elevation from east

Elevation from west

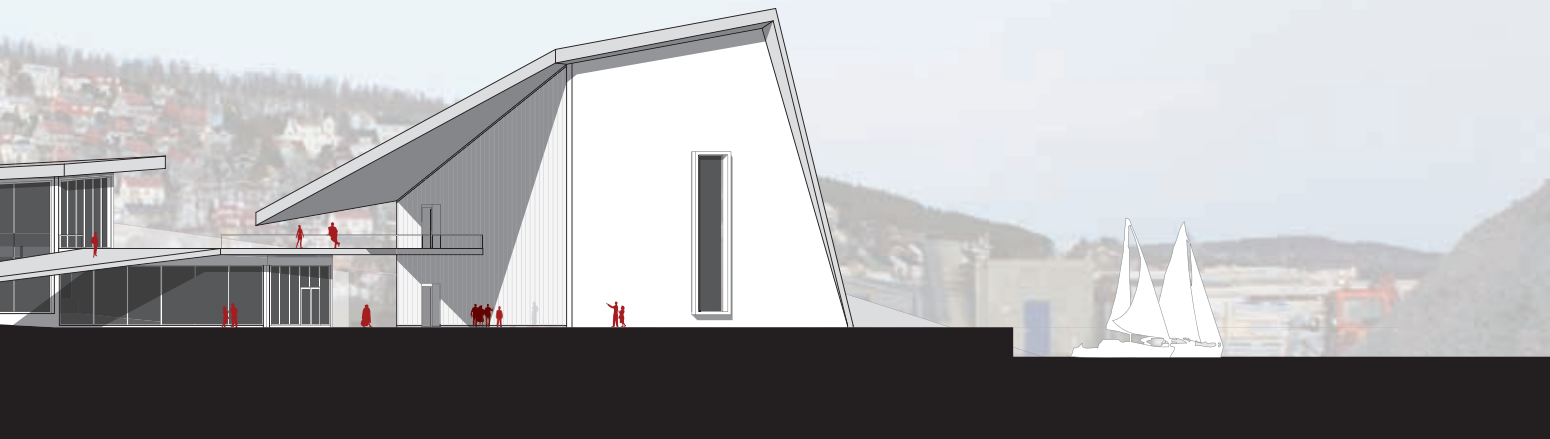
ill. 98.1 - Elevation from west

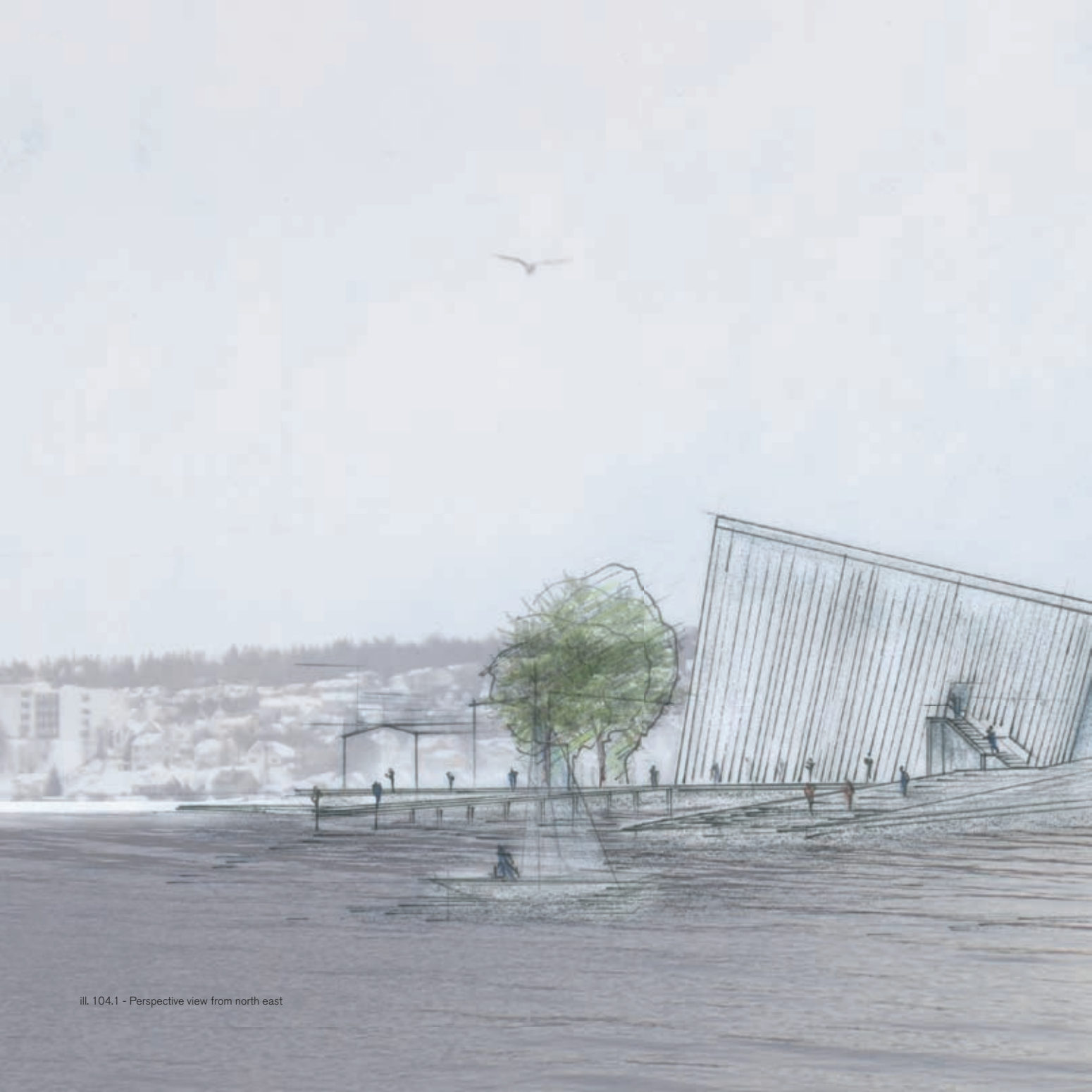
Elevation from north

ill. 100.1 - Elevation from North

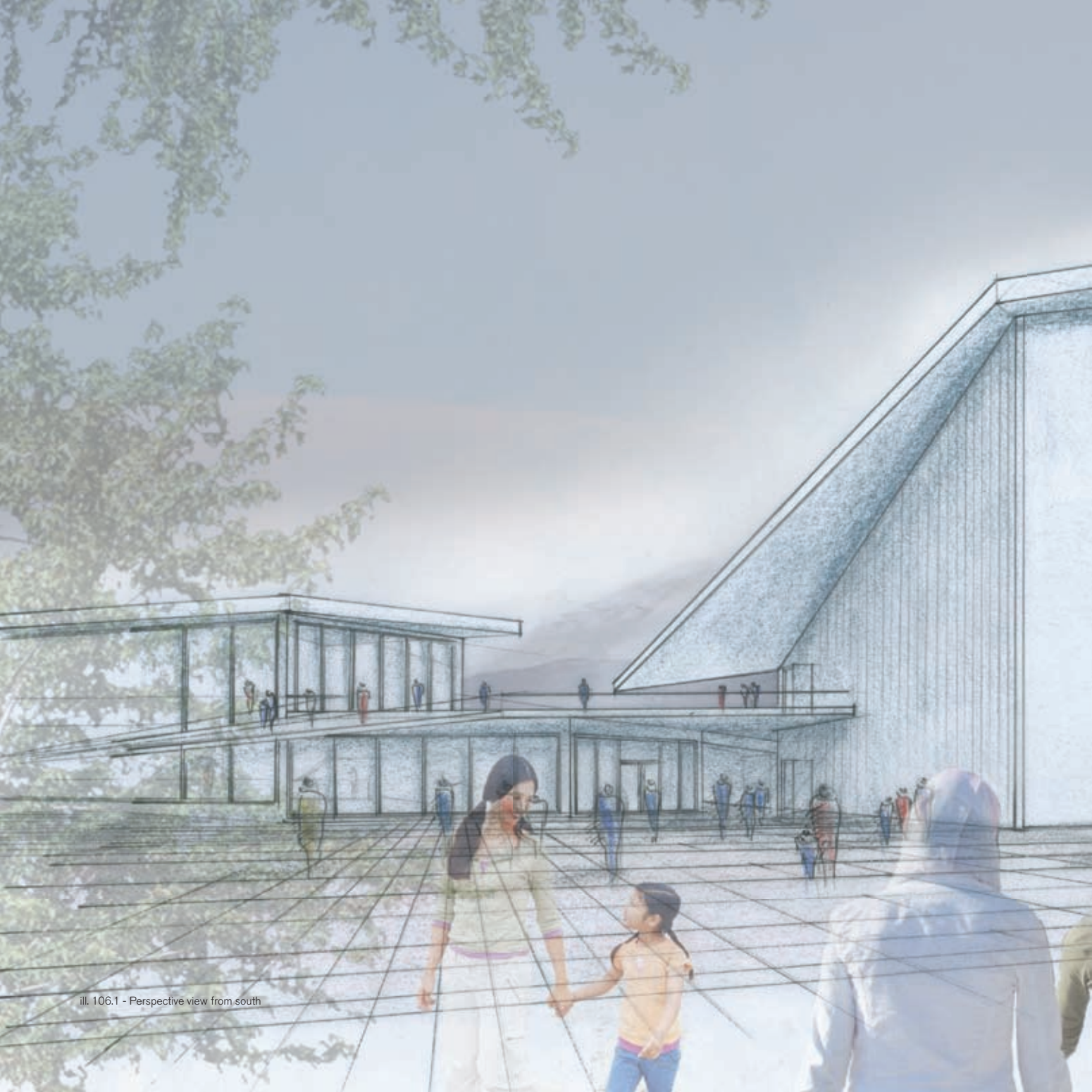
Elevation from south

ill. 102.1 - Elevation from South





ill. 104.1 - Perspective view from north east



ill. 106.1 - Perspective view from south

Reflection

Reflection

The following chapter will present thoughts and discussion on the conceptual idea for the mosque and community center designed in the Nordic and north Norwegian context, reflecting the motivation, the analysis, the design criteria, and the vision formed for the conceptualization.

The first question to be raised is: what is a Mosque and community centre designed in a Nordic context?

From the analysis and research made of mosques and Islam, the overall conclusion on the topic is that a Mosque is simply a place where Muslims can practice their religion. In fact, there is no demand for the design or visual symbolic effects for this place. The only demand is that the direction of the prayer should be facing towards the holy town Mecca. One can simply say that the place where a person puts down his or her prayer rug becomes his or her Mosque. All other things known or seen from mosque design are culturally related and not theological demands. With the basis in this conclusion, the conceptualization of this project could be challenged to find new ways of designing Mosques and Islamic centres to fit into their specific context.
A Mosque and community centre designed in a Nordic context has, as one of the main concerns in the conceptualization, worked with finding a way to design a contemporary building complex without the use of visual Islamic symbol effects and to contextually fit this complex into the context of Tromsø.
The project is designed with an architecture inspired by the strong arctic natural landscape of Tromsø, while fulfilling the sacred aim of a mosque and the social function of a culture centre. The complex is thought to stand out as an architectural building typology, giving the occupied site area back to the town in terms of an urban quality, which gives the site a character of openness. The open roof on top of the culture centre works as a terrace/ramp rising up from the water front, and, together with the public square, is contributing to provide the intended urban quality. The sacred function is architecturally expressed through the design of the large mosque volume standing out, creating a signal of something special. The perception of the sacred mosque space is creating a clear difference between sacred and profane space through the scale and materiality.

Architectural experience

The project has been working with simplicity as motivation and rule for the design and expression. The mosque space is expressing the sacred and spatial quality through the voluminous space carried up by the steel structure. The eastern and western walls of polycarbonate create a soft environment with natural light in the mosque space. The load bearing steel frames create a play of shadow on the soft carpet in the mosque, giving a sense of time. The heavy quibla wall is representing a heavy contrast to the light polycarbonate walls marking the sacred direction in the mosque. The technical aspects have been incorporated in the design where load bearing structure, the specially designed mihrab for acoustic purposes, and the polycarbonate bringing in the light, is creating the composition for a whole, unified composition expressing architectural, spiritual and spatial qualities to the space.

A place for gathering

Part of the vision for this project is >> to design a mosque with a community centre that could function as a gathering place for Muslims and non-Muslim citizens of Tromsø.<<
The functions and the architectural composition of this complex are answering this part of the vision. The spaces are designed with a notion of openness both physically and mentally to narrow down the cultural gap between the Muslim and non-Muslim citizens of the Tromsø. The interior spaces as well as the exterior spaces are designed as

open spaces with free public flow based on architectural, spatial and spiritual qualities, in order to generate the intended interaction across the cultural boundaries.

Segregation

One of many challenges in this project has been to design this complex with the important social issue of gender segregation. The issue is both culturally and theologically related. Even if this project is focusing on a design reflecting future generations, it is still important to respect the present user group. This group is still strongly tied to their cultural traditions, which call for a flexible design of the interior spaces to deal with the task of segregation without being segregated.
The theological demand has been fully respected in the sacred mosque space where the functions are architecturally solved by separating the prayer spaces in two levels with male users on the ground floor and female users on a floating gallery in the same space. The goal has been to provide the same spatial and spiritual quality to both user groups. The solution is creatively segregating the worshippers but also creating connections between them by giving the feeling of being in a larger congregation. The importance of providing equal qualities has been one of the design criteria for the mosque. It is important that architecture is also dealing with social aspects like discrimination. Solving the functions through the architecture is avoiding the unnecessary focus on discrimination.
The spaces in the cultural area are designed as open public spaces with open public flow in two levels where the possibility of gender segregation could be made in the proposed levels if wanted. The segregation issue will over time change and maybe not be an issue in the future.

Personal motivation

The personal motivation for this project is based on being a second generation Muslim in Norway, and the ongoing discussion about the negative focus on the mosque topic which has been one of the reasons behind working with this project. Being able to change the focus from something negative tied to mosques has resulted in the design of this project. The personal motivation is also tied to being a father and what kind of future we want to give to our future generations. Creating a society based on tolerance and dialogue is the only solution for the problem mentioned above.

Future mosque and Islamic centres.

The proposal presented is thought as a conceptual idea of the design and functional organization of a mosque with a cultural centre. The design is reflecting the present context and building tradition, and in this way is challenging the traditional mosque typologies by moving out from the traditional mosque frame. The research made for this project is proving the fact of allowing these traditional typologies to be challenged since they are culturally related and not theologically required. Designing a framework for future mosque and Islamic centres where future generations can practice their religion, gather across the cultural boundaries, and create a society based on tolerance and dialogue, where the architecture is contributing to solve the aesthetic of a building and socio-cultural aspects in the society has been a significant motivation.

Reflecting back on the personal motivation, the design criteria, and the parameters put up for the conceptualization, it could be concluded that the proposed design is answering the vision formed for this project. The goal for the conceptual design of this project is therefore seen as achieved. The design of this project will hopefully contribute to a discussion of the future mosque and Islamic centers designed in Norway.

Literature
Illustrations
Appendix

Litterateur list

books

Teknisk Ståbi, 18 udgave, 5. opplag 2004, Nyt Teknisk Forlag, Copenhagen, Denmark, ISBN 87-570-2134-6

web

[FSTC] www.fstc.co.uk (26.04.2010)
[Norwegian standard] http://www.snofangerkroken.no/sider/snolastm.html (28.04.2010)
[gyproc] www.gyproc.no (26.04.2010)
[contiga] www.contiga.no (23.04.2010 - 23.05.2010)

illustration list

Appendix 1

Table ill.xx shows the result of a calculation made in the spread sheet to compare with the results from Ecotect, presented in the chapter for acoustic. The results presented on this page are based on the same material data used for the analysis presented in iteration 2.

The result from the spreadsheet gives a reverberation time of 1.6 seconds, which is very close to the result from Ecotect.

The conclusion on this initial trial is that Ecotect gives almost the same result as a calculation made manually, and could be used for initial acoustic analysis.

Reveberation time

Equation for reveberation time	T=(0,16*V)/((Σα*s)+(Σn*A)+(4*m*V))
Equivalent absorption area where α = absorption coefficient and S = surface area	(Σα*s)
Absorption from persons where n = number of persons and A = absorption coefficient for person	(Σn*A)
Absorption in air where m = air absorption and V = volume of room	(4*m*V))

Reveberation time

Equivalent absorption area	**Material**	**Areal** S(m^2)	**125 Hz** α	**125 Hz** Sα	**250 Hz** α	**250 Hz** Sα	**500Hz** α	**500Hz** Sα	**1000Hz** α	**1000Hz** Sα	**2000Hz** α	**2000Hz** Sα	**4000 Hz** α	**4000 Hz** Sα
Floor	concrete slab carpeted	593	0,02	11,86	0,06	35,58	0,15	88,95	0,4	237,2	0,6	355,8	0,65	385,45
Ceiling	Acoustic ceiling (gyproc ringtone BIG)	317	0,57	180,69	0,73	231,41	0,67	212,39	0,52	164,84	0,3	95,1	0,18	57,06
		0	0	0	0	0	0	0	0	0	0	0	0	0
Window area (walls east and west)	Translusent polycarbonate	666	0,14	93,24	0,09	59,94	0,02	13,32	0	0	0	0	0	0
Mihrab	Concrete render	88	0,1	8,8	0,07	6,16	0,02	1,76	0,02	1,76	0,02	1,76	0,03	2,64
Rear wall	Acoustic wall (gyproc ringtone BIG)	214	0,57	121,98	0,73	156,22	0,67	143,38	0,52	111,28	0,3	64,2	0,18	38,52
Quibla wall	Concrete render	218	0,1	21,8	0,07	15,26	0,02	4,36	0,02	4,36	0,02	4,36	0,03	6,54
Absorption from persons		**N**	A	**n*A**	A	**n*A**	A	**n*A**	A	**n*A**	A	**n*A**	A	**n*A**
Church bench with 50 mm fabric on seat and back		100	0,1	10	0,25	25	0,42	42	0,53	53	0,55	55	0,57	57

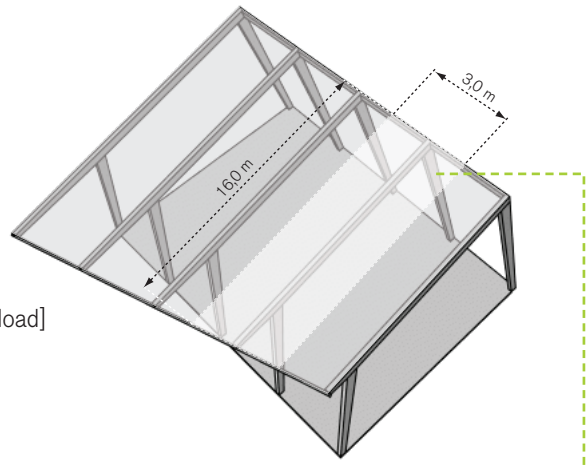
Absorption in air

		Volumen [m3]	**125 Hz** 4*m*v	**250 Hz** 4*m*v	**500Hz** 4*m*v	**1000Hz** 4*m*v	**2000Hz** 4*m*v	**4000 Hz** 4*m*v
		5545,26			11,091	28,8354	2,52468	255,0820
Total absorption			448,4	529,6	517,3	601,3	578,7	802,3
Reverberation time	T=(0,16*V)/((Σα*s)+(Σn*A)+(4*m*V))		2,0	1,7	1,7	1,5	1,5	1,1
Average reverbaration time								1,6

Appendix 2

Structural calculations

In the following chapter, the calculation of a column is made to determine the size of the load bearing visible structure in the mosque space. The calculation is made according to demands for characteristic loads according to Norwegian standards. This calculation is seen as a rough estimation to get an idea of the column size in the mosque space. The size of these columns will have a significant effect on the aesthetic of the planned space and is therefore seen as an important parameter to consider.



ill. 119.1. - Diagram showing the load area for the calculation

Loads

Snow load Tromsø: 6,0 kN/m² [Norwegian Standard for characteristic snow load]

Safety factor: 1,5

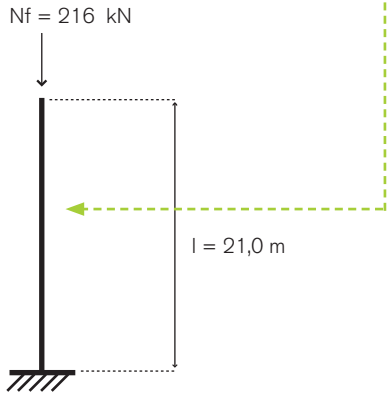
Total load:: 6,0 x 1,5 = **9,0 kN/ m²**

Load area: 3 m x 16 m =**48 m2**

Tensile strength condition ultimate limit state

9,0 kN/ m² x 48 m² = 432 kN

N_f= 468 kN/2 = 216 kN



ill. 119.2. - Diagram column to be calculated

Dimensioning - column vertical force

Breaking length:

[Column length) l = 21 m = 21000 mm

(Effective column length factor) β = 2,0

$l_k = l * \beta = 21000 * 2{,}0 = 42000\ \text{mm}$

Radius of gyration

$i_z = 82{,}7\ mm$, Choice profile rectangular **400 x 200 x 12**

Slenderness ration

$$\lambda = \frac{l_k}{i_z} = \frac{21000}{82{,}7} = 253 > \lambda_{max} = 250, \qquad not\ OK$$

$i_z = 100\ mm$

$$\lambda = \frac{l_k}{i_z} = \frac{21000}{100} = 210 < \lambda_{max} = 250, \qquad OK$$

Relative slenderness ration

βA=1
$f\gamma$ = Yield stress = 355 N/mm²
$E = E\ module\ module\ for\ elasticy = 2{,}1 * 10^5$ N/mm²

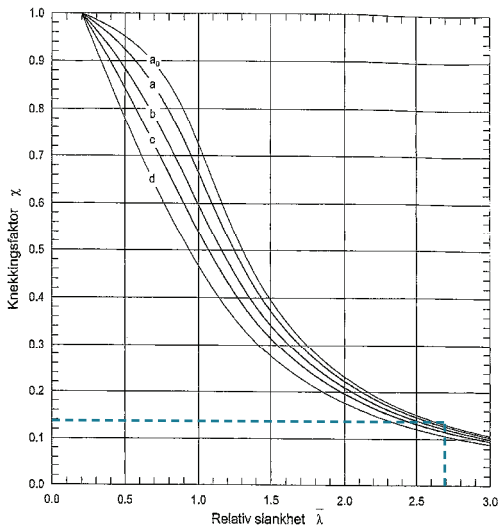
$$\lambda = \frac{\lambda}{\pi} * \sqrt{\frac{\beta A * f\gamma}{E}} =$$

$$\lambda = \frac{210}{\pi} * \sqrt{\frac{1 * 355}{2{,}1 * 10^5}} = \mathbf{2{,}7}$$

- Table 11 in NS 3472 gives a breaking curve a

- Table: Fig. 3 gives breaking factor, $\chi = 0{,}14$ [NS 3472, p 36]

Side 36
NS 3472:2001



Figur 3 – Knekkingsfaktor χ for bøyningsknekking av staver

ill. 120.1. - Diagram breaking curve

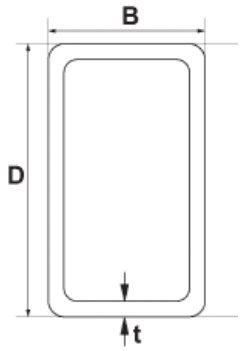
Column dimensioning capacity

χ=0,14
βA=1
A=13400 mm²
fy= 355 N/mm²
γ_{M1}= 1.1

$$N_{kd} = \chi * A * \frac{fy}{\gamma_{M1}} =$$

$$N_{kd} = 0{,}14 * 1 * 13400 * \frac{355}{1{,}1} = \mathbf{605\ kN > 216\ kN, ok}$$

Choice profile: rectangular 400x200x12



ill. 121.1 - chosen profile

Dimensioning column horizontal force

Breaking length:

(Column length) l = 21 m = 21000 mm

(Effective column length factor) β = 1,5

Breaking length

$l_k = l * \beta = 21000 * 1{,}5 = 31500mm$

regner β = 1,5 som omtrentlig innspenning

Slenderness ration

$$\lambda = \frac{l_k}{i_z} = \frac{31500}{142} = 222 < \lambda_{max} = 250, \;\; Ok$$

Relative slenderness ratio

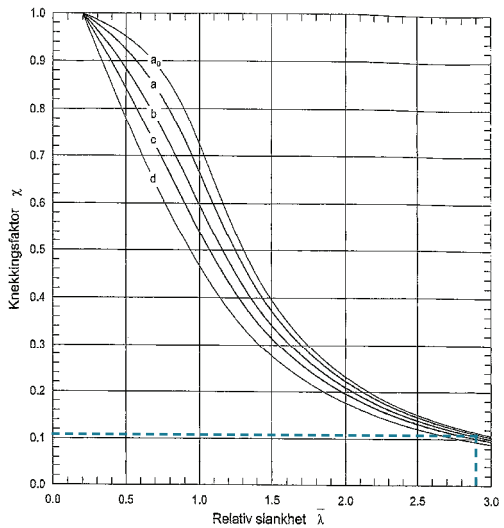
$$\lambda = \frac{\lambda}{\pi} * \sqrt{\frac{\beta A * f\gamma}{E}}$$

$$\frac{222}{\pi} * \sqrt{\frac{1 * 355}{2{,}1 * 10^5}} = \mathbf{2,9}$$

- Table 11 in NS 3472 gives a breaking curve a

- Table: Fig. 3 gives breaking factor, χ = 0,11 [NS 3472, p 36]

Side 36
NS 3472:2001



Figur 3 – Knekkingsfaktor χ for bøyningsknekking av staver

ill. 122.1. - Diagram breaking curve

Column dimensioning capacity

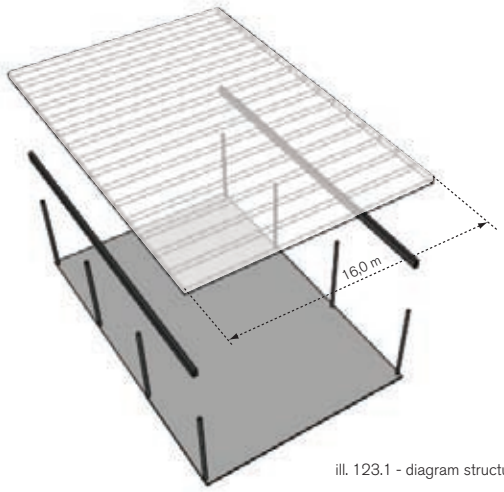
χ=0,11
βA=1
A=13400 mm²
fy= 355 N/mm²
γ_{M1}= *1.1*

$$N_{kd} = \chi * \beta A * A * \frac{fy}{\gamma_{M1}}$$

$$N_{kd} = 0{,}11 * 1 * 13400 * \frac{355}{1{,}1} = \mathbf{475,7\ kN > 216\ kN, OK}$$

NB! The column could be dimensioned considering the force calculated for the strong direction. *475,7 kN < 605 kN.*

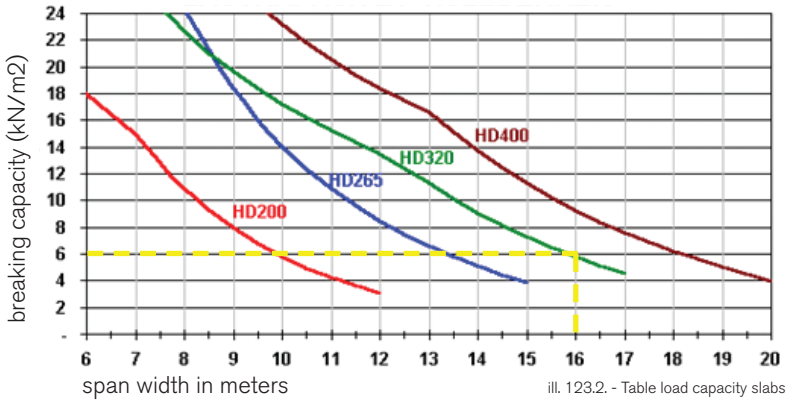
Structural estimation



ill. 123.1 - diagram structural principle

This chapter will present estimation results for the dimensioning of prefabricated concrete slabs. The purpose of this estimation is to determine the size of the concrete slab which has an influence on the aesthetic of the building and the room heights in the different spaces. The pay load used for this calculation is taken to be the same characteristic as the snow load for Tromsø.

load capacity concrete slabs

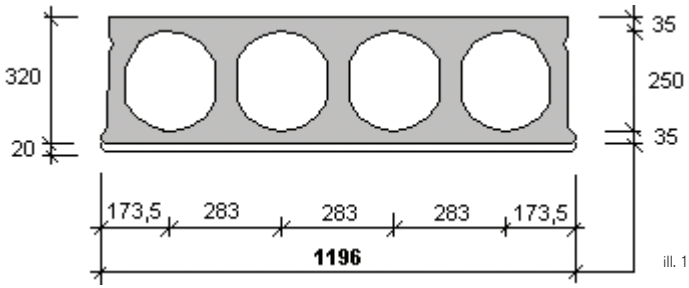


ill. 123.2. - Table load capacity slabs

criteria dimensioning of slab:

Payload / snow load [Norsk standard]	6,0 kN/m2
Span	16,0 m

The table shows that HD320 element can span 16 m with the dimensioning criteria for loads.



ill. 123.3 - Slab element

element specifications

HD320; maximum span up to 16, 0 m
- 420 kg/m² transport weight
- 440 kg/m² mounting including joints

[www.contiga.no]