CLOSE TO HEAVEN

-A CHURCH IN ØRESTAD SOUTH

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TITLE PAGE



Ill. 1 St. Mary's Cathedral, Tokyo, Kenzo Tange

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SYNOPSIS

CHURCH IN ØRESTAD SOUTH

The project evolves around the design of a Christian Church in the developing city of Ørestad South close to Copenhagen city centre. The church is designed from the aspects of using acoustics and light as a formgiving parameter, but also from a discussion of the meaning and use of churches and christianity in Denmark today. The project seeks to design a church using the three main subjects; light, sound and materiality.

PREFACE

As preface to this project I have decided to dwell on my own opinion and connection to the Church and where my inspiration for Churches, Church architecture and Church ideology originates from.

About one year ago in November, the first Sunday of advent, I got baptized into the Evangelical Lutheran Church in Denmark. I was 24 years old at the time and even though my main reason for being baptised was to become Godmother to my niece a month later, the ceremony meant a lot to me. I am one of the few who will remember the day I got baptised for the rest of my life and I joined the Church by agreeing to my belief in God, the Holy Spirit and Jesus by my own voice, and I truly appreciate that.

My baptism took place in an old Danish village church which has the traditional whitewashed walls and old wooden church benches, a single aisle church with the organ in the back and the church tower protruding up above all the houses in the village.
There are many of these churches in the villages in Denmark and many of them are somewhat similar. Newer churches have different layouts and different architecture, such as the Bagsværd Church by Jørn Utzon, or some of the larger churches in Copenhagen, such as Grundtvigs Church or the Marble Church, but with all the different church architecture the question must lie within the purpose of the church building. What makes a building a church and when does a building become a church? Surely, it is not enough to just call the building in question a church for it to become one?

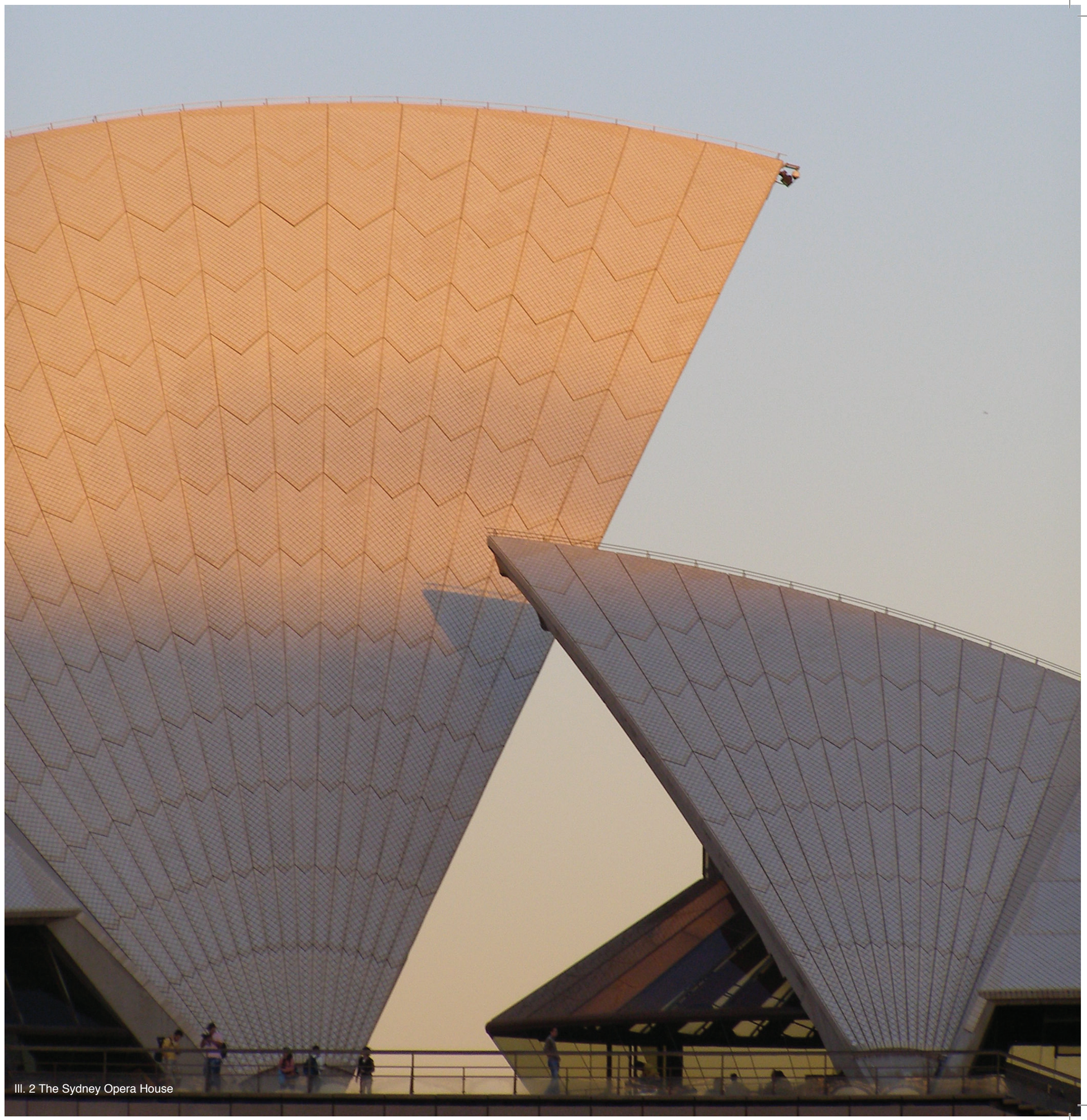
A few months after my baptism I visited London as part of a school study trip. The last day I walked around on my own and my last stop before going to the airport was Westminster Abbey. I contemplated not going in, but decided I had time to kill and went inside. Westminster Abbey was beautiful, much more inside than outside. I remember feeling a little proud that this was MY church and I had a distinct feeling of belonging as I had joined Christianity and I became part of this large magnificent place, with the history of Kings and Queens and glass mosaics that made the sun light up the church interior with a warm glow.

The village church is one thing, Westminster Abbey another, but I believe that the main part of the Church is to create a feeling of belonging - no matter who you are, you are welcome into this building; (even though Westminster Abbey charges admission) and the Church gives you a possibility to become closer to yourself and somehow brings you to peace; and brings you close to heaven.

When does religion come into play? For the last 6 months I was living in Sydney and I clearly

remember my first encounter with Jørn Utzon's Opera House. This building is amazing and to me it has a distinct church like quality. I was lucky to live no more than a 20 min. walk from the Opera House and I would often walk to see it in the sunset. I would dare say that the Opera House has the same effect on me that churches do. Watching the changes of scenes as the sunlight hits the shells of the Opera House roof is ever-changing scenery and I feel quite fortunate to have lived this close to this building for just a short period of my life. The Opera House belongs to everybody - the view of the building is free, and it gave me the same curious sense of belonging as Westminster Abbey and as the village church. Maybe the opera house is even a church turned inside out.

The questions I then pose are; when does a building give a sense of belonging? When is a building religious? What can architecture and building do for the community and the city?



Ill. 2 The Sydney Opera House

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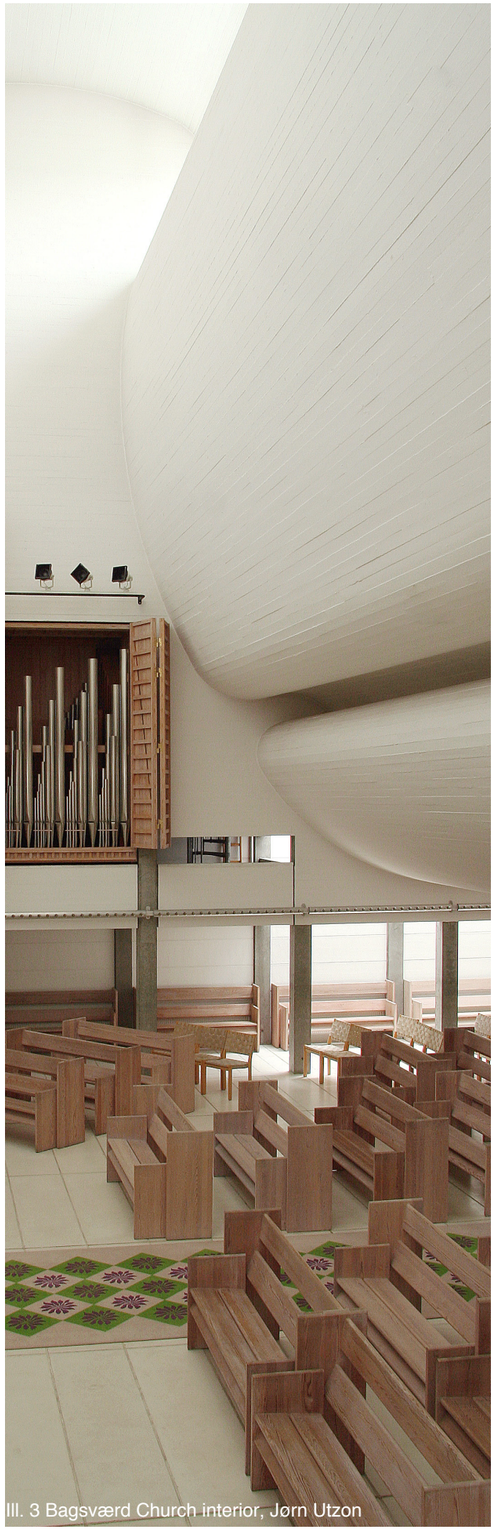


Ill. 3 Bagsværd Church interior, Jørn Utzon

INTRODUCTION

In Denmark the traditional religion is the Evangelical Lutheran religion. Most cities and villages have churches relating to this religion and 80,9% of the population in Denmark in 2009 are members of the Evangelical Lutheran Church; the Danish national church. [NYT, 10]

For most Danish people the national religion and religious ceremonies are not important in everyday life. [Olsen, 9, 99] This is seen in the sense that most people do not participate in the church activities or even agree with the church teachings, even though they are still official members of the church. [Olsen, 9, 99]
When people are not visiting the churches for the sake of their religion or belief, the church will have to offer something different, for exam-

ple; in this project, the idea is to combine the church with functions for the community, such as room for scout groups or other activities. [KK, 15, 04]

In the developing city of Ørestad South an urban plan has been made for both housing, and businesses, but also for what public institutions is needed in the area. Within this plan is a Church and Church centre for the community. [KK, 04]
Ørestad South will have its own church parish and the Church and Church center will be built when about 5000 inhabitants have moved into the area. [KK398, 06]
Currently only a few of the planned buildings for Ørestad South has finished and only a small amount of the inhabitants have moved in to Ørestad South. [Orestad II, 10]

Ørestad South is situated both very close to Copenhagen city centre and the green park areas of Kalvebod Fælled. The city lies literally on the border of the capital city of Denmark and marks an edge between the city and nature. [Orestad II, 10] This means that the new church will have to relate to both the dense cityscape but also the natural surroundings.

As Ørestad South is a new city, built literally on tabula rasa it has all the possibilities for development to offer that the old and highly dense Copenhagen city centre has not.

PROJECT IDEA

The project takes its starting point from an idea catalogue for “Establishment of public institutions in Ørestad South”. [KK, 04]

The new neighborhood of Ørestad South will be built on an empty site just south of the newly developed area of Ørestad, near the capital city of Copenhagen, Denmark. (Ill. 4)

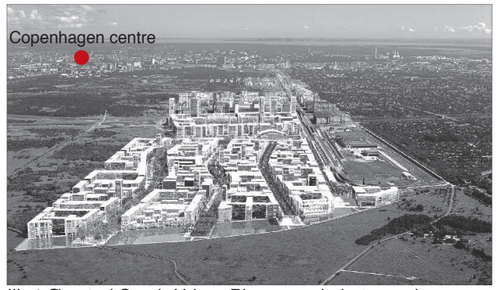
As the development of housing in Ørestad South proceeds, the need for cultural institutions is identified to make the quarter a functioning part of the city. [KK, 04] In the idea catalogue for Ørestad South, five ideas for public facilities and institutions for the area are discussed and guidelines for a possible district plan are defined. The five groups of institutions are; schools and after school activity institutions, day care centers, assisted living facilities and health centre, church and church centre, and sports centers. [KK, 04] This project will deal with the design of the church and church centre for the community of Ørestad South.

THE CHURCH AND CHURCH CENTRE

The new city of Ørestad South will have its own parish in which the new church will be part. The church will The church and church centre of Ørestad South are defined as a sanctuary for the inhabitants and users of the neighborhood. The church and church centre has to be open for everyone and will not only be used for religious purposes but also for other activities, such as choir or theatre. [KK, 04]

Amagerland Provsti, who is the council for the church, sees it as very important that the church will interact with the community and be a very extrovert institution. This will ensure visitors to the church, who will not only use the church for the religious purposes but also as a breathing space and pause in their active daily life. [KK, 04]

The key words within the project are therefore the application of multi-use spaces, the openness, extroversion and transparency of the sacral space, integration with the community, and creation of an everyday sanctuary, that give the inhabitants room to breathe.



Ill. 4 Ørestad South Urban Plan aereal photograph.

PROJECT SPECIFICATIONS

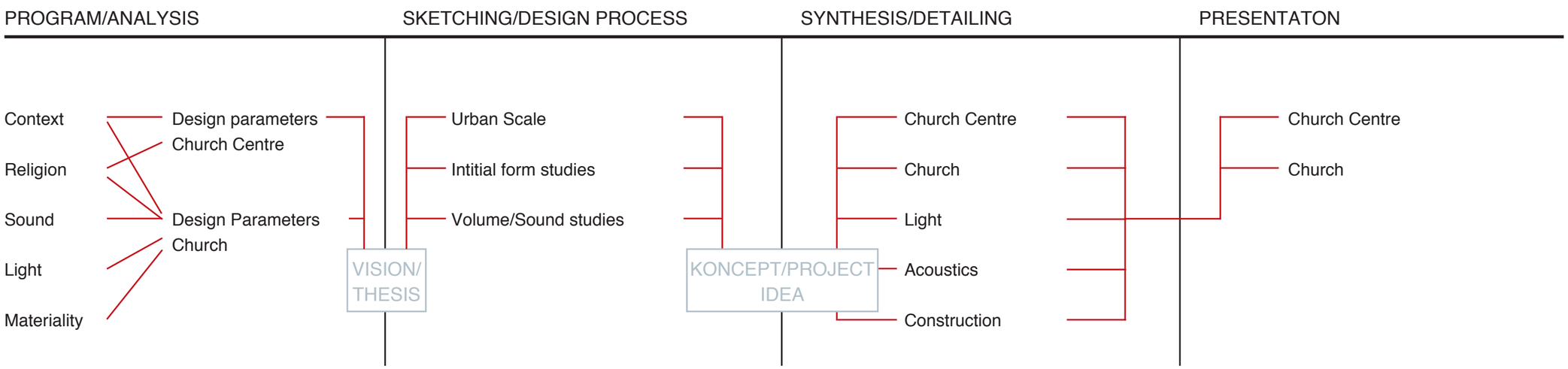
The design for the new church will have to comply with the demands as mentioned below.

- A sacral space of 200-300m^2.
- 4 office spaces/ group rooms of about 15-25m^2.
- Kitchen and bathrooms for the staff.
- 4 education rooms of 45m^2.
- Education room for e.g. confirmation students.
- 2 storage spaces of 45m^2.
- Café
- Multi-hall with flexible use 800m^2.
- Large kitchen connected with the multi-purpose hall.
- Public bathrooms.
- Outdoor spaces.
- Arrival/departure area [KK, 15, 04]

PROJECT GUIDE/METHOD

The proejct will be divided into 4 main sections. These sections or phases are the analysis phase, the sketching phase, the synthesis phase and a presentation. The division of sections are derived from the Integrated design proces. [Knudstrup, 04]

The first phase, the analysis, will function as a program for the further proces and will uddybe og undersøge the initial problem and will conclude in a thesis for the project. With the thesis and goals of the project in mind, the the sketching phase commences to reach a design that fulfils the demands that are previously stated.
In the synthesis phase, a detailing of the design is performed and calculations and verifications of the technical aspects of the design are made before the design is finally presented in the presentation phase.
The connection and direction of the various subjects of the project are defined in the project guide. (Ill. 5)



Ill. 5 Project Guide

PROG

PROGRAM

CONTEXT



III. 6

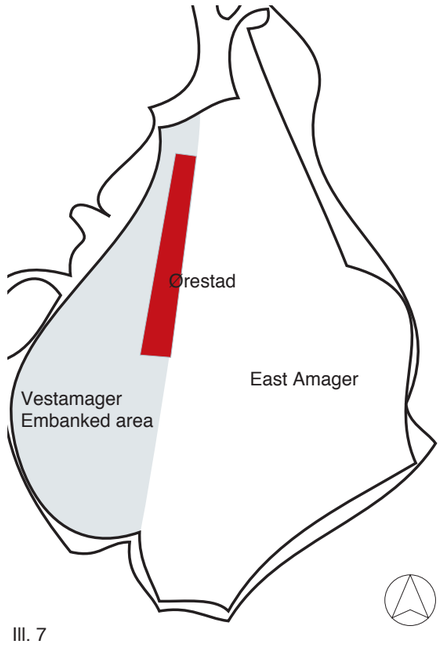
ØRESTAD_OVERVIEW

The “new” city of Ørestad just east of the Danish capital of Copenhagen and is part of Copenhagen Municipality.

Historically the area has been embanked from Øresund as part of the island of Amager around 1940. [Illeris, 08] The embanked area is called Vestamager (West Amager) and lies directly west of the city of Tåstrup and Kastrup which is home of the Danish national Copenhagen Airport.

While the eastern part of Amager was built up with housing and businesses, Vestamager was being used as a military training exercise area, why it has not been developed through the years and it was not until the 1990’ies and the realization of Øresunds Bridge between Amager and Skåne that the future plans for Vestamager could be developed. [Furhauge, 08] Since the Øresunds bridge opened in 2000, Amager has become an infrastructural hub, with international connections. In 2002 a new metro system was lead to Amager to make a direct link to the airport and Sweden, but also to connect Ørestad with the rest of Copenhagen. [m, 10]

From central Copenhagen to Ørestad it takes 10 min. by the also newly finished Metro that goes through the area. This brings the proximity of Ørestaden very close to the Copenhagen centre with the Metro running between the two approximately every 5 min.



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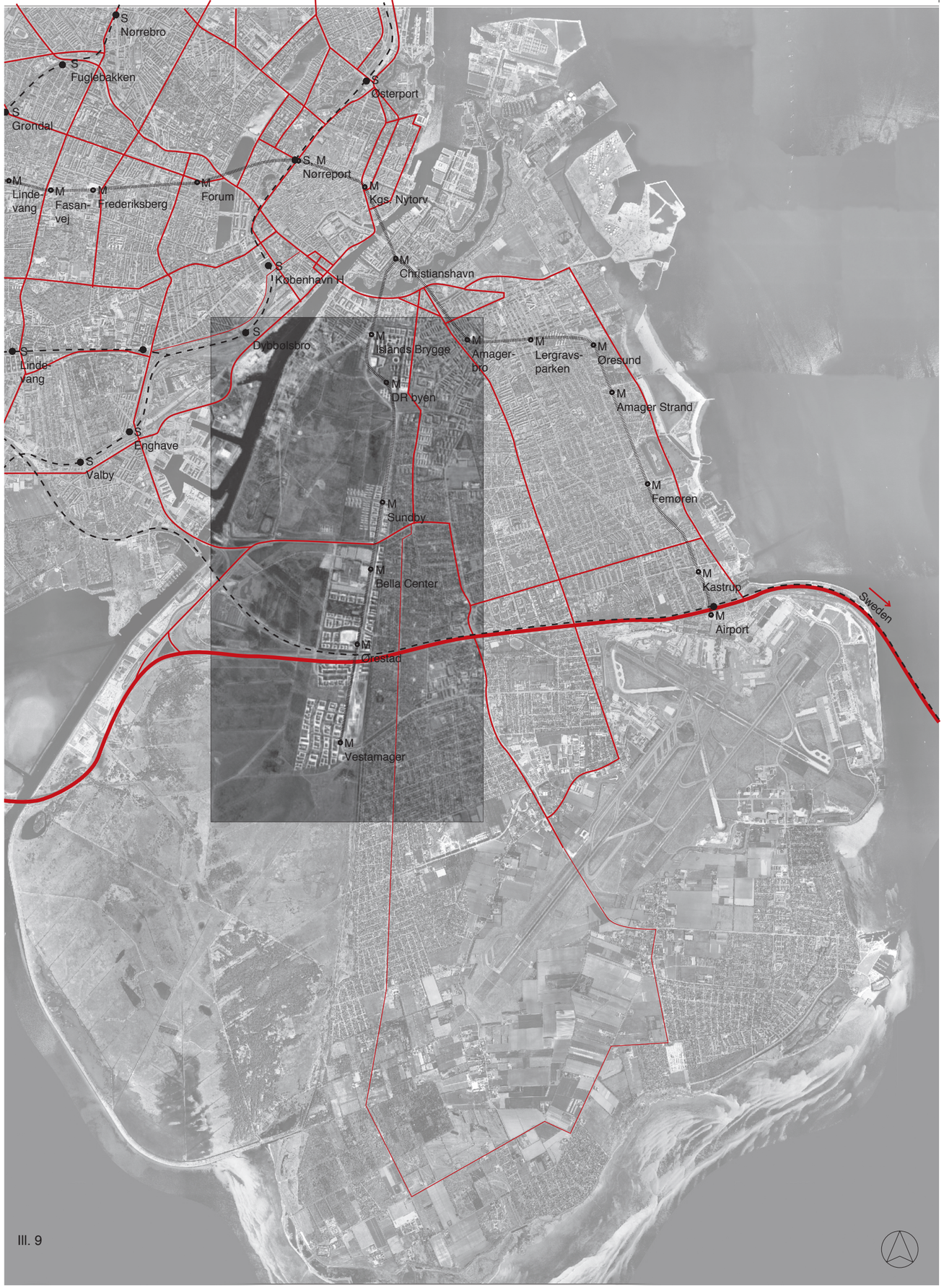


III. 9

ØRESTAD_INFRASTRUCTURE

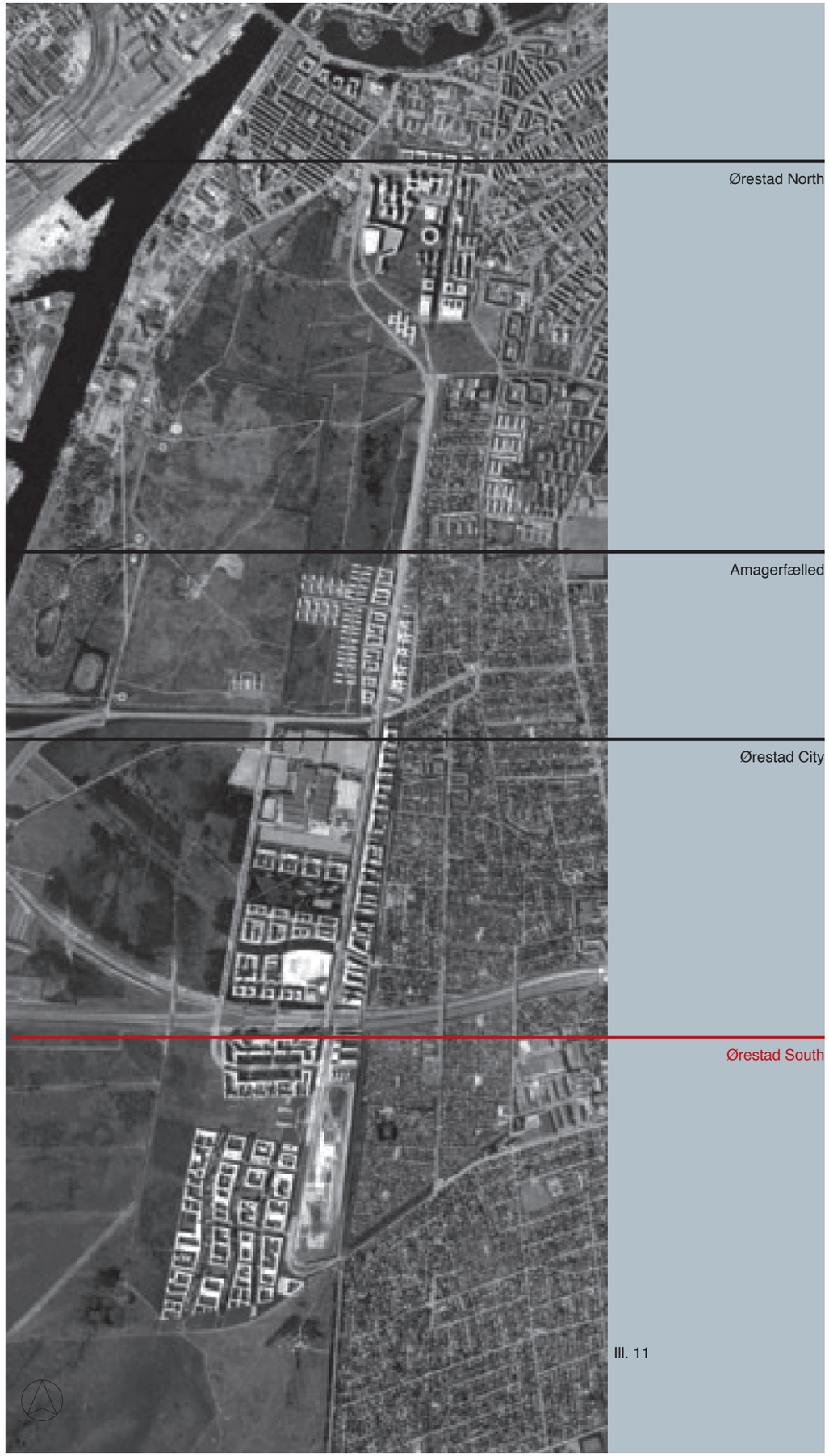
Infrastructurally Ørestad is directly connected to Copenhagen City centre and Sealand by train, metro and road infrastructure. (Ill. 9-10)
On the other side of amager lies the Øresund Bridge that connects Denmark with the Swedish city of Malmö.

M Ørestad — Metro station
Metro line
S-train station
S-train line
Øresund motorway
Road infrastructure (main)
Road infrastructure (secondary)



M
Ørestad — Metro station
Metro line
S-train station
S-train line
Øresund motorway
Road infrastructure (main)
Road infrastructure (secondary)

Ill. 10



III. 11

ØRESTAD_DISTRICTS

The overall urban plan for Ørestad is developed by ARKKI aps, who won the competition of the masterplan in 1995. [Ledgaard, 08]
Ørestad is a part of Copenhagen municipality and is divided into four districts; Ørestad North, Ørestad City, Amagerfælled and Ørestad south, where this project is situated. (Ill. 11)
The four districts have been developed in different phases starting with Ørestad North and Ørestad City. Today, the development of Ørestad South is started and most of the streets and cityscape is laid out and projects have been built on a few building sites. The last ciy district to be finished will be Amagerfælled. [Orestad I, 10], [Gyldendal, 10]

ØRESTAD NORTH

The development in Ørestad North is almost finished and consists of both housing, businesses, and public institutions.
In Ørestad North lies Copenhagen University Amager, The Bikuben and Tietgen kollegiums, Karen Blixen Parken, the national tv channel DR's headquarters; "DR byen" and its concert hall, the It-university, and The Royal Faculty library. [Orestad III, 10]

AMAGERFÆLLED

Amagerfælled will be the last part of Ørestad to be finished and has not been built on yet west of the Metro line and stand as a green park area, where cows are currently grazing.
East of the Metro rail line lies Amager Hospital, a school and kindergarden and some housing.
A district plan for the area is scheduled to be developed in 2010. [Orestad IV, 10]

ØRESTAD CITY

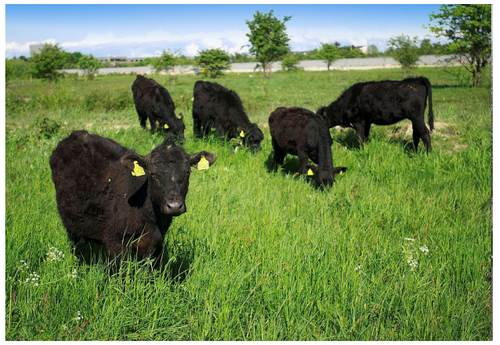
This area was the second area of Ørestad to start its development. One of the larger buildings of Ørestad City is the shopping centre "Field's". The area will be the part of Ørestad with the most jobs and businesses. [Orestad V, 10] In Ørestad city lies the internationally known housing projects "VM Husene" by PLOT architects and "VM Bjerget" by BIG architects.

ØRESTAD SOUTH

The main focus of Ørestad South is housing. The area lies close to the nature of Kalvebod Fælled and offers therefore both closeness to the capital and green scenery. [Orestad II, 10] One housing project is already finished; "Stævnen" by Wilhelm Lauritzen Architects and "8-tallet" by BIG architects is currently being finished. At the moment Ørestad South is temporarily used as an activity space called Plug n' Play. [Orestad II, 10]



Ill. 12 Aereal of Ørestad North



Ill. 13 Grazing cows on Amager Fælled



Ill. 14 Aereal view of Ørestad North

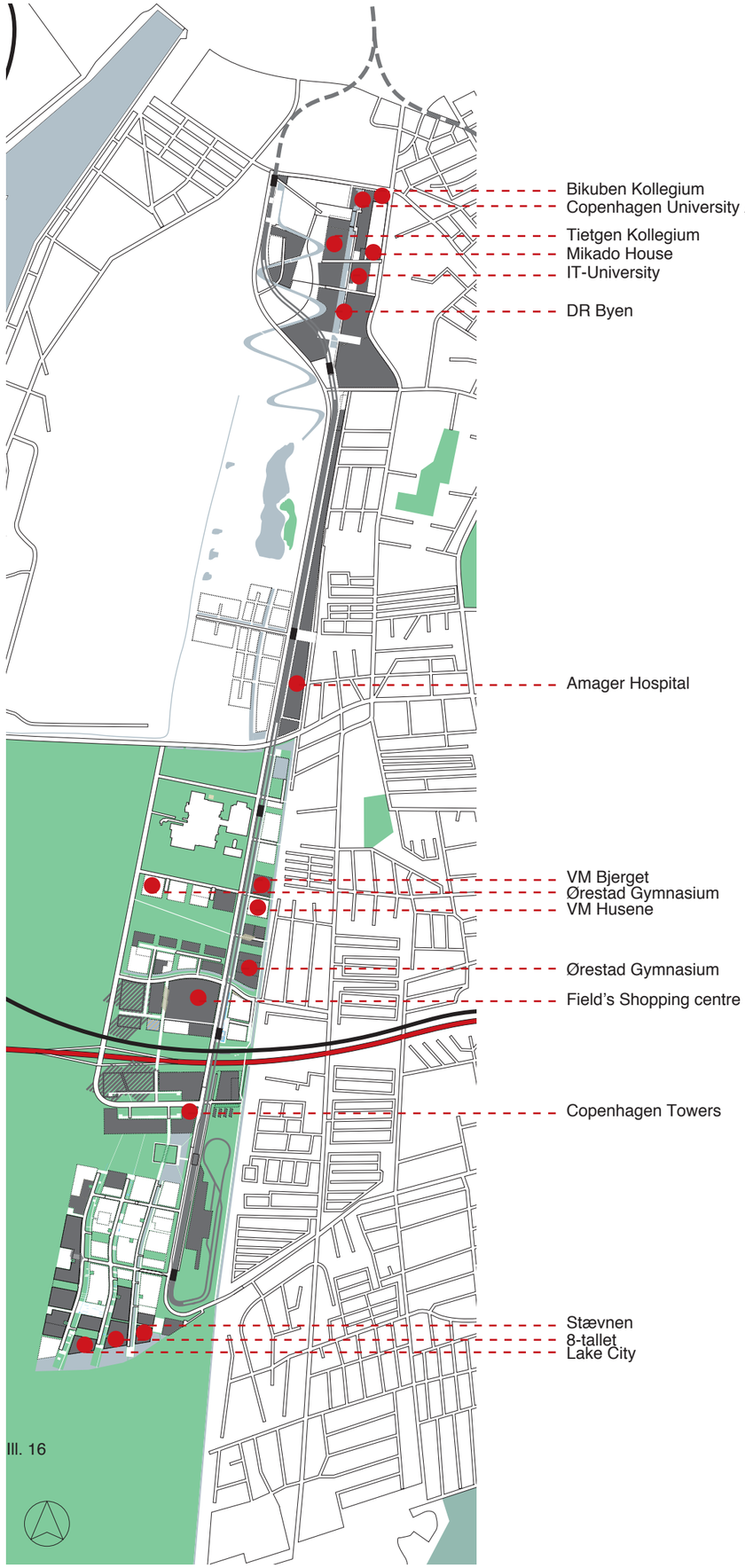


Ill. 15 Aereal view of Ørestad South

ØRESTAD

ARCHITECTURE IN ØRESTAD

Since the beginning of 1990'ies the city of Ørestad started its ongoing development. Being a "new" city built from nothing the area is now a flourishing mecca of new built housing, offices and public institutions. This means the area has an architecture that stands out and marks some of the architectural tendensies for the decade. (Ill. 16-31)



Ill. 16



Ill. 17 Bikuben Kollegium - Student housing.



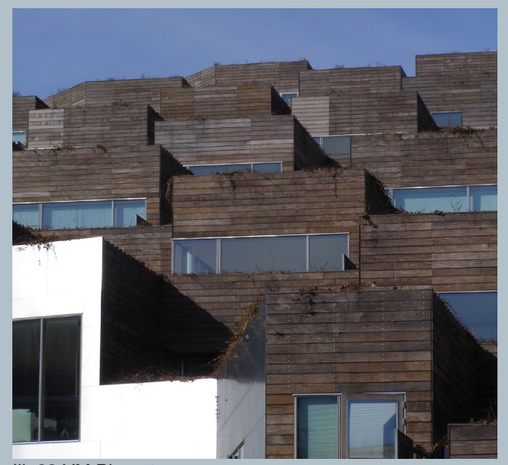
Ill. 18 Tietgen Kollegium - Student Housing in Ørestad North.



Ill. 19 DR Byen - National TV channel headquarters.



Ill. 20 Copenhagen University Amager.



Ill. 23 VM Bjerget.



Ill. 26 Field's shopping centre.



Ill. 29 8-tallet



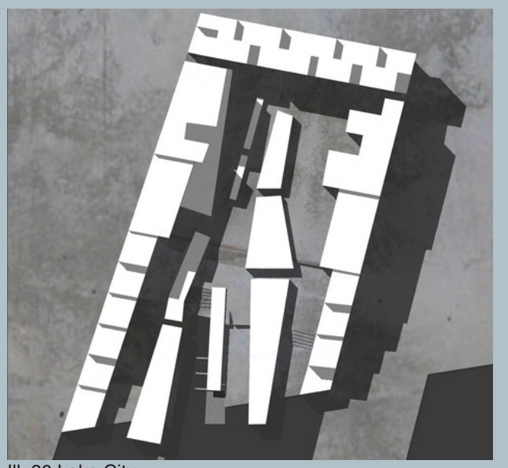
Ill. 21 It-university Copenhagen.



Ill. 24 Ørestad Gymnasium.



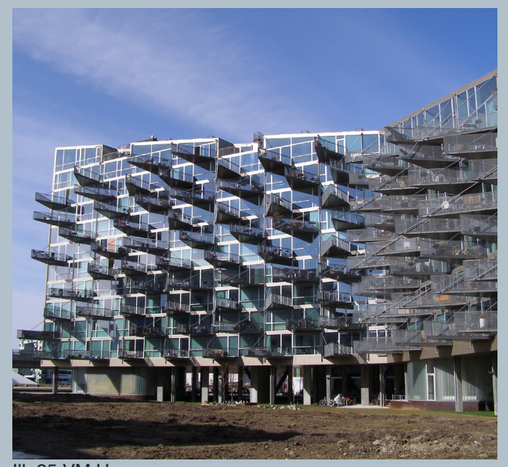
Ill. 27 Copenhagen Towers.



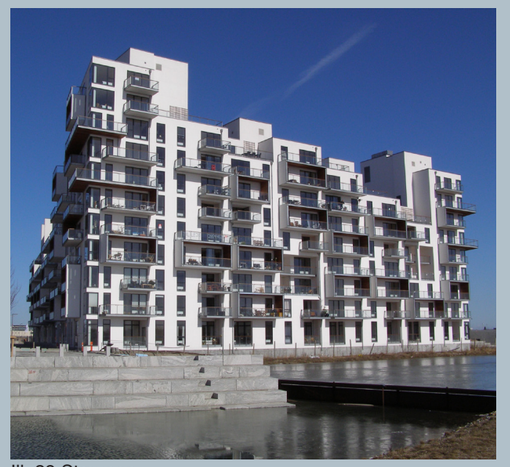
Ill. 30 Lake City.



Ill. 22 Amager Hospital



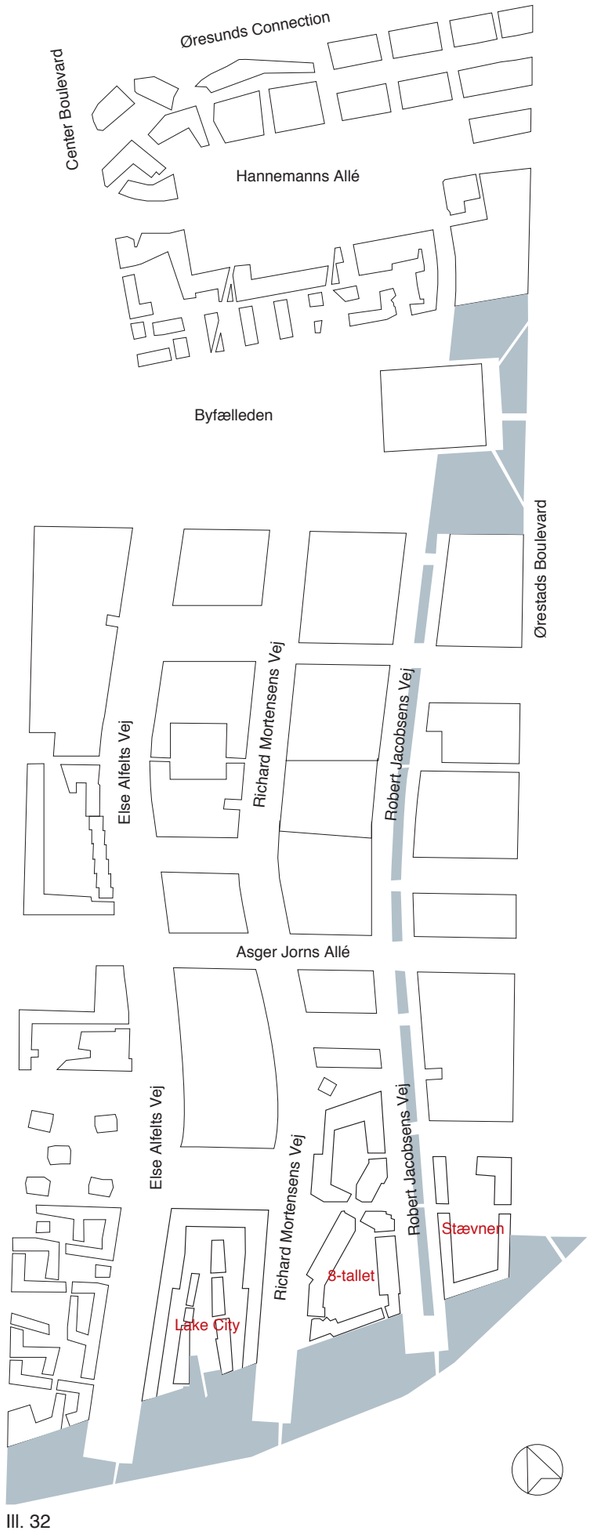
Ill. 25 VM Husene.



Ill. 28 Stævnen.



Ill. 31 Mikado House.



Ill. 32

ON THE EDGE OF CITY AND NATURE

The development of Ørestad South started in 2007 with the residential building “Stævnen” where the first inhabitants moved in, in 2009. [By&Havn, 07]

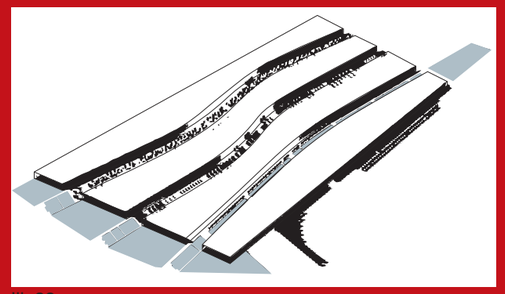
The main focus for Ørestad South is primarily to create a residential area with an equal distribution of housing, public institutions and employment. [KK398, 06] In this way it is planned to have about 10.000 residents and about 15.000 people using the area. [By&Havn, 07] The quarter north of Byfælleden is called Hannemanns Allé and marks the northern part of Ørestad South. In this project the main focus will be on the southern part of Ørestad South - the area South of Byfælleden.
The development of Ørestad South marks a different approach to design of urban fabric because the public urban spaces are developed prior to the buildings. By this approach the intention is to create awareness of the urban space and its qualities to the potential inhabitants, before moving into the area. [Ledgaard, 08]

The urban spaces of Ørestad South reach to integrate the surroundings of Kalvebod Fælled into the development. The three north-southbound streets; Else Alfelts Vej, Richard Mortensens Vej and Robert Jacobsens Vej are used as green urban spaces and Robert Jacobsens Vej has water brought through as well. The streets crossing in the east-westbound direction will have more urban character shaped by the built fabric. The major East-westbound

street is Asger Jorns Allé reaching from the Metro station of Vestamager in east to Amager Fælled in West. [KK398, 06]

The urban spaces of the plan have different characters so that the main streets become public spaces, but inside the building blocks, other more private and smaller scale spaces will be established. The goal is for the different urban spaces to be connected but have a variation in privacy through, for example, entering the backyard of a building block through small gates or tunnels, such as it is the case of the older parts of Copenhagen. This will give a variety of experiences when visiting the area. [KK398, 06]
The basis for the public institutions of the area has been developed through cooperation between different architects and representatives for the various institutions. Through the work a series of guidelines for the institutions have been defined. The public institutions discussed for the area are; a school and after-school centre, daycare and institutions for marginalized people, assisted living facility housing and health centre, sports facilities, city culture and finally the Church and Church centre. [KK, 04]

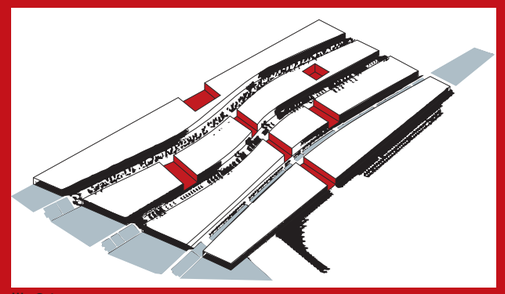
Currently, Ørestad South is being built slowly and it is therefore in the meantime being used as an sports-, cultural- and activity space called Plug N Play. This is an initiative that activates the area even in its current state and creates visitors to explore the potentials of the area. [OrestadVI, 10]



Ill. 33

INITIAL IDEA

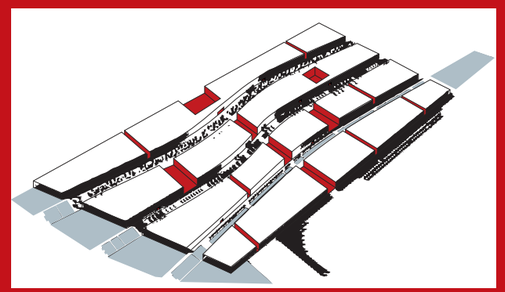
Ørestad South is surrounded by protected area of Kalvebod Fælled and the green element is brought into the site through three large streets. The large streets connects the urban plan to its surroundings and changes character accordingly. [ARKKI, 07]



Ill. 34

MAIN STREETS

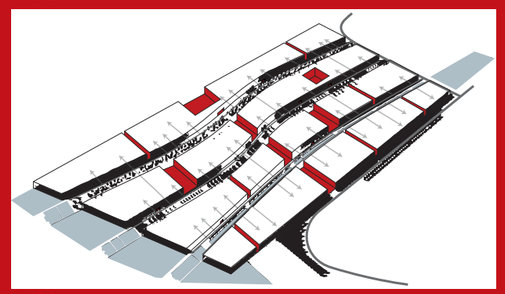
To connect the large streets a series of perpendicular main streets are laid into the plan. The larges of the main streets crosses the center of the built-up area reaching from the Metro station in east to Kalvebod Fælled in west. [ARKKI, 07]



Ill. 35

MINOR STREETS

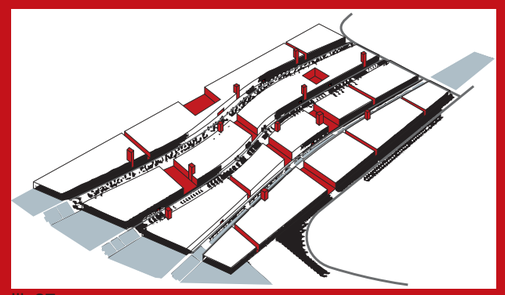
In order to create more connectens between the green larger streets, passageways and narrow streets are placed into the plan. These create more divisions in the built structure. [ARKKI, 07]



Ill. 36

CAR TRAFFIC

The roads of the plan are placed so that car, bicycle and pedestrian traffic will co-exist in the cityscape. The roads are placed in a north-southbound direction on only one side of the building blocks. This means that the city blocks will be connected to greenery on at least one side. [ARKKI, 07]



Ill. 37

BUILT FABRIC

The built fabric will create a clear and distinct border towards Kalvebod Fælled and will have character as a collected built mass. Towers are placed into the plan to create landmarks and orientation points. [ARKKI, 07]

ØRESTAD SOUTH - VISION

The vision for Ørestad South is shown here with images from ARKKI's presentation of the area.



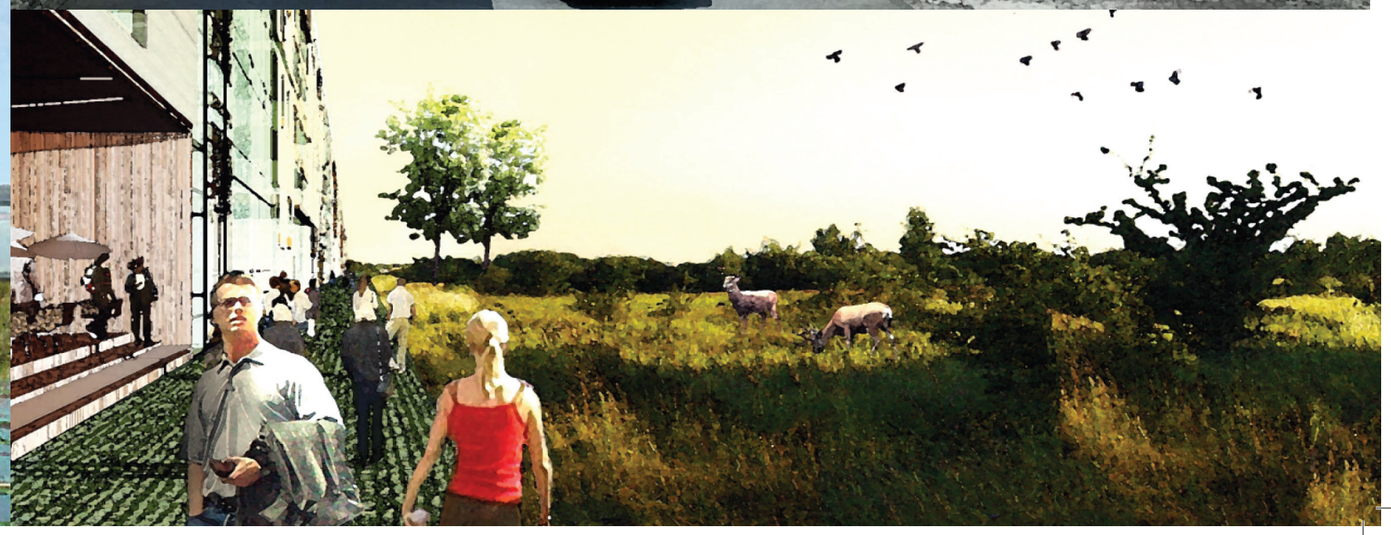
Ill. 38 The towers of Ørestad South
Ill. 39 The smaller streets and passageways
Ill. 40 Vesternager Metro Station
Ill. 41 City squares
Ill. 42 Water brought into the cityscape
Ill. 43 View from Amager Fælled
Ill. 44 The main Street
Ill. 45 Where city meets nature











ØRESTAD SOUTH - TODAY

Images of Ørestad South in its current state where only Stævnen and 8-tallet are actually built on the site.

Ill. 46 Amager Fælled
Ill. 47 Vesternager Metro Station
Ill. 48 The Metro Station seen from the main street
Ill. 49 Ørestad enclosure
Ill. 50 Vegetable plots
Ill. 51 Looking north up Roberts Jacobsens vej from the main street
Ill. 52 Looking south up Roberts Jacobsens vej from the main street
Ill. 53 Plug n' Play area
Ill. 54 Pavement Robert Jacobsens vej, South view
Ill. 55 Water integrated in the street.
Ill. 56 Plug n' Play area
Ill. 57 "8-tallet" and "Stævnen"
Ill. 58 View of the main street towards West























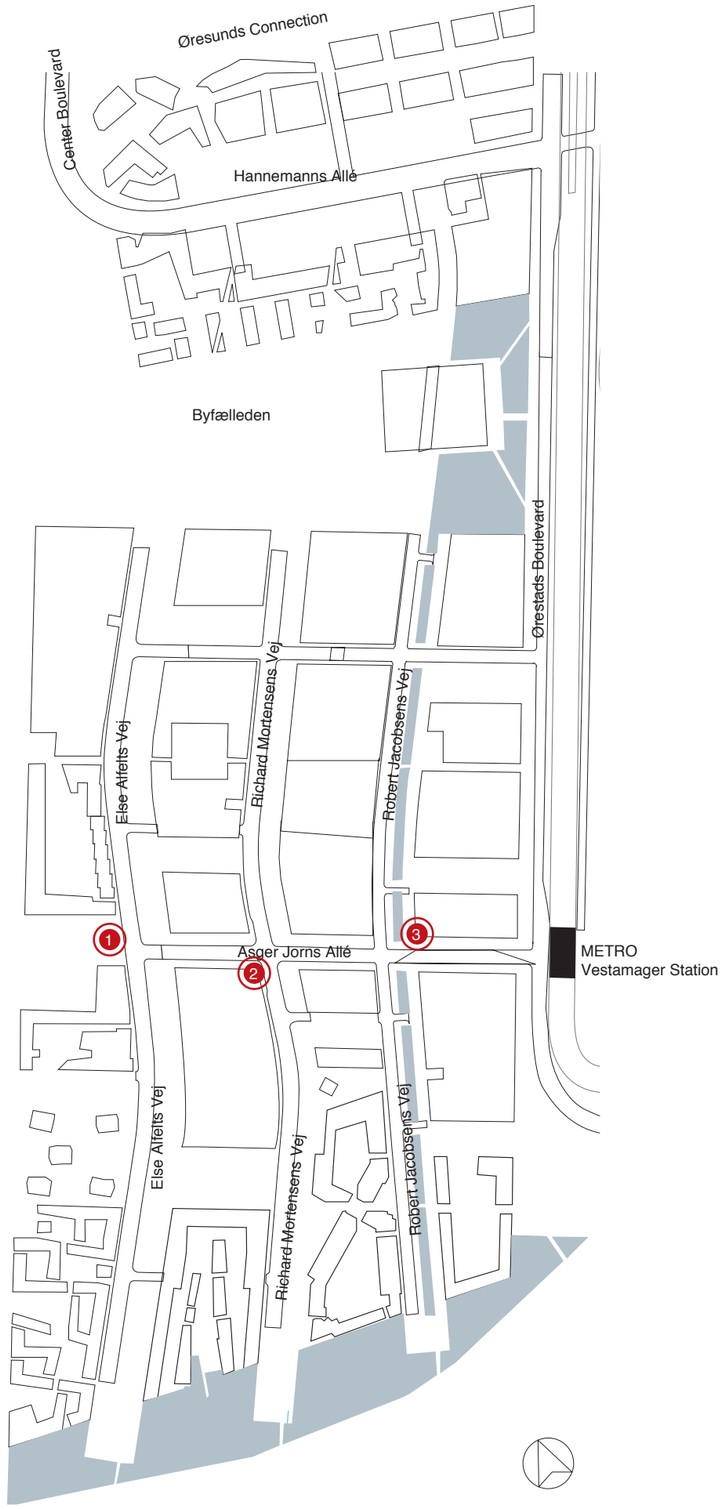








PLACEMENT OF CHURCH CENTRE



Ill. 59

In the project brief three possible locations for the church in Ørestad is given. The three scenarios will be described here. The final choice of location will be made after the forthcoming analysis as part of the sketching phase. The three placements are seen as suggestions and not as final decisions in the urban plan. Other locations in Ørestad South will be considered equally, when the final placement is decided.

1. AT THE END OF THE MAIN STREET TOWARDS AMAGER FÆLLED

The church will be visible from the metro station and the nature area of Amager Fælled. The Church would become part of the transition between city and nature, both architectonically and psychologically. The church would become a building for both activity and quiet contemplation.

2. IN THE MIDDLE OF THE MAIN STREET

The church will become an active part of the cityscape. The Church café is directly connected to the street and people who are shopping will be encouraged to look at, for example, marriage ceremonies without being invited. The church's group rooms and multi-purpose hall will be visually connected to the street.

3. BY THE MAIN STREET, THE CANAL AND THE METRO

This placement has the advantage of accessibility for visitors and users that live outside the area and has water as a strong element. [KK, 15, 04]

MICROCLIMATE

The microclimate of the site is important in order to find the environmental impacts for buildings on the site. In this section, the sun and wind conditions in Ørestad South will be investigated.

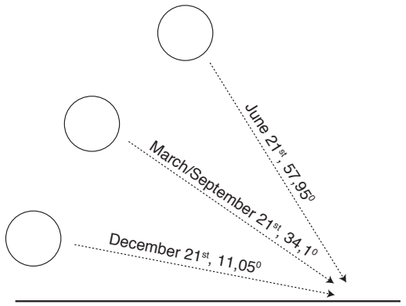
SUN CONDITIONS

In the danish climate the sun conditions changes a lot during the passing of the year. The height of the sun changes from summer to winter with more than 45^0, which has great influence on the daylight in buildings. (Ill. 60)
In Winter, when the sun is low on the sky, buildings in a city will mostly shadow each other for a large part of the year. This has great importance for the daylight quality inside the affected buildings. The angles of the sun during the year is calculated from the latitude in Denmark, which is $55,5^0$.
By using the angle of the sun and the height of two closely placed buildings it is possible to calculate the distance needed between the two in order for the daylight to reach into the northernmost building during the whole year. (Ill. 61)

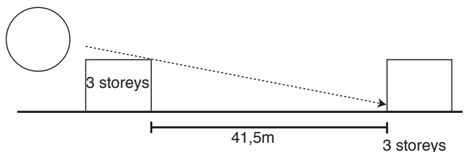
In order to get an overview of the sun path on the site; a sun diagram is used. The sun diagram shows how the sun moves according to the different times of year. (Ill. 62)

WIND CONDITIONS

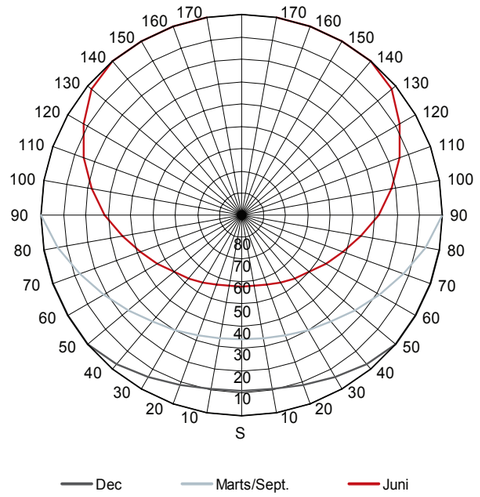
The wind consitions are looked at in order to take any possible problematic issues on the site into account early in the design process.
The Urban development of Ørestad South lies on an open field and is therefore unprotected from the wind. In Denmark the wind primarily comes from west. (Ill.64)
The site of Ørestad South will consist of mainly tall freestanding buildings positioned close to each other. This will give some issues in terms of wind in the urban spaces as wind tunnels are a possibility - especially towards the western parts of the development. [KK398, 06] If the church is placed in this area it will have to be considered how to make the exterior surroundings of the church a pleasureable experience.
The problem of windtunnels can, for example, be reduced by planting trees that filter the wind or by using wind screens.



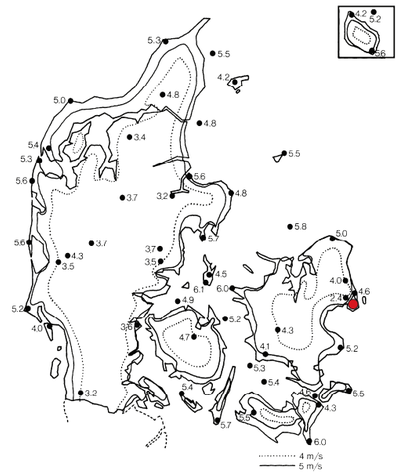
Ill. 60 The angle and height of the sun changes according to the time of year.



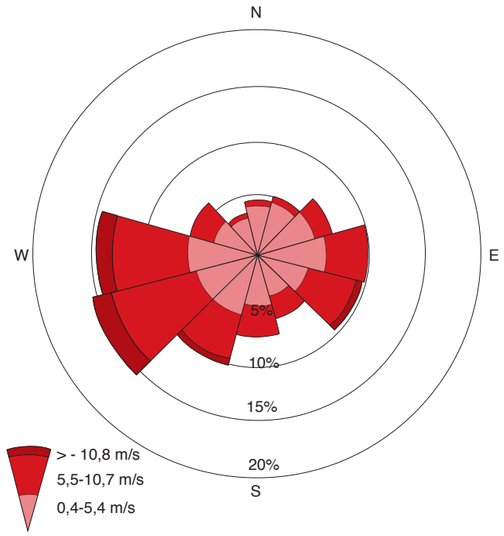
Ill.61 In the winter time in Denmark a 3 storey building casts a shadow of 41,5m.



Ill. 62 Sun path diagram on the site, showing the movement of the sun during the year.



Ill. 63 Average windspeed in Denmark. In Ørestad the average wind speed is between 2,4 (west) and 4,6 (east).



Ill. 63 Wind rose for Denmark showing the wind speed from all directions.

SUMMARY

In the context analysis a series of investigations are made to explore the area in which the new Church Centre will be situated.

The different districts of Ørestad have different qualities. Ørestad South has a more rural urban character that comes to play because of the importance on housing in the area. The other areas, such as Ørestad North and Ørestad City have a lot traffic coming to the area because of the school, business and shopping possibilities here. Ørestad South will become the more suburban part of Ørestad as most of the public functions address the closer community.

In terms of infrastructure, Ørestad South is well connected to the rest of Copenhagen and its other surroundings by Metro, Train and Motorway. A problem for the area might be the attractiveness for visitors to the area. As described, Ørestad South lies on the edge of the larger city and needs attractions in order for people to have a purpose for coming into the area. The danger of this kind of placement is that Ørestad South could become a "ghost town"; on the other hand the main attractions could be the nature area of Kalvebod Brygge and its green scenery. It will need a well functioning cityscape and network of public institutions to lead people to the area on a regular basis.

The idea of nature is an important part of Ørestad South and greenery is drawn into the building development through the three main streets. As the area lies close to the preserved Kalvebod Fælled it is very attractive for residential development. The integration of nature as a repeated element in the development is used to the extent that the expression changes according to the surroundings creating different kinds of urban and green spaces throughout the development. This might be used in connection with the Church and Church centre depending on its placement in the area.
The urban spaces for Ørestad South have even been developed independently through a separate architectural competition won by GHB Landskabsarkitekter A/S in 2007. [Ørestad, 07] Currently the urban spaces of Ørestad are used as the activity area; Plug n Play which activates the areas of the un-built city.

The master plan focuses on the development of towers in the building mass that will function as orientation points. It seems like an obvious choice that the church tower will be one of these landmarks that will stand out and mark itself as a central element for the community.

Ørestad is a new city, which is shown by the various new built architecture that all have different architectonic qualities. Ørestad has room for any kind of buildings and the common factor for most of the architecture is that it is designed by the leading Danish architects of the decade. This leads to an area of many various architectonic expressions and most of the buildings in the area have their own name such as; Stævnen or 8-tallet. This is in contrast to the old apartment blocks in Copenhagen that rarely have their own recognizable names.

One of the main focus points is to integrate the church into the community and make the architecture and function of the church transparent towards the surroundings. In order to achieve this transparency it is important to place the Church along one of the major streets, which is also given by the project brief.

For a new city, such as Ørestad South, it is important to consider the sun and wind conditions. The main problem in terms of wind is the creating of wind tunnels between the tall buildings in the area. In terms of sun and sunlight, it is important to consider placement of smaller buildings between the taller buildings of the surroundings that might shadow the Church a great part of the year.

From the context analysis it is possible to determine a series of design parameters for the synthesis phase.

DESIGN PARAMETERS - CONTEXT

- The Church Centre is to become a landmark and orientation point for the community.

- The Church Centre is to have a transparency in the interaction with the surroundings.

- The consequence of the tall cityscape is to be considered for the design of daylight in the Church Centre.

- Exterior spaces in the Church Centre have to be sheltered from the wind.

- The Church Centre design has to interact with the intention of bringing nature into the urban space.

RELIGION

In this section an investigation of the Religioin id Denmark is made. Here, both the current state of the Danish Evangelical Lutheran Church and its future will be discussed in order to gain knowledge about the Church and its function in the Danish society.

THE CHURCH IN DENMARK

The Evangelical Lutheran Church is the traditional and national church in Denmark. [Iversen, 99]

The Danish church has historically evolved differently than in other countries in the sense that it has, through many years, evolved to become more part of the Danish culture, tradition and history, than the religion. [Iversen, 99]
Pat of this development has happened due to the Danish mentality that originates from an individualistic way of thinking, which is also reflected within religious and ethical matters. The individualistic position of the population means that you cannot impose something on the Danes as they will not be told what to do. [Iversen, 99]

Even though the Evangelical Lutheran Church has the largest following of the Danish population, it has a very low attendance to the church activities and services. Most of the population only uses the church for rituals and ceremonies such as baptism, weddings, confirmations and funerals. [Iversen, 99]

The Danish church members can, according to the Danish professor in practical theology Hans Ravn Iversen, be divided into three groups; these are Christians according to 1) Church, 2) Culture or 3) The Charismatic Christians. As mentioned before, the majority of the Danish population is Culture Christians, which means that their relationship to the Christian faith has its roots in the Danish culture through a historical development. This means that the traits of

the Danish culture - such as looking out for the poor and social equality - are based on a Christian history, and the Christianity to the cultural Christians is not about attending church activities but is very indirect. The cultural Christians might not even be aware of their “Christianity”. [Iversen, 99]

In Denmark the Church Christians are the ones that attend the church ceremonies on a weekly basis - active members of the church. The church Christians comprise only 2% of the population, but these are the ones that keep the church going for when the cultural Christians attend the church service for, for example, baptisms. [Iversen, 99]

For the last group, the Charismatic Christians, the church and their belief s very important and they do not hesitate to tell people about it. The Charismatic Christians are the “active” Christians compared to the more “passive” Church Christians. They have been redeemed and will spread the word of this redemption to everyone who will listen. They have a true passion for the faith and for Christianity.

The three groups are dependent on each other in order to sustain to the survival of the church in Denmark. This is can be described, roughly, in the sense that the cultural Christians contribute to new church members, the Church Christians keep the church activities going and the charismatic Christians spread their words of joy of their religious experiences. One common factor is that it is through the church activities and services that the three groups come together. [Iversen, 99] It should also be said that a lot of people change between the different groups - for example when a Cultural Christian becomes a member of the parochial church council and become regular church visitors and therefore moves into the group of the Church Christians. [Arendt, 99]

THE CHURCH AND THE POPULATION

The uniqueness of the Danish church lies within its meaning to the population as the church’s purpose and significance in the society purely is decided by the people. The Danes do not want a church in its ancient meaning. This is where the Evangelical Lutheran Church of Denmark and the Danes fit well together as the church do not set out rules or expect anything from its members [Iversen, 99] A curious notion is that the Danes see the holy days of the church more as a holiday (part of the culture) than as a religious ritual - also the Danes will visit a church more often as a tourist than as a member, [Arendt, 99]

Historically the Danish Evangelical Lutheran Church was instituted under the reign of the king Harald 1. (Harald Bluetooth). [Iversen, 99] As the church has been implemented by the Danish state the inauguration of new priests would also be controlled and decided by the state. In that sense other religions in Denmark at the time, slowly died out as Christianity was the only religion the people where able to practice. It could be said that the strong connection between the state and the church in Denmark made Christianity a religion empowered from above. To this day, the state and church are still connected in this way and priests are still employed through the state. In this sense it is the state that takes responsibility for the Danish religion and not the Danes themselves. [Iversen, 99]

As the Danes do not want a religion imposed upon them the relationship of church, the state and the people work in a way that the church, as institution, is paid by and dependant on the government, the population as the great followers, and the church as an institution that take care of the Danish cultural rituals; baptisms, weddings, funerals and confirmations. [Iversen, 99]

THE FUTURE OF THE CHURCH

The discussion about the future of the Danish national church has its starting point from the previous section, which describes the relationship that Danes have with the church today.

There are people who are both for and against the previously described relationship to Christianity because of the lack of Gods words and mission within the major part of the Danish population; the culture Christians. So, where is the national Danish church heading in the future when people do not see Christianity as the biblical narrative but has more diffuse ideas and values about the Christian faith? [Højlund, 99]
In the article “Fremtidsscenarier for Folkekirken” (future scenarios for the national church) by Rolf Jensen it is sought to discuss this future by outlining 4 scenarios for the church. [Jensen, 05]
These scenarios will now be described further in this section.

SCENARIO I - CONTINUITY

The number of members of the Evangelical Lutheran Church is decreasing very slowly, which means that the church in its current state will continue for many years. [Jensen, 05]
In this scenario the church and its meaning to the Danish society does not change, if anything, the church rituals will be more and more forgotten to become part of the culture. The traditions and rituals of the church will keep on being and becoming a large part of the Danish culture. [Jensen, 05]

SCENARIO II - DIVERSITY

The church and the belief becomes more and more individualistic - a personal belief in a personal God. The community and support around the Evangelical Lutheran Church will decrease. There is a search for spiritual answers outside of the church. [Jensen, 05]
The Danish people have little faith in authorities and the Danish church will suffer under this as an authoritative institution. [Jensen, 05]

SCENARIO III - SENSE OF COMMUNITY

The values of the Danish community have not been globalized as the media and the product market has, which means that the Danish values are very extreme in an international perspective. The church will be the pleading power between the cultural differences from the globalized world. The church will be what brings the cultures together. [Jensen, 05]
It will take longer to internationalize the Danish approaches and values than the internationalization of the media and trading market - this leads to having national opinions in a global world. As there is a conflict between national and international interests people will turn to the church for a sense of community and the number of church members will rise. [Jensen, 05]

SCENARIO IV - PASSION

People will stop believing in messages from above and at the same time there is a larger focus on the experience economy and less belief in authority. People have high expectations of the Church and especially the value of its stories. [Jensen, 05]
Faith and the belief will be created through dialogue and not through one-way messages coming from above. In this scenario there is a critical attitude towards authority and people want answers to their questions as well as stating their own opinions. The followers of the church become active participants with personal interpretations of the biblical messages – this is where the element of passion comes into play. The Church will become more active in the community – not by its Sunday services, but outside of the church. [Jensen, 05]

COMPARISON

The 4 scenarios are each plausible in their own way as they all rely on current facts and statistics. The interesting part of this investigation lies within seeing that the position of the church never will go back to its original state - but change according to its surroundings and in that sense move forward. In the first scenario the church changes to become a large part of the culture, in the second people search away from the church in a belief in their own personal God.
In the third case the church changes toward becoming a safe place - the creator of community in a global world and in the fourth the passion for the faith is revived.
One common factor is still that the Church will never be able to go back to institution it once was. The church in Denmark is highly dependent on the population - is highly dependent on the culture.



Ill. 65

Ill. 65



Ill. 66

In Denmark the Church, as an institution closely connected to the government, does not ask you to attend ceremonies or to make any personal sacrifices in order to stay true to your religion and/or state. This raises the question of why people should attend or visit Church for any other reason than baptisms, funerals, weddings or confirmation – Rituals that are increasingly becoming more cultural rituals than religious statements to the Danish people. The major part of the Danish population has and will grow up being taught about the Danish Church through their culture. When dividing the Danes into different kinds of religious Christians, these "Culture Christians" form the largest part of the community, whereas the "Church Christians" and "Charismatic Christians" only constitute a smaller part.

THE CHURCH IN THE COMMUNITY

For the Church to regain its religious use and mediate between the different kind of Christians, there will have to be a larger versatility in what the Church has to offer to the community and it will have to represent more than its religious rituals to reach all groups.
In the idea catalogue for this project, the intension for the Church Centre is to function as a meeting place for the community in a more cultural than religious way. This means that the Church should offer the religious rituals as well as functioning as a community centre used by, for example, Girl and Boy Scout groups.
As priest and general secretary of Danish scouts KFUM and KFUK Margith Pedersen states in the article "Organisationernes kritiske solidaritet med Folkekirken" (The organizations critical solidarity with the Church); "Cooperation between the free church child- and youth organizations and the Church is the only way forward if the thresholds between the cultural, church and charismatic Christians shall be brought down." [Pedersen, 100, 99] By this she states that the teachings of the church and the work of the youth organizations could come together to redirect focus back to the church and the religion and thereby mediate between the different groups of Christians.

The discussion of the Danish Church and its future is present in the media today as well as it was in the 20th century. The discussion especially evolve around the subjects of the connection between the state and the Church and whether it is enough to have the Church function as the cultural institution and not so much a religious institution.

In the four different future scenarios for the Church it is discovered how the Church never will be able to go back to what it once was and that the evolvement of the church is highly dependent on the culture in which it is situated. The future of the Church has the possibility to evolve in different directions but the common factor for the future Church scenarios is its function in the community and its meaning to the Danish culture.

DESIGN PARAMETERS - RELIGION

- The Church Centre has to be very open to the community - in use every day.

- Will become a social meeting point.

- The church will have to accommodate more functions than just the ceremonies.

- The Church Centre has to relate to the community and therefore to a smaller human scale than the current development of apartment blocks in the area.

RELIGIOUS ARCHITECTURE

Ill. 67 Water Temple, Japan, Tadao Ando.
Ill. 68 Water Temple, Japan, Tadao Ando.
Ill. 69 Notre Dame Du Haut, Ronchamp, Le Corbusier.

INSPIRATIONAL COLLAGE

Church architecture, sacred arhitecture, places of worship - what constitutes these places? What is it about these places that make believers become closer to God and what makes people quiet down and proceed carefully when entering these spaces?

In the follwing, these questions will be discovered through a series of images that portray places I have visited and experienced myself - places that give a sense of spirituality and sacredness.















Ill. 70 Water Temple, Japan, Tadao Ando.
Ill. 71 St. Mary's Cathedral, Tokyo, Japan, Kenzo Tange.
Ill. 72 La Sagrada Familia, Barcelona, Spain, Antoni Gaudi.

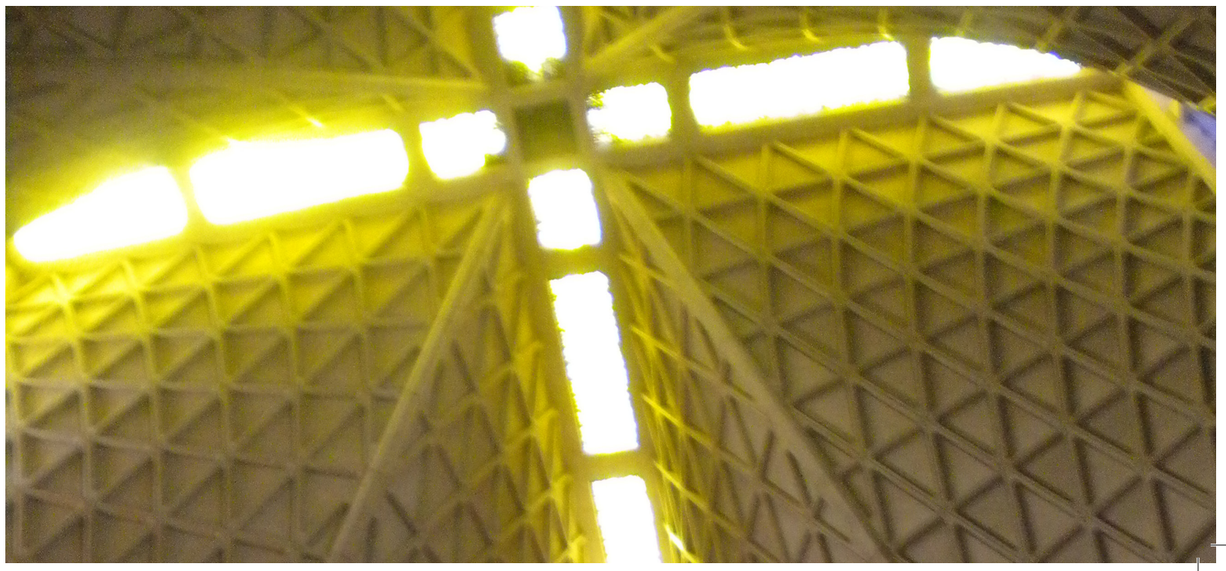


Ill. 73 Saint Mary's Cathedral, San Francisco, California, Pier Luigi Nervi
Ill. 74 Islev Church, Denmark, Johannes Exner.
Ill. 75 St. Mary's Cathedral, Tokyo, Japan, Kenzo Tange.
Ill. 76 Saint Mary's Cathedral, San Francisco, California, Pier Luigi Nervi

















Ill. 77 Grundtvigs Church, Copenhagen Denmark.
Ill. 78 Bagsværd Church, Bagsværd, Denmak, Jørn Utzon
Ill. 79 Church of Light, Japan, Tadao Ando.
Ill. 80 Balinese Temple, Bali Indonesia.





Ill. 81 Tanah Lot Temple, Bali, Indonesia.

SUMMARY

When is architecture religious? - The point of the religious architecture is basically to create a space that accommodates the gathering of people for a ceremony. As seen in the images the ceremony can take place in any kind of building and even outside under the open sky. Here is when the architecture comes into play - it sets the frame for the gathering and seeks to enhance the religious experience.

When the framework for the gathering space is set, another major factor of religious architecture is the atmosphere that enhances the religious experience. The atmosphere of a religious building is unique compared to any other built structure. This atmosphere is mainly created by the liturgy of the space - the actions that are or have been taking place within the space, sometimes for centuries. [Crosbie, 06]

The elements of the atmosphere are difficult to describe as they rely on an individual perception of the space, and the atmosphere is created by elements in the architecture and aesthetics of the place.
The previous images are all from places that I have visited and experienced myself, why my perception of the architecture is very subjective and might have been experienced differently by others. The images become useful in my wordless description of the religious architecture in order to express the effects used to create the religious atmosphere.

In the images it is evident how spaces are constituted by their atmosphere, which enhances the sacredness of the place and is seen how sacred architecture is more than just the architectural and aesthetic frame.

The images portray different religious spaces that do not solely belong to Christianity, but also to Buddhism and Hinduism. Across these various religions there are common factors in the sacred places such as the atmosphere of the building, the spatial quality and the ceremonial rituals within.

The atmosphere of the Buddhist water Temple in Japan by Tadao Ando can be compared to the aura of Bagsværd Church by Jørn Utzon in Denmark or by the outdoor ceremonial spaces in Indonesia, as they all religiously brings a sense of calmness and devotion.

As the atmosphere only exists in the architecture after it has been built and therefore cannot be designed, it is only possible to try to use architectural elements in the design to enhance a religious experience in the space. The religious atmosphere should be enhanced by a combination of elements in the place of worship. The question is; what are the basic elements of Religious Architecture?

In the following sections the elements of religious architecture are divided into three main subjects. The subjects are derived from looking at the images in this section. The effects of religious architecture is divided into the three elements; SOUND, LIGHT and MATERIALITY.

DESIGN PARAMETERS - RELIGIOUS ARCHITECTURE

- The design parameters for Religious Architecture are subdivided intp three major elements; SOUND, LIGHT, and MATERIALITY.

SOUND

The importance of sound or acoustics within the church bounds in the sound being a symbol of the sacred and as such is a fundamental experience to a church community. The sound quality in a room, and especially in a church building is the factor that sets the athmosphere.

ARCHITECTURAL ACOUSTICS

Architectural acoustics are defined as the way the sound behaves in an enclosed space. The different acoustic conditions that explain the quality of acoustics in a closed space are;
- The distribution of sound from a source to the receiver.
- The reverberation timer.
- Acoustic reflections. (Echo, flutter echo)
- Sound insulation and background noises. (E.g. air condition system) [Kirkegaard, 04]

There are three ways to describe the fields of sound in an enclosed room; 1) wave theoretic architectural acoustics, 2) geometric architectural acoustics and 3) Static architectural acoustics. These are given to be an estimation of the sound propagation in a room compared to its dimensions and the wavelengths of interest. [Kirkegaard, 04]

WAVE THEORETIC ARCHITECTURAL ACOUSTICS

The wave theoretic architectural acoustics describe the natural frequency of an enclosed space given by its dimensions.
The natural frequency should be evenly distributed in a space.

GEOMETRIC ARCHITECTURAL ACOUSTICS

This is a graphic method over the sound and its reflections in a given room with a given shape. (Ill. 82-84)

By using the geometric architectural acoustics it is possible to determine acoustics defects in a room such as echo, flutter echo and dead zones. The outcome will only tell something about the sound propagation but not the strength of the sound. [Kirkegaard, 04]

STATISTIC ARCHITECTURAL ACOUSTICS

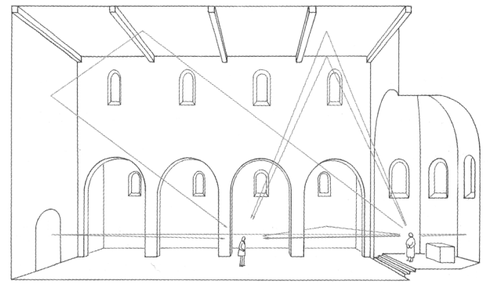
This has to do with the sound absorption of surfaces, stationary and transient energy density and reverberation timer. The statistic architectural acoustics are used to approximate some of the typical acoustic characteristics using an average value of energy density.
All materials have a sound absorption coefficient which shows it ability to absorb sound within the frequencies of 125, 250, 500, 1000, 2000, and 4000 Hz. [Kirkegaard, 04]
Stationary and transient energy density is a

calculation of the sound pressure level in a combined sound field in a closed room. The sound pressure level in a room is defined from the sound intensity and the sound effect, The sound pressure s measured in dB.
The reverberation time is dependent on the room dimensions, its surface materials and things and people in the room. The reverberation time measures the time it takes for the sound pressure to decrease by 60dB after the source has stopped. [Kirkegaard, 04]
The property and structure of the surface material can have an effect on the sound waves by, for example, scattering of high frequencies but not lower frequencies. (Ill. 85)
The use of the room determines the preferred reverberation time; for a church the preferred reverberation time is for speech is 0,8s [Kirkegaard, 08] for the organ and choir 2,5-3,0s. [Neufert, 00]

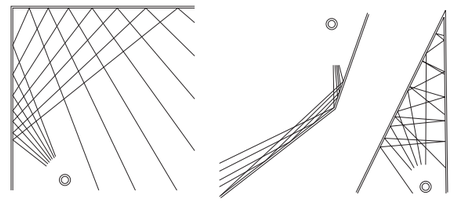
CHURCH ACOUSTICS

The quality of the church acoustics has to be able to adapt to several situations as the sound reaches the congregation from different sources; priest, organ, choir. As the church in this sense has more than one zone its complexity in terms of architectural acoustics is apparent. [Stegers, 08]
Another considerable factor of the church is that the amount of people gathered for the services is very changable. This can go from a full church on some sundays and only a few people on others.

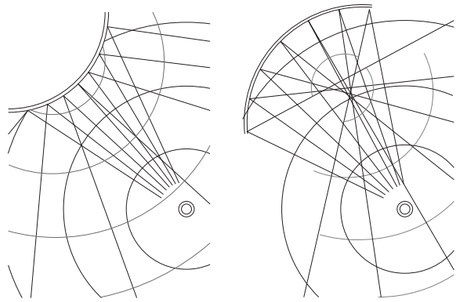
In the following church acoustics will be further explored through examples of churches where the acoustics have a central factor in the design.



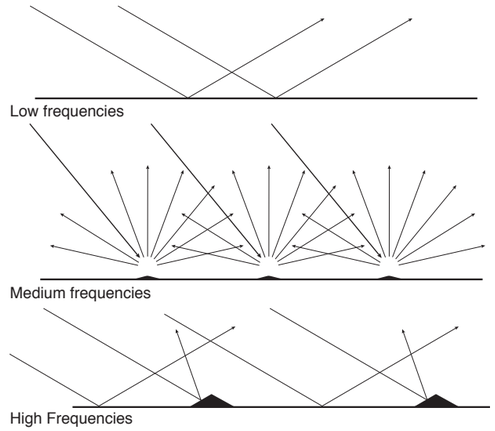
Ill. 82 Relections in a given room.



Ill. 83 Reflections on different angles of walls.



Ill. 84 Reflections on concave and convex surfaces.



Ill. 85 Reaction of reflections of different frequencies on a scattering material.

BAGSVÆRD CHURCH

Bagsværd Church is designed by Jørn Utzon and finished in 1976. The church lies just outside of Copenhagen, Denmark.

The sound in a church space has a very special quality that through the combination of the acoustic character of church space and the distinctive sound sources, In Bagsværd Church it is evident how the interior space becomes an instrument in itself both visually and physically and gives that unique experience of the sound in a House of God.

In the sacral space of Bagsværd Church it is sought to solve the problems between the sound demands for the different sounds in the space.

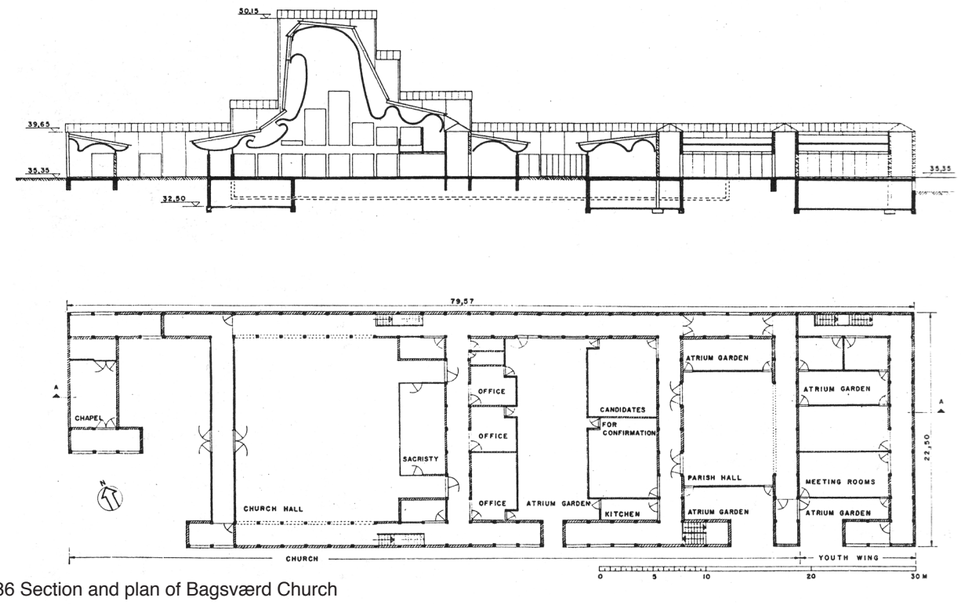
In general Churches need to comply with the conflicting acoustic demands of speech, organ music and choir being in the same room. The main focus has been on the organ and church music, but at the same time it is sought to optimize the speech of the priest to the most possible extent. This is done by placing the congregation as close as possible to the alter and the pulpit, and by the low ceiling to the back of the church that reflects the sound to the rearmost benches. [Bløndal, 05]

The ceiling has a wavy shape which is optimizing the sound, not only from the priest to the congregation but also by the placement of the organ in the part of the high ceiling to achieve a longer reverberation time for the organ music. (Ill. 88)

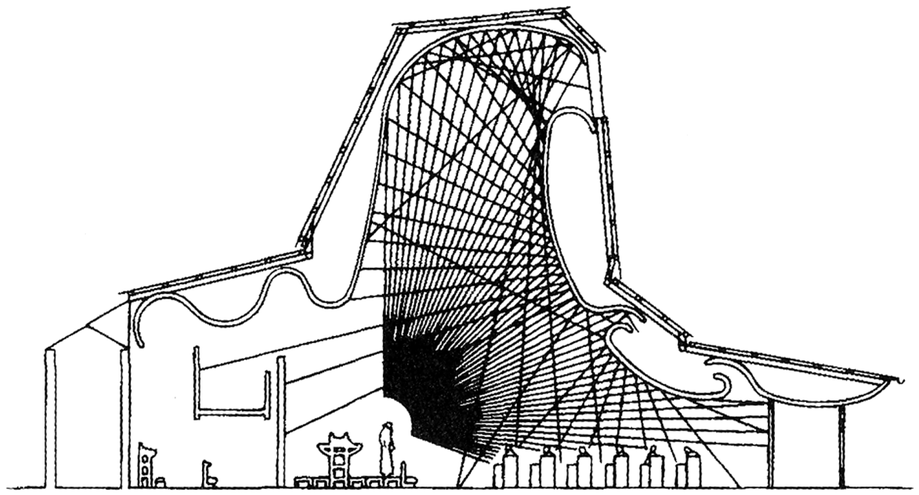
The ceiling above the church benches is shaped by convex shapes that disperse the sound waves and stops the sound from having focus in only one spot. (Ill. 87) In the higher parts of the ceiling the shape becomes concave to focus the sound in spaces above to avoid that these reflections reach the audience.

The reverberation time of the sacral room is defined by the hard surface of the concrete ceiling having a low absorption coefficient and the softer textiles and carpets, and the wooden benches compensate for this with their higher absorption coefficient. [Bløndal, 05]
The acoustic elements of Bagsværd church are highly evident in the whole expression of the interior space and therefore become part of the sacral experience.

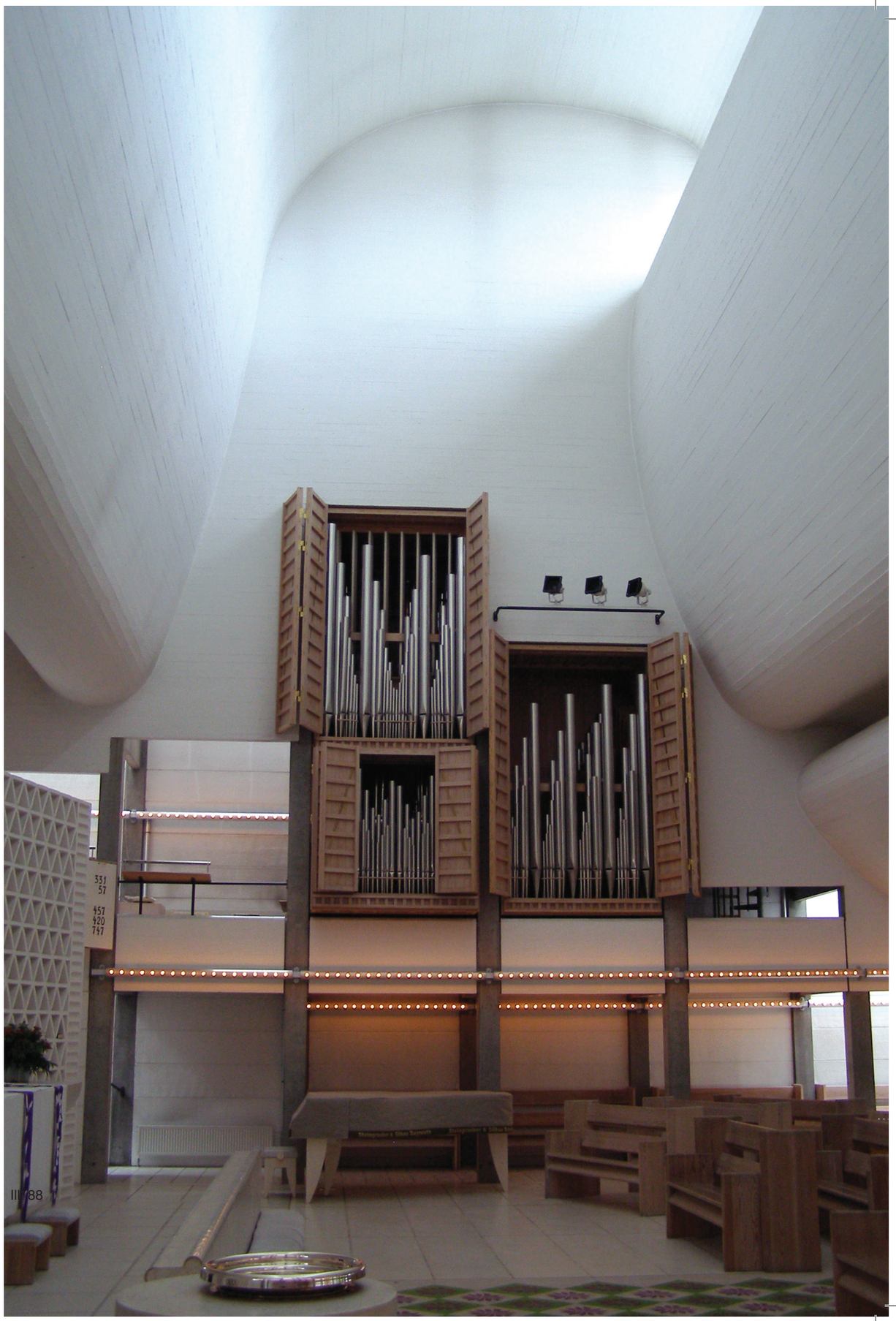
The sacral room is around 3.000 m^2 and has a reverberation time of around 3 sec. which is very good for the church organ and choir. In terms of speech this is not optimal, but the shape of the ceiling evenly distributes the sound of speech to the audience and objective measuring show that the comprehension of speech is better than first anticipated. [Bløndal, 05]



Ill. 86 Section and plan of Bagsværd Church



Ill. 87 Geometric drawing of the sound radiation i Bagsværd Church.



Ill. 88

SOGN BENEDETG CHAPEL

Sogn Benedetg chapel is designed by Peter Zumthor and finished in 1988. The chapel lies in Somvix, Switzerland.

This small chapel is only about 70m2 and has larch cladding on the exterior and thin wooden pillars of laminated pine in the interior.
The meeting of the wall towards both roof and floor is designed to become part of the sacred experience. Before the wall reaches the roof, a band of window is put in to give a sense of a floating roof. This is where the daylight penetrates to enter the room and gives a sense of lightness to the interior. The church benches are placed centrally and the aisles are towards the walls. The meeting between the walls and the floor does not create an end of the room as the wall continues underneath the floor to give a sense of a floating floor. (Ill. 92)

The plan of the church is shaped like a pointed oval which means that the reflections off of the walls are reacting according to the concave effect, which focuses the reflections to reach the congregation.

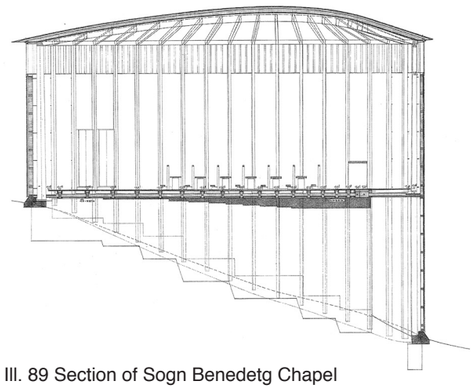
The priest is placed to the rounded end of the oval and is pulled back a little from the focal point of the sound. The sound reaches the congregation and is evenly distributed across the space which is only about 13,5m long.
The short length of the chapel means that the reflections off the walls happen quickly and the sound from the priest will be reinforced. [Stegers, 59, 08]

The direct sounds from the priest reach the whole room and are again reflected to the whole room. The second reflections reach only the back end of the Chapel. (Ill. 90) This works very well as the receivers in the back end of the room will hear the direct sound later than the front audience.
The part of sound from the speaker which is darker radiates from behind the priest and reflects hereafter to reach a focal point right in front of the altar before it is spread out to the congregation. (Ill. 91)

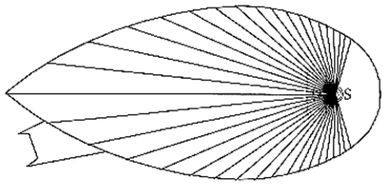
Theoretically the oval shape would not be ideal for a church room as there is a great risk of echoing and it creates an acoustic focal point. Zumthor has worked around these problems by choosing materials that help reducing the strength of the sound waves for walls, ceiling and floor and by designing the roof slightly pitched. [Stegers, 59, 08]

The material and construction of the chapel walls, roof and ceiling absorbs the low frequency sounds while the medium and higher frequency sounds are scattered in the space evenly, as before mentioned. Another aspect of the construction is that the floor in the chapel is hollow (Ill. 89), which gives it a different resonance compared to a normal floor. [Stegers, 59, 08]

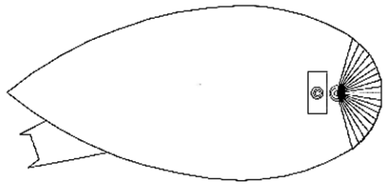
The acoustic qualities of the pointed oval together with the choice of materials give a very intense acoustic experience of the space.



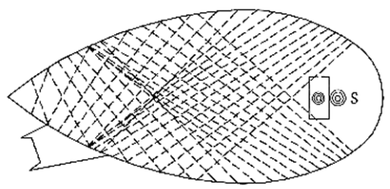
Ill. 89 Section of Sogn Benedetg Chapel



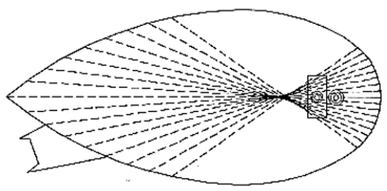
Direct sound



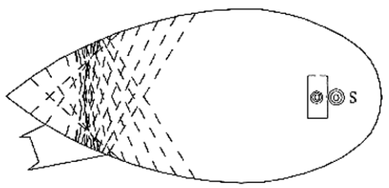
Direct sound



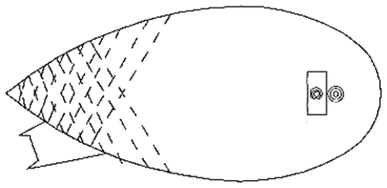
1. reflections



1. reflections



2. reflections



2. reflections

Ill. 90 Sound path in the interior.

Ill. 91 Radiation of darker sound.



SUMMARY

Through the investigation of acoustic parameters, the importance of the acoustic design of the Church interior is apparent. The acoustics in a Church is marked by certain characteristics that therefore has a lot to do with the experience of the church building both spitiually, psychologically and physically.

Through the case studies of Bagsværd Church and Sogn Benedetg Chapel it is seen how the acoustic design for a sacral room has different solutions.
Bagsværd Church has a focus on the ceiling as the main reflector of sound whereas the focus of Sogn Benedteg Chapel has been on the lateral reflections of the walls. The different methods for these to cases shows the complexity and possibilities of acoustic design. In the one case the acoustic element has a more physical and visual quality in the sacral room, whereas the acoustic quality in Sogn Benedetg Chapel is more hidden within the interior.
The common factors do the two cases is though, that they are remarkable in terms of their acoustic experience.

DESIGN PARAMETERS -SOUND

- The church will have to accomodate the different uses of the sacral room to the best possible extent

- For Church organ and choir the reverberation time should lie between 2,5-3,0s.

- For speech the reverberation time should be around 0,8s.

- Acoustic design has to contribute to the interior experience and atmosphere in the Church.

-The acoustic design has to be designed advantageously for both speaker/organ/choir and receiver.

- The radiations and reflections from the sound source should be evenly distributed towards the receivers.



Ill. 93

LIGHT

“And God said, “Let there be light,” and there was light. And God saw that the light was good. And God separated the light from the darkness. God called the light Day, and the darkness he called Night. And there was evening and there was morning, the first day.” [Genesis 1.3-1.5]

The genesis tells the story of the beginning of life and the prerequisite for life. God created light as one of the first things, which tells us about the importance of daylight for living beings.

DAYLIGHT IN CHURCHES

As a central element of the Christian faith, lighting design for churches is important and has been done in many different ways with different effects for centuries and is highly a part of the spiritual experience. (Ill. 94-95)

The daylight in a church is also important for how the congregation perceive the liturgy and ceremony, as the light can help focus attention to certain areas in the church on the other hand leave parts of the church darker for silent prayer. [Stegers, 08]

The light and glazing in a church room higly characterize the interior space, which means that the daylight effects the experience of the room as for example light/heavy or open/closed. This, in interaction with the materials and the structure of the surfaces of the interior will have an impact on the spiritual atmosphere and experience for the visitor.

DIRECT AND DIFFUSE LIGHT

Visually the effect of daylight in a room highlights the contrasts of the interior. Daylight enters a room as both direct and diffuse light. The direct light will be reflected on the interior surfaces to become diffuse lighting in the room. This effect can be regulated through the choice of material and can also be used to distribute light further into a building. The direct light will cast sharp shadows whereas the diffuse light will cast softer and more blurred shadows.

ILLUMINANCE

The term illuminance is used to determine the brightness of the light in a certain place in a room. The illuminance is a significant factor for, for example, the priest when he reads passages from the Bible. The illuminance is measured in lux. There are no specific demands for church buildings in terms of illuminance, but guidelines are given, for example, for the priest's readings the illuminance will have to be around 200 lux, depending on the room surface reflectance. [Appendix I]

DAYLIGHT FACTOR

The daylight factor defines the degree to which the light contributes to the illuminance of the interior space. In the Danish climate the daylight factors are evaluated from cloudy skies, which is the most common in the northern climate. The daylight factor changes according to the dimensions of the room, which also contributes to changes in the quality of light.
In the sacral room in a church building, the daylight factor should be between 2-4% before the services can be held without artificial light. [Stegers, 08]

In the following the experience and effect of light in the sacral room will be explored through examples. The church spaces will be described partly from private experiences of the sacral space.



Ill. 94 Henry VII Chapel, Westminster Abbey London, 1503



Ill. 95 Notre Dame du Haut, France, 1954

CHURCH OF LIGHT, IBARAKI, OSAKA, JAPAN, TADAO ANDO, 1989

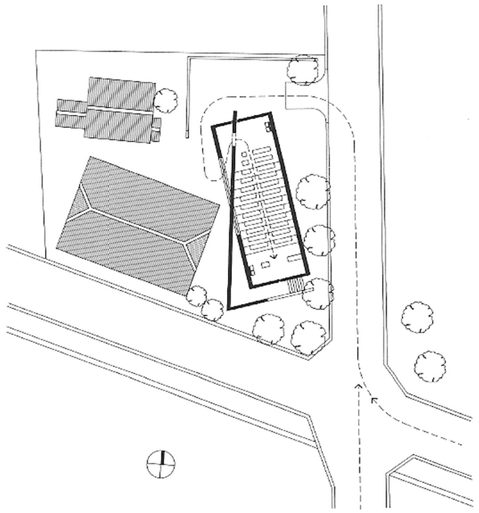
When entering the sacral room of the Church of Light, you're immediately struck by the intimacy of the space and its one large focal point, the cross, which relates the purpose of the space clearly. The large cross, which is cut out from the end wall is the symbol of Christianity and is, as such, the focus of the religion and the focus of the sacral space. The cross actualizes a sense of humility towards the belief as its light overpowers any other element in the room. The simpleness of the sacral room lies within the use of mostly perpendicular lines and no ornamentation. The rectangular room is at one point pierced by a diagonal wall coming in through the western wall and becomes the entrance to the sacral space. (Ill. 96)

The spatial emptiness is enhanced by the 2 daylight openings in the sacral room; one on the right hand side of the room and the cross. By carving out the cross from the massive concrete wall to let daylight in, a clear point of focus in the room is established. The cross is situated on the southern wall and direct rays of sun can enter through the narrow slits. (Ill. 97) This means that the direction of the entering sunlight will change according to time and thereby give a sense of the time of year and day.

All churches are built up around the symbol of Christianity - the cross. The difference in the Church of Light is that, whereas in other churches the cross is lit up, the church of light constitutes a cross which IS the light. The cross highly symbolizes the a path in life and plays on the concept of following the light or a "light" path in life, shying awa from the darkness - from the devil.

Physically, the light from the cross reflects on the concrete surfaces of the interior and makes them shine and glint, and again focuses the attention towards the light source - the cross. The reflections give a green or blue tint to the otherwise quite dark space. In order for the cross to have this strong intense effect, the room around it is consequently quite dark. The walls of grey concrete and the dark wooden floor do not "light up" the space, but darkens it to create focus on the light from the cross. The materials stand in their raw form and nothing is hidden. The contrast between light and dark enhance each other and the dark becomes darker and light becomes lighter which gives the space a mystical character. In a sense it is a simplistic interpretation of remembering, not the agony of Christ hanging on the cross, but the cross as symbolism of Jesus and the glory in following the Passion. [Baek, 09]

In the church of light, the light is not used for the illumination of form and shape but becomes the form and shape itself. Where the light is pulled into the space - at the cross and by the intersecting plane it is as though the light has had its own power that has cut through the planes itself. The light cuts through the solids. [Plummer, 95]



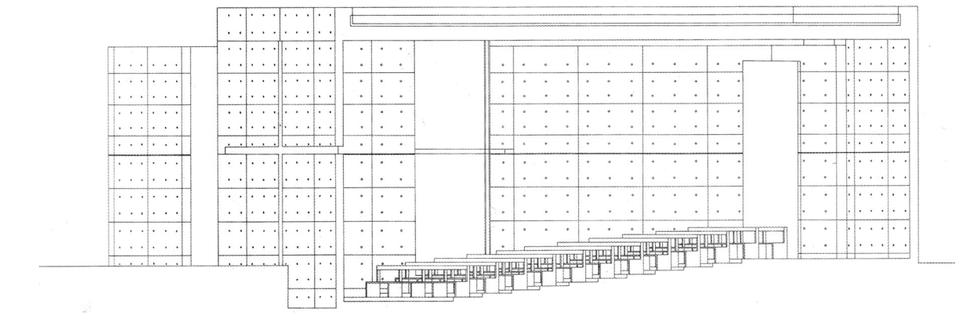
Ill. 96 Plan of the church of ligth.

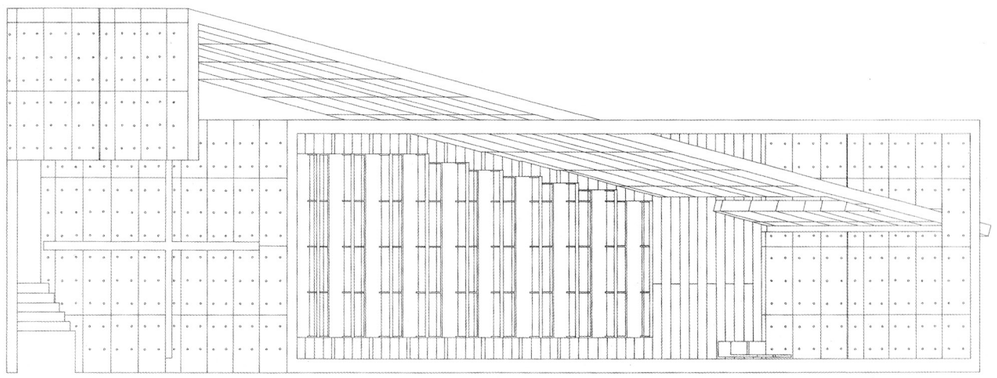


Ill. 98 The Intersecting wall marks the entrance.



Ill. 99 The light enters the room in a clear cross shape.





Ill. 97 Sections of the church of light. Above South-North section, below west-east section.



Ill. 100 The sacral space.

NOTRE DAME DU HAUT, RONCHAMP, FRANCE, LE CORBUSIER, 1955.

On a study trip to Italy in the first year of my studies in architecture we visited the church Notre Dame Du Haut, which lies on a somewhat remote hill-top in France near the German border. The church is reached from climbing a small hill on the southern side of the church. From this, the Church becomes visible with its white painted concrete walls and the heavy darker colored roof that plays against the backdrop of the clear blue sky.

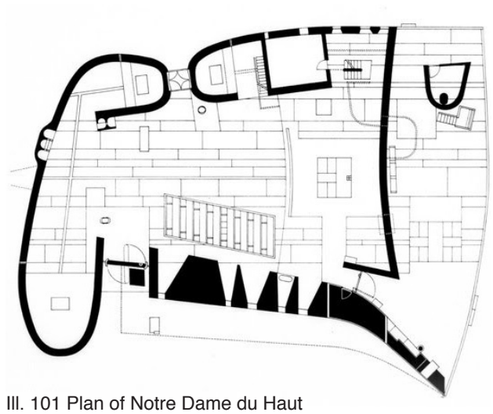
At Notre Dame du Haut, the church sermon is not restricted to the interior space, but can be held outside where pulpit altar and large cross is situated. The interior space is quite dark, which accentuates the penetrating lights from the windows. The openings in the walls and roof are separated smaller windows which lets lights in small areas through the thick concrete walls. On the southern wall this expression is exaggerated by giving the wall extra thickness to create an effect of light shafts that lead light into the room, but is also greatly reflected on the surfaces on the holes in the wall.
The windows on the south wall are decorated with colored glass that also reflect into the interior and becomes a part of the space ambience. The window “mosaics” are designed by e Corbusier and are inspired by the landscape and nature in which the church is situated. [Pauly, 08]

From the outside the darker concrete roof lies heavily on the white walls, but in the interior the roof seems to float on top of the walls because it is lifted by small pillars to create a fissure of about 20 cm that lets light into the room and accentuates the shape of the roof that hangs into the sacral space. (Ill. 108)

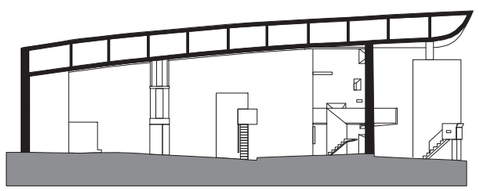
The interior room consists of the sacral room and smaller chapels connected to it. These are all rounded shapes that are lit from above by skylights. In the sacral room the light enters through a row of windows pierced in the thick concrete wall on the right hand side. As the light in the smaller chapels is coming from above, the effect is that the sacral room becomes secluded because of its darker character. The illuminance of the smaller chapels gives them a private atmosphere for private prayers.

The light sources in Notre Dame du Haut comes from many various places which seem somewhat coincidental - such as the circular holes in the wall behind the altar and the different size windows on the side walls. This means that the room has a lot more different impressions to take in for the viewer than in Tadao Ando’s Church of Light and there are more aspects and visual shifts in the room - several orientation points.

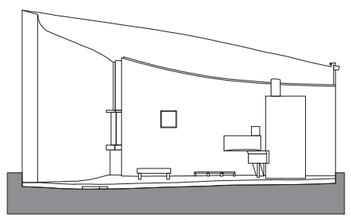
The overall lighting concept for the church is to let light in through smaller cut-outs in the walls and ceiling that lets light in, in more focused areas. The effect means that the difference between light and dark is accentuated and the contrast between light and dark - light source and dark surface becomes clear.



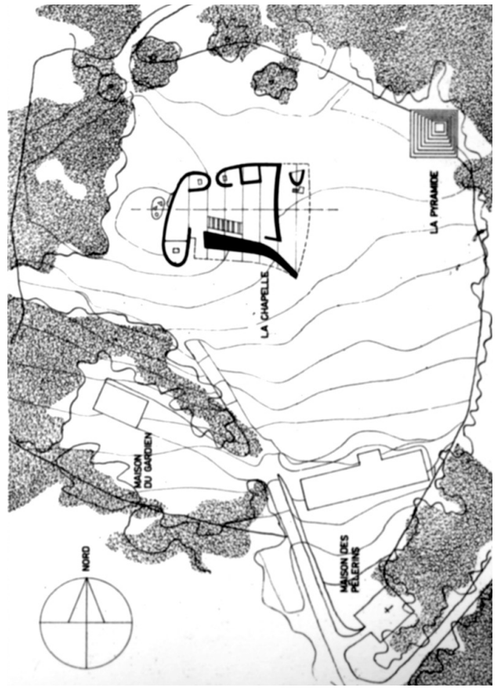
Ill. 101 Plan of Notre Dame du Haut



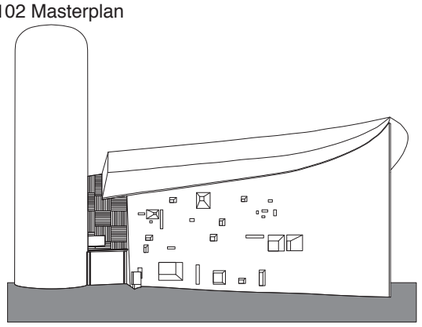
Ill. 103 Section of Notre Dame du Haut



Ill. 104 Section of Notre Dame du Haut



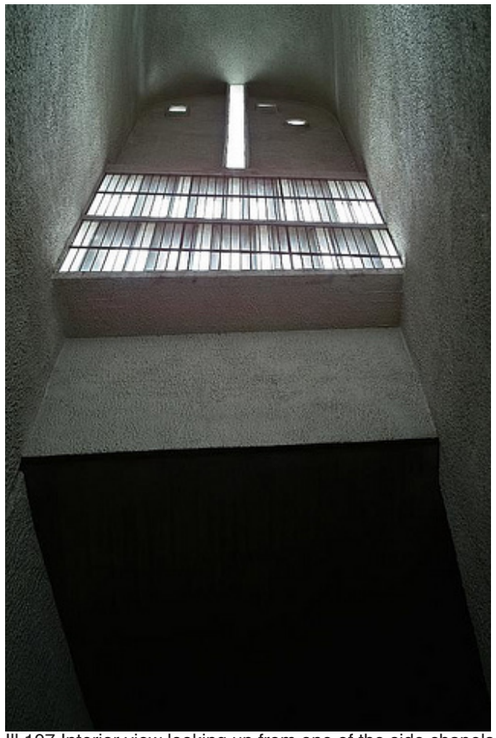
Ill. 102 Masterplan



Ill. 105 South Elevation



Ill. 106 Interior view from the south side Chapel



Ill.107 Interior view looking up from one of the side chapels



Ill. 108 Illumination in the sacral room

SUMMARY

Light in Churches is very important for the religious experience of the sacral space. The investigation of the two examples show how the light can be used to create focus points within the buildings that catches the attention of the viewer. Light is also used to accentuate the texture and surfaces of the interior spaces and define the scale of the room. In Le Corbusier's Notre Dame du Haut, various different lighting effects and inflow of light is used to control the amount of light reaching into the room - the light sources vary in shape and size to accommodate light differently on its different parts and surfaces. The light enters from above in the side chapels, from the side in the sacral room and is used to mark the shift between wall and roof. On the contrary, Tadao Ando's method for the lighting is simpler with only the large cross and a side window accommodating all the light flow in the room. In both cases the controlled and focused illumination removes the amount of diffuse lighting and is a large part of the sacral character of the room.

DESIGN PARAMETERS - LIGHT

- Use the light to define the interior spaces.

- Use light reflections to enhance the texture of the materials.

- Enhance contrast between light and dark in the sacral room.

- The daylight factors and illuminance of the room must comply with the use of the sacral room in certain areas. (E.g. reading at the altar)



Ill. 109 Inflow of light in Notre Dame du Haut, Ronchamp

MATERIALITY

As seen previously, religious architecture have many different expressions and materials. The choice of material has a lot to say for the overall experience of the sacral space and has a great effect on the perception of the viewer/ visitor. Especially in Church Architectecture this perception is important for the visitor and it should seek to enhance the religious experience. [Crosbie, 06]

Within the subject of materiality lies a number of sub-elements that help to form a more detailed description. Here, elements of texture, structure, symbolism, scale, sense of space, construction and spatial quality become the defining factors.

The definition of materiality in this project constitutes the architectural frame and aesthetic elements placed within.

In this section the discussion of materials and construction in church architecture wil be used to study the effect of the architectonic expression on the sacred space. The character of the three churches; St. Mary's Cathedral in Tokyo, Japan by Kenzo Tange (Ill. 110), Grundtvigs Church by P. V. Jensen-Klint (Ill. 111), and St. Henrys Ecumenical Chapel, Turku, Finland by Matti Sanaksenaho (Ill. 112) will be looked at in terms of spacial quality, materials, texture, construction, scale, symbolism and sense of space.

The case studies are chosen because of their use of material and structure that seeks to enhance a tactile effect in the building and has a sanselig effect.



Ill. 110 St. Mary’s Cathedral, Tokyo, Japan.



Ill. 111 Grundtvigs Church, Copenhagen, Denmark.



Ill. 112 St. Henry’s Ecumenical Chapel, Turku, Finland.

THE CONCRETE CHURCH

St. Mary's Cathedral, Tokyo, Japan by Kenzo Tange is built in 1963-64.
The Church is constructed of reinforced concrete with an exterior stainless steel cladding.

EXTERIOR EXPRESSION

From above, St. Mary's Cathedral forms the shape of the Christian symbol - the cross. (Ill. 113) This resemblance of the cross is not evident in the same way when seeing the church from ground level and the idea of the cross as a symbol therefore becomes played down to an understated symbolism. This means that the use of the cross symbol does not become a confrontational aspect to the architectural expression.

The walls of the Church are constructed of double curved hyperbolic paraboloids that stand perpendicular to each other. In between the eight paraboloids is placed long glass panels that brings light into the church interior from narrow slits in both the roof and at the end of each of the cross arms. These mark the entranceways to the church. Again, this is an understated symbolism of entering or exiting the Church through a "gate of light".

The exterior of the church changes character when moving around the building as the light reflects on the steel exterior. The height of the church walls changes and creates an exterior direction of the building and emphasizes the east-west direction. (Ill. 114)

Surrounding the large cross that constitutes the sacral space, lies smaller rectangular concrete structures that contain among other things; the baptistery and baptismal font. These smaller rectangular structures stand as massive and raw structures that contrast with the rest of the building. The massive concrete blocks seem to create a lower base for the high reaching sacral room, which seems lighter on the exterior due to the steel cladding.

INTERIOR EXPRESSION

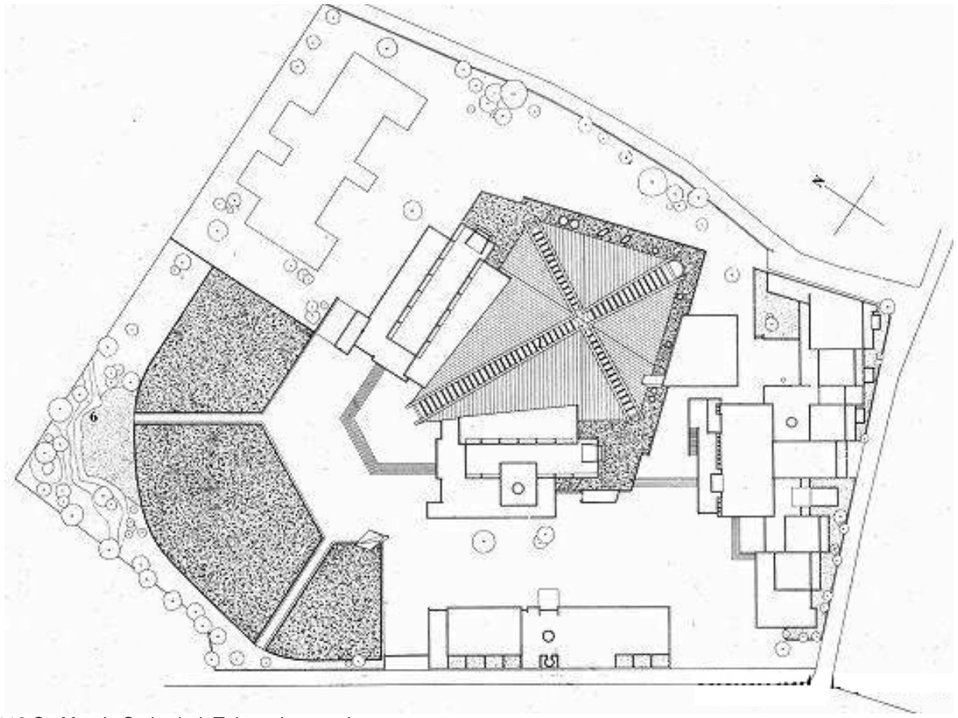
The concrete walls give a cool glow to the interior that has a spiritual effect in the room. When the light enters the sacral space from the narrow slits of skylight and from the four vertical windows at the end of each cross arm, the spiritual and religious atmosphere and glow in the room is accentuated. (Ill. 115)

Having the light enter the room from above mean that the light will flow down along the walls and accentuate the texture of the concrete material and enhances the heavy and rough effect of its surface texture. The concrete elements are not smoothened, but have clear marks from when they were cast and the composition of the construction is therefore clearly visible.

The religious ceremony is centralized in the interior space having wooden church benches placed to create a central aisle along the axis of the cross. The placement of all elements in the sacral room is following the clear symmetry of the plan and therefore constitutes a harmony in the interior space and marks a clear central focus in the room.

The effect of the difference of the exterior and interior materials work well, as the exterior steel cladding reflects the sunlight and give a shiny effect on to the building, giving it a lighter character, while the interior concrete walls and their heaviness becomes accentuated when the sunlight enters the from the roof and reflects the texture of the material structure.

The structure is very monolithic and is as such the symbolism of God as the rock on which man leans. This is highly evident in the interior where the Church has a cave-like expression that surrounds and "protects" the congregation.



Ill. 113 St. Mary’s Cathedral, Tokyo, Japan, plan.



Ill. 114 St. Mary’s Cathedral, Tokyo, Japan, exterior.



Ill. 115 St. Mary’s Cathedral, Tokyo, Japan, interior.

THE BRICK CHURCH

Grundtvigs Church, Copenhagen, Denmark, by P. V. Jensen-Klint is built in 1921-40. The church is constructed as a Roman Basilica in plan and inspired by the gothic period having pointed arches in the nave, supporting buttresses exterior to the choir and being very vertically orientated.

EXTERIOR EXPRESSION

The church is constructed of yellow bricks which was a very ordinary and mostly the peasants' building material at the time. Today, brick is still a very common material in Denmark and is especially used for housing.

The brick construction together with the height of the church gives it a very monolithic exterior expression that stands out in an area of otherwise 2-3 story buildings.

The exterior has a clear expression of being a House of God and references to elements of classic church architecture. The Grundtvigs Church is built in the gothic style with the exterior buttresses that support the monolithic expression of a "heavy" church. Again, the heaviness and massiveness of the building references to the metaphor of God being the rock that supports the people.

The front of the church has a very closed expression but different use of material is used to divide the facade into smaller phases. (Ill.116)
The facade has a clear vertical direction having elements in the facade pointing upwards leading the viewer to look towards the sky - towards God. This is a very strong statement and symbolism that seems like a large arrow pointing you in the right direction.
Surrounding the church is a small housing development built in the same material having the same color. The placement of the housing development that literally surrounds the church makes sure that the visitor will arrive at the church seeing the west facade first.

INTERIOR EXPRESSION

The interior space is stretched long and tall and has a perspective quality where lighter areas are always present at the far end from where the viewer is positioned. The quality of the light entering the room at the end of both the nave and the side aisles accentuate the direction and the point of attention in the building.

The light in the church has a warm glow that is reflected in the yellow interior brick construction and accentuates the texture of the buildings and a construction that is very visible.
The minimalistic approach to the material use makes the space seem very pure and simple with no disturbing elements giving the room a harmonious character that makes it easy to see the space as a whole - there is a strong cohesion of elements because of the repetition of form, material and symmetry. The large tall pillars enhance the monolithic experience and mark the atmosphere of the space where it is possible to reach God. (Ill. 117)

As both the exterior and interior materials are the same there is a strong cohesion between the exterior and interior expression. It is noticeable however, that the detailing of the interior is much finer than the exterior which gives it a lighter expression than the heaviness of exterior facade that seems very closed and massive.



Ill. 116 Grundtvigs Church, Copenagen, Denmark, interior.



Ill. 117 Grundtvigs Church, Copenhagen, Denmark, exterior.

THE WOODEN CHURCH

St. Henrys Ecumenical Chapel, Turku, Finland by Matti Sanaksenaho is built in 1995-2005. The interior of the chapel and its construction is made of pine wood copper plates cladding on the exterior.

EXTERIOR EXPRESSION

The form and shape of the chapel is very simple and easily read for the viewer and has a strong reference to the bow of a boat or a fish. It is placed in natural surroundings and uses the materials of the context within the sacral space which gives a close connection to nature and the site in general.
The exterior copper cladding reflects the sunlight and makes the building light up in the surroundings. This has a symbolic reference to God as the giver and creator of light. The shiny surface changes according to the position of the viewer and according to the weather on the current day and will therefore be ever-changing just as the landscape that surrounds it. (Ill. 120)
The metal exterior does not have the cool glow of for example steel, but has a warmer glow due to the redness of the cobber plates - in time the shining cobber plates will be marked by its surrounding elements and get the green verdigris effect that will give an expression of wear and tear and unite the building and the context even further.

The tactile effect of the shiny red cobber plates and the green matte verdigris is very different and it seems that the verdigris will enhance the Chapel's reference to being a shelter in the forest. The verdigris texture has a softer character and often references to a built structure which has existed for many years.

INTERIOR EXPRESSION

The interior space is very simplistic, elongated and is stripped from any unnecessary elements. The pointed arches give an almost cathedral-like character to the interior. (Ill. 119)
The repetition of the wooden arch construction gives a sequence to the room and accentuates a movement towards the light at the altar. As the light only enters the room at the end by the altar, the effect of the contrasting areas of the congregation's darker seating area and the bright altar position works to create the religious atmosphere in the room. (Ill. 121)

The sacral space has a very warm glow which is mainly due to the material quality of the wood and the way the light enters from only one direction to accentuate a warmth and protective atmosphere. The Chapel is a smaller scale construction which gives the space a more intimate character that together with the warmth of the interior gives a protective scale to the room.

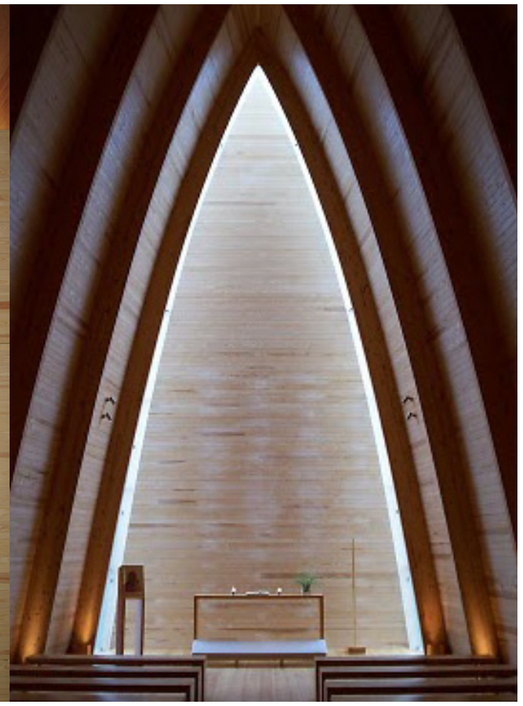
Wood is a "soft" and "living" material which tactile quality is unique and has a natural sequence where not one composition of the material is the same.
Wood, as a material, has natural flaws and imperfectnesses that give a changing character of the material. This help to shape the cozy sense in the space as the wood stands in its raw form unpainted.

The entrance into the sacral room is defined by an almost portal-like narrow path that marks a step into sacral space. (Ill 118) The entrance has a compression and release effect where you are firstly placed in a small space and afterwards a large structure. This effect of the entrance helps to make the sacral room seem larger.

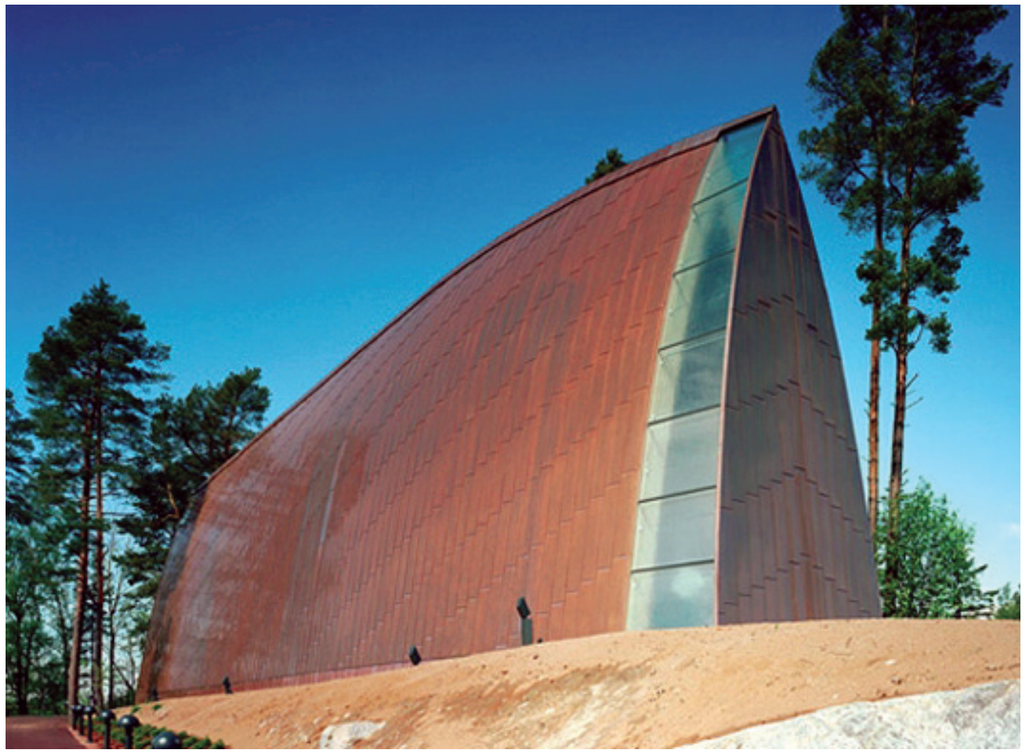
The interior wood structure and the exterior cobber cladding works very well together due, to the warm character of the material. The Chapel is a smaller scale sacral room and is therefore given a cozy atmosphere which the material seeks to accentuate.



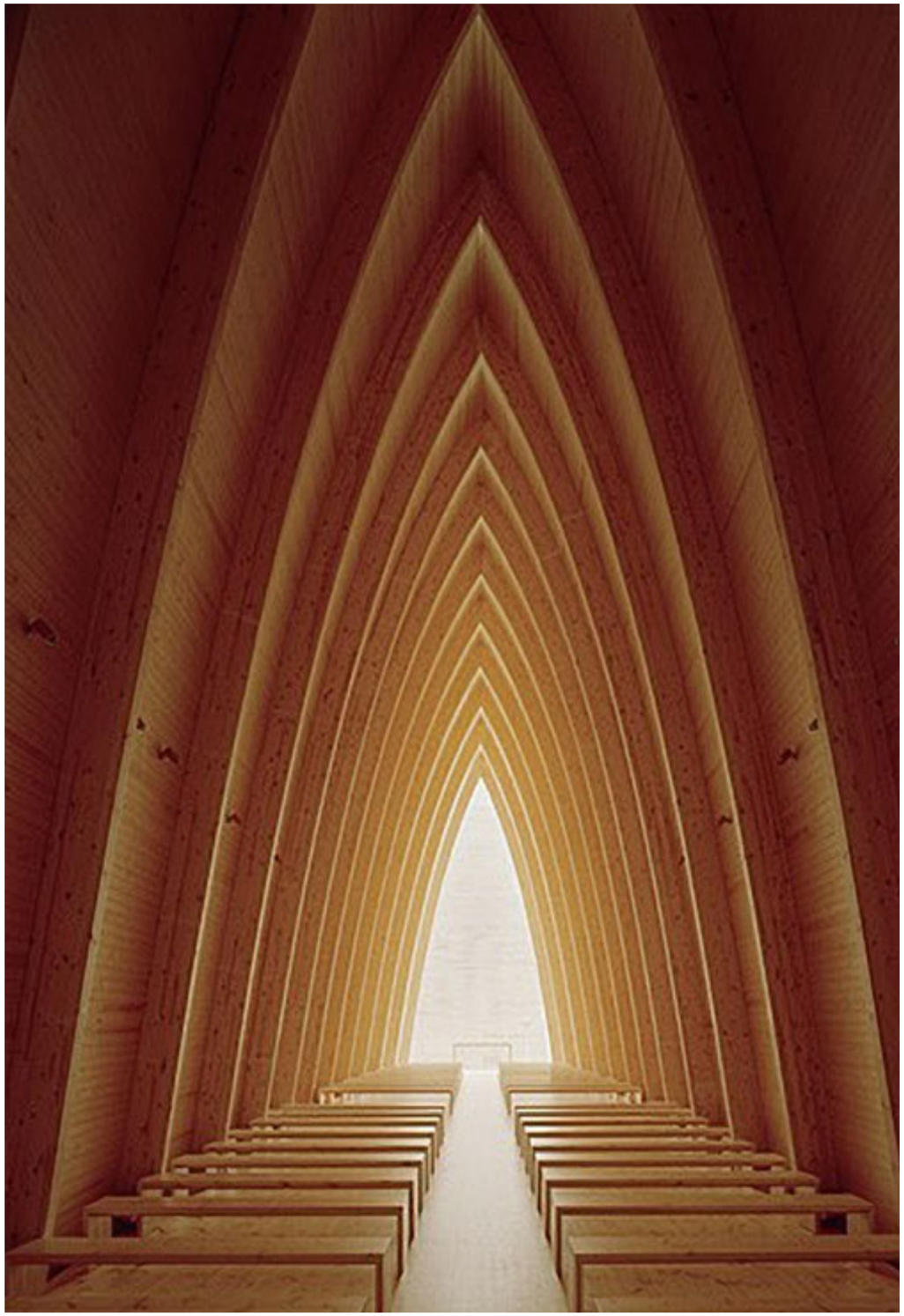
Ill. 118 St. Henry's Ecumenical Chapel, Finland. Entrance.



Ill. 119 St. Henry's Ecumenical Chapel, Finland. Altar.



Ill. 120 St. Henry's Ecumenical Chapel, Finland. Exterior.



Ill. 121 St. Henry's Ecumenical Chapel, Finland. Interior.

SUMMARY

The three examples of sacral spaces have very different characters that all have a spiritual or religious atmosphere. In the three cases, different approaches to aesthetics, materials and architecture all seem to reach to create a sense of the sacred through different effects, symbols and intimations.

The common factors are that light is used in the buildings to accentuate materials, the symbolisms and the important aspects of the sacral space. It is seen how the choice of material and construction has a great effect on the perception of the space and that the play between heavy (massive) and light is used as contrasting elements that give a tension in the room. Also, contrast is evident in terms of light and dark, as all three buildings play with the sunlight by reducing the amount of diffuse light in the room to create clearer borders between what is light and what is dark. By use of contrast, the elements will become accentuated.

Two of the churches are very monolithic and massive in their expression while the third case has a more human and intimate scale. The monolithic will stand out in the surroundings while the wooden church placed in nature will blend more into its environment. This all links back to the intensions of the architects and the context in which the churches are situated.

When designing a new church the aspects of both the exterior and interior expression of the church architecture should be considered as to what the context expects from the sacral space and how it interplays with the surroundings. The materials and light are very important in the interior to create a sense of the sacred space that is both welcoming but also tells the story of the superior God as the creator.



Ill. 122



SUMMARY

When designing sacred architecture it is important that both the interior and exterior atmosphere and the functionality of the sacred space are considered. On the other hand, it is impossible to design a building which is holy or sacred in itself, as the Church will only become sacred because of its liturgy as a function of its ceremonies.

When looking at the sacred spaces, some of the common factors are the use of penetrating daylight, contrasts, materiality and acoustic considerations in the interior. When looking at this materiality and construction of church buildings, it is evident how the expression of the aesthetic elements becomes important in the human perception of the space. In order to achieve a sacred atmosphere in the space, the various elements of the architecture have to enhance each other's aesthetic qualities. For a Church building it is important to consider this cohesion between the various effects in the architecture (light, materiality, construction...) in order to make the individual spatial experience become intimate for a large number of people sharing the same space.

In terms of the architectural expression, this project will try to use a mix of the monolithic cooler materiality constituted by the heavy and massive and the warm intimate quality of the wooden construction that speaks to a smaller scale space of only 200-300m. It is therefore chosen to work with the wooden quality that gives a warm glow to the interior but also use a heavier and more massive material that creates a more monolithic expression.

It is now possible to outline a series of design parameters for the architecture of the sacral space of the Church Centre in Ørestad South.

MATERIALITY

- The sacred room should be designed with a sense of atmosphere that brings the visitor closer to the religion.

- Atmosphere in the sacral room will be sought through working with light and acoustics in the design.

- The design should mediate between the monolithic heavy construction and the warm intimate spatial aesthetics.

- Both wood and a more massive material such as concrete or brick will be used for the design of the Church.

FUNCTIONS

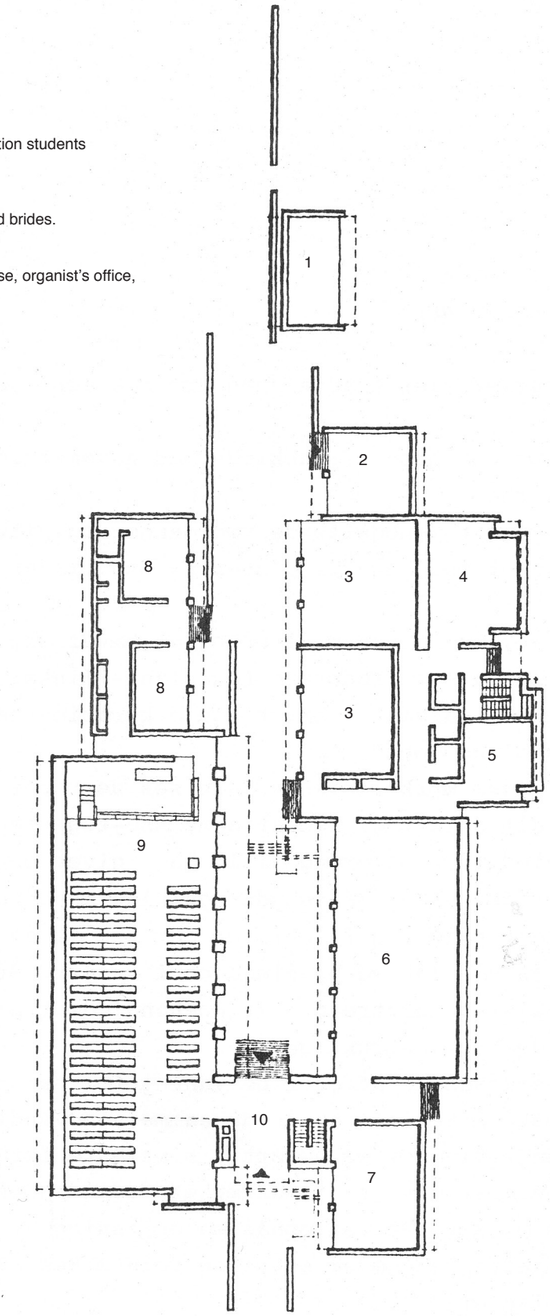
The facilities for the Church and Church center are described in the Idea Catalogue for the project.

The description of functions is somewhat perfunctory and a further investigation of the Church's needs in terms of the room program is performed. It is important to consider the use of the church together with the overall facilities described in the project brief. A ceremony, such as a funeral will need extra space for keeping the coffins and maybe a room for the family to say their goodbyes. It is chosen to look at two scenarios of danish churches to both look at the organization, size and function of spaces. From these other functions such as Chapel and sacristy is derived to be taken into the functions diagram. (Ill. 125, p. 80)

The functions diagram is used to create an overview of the functions needed in the project and also describes the amount of space needed for the Church and Church center.

Buddinge Church functions;

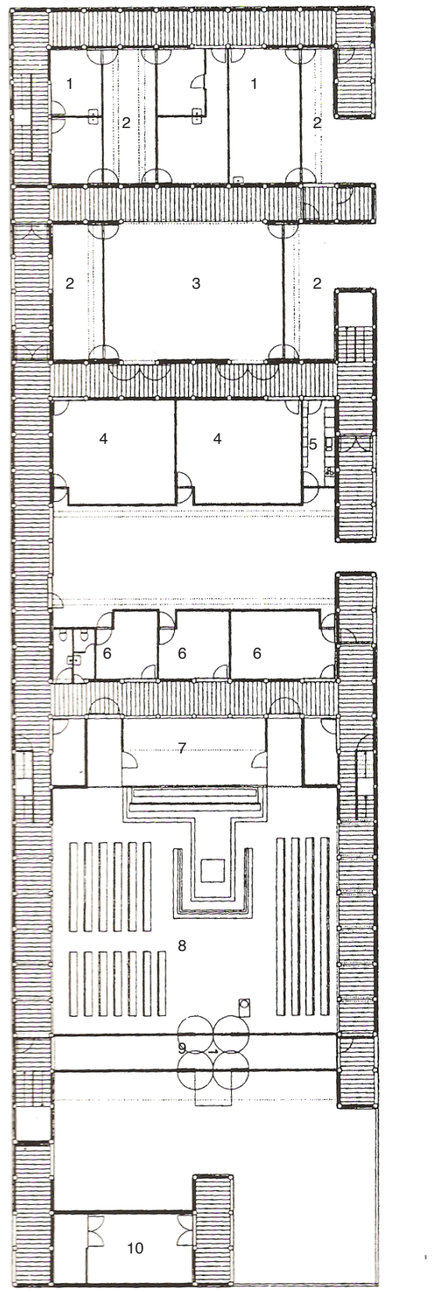
1. House for the gartner
2. Chapel
3. Education room for confirmation students
4. Storage room
5. Ktichen
6. Parish Hall (meeting room)
7. Waiting room for babtism and brides.
8. Offices (priest and sacristan)
9. Sacral room
10. Church Tower, weaponhouse, organist's office, and choir room.



Ill. 123 Plan of Buddinge Church, 1970

Bagsværd Church functions;

1. Meeting rooms
2. Atrium garden
3. Parish Hall (meeting room)
4. Education room for confirmation students
5. Kitchen
6. Offices
7. Sacristy
8. Sacral room
9. Weaponhouse
10. Chapel



Ill. 124 Plan of Bagsværd Church, 1976

	FUNCTION	M²	QUANTITY	TOTAL M²	ACITVITIES
CHURCH CENTRE	Sacral room	200-300m²	1	200-300m²	Ceremonies
	Weaponhouse	20-25m²	1	20-25m²	Entrance, Baptism waiting room, wardrope, childrens play area.
	Sacristy	10-15m^{m}	1	10-15m^{m}	Priest's change and preparation room
	Arrival/departure area	-	-	-	Hearse access, drop-off/departure
	Education room for confirmation students (2)	50m²	1	50m²	Teaching for confirmation
	Storage space	45m²	2	90m²	Storage for furniture, decoration, etc.
	Café	50m²	1	50m²	Relaxation, coffee
	Multi-purpose hall (flexible use)	800m²	1	800m²	Concerts, special events, large ceremonies
	Large Kitchen in connection with hall	40-50m²	1	40-50m²	Communal eating, cooking
	Public bathrooms	10-15m²	1	10-15m²	Wardrope, lockers
	Outdoor spaces	-	-	-	Outdoor stay, urban space, park
	Education rooms (1)	45m²	4	180m²	Teaching, smaller sessions, meetings, choir room.
	Chapel	10-20m²	1	10-20m²	Storage of coffins, relative's goodbye
	Staff facilities (Bathroom and Kitchen)	10-20m²	1	10-20m²	Cooking, Lunch, Lockers, wardrope
	Office space/group rooms	15-25m²	4	60-100m²	Priest's office, Meetings, spare time activities
	Total			1530m²-1715m²	

Ill. 125 Functions program [KK, 04], [Neufert, 00]

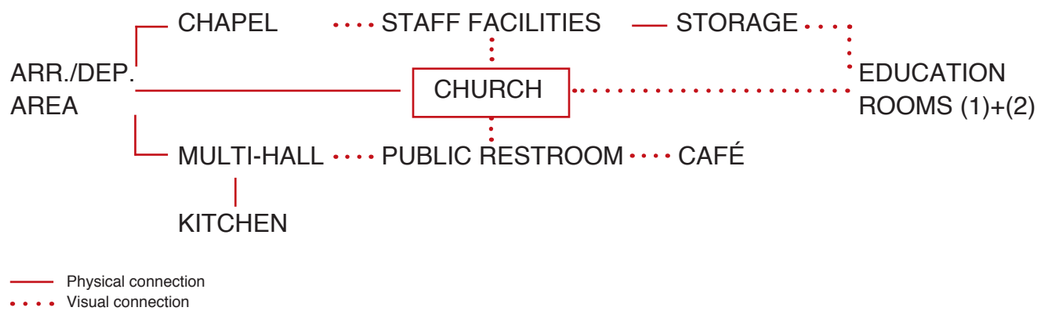
CONNECTING THE FUNCTIONS

The elements in the functions program have to be somewhat interconnected for the Church Centre to have a functionality and flow between the elements of the program.

Some functions such as the sacral room and sacristy have to be closely connected for the priests prepareing and at the same time the arrival/departure area will have to be closely connected to the sacral room entrance to accomodate the hearse for funerals. The other functions such as staff rooms and education rooms do not need the immediate connection to the sacral room, but could be accessed from walking outside - that is, be situated in another building.

The functions can be descriped in two groups as seen in the functions program (Ill. 125); 1) the Church Centre and 2) The Church. In this way the Church lies as a subdivisional element when discussing the Church Centre. Therefore, two function diagrams can be made. One for the Church Centre and one for the Church.

The connections between the functions are shown in a flow diagram. (Ill. 126-127)



Ill. 126 Overall flow diagram for the church centre with the Church as the central point.



Ill. 127 Flow diagram for the Church.

VISION

The project will seek to design a church in Ørestad, which becomes a center for the community and a central part of the urban landscape.
The number of people attending the church in Denmark for normal Sunday services or other weekly church activities is very low. This means that the church will have to accommodate other functions to become a larger part of the community. The functions diagram takes this into account by the implementation of a multi-purpose hall and café. The functions and the activities in the church have to be turned outwards to engage with the surroundings.

The Church interior and especially the sacred room have to have a “religious” atmosphere in the sense that the atmosphere has to encourage and support the church services and ceremonies (baptism, funeral, etc.). The atmosphere will be sought obtained through the use of materialality, sound and light.

The acoustics will be implemented through working with the design of ceiling and walls to give the best geometric acoustic quality. Through choice of material and work with surfaces the wanted reverberation time is sought obtained. The reverberation time organ and choir music is in this case deemed more important than the reverberation time for speech, as music and choir is very important for the religious experience.

In terms of light, the interior spaces will be illuminated to accommodate its purposes. In the sacral room the inflow of light should accentuate the important areas of the room to make them stand out and become points of focus.

Materiality will be implemented in the project by basing choise of materials, structure, texture, and construction on their experiental quality and the aesthetic expression.
From this, an overall summary of the design parameters are given.

CONTEXT;
- The Church Centre is to become a landmark and orientation point for the community.

- The Church Centre is to have a transparency in the interaction with the surroundings.

- The consequence of the tall cityscape is to be considered for the design of daylight in the Church Centre.

- Exterior spaces in the Church Centre have to be sheltered from the wind.

- The Church Centre design has to interact with the intention of bringing nature into the urban space.

RELIGION;
- The Church Centre has to be very open to the community - in use every day.

- Will become a social meeting point.

- The church will have to accommodate more functions than just the ceremonies.

- The Church Centre has to relate to the community and therefore to a smaller human scale than the current development of apartment blocks in the area.

DESIGN PARAMETERS
- CHURCH

SOUND;
- The church will have to accomodate the different uses of the sacral room to the best possible extent

- For Church organ and choir the reverberation time should lie between 2,5-3,0s.

- For speech the reverberation time should be around 0,8s.

- Acoustic design has to contribute to the interior experience and atmosphere in the Church.

-The acoustic design has to be designed advantageously for both speaker/organ/choir and receiver.

- The radiations and reflections from the sound source should be evenly distributed towards the receivers.

LIGHT;
- Use the light to define the interior spaces.

- Use light reflections to enhance the texture of the materials.

- Enhance contrast between light and dark in the sacral room.

- The daylight factors and illuminance of the room must comply with the use of the sacral room in certain areas. (E.g. reading at the altar)

MATERIALITY;
- The sacred room should be designed with a sense of atmosphere that brings the visitor closer to the religion.

- Atmosphere in the sacral room will be sought through working with light and acoustics in the design.

- The design should mediate between the monolithic heavy construction and the warm intimate spatial aesthetics.

- Both wood and a more massive material such as concrete or brick will be used for the design of the Church.

THESIS

IT IS SOUGHT TO DESIGN A CHURCH IN ØRESTAD THAT ACCOMODATES AND CONTRIBUTES TO THE COMMUNITY AND SIMULTANEOUSLY BECOMES A COMMUNITY LANDMARK. AT THE SAME TIME, THE WISH IS TO DESIGN A CHURCH INTERIOR WITH A RELIGIOUS ATHMOSPHERE USING LIGHT AND ACOUSTICS IN THE DESIGN PROCESS.

DESIGN F

DESIGN PROCESS

INTRODUCTION

The design process is a highly iterative process and is developed through working in different scales and levels coherently. In the following the design process is sought described more linear to give a better understanding of the design development. The process is divided into three scales; Urban scale, Architectural scale and human sale.

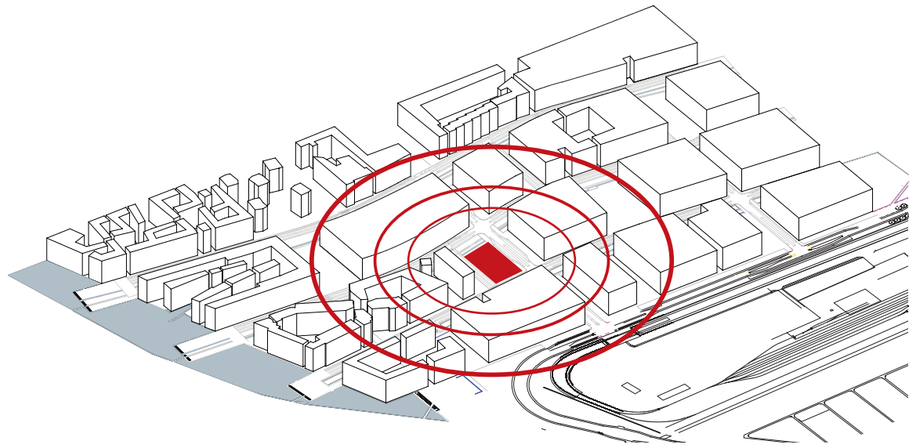
SCALE

URBAN

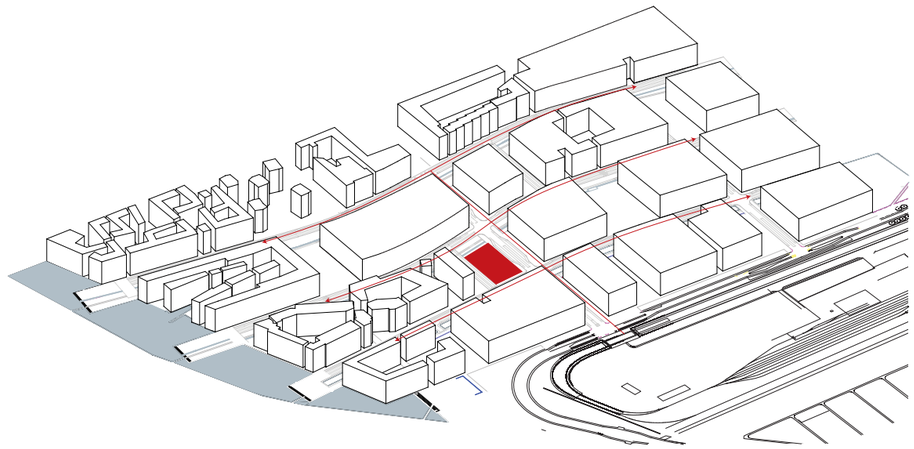
PLACEMENT IN CONTEXT

In this section the final placement of the Church Centre will be decided. As previously described, the idea catalogue [KK, 04] has suggested three possible positions for the church in Ørestad South.

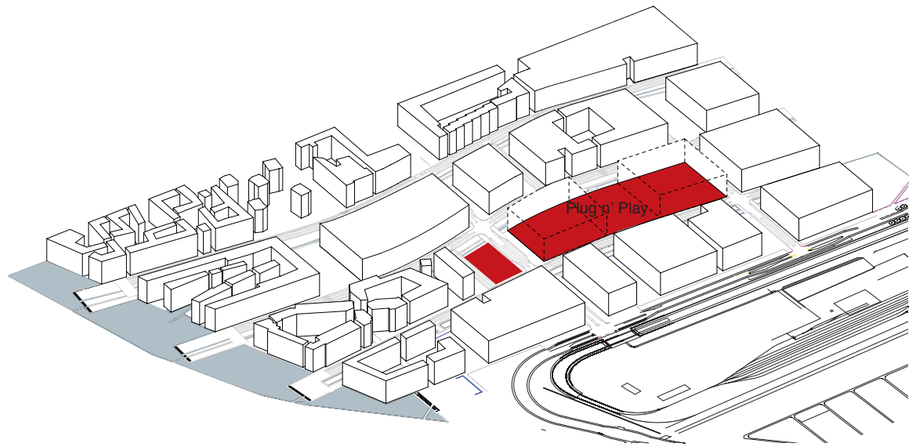
The church and church centre will be placed as shown on illustration 127, which is not one of the proposed placements from the idea catalogue.
The current placement is chosen because of the wish to make the church and church centre become a central part of the community. (Ill. 127) The current placement will make the church centre visible when arriving to Ørestad South by both car and Metro and people arriving by both car and Metro are automatically led past the site. (Ill. 128)
Another factor for the placement is the current Plug n' Play area in Ørestad South which lies just north of the site. (Ill. 129) It is deemed that the Plug n' Play area will be situated in Ørestad South for many years and that the two urban initiatives (Church Centre and Plug n' Play) can profit by each other in the city.



Ill. 127 1:100000 Placement of Church Centre centrally in Ørestad South.



Ill. 128 1:100000 The church centre is placed centrally in the community close to the main street which will make sure that people are led past the Church Centre.



Ill. 129 1:100000 The Church Centre and the Plug'n Play area will become a large area in Ørestad South of public functions.

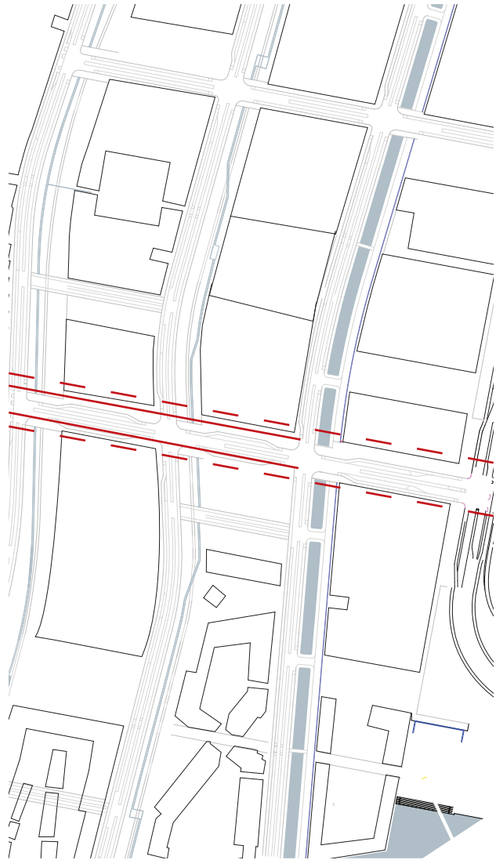
DISTRICT PLAN REQUIREMENTS

According to the district plan, the building developments of the planned site has to be maximum 34m high with a housing/business ratio of 30/70 within the sub-area. (Ill. 130)

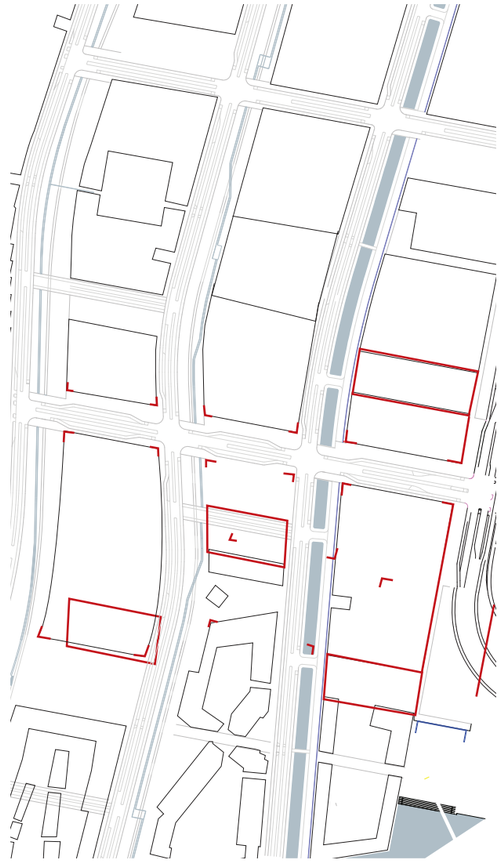
In the corners of the built-up area must be between 18-34m. (Ill. 131) Over the whole area the district plan has set out designated areas for parking. The parking can consist of parking towers, buildings or other. (Ill. 132), [KK398, 06]



Ill. 130 1:10000. Buildings in the marked area must have a maximum height of 34m. The housing/business ratio must be 30/70 within this area.



Ill. 131 1:5000. Buildings along the main street must have businesses or public service functions at street level and have housing or public institutions at higher levels.



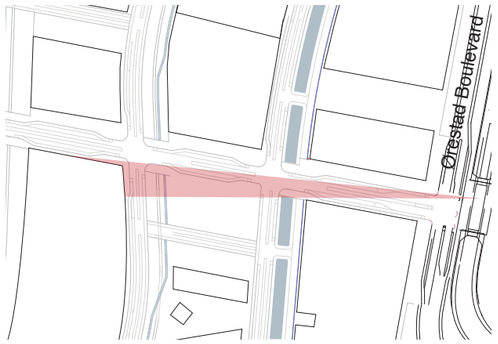
Ill. 132 1:5000. The overall parking plan constitutes areas for parking in Ørestad South. Around the corners of the buildings the height must be between 18-34m.

URBAN CONDITIONS FOR THE SITE

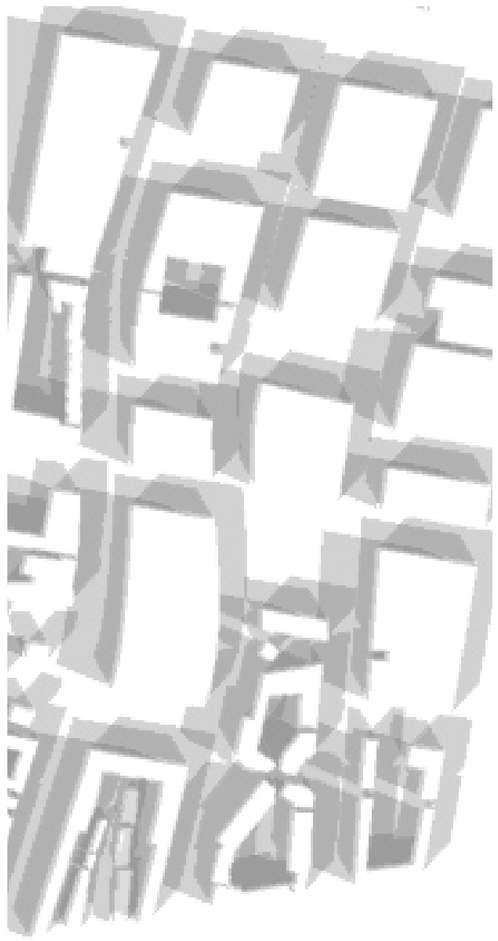
In this section the exterior parameters that have an affect the site will be discussed to make sure that the Church centre functions are placed in their most favourable position in terms of sunlight and sightlines.

Visually, only the northern part of the site can be seen from the Metro Station and when driving on Ørestad Boulevard. (Ill. 133) This means that the function placed here should be representational for the intensions of the Church and Church Centre.

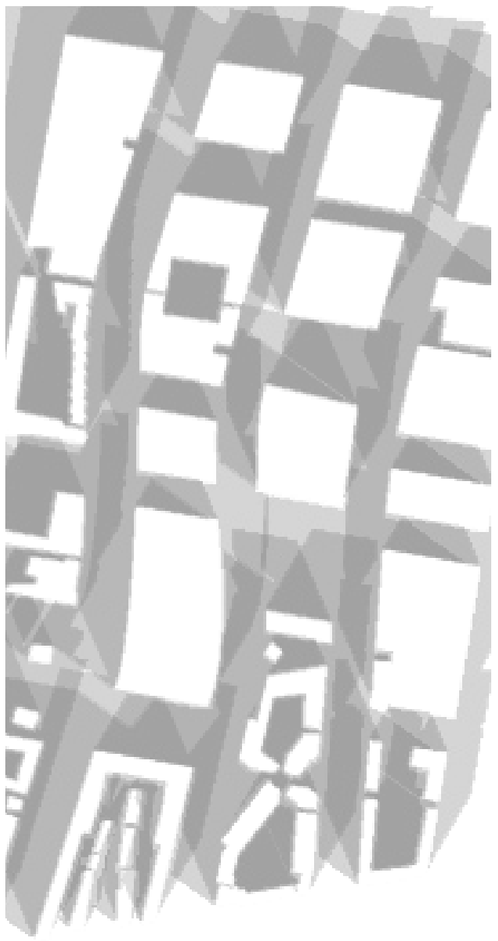
In terms of sunlight the site lies in shadow from the end of September to the beginning of April. (Ill. 134-136) This should also be taken into account when placing functions that need sunlight as part of an aesthetic expression.



Ill. 133 1:5000. Field of view from Metro Station.



Ill. 134 Shadow diagram for March at 10-12-15 o'clock.



Ill. 135 Shadow diagram for June at 10-12-15 o'clock.



Ill. 136 Shadow diagram for december at 10-12-15 o'clock.

SCALE

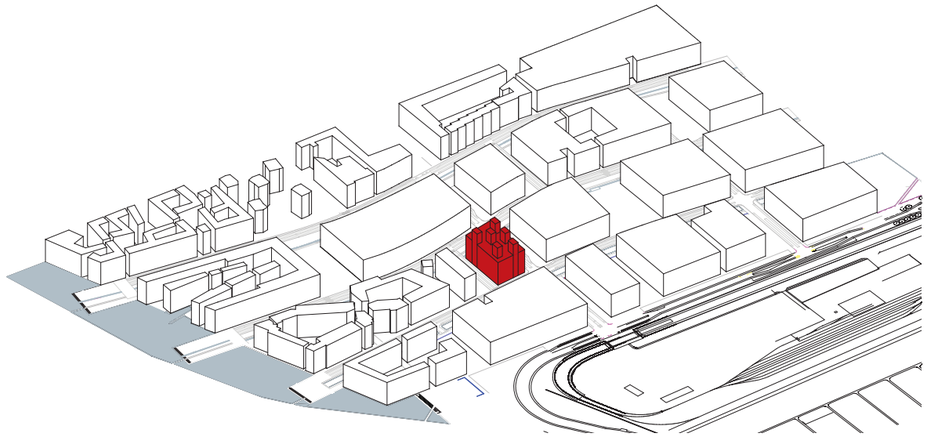
Ørestad South will, accoding to the masterplan, become a cityscape of building blocks with an average height of 34m with towers reaching as far as 50m. [KK398, 06]
This means that the street level will have very defined borders that encloses and marks a clear edge. The height of the buildings will accentuate this very firm grid.

Three scenarios for the scale of the Church centre is set up to explore the possibilities and it is chosen to work within the smaller scale structures that does not create towering walls towards the street - but actively invites people into the church centre. (Ill. 138-140)
By making the church centre in a lower scale the attention is for the church centre to be an open area that is an active part of the community and easily accessible both physically and visually for the inhabitants.

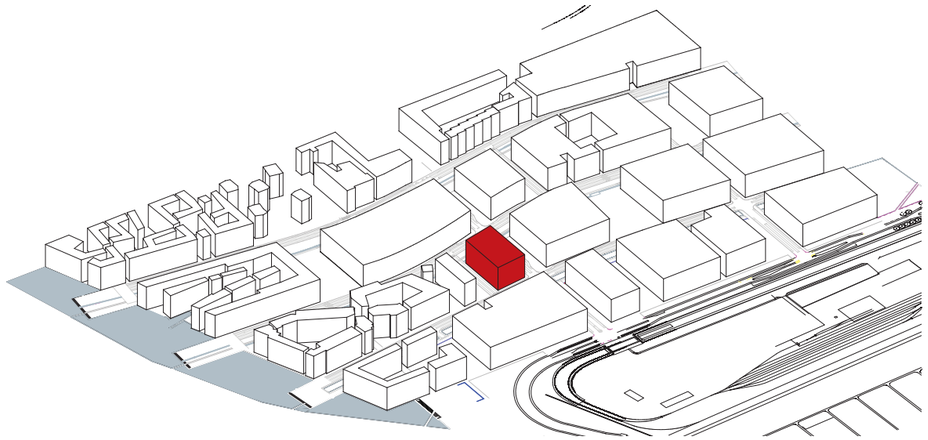
It is chosen to work with a general height of around 18m with the possibility for towers reaching higher in some places, for example the church tower. (Ill. 137)



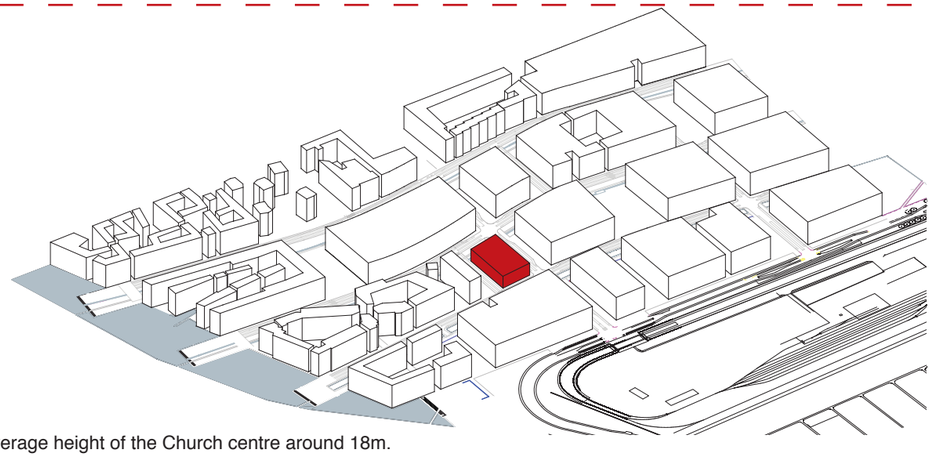
Ill. 137 Sketch of building heights 18-34m.



Ill. 138 Average height of the Church centre between 34-50m.



Ill. 139 Average height of the Church centre around 34m.



Ill. 140 Average height of the Church centre around 18m.

URBAN VOLUME STUDIES

In order to situate the buildings in the context a series of urban volume studies are made.

In the following, 3 scenarios are set up for the placement of volumes on the site. The ideas are evaluated in terms of the connection with the context and the function and visual expression as a community centre.

By placing the all the building mass in the center of the site all functions of the Church centre will be closely connected. (Ill. 141) The building lies as a closed mass on the site and does not invite people to interact with the building and exterior spaces and squares are left undefined. Another problem is that the connection with the surrounding building masses is lost as the centrally placed mass does not relate to these.

In the second study the built mass is placed to the front of the site to relate better to the street edge and to the context. (Ill. 142) The placement along the edge creates a defined square behind the church building which works well, but it is seen as problematic that the square is “hidden” from the main street. Again the building is a defined closed mass that evolve around itself and therefore lacks communication with the community.

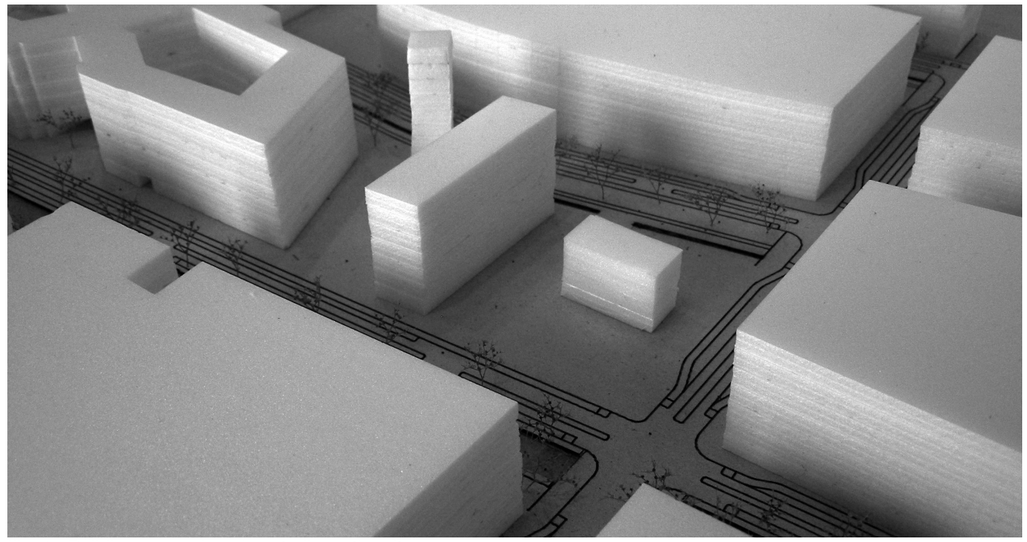
In the third trial the built mass is divided into smaller buildings that are placed peripherally on the site to relate to the taller buildings in the context. Also, a central defined square is created. The division of buildings around the square means that there are many ways in which to enter the site and the Church Centre. The buildings become less closed around themselves as the masses are spread out.

People are able to walk through the site as a park area or square without visiting the Church Centre, but will still have a visual connection with it. This means that the area will be known in the community by its differentiation of scale and division of mass.

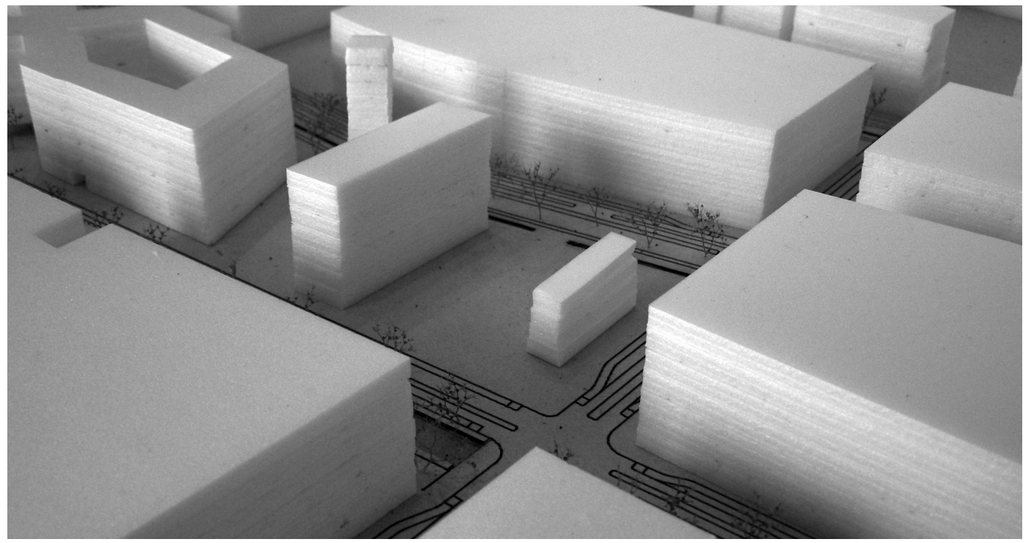
CONCLUSION

It is chosen to place the Church and Church centre functions peripherally on the site. (Ill. 143) As the choice is to build the Church and Church Centre in a lower scale (18-34m) than the other areas in Ørestad South, it is important to keep a connection and cohesion with the other built structures around the site.

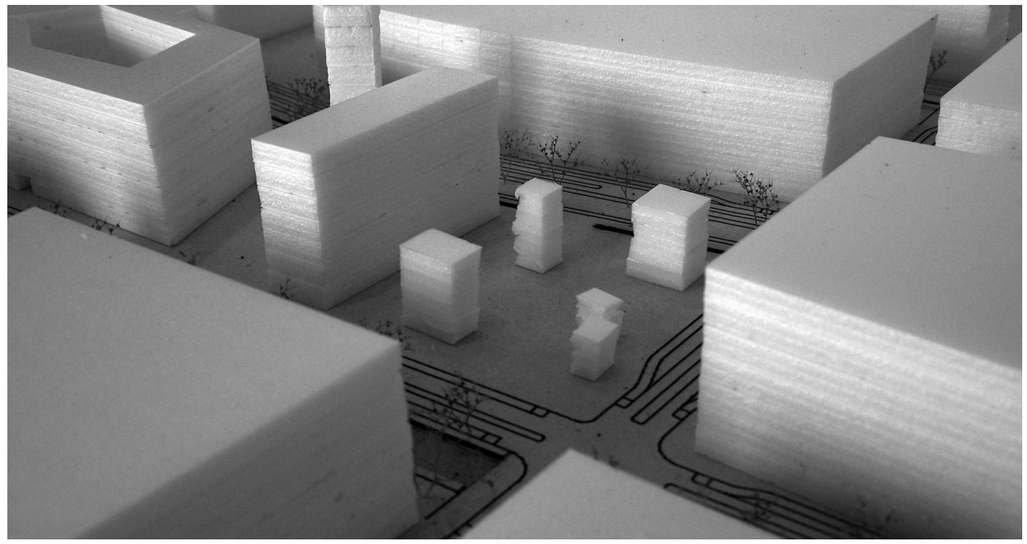
In order to create the sense of community in the urban landscape of Ørestad South, inspiration is taken from the temples of Indonesia and Japan where the different parts of the religious facility is spread out over a larger area. (Ill. 144, p. 96) The idea is to give the area a different character than the rest of Ørestad South, which will create focus on the church and its surroundings as a sacral area. The same effect is seen in the Japanese or Indonesian temples when crossing through a large gate when entering the sacral site. To accommodate this idea, the church and church centre will not only consist of one building IN the community but become a larger area OF the community.



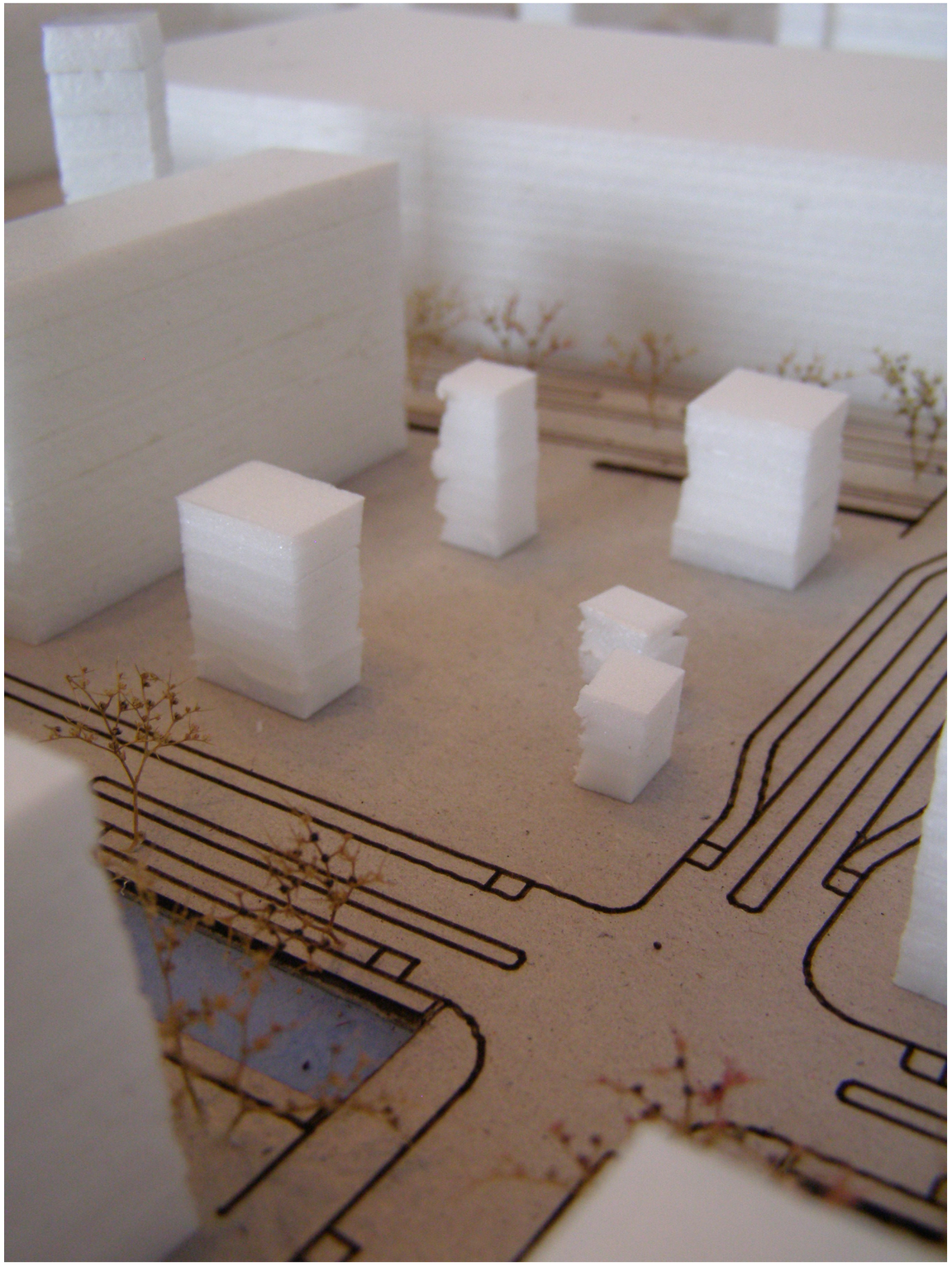
Ill. 141 Building mass placed centrally on the site.



Ill. 142 Building mass placed to the front of the site.



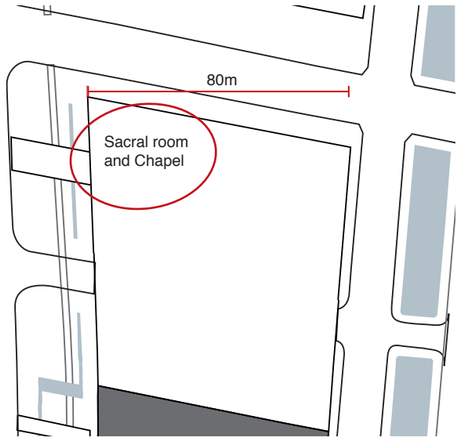
Ill. 143 Spread out building mass placed peripherally on the site.



Ill. 144 Model of chosen volume solution

PLACEMENT OF FUNCTIONS

In the following an overall placement of the functions on the site will be decided.
The distribution of the Church Centre functions is defined by the 4 main functions; the sacral room (Church), the multi-functional hall, the café and central square ,and the staff facilities.



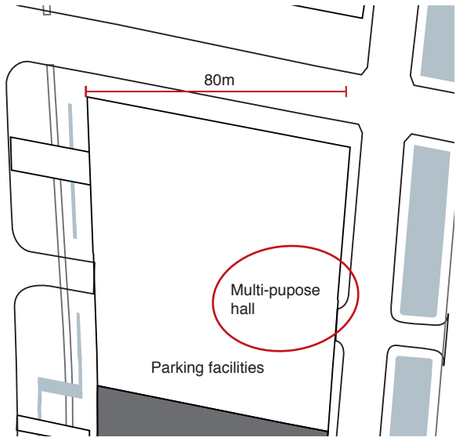
Ill. 145 Sketch of building heights 18-34m.

THE CHURCH

The Church building and sacral room is placed to the north western part of the site to ain form having the most sunlight during most of the year as the sun is seen as an important aesthetic element in the sacral room. (Ill. 145)

This placement also accomodates a visual connection of the church from the Metro and from arriving vehicular traffic coming from Ørestad Boulevard.

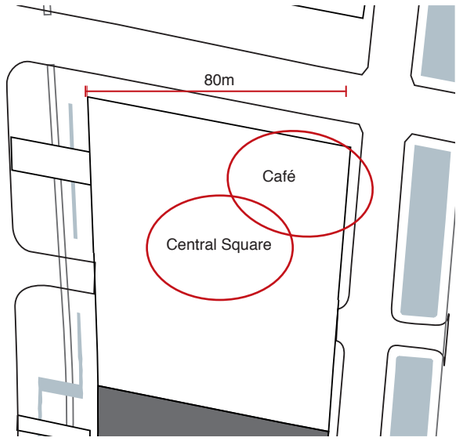
When placing the Church close to the main road, there will be easy access for the arrival and departure of the hearse and bridal cars. The church will have a visually central place in Ørestad South.



Ill. 146 Sketch of building heights 18-34m.

THE MULTI-FUNCTIONAL HALL

The multifunctional hall is placed to the southern end of the site close to the parking area as designated in the district plan. The hall is pushed back on the site as it is a selfconstituated attractor by having a variety of activities. The hall does not need to attract attention as it will gain attention according to the activities within. (Ill. 146)

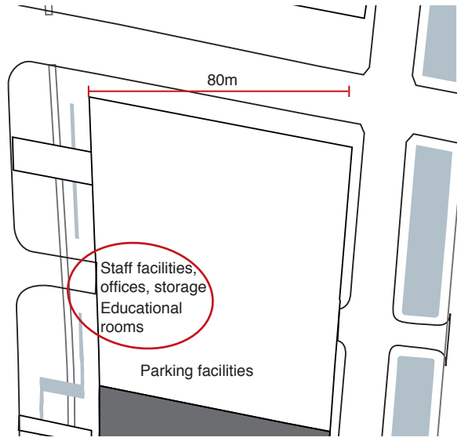


Ill. 147 Sketch of building heights 18-34m.

THE CAFÉ AND CENTRAL SQUARE

The café is, like the Church, placed to the northern part of the site in order to gain positively from the sunlight in the summer months. By placing the café close to the main street in Ørestad South, it will be higly noticeable and attract people into the area of the Church and Church Centre. (Ill. 147)

In the center of the site a central square or athering area will be formed. The intension for the area is to have outdoor seating facilities much like an outdoor auditorium for outdoor concerts or theatre.



Ill. 148 Sketch of building heights 18-34m.

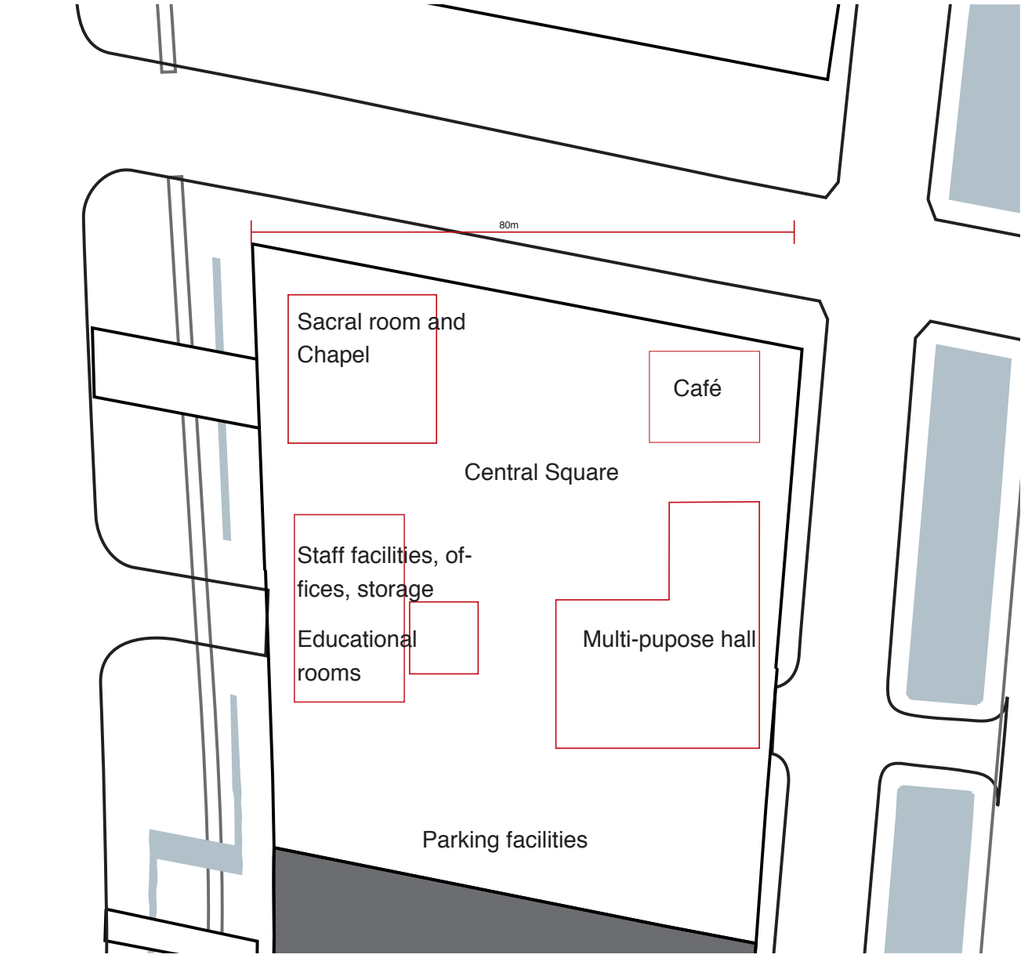
STAFF FACILITITES

The staff facilities are placed close to the parking area towards the southern part of the site and at the same time close to both the Church and the multi-functional hall. (Ill. 148)



Ill. 149 Entrance to Indonesian temple area.

SUMMARY



Ill. 150 Position of the different functions.

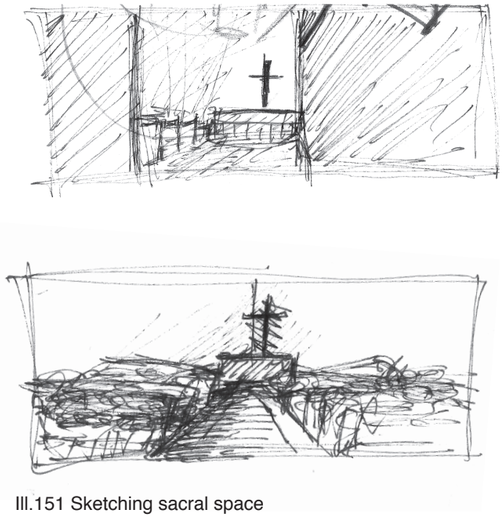
The Church Centre is placed centrally in Ørestad South where people will pass by coming by either metro or car traffic. By placing the Church Centre centrally, the importance within the community is marked and it will be highly noticeable in the urban landscape.

The overall placement for the Church Centre has now been decided as seen in illustration 150. The decision of the placement of functions is based on a series of volume studies, sun studies, and contextual studies.

The Church is placed in the north-western part of the site in order to receive direct sunlight for most of the year and to be visible from the Metro Station. Other functions, such as staff facilities and the multi-functional hall are placed close to the parking area south of the site.
All functions are placed periferically to create a central square and in order to relate to the taller buldings surrounding the site.

It is chosen to spread out the buildings and functions of the Church Centre in order to create an area that will be used actively by the community. By seperating the buildings of the CHurch centre it is possible for people walk into the site and visually interact with the buildings without having a purpose for visiting the area.

SACRAL SPACE



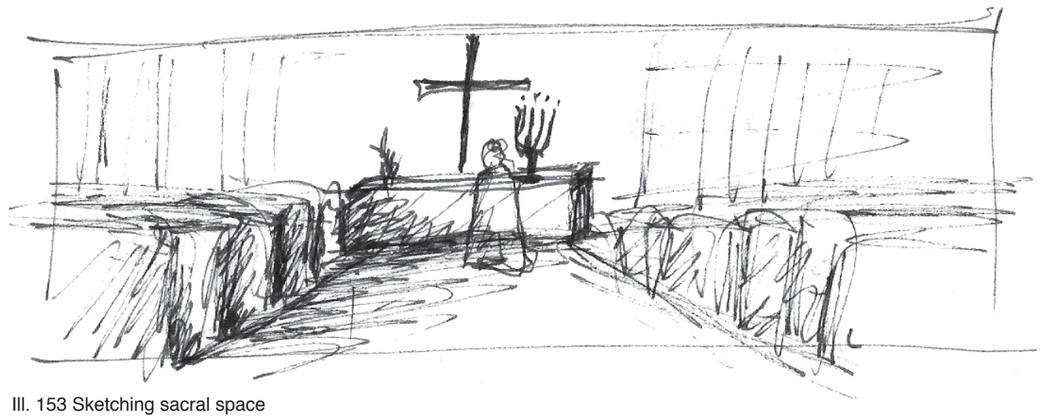
III.151 Sketching sacral space



III. 152 Sketching sacral space

In this section the design of the sacral space - the church - will be developed. In here, both technical and aesthetic parameters are used as part of the sketching process.

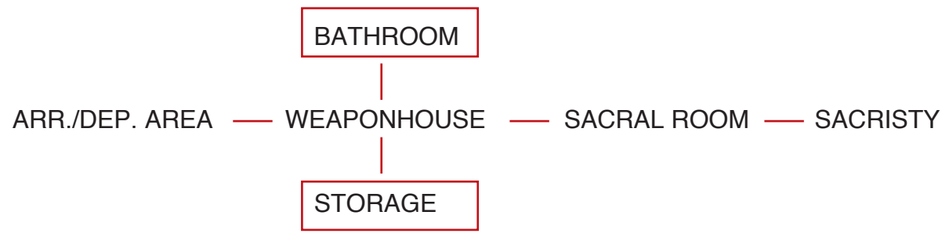
The final concept for the church space will be used further on in the development of the other parts of the church centre; the café, the staff facilities, the central square and the Multi functional hall.



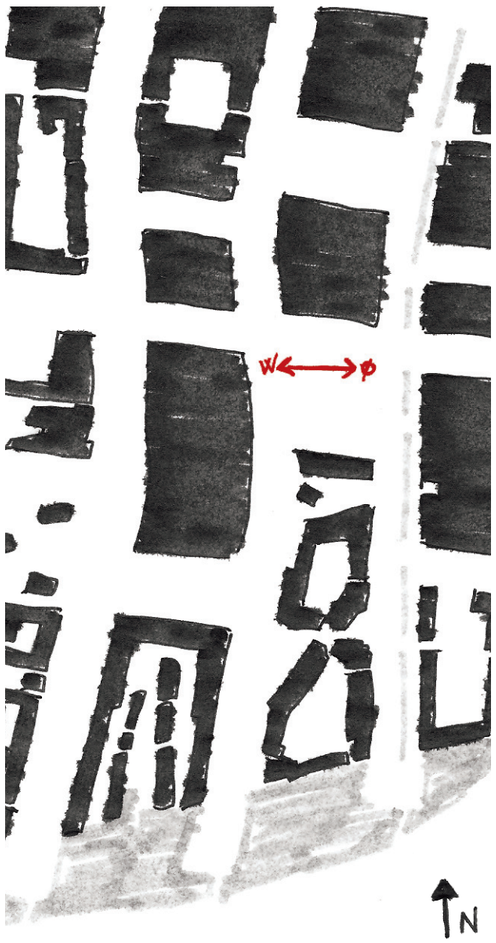
III. 153 Sketching sacral space

As seen in the urban design process, it is decided to seperate the Church Centre into smaller free-standing volumes. This seperations means that the Church or sacred space also will need a small storage facility and public bathrooms close to the weaponhouse. These functions will also be considered when designing the Church. (Ill. 154)

It is chosen to use tha classical approach of placing the church in an east-west direction which also accomodates the grid of the urban landscape in Ørestad South. (Ill. 155)



Ill. 154 Flow diagram for the Church with additional functions; public bathrooms and storage.



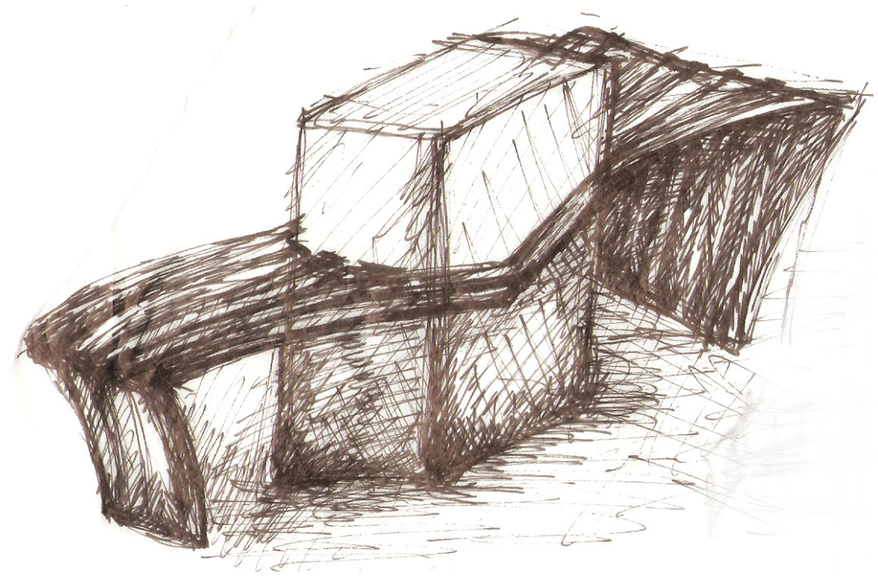
Ill. 155 The Church is placed in an east//west direkction.

FORM STUDIES

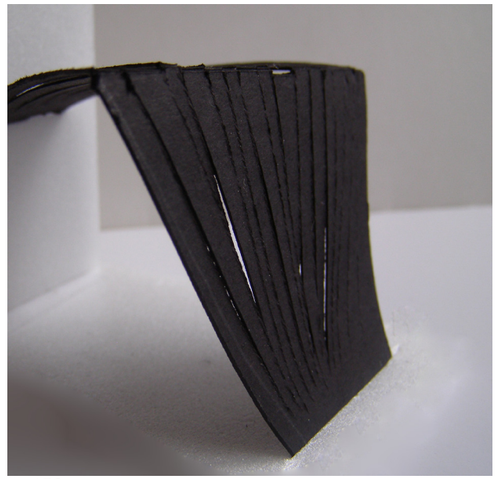
INITIAL FORM STUDIES

To initiate the design process a series of initial form studies have been made to investigate architectural principles and ideas derived with inspiration from the analysis.

In this section the form studies are protrayed and described through models, images and text. Some of the studies are used directly in the further design process, whereas others are only used as stepping stones for other ideas and designs.



Ill. 158

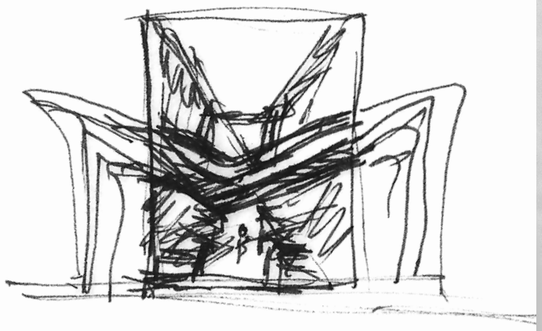


Ill. 156

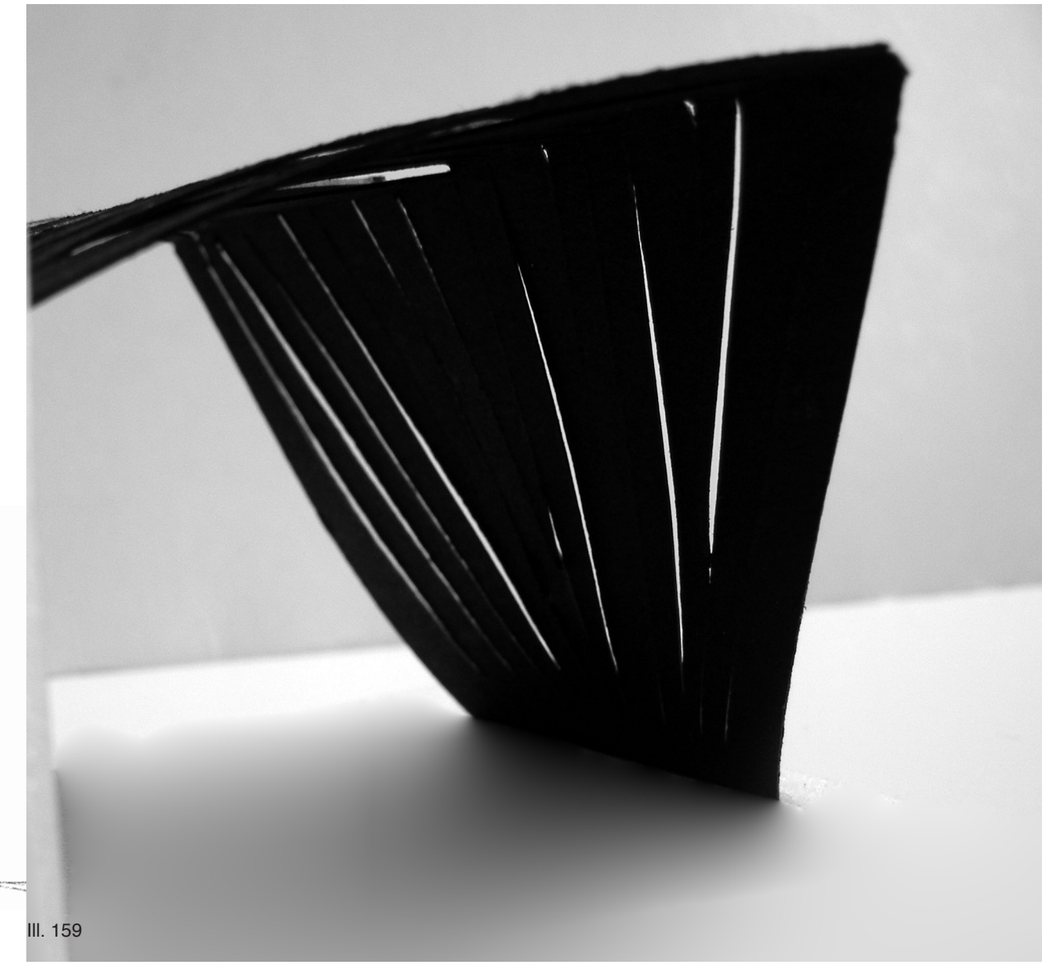
STUDIES OF WALL STRUCTURE

The wall structure is used to filter light into a space. The light filters in through the narrow slits and it creates a clear contrast between the dark material and the light entering through the brighter slits.

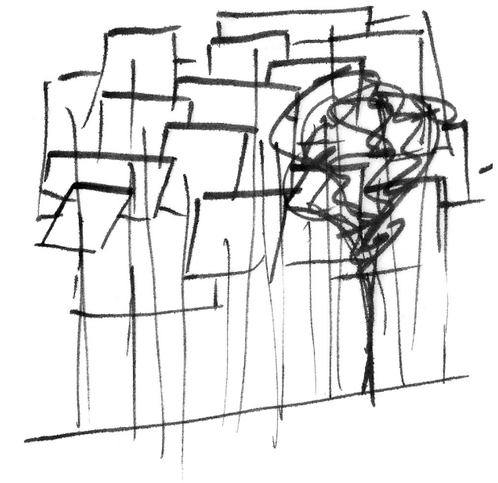
The structure can be used both as an exterior and exterior effect. In the exterior as a shaded walkway and in an interior as a wall and roof element to control the amount of light entering a room.



Ill. 157



Ill. 159



Ill. 160



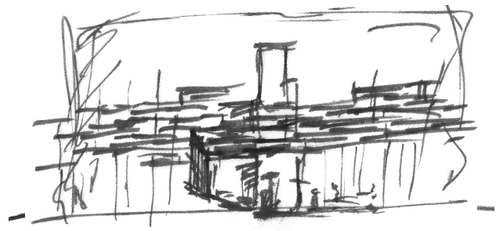
Ill. 161



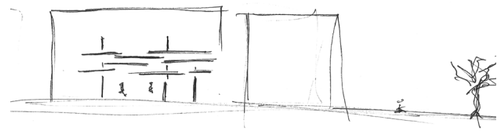
Ill. 162



Ill. 163



Ill. 164



Ill. 165



Ill. 166

STUDIES OF URBAN STRUCTURE

With reference to the surrounding nature of Ørestad South and urban structure of “trees” is used to create a roof that connects the whole site of the Church Centre. The inspiration is metaphorically to have a “forest” of crosses.

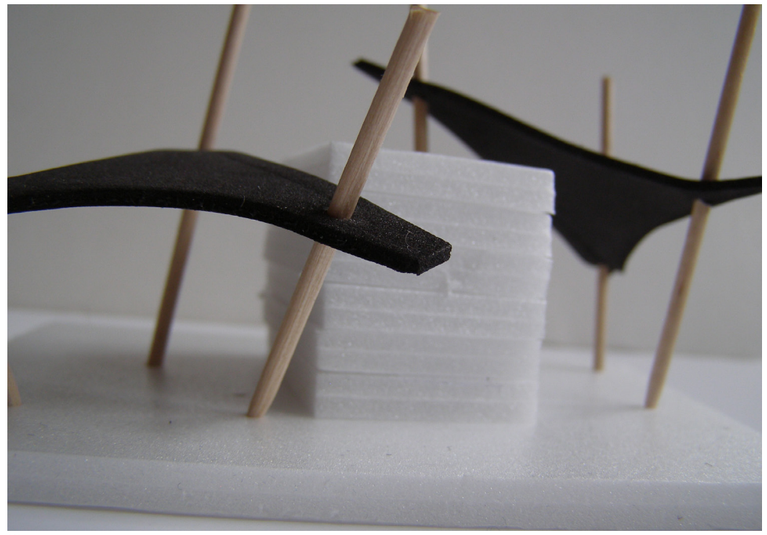
The roof is made of a stacking of materials in different levels and it is possible to walk both under and on the structure. The placement of the stacked plates leave room for a filtering of light through the roof that give an interesting pattern of “light squares” on the ground.

STUDIES OF BENDING STRUCTURE

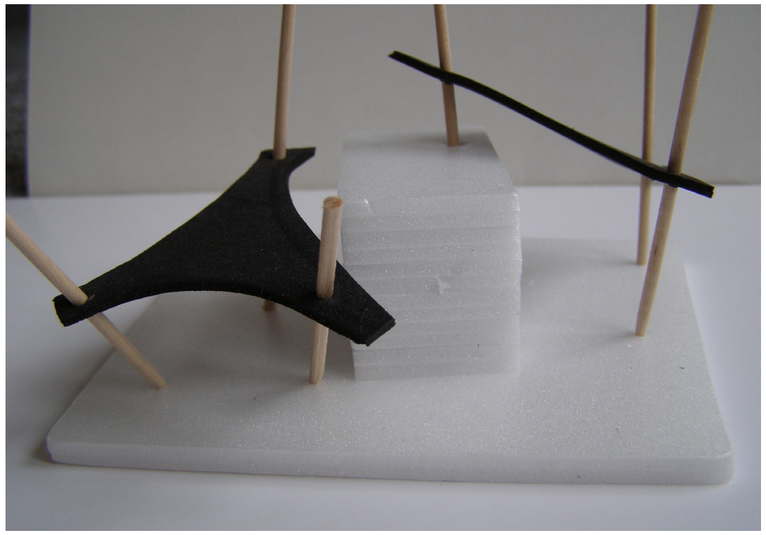
By using a material of a softer structure more free shapes can be discovered.

One idea is to span out sails that shelter the outside areas of the Church Centre to create a pleasent outdoor environment.

The other idea suggests the making of a singular shaped building that expands out from each end to shape a large room and enclose it, almost like a protective bubble. Slits are cut into the roof and walls to allow for sunlight.



Ill. 167



Ill. 170



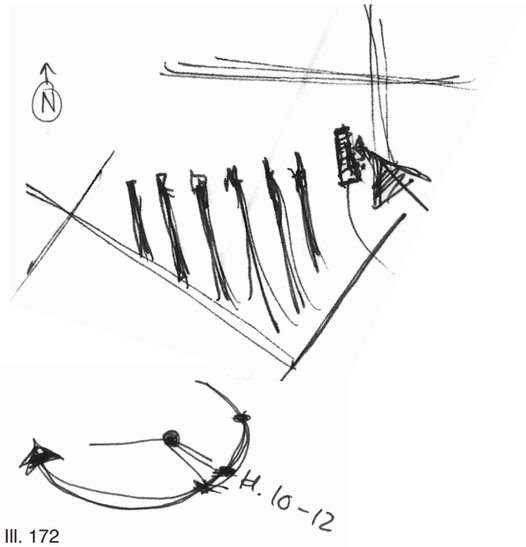
Ill. 168



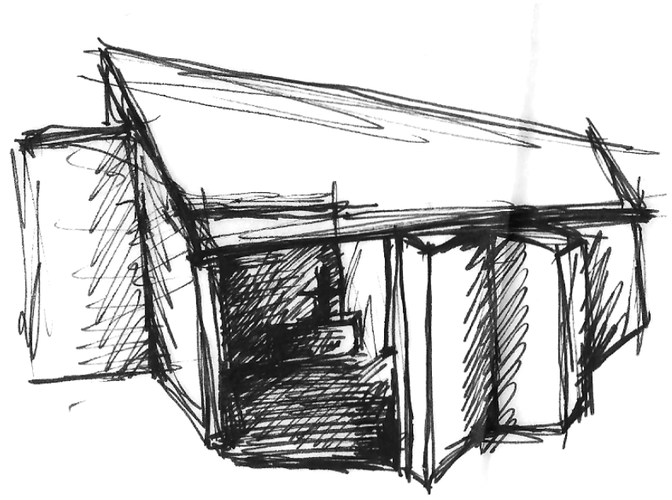
Ill. 169



Ill. 171



Ill. 172



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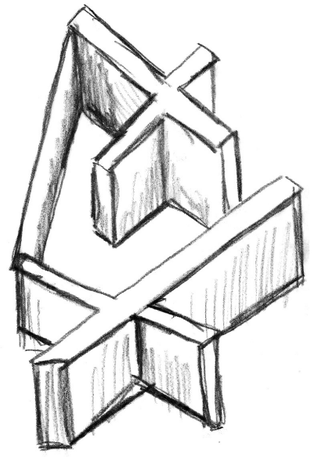


Ill. 176

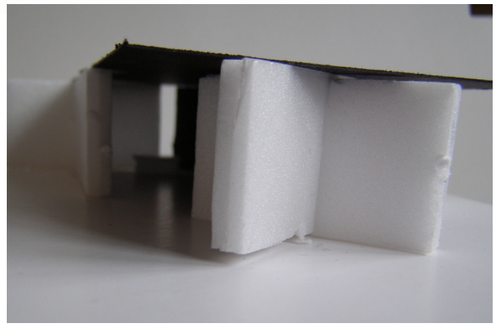
STUDIES OF PLAN

The plan of the sacral room is spanned out by two large crosses and a perpendicular wall that shapes out a triangular room. The first cross is placed in a clear east-west direction whereto the two other walls are attached.

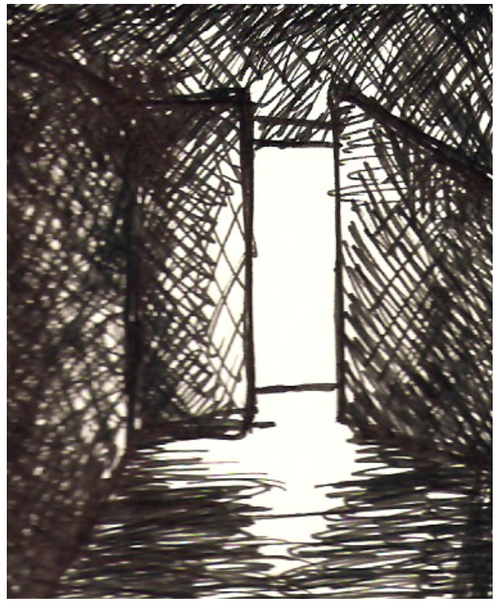
A slit in the wall at the end o the room by the altar lets light in between 10-12 AM which is the timeslot for Sunday services. This will only happen on certain times of year seeing as the placement of the sun in the sky changes.

The room is entered by at the opposite end of the altar having an undisturbed view towards the light at the end of the room. The aisle will pass along the east-west wall and seating will be to the right hand side.

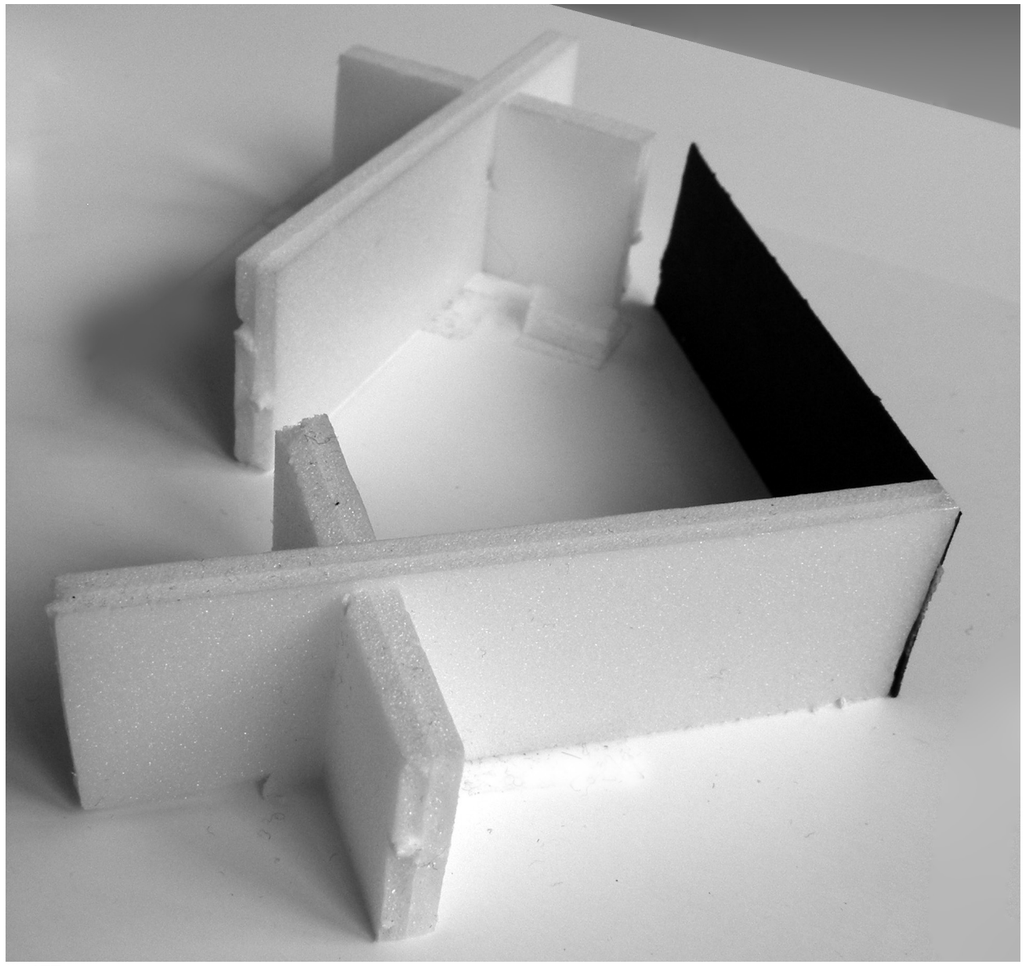
The plan studies are conducted with a very simple composition of three walls that constitutes the sacral room having strong symbolic reference to Christianity with the two thicker cross-shaped wall elements.



Ill. 173



Ill. 174



Ill. 177

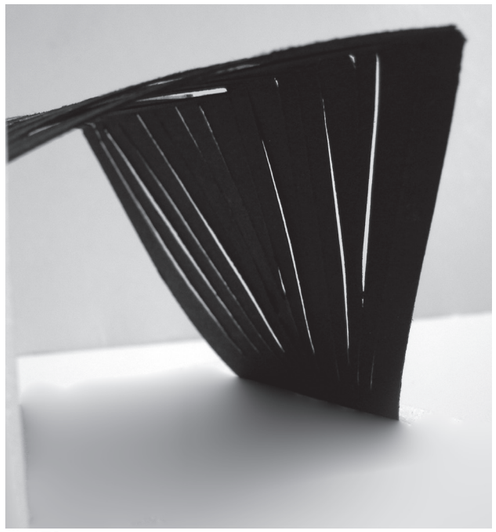
SUMMARY

The form studies give an idea for the direction of the project and the ideas will be used for the further design.

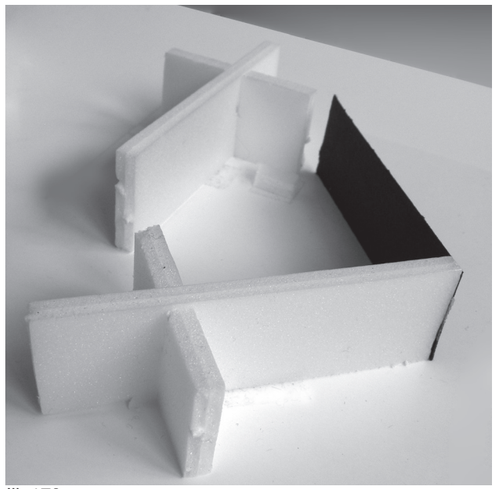
The initial form ideas are created in different levels of the project - from wall element to urban structure. This can be used to mark the design for the various design levels of the Church Centre in a search to create a clear cohesion between the designs.

As the sketching has been performed in different scales, it is chosen to keep working and developing the plan solution from the plan studies. (Ill. 179) This design concept is chosen because it is seen as having most potential to create an interesting sacral space that has a different plan than the conventional square plan. In the following the aesthetic and acoustic quality of different room types will be tested to compare the idea of the triangular plan to the square plan.

The other studies such as the wall studies and urban studies can be used to implement later in the design to shape some detailing elements of the Church and Church Centre.



Ill. 178



Ill. 179



Ill. 180

VOLUME STUDIES

An investigation of different volumes of church spaces are made to evaluate and identify the acoustic challenges in a given room with a given height and volume and evaluate the given plan idea for this project with the acoustic qualities of similar sized rooms having different shapes.

The four projects will also be described with an overall estimation of the spatiality together with the acoustic parameters. The following diagram shows only an estimation of the acoustic qualities of the interior space and will therefore only be used as guidelines to compare solutions in a decision making proces for the further Church design. (Ill. 181)

The wall material used for all trials is wood. The height of the sacral room is given to be 18m according to the demands from the district plan and the room area is 300m^2 according to the functions diagram.

ACOUSTIC PARAMTERS

The acoustic quality of the sacral space will be calculated in the program CATT-Acoustics. The criteria which should be fulfilled in Catt-Acoustic are:

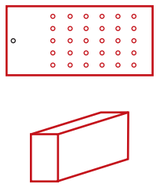
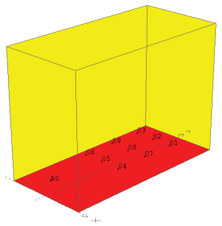
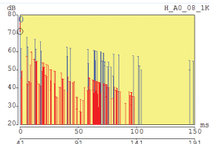
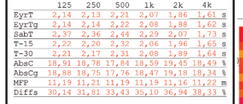
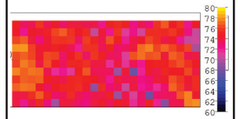
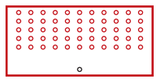
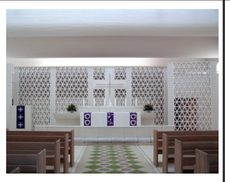
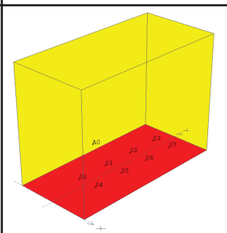
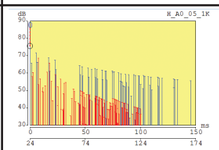
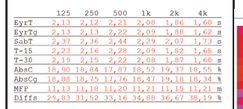
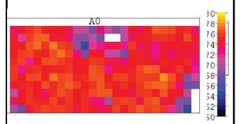
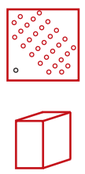
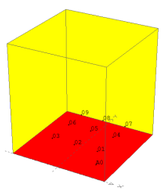
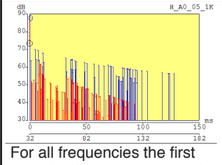
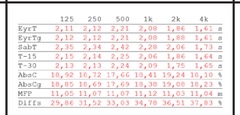
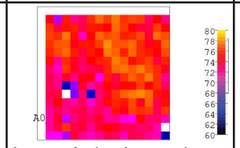
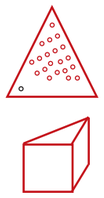
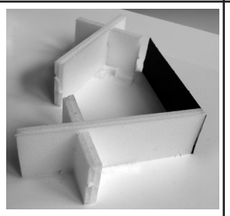
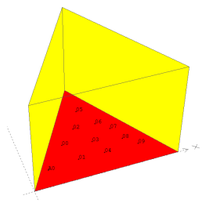
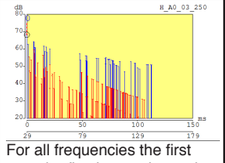
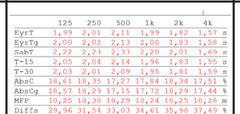
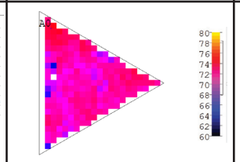
• The first sound reflections of the room should not reach the receiver more than 50 ms after the direct sound [Kirkegaard, 2008b].
• The difference between the highest and lowest sound pressure level should not exceed 10 dB [Kirkegaard, 2008b].
• The deutlichkeit D-50 should have a value higher than 50 % [Kirkegaard, 2008b].
• The reverberation time should be around 0,8s for speach and 1,3-1,5s for music [Kirkegaard, 2008b].
- The Clarity C-80 has to lie between -4 and +4. [Kirkegaard, 2008b].

EVALUATION

As seen in the schedual the different types of volumes have different quality in the different aspects of the acoustics. The common element is though, that none of the shapes have the perfect acoustic quality created by just the room shape. It is seen how all room volumes are possible solutions to create a sacral space with good acoustic qualities.

In all four cases there are problems with Deutlichkeit and the sound pressure level. All cases seem to work for music in terms of reverberation time but not so well for speech.

It is noticed that all room shapes will need iterations in terms of materiality and possibly the placement of sound source and receivers. It is chosen to continue work on the triangular plan solution for the Church in this project.

ROOM TYPE ca. 300m², h=18m	SPATIALITY	EXAMPLE	GEOMETRY (CATT)	SOUND REFLEC- TIONS	DEUTLICHKEIT/ CLARITY(D50/C80)	REVERBERA- TION TIME	SOUND PRES- SURE LEVEL	PROBLEMS/ IMPROVEMENTS
 l=25m, b=12, h=18	- Clearly defined room direction. - Symmetrical arrangment. - Classical approach - Use of only perpendicular lines create harmony and calmness in the room. - Distance between priest and congregation is accentuated.	 Church of Light, Tadao Ando.		 For all frequencies the first sound reflections arrive at the receiver in the first 50ms.	D-50 Back = 35,1-38,3% Middle = 35,4-38,1% Front = 48,1-48,7% For 1kHz C-80 Back = -0,3-2,3 Middle = 0,7-3,4 Front = -0,3-1,9	 Reverberation time lies between 1,64-2,31s for 250Hz-4kHz.	 Average for all frequenzies (250hz-4khz) is a difference of 20 between 20-50ms. This should be lowered.	- The reverberation time is good for music, but can be lowered for speech by changing materials in the room. - The D-50 percentage is below 50% which can be made higher by changing the materials by the speaker to more absorbant materials.
 l=25m, b=12, h=18	- Closeness between priest and congregation. - Intimate expression. - Perpendicular lines bring calmness to the room. - Direct confrontation with the religious aspects of the sacral room. (eg. cross, altar.)	 Bagsværd Church, Jørn Utzon		 For all frequencies the first sound reflections arrive at the receiver in the first 50ms. The lateral reflections are the longest.	C-50 Back = 41,2-58,7% Front = 42,8-67,2% For all frequenzies C-80 Back = 0,2-3,2dB Front = -0,2-2,6dB For all frequenzies	 Reverberation time lies between 1,60-2,22s for 250Hz-4kHz.	 Average for low frequenzies (250hz-500hz) is a difference of 10 between 20-50ms, for high frequenzies (1kHz-4kHz) there is a difference of 20.	- The reverberation time can be lowered for speech by changing materials. - The D-50 percentage can be made higher by changing the materials close to the speaker. - The SPL can be more evenly distributed by changing the shape of elements in the room.
 l=16m, b=16, h=18	- Simple room shape makes the space very harmoniuous. - Intimate space. - Diagonal orientaton accentuates an axis and gives a direction to the symmetrical room and removes the natural focal point from the center to the altar in the corner.	 Islev Church, Johannes Exner		 For all frequencies the first sound reflections arrive at the receiver in the first 50ms. The reflections from the ceiling are the longest.	D-50 Back = 40,8-54,8% Middle = 40,4-55,7% Front = 41,8-74,6% For all frequenzies C-80 Back = 0,1-2,9dB Middle = -0,2-3,0dB Front = -0,2-2,5dB	 Reverberation time lies between 1,65-2,24s for 250Hz-4kHz.	 Average for low frequenzies (250hz-500hz) is a difference of 10 between 20-50ms, for high frequenzies (1kHz-4kHz) there is a difference of 20.	- The reverberation time can be lowered for speech by changing materials. - The D-50 percentage can be made higher by changing the materials close to the speaker. - The SPL can be more evenly distributed by changing the shape of elements in the room.
 l=25m, b=21,6, h=18	- The speaker is placed in a clear focal point in the room. - The placement of the soncregation is not clearly symmetrical and adds a division in the room that accentuates the difference between aisle and seating. - Direct confrontation with the religious aspects.	 Design idea		 For all frequencies the first sound reflections arrive at the receiver in the first 50ms. The reflections from the ceiling and back wall are the longest.	D-50 Back = 34,8-52,5% Middle = 41,9-55,8% Front = 64,0-77,1% For all frequenzies C-80 Back = -0,4-2,6dB Middle = 0,7-3,3dB Front = 3,3-5,8dB	 Reverberation time lies between 1,59-2,09s for 250Hz-4kHz.	 Average for all frequenzies (250hz-4khz) is a difference of 20 between 20-50ms. High frequencies are better than lower.	- The reverberation time can be lowered for speech by changing materials. - The D-50 percentage can be made higher by changing the materials close to the speaker. - The SPL can be more evenly distributed by changing the shape of elements in the room.

∘ Speaker
∘ Audience

Ill. 181 Acoustic evaluation of room tyoes.

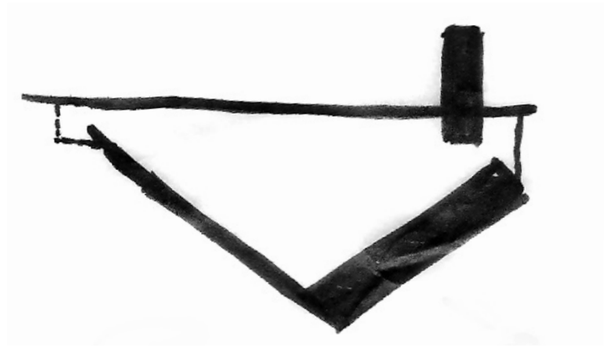
PLAN DEVELOPMENT

In this section the triangular plan is developed through different plan trials and ideas to reach a concept for the Church design.

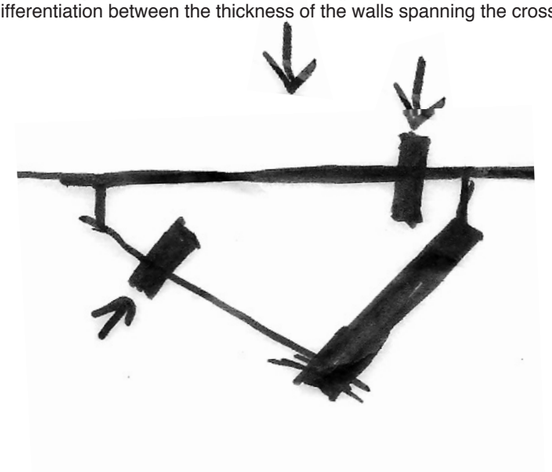
In the further design, the wish is to tone down the strong symbolism of the crosses in the plan and to finish and connect all wall elements.

It is sought to use the elements of differentiation between thick and thin wall to control the experience in the room and the effect of incoming daylight. The thick walls are seen as a heavy construction whereas the thinner walls are seen as wood construction.

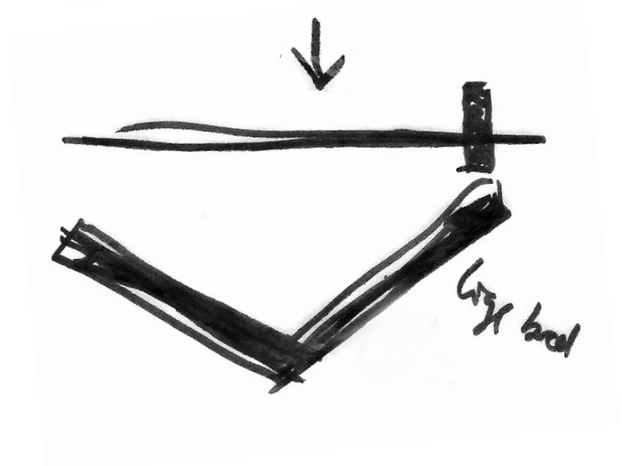
In the further development different plan ideas are tested in both drawing and modeling.



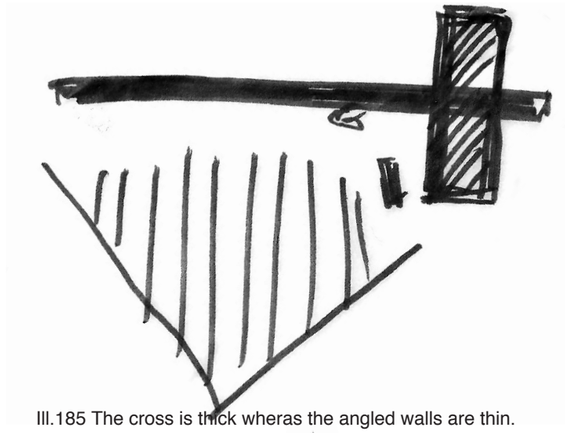
Ill. 182 The symbolic reference to the cross gets underplayed when having a differentiation between the thickness of the walls spanning the cross



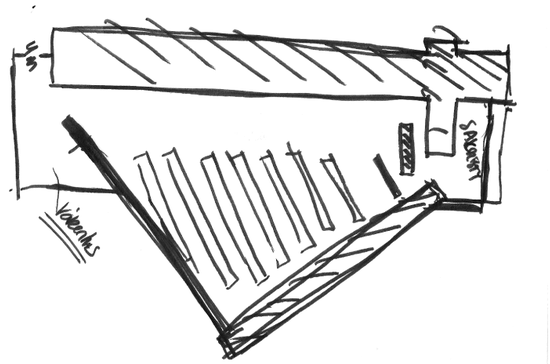
Ill. 183 The cross arms functions as entrances into the Church space.



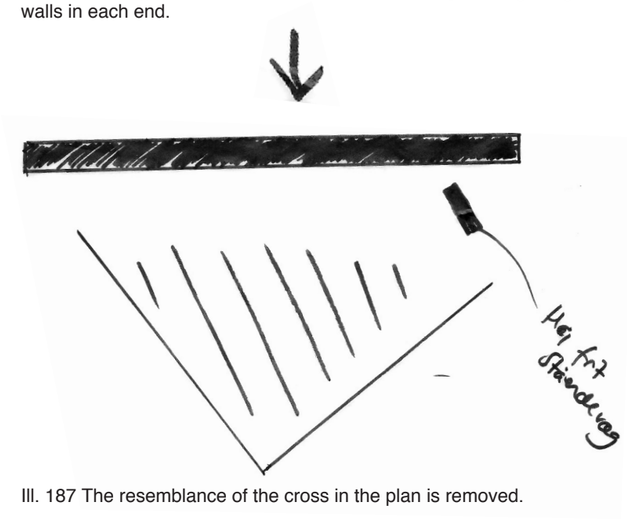
Ill. 184 THe angled walls becomes the thick walls.



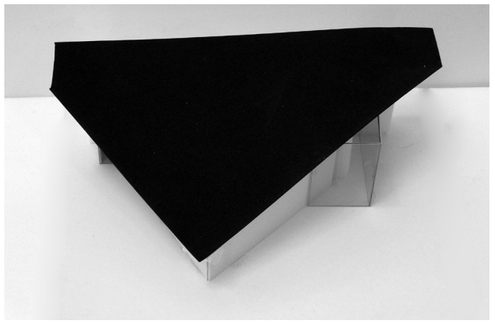
Ill.185 The cross is thick wheras the angled walls are thin.

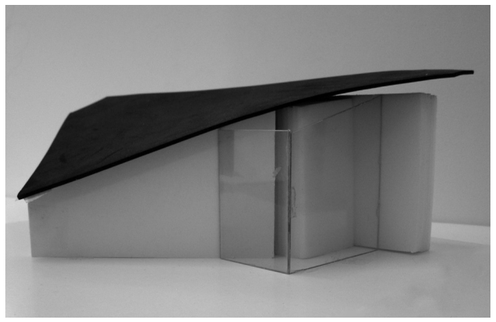


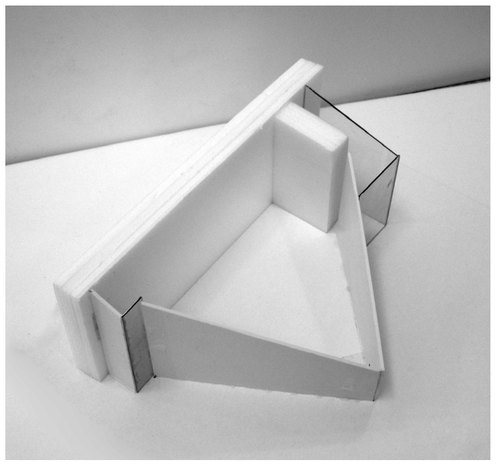
Ill. 186 The angled walls and the cross are closed by rectangular glass walls in each end.

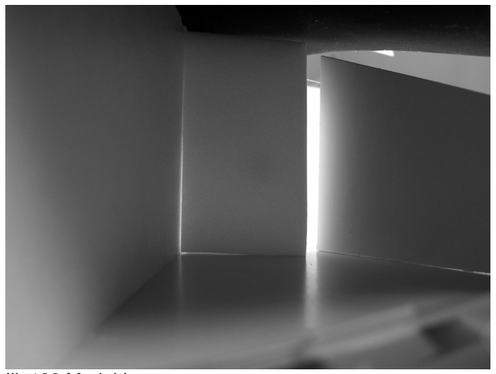


Ill. 187 The resemblance of the cross in the plan is removed.

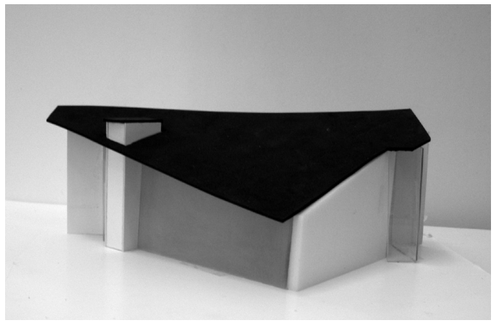


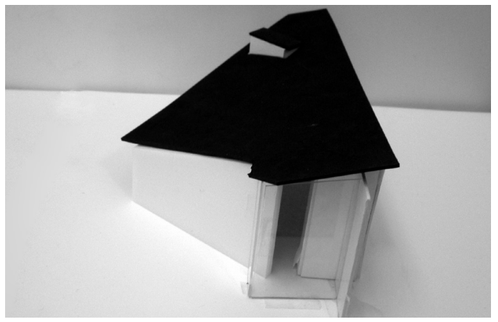


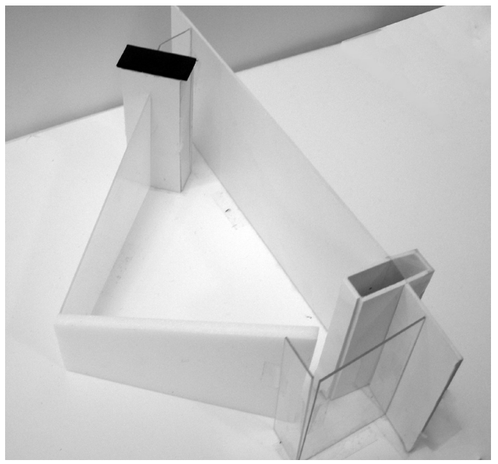




Ill. 188 Model I









Ill. 189 Model II

Some of the ideas are tried in models in order to get a better idea of the interior space. The models take their starting points from outer parameters of the northern wall being 18m and the roof sloping down towards south at the lowest point of the Church which is 10m.

In the two models, it is tried to evaluate the effect of the thick and thin walls and shift in material - glass walls and solid walls.

In the models it is seen how the thick taller wall from the first model functions better than the thin wall and it is chosen to continue work with this solution and to build the sacral room around the thick wall. (Ill. 188-189)

In the first model the v-shape of the room consists of solid walls whereas the second model uses a frosted glass wall towards west that will let more light into the room.

The window areas of the v-shape are yet to be defined, but it is seen as necessary to design openings in these walls to let light into the seating area of the Church.

The plans of the Church are closed in by rectangular shapes at either end of the triangle. F0r both cases this solution is seen as insufficient as the rectangular shapes become attachments to the overall idea and therefore do not become part of the plan solution.

The idea of letting light in, in each end of the room works well in both cases where a strip of light enters from the entrance and by the altar.

In the following the design of the plan will be further developed in order to reach better solutions for the entrance and altar areas.

ELEVATIONS AND PLAN DECISIONS

In this section the further development of the Church building is being designed using elevations and plans to decided.

PLAN

As it was seen the the model trials (Ill. 188-189, p. 111) the rectangular elements placed to each end of the triangle seems like too much of an attachment to the original plan idea. (Ill.190)

The plan is therefore changed into having three repeated triangles of different that size that shape the weaponhouse, sacral room and sacristy. (Ill. 191)

The sacristy is hereafther moved into the thick norther wall so that the interior in this space is utilized. This means that the third and smallest of the triangles can be removed from the plan solution. (Ill. 192)

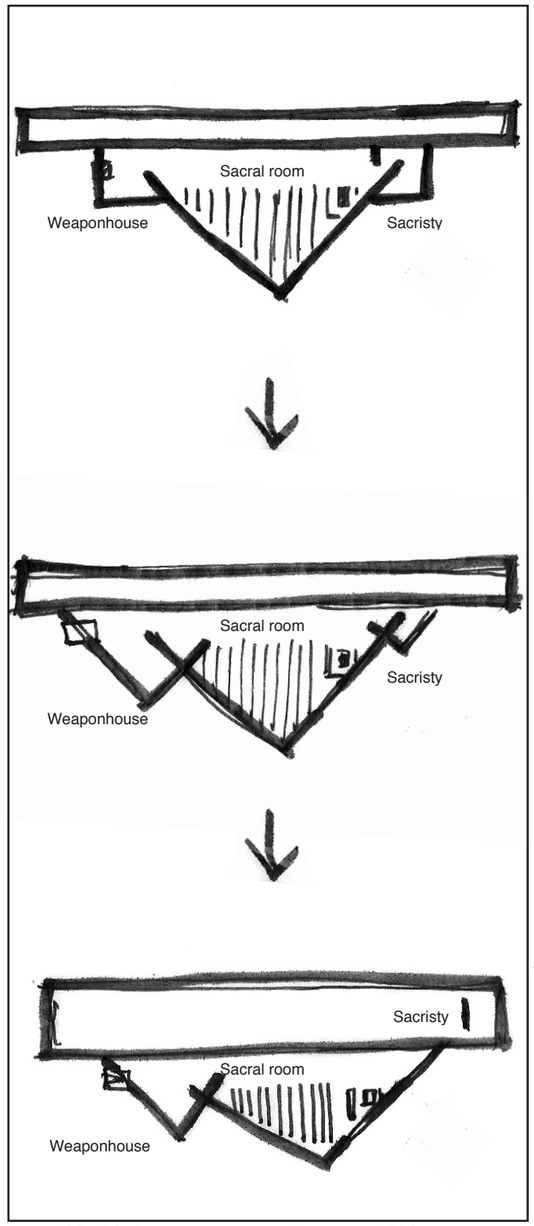
By removing the third triangle the plan becomes simpler and a stronger cohesion between the weaponhouse and sacral room is created.

ELEVATIONS

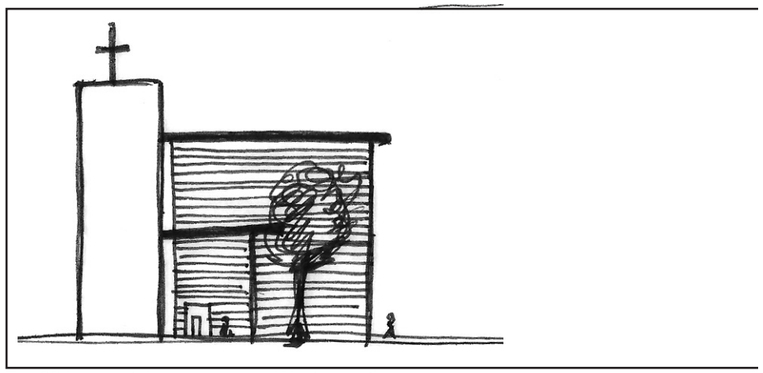
Drawings of elevations of the Church buildings are used to define the roof slope and the thickness of the northern wall and at the same time initiate ideas for the facade expression. (Ill. 193-202)

It is chosen to use the lowered sloping roof for the Church as this design creates the most tension between the thick heavy northern wall and the thinner wood construction of the triangular church walls. When having the sloping roof lowered down from the northern wall the heaviness of the northen wall is accentuated at the same time as the lightness of the wood construction is accentuated. (Ill. 194) This means that the contrasting elements enhance each other.

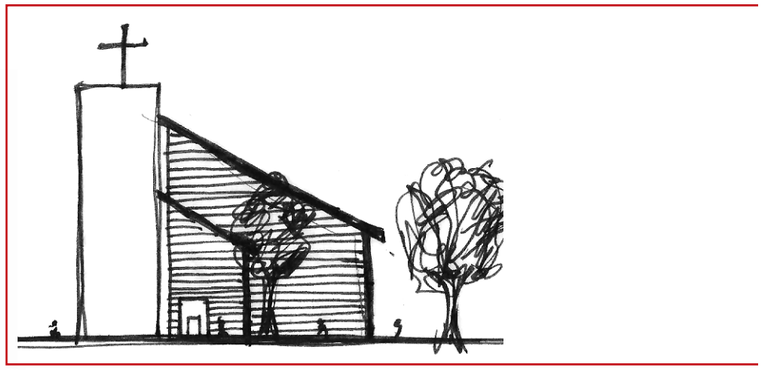
In the interior, the sloping roof seem to define the direction of the triangular room. The roof is lowered above the congregation's seating area and the space is therefore brought down to a lower scale.



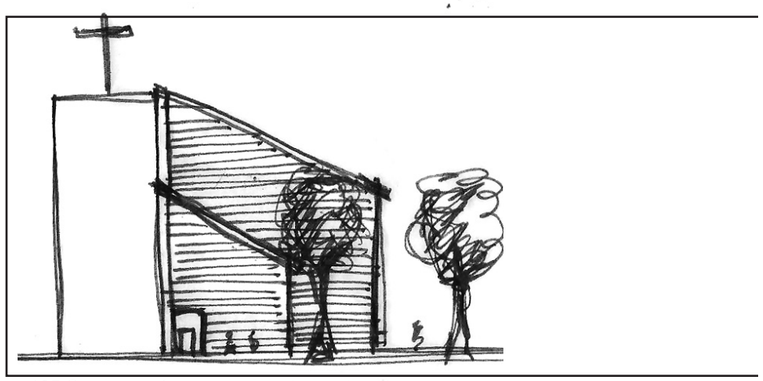
Ill. 190-192 Plan development. Sketches 1:500.



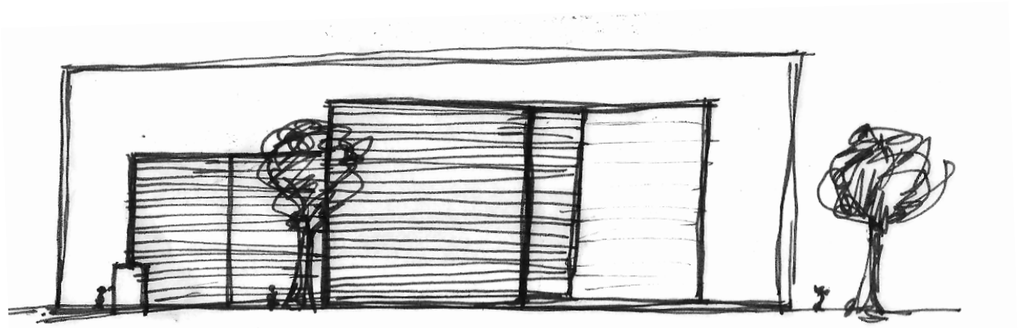
Ill. 193 Horizontal roof scenario. West elevation.



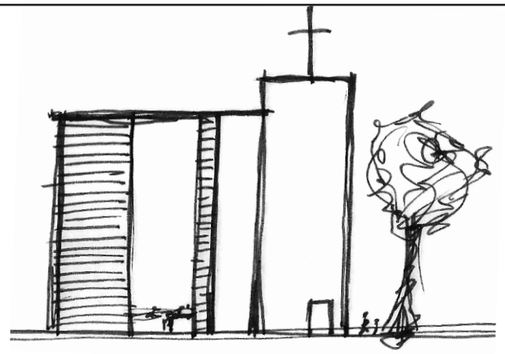
Ill. 194 Lowered sloping roof scenario. West elevation.



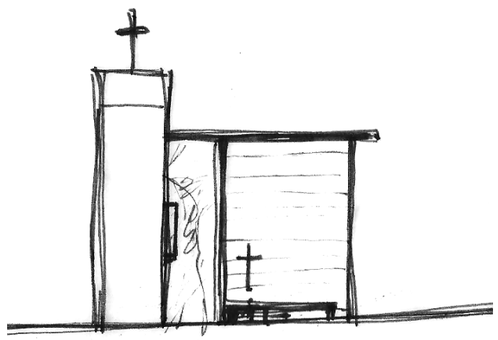
Ill. 195 Sloping roof scenario. West elevation.



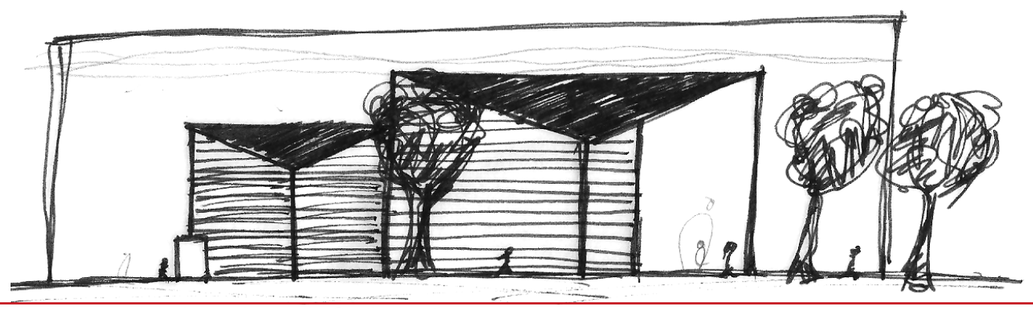
Ill. 196 Horizontal roof scenario. South elevation.



Ill. 200 Horizontal roof scenario. East elevation.



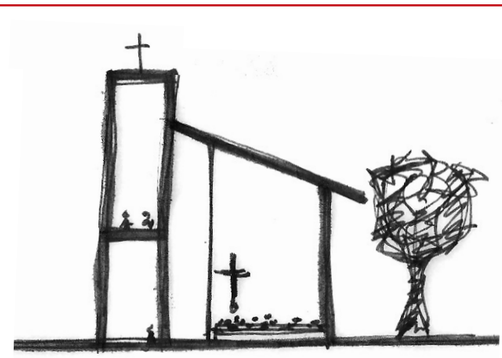
Ill. 203 Horizontal roof scenario. North-South section.



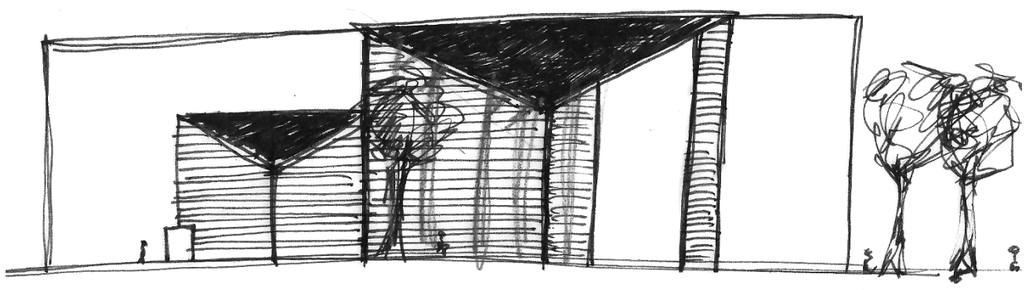
Ill. 197 Lowered sloping roof scenario. South elevation.



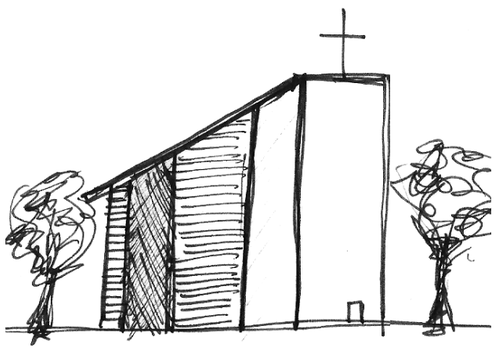
Ill. 201 Lowered sloping roof scenario. East elevation.



Ill. 204 Lowered sloping roof scenario. North-South section.



Ill. 198 Sloping roof scenario. South elevation.



Ill. 202 Sloping roof scenario. East elevation.



Ill. 205 Sloping roof scenario. North-South section.

SUMMARY

The overall concept for the Church design has been determined using a series of form studies and design iterations and an initial plan has been decided.

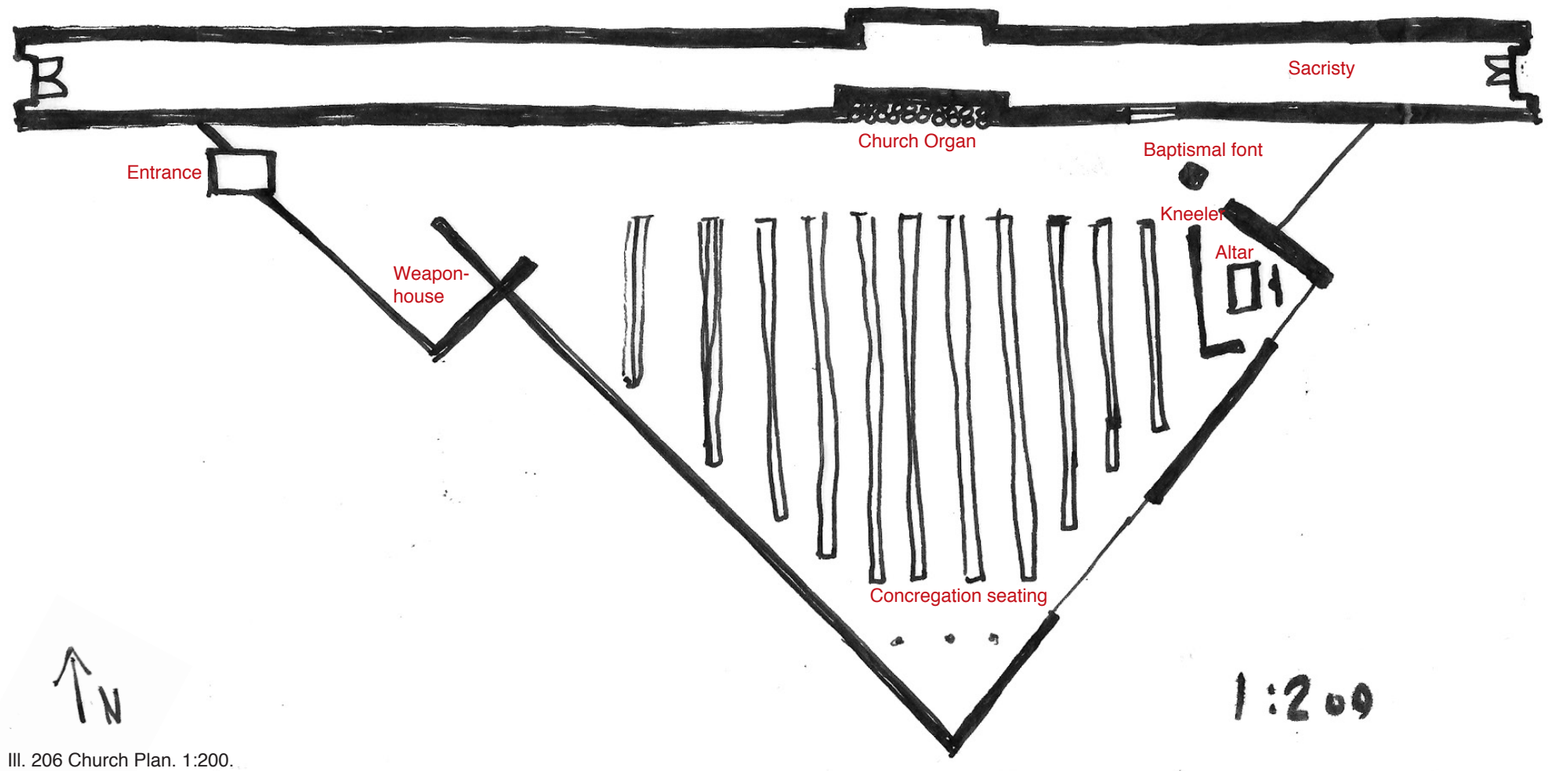
The Church has been developed using plan, elevation, modeling and acoustic investigations.

The form studies give an idea for the direction of the project where elements of different scale are tested. In the form studies of plans, the idea for the Church is derived.

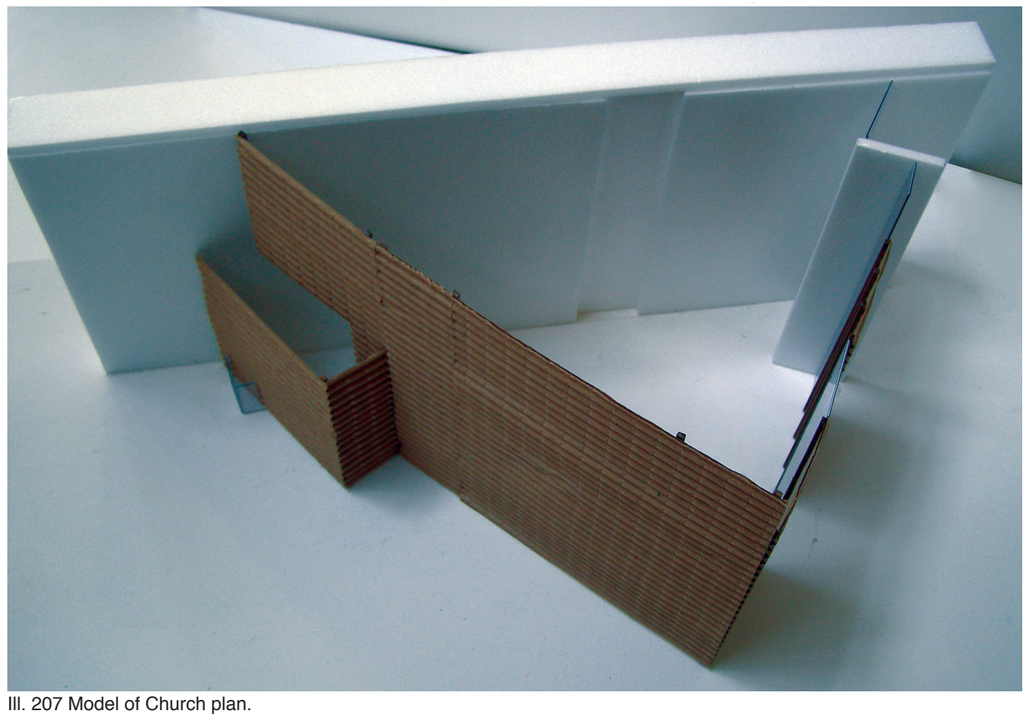
Through the acoustic analysis of different spaces it is seen how a space possess different natural acoustic qualities. The triangular form idea is tested against the more regular rectangular rooms and it is chosen to keep working with the triangular plan.

The plan is tested with different scenarios of wall sizes and window placements and iterations are made to unify the plan further. Through elevations, sections and modeling the Church design becomes more defined and a concept is derived.

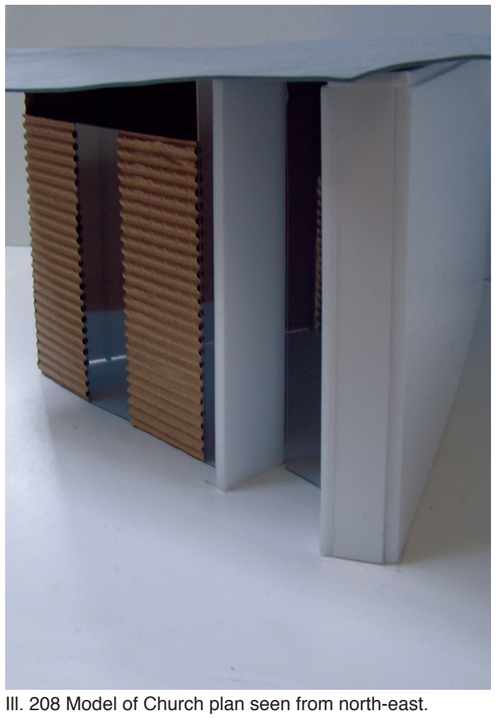
The overall concept is used further in the detailing process of the project.



Ill. 206 Church Plan. 1:200.



Ill. 207 Model of Church plan.



Ill. 208 Model of Church plan seen from north-east.

DELTA

DETAILING

INTRODUCTION

In this section the various elements of the Church Centre will be further detailed using the ideas and solutions from the sketching process.

In this section the placement of the Church together with the Church Centre is given according to the previously defined objectives during the sketching phase.

THE CHURCH

The Church is placed in the north western part of the chosen site in order to gain from the most sunlight and become visible from the Metro Station. The outer parameters of the Church are given from the sketching phase and it is seen how it will stand as a large element on the site and therefore become highly noticeable in the urban landscape. (Ill. 209)

The Church is accessed from east where there is a small drop-off area for the hearse and for bridal cars. The area helps to mark the entrance into the Church building.

THE MULTI-FUNCTIONAL HALL

The large Multi-functional hall is placed in the opposite corner of the site from the Church. As the multi-functional hall has flexible use the interior placement of objects are taken from a large sports hall which can be used for concerts, sports, community gatherings, and large Church ceremonies. The requirements of the multi-functional space is seen as a removable stage area and removable seating, storage for stage, chairs and tables, and public bathrooms and changing rooms. The entrances of the multi-functional space are placed towards south at the parking area and towards north at the Church Centre's central square. (Ill. 209)

STAFF FACILITIES AND EDUCATION ROOMS

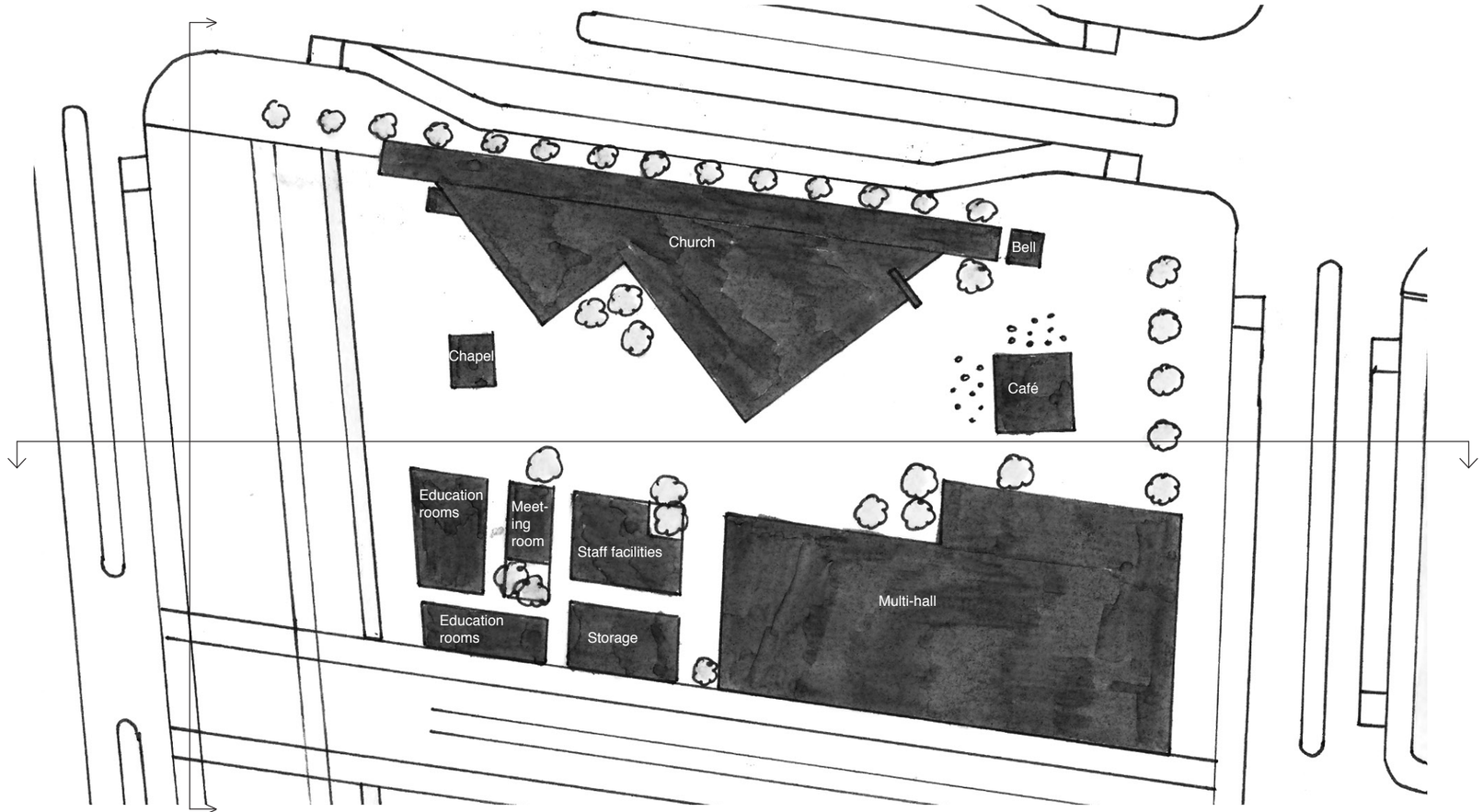
The functions within this category all consist of smaller separate elements that do not need to be immediately connected. It is therefore chosen to place the different functions in smaller built volumes of 1-2 stories, making them approximately 10m high. The height is wanted in order to relate to the nearby structures around the site that are approximately 34m high.

THE CAFE

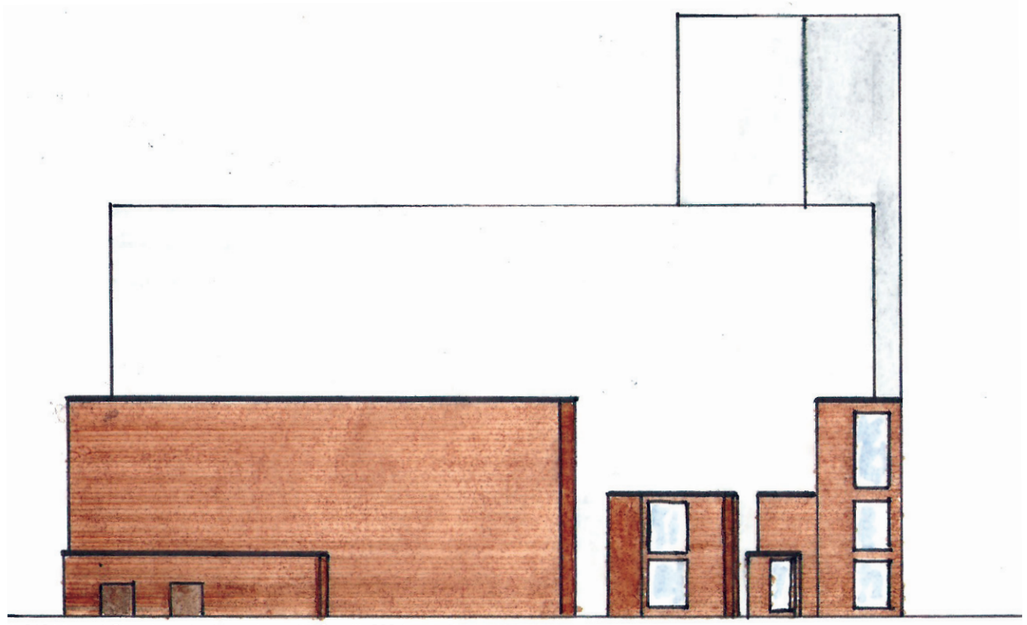
The public café is situated by the central square of the Church Centre and will encourage longer stays in the area. The café is placed in a more natural park environment that invites people to pass through the Church Centre and thereby connect with the area.

SUMMARY

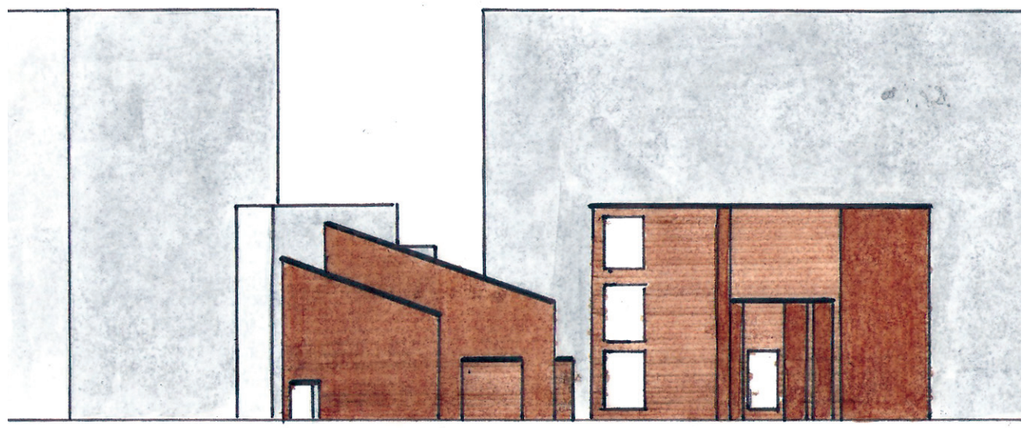
The placement of the various functions creates an urban space in Ørestad South that relates to a more human scale. The small park area will lead people into the site and will lead them to interact with the Church Centre. The facades are made in wood in order to give a softer and lighter character to the buildings of the Church Centre.



Ill. xx 209 Plan of Church centre 1:500



Ill. 210 View of Church centre towards south. See ill. 209 for section mark.



Ill. 210 View of Church centre from west. See ill. 209 for section mark.

THE SACRAL SPACE
PLAN DETAILING



Ill. 211

In this section, the detailing of the various functions in the plan will be decided. In the following, the elements of the Church plan will be defined within their various functions.

THE SACRAL SPACE

The sacral space is the most important space within the Church. This is the space where quiet prayer and ceremonies take place. The specific functions of the sacral room are; seating for the congregation, altar, kneeler, pulpit, organ, and choir. In the previous sketching these functions have only been insinuated in the plan.

When detailing the plan drawings it is important to have the experience of the sacral room in mind. When entering the sacral room the seating area is positioned to the right and it is chosen to finish the long stretch of the aisle along the northern wall by a large window that accentuates the elongation of the northern wall and enhances the east-west direction of the Church. (Ill. 211)
The congregation is placed centrally in the sacral space facing the altar towards east.

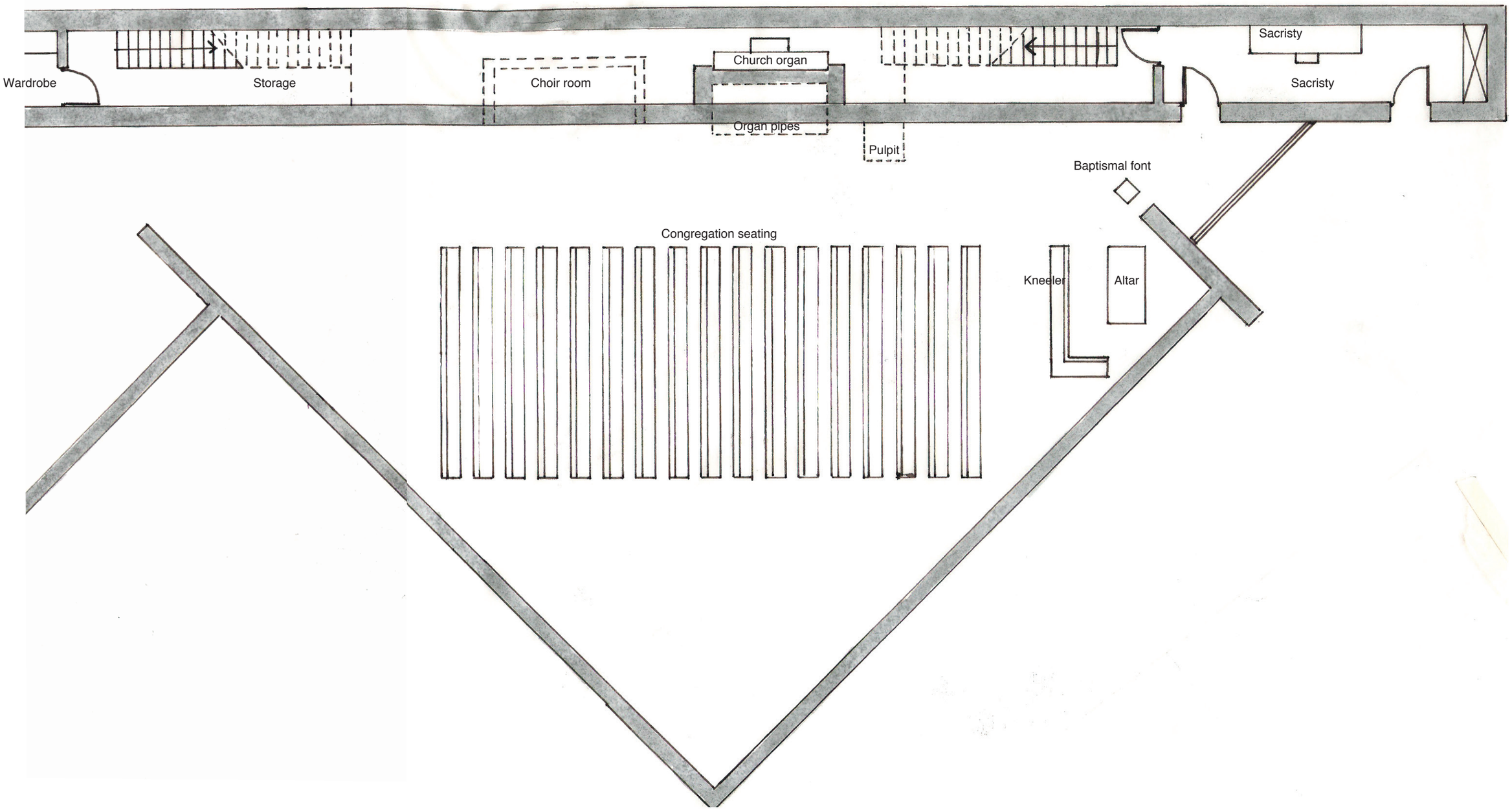
In front of the altar is the kneeler for the Holy Communion. To the left of kneeler is the baptismal font standing in aisle. (Ill. 212)

The placement of elements in the room is very simple and follows the lines and walls of the plan in order to create a harmonious space for quiet contemplation and ceremonies, without interrupting elements.

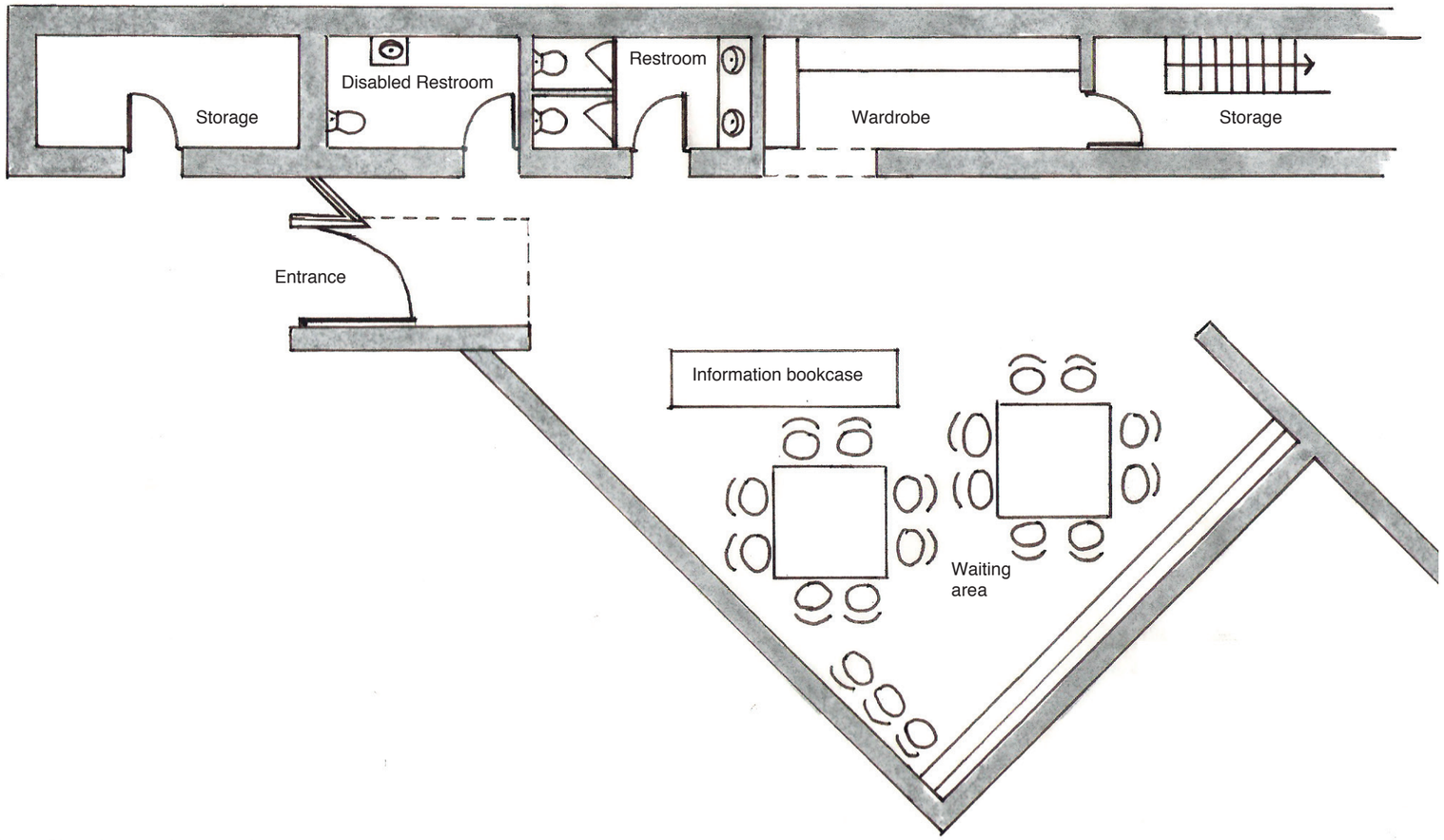
SACRISTY, CHOIR AND ORGAN

The sacristy lies to the western end of the church where there is a separate entrance for the priest. The sacristy has room for changing into priest's vestments and has a small private altar.

From the sacristy it is possible to enter directly into the sacral room. At the end of the sacristy is an entrance to a storage room that also gives access to the pulpit, organ and choir room. The Choir room and the pulpit are situated in different plan from the sacral room and lies 4 meters above ground level. (Ill. 212)



Ill. 212 Plan of the sacral room 1:100.



Ill. 213 Plan of weaponhouse and entrance. 1:100.

WEAPONHOUSE AND ENTRANCE

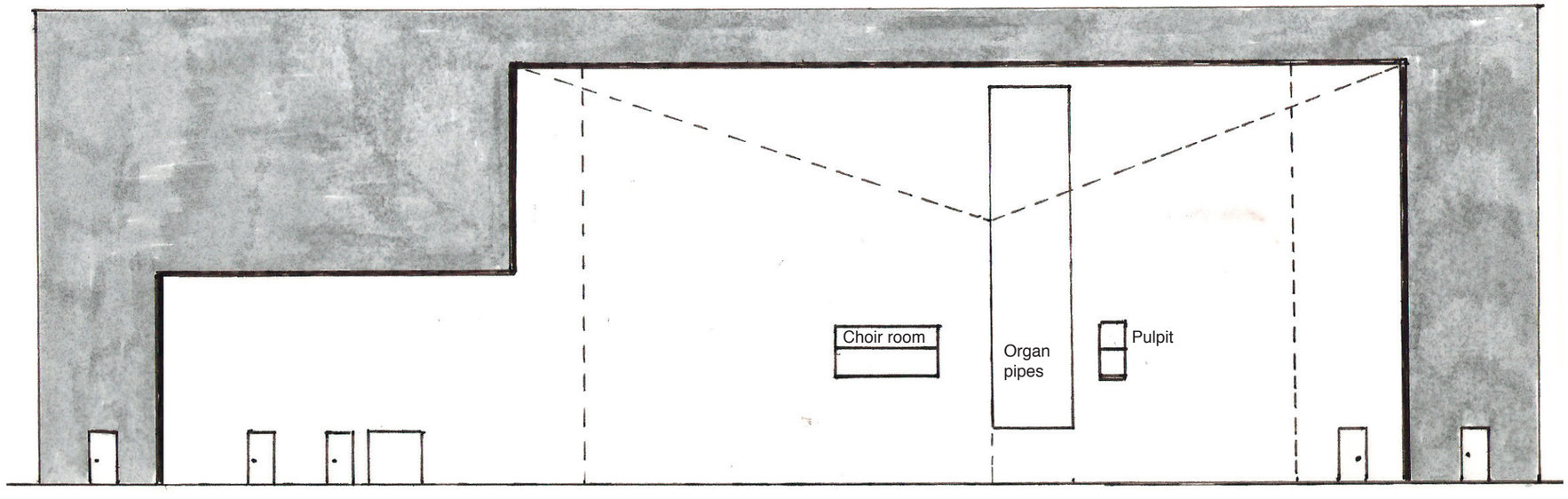
The weaponhouse functions as the entrance to the Church and the sacral room. The functions needed here are wardrobe, toilet facilities, waiting area for weddings and baptisms and a small play area.

The entrance to the Church is marked by a wooden door shaping a rectangular box connected to the triangular shapes of the weaponhouse and Church. By placing the entrance in this area and mimicking the rectangular shape of the large northern heavy wall the aisle of the church is enhanced in both the sacral room and the weaponhouse. (Ill. 213)
In the weaponhouse the functions are divided to each side of the aisle with restrooms and wardrobe to the left and the seating and play area to the right.
By placing the functions of restrooms and wardrobe within the heavy wall the functions become of less importance to the experience of the Church.

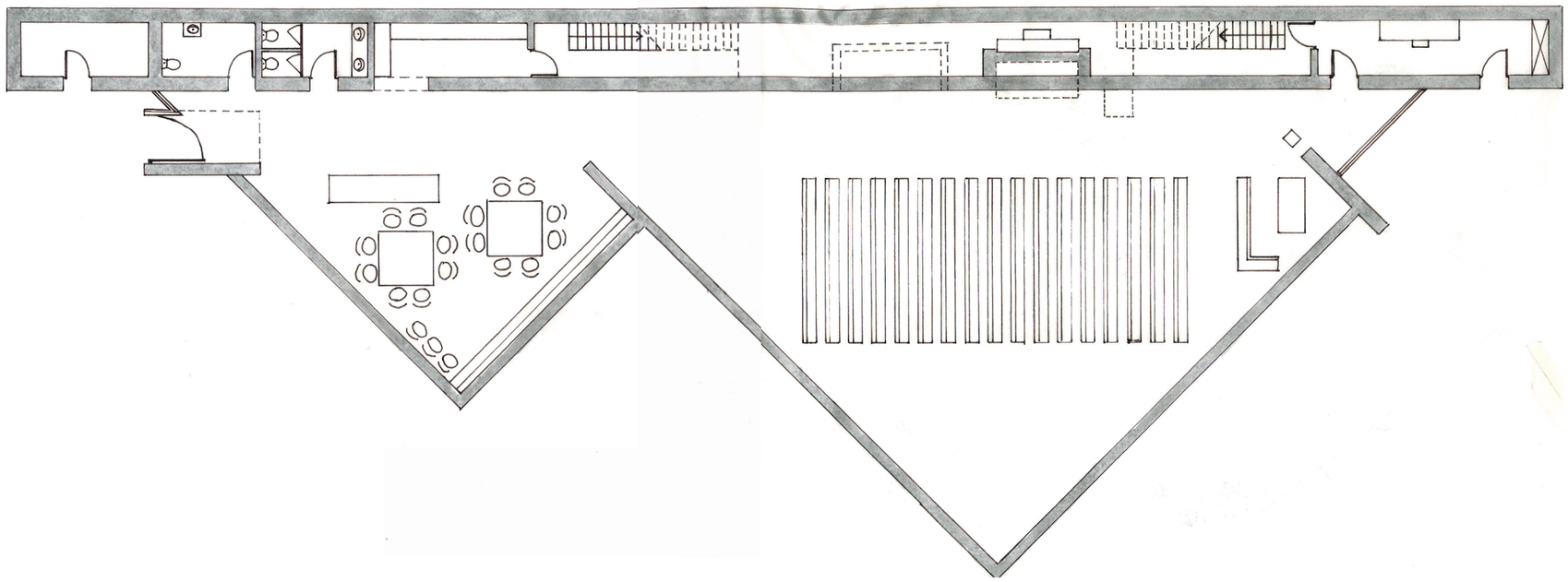
The waiting room and play area is laid out behind a small bookcase holding Church brochures and other information. The bookcase is placed in this area in order to accentuate a division between the aisle and the waiting room and at the same time lead the way towards the sacral room.

SUMMARY

The various elements of the Church have been placed within the sacral room and both the outer and inner parameters of the Church have been defined. In the following, the plan solution will be improved by implementing the elements of light, acoustics and construction.



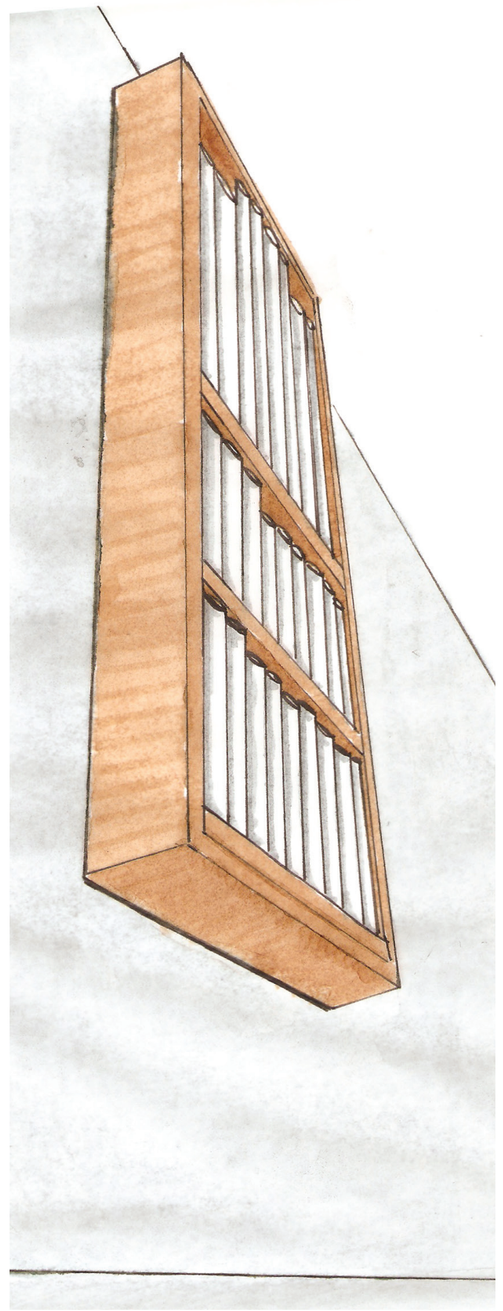
Ill. 214 East-west section 1:200 showing placement of Choir, Organ and Pulpit.



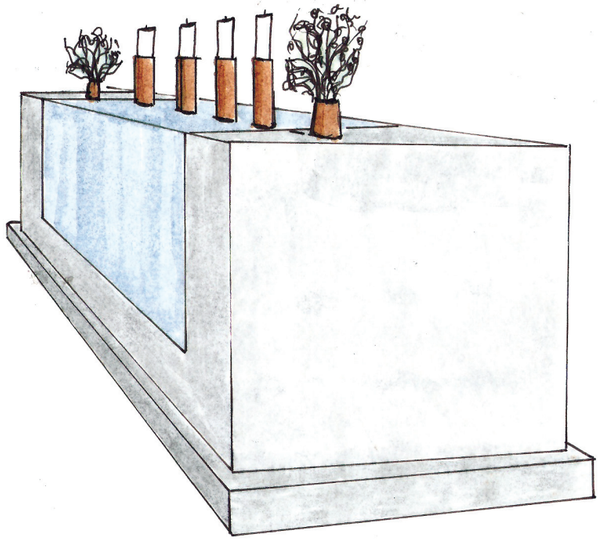
Ill. 215 Total plan of Church. 1:200.

THE SACRAL SPACE
INTERIOR DEVELOPMENT

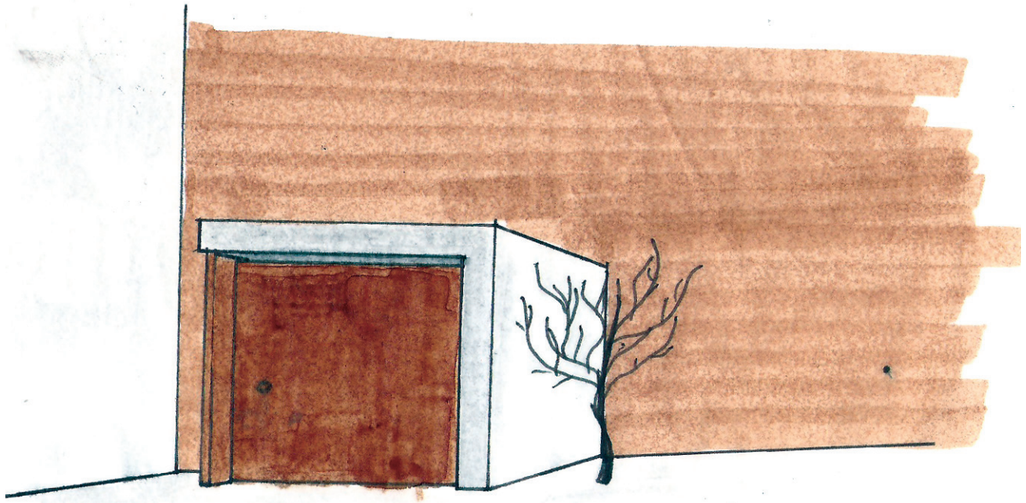
The various elements within the Church are yet to be defined. In this section the Organ, Pulpit, Choir, Altar and Seating will be defined using sketches.
The ideas for the different elements are derived from the ideas that were used to create the plan solution.



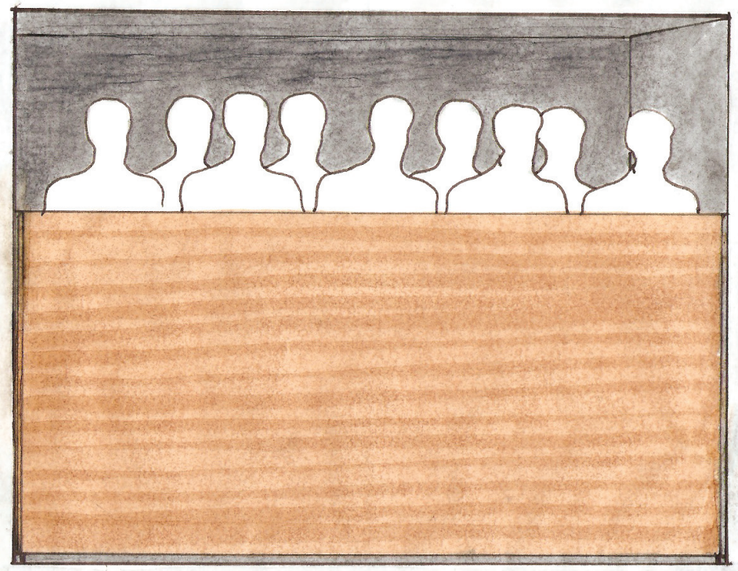
Ill. 216 The Church Organ pipes are situated in the northern wall and becomes an element that reaches out of the wall and into the sacral space.



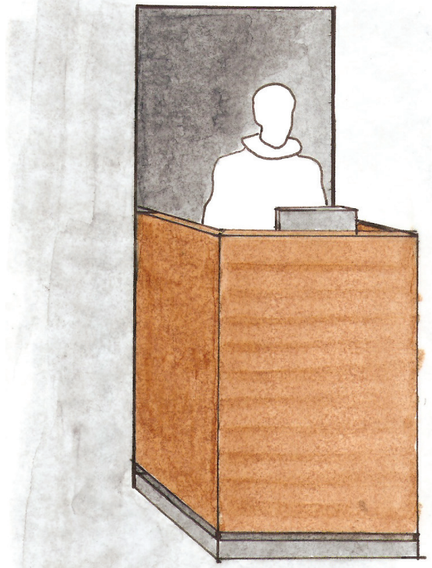
Ill. 217 The entrance is pushed out from the wall to emphasize itself. The Church door is a large massive wood door.



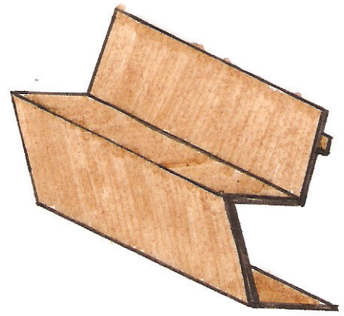
Ill. 218 The entrance is pushed out from the wall to emphasize itself. The Church door is a large massive wood door.



Ill. 219 The Choir is placed within the northern wall



Ill. 220 The Pulpit is placed in the northern wall and becomes an element that reaches out of the wall and into the sacral space.



Ill. 221 The seating for the congregation is chosen to be Church Benches made in laminated wood

DETAILING LIGHT

In the following, the light within the sacral space will be detailed and tested in terms of daylight quality.

LIGHT EFFECTS

The light in a sacral room means a lot for the religious experience. As discussed in the analysis, light can be applied in a room with different effects.

In the sacral room contrast between dark and light can be used to create elements of focus in the room where the light accentuates different aspects in the interior.
In this project the effect of contrast will be used to create focus on the altar as the important place of ceremony in the room. It is therefore sought to make the altar the lightest area in the room and the other areas a little darker.

Another effect of light is when it is used to accentuate the material surfaces of the room. This effect is also wanted within the sacral room as materiality is seen as very important for the experience of the sacral room.
It is sought to use this effect by placing smaller windows in a narrow band in the wall close to the roof. This will accentuate the materials and textures of the wall and roof.

The ideas for the window placements are tested in the light simulation program DIAL-Europe. The program will give an overview of the light distribution in the room and give a daylight factor.
The daylight factor is used t define the light level in the room. The average daylight factor should be above 2%, which will enable reading in the room.

TRIAL 1

In trial 1 the idea is to place windows high directly under the roof in order to create contrast in the interior and to use the light to accentuate the materials of the walls and roof. (Ill. 222) The average daylight factor is 2,2% which will give the room a darker character in some areas.
The main light source is derived from the widow behind the altar and the daylight factor gets lower from this point. This means that the altar will be accentuated and lit up, contrasting with the darker areas of the congregations seating.

TRIAL 2

In trial two another window is added behind the altar having frosted glass. The extra floor-to-roof window heightens the mean daylight factor to 3%. (Ill. 223) As all the light enters behind the altar and the priest it means that the priest will become dark when facing the congregation due to the contrasting bright light coming from behind. The brightness of the light coming directly from behind the priest can be regulated by frosting the glass with a darker tint, for example a mosaic.

TRIAL 3

In order to level out some of the contrast between the congregation and the priest a large window is added behind the congregation. The window is shaded by wooden lamellae covering 50% of the window area from the outside. (Ill. 224) The daylight factor reaches 9,5% and the light in the sacral room becomes very evenly distributed which means that the light-dark contrast disappears

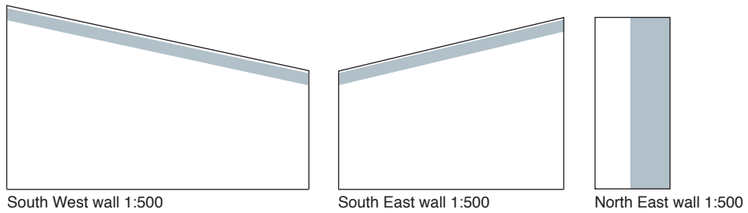
TRIAL 4

In this trial more lamellae are added to the facade in order to have more control of the light, which enters behind the congregation. (Ill. 225) By placing wood lamellae that covers 80% of the glass area of the facade the mean daylight factor is lowered to 4,5% and the contrast between light and dark will become enhanced compared to trial 3. It is also seen that the room is most brightly lit around the altar why this area of the Church is enhanced as wanted.

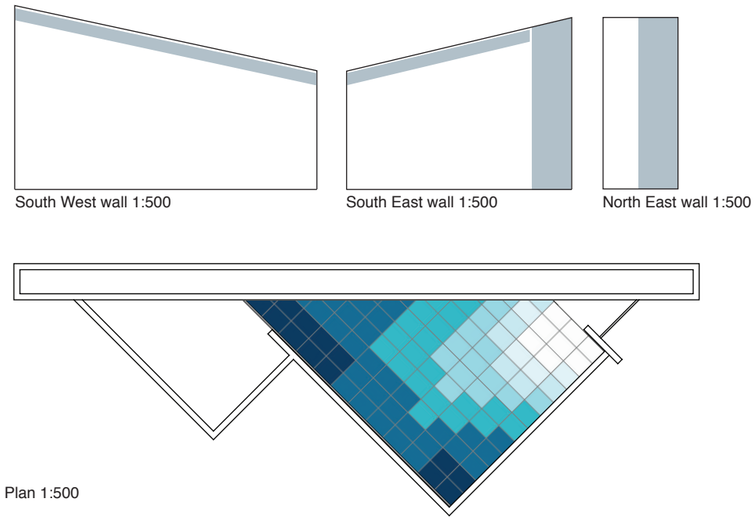
SUMMARY

The light trials portray two main ideas for the interior and exterior expression for the Church. The placement and area of the windows will have an effect for both the acoustics and the facade expression.
It is chosen to use both the ideas of trial 2 and 4 in the further development as the decision for the light will affect other aspects of the design. The two ideas have very different interior expression as one is lighter than the other and it is seen as important to evaluate the acoustics, materials and facades before the final solution for the light in the Church interior is made.

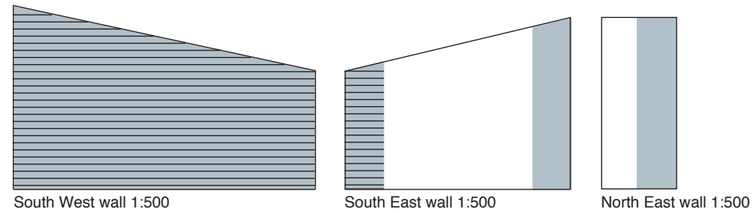
In the following the acoustics of the room will be evaluated as the acoustic quality of materials it will have a great impact on the choice of materiality in the interior. The two scenarios will be tested and looked at in terms of possible improvements. It is noticeable that glass, as a material, do not have very good acoustic quality and should therefore be avoided in certain areas. This will be tested in the next section.



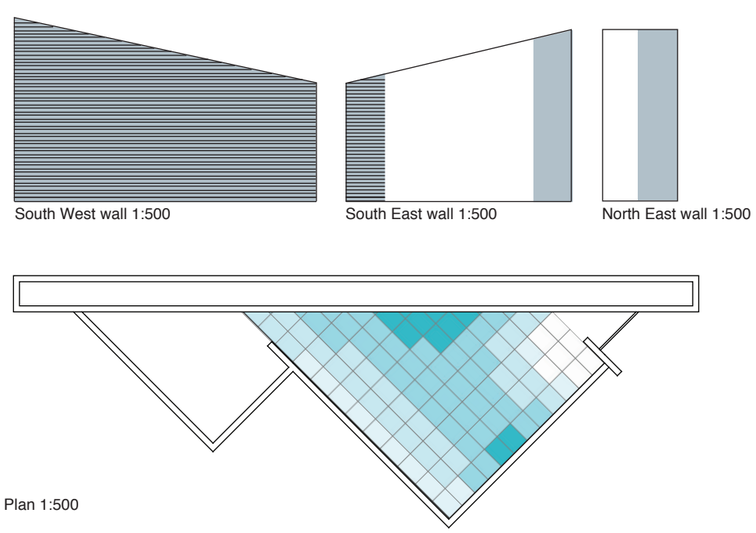
Ill. 222 Trial 1. The window placement gives a mean daylight factor of 2,2 percent.



Ill. 223 Trial 2. The window placement gives a mean daylight factor of 3 percent.



Ill. 224 Trial 3. The window placement gives a mean daylight factor of 9,5 percent.



Ill. 225 Trial 3. The window placement gives a mean daylight factor of 4,5 percent.

ACOUSTIC OPTIMIZATIONS

In this section the acoustic parameters of the sacral room will be optimized by testing a model of the sacral room in CATT-acoustic.

MATERIALITY

In terms of the acoustics of the sacral space the interior materials are very important. As decided in the previous sections. The Church will have a heavy concrete wall towards north, whereas the southern, western and eastern walls are made of wood with glass windows.

In order to accentuate a feeling and tactility of the material it is chosen to keep the exterior and interior materials the same. This means that the northern interior wall will mimic the outer wall of concrete and the other walls will be constructed of wood. This means that the seating of the congregation will be placed in the “wooden” part of the room that “leans” on the concrete northern wall. The organ is placed as an element in the concrete wall together with the choir and the pulpit.

In terms of acoustics; concrete is a hard material that mainly reflects sound whereas wood is a softer material that absorbs sound. These material properties will help shape the acoustic interior of the room.

ACOUSTIC MODEL I

The first acoustic model is used to create an overview of possible problematic acoustic issues for the sacral room.

The materials used in the model are concrete for the northern wall and wood for the other walls, floor and roof. The north-east wall is made of glass.

The sacral room has four sound sources; the priest at the altar, the priest at the pulpit, the choir, and the Organ. The four sound sources are positioned in different places in the room. (Ill. 226).

The first acoustic model shows good results for an evenly distributed sound pressure level for all sources, receivers and frequencies. (Ill. 227)

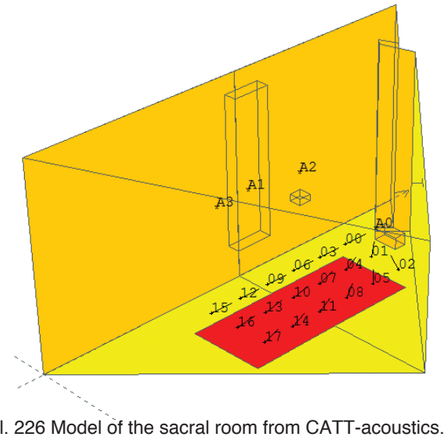
The first sound reflections also reach all listeners within the first 50ms after the direct sound. (Ill. 228) The reverberation times for choir, pulpit and altar are approximately the same, lying between 1,02-2,48s. This is a little high for speech, but better for the music from the Choir. (Ill. 229) The organ has a reverberation time between 1,44-3,13.

Deutlichkeit is very low for most of the room, whereas Clarity (C-80) has better values.

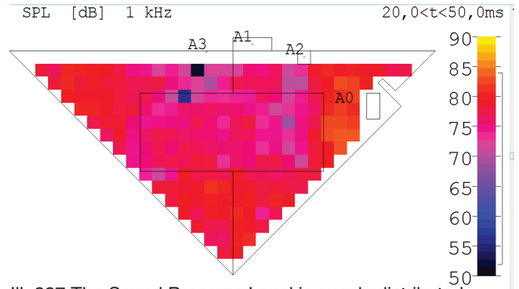
[For calculations, see enclosed CD]

WINDOW MODEL 1

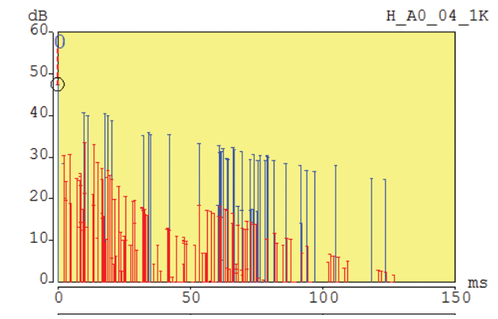
The model takes its starting point from the ideas in the previous sections in trial one and two. In the model it is estimated that the small band of windows following the roof line will have very little meaning for the sound reflections in the room due to the high placement, and therefore they are not included in the model.



Ill. 226 Model of the sacral room from CATT-acoustics. Sound sources are A0) The priest at the altar, A1) The organ, A2) The priest at the pulpit, and A3) The Choir.



Ill. 227 The Sound Pressure Level is evenly distributed centrally in the room where the seating area is situated.



Ill. 228 Example of sound reflection from the priest speaking at the altar.

	125	250	500	1k	2k	4k	
EyrT	1,84	1,07	1,47	2,13	2,47	1,64	s
EyrTg	1,84	1,07	1,47	2,14	2,48	1,64	s
SabT	2,07	1,28	1,68	2,36	2,67	1,76	s
T-15	1,77	1,03	1,40	2,13	2,53	1,64	s
T-30	1,77	1,02	1,38	2,09	2,47	1,63	s
AbsC	17,44	28,04	21,02	14,51	11,61	14,42	%
AbsCg	17,44	28,02	21,01	14,44	11,57	14,50	%
MFP	8,81	8,82	8,83	8,81	8,82	8,83	m
Diffs	19,76	20,18	20,71	21,18	21,64	22,08	%

Ill. 229 Reverberation time for the Choir.

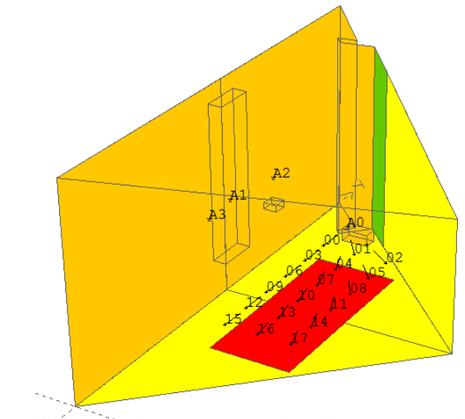
A large window is added behind the altar in the room. (Ill. 230) Adding the window to the initial model does not change the results from CATT-acoustic very much, but the reverberation time is a little bit higher for choir, pulpit and altar, whereas the reverberation time for the organ is lower. In this case, it would have been preferred to create a longer reverberation time for the organ and lower reverberation times for the speakers and Choir. (Ill 230-233)

WINDOW MODEL 2

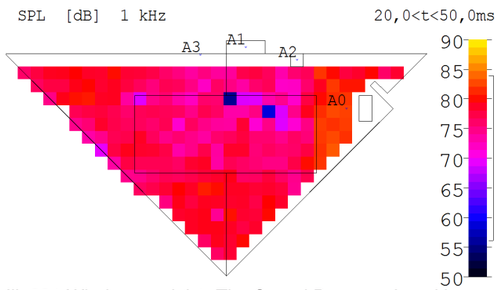
The model takes its starting point from the window areas defined in trial 3 and 4 in the previous section. Windows are added to the South-West and South-East walls in the model. (Ill. 234)As expected the hard material of glass heightens the reverberation time for all sound sources in the room. (Ill. 235)
The sound pressure level and sound reflections are still good, but the problems in the model lies in the reverberation time and the deutlichkeit, which are too high and too low, respectively. (Ill. 236-237) These elements can be improved by adding sound reflectors and absorbers or by changing the materials in the room to become more absorbent. Both wall and woof materials are made of wood and can be changed into more absorbent wood materials.

SUMMARY

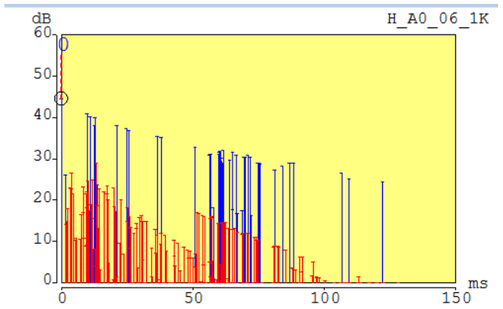
The two scenarios for the acoustic interior are both plausible solutions as both ideas need to be further reworked in the interior to improve the acoustics and lower reverberation times and improving deutlichkeit.
In terms of the calculations, the ideas in model 1 seem to be the better solution acoustically because of the larger glass area in model 2.
In the example, the large glass panels in the interior do not have any construction elements and it is deemed that the acoustic qualities will change in this scenario when adding the construction to the interior.
It is chosen to continue working with Window model 2 in the further process as it has the most potential in terms of light (see p. 127) and will give thinner facades having more visual transparency. It is deemed that the acoustic qualities of the room will improve when the construction is applied in the model and materials of roof and walls are made more absorbent.



Ill. 230 Model of the sacral room from CATT-acoustics for window model 1. The newly placed window is coloured in green.



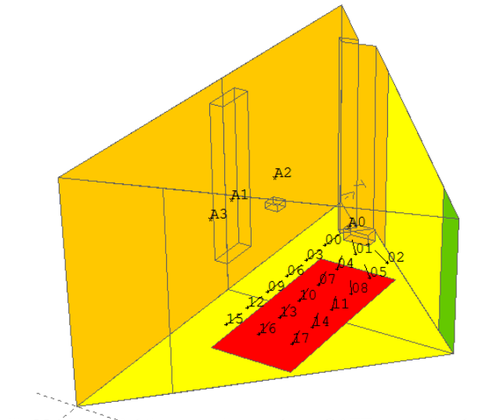
Ill. 231 Window model 1. The Sound Pressure Level is evenly distributed centrally in the room where the seating area is situated.



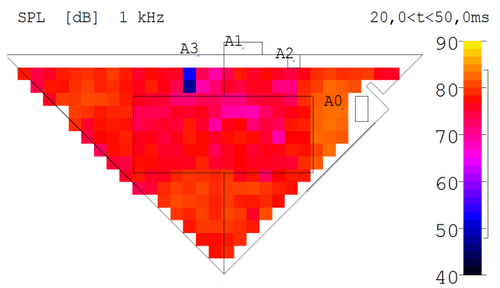
Ill. 232 Window model 1. Example of sound reflection from the priest speaking at the altar.

	125	250	500	1k	2k	4k	
EyrT	1,90	1,14	1,54	2,20	2,53	1,67	s
EyrTg	1,91	1,14	1,54	2,21	2,54	1,68	s
SabT	2,14	1,36	1,76	2,43	2,73	1,80	s
T-15	1,85	1,12	1,53	2,19	2,56	1,68	s
T-30	1,86	1,12	1,52	2,20	2,58	1,67	s
AbsC	16,94	26,51	20,08	14,05	11,33	14,06	%
AbsCg	16,91	26,57	20,09	14,03	11,27	14,02	%
MFP	8,82	8,81	8,81	8,81	8,82	8,80	m
Diffs	19,26	19,80	20,24	20,73	21,41	21,62	%

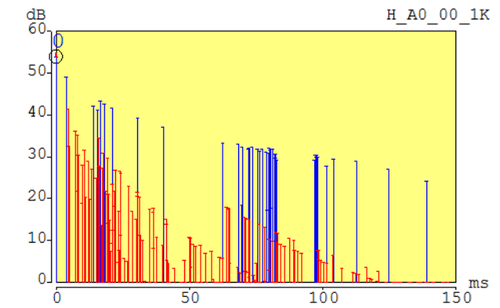
Ill. 233 Window model 1. Reverberation time for the Choir.



Ill. 234 Model of the sacral room from CATT-acoustics for window model 2. The newly placed windows are coloured in green.



Ill. 235 Window model 1. The Sound Pressure Level is evenly distributed centrally in the room where the seating area is situated.



Ill. 236 Window model 1. Example of sound reflection from the priest speaking at the altar.

	125	250	500	1k	2k	4k	
EyrT	2,40	1,78	2,18	2,68	2,97	1,99	s
EyrTg	2,39	1,78	2,17	2,69	2,97	1,99	s
SabT	2,63	2,01	2,40	2,91	3,15	2,10	s
T-15	2,41	1,92	2,30	2,75	3,06	2,04	s
T-30	2,43	2,65	2,35	2,84	3,04	2,05	s
AbsC	13,71	17,83	14,55	11,57	9,46	11,11	%
AbsCg	13,73	17,85	14,56	11,54	9,47	11,11	%
MFP	8,83	8,80	8,80	8,81	8,83	8,82	m
Diffs	16,42	16,93	17,40	17,95	18,35	18,86	%

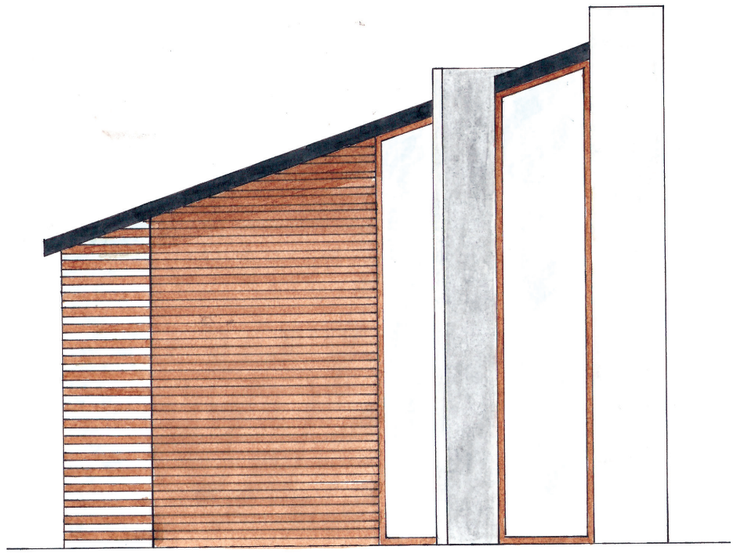
Ill. 237 Window model 1. Reverberation time for the Choir.

FACADES

In this section the facade for the Church will be detailed and defined. The starting point for facade drawings is taken from the previous sections; “Light detailing” and the “acoustic optimization”.

The materials are chosen according to the exterior expression of the Church building and the interior acoustic qualities of the material.
It is chosen to use concrete for the heavy wall and to use wood for the remaining walls. Some walls will be of solid wood whereas others will be a glass wall with wooden lamellae. This ides is derived from the initial form studies of filtering light into a room.

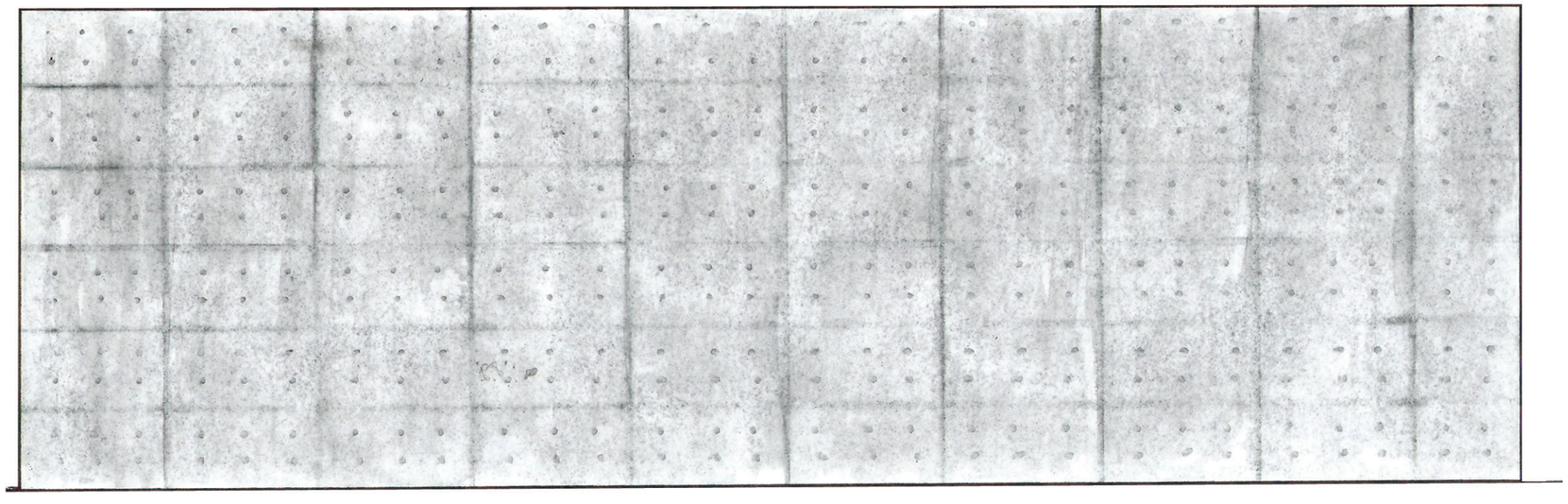
The south, east and west wall materials change between open and closed wooden facades whereas the northern concrete wall is very closed. The northern facade is given life by showing elements from the cast of the concrete blocks. This also divides the facade into smaller pieces and makes it become more interesting.



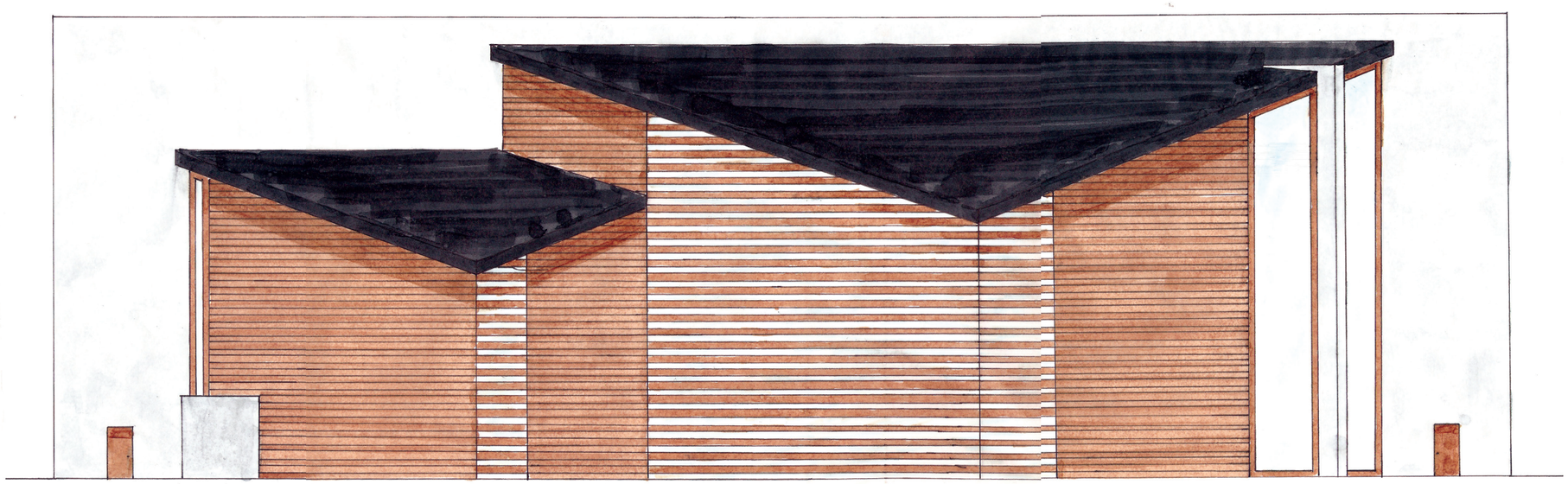
Ill. 238 East facade. 1:200.



Ill. 239 West facade. 1:200.



Ill. 241 North facade. 1:200.



Ill. 240 South facade. 1:200.

CONSTRUCTION

In this section the construction of the Church will be discussed and defined using constructional estimations and sketching.

MATERIALITY

In order to keep a softer feeling in the Church interior it is chosen to create to roof construction in wood. This choice of material will also have an effect on the acoustic parameters in the room.
To give a tactile quality to the sacral room it is chosen to have the roof construction as a visible element in the space that will enhance the direction of the room. It is seen as important that the physical structure of the Church is visible in the interior and not being hidden. By showing th estructure, it will become an element in the room and therefore a part of the experience.
In the following two different structures are tested for the roof construction, the column-beam construction and a fan-shaped construction. (Ill 241-248)

COLUMN-BEAM CONSTRUCTION

The first idea protrays the simple “common” soluton of a frame construction with pillars and beams positioned for every 2m. The beams are placed along the edges of walls and roof and are used tio accentuate the roof shape. The sequence of the beams adds a calmness and harmony to the room expression.

FAN CONSTRUCTION

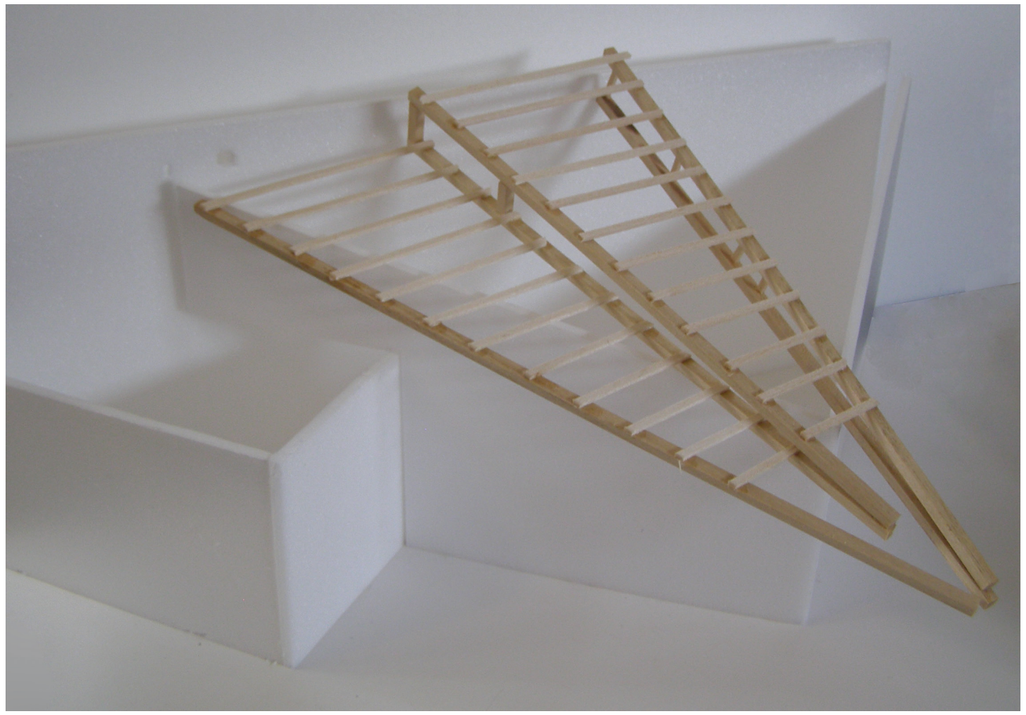
The second idea consists of a fan-construction where all beam elements are gathered in one point in the Church’s southern triangular corner. The construction shifts in heigh to let liight intp the room from the roof to accentuate the construction and the shape of the room.
The large beam holding the construction is placed in the southern corner inside the sacral room and therefore becomes an aesthetic element or sculpture within the sacral space.

EVALUATION

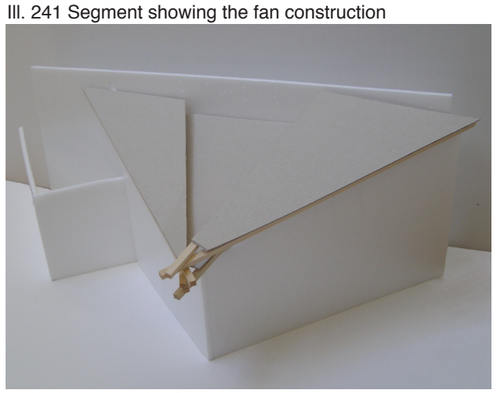
The two ideas have different qualities and flaws, why different elements of the two ideas are used in the further process.

The common column-beam construction is seen as too hidden in the room and does not create a sculptural element in the room such as the large column from the fan-shaped construction.
The fan-shaped construction will rely too much on the one beam in the south corner of the room, and the difference of roof heights according to the fan-shape seems to overaccentuate the heaviness of the roof held by only one pillar.
It is chosen to use the idea of the pillar becoming a sculptural alement in the room and therefore be moved back from the wall as in the idea of the fan-shaped construction, but also the harmony of the sequential positions of beams is wanted.

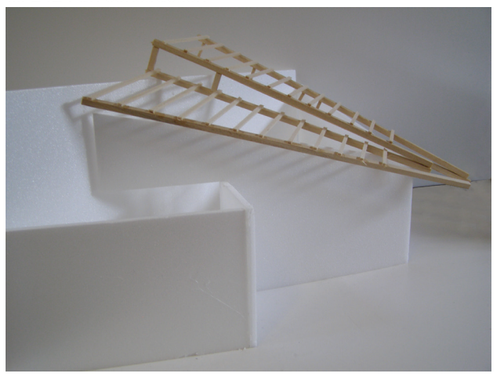
In the following a further development of the construction will be performed with calculations of beam and pillar sizes according to the load from the roof. The calculations are performed with a starting point from the column-beam construction. (Ill. 246-248)



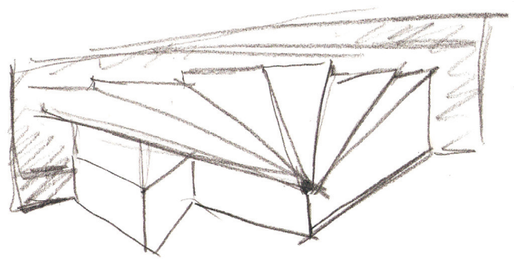
Ill. 241 Segment showing the fan construction



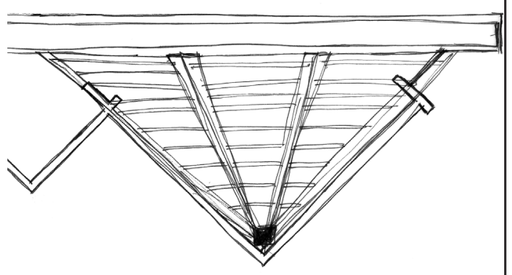
Ill. 242 Fan construction



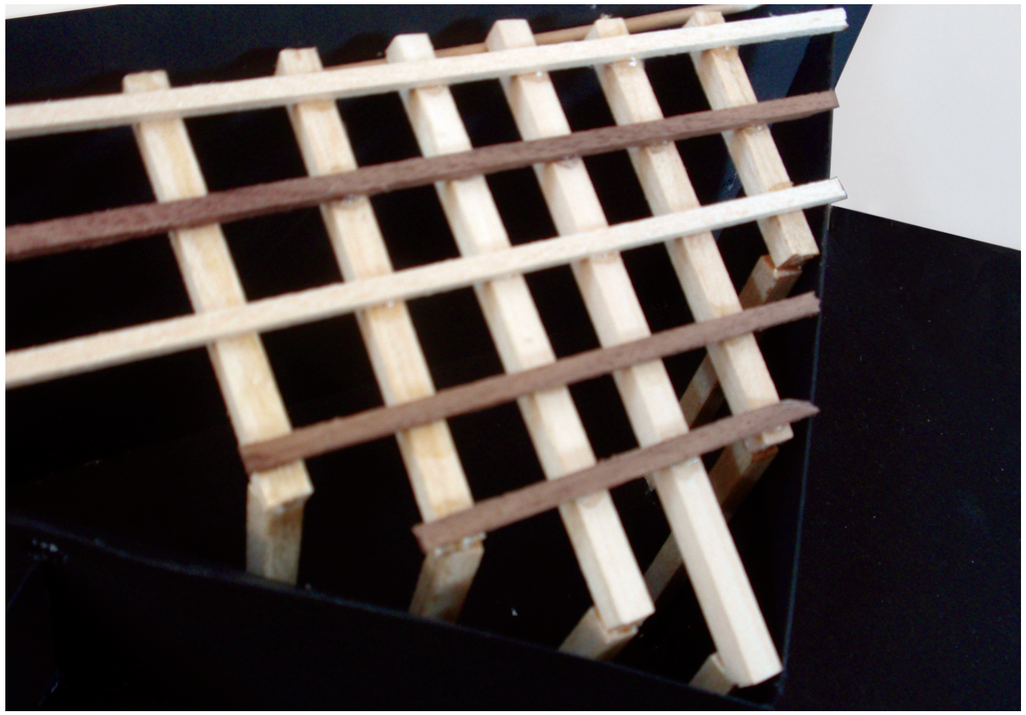
Ill. 243 Fan construction



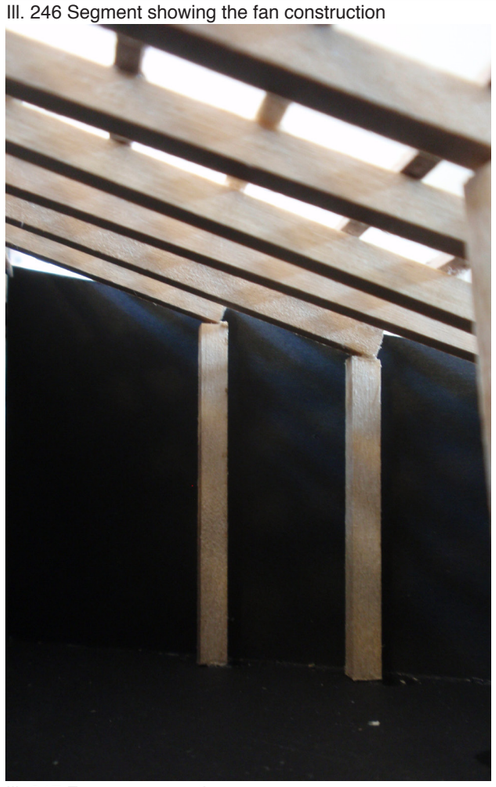
Ill. 244 Sketch of fan construction



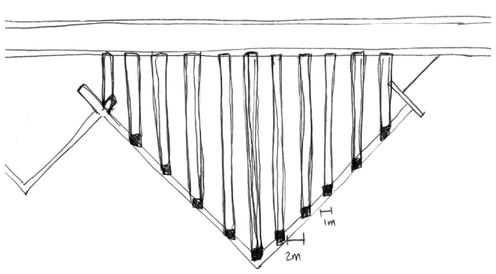
Ill. 245 Top view of the construction 1:500.



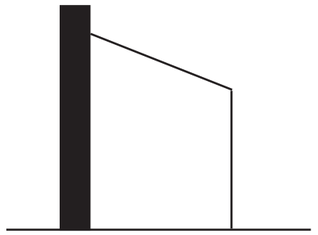
Ill. 246 Segment showing the fan construction



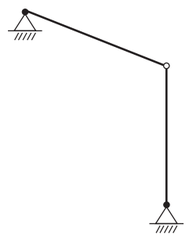
Ill. 247 Frame construction



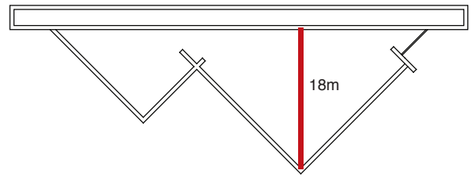
Ill. 248 Top view of the construction 1:500.



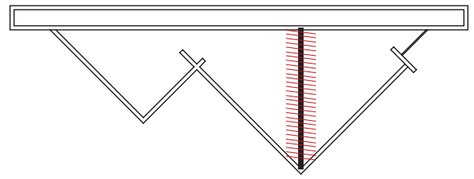
Ill. 249 Figurative section of the Church



Ill. 250 Static system for the roof construction.



Ill. 251 The construction is estimated from the dimension of the largest beam in the construction.



Ill. 252 Example of load for a beam.

TECHNICAL CONSIDERATIONS

The static system for the construction is defined by a column and a beam that are fixed along the the ground and the heavy wall respectively. (Ill. 250)

To keep with the materiality of the Church interior the beams and pillars are constructed of wood.

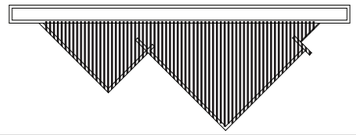
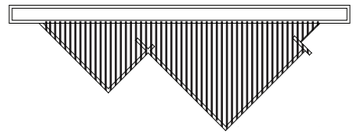
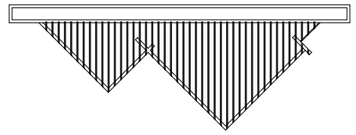
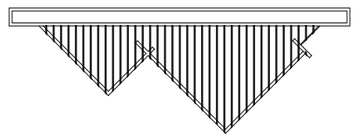
The Church lies in the load category of large indoor gathering spaces and therefore has a variable load of 4,0 KN/m^2. In the following, the estimation of beam and column sizes have been decided from the elements of heavy construction. [Ahler, 97]

As it is chosen to use wood for the construction and because of the large span of about 18m centrally in the Church space. (Ill. 251) The span of 18m will be defining for setting the dimensions for the beam size. The dimensions are estimated from the book: [Dimensionering med diagrammer].

In order to reach a span of 18 meters it is seen that laminated wood is a possible wood material. [Ahler, 273, 97], [App. II]

When choosing laminated wood with a (strenght class L40) there are various possibilities for placement and thickness of the material. (Ill. 253)

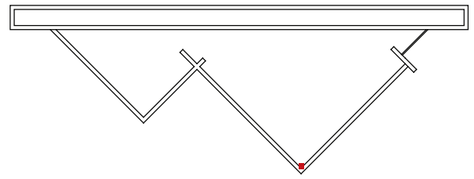
The different scenarios for the placement and sizes of beams are compared in order to chose a solution having both a constructional and aesthetic character for the room. In the estimation the pillars and beams are placed according to the common beam-column construction. (Ill. 253)

Beam distance	Diagram	Load	Beam dimensions
0,5m		0,5m	Width =185mm Height =900mm
1,0m		1,0m	Width =185mm Height =1100mm
1,5m		1,5m	Width =185mm Height =1200mm
2,0m		2,0m	Width =185mm Height =1300mm

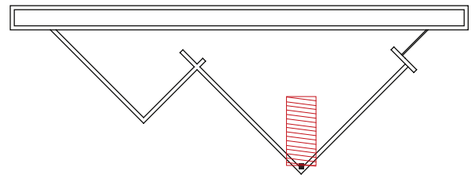
Ill. 253 Scenarios for placement of beams in the Church.



Ill. 253 Laminated wood.



Ill. 254 The construction is estimated from the dimension of the column bearing the most load in the construction.



Ill. 255 Example of load area for a pillar.

The beam scenarios are defined by their height and the expression a beam of about 1m will give the interior.

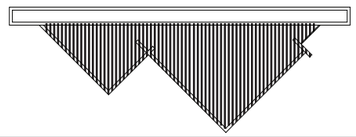
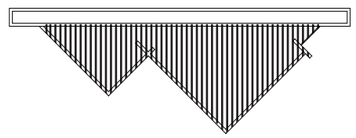
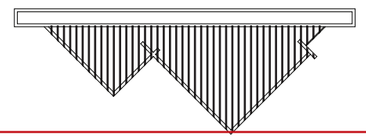
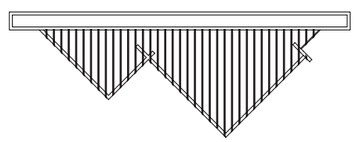
In the following the possible column structures are evaluated in terms of their size and sequential placement. Again, the column holding the largest load area will shape the column size for the rest of the construction. As laminated wood will be used for the beams, it is chosen to use laminated wood for the columns as well. The calculations are performed using the same method as for the beam. (Ill. 254-256)
The column is set to be 10m high according to the initial design for the facades and buildt structure.

EVALUATION

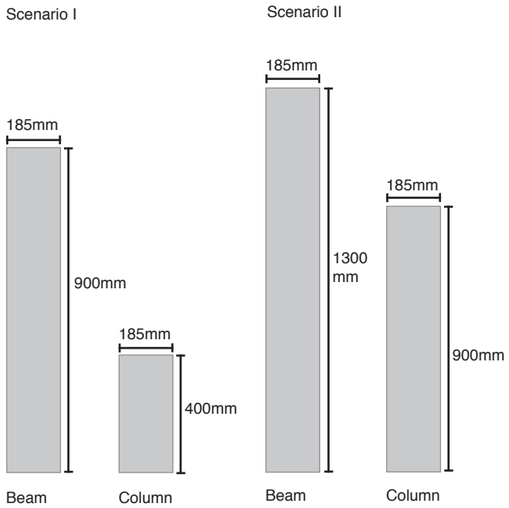
In order to find a suitable column-beam construction both the beam and column sizes have been looked at. It is seen that four different scenarios are possible. The main issue is the distance between two beams and columns. This distance has importance for the experience of the room as the construction will be visible within it.

It is chosen to discard the distance of only 0,5m as the beam and column size for this scenario is very different and a cohesion of volumes is wanted.

In the follwoing the scenarios for a distance of 1,0m and 2,0m are set up and tested in models.

Column distance	Diagram	Load area	Column dimensions
0,5m		9m x 0,5m = 4,5m^2	Width =185mm Height =200mm
1,0m		9m x 1m = 9m^2	Width =185mm Height =400mm
1,5m		9m x1,5m = 13,5m^2	Width =185mm Height =500mm
2,0m		9m x 2m = 18m^2	Width =185mm Height =900mm

Ill. 256 Scenarios for placement of beams in the Church.



Ill. 257 Cross section of beams and columns for the two scenarios 1:200.



Ill. 258 Scenario I - Beams and columns are positioned with a distance of 1m. Interior view.



Ill. 259 Scenario I - Beams and columns are positioned with a distance of 1m. Top view.



Ill. 260 Scenario II - Beams and columns are positioned with a distance of 2m. Interior view.



Ill. 261 Scenario II - Beams and columns are positioned with a distance of 2m. Interior view.

FURTHER DESIGN OF CONSTRUCTION

In order to join the elements of the two constructional ideas and the dimension giving paramters, two scenarios are tested in a model 1:100. (Ill. 258-261)
When moving the columns back from the walls and into the room they become elements within the space. It is therefore important to evaluate the effect of the number of elements created by the columns in the interior. The columns will be moved aproximately 1-1,5m back from the wall to make the columns become more part of the sacral room and a reference Roman Basilica's side aisles is made as an aisle will be created along the southern walls.

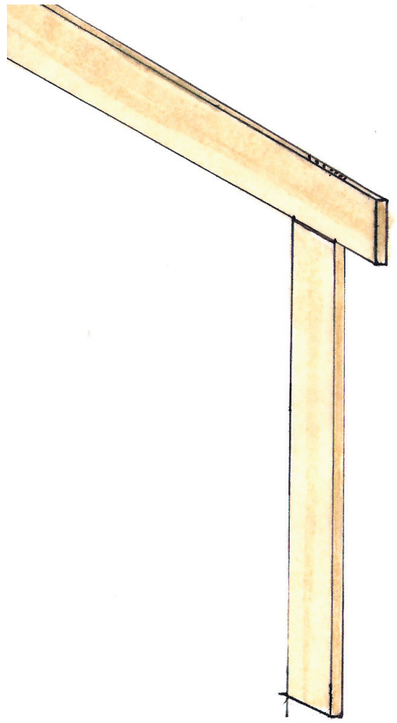
The distance of 1 meter between the columns add a large number of columns in the room and they are standing close and therefore almost become like a second wall element. (Ill. 257-258) This effect is not wanted. When placing the columns with a distance of 2 meters, fewer columns and beams are added to the room and even though the constructional elements will become larger, the effect of the columns as sculptural elements in the interior can be accentuated. (Ill. 260-261)

In order to create focus on the pillars as sculptural elements in the sacral space the it is wished to design a pillar or column with more detail.

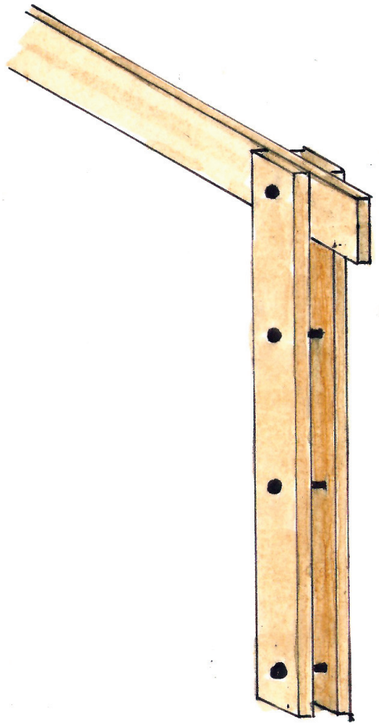
COLUMN DESIGN

The column design is decieded after sketching various ideas. (Ill. 262-265) It is chosen to divide the column into 4 smaller pieces that are bolted together in 4 places. (Ill. 265) By connecting the 4 smaller columns in severel points, the moment of inertia will be similar compared to the original column when the overall dimensions of the original column are kept and it is bolted together.

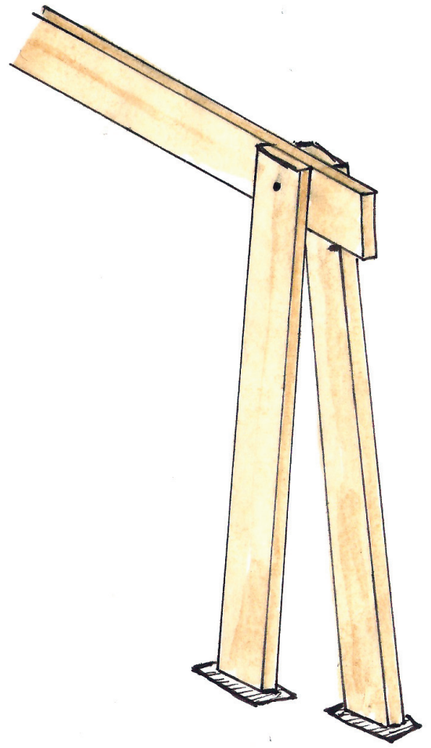
There are several possibilities for the floor joint of the column and different sketches of joints are made. (Ill. 266) The joint where the wood is bolted to the concrete base embedded into the slab is seen as the most structural and elegant joint and it is therefore chosen to use this joint in the Church. (Ill. 266,3)



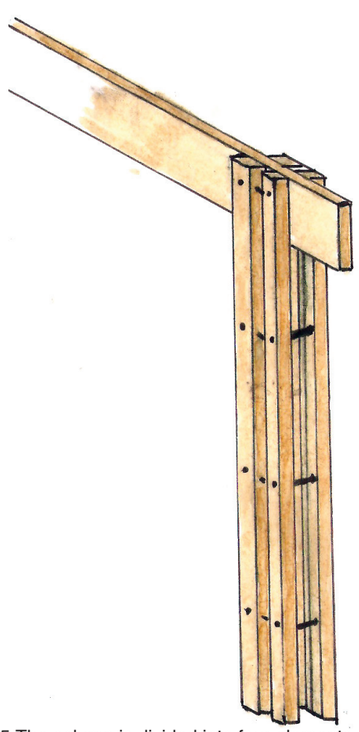
Ill. 262 Simple column-beam construction



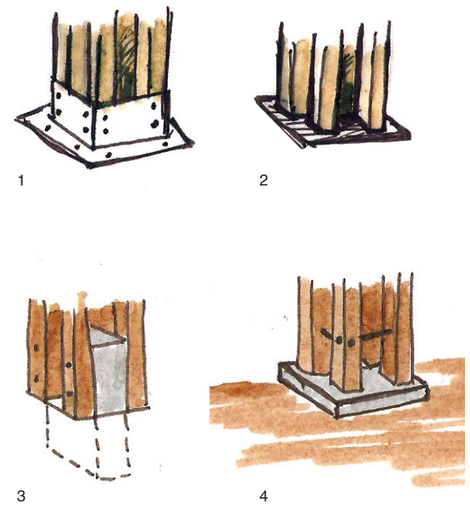
Ill. 264 The column is divided into two elements connected with bolts.



Ill. 263 The column is divided into two diagonal elements.



Ill. 265 The column is divided into four elements connected by bolts



Ill. 266 Examples of Joint solutions 1) Steel fitting, 2) Dissapering through a grid in the floor to connect with the concrete slab underneath, 3) Connected to an embedded concrete element coming up through the floor. 4) Embedded in to concrete coming up through the floor.

SUMMARY

The construction in the Church will be visible and the beams and pillars will become structural elements in the room that will define the room and accentuate tangible element of the materiality.

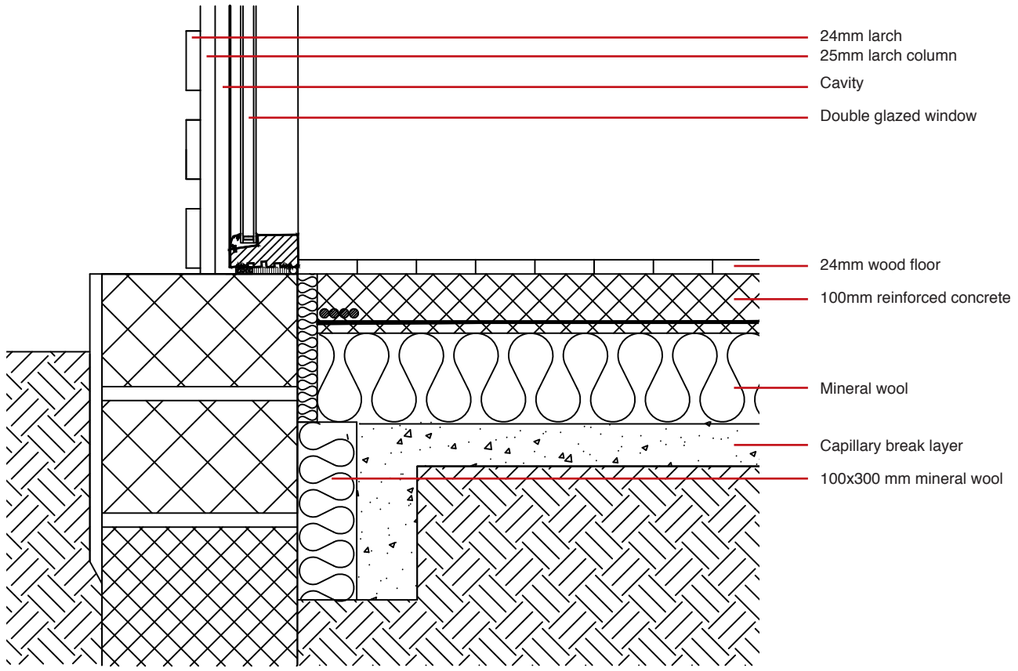
It is chosen to use a beam-column construction with a simple beam and a column that has a more structural character and becomes a sculptural element in the room. The columns are pulled back from the wall in order to give the effect of the sculptural element. Also, the columns will create a small aisle near the South-east and South-western walls.

CONSTRUCTION
DETAILING WALL ELEMENTS

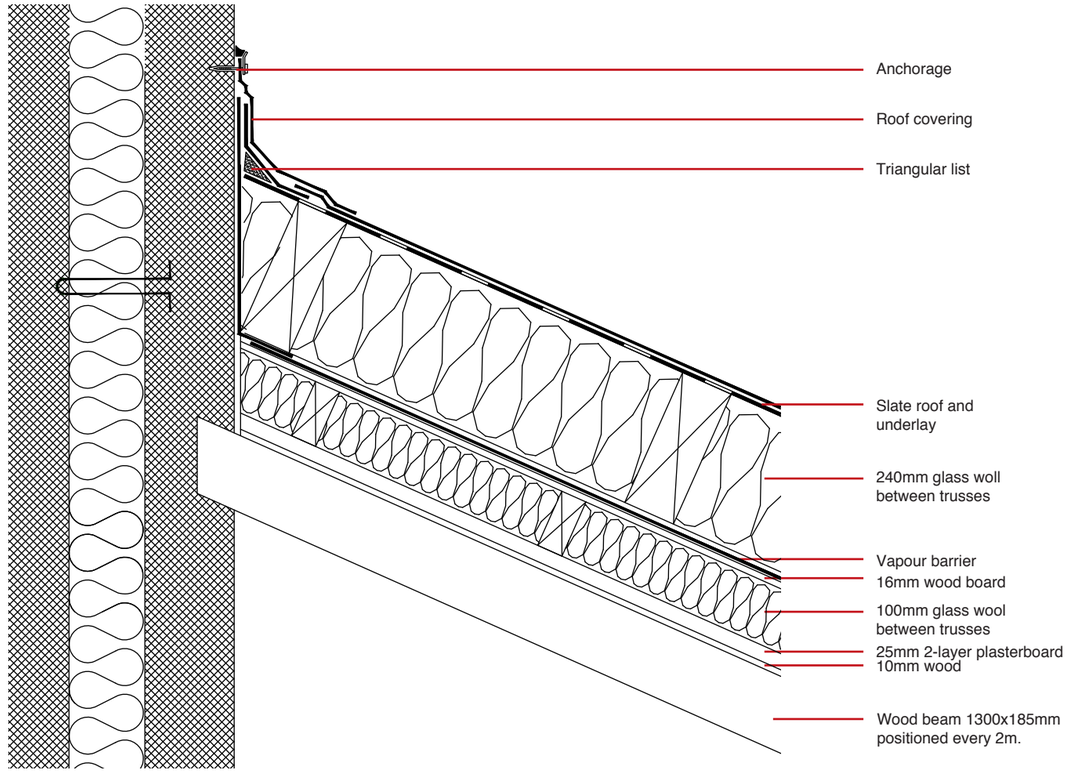
As the facades and construction has been decided it is possible to draw detailed sections of wall and roof elements.

It is chosen to detail the construction of floor and the large floor-to-roof window (Ill. 267) and the detail of the meeting between the roof and the concrete wall. (Ill. 268)

The details show how the elements of wall, roof and floor are connected in the Church physically, but also give an idea about the visual outcome of these connections.



Ill. 267 Detail 1, 1:10. Meeting between glass facade with wood lamellae on the exterior and floor.

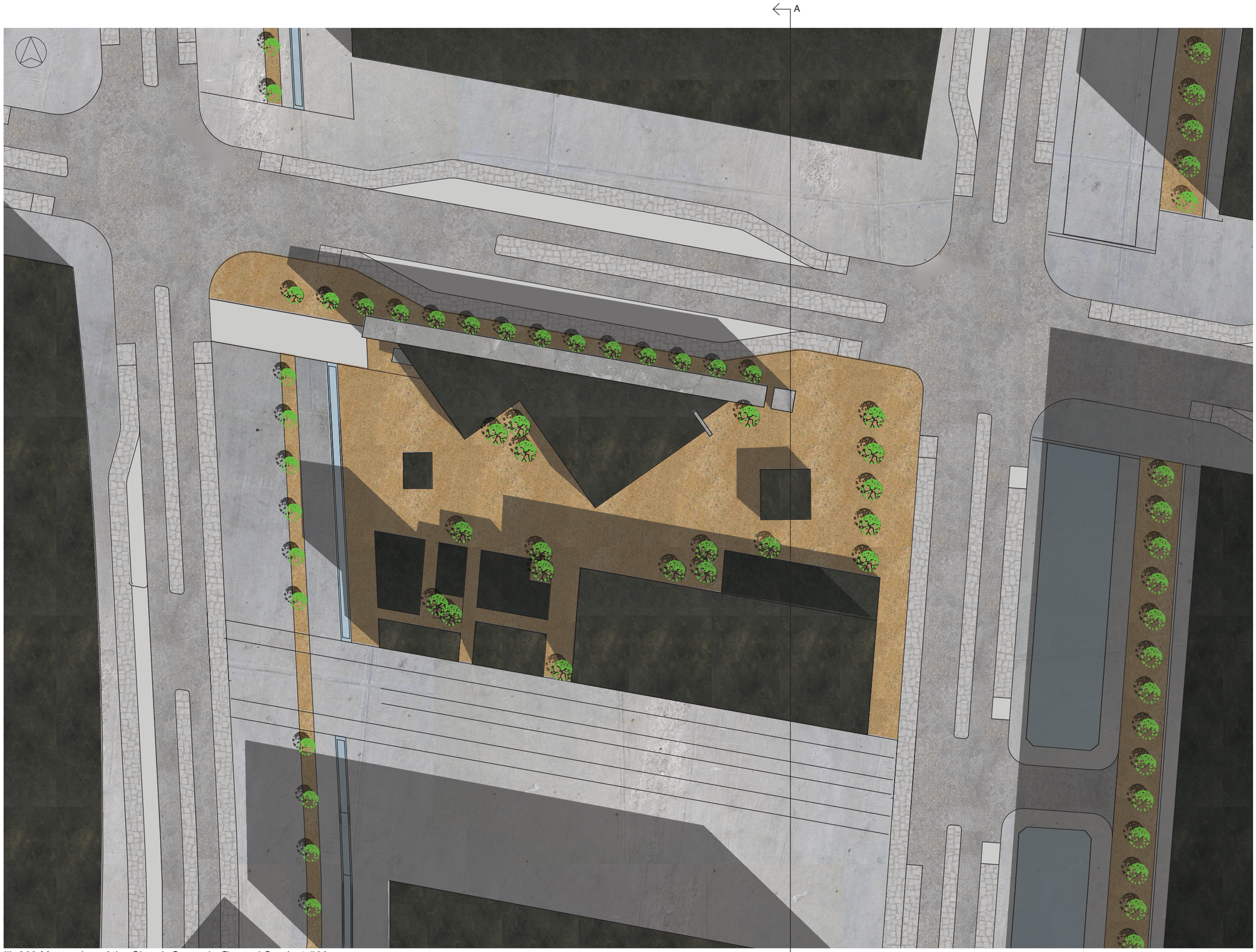


Ill. 268 Detail 2, 1:10. Meeting of roof and concrete wall. REI60A2 roof construction.

PRESEN

PRESENTATION

MASTER PLAN

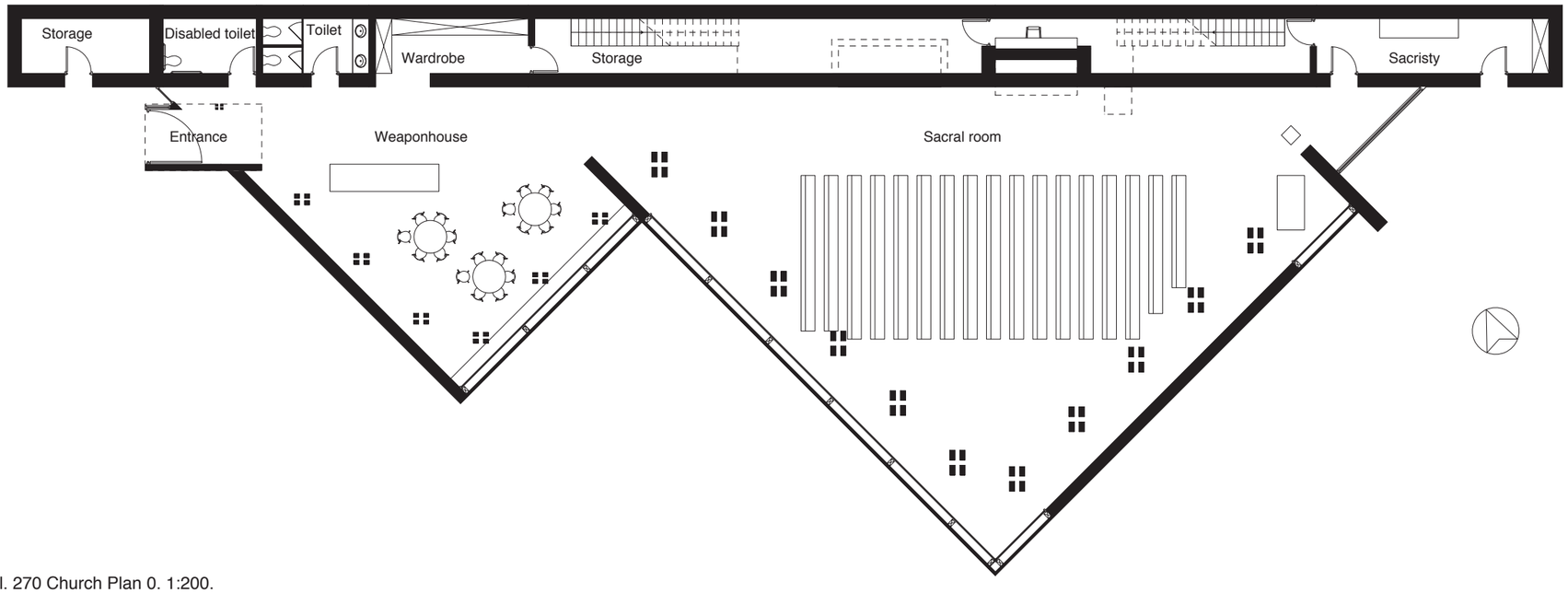


Ill. 269 Masterplan of the Church Centre in Ørestad South. 1:500.

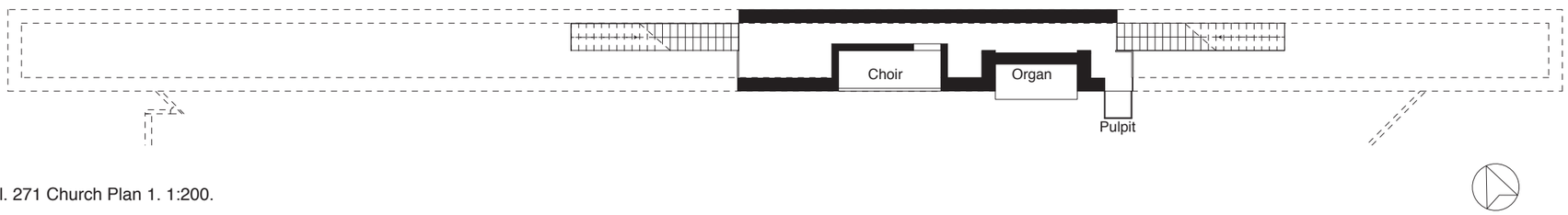


Ill. 269 Masterplan section A-A. 1:500.

CHURCH PLAN

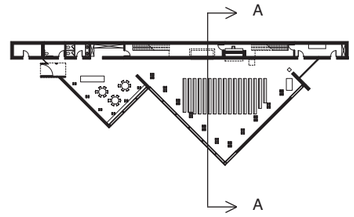


Ill. 270 Church Plan 0. 1:200.



Ill. 271 Church Plan 1. 1:200.

CHURCH SECTION



Ill. 272 Church section A-A. 1:100.

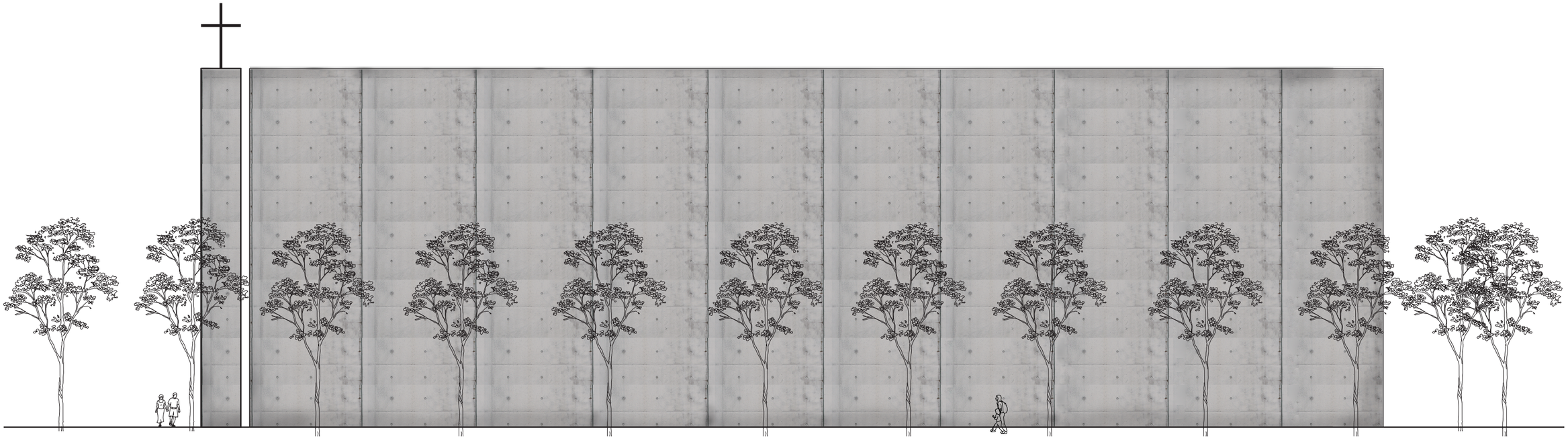
ELEVATIONS



Ill. 273 East elevation. 1:200.



Ill. 275 West elevation. 1:200.

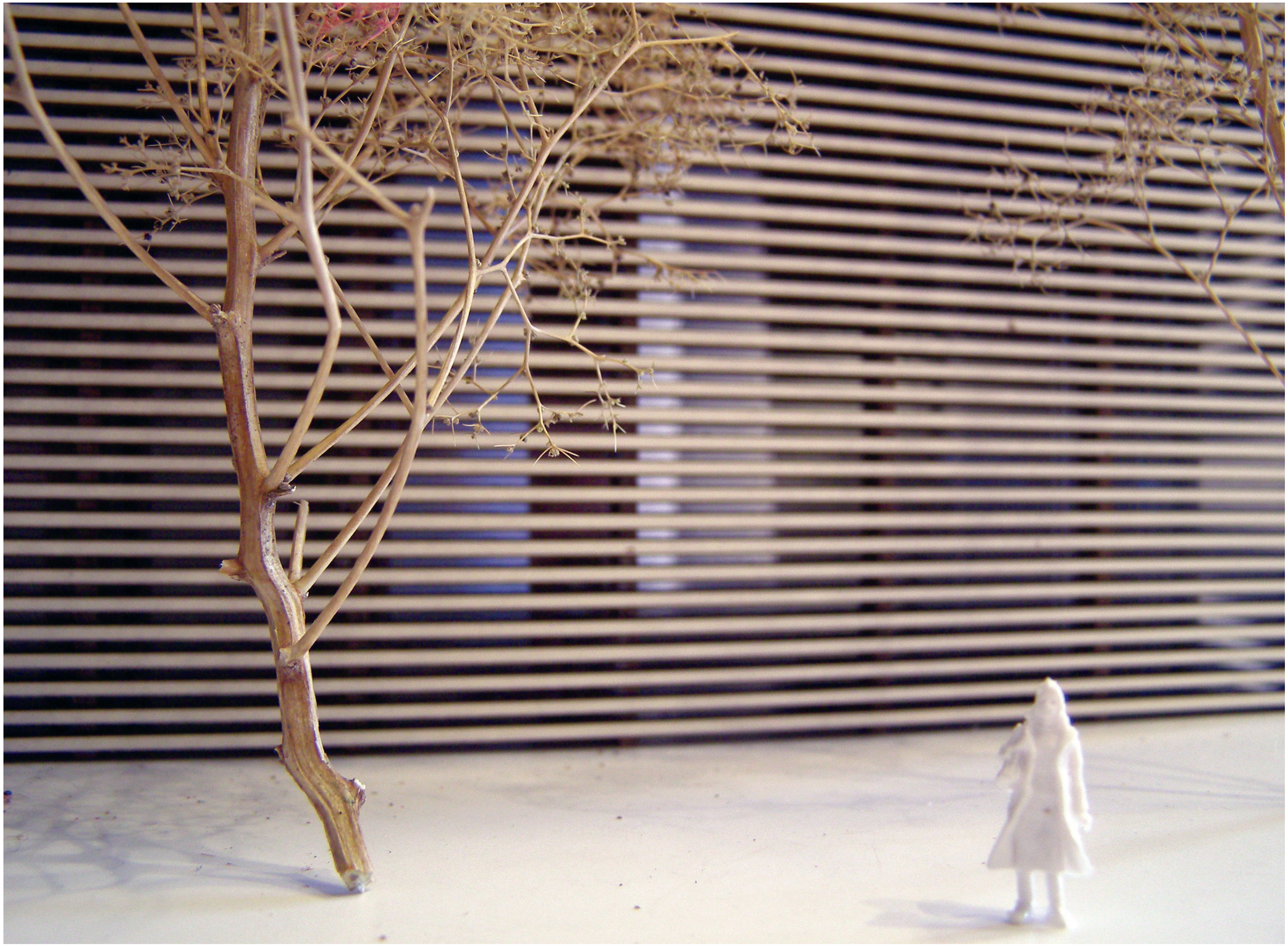


Ill. 274 North elevation. 1:200.



Ill. 276 North elevation. 1:200.

EXTERIOR



Ill. 277 The facade is constructed as a glass pane shaded by wooden lamellae.



Ill. 278 View of the Church from South-West.



Ill. 279 View of the Church from east.



Ill. 280 View of the Church from above.

INTERIOR



Ill. 281 Interior view of the sacred space.





Ill. 282 Interior view of the congregation and altar.



Ill. 282 Interior view along the main aisle.

SINGCLOUD

CONCLUSION

The conclusion will seek to discuss the final design for this project and compare it with the vision and thesis for the project. Also, connections will be drawn between the major design discussions in the analysis; Religion, Light, sound and materiality that will be compared to the final design.

RELIGION

The element of religion relates to the urban scale of the project. In Denmark the religion is seen as a cultural aspect and the average Dane do not regularly attend Church or uses the Church facilities. In the design of the Church Centre in Ørestad south it is therefore important how the Church becomes part of the community and communicates visually to invite people into the site. This issue is already considered in the idea catalogue where the Church Centre becomes more of a community centre with various offers. In this case the Church becomes an offer for the community on the same line as other social activities.
It will become the social activities that shape the use of the space and this is also the reason for dividing the different functions of the Church centre into more building volumes. This will force people who are either visiting or working in the Church Centre to interact with and use the public outdoor space. The idea of the public easily accessible as part of the Church centre contrasts with many current Danish Churches that are often very closed and some even locked, only having specific opening hours.
In order to make the Church Centre recognizable in the cityscape the architecture seeks to differ from its context by having a smaller scale and thereby inviting people into the site. The current masterplan is based on very large city block that clearly frame the public areas of the street and the privacy relating to each apartment block. The idea for the Church centre is to establish a very public area that invites people in. (reinforced by one of the main elements of Christian faith; that the Church welcomes everyone).
All the buildings of the Church Centre have a similar character that enhance the connection of the building volumes, but also frames the space of the Church Centre and marks a transition into an area having a religious significance. This does not mean that wood is a religious material, but states the idea of an area having a different character and the symbolism of the Church and its actions constitutes a different atmosphere in both the exterior and interior spaces.

LIGHT

The project seeks to use light to enhance the ceremonial space and to accentuate the important areas of the room by using contrast. Therefore, the sacral room has two different window designs allowing for two different expressions for incoming natural light. The large floor to roof windows let in a large amount of light that heightens the luminosity around the altar whereas the southern window has wooden lamellae that filters the light into the room to create a lower luminosity around the congregation. This means that the wanted contrast is achieved in the sacral room marking the altar and creating a focus point here. The idea of the filtering light also adds an aesthetic quality to the room where the change of time and day will mark the light beams hitting the interior space.
It is deemed that the solution in terms of lighting portrays the wanted sacral experience in the interior.

SOUND

The sound or timbre of the room is important for the religious experience of the room and different materials create a different interior. The project uses a mix of hard materials such as concrete and glass and the softer material of wood. As calculated in the acoustics program, the room has a reverberation time has an average of 1-3s. This means that the sound will linger the interior space for a while and give

an intense sound perception. In this case, the choices and wishes for the materials and room shape benefit from each other. The acoustic design for the sacral room has been estimated from a certain point in the process and more precise calculations could be performed to give a more accurate illustration of the acoustics of the room, for example by including the constructional beams and columns in the calculations. It is deemed, however, that the overall parameters of the room such as shape and materials are good and contributes to the atmosphere.

MATERIALITY

The project uses the two main materials of wood and concrete. The two materials have very different character and if one was replaced with another it would give yet another character. The interesting part about materiality is to bring it out visually in the building and not hiding the structure and construction away. By showing the materials in a “raw” form, the sense and tactile quality becomes enhanced. The two materials of wood and concrete have this “raw” expression because of the lines created by nature in one material and lines created by the casting. It is within this hands-on preparation of the material that the term of materiality comes into play. In this project this tactile quality of the materials is evident in the concrete wall and the large wooden beams spanning across the sacral space supporting the roof. The meet of the two contrasting materials make them enhance each other’s qualities in the room and their contrasting properties of warm-cold, hard-soft, absorbent-less absorbent, plays very well together in the space where the wood “leans” on the concrete.

Materiality is a subject which is hard to describe as it speaks of senses and subjective experiences and it will, because of the subjectivity, always be differently approached. For the Church en Ørestad South the design is also subjectively decided from personal opinions on this materiality and its aesthetics.

SACRED SPACE

Many sacred spaces has a unique kind of materiality and experience that give immediate religious effect on people whereas other places become sacred due to the actions performed in the space and are hereafter stored somewhere in our memory.

Designing a sacral space is an interesting scenario, but also very intangible as there are no rules stating when a place is sacred or when it is not. The project has been derived through a large analysis, bringing in several references to sacral spaces that are all uniquely designed and uses unique effects for lights, acoustics and materiality. By having these references and inspirational experiences in mind, the understanding of the elements within the sacral space becomes more tangible and a design process can take shape.

The final design for this project portrays a Church that focuses on the use of light and materiality within the sacral space and how these elements are used to enhance and contribute to each other. In terms of acoustics and sound the sacral space does not apply a special roof, wall or ceiling formation, as for example in Bagsværd Church, but the acoustics are used to tweak the final elements of materials and roof angle. In total all three elements are used and the sacredness and religious atmosphere of the Church can only be decided by its visitors.

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ILLUSTRATIONS

All illustrations used in this project are own illustrations except for those mentioned here.

ILLUSTRATION NUMBER	SOURCE
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4	http://www.arkitektnytt.no/images/large/orestad%20sydsyd.jpg
6-8	http://kort.plansystem.dk/
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15	http://www.arkitektnytt.no/images/large/orestad%20sydsyd.jpg
16	Developed from Status på byggerier i Ørestad, Udviklingsselskabet By & Havn I/S, page 2.
21	http://www.denstoredanske.dk/@api/deki/files/13593/=21221995.jpg
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31	http://www.mikadohouse.dk/#/billeder/4/
33-37	Developed from Ørestad, ARKKI, Power Point præsentation, 2007.
38-45	From Ørestad, ARKKI, Power Point præsentation, 2007.
65	From Study trip 2006, Photo is taken by fellow student Kristina Møller Hansen.
69	From Study trip 2006, Photo is taken by fellow student Kristina Møller Hansen.
79	http://www.bdonline.co.uk/Pictures/web/c/p/g/John_Barr___Church_of_the_Light_web.jpg
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64-67	Developed from A Design Manual, Sacred Buildings, by Rudolf Stegers, page 55-56.
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92	http://upload.wikimedia.org/wikipedia/commons/archive/1/10/20090213081708!Saint_Benedict_Chapel.jpg3.jpg
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APPENDIX I

RECOMMENDED ILLUMINANCE TARGETS
[Roberts, 212, 04]

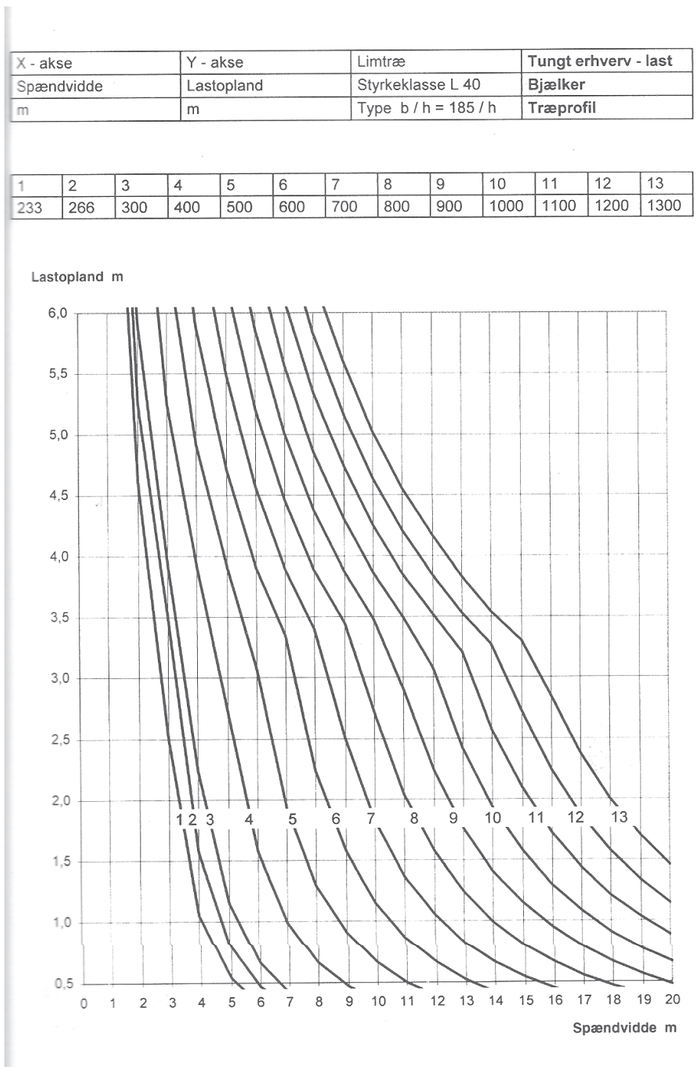
		ROOM SURFACE REFLECTANCE		
Area or Activity	**Age of Occupants**	**High (>70%)**	**Medium (30–70%)**	**Low (<30%)**
			Illuminance in Lux	
Simple orientation for short, temporary visits	Under 40	50	75	75
	40–55	75	75	75
	Over 55	75	75	100
Reading tasks, occasionally performed	Under 40	100	150	150
	40–55	150	150	150
	Over 55	150	150	200
Reading tasks, prolonged but simple	Under 40	200	200	300
	40–55	200	300	300
	Over 55	300	300	300
Reading tasks, prolonged and difficult	Under 40	500	500	750
	40–55	500	750	750
	Over 55	750	750	750
Accent lighting	Emphasis will be percieved when light level is more than three times the reading targets above. As the reading targets increase above 200 lux, accent lighting is less practical.			
Architectural lighting	Approximately 25 percent of the reading target illuminance above.			

APPENDIX II

SIZE CHARTS FOR LAMINATED WOOD L40
[Ahler, 273, 97]

X - akse	Y - akse	Limtræ	**Tungt erhverv - last**
Spændvidde	Lastopland	Styrkeklasse L 40	**Bjælker**
m	m	Type b / h = 185 / h	**Træprofil**

1	2	3	4	5	6	7	8	9	10	11	12	13
233	266	300	400	500	600	700	800	900	1000	1100	1200	1300



Tungt erhverv - last	Limtræ	X - akse	Y - akse
Søjler	Styrkeklasse L 40	Søjlelængde	Lastopland
Træprofil	Type b / h = 185 / h	m	Etage - m^2

1	2	3	4	5	6	7	8	9	10	11	12	13	14
200	233	266	300	333	366	400	500	600	700	800	900	1000	1100

