MASTER THESIS PROJECT

# BACK TO EARTH

IMPLEMENTING RAMMED EARTH INTO ROBUST ARCHITECTURE FOR THE CEREMONIES OF DEATH

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MASTER'S PROGRAMME OF ARCHITECTURE AND URBAN DESIGN (MPARC)
GRADUATION AND PUBLICATION YEAR: 2020

SUPERVISOR: BJÖRN GROSS
EXAMINER: MIKAEL EKEGREN


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# ABSTRACT

The genuine, robust and honest materials of architecture is concrete, masonry and wood. That is what we have for a long time assumed and seen as the building blocks on which long-term and lasting architecture rests. The aim of this master thesis project is to expand and challenge the material palette of the robust and timeless architecture and discover rammed earth and the different ways of using it, both prefabricated into elements and built up on site and understand its structural qualities. Although rammed earth is often associated with warmer climates, there are good examples of how the material behaves under significantly lower temperatures and structures made of earth and clay can be found in countries such as Germany, Switzerland and Sweden. The fundamental starting point of this master thesis is that sustainable architecture is robust architecture that are able to be beautiful and functional forever. How can rammed earth by itself and in combination with other materials achieve this? In this master thesis project ur method main method to get to know and argue for rammed earth in a hybrid construction, is implementation trough detailed and traditional drawings and models. As a result, more design issues were raised. In what place in the design does the right material fit and how do we protect a wall from harsh weather in a beautiful way?

With this architectural basis, the ambition was to design secular space for the ceremonies related to death such as the funeral and create a quiet memorial near everyday life in an urban context in the city of Gothenburg. The robustness of the religious architecture and its meticulous detailing create spaces with high conservation value, not only by what it symbolizes but also by the way it is designed. How do we create atmospheric tranquility in secular emphatic space with the same ambitions as the traditional sacred spaces and how do we design dignified architecture with the purpose of letting the urban man say goodbye? It is difficult to say whether we have succeeded in answering this question and in the discussion part of the project we ask ourselves if it is even possible for us to create neutral and secular places for burials, without bringing our own cultural backgrounds and traditions of performing them in religious buildings.

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# INTRODUCTION

THE FRAMEWORK

# AIM & PURPOSE

The aim of this master thesis project is to explore how to create contemporary architecture with high quality and great care of every detail. Our belief is that sustainable architecture is robust architecture that are able to be beautiful and functional forever. The aim is to introduce rammed earth as an honest and rustic material among materials like concrete, wood and brick and implement this building technology in an urban context. With this architectural basis, we want to design space for ceremonies related to death, such as the funeral, and create a quiet memorial near everyday life.

# THESIS QUESTIONS

Main research question:

How can one implement rammed earth in a robust, solemn and detailed public building in an urban context?

Sub-question:

How can a secular building be a container of man´s rituals and ceremonies and the feelings connected to them regarding death, in an urban context?

# METHOD

In an initial phase, published research material and techniques on rammed earth will be studied. Case studies will be important in this phase and we will explore the detailing of the projects involved in the case study. We will look into a Nordic climate and study contemporary cases as well as historical ones. A research phase that deals with the death ceremonies in a historical and cultural perspective is also necessary. Site analysis then needs to be performed. This is primarily a research by design project and we will work with drawings and models to find implementation methods for our background research.

# DELIMITATIONS

This master thesis project aims to implement rammed earth techniques in a robust urban project. We will rather focus on exploring already investigated ways of using the material, both built up on site and prefabricated elements, rather than invent new techniques. We will not focus on designing our own blend of rammed earth and will rather create architecture out of conventional methods of using the material. We see no value in deciding to use only rammed earth in our proposed project, but are open to looking at ways of mixing materials to create as robust and tectonically strong building proposal. Materials such as concrete, masonry or wood could be relevant to use in combination with rammed earth. Each materials structural capacity should be taken in consideration.

# BUILDING WITH EARTH

Techniques that use earth for construction have been known for thousands of years. Houses made from mud bricks have been dated up to 8000 BC and rammed earth foundations around 5000 BC. In all ancient cultures earth was used as building material for both houses and sacral buildings. Traditionally earth has been the standard material in hot-arid and temperate climates but more recently the material and the building techniques have been adapted, used and developed in other regions. This have moved earth-based constructions from mainly a do-it-yourself projects to adaption on an industrial scale involving contractors (Minke, 2006). Soil is in fact rocks that have been worn down by different processes. From what kind of rock it originates and how it has been eroded determines how it performs as building material when used in construction. The mixture used for construction contains clay, silt and sand. Compaction of moist soil causes the particles to vibrate into a more stabilized structure. When dry, the solidified walls become well suited for exterior loadbearing walls (Golden, 2018). There is no exact recipe, as for concrete, to the mixture for an earth construction. The components can be taken from an excavated site or somewhere else locally. Depending on the purpose and requirements, and the availability of recourses, the mixture can be given the desired properties and appearances (Sauer, Kapfinger, 2015). Earth with capacity for construction can be found nearly anywhere in the world, but the often unique mixture from local materials make a standardization difficult. A collaboration between earth building experts, structural engineers, building physics engineers and architects are therefore important to build up an understanding of this material and the construction techniques (Sauer, Kapfinger, 2015).

FIG 01 HAUS RAUCH

B. Bühler - *Used with permission*

A rammed earth wall is built up from layers of moist earth that is poured into a formwork and rammed gradually layer by layer. This technique is often referred to as the pisé technique. The formwork is usually based on two walls that are connected and held together by spacers. The ramming can be done by hand but also mechanically (Minke, 2006). Walls that are made in situ is constructed in a similar way as a concrete wall. A negative form is built and then filled with material. The difference between concrete and rammed earth is that the latter has to be made layer by layer to build up the full height. The form is gradually moved upwards and the wall is reinforced, at the joint with the slab, to distribute loads. The technique results in a beautiful seamless result but demand craftsman skills and suitable weather conditions. Rammed earth is not a suitable material for slabs and roofs as it can´t handle the tension on the bottom of the plane. Therefore another material has to be used for these parts and concrete or wood works well together with the characteristics of earth (Sauer, Kapfinger, 2015).

Prefabrication is a relatively new way of handling the construction of rammed earth buildings. It creates new possibilities of projects and sites where rammed earth can be used. Separating the production and installation of the building processes can be economically beneficial as on-site logistics becomes faster and more perspicuous. Producing the prefabricated elements is just as time-consuming as on-site production but can be done regardless of climate and season. The mounting is more easily planned and coordinated, resulting in shorter duration of the construction work. Production technology and design possibilities of prefabricated rammed earth elements has developed so that detailing and retouching of joints has similar results as on-site production. To minimize the number of blocks to be transported, the length of the elements is calculated depending on wall thickness and load limitations of the crane. This also lowers the costs and shortens the production schedule.

The height of the elements is measured to match the roof height. The strenuous work of filling and compacting the earth into a frame can today be carried out by a machine. Since man no longer has to be able to fit into the frame, thinner walls can also be achieved. As the earthen blocks have very low tensile strength the weight must be distributed over the length of the element, when lifted and transported. Different uses of straps, frames and channels through the earthen blocks, can be used for levelled assemblages (Sauer, Kapfinger, 2015).

Over time the appearance of a rammed earth walls will change due to erosion. When water flows down the wall it sweeps loam and small particles away and to slow down this process, earthen walls are design with horizontal erosion checks. They often consist of trass-lime mortar or bricks that are incorporated and calculated in the process and production of the wall. As stones and gravel are exposed the surface of the wall change both looks and characteristics. Though the water solubility is what could make the wall totally erode back to the earth eventually it is at the same time what gives the material its good characteristics as creating a good indoor environment and nontoxic structures (Sauer, Kapfinger, 2015). The rammed earth´s vulnerability to moist and frost is well known and handled in different ways. In arid climates buildings can be designed with walls that are exposed to the weather while in areas with a high precipitation a large roof overhang is needed to create a long-lasting structure. As there are no Swedish examples of unprotected rammed earth buildings that are stabilized only through compaction, comparisons with similar climate zone could tell us something about the reality. Buildings from these areas that have withstood the weather for a long time has projected roofs. Experiments with rammed earth in the Swedish climate has also shown that the erosion of an unprotected wall can be drastic (Escobar, 2013). The durability of a wall could be improved by a mixing of cement but thus impair other characteristics of the wall. (Sauer, Kapfinger, 2015).

# ARCHITECTURE FOR FUNERALS

The fact that we die unites us. Regardless of the epoch, culture and religion, death, its ceremonies and the importance of honouring and remembering the dead have always been a natural part of life and communities. It is universal and occurs to everyone everyday. *"Understanding death and dying, and particularly their related practices, rituals and spaces, thus offers insights into life and the living"*, Professor Lily Kong at the University of Singapore states in her foreword to the text collection "*Deathscapes: Dying, Mourning and Remembrance*", edited by Avril Maddrell and James D. Sidaways. Kong describes the process and experience of death and dying as place-based and deeply associated with certain locations, even though the essence of our meaningful experience with place is fundamentally anchored in emotions, rather than functions. *"This spatial significance is expressed, for example, through the creation of memorial sites, the choice of which carries deep symbolic meaning. Yet, this locatedness of grief and memory faces increasing challenges as pressures on space for alternative uses erode the ability to anchor meaning in place. In some urban settings, this has led to the virtualisation of memorial sites. The ways in which the emotional relationship between people and place is altered more fundamentally deserves further study"* (Kong, 2010). Some of the earliest structures in the history of architecture are directly connected to death and the pre-historic Aegean tombs at Knossos are examples of these early structures that ate significant for the birth of the world history of architecture.

FIG 02 KNOSSOS TEMPLE TOMB

*Retrieved from open source*

The floorplans of the tombs tells stories about how the ceremonies of the funerary events were important for honouring the dead person and care for its peregrination into the afterlife. The courtyard framed by columns could contain around 40 people and was easy to access from the settlements nearby while the eastern facade was only accessible from the inside, isolating the crypt and the bigger chamber. Strictly controlled access to these spaces indicates that smaller and more private rituals, witnessed by a few people were performed there. The sequence from light and accessible spaces, to the dark invisible interior spaces tell stories about further structured ritual practices through series of spatial compositions (Dakouri-Hild, Boyd-Clark, 2016).

From a more local perspective, and significantly closer in time, one can see how the places of burial, as well as perhaps the view of death and ritual around death, are changing during the 19th and 20th centuries. An ordinary Swedish funeral in the 19th century took place outside the cemetery. The body was kept at home before the funeral and the walk with the dead to the cemetery became a part of the ceremony itself and people joined the walk along the way to church (Karlsmo, 2005). By the turn of the century, funerals began to move into the church itself or into funeral chapels. The newer cemeteries outside the cities were more often provided with a centrally located chapel. Initially, they were probably primarily intended to store the bodies, as it became more common not to store them in the home prior to the funeral, but soon chapels intended for the burial ceremony itself began to be constructed. The new type of chapel could accommodate about 50-100 people. Sometimes there was an organ in the chapel and the coffin had the most central location in the room. Often the furniture could be framed in a way so that the delegates sat around the coffin and against each other instead of classic church benches against an altar (Karlsmo, 2005).

During the 20th century, the ideal and aesthetics of cemetery design changed in general in Sweden and the so-called forest cemetery, *"Skogskyrkogård"*, became the new ideal where the graves were given a seemingly more spontaneous placement in more natural and more un-touched nature. The design language of the funeral chapel became more traditional during this period and a kind of everyday national romanticism, *"vardaglig nationalromantik"*, became the new ideal. During this period, cremations became more and more relevant and common (Karlsmo, 2005).

Towards the 1930s, the chapel grew in size and a number of new features were added to it. This applies primarily to the chapels that were attached to the crematorium, where many purely practical rooms, for handling the ashes and other functions, were added. It also became more common that there were two different rooms for the funeral ceremony itself - one for smaller funerals and one for funerals with significantly more visitors. Over the next decade, it became more common for the larger room to become more church-like with benches and aisles. This ideal came to be discussed intimate stillness could be difficult to achieve in these larger rooms which could rather feel desolate (Karlsmo, 2005).

After the 1950s and the years after the war, Swedish building construction entered an intensive phase, which also included churches, chapels and crematoriums. The classic statement about *"Skönhetens tillflyktsort"*, the sanctuary of beauty, by architecture historian Göran Lindahl is referring to how the sacred buildings became a prestige building where a big effort was put on the detailing and aesthetic values of these types of buildings, in contrast to the otherwise more large-scale and rational constructions that was built in Sweden during the same period. Ideally, once again, the design was based on looking back to older ideals and with that as a base, the architecture was refined and reduced. Peter Celsing and Sigurd Lewerentz were seen as pioneers of this design language (Karlsmo, 2005).

Through the law about religious freedom, civil funerals became more and more common, thus, the Christian motifs became fewer in the chapels. The importance of an open interpretation of symbolism became more fundamental and one can see this ambition more frequently during the latter decades of the 20th century even though not many new chapels were built anymore. A recurring theme in the more present funeral architecture is the relationship between closed massiveness and openness. Often, despite high solid walls, there are a few light inputs, such as a tall window sill. The only opening with a view is often directed towards nature - forest, fields or the sea. The symbolism of light and darkness and the symbolism of the view towards the unifying nature could be seen as a new kind of open symbolism that does not really refer to any particular religion. The room is sober and simply designed and almost atheist neutral. The religious symbols are easy to replace or remove. *Stockholms Skogskrematorium* by Gunnar Asplund is an example of this kind of chapels. On the other hand, everything lies in the eyes of the beholder and the crematorium with references from past times can be interpreted both as completely neutral and as an attempt at renewed sacred architecture (Karlsmo, 2005).

In step with the secularisation in Sweden and the fact that more citizens are leaving the Swedish church, civil funerals outside church become more popular. A civil funeral ceremony is usually held in a chapel, but it can take place anywhere. Civil funerals do not require any special fees in Sweden. It is included in the funeral fee that all public records in Sweden pay. So does cremation and burial in ground. The neutral chapels are often situated around or in cemeteries outside the central parts of the cities. It is usually the religious spaces of burials, such as churches, that are centrally located.

FIG 03 SKOGSKAPELLET

*Retrieved from open source*

# REFERENCES

RAMMED EARTH

# EARTH IN INTERIOR & EXTERIOR

## HAUS RAUCH

MARTIN RAUCH & ROGER BOLTHAUSER

On a steep southern slope lies Haus Rauch looking out over the village of Schlins in Austria. The house was finished in 2008 and is a unique example of how to use local materials for a rammed earth house. With the expertise of Roger Boltshauser and Martin Rauch, 85% of the building material could be taken directly from the site and to one hundred percent for the rammed walls. The rest of the materials also came from the nearby area. The cubic design is consciously placed in the slope with almost no exposure to the north, but a lot of solar heat input from the south. The walls and openings as well as the interior and the logistics of rooms, are all carefully design from the premises of the material and the site. The distance between the horizontal layers of bricks for erosion protection varies and gives the façade a slight gradient towards the sky. The absence of silicone and plastics creates a house almost free from pollutions (Boltshauser, 2019).

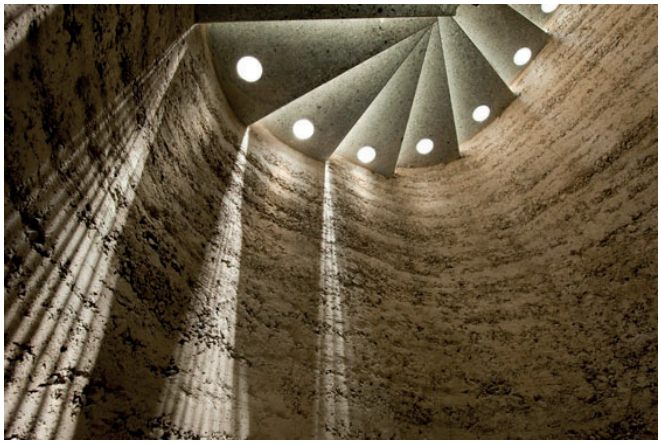


FIG 04, 05, 06 HAUS RAUCH

B. Bühler - *Used with permission*

# EARTH & CONCRETE

OBSERVATION TOWER

DE GOUDEN LINIAAL ARCHITECTEN - BELGIUM 2016

Situated in a natural reserve on a former gravel extraction area in Negenoord, Belgium, the façade of the observation tower reaches 12 meters into the sky. The prefabricated concrete core and stairwell rests on the 80 centimetres thick rammed earth walls. An international team of experts in rammed earth construction consulted the project as there were no standards for earth construction technique. By using nearby excavation, they could define a material mix of gravel, sand and earth stabilized by hydraulic lime. The rammed earth work was carried out during seven weeks by a professional contractor. The combination of concrete and rammed earth in the Observation Tower is inspiring and beautiful. The use of rammed earth in the vertical elements and concrete for the horizontal creates a structure that shows how the slabs and the half-floor climbing landings of the stairs, rest on the earthen walls. The local earth mix smoothly blends into the vast landscape with small hills and fields of reeds and grass. The warm colour of the earth is contrasted by the light grey concrete creating a slightly more vivid sculpture.

FIG 07 OBSERVATION TOWER IN NEGENOORD

F. Dujardin - *Used with permission*

# PROTECTED EARTH

## CHAPEL OF RECONCILIATION

### PETER SASSENROTH & RUDOLF REITERMANN - GERMANY 1999

On the site of an old demolished church, but also where the wall once divided East and West Berlin stands the Chapel of Reconciliation. The chapel has a footprint close to 400 m² and a seating capacity of 100 persons. As parts of the old church is integrated in the design, the building tells a story about the past. The oval core walls of rammed earth consist of a mixture of earth, brick grit and straw fibres, and symbolizes the most compact form of gathering. Another layer consisting of vertical timber slats create a second semi-transparent skin of the building. The irregular corridor between the two shells allows visitors to walk around the chapel. As the sun circles around the building during the day, the coarse surface of the rammed earth seems to shift in colour in the filtered light. The design of the Chapel of Reconciliation uses the characteristics of materials in a smart and interesting way. The rammed earth that tells a story about the origin of the site and contribute to a better indoor climate, and at the same time is sheltered from erosion by the wooden shell. The outer structure has changed character with time and gone from wooden yellow to silver grey. When time comes to replace the wooden slats, the core stands untouched still. The layers also create a sequence from the semi-open corridor to the warm, secure feeling of the core.

FIG 08 CHAPEL OF RECONCILIATION

*Retrieved from open source*

# PREFABRICATION

## GALLERY OF RICOLA KRÄUTERZENTRUM
## HERZOG & DE MEUREN - SWITZERLAND 2014

In the countryside near Laufen, Switzerland, lies the Ricola Herb Centre among other scattered industrial buildings. The centre is a long rectangular structure that is mainly built from rammed earth. An onsite mix of earth consisting of clay, marl and soil was taken from excavation sites nearby and used to prefabricate façade blocks in a local factory. The self-supporting façade was built up by stacking these blocks around a loadbearing concrete shell. The joints between the blocks could be seamlessly mended due to the plasticity of the loam. The shape of the building supports the logistics of the production inside and the earthen walls also enhance the indoor climate. The strict rectangular elevations are punctured by two big circular windows.

FIG 09 GALLERY OF RICOLA KRÄUTERZENTRUM

M. Bühler - *Used with permission*

# REFERENCES

ARCHITECTURAL ELEMENTS

# COURTYARD

SANTI QUATTRO CORINATI

ROME

The courtyards in the city becomes like pauses in the otherwise buzzing urban context. It is a room outdoors but still something completely different from the street outside and it becomes a clear motive for the tranquility of the city. Located on one of the hills of Rome the courtyard of Santi Quattro Corinati is an oasis providing shadow in the hot and crowded city of Rome. The outer courtyard further leads into an inner courtyard and the visitor gets another tranquil step on the way towards the basilica itself. The first church on the site was begun by Pope Miltiades, in the 4th century. This church was burnt down during war time and instead of building the very same church again, Pope Paschal II built a smaller basilica with a two courtyards, one in front of the other; the first corresponding to the original 9th century courtyard, while the second was sited over the initial part of the nave. The church has also served as an orphanage driven by nuns who installed a ”drop-off box” for unwanted children close to the entrance.

FIG 10 SANTI QUATTRO CORINATI

*Retrieved from open source*

# EAVES

LJUNGHUSEN

PER FRIBERG 1960

Ceiling projections may not be the most widely used architecture elements in today's Swedish architecture schools and the meeting between the ceiling and the wall is often tightly designed without any protruding parts although the usual rainfall then places higher demands on the wall. Landscape architect Per Friberg's summer house from 1960 is located in southers Sweden and is a beautiful example of how to achieve the above-mentioned tight and elegant design and yet designs with grand eaves. The classic Nordic 1960s architecture is light and clearly constructive. The beams that support the roof structure are easily visible and feel beautifully simple and honest. The fact that they are made of wood contributes to the feeling of ease. Friberg has left the wood unpainted and, as far as possible, untreated. The living material gets naturally aged and gets patina over time.

FIG 11 LJUNGHUSEN

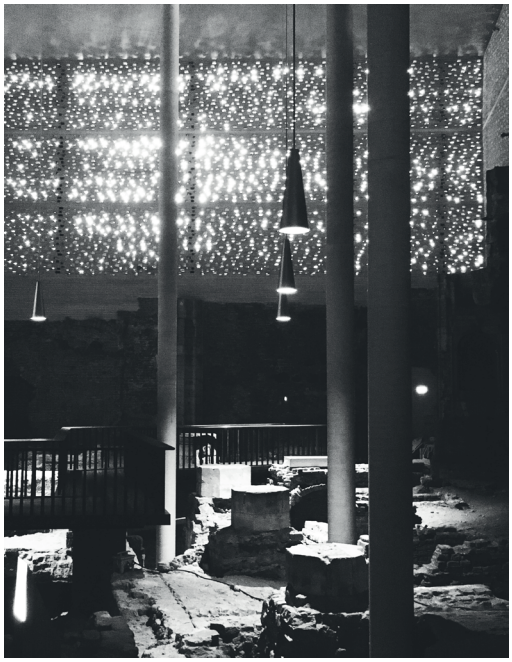
*Retrieved from open source*

# LIGHT WITHOUT INSIGHT

KOLUMBA MUSEUM & CREMATORIUM CHAPEL

PETER ZUMTHOR 2007 & JOHAN CELSING 2013

To disappear into calmness and silence may be to turn your back on your context. Protecting oneself from insight, and maybe even outsight, can be a prerequisite. Despite this, light is an important component in creating atmospheric rooms and the balance between light, darkness and protection against transparency becomes important. In the Kolumba Museum, located in Cologne in Germany, Peter Zumthor has used the small spaces between the bricks to filter the light, which creates room with a diffused light that is constantly changing during the day. In the chapel that belongs to the new crematorium in the forest cemetery outside Stockholm, Peter Celsing has worked with overhead lights, trailing lights and light intakes towards small atriums to achieve the same kind of results - changing atmospheres with light that changes throughout the day but without insight and outsight. The subsequent model study, implemented using plaster casts, explores the same type of motifs.



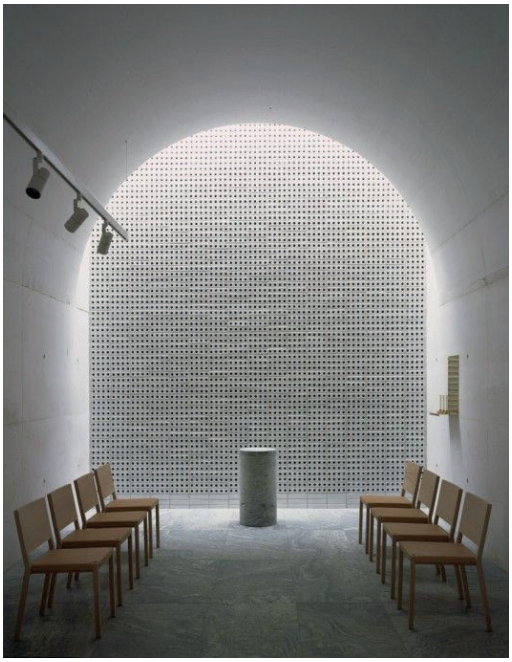


FIG 12 & 13  KOLUMBA MUSEUM & CREMATORIUM CHAPEL

xxxxx & I. Marinescu - *Used with permission*

FIG 14 LIGHT PROTOTYPES

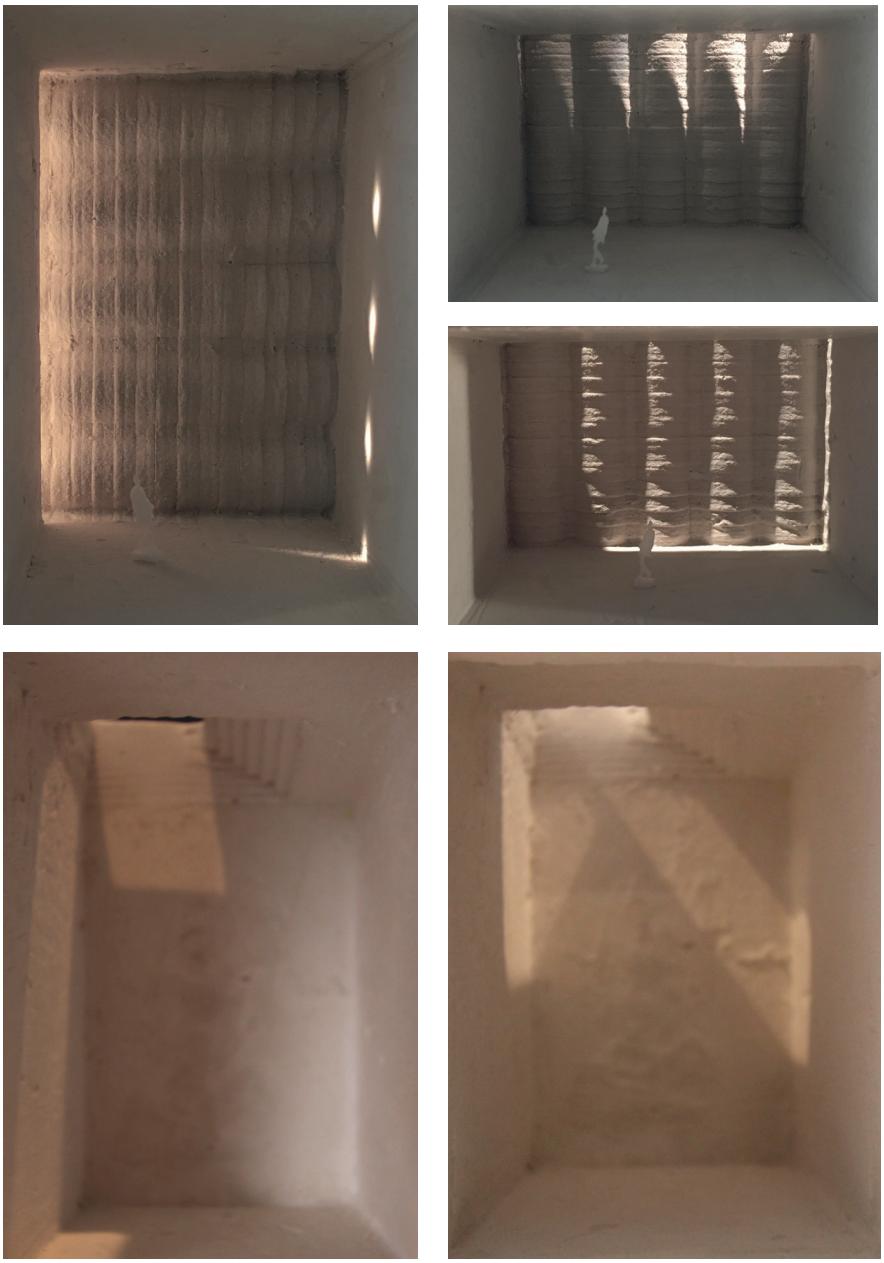


FIG 15 LIGHT PROTOTYPES

# TO CHOOSE A SITE

## RAMMED EARTH AND ITS SURROUNDING CONTEXT

In the process of choosing a site we could not only look at the situation and surroundings, we also had to consider the principles of using rammed earth as a construction material in a chosen context. As there are no regulations for building with rammed earth in Sweden and as the level of precipitation is higher than in countries where the material is currently used, we had to make some conclusions on how to design a long-lasting structure with this material in the Swedish climate. Our research resulted in a conclusion that the earthen wall needs to be protected from direct rain and splashing water to be sure to avoid heavy erosion of the material. We categorized different design principles that we thought could be implemented to achieve a robust building in our climate; a projecting roof, an arcade and a double façade system. These principles were later tried out when sketching on a building at three different sites. The sites were of different character; an urban detached site, an infill and an urban park.

As we realized we wanted to work with the expression of earth both on the interior and the exterior and that projecting roofs were a bit unfamiliar addition in the urban context the site we choose was the urban park as it gave us the best prerequisites to work with both exposed earthen walls and projecting roofs.

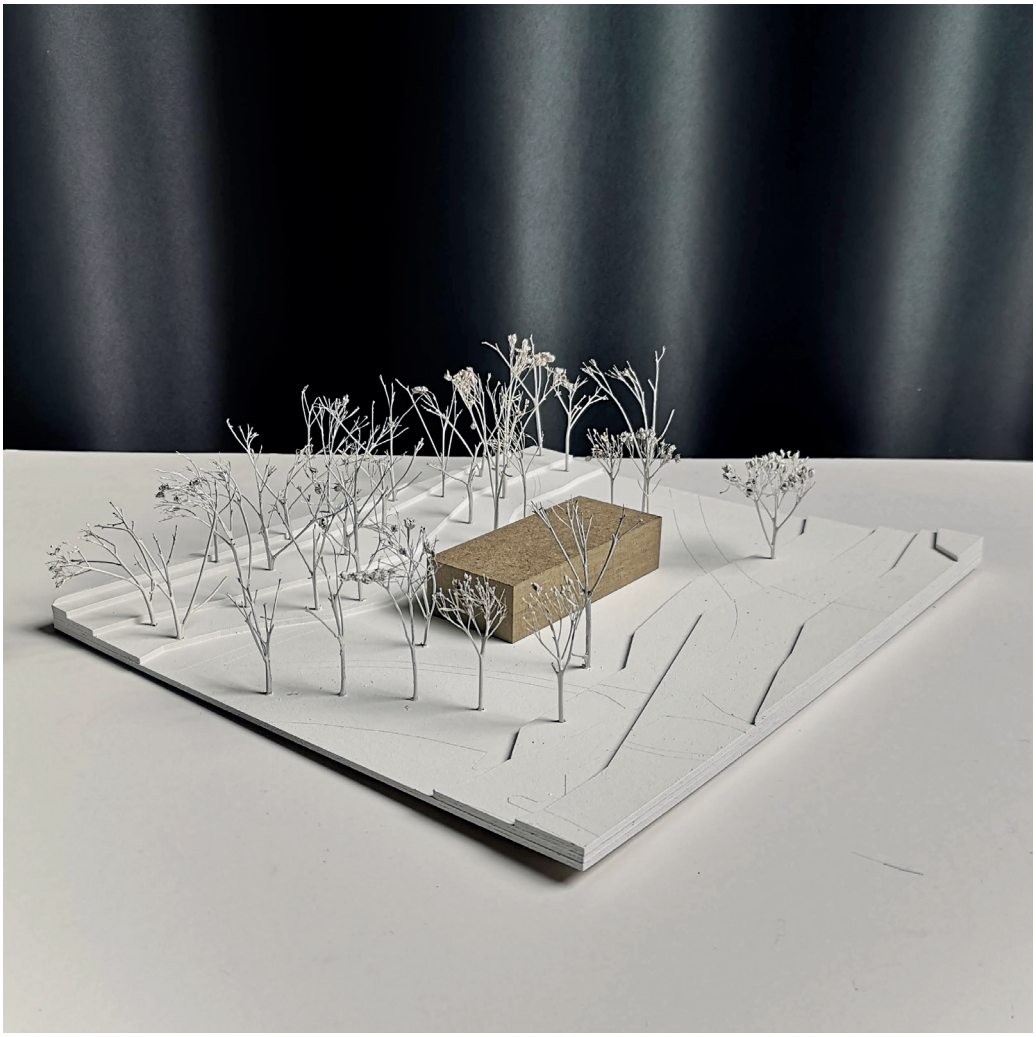


FIG 16 THE URBAN PARK

A concrete base is an important design element to handle splashing water during heavy rainfalls. It can also be combined with a channel of gravel along the façade that could decrease the amount of water repelling from the ground. A projecting roof of up to one third of the façade height can prevent rainwater from hitting the façade. The roof could also be combined with pillars that result in an arcade along the façade creating a distance to the rammed earth walls and protecting the surface. The earthen material is visual but needs to be combined with other pillar materials. As in the reference The Chapel of Reconciliation the rammed earth walls could work as a structural core of the building connected to an extra layer of protecting façade creating a lengthwise corridor on the inside. The rammed earth is not shown in the façade and only experienced inside the building. Facades covered by plaster or other surfaces can also protect the earth from erosion and be designed without a roof overhang. The visual outcome can be an earthen interior though the outside is covered by something else.

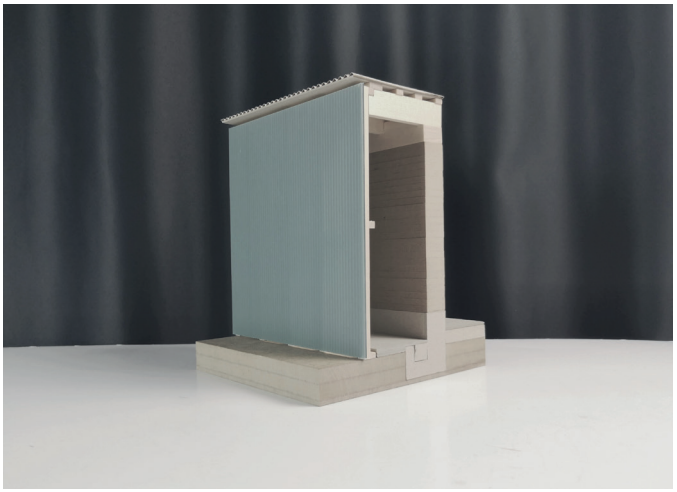
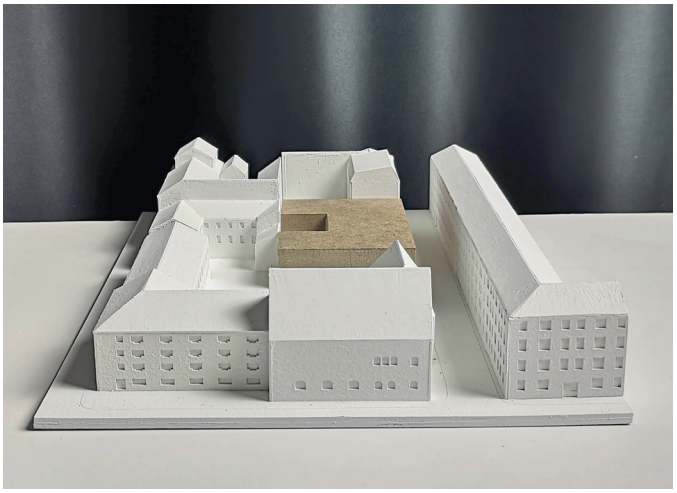


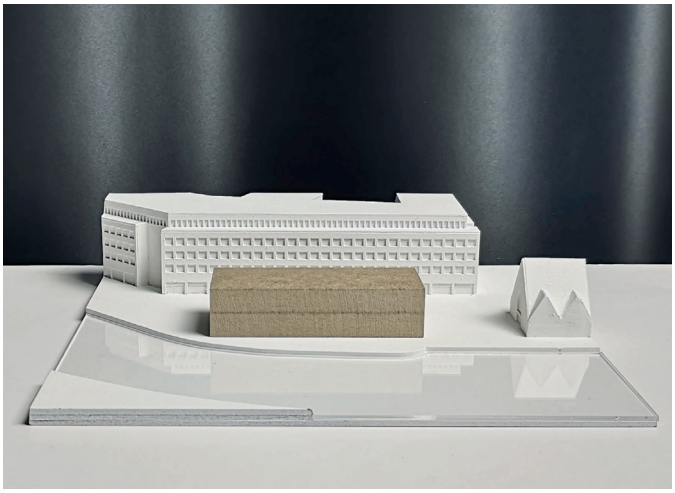
FIG 17 CONSTRUCTION OPTIONS

The urban infill site at Tredje Långgatan offer both possibilities and difficulties designing a rammed earth building. The narrow relation to other buildings offers protection from rain and wind but can be demanding when it comes to light conditions. Large roof overhang and arcades would be a bit unfamiliar ingredients at the site and plastered or double façade design proposals could easier be applied. Rammed earth would clearly be a new material in the context but could fit.

The unconnected site at Rosenlund is exposed to wind and rain from the west. Different design principles could be used at the site, but arcades have been unwanted in the area due to how they can be hiding places for criminal activities and create dark and damp spaces.

The urban park site in Slottsskogen is more disconnected from the city blocks nearby but still has clear urban connection to the city with a lot of people moving in the area. The site gives many design possibilities but could be over exploited with a large building.





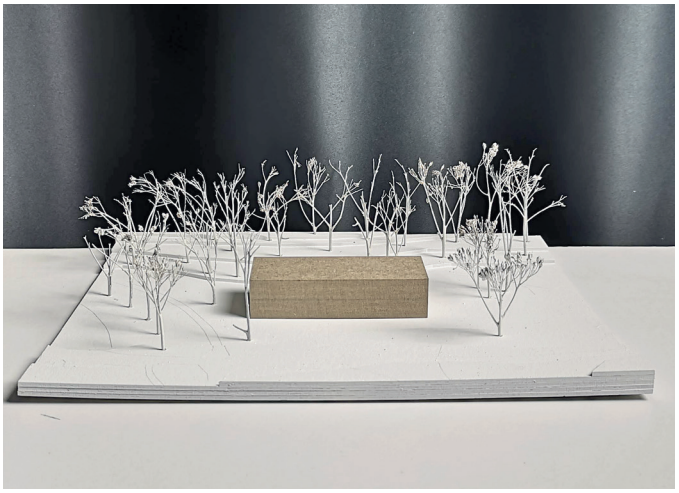


FIG 18 SITE OPTIONS

# SLOTTSSKOGEN

## AT THE ENTRANCE OF AN URBAN PARK

Slottsskogen is one of Gothenburg's largest well-used places for outdoor recreation. The park, which was inspired by both Skansen in Stockholm and Hyde Park in London, was completed in 1874 and previously served as pasture on the outskirts of the city. The selected site is located on the edge of the park and is adjacent to Linnestaden, a district with a rich selection of restaurants and shops that is popular to both live and work in. The buildings found in Slottsskogen, including a couple of cafes, a small art school and administrative buildings for the care of plants and animals, are located among the trees with a distance to the pedestrian walkways. The nearest neighbor of the chosen site is an elderly residence, right at one of the entrances to the park. The plot is in a valley and behind it on a hill lies the museum of natural history hidden in greenery. Opposite the site is a large playground that is well attended by the city's children. The site is well defined by the pedestrian paths and the larger road Jungmansgatan that runs along it. Several of the park's many grassy areas are larger and much more extensive than this particular site. The fact that it is west of the hill means that it is relatively hidden, as the park's large and most well-used entrance is on the opposite side of the hill.

SITUATION 1:10000

FIG 19 VIEW TOWARDS HOUSING FOR ELDERLY COMPLEX

FIG 20 & 21 VIEW FROM PLAYGROUND & VIEW FROM JUNGMANSGATAN

# DESIGN PROPOSAL

SLOTTSSKOGEN MEMORIAL CHAPEL

FIG 22 ENTERING

**USERS**

CEREMONY VISITORS

MEMORIAL COURTYARD VISITORS

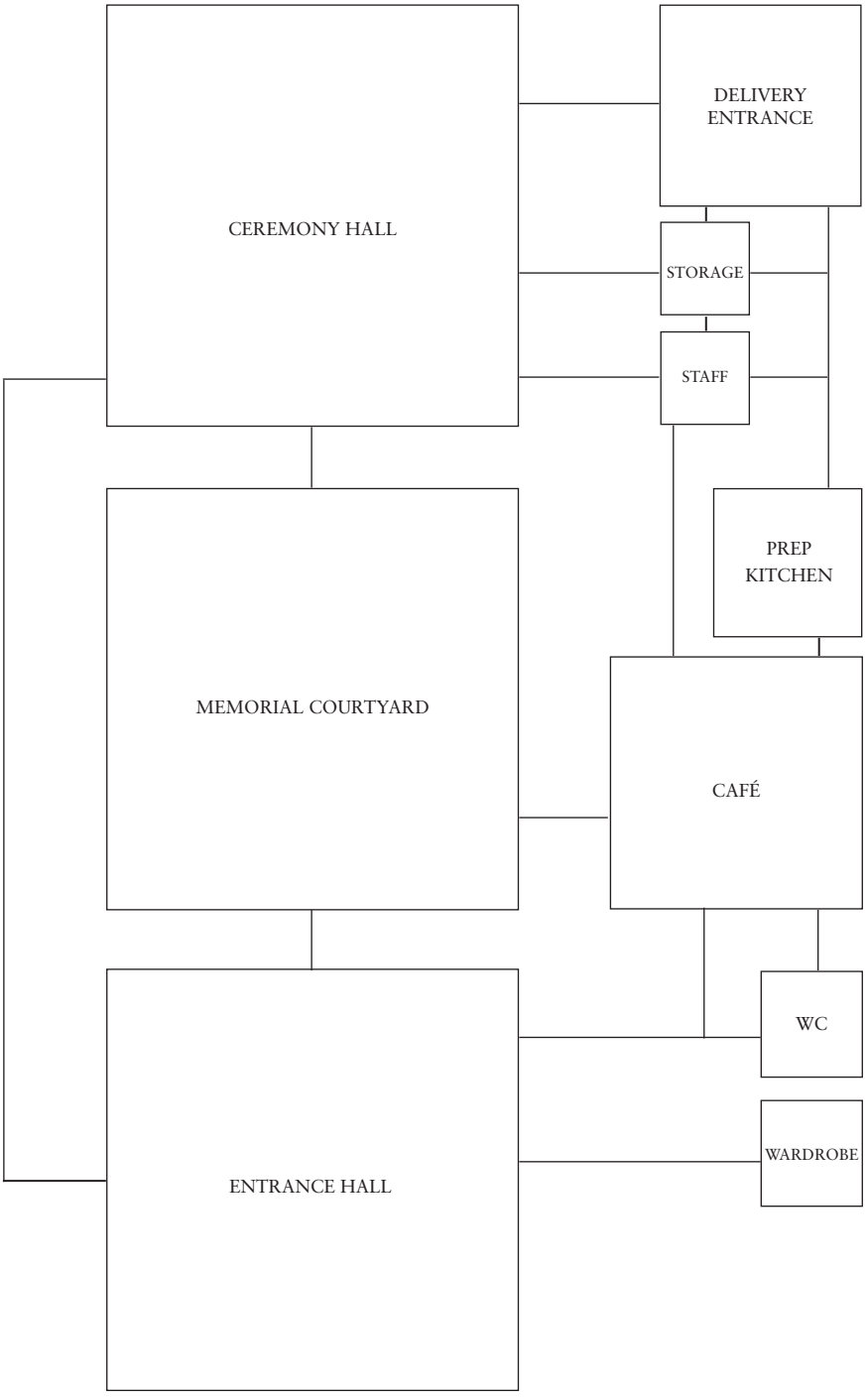
STAFF

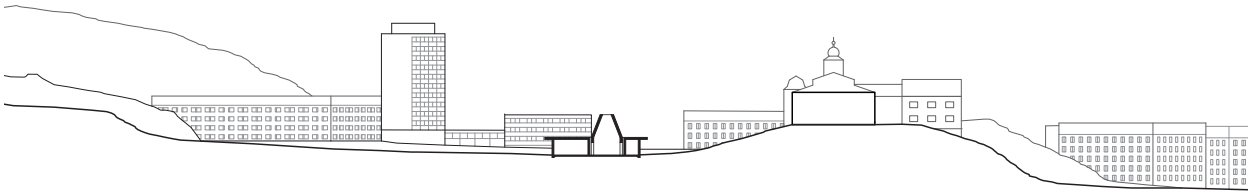
BODY & ASH

---

**SPACES**

| | |
|---|---|
| ENTRANCE HALL | 130 m2 |
| CEREMONY HALL | 130 m2 |
| COURTYARD | 130 m2 |
| CAFÉ | 100 m2 |
| KITCHEN | 20 m2 |
| WC | 20 m2 |
| GARBAGE ROOM | 8 m2 |
| DELIVERIES/STORAGE | 8 m2 |
| STAFF & OFFICE | 60 m2 |
| TECHNIQUE | 16 m2 |
| COLD COFFIN ROOM | 7 m2 |
| COFFIN DELIVERY & PREPARATIONS | 60 m2 |
| **BUILDING FOOTPRINT** | **900** m2 |

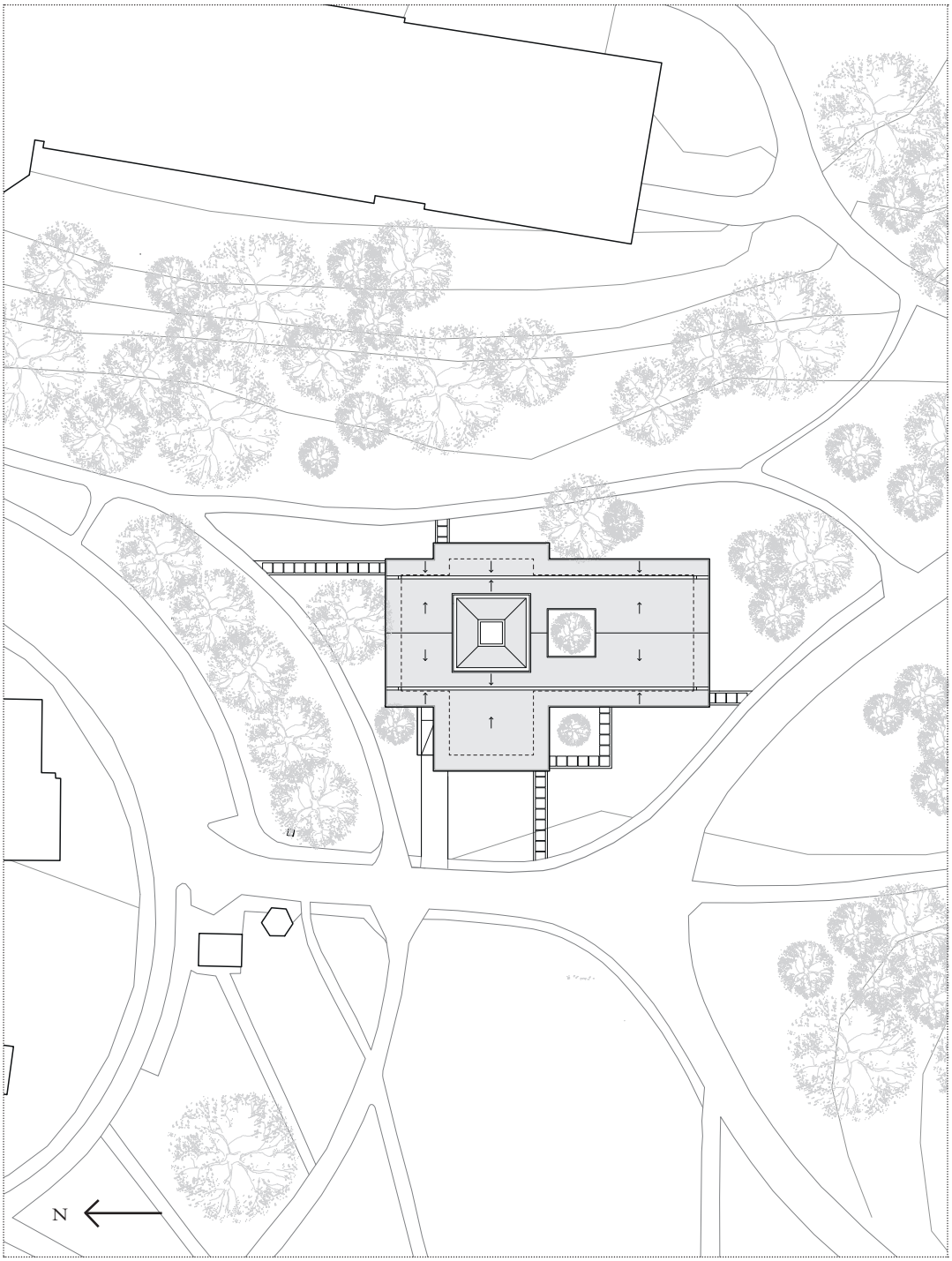

CEREMONY HALL
DELIVERY ENTRANCE
STORAGE
STAFF
PREP KITCHEN
MEMORIAL COURTYARD
CAFÉ
WC
WARDROBE
ENTRANCE HALL



1:2500


HOUSING
FOR ELDERLY
PLAYGROUND
MUSEUM OF
NATURAL HISTORY
N

1:2500



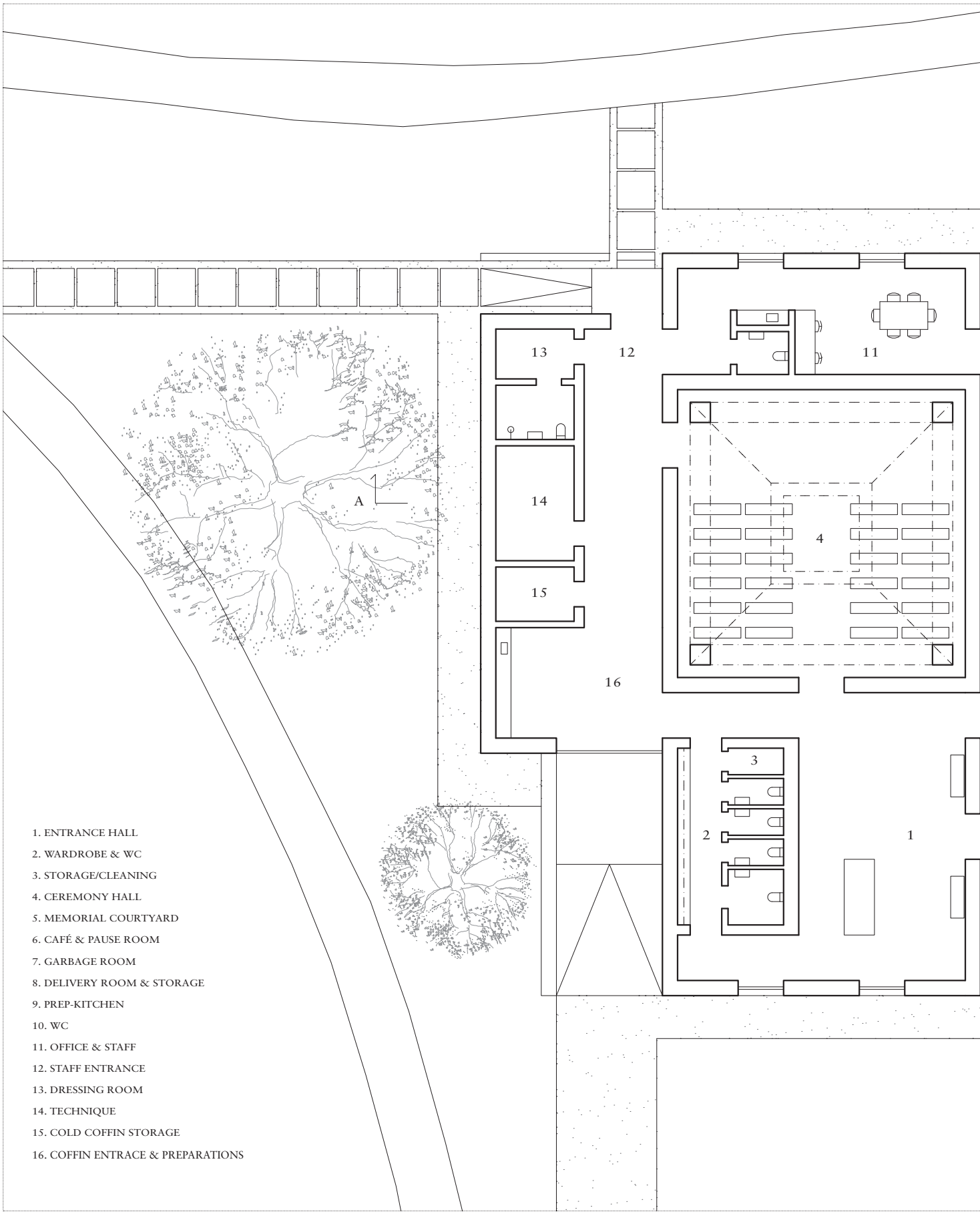

SITUATION 1:1000

FIG 23 VIEW FROM THE PLAYGROUND

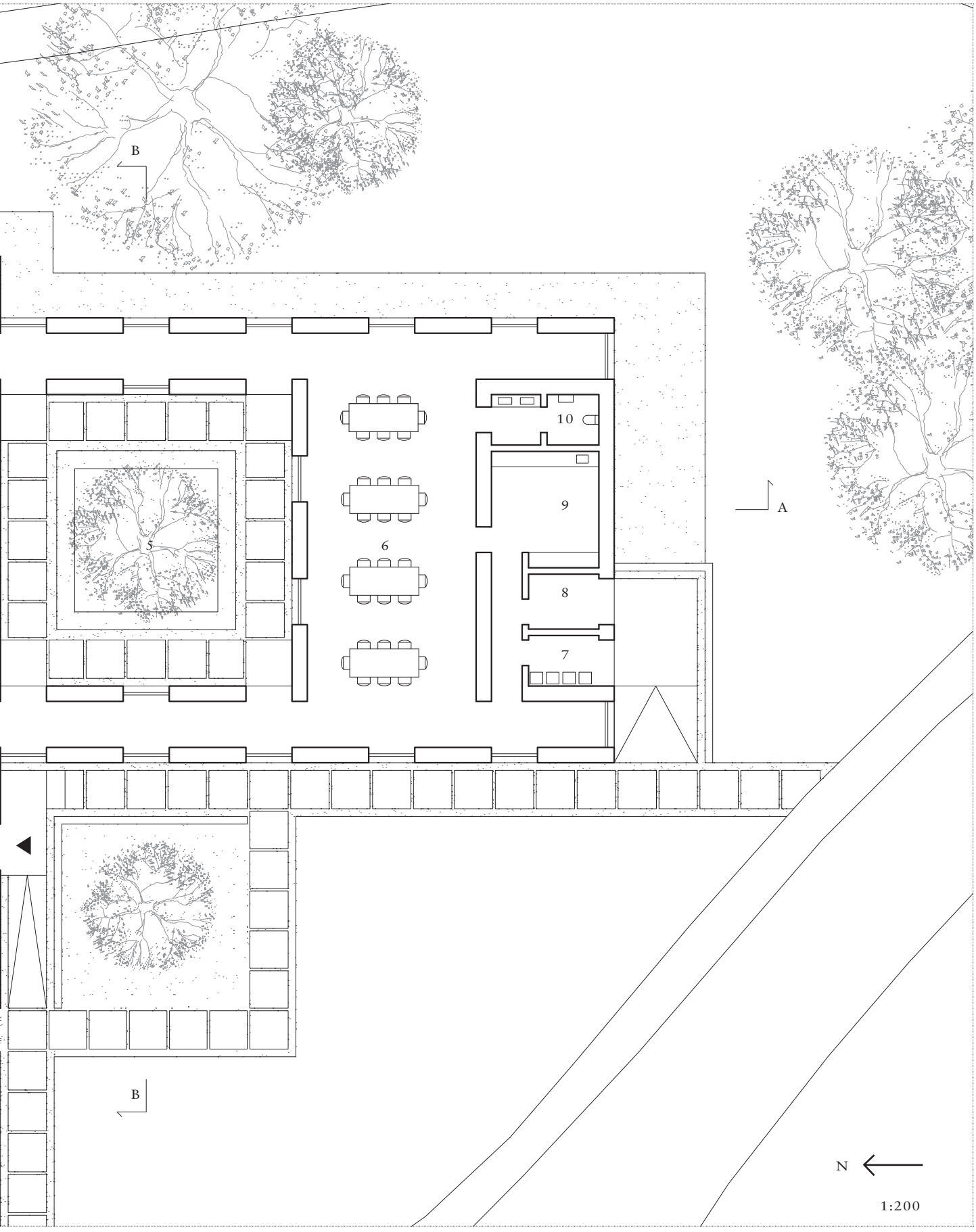
The plan is based on a 2,4 m grid and clearly divided between staff area and the visitors. Walking through the building the spaces has different characters and atmosphere. The visitor's entrance is placed in the west wing close to the bigger road through the area. The core of the building consists of the ceremony hall and the courtyard, and south of the courtyard is the room for the gatherings after the ceremonies. As a staff member you enter through a separate entrance in the east which is connected to a changing room, a small kitchen and an office. These areas are also connected to the back spaces of the ceremony hall. This is where technique, storage and coffin preparations are located.

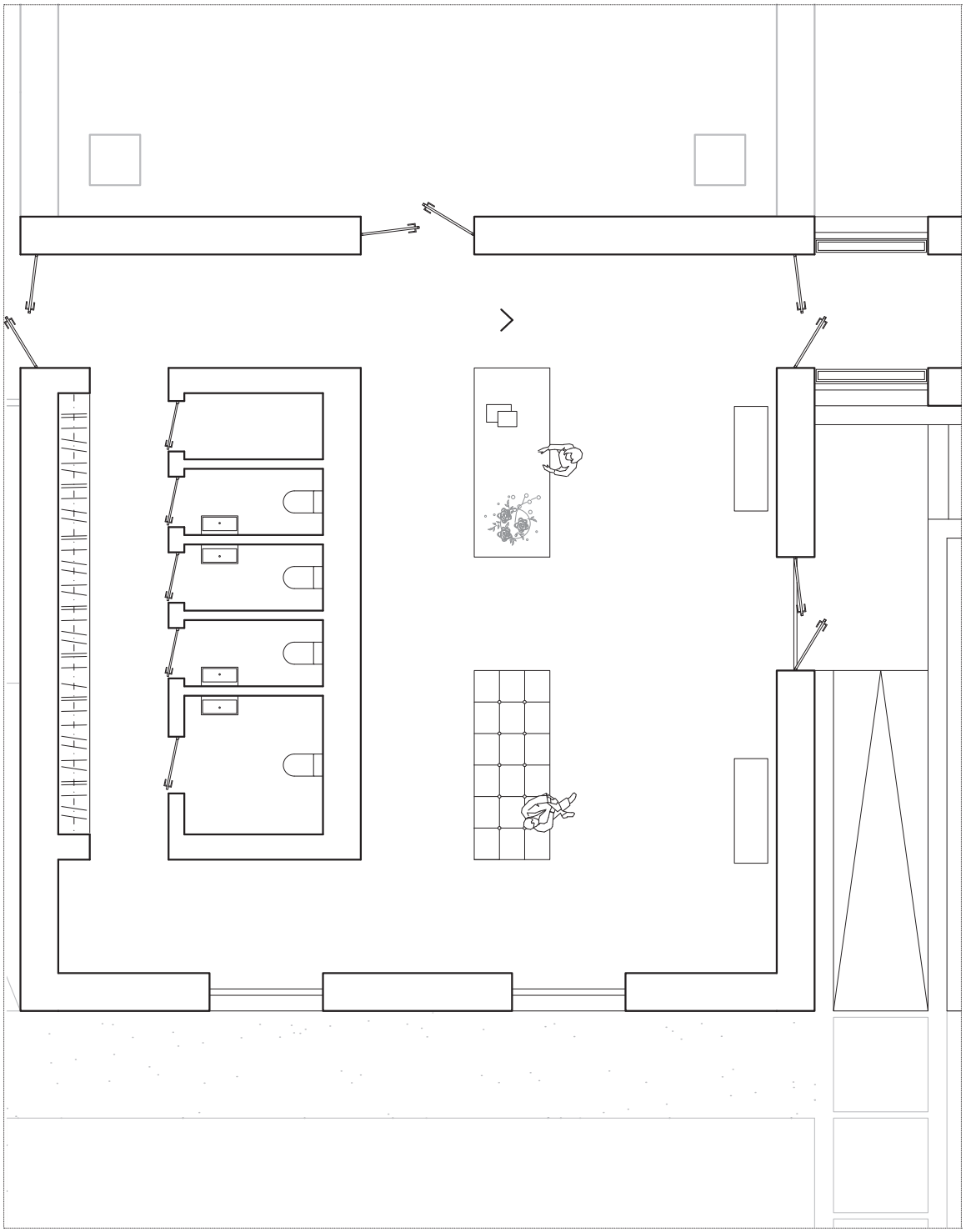
The roof projects as a sheltering brim when walking along the facade. The glazed seam between the walls and the roof create possibilities of natural light in closed or private areas of the building without revealing the activities inside. Overall the stacked composition uses the density of the materials in a natural hierarchy. Aimed to stand out from the rest of the building the ceremony hall differs in shape and material. As a new landmark in the park the cone-shaped, slate roof gives the building its character even in a distance. A skylight surrounding the room lined by a small creek of gravel in the floor shape this small island of contemplation inside the building. The rammed earth walls are framed by the big concrete pillars and beautifully lit by a stripe of natural light that moves and shifts in colour during the day.

FIG 24 TOWARDS THE ENTRANCE




1. ENTRANCE HALL
2. WARDROBE & WC
3. STORAGE/CLEANING
4. CEREMONY HALL
5. MEMORIAL COURTYARD
6. CAFÉ & PAUSE ROOM
7. GARBAGE ROOM
8. DELIVERY ROOM & STORAGE
9. PREP-KITCHEN
10. WC
11. OFFICE & STAFF
12. STAFF ENTRANCE
13. DRESSING ROOM
14. TECHNIQUE
15. COLD COFFIN STORAGE
16. COFFIN ENTRACE & PREPARATIONS


B
10
9
A
6
5
8
7
B
N
1:200



1:100

FIG 25 ENTRANCE HALL & CORRIDOR

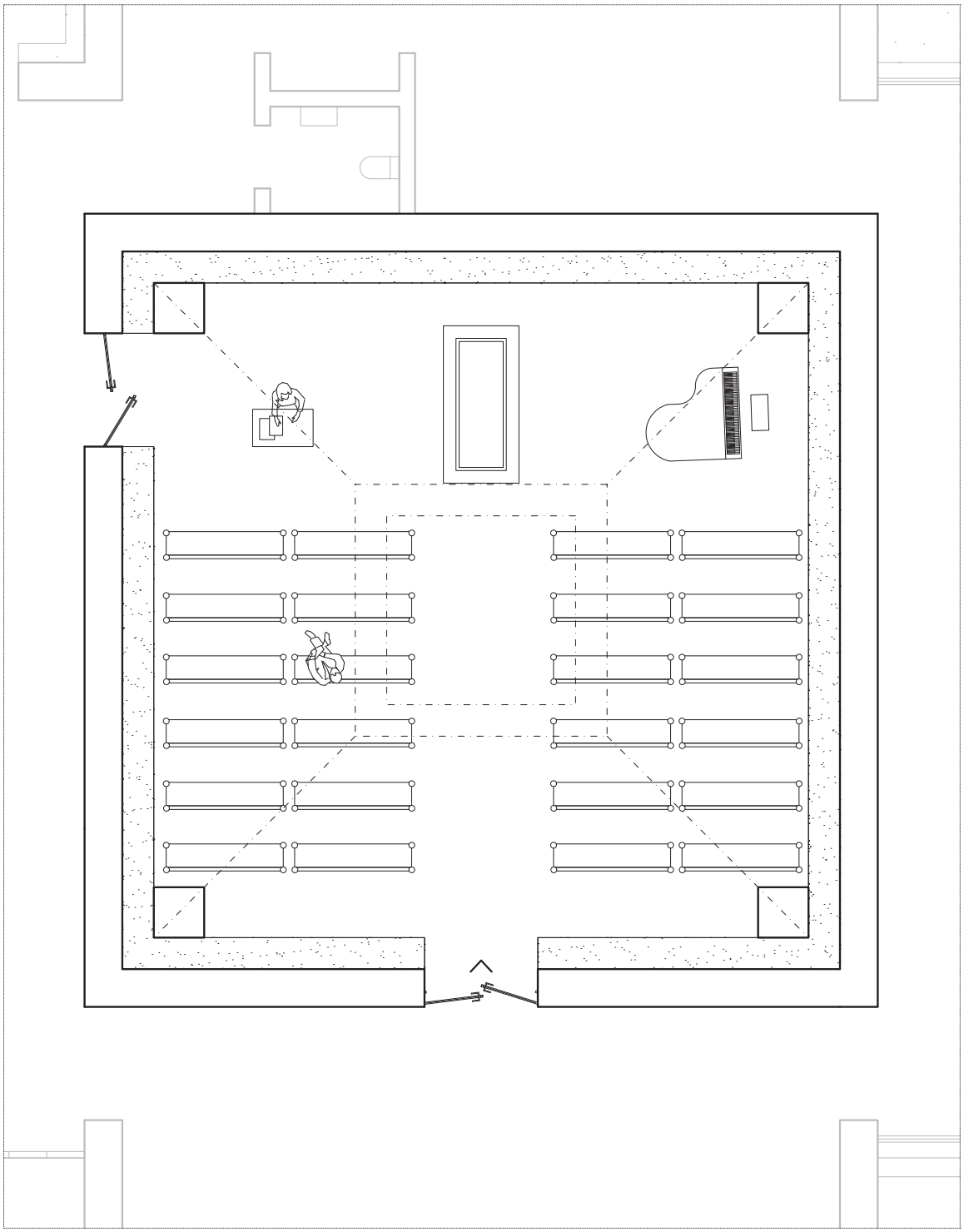


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FIG 26 CEREMONY HALL

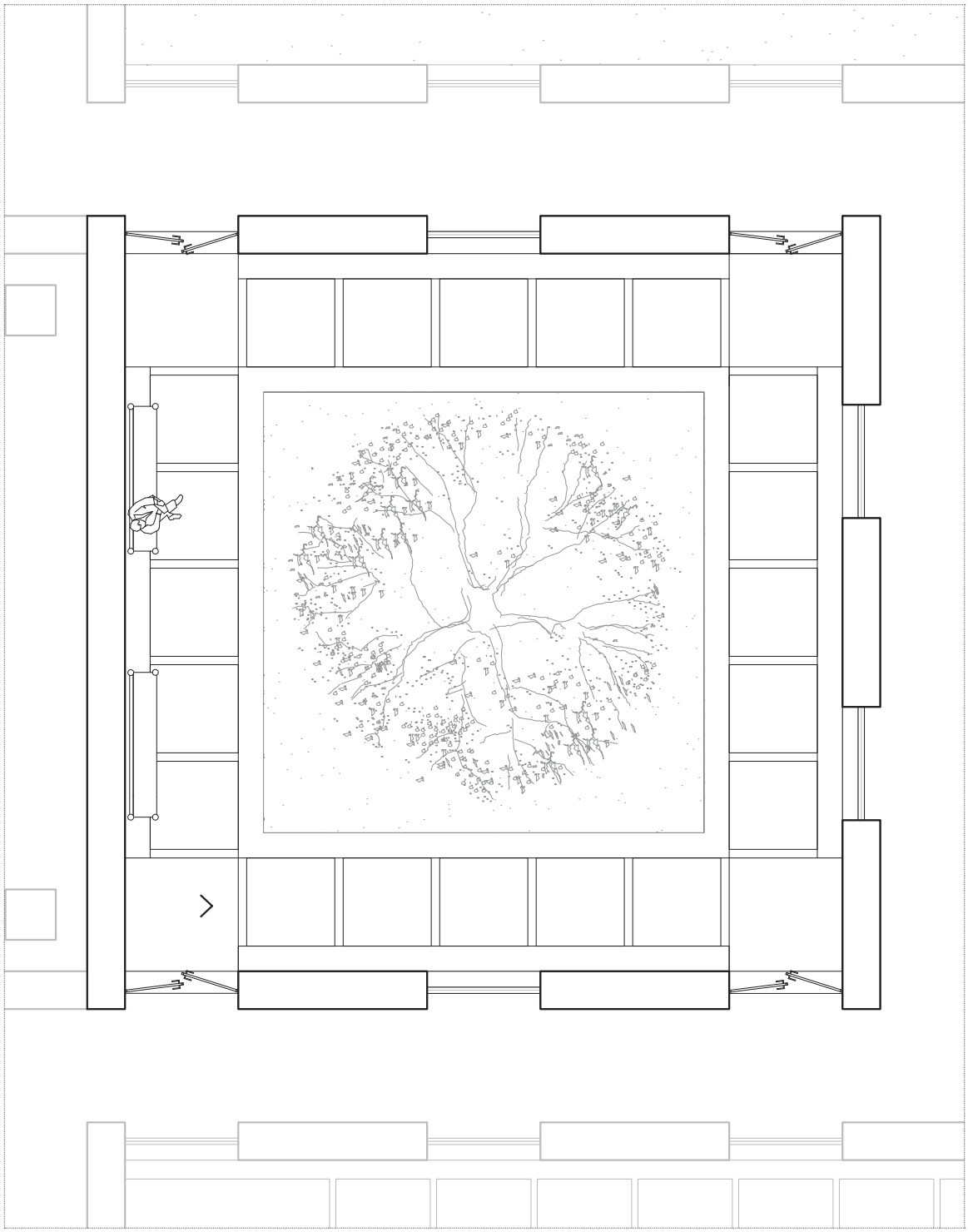

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FIG 27 INNER COURTYARD

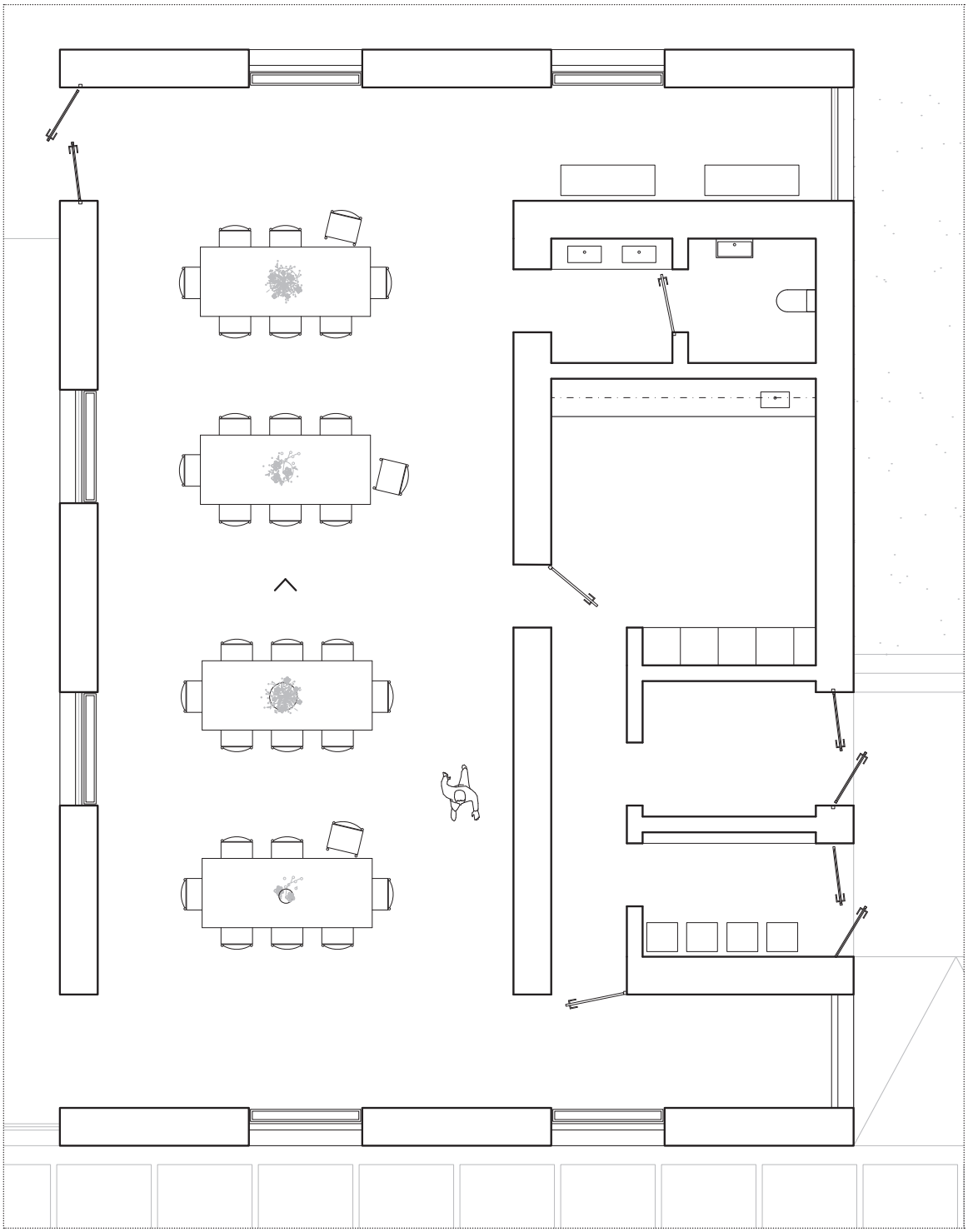

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FIG 28 CAFÉ & POST CEREMONY ROOM

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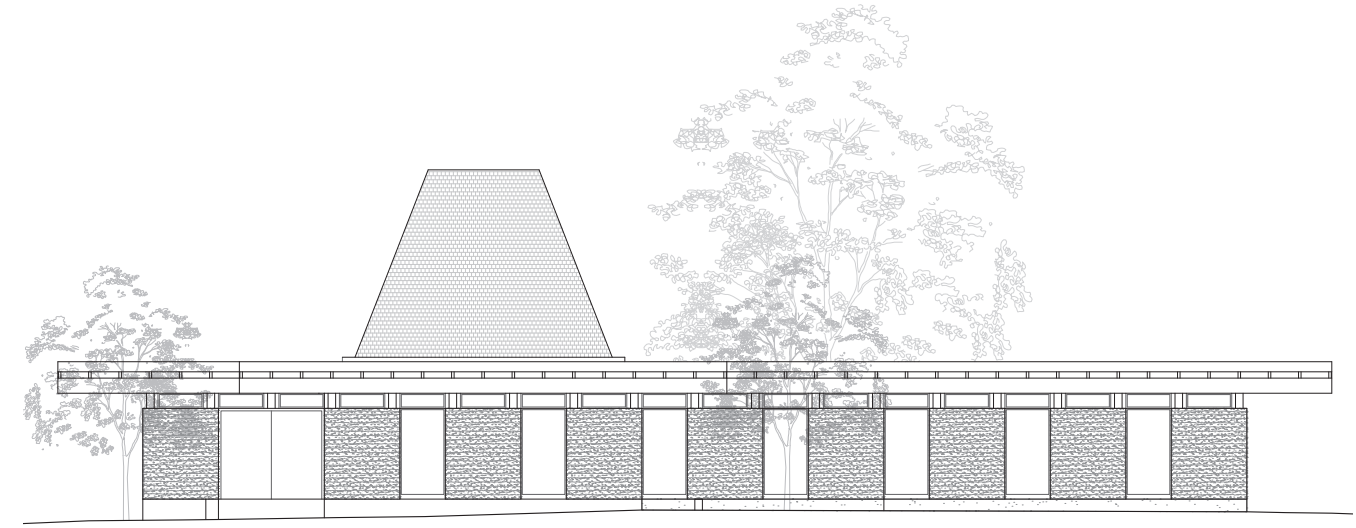
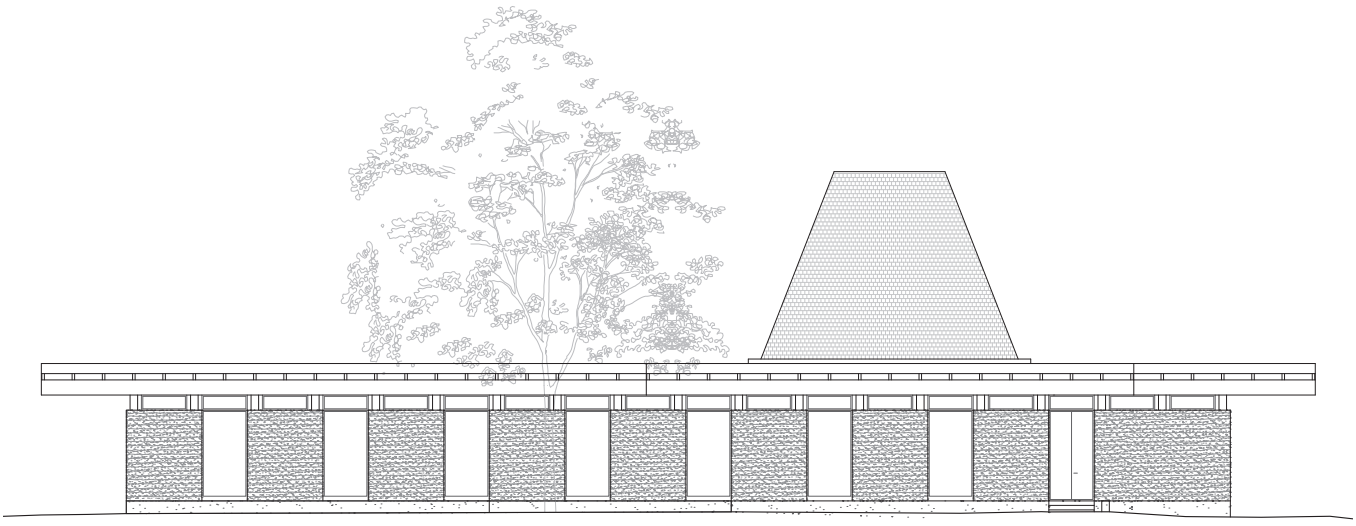
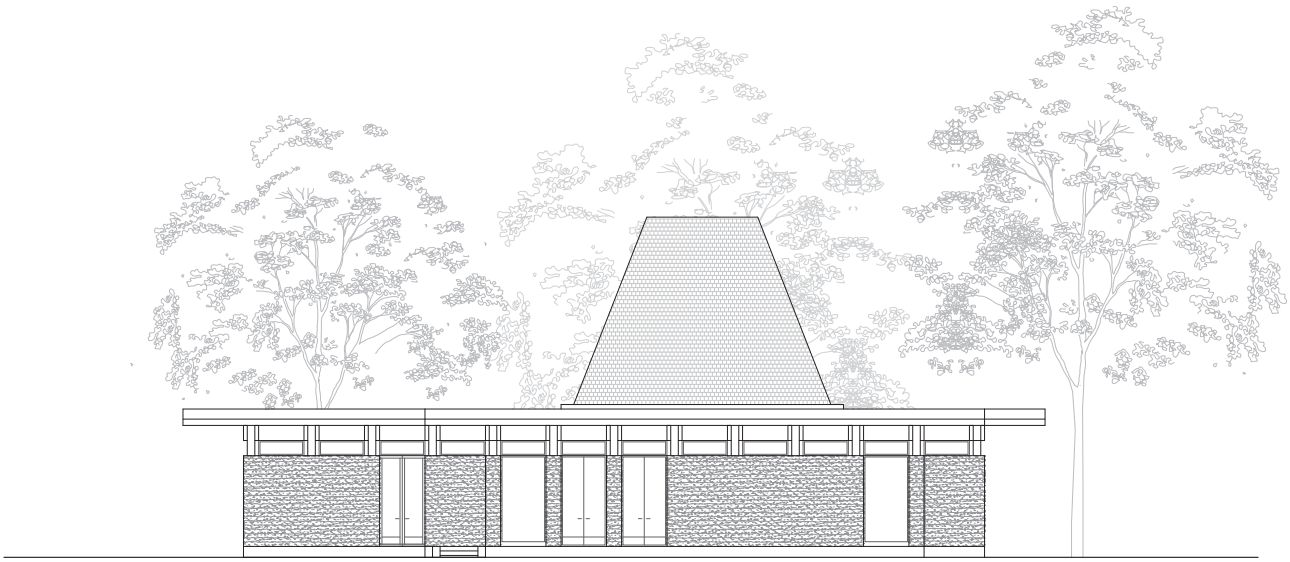


WEST FACADE

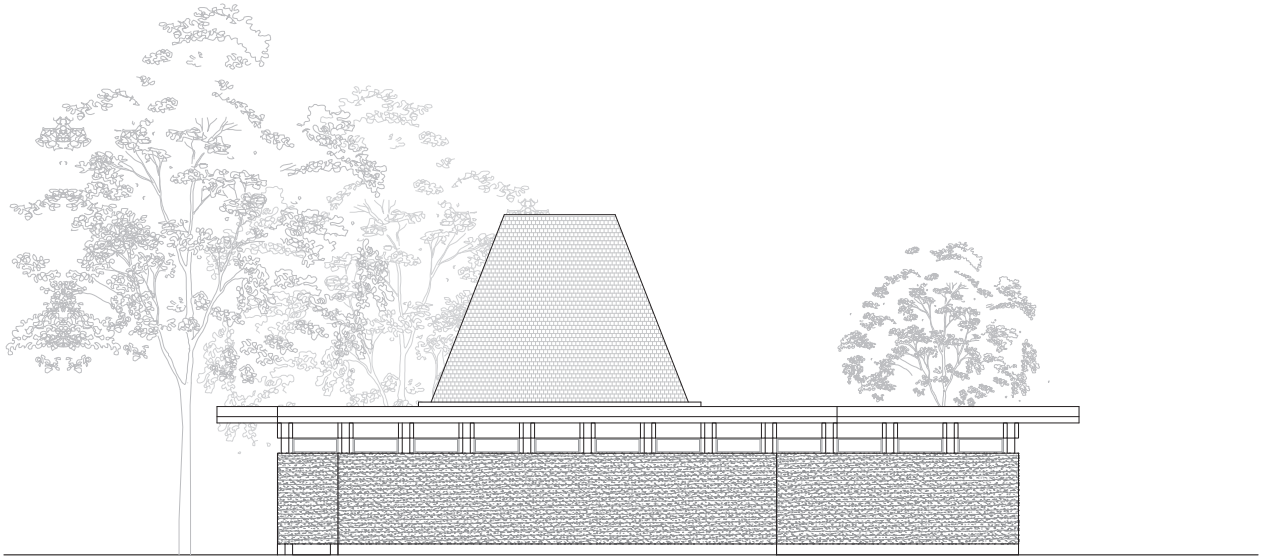


EAST FACADE

1:300



SOUTH FACADE

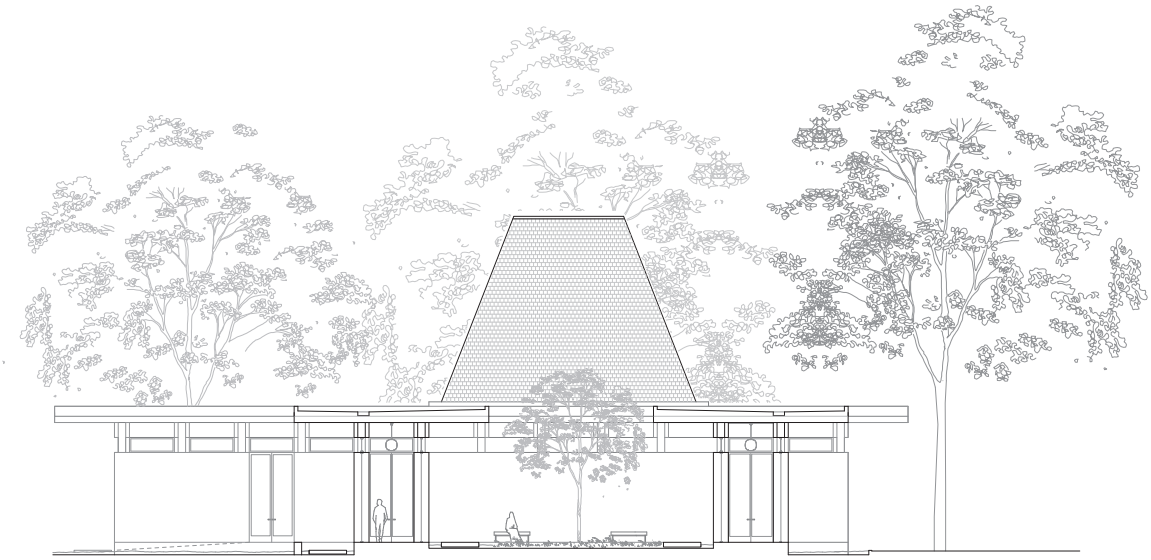


NORTH FACADE

1:300

SECTION A - A

1:300



SECTION B -B

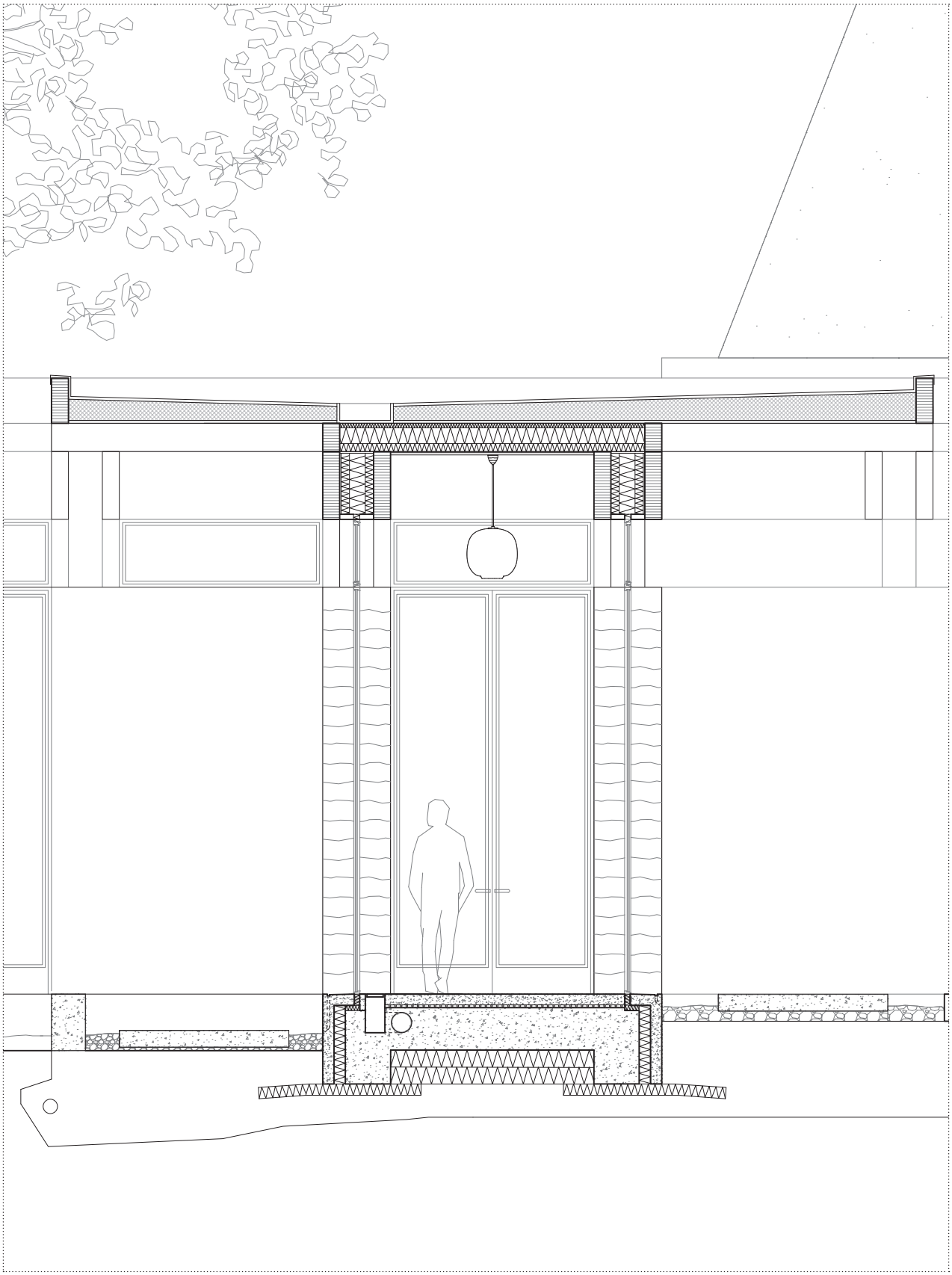
1:300

1:100

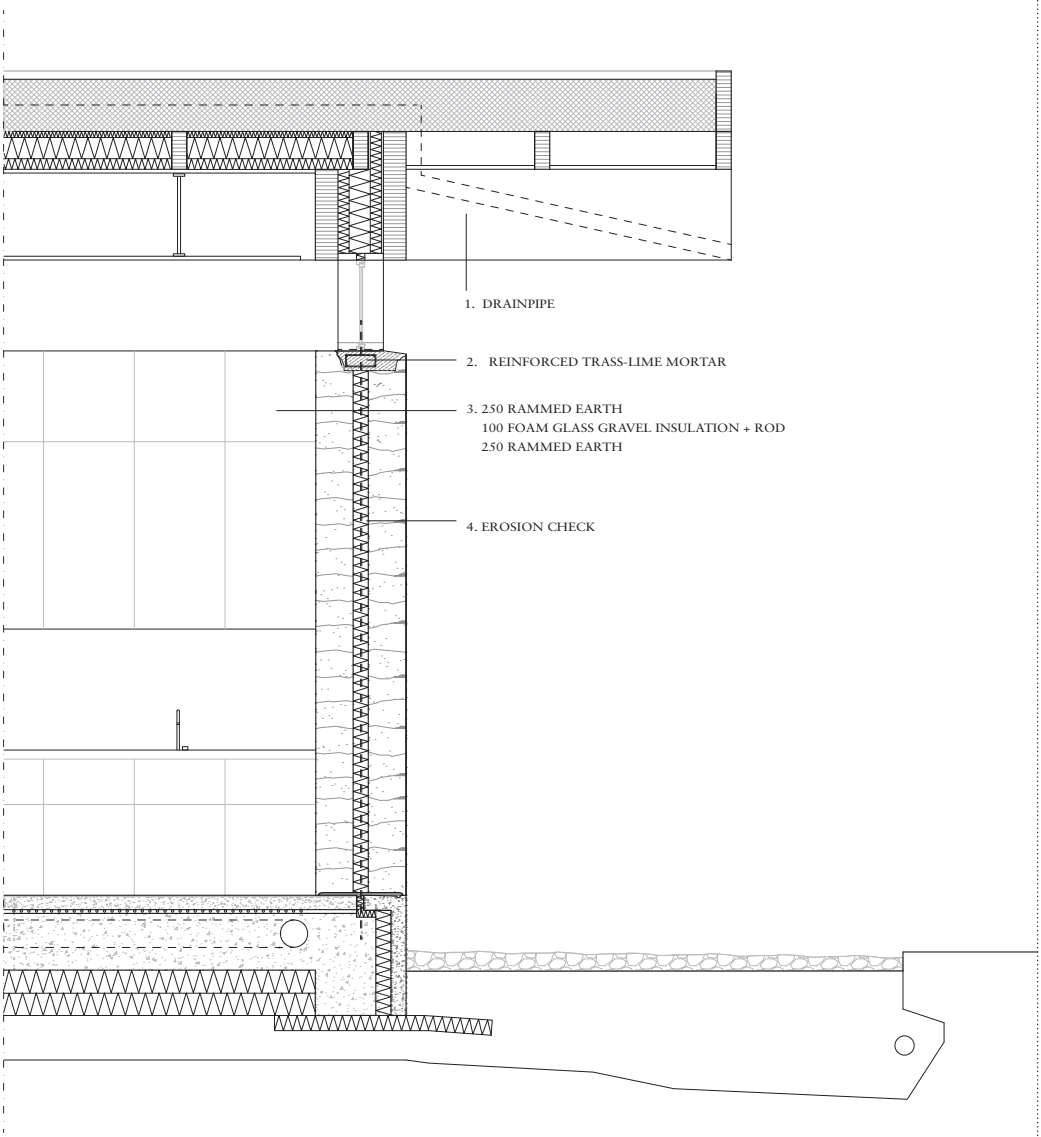
The building has a clear stacked structure. The rammed earth wall rests on the concrete base and on the top, a wooden construction that is solid but has a light, floating feeling. The high rising slate roof whisper of something else happening inside and differ in material and shape from the rest of the building. The details are designed to create a clear and clean structure. How the drainpipe is placed between the double beam is an example on how we have hidden components that is not part of our chosen material palette. The wall consists of two 250mm earth walls with 100 mm foam glass gravel insulation between them. The roof is grounded by a steel rod going through the insulation layer and then attached to the base. This is to fix the roof to the construction during heavy storms for example. The Earthen walls are ended by a concrete base lined by gravel which is a conventional way of preventing splashing water to hit them. The wooden roof construction is stacked, clearly showing the bearing in two directions. The ventilation is installed mainly in the floor but also in walls where it needs to be complemented such as in the kitchen and the office. The exterior windowsills where rainwater could gather, are sloped towards small drainpipes to lead it off. This is to avoid the concrete base to age differently. The high-rise roof has an honest, concrete construction showing in the interior. The outside is covered with a slate roof that is a beautiful compliment to the material palette and could age in a more suitable way than concrete would in this context.

# DETAILS

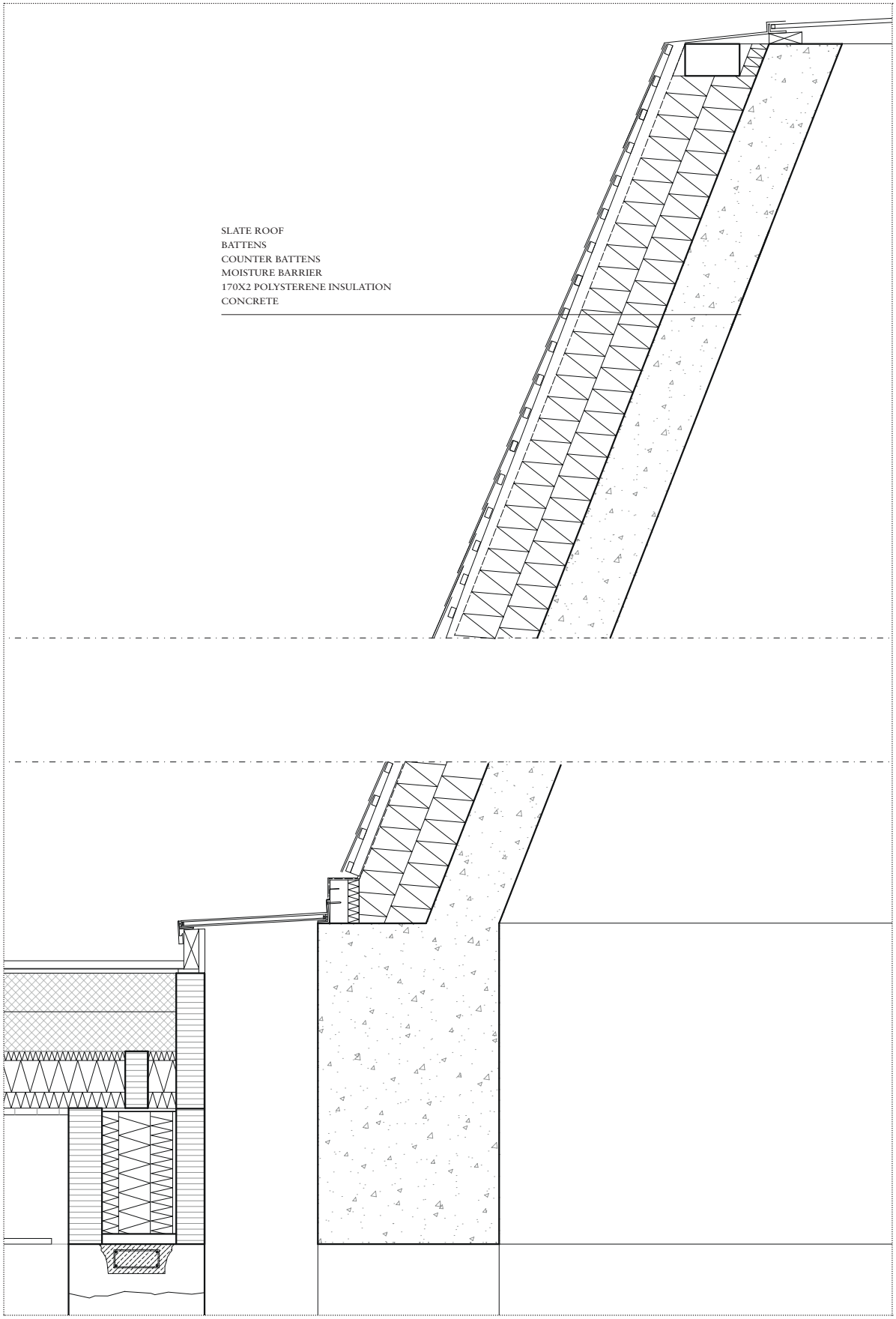
SECTIONS & MODELS



1:50


1. DRAINPIPE
2. REINFORCED TRASS-LIME MORTAR
3. 250 RAMMED EARTH
100 FOAM GLASS GRAVEL INSULATION + ROD
250 RAMMED EARTH
4. EROSION CHECK

1:50


SLATE ROOF
BATTENS
COUNTER BATTENS
MOISTURE BARRIER
170X2 POLYSTERENE INSULATION
CONCRETE

1:25

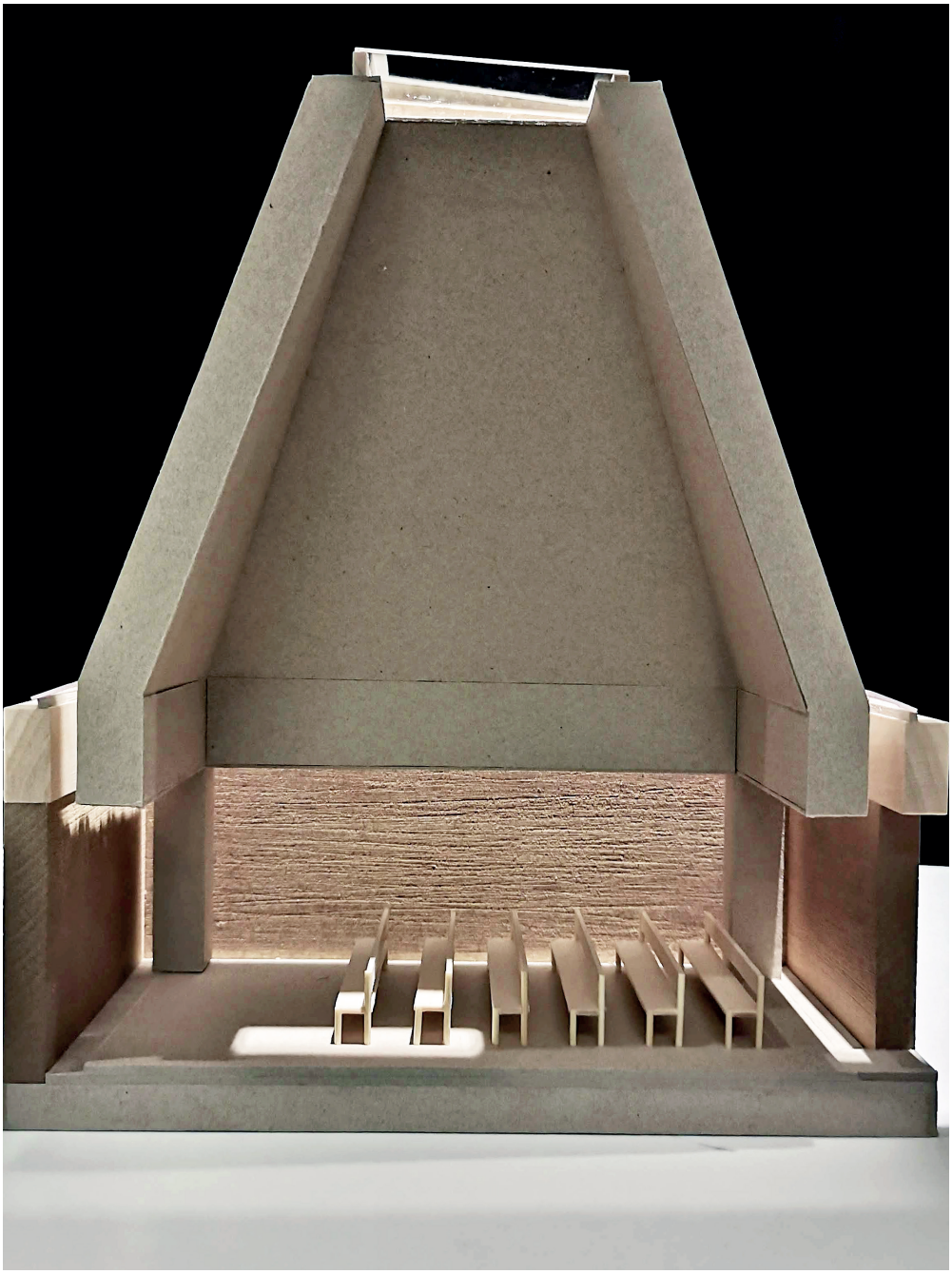
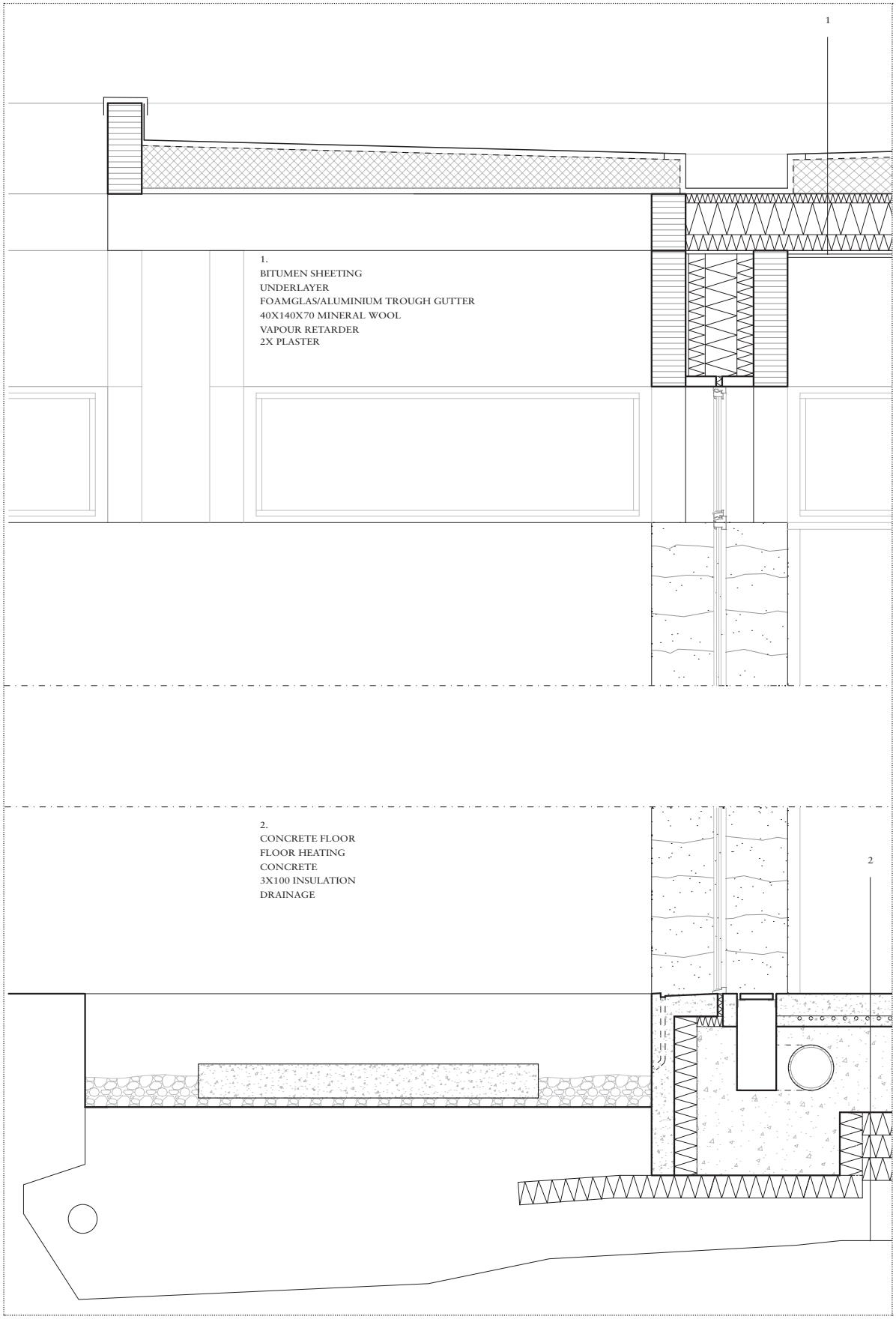
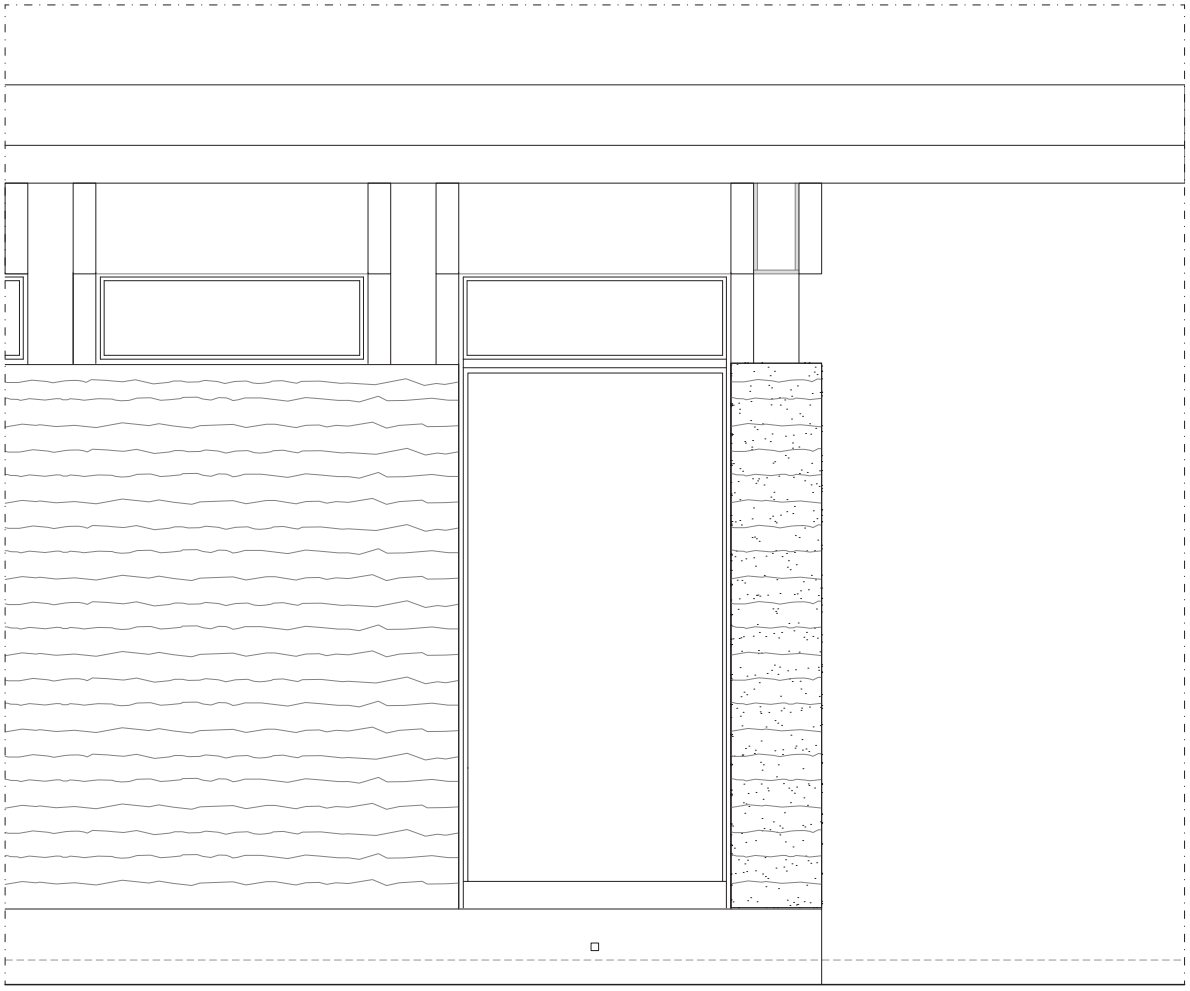


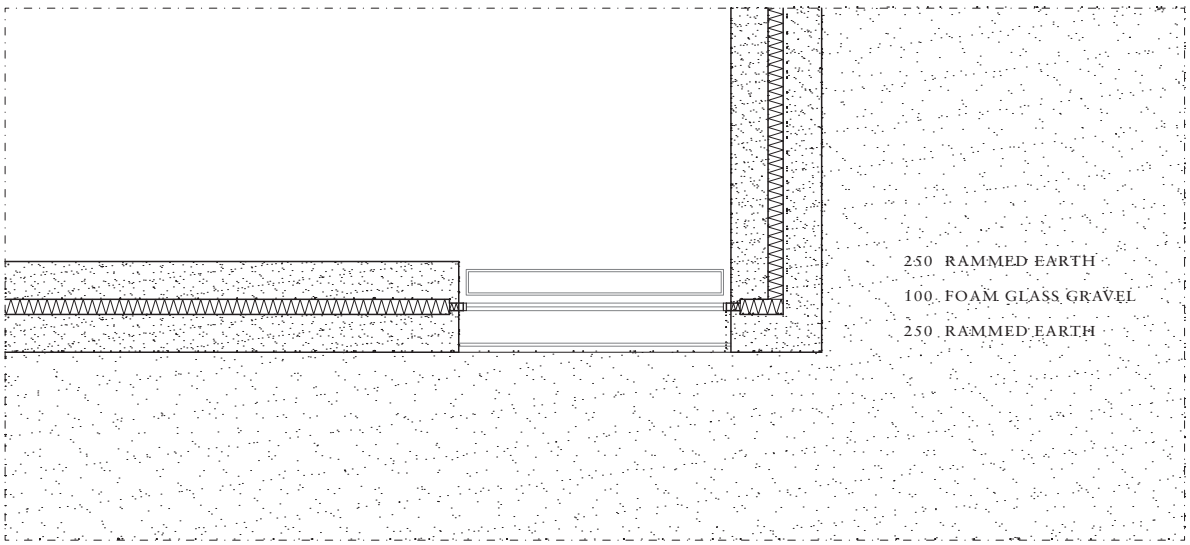
FIG 29 MODEL - CEREMONY HALL


1
1.
BITUMEN SHEETING
UNDERLAYER
FOAMGLAS/ALUMINIUM TROUGH GUTTER
40X140X70 MINERAL WOOL
VAPOUR RETARDER
2X PLASTER
2.
CONCRETE FLOOR
FLOOR HEATING
CONCRETE
3X100 INSULATION
DRAINAGE
2

1:25

FIG 30 MODEL - CONSTRUCTION






1:50

FIG 31 MODEL - CONSTRUCTION

*Authors´ own copyright*

FIG 32 MODEL - CONSTRUCTION

FIG 33 MODEL - CONSTRUCTION

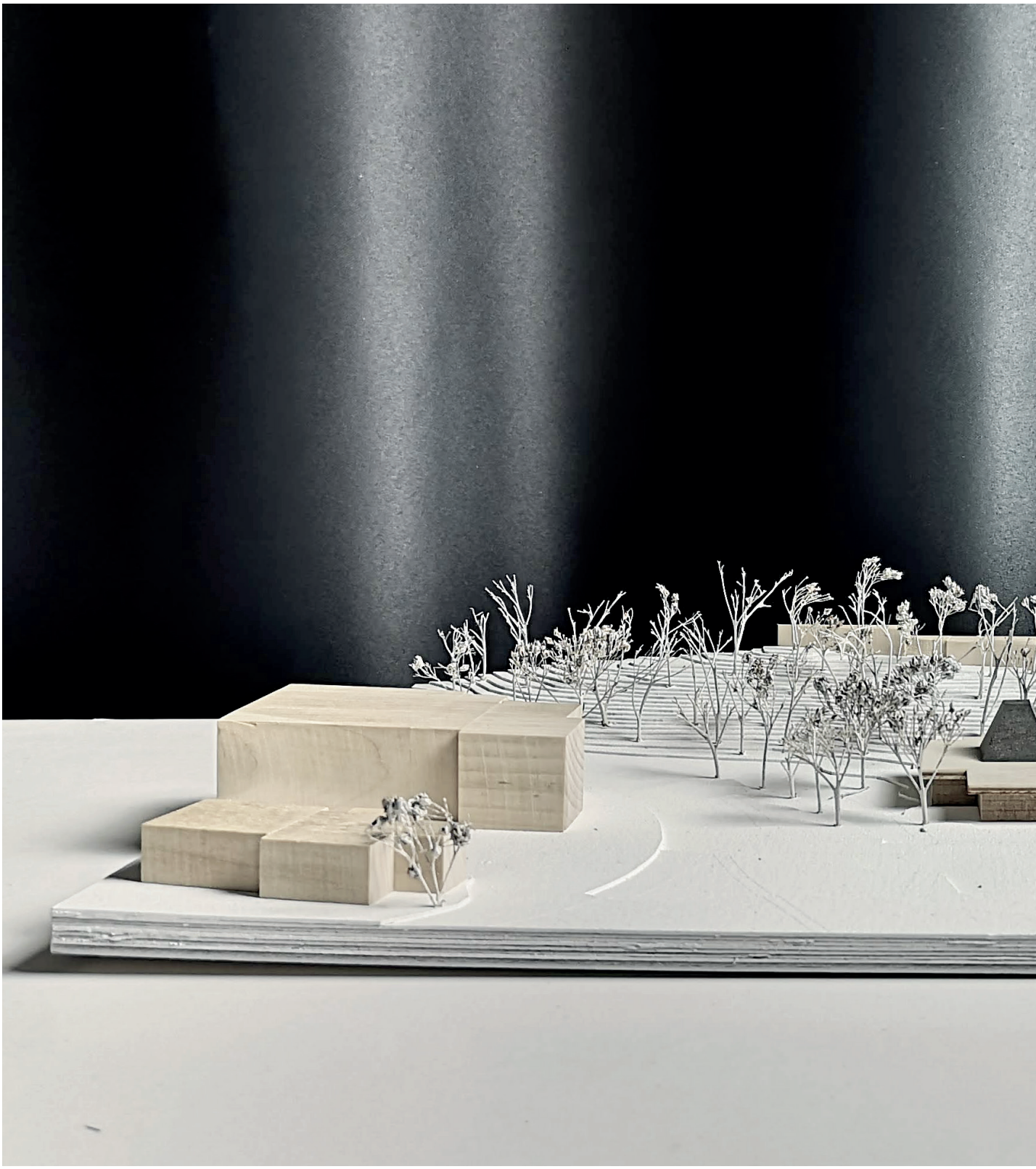


FIG 33 MODEL

*Authors' ov*

L - SITUATION

*wn copyright*

# DISCUSSION

## CONCLUSIONS & TOPICS FOR FURTHER DISCUSSION

The initial purpose of this master thesis project was to broaden the material palette for us as recently graduated architects. On the one hand to be able to achieve greater material diversity in contemporary architecture from a creative and aesthetic perspective, and on the other hand to start discussing the importance of being able to handle a larger number of sustainable materials from an ecological perspective. However, our approach never came to argue about rammed earth as an ecologically sustainable material and focus on describing why it should be used. Instead, we chose implementation as a method for our project. We wanted to use, test, argue and try to understand the material using traditional drawings, instead of engaging in verbal activism for its sustainable benefits. What happens when architects who are not specifically and explicitly focused on sustainability try to create a detailed project with a, in our context, new sustainable material?

As the project progressed, we came across design issues directly linked to our main choice of material that we could not have anticipated at first glance. The need to protect a wall made of rammed earth in a climate that is much rainier than in places where the material is used more frequently led to a need for us to learn how to design the roof in a way we had not done before. During our previous years of study, we had both been influenced by contemporary architectural trends where eaves were generally speaking non-existent. To be able to design a roof that both protects a wall construction and at the same time is a beautiful design element could be relevant for us as architects in a Nordic tough climate regardless of whether the wall is made of rammed earth, wood or another material. Although rammed earth became the extreme scenario that forced us into handling that kind of design problem and search for that kind of architectural references.

In the end, our design proposal became a hybrid design between rammed earth, wood and concrete  and we believe that a prerequisite for implementing rammed earth among the rustic architectural projects is to apply the right material into the right place and context. Both in terms of site and in terms of location in the actual construction. The process of finding the right type of construction for different kinds of sites became a significant part of the initial phase of the project. We believe this can reflect a reality where it is important to implement rammed earth and make decisions about materials and construction early in the process to create the best possible conditions for the material. This may be applicable to more materials than rammed earth and we believe that early implementation and carefully selected materials at the right place is a generally important part when it comes to creating long-term and rustic architecture.

To handle the fact that death and grief has cultural differences and that we bring our own experiences and heritage into this work was probably inevitable. Living in a culture where Christianity has been the foundation of religious beliefs and the church the typical place for these ceremonies, we sometimes found ourselves falling back on churches and other religious buildings as references when it came to the spiritual room. Maybe though the secular person has found, or would like to find, new places to practice these emotions and create ceremonies that is different from what has been standard and that these would be placed in a completely different context. We have not to the full focused on exploring that question and think that it would have been a different thesis project. We have still thoroughly explored how materials, light and space can work together to create an atmosphere that could be the host for various ceremonies and rituals. We ask ourselves if the lack of symbols, such as crosses, are the only thing that separate our building from a traditional church? The strength of symbols is very strong, and the design of the modern church has got wide expressions, so on that question the answer might be yes. The new feature could be the rammed earth that distinguish itself from traditional materials in Sweden yet could have the comforting robustness of something long-lasting.

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Sidaway, J. D. (2010). Deathscapes : Spaces for death, dying, mourning and remembrance. Retrieved from https://ebookcentral.proquest.com

# IMAGE SOURCES

Figure 02,  Ruins Palace Of Knossos Minoans
Retrieved from free source: https://www.needpix.com/photo/78620/ruins-palace-of-knossos-minoans-island-of-crete-greece-archaeological-site-archaeology-minoan-city-minos

Figure 03, Holger Ellgaard, Skogskapellet
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Figure 04 - 06. Bühler B., Haus Rauch.
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Figure 07. Filip Dujardin. Observation Tower Negenoord.
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Figure 08. Tony Webster. Chapel of Reconciliation.
Retrieed open source: https://commons.wikimedia.org/wiki/File:Kapelle_der_Vers%C3%B6hnung_(Chapel_of_Reconciliation)_in_Berlin,_Germany_15622676838.jpg

Figure 09. Markus Bühler. Ricola Kräuterzentrum.
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Figure 10. Michael Tink, Santi Quattro Coronati
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Figure 12. Kolumba Museum
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Figure 13. Ioana Marinescu. Crematorium Chapel.
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Figure 14, Ljunghusen
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