NORWEGIAN DAYLIGHT ARCHITECTURE

Exploring the Spatial Potential of Daylight at Northern Latitude

Binder 1

Nora Kilstad

Diploma

Norwegian Daylight Architecture
Exploring the Spatial Potential of Daylight
at Northern Latitude

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Diploma
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Arkitektur- og designhøgskolen i Oslo
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Binder 1

Organisation of the binders

Binder 1 consist of an extract of the diploma. Binder 1 gives an overview of the project and describes how the diploma has been structured. This binder includes descriptions of each part of the diploma and the overall learning outcome.

Binder 2 is a presentation of the diploma project as a whole. Binder 2 presents the process and analysis of each of the 5 components of the diploma.

All relevant images, illustrations and drawings are enclosed in binder 2.

For a proper understanding of the diploma, both binders must be read.

Fig. 1.01 Model photo from diploma work

Introduction to theme

This diploma first and fo emost considers the spatial experience of daylight in architecture, studying relations between the geometry of daylight in Norway and the geometry of Norwegian architecture.

The daylight that surrounds us in Norway, with its inherent variations, represents an underutilized quality that should encourage more discourse within architectural education and practice. In this country, where the people are greatly affected by the changes of daylight that comes with the seasons, my personal experience is that daylight is underdiscussed in the field o architecture. There is a tendency to design despite the daylight variations, rather than with it. The inspiration for the theme of this diploma stemmed from my personal frustration with the limited emphasis on daylight in architectural education.

“Light is only one of the many aspects of architecture. But light reveals the building, its intentions, its place, its form, its space, and its meaning. Light reveals architecture and, in the best instances, architecture reveals light.”[1] Daylight connects us to the flows o nature, even in human-built environments. The light from the sun and the sky, the shadows it casts and its reflections can change how spaces are perceived, and effect how we feel, improve our quality of life. With daylight design we view how the architecture can exist in the natural world, and how the natural world can unfold in architecture.

Contemporary architectural practices are leaning towards the quantitative and measurable aspects of daylight. The technical aspects provide a more tangible foundation that is easy to comprehend, because it is simpler to grasp numerical facts than qualitative facts. However, if we remember to consider the phenomenological aspects, daylight can be a bridge between science and art.

[1]Marietta S. Millet. *Light revealing architecture.* (New York: Van Nostrand Reinhold, 1996) p. 3.

Quantitative measurements determine whether a building meets a set of requirements, numbers conclude if the daylight conditions are good enough, and the qualitative aspects are left behind. This leads to the daylight being regarded as a detached dimension, unrelated to the architecture or the overall spatial experience.

Playfulness with diverse daylighting seems not to be a priority. Our technology enables us to create almost indefinitely la ge windows, and we are therefore at the risk of overexposure. However, diversity of size and intensity benefit the xperience, there is in fact such a thing as too much light. Without the contrast of the dark, the light cannot be appreciated as much.

Numerous devises are used to control daylight, however, we should place more confidence in the uniqueness o daylight. Daylights physical reality is not all measurable, certain aspects must be experienced to be genuinely grasped. The potentials that lie in the interplay between daylight and architecture is somewhat overlooked, and nowadays there is a lessened attention to how daylight occupy space and the human experience of this phenomenon.[2]

"In recent decades, this poetic tradition has grown even more obscure yet involving, using pure geometry and severe austerity to defamiliarize architecture from nature, and reinforcing this divergence with industrial materials or coats of paint."[3] In the time before artificial light architecture evolved through the tension between the limitations in construction technology and the need for light. With the advanced technology of today, this tension is less determining for the overall design. However, daylighting can still be a tool for creating spatial experiences, contrasts and dramatic effects in architecture.

[2]Louise Grønlund, "The Appearances of Daylight – an educational method for studying daylight"
[3]Henry Plummer. *Nordic light: Modern Scandinavian architecture*. (London: Thames & Hudson Ltd., 2012) p. 10

INTRODUCTION TO THEME

Fig. 1.02 Model photo from diploma work

Physical or psychophysical measurements does not say anything about the overall experience of a room and its variations in geometry, colour and light. The measurements know nothing about how we sense the room and how our bodies adjust to its slight changes.[4] The interest of this diploma is less in expression of technology, more in the overall presence of a space. Considering light as a figu e, an active protagonist.

Daylight does not scale, and the qualitative variations of daylight can be observed in models. Model making serves as an analogue approach for spatial exploration in a significant po tion of the research implemented in this diploma. “One of the greatest values of studying daylight with the aid of models is that subjective appraisals can be made, and a clear idea obtained of the character of the lighting and the appearance of the interior (…) There are many aspects of daylight design which are not amenable to numerical prediction or to precise measurement. These aspects can only be studied by direct subjective appraisal.”[5]

In my view, more attention towards greater understanding the nuances of daylight’s protentional is needed in architecture practice. Especially in the context of Norway, at Northern latitudes, where the variations are notably significant There is very little focus on the different daylight of the seasons in Norway, the special variations don’t seem to hold much importance. There is a tendency to treat daylight as something static. We need to utilize the aspect of time, because architecture can be an everchanging performance of spatial experiences, if we let daylight direct the scene.

[4]Ulf Klarén, “Medan mänskligt mått mätt – Om perception, färg, ljus och rum.”, in *Färg & Ljus: För Människan – I Rummet*. Edited by Karin Fridell Anter and Ulf Klarén. (Stockholm: Svensk Byggtjänst, 2014)

[5]R. G. Hopkinson, P. Petherbridge and J. Longmore. *Daylighting*. (London: Heinemann, 1966) p. 379.

INTRODUCTION TO THEME

Fig. 1.03 Model photo from diploma work

Fig. 1.04 Model photo from diploma work

There lies so much potential in the daylight in Norway and the rest of the Nordics. This diffuse and melancholy light, with its multitude of nuances can create several different atmospheres. The Nordic daylight is always in motion. There are variations of daylight over the course of a day, over different seasons and there are variations according to changes of weather. Each season, month, day, and even each moment possesses its one unique character. It is an ever-changing phenomenon that shift from one moment to the next. Given the daylight's unceasing variations, should we not have a greater focus on designing architecture that allows the daylight to make spatial experiences with this continual change?

With this diploma, I present a wish to better understand the relation between Norwegian daylight and architecture, and explore the spatial potentials that inhere in this relation. Throughout the diploma process, the following questions have been central to me: What is Norwegian Daylight? What does Norwegian daylight do to architectural space? What is- and what has daylight been in Norwegian architecture? What is the spatial geometry of daylight in Norwegian architecture?

Motivated by a personal desire to delve deeper into the role of daylight in architecture, this diploma will centre around research. To investigate the impact of daylight on architectural space, explorations involving models will be incorporated. Hence, the research question is as follows:

In what ways can an approach of research and explorations in models assist in identifying critical elements for formulating a design strategy that reflect the ever-changing nature of the Norwegian daylight?

Aims and delimitations

This diploma will study the relationship between the Norwegian daylight and how this daylight is experienced within Norwegian architecture. The wish is to learn more about the opportunities that lie within daylights ever-changing nature for architectural space.

The main goal of this diploma is to attain more knowledge about the daylight we live with in Norway and gain a greater understanding of how we can create architecture that focus on utilizing its qualities.

One of the major parts of this diploma is readings and research through literature. Aiming to obtain a base understanding of daylight through theory.

Physical model explorations of spatial experiences or observations will be the main tool for research.

The spatial studies of this diploma will only consider daylight, and its changeability and unpredictability in Norway. It will not include discussions of artificial light

This diploma will not do or consider digital or technical measurements of daylight, it will solely focus on the experienced or observable spatial qualities of daylight.

The diploma will also include three different working methods of spatial studies, where the goal is to research three different aspects of Norwegian daylight.

As a result of the diploma process, a design strategy and project will be presented. The strategy of this project will be fully based on the knowledge obtained from the readings and the findings f om the three working methods.

The theoretical research, each of the three working methods and the resulting project will be equally important parts of the diploma.

One latitude will be chosen as case and base for observations – the latitude chosen being approximately 60° north. This enables comparability between findings and a mo e detailed assessment.

I will not present one singular conclusion about the correct use of Norwegian daylight in architecture, but introduce the discussion on other ways to work with daylight than through digital and quantitative measurements.

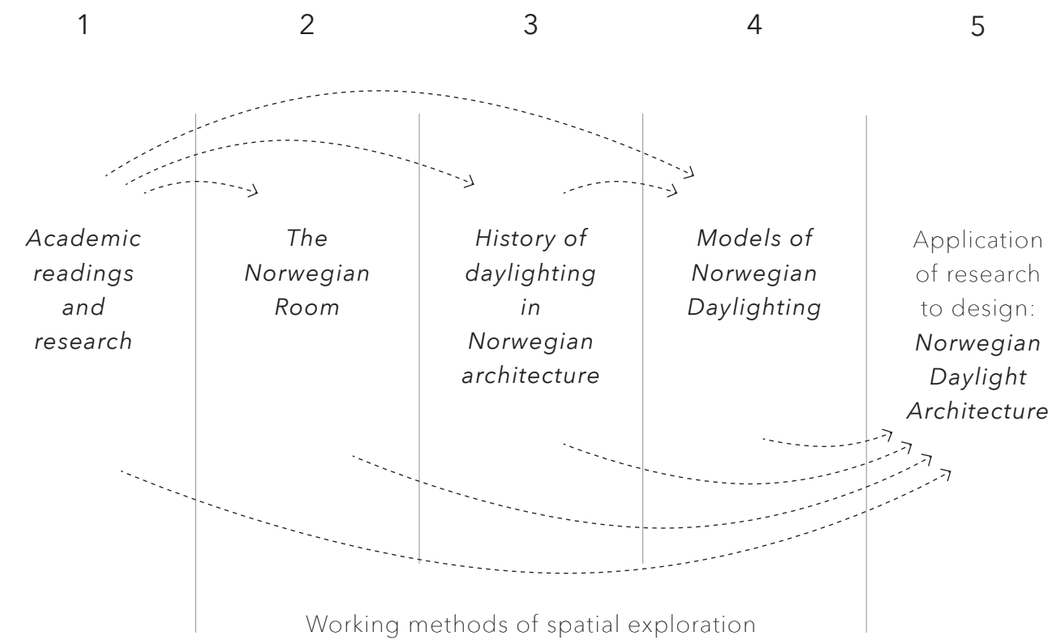


Fig. 1.05 The components of the diploma

The 5 components

With the main goal of the diploma being a wish to learn more about how different daylight conditions affect architecture, the majority of this diploma project is the process. It is the research and the process of discovering a greater understanding of the theme which is the most important when viewing the work.

The diploma can be sorted into 5 components of equal importance.

The first component is theo etical research. By looking towards what architects, researchers and other academics has written about different aspects of the theory relevant to this diploma, I have gained necessary understanding needed to delv into other methods of research. The academic readings is the foundation for all of the work done in the diploma.

After the theoretical research, the three next components are *the working methods* of this diploma. The frameworks behind the methods are choosen based on different aspects of spatial daylight qualities that I wished to study further with spatial and practical research.

The second componant, the first working method has been given the name *The Norwegian Room*. The goal of this method was to observe how the geometry and character of one room change with the changing daylight in Norway. This was achieved through photographic documentations in a large scale model over the period between sommer solstice and winter solstice.

The third componant, the second working method, is *Norwegian daylighting History*. With this method, the goal was to gain a better understanding of the role of daylight in architecture through Norwegian history, achieved through studies of a selection of case studies.

The fourth component, the third and final working method has been given the title *Models of Daylighting*. In this method different geometries of Norwegian rooms has beed explored in monocrome models, stripping away the details to learn more about the geometry of the daylight that enters the models.

The fi th and final component is the applic tion of the four previous components to a design strategy. Findings from each of the components make up the framework of an architectural design project, which is a continuation of the work of this diploma. This project is also a research method, where the goal is to open up the discussion of ways of designing with daylight that are not based on quantitative measurments or digital modelling.

The theoretical research, each of the three working methods and the design project are equally important parts of the diploma, each part contributiong to the other components.

Why 3 different working methods?

"Architectural culture works along a large variety of epistemes (…) They are related to a specific set o tools – ranging from drawing to collage and diagram – and methods, including mapping, charting and fieldwork Epistemes are the bridges between investigation and projection, between analysis and design. They are specific thought frames from which architects operate and that provide a basis for analysis, comprehension and intervention in the built environment. Epistemes – sometimes a single one but most often a combination of many – offer a horizon for the delineation, formulation and composition of architectural projects."[6]

As mentioned in the previous pages, this diploma includes three different working methods of spatial exploration and research. The chosen format for each method is designed to facilitate observations of certain features that daylight has in architecture. It seeks to examine and sense first-hand specific aspects daylight that has been encountered in theoretical readings. The objective is to align the theoretical with practical applications, allowing for a hands-on exploration of daylight phenomena. By employing these methods, the objective is to bridge theoretical knowledge with practical insights, fostering a comprehensive understanding of daylight through hands-on experimentation and observation.

Utilizing three methods instead of one is rooted in the belief that knowledge is best acquired through the application of various media. This principle also applies to architectural design, where a more robust foundation is established through conducting research of diverse nature before presenting a design proposal. The diploma did not follow a phased approach, all three methods underwent a gradual development throughout the entire semester. It has been crucial to parallelly conduct all the methods throughout the entire diploma process, learning from all three working methods along the whole process.

[6]Tom Avermaete, "A Black Box? Architecture and its Epistemes", p. 80

The methods are employed to investigate the previously presented questions: What does Norwegian daylight do to architectural space? What is- and what has daylight been in Norwegian architecture? What is the spatial geometry of daylight in Norwegian architecture?

The aim for the outcomes and insights obtained through the three methods – with the knowledge obtained through the academic readings – is to obtain a more profound understanding and knowledge when presented the questions: What is Norwegian daylight? And what is Norwegian daylight in Norwegian architecture?

PROJECT OVERVIEW

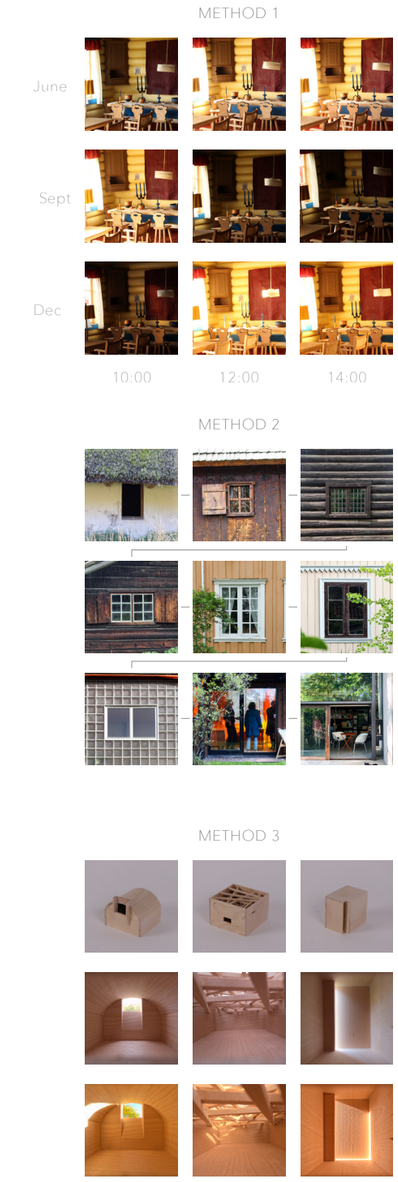


Fig. 1.06
3 working methods of spatial research

THE NORWEGIAN ROOM

WORKING METHOD 1

Fig. 2.01 Photo of my grandmother from a summer day in early 1980s

What does Norwegian daylight do to architectural space?

" A fully-detailed scale model of the interior of a building is a true photometric analogue and permits a precise study to be made of the lighting in its photometric aspects. (…) The model should be true to scale and the main internal surfaces must have reflectances corresponding to those of the full-scale room "[7]

" Measurements and visual appraisals can be made in a model under natural sky conditions in exactly the same way as in a full-scale building. The illumination levels and luminance are the same and no scale effect is introduced. "[8]

The Norwegian Room is a working method stemmed from the desire to learn more about how varying daylight in Norway can change the character and geometry of one Norwegian room.

With the diploma semester taking place during the autumn semester, the method was therefore conducted in the period between summer solstice and winter solstice, from the day with most daylight hours until days near the darkest during the year. (Winter solstice will take place after delivery of the diploma)

To ensure a stable framework for this research, the decision fell om creating a fully-detailed scale model rather than doing the documentation in an actual room. In a actual full-size room, life would unfold, and variations would occur.

The documentation was done through a series of photographs, taken with the same settings. Each sequence within the series of photographs were taken over two days from sunrise until sunset, with photos taken every second hour, more precisely every even hour. These photographic series were carried out in intervals of six weeks during the course of the semester, making the total of photographic series to five

[7]R. G. Hopkinson, P. Petherbridge & J. Longmore. *Daylighting*. (London: Heinemann, 1966) p. 383
[8]Ibid., p. 383

Fig. 2.02 Modelmaking, preperations and process

When choosing a room to model and conduct this method in, the decision fell on making the living room in my family's old cabin. This room was selected due to a personal attachment to this place, and an especial fondness for a photograph featuring my grandmother seated within it, enjoying the illumination of summer daylight.

This cabin was torn down in 2003, therefore this architecture does not exist anymore, but the daylight at the site is still there. Even if the architecture is gone, the daylight and the geometry can still be explored.

The photographic series was captured within the model while situated at Ustaoset in central Norway, where the old cabin stood. The model was placed at the same spot for each photo and directed southwards, as the cabin was.

The model was made in the scale 1:15. The choice of a 1:15 scale was driven partly by logistical constraints, it being the largest size that would still be feasible for transportation from Oslo to Ustaoset. Additionally, this scale was sufficient to ensu e the detail level necessary for proper documentation. The model was detailed with authentic furniture, objects, and colours, contributing to a representation of the original setting.

Fig. 2.03 Model 1:15

Fig. 2.04 Model 1:15

Fig. 2.05 Model 1:15

Fig. 2.06 Model 1:15

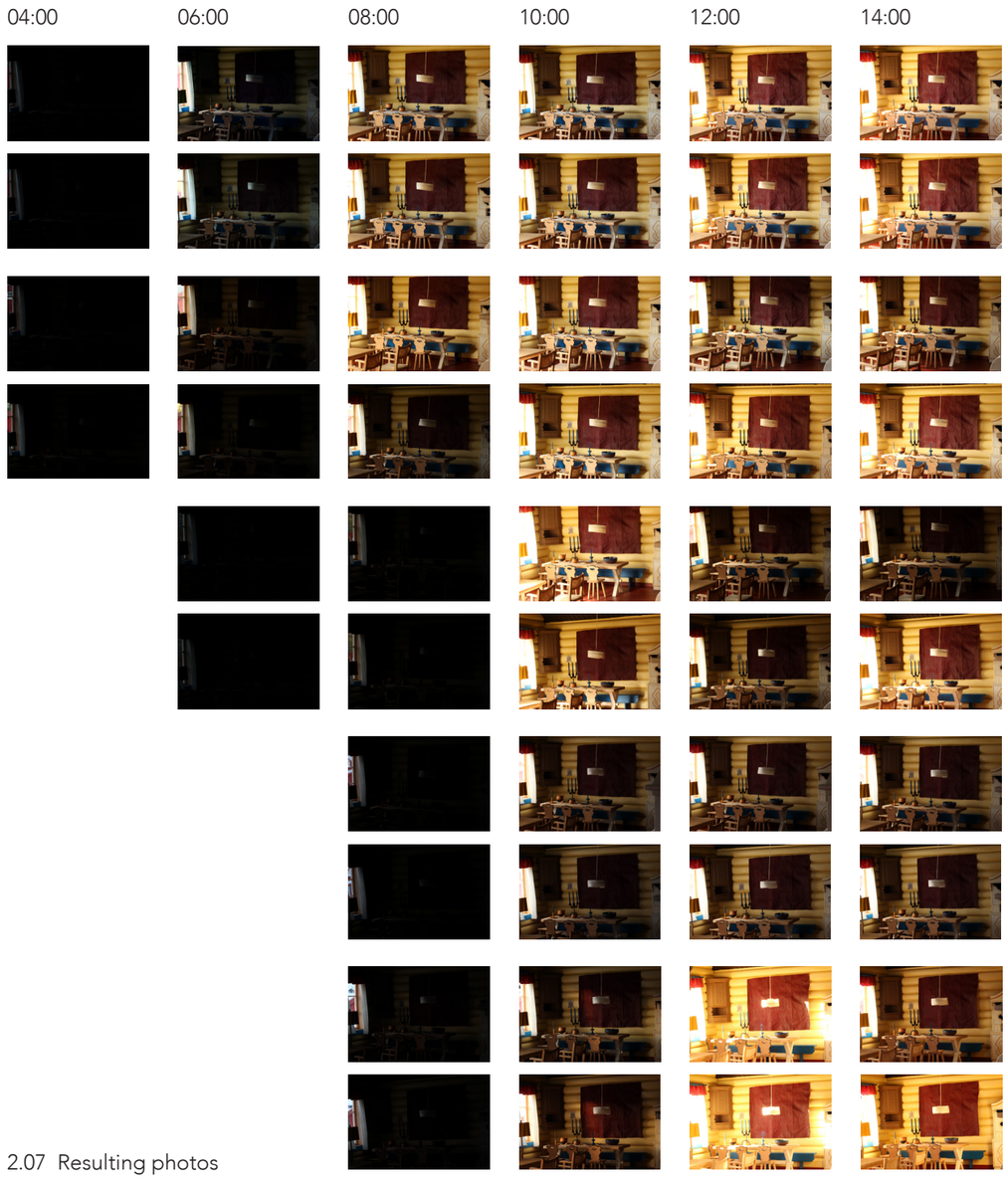
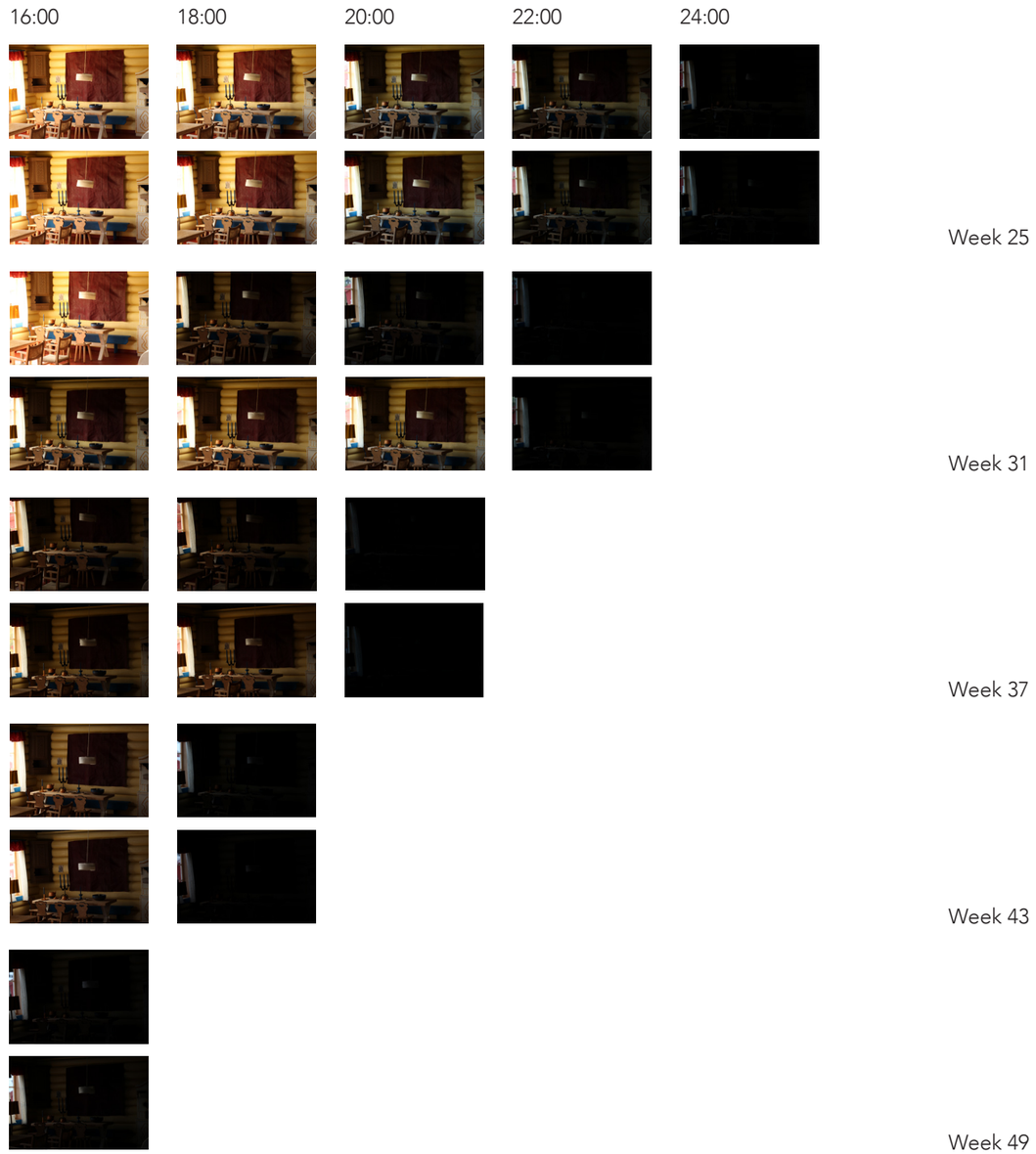


Fig. 2.07 Resulting photos



The resulting compilation of photographs visualises and makes evident the extreme variations of daylight hours over the course of half a year. With the two-day series in each round of photographing, it is also apparent how weather and other local variations impacts the experienced daylight within the room from day to day. The results make multiple of the read theory observable, and it is clear how one single Norwegian room, however geometry, consist of a multitude of different spatial experiences with the influence o Norwegian daylight.

THE NORWEGIAN ROOM

	10:00	12:00	14:00
June			
September			
December			

Fig. 2.08 There were evident changes through the autumn

NORWEGIAN DAYLIGHTING HISTORY

WORKING METHOD 2




Fig. 3.01 Study trips to visit the case studies

What is- and what has daylight been in Norwegian architecture?

The feeling of history in our surroundings, the landscapes and the architecture, is different from the factual history read on paper and learned in universities. The history that surrounds us is a storage of memories, they are real, unique and authentic. As you look and wonder, you see the times represented in the places. Later, we can try to understand what lies behind. There is a connection between memory, experience and place.[9]

From the dawn of time until the introduction of fluo escent lamps, the sun was the dominant source of light in buildings, as it was far more available and effective than other sources. The introduction of daylight into buildings shaped structural concepts and influenced the form o the architecture.[10] Architects have always sought to work with and create effects with light. Before the technically control over light, there was different way of considering daylight, as it was the one main light source.[11]

I believe that one cannot with certainty utter facts about the contemporary without understanding the past. With the working method *Norwegian Daylighting History*, I wished to learn more about the architectural history in Norway, and explore the spatial geometries that has unfolded in our history.

Within this approach, a significant po tion, and the starting point of the whole working method, involved academic reading to acquire more insights into Norwegian Architectural History. After a substantial amount of readings and research into Norwegian history and then deeming my knowledge satisfactory, I proceeded to curate a list of case studies for further research.

[9]Peter Zumthor and Mari Lending. *A Feeling of History* (Zürich: Scheidegger & Spiess, 2018)
[10]Benjamin H. Evans. *Daylight in Architecture* (New York: Architectural Records, McGraw-Hill Publishing Company, 1981)
[11]Gernot Böhme. *Atmospheric Architectures: The Aesthetics of Felt Spaces* (London: Bloomsbury Publishing Plc, 2017)

In the process of selecting case studies, a deliberate effort was made to choose 12 buildings that exemplify typical architectural types, illustrating the gradual evolution across Norwegian history. A specific typology was chosen to enable a consistent comparison within a shared framework. The selected typology was *stua*, which translates to *living room* but also conveys to *home* in Norwegian architectural history. This typology has a long history, and it was possible to find case studies far back in time

To further narrow this framework, buildings situated at an approximate latitude of 60 degrees north were specifically chosen so that the daylight was comparable as well. Before finalizing the selection o the 12 case studies, the initial list comprised approximately 20 buildings. Prior to narrowing down the choices, on-site visits were conducted to experience the buildings.

In the previous working method, The Norwegian Room, the change of daylight was observed and documented within a 1:15 model. With method 2, the objective was to experience the collision of daylight and architectural space in full scale. With emphasis on perceiving the geometries and the immeasurable qualities inherent in the spaces.

Following completion of the list of case studies, involving the study trip of visiting the case studies, a further analysis was conducted to understand the experienced rooms better. Photos taken on site has been compared, and sections in 1:50 was drawn to visualize and better understand the different room geometries. Additionally, the sun path diagram was employed to investigate the daylight conditions that contributed to the overall experience of the visited spaces. In this diagram, the angle of the near parallel beams of sunlight could be found and drawn in the section.

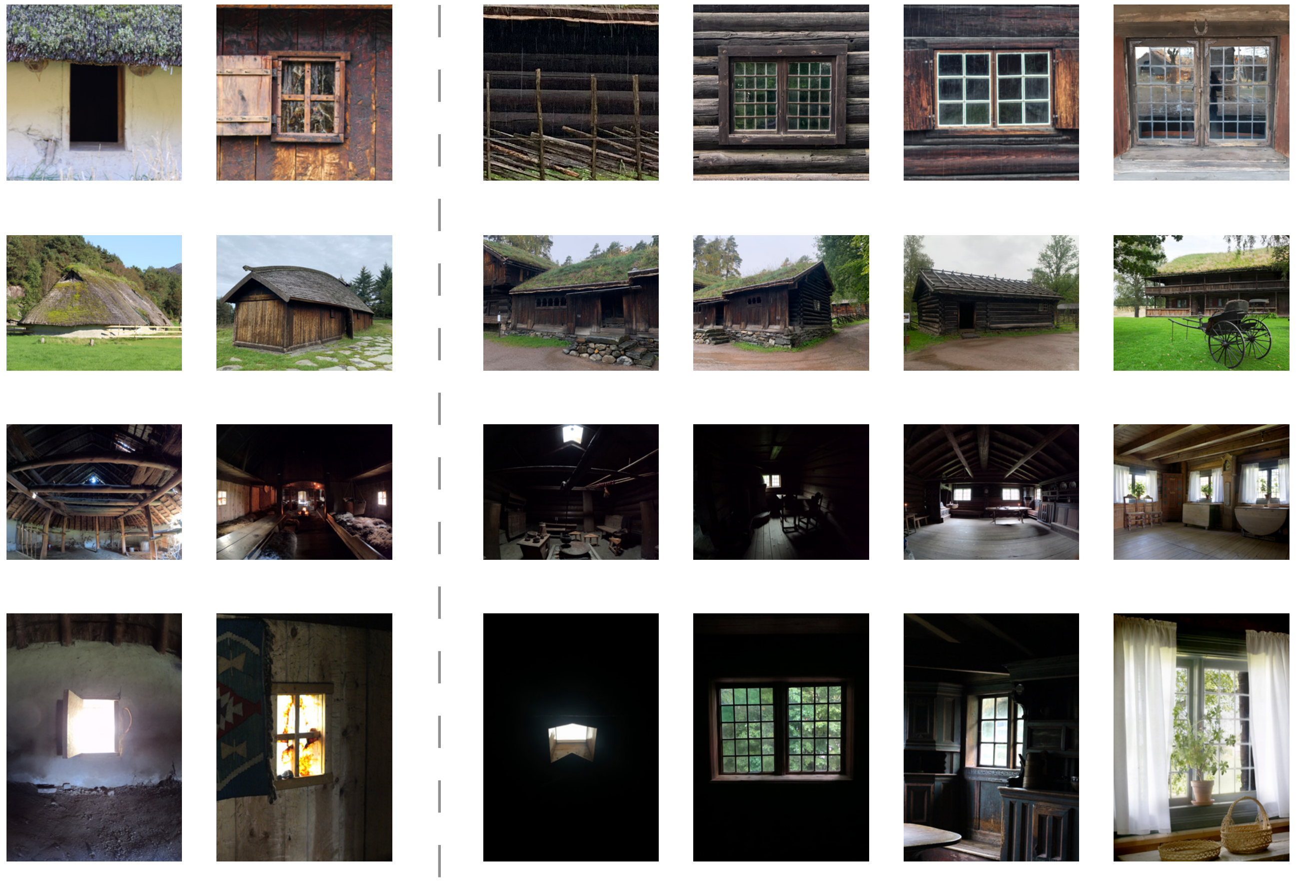
With the research, experience and analysis within this working method, two main discoveries were made:

One discovery outlines four key epochs of attitudes towards daylight in architecture throughout Norwegian history. The first epoch during the Bronze-Age and Viking-Age, where they lived in **symbiosis** with nature, and by that also in symbiosis with daylight. A significant shi t occurred during the Middle Ages, when nature and daylight became something **mysterious** and scary, resulting in a more enclosed architectural approach. The Age of Enlightenment marked another turning point, when the perception of nature and daylight became something **healthy**, evident in post-1800s case studies featuring larger windows and brighter interiors. The final shi t involves **technological** advancements, removing geometrical constraints in construction and leading to increased window sizes.

The second main discovery is that Norwegian architecture presents a **warm enclosedness against the cold outdoors**. A general observation after visiting the case studies, is a sense of intimacy and warmth, this counts for all the case studies from the earliest to the latest. With the Norwegian climate, the home is a safe space and the rooms within reflects this by being gene ally warm in colour contrasting from the cold light of the outside.

Symbiosis | *Mysterious*

The Bronze-Age house | The Viking farm | Gamlestog "Årestue" | Nystog "Peisstue" | Grøslistua "Peisstue" | The Arcade Building



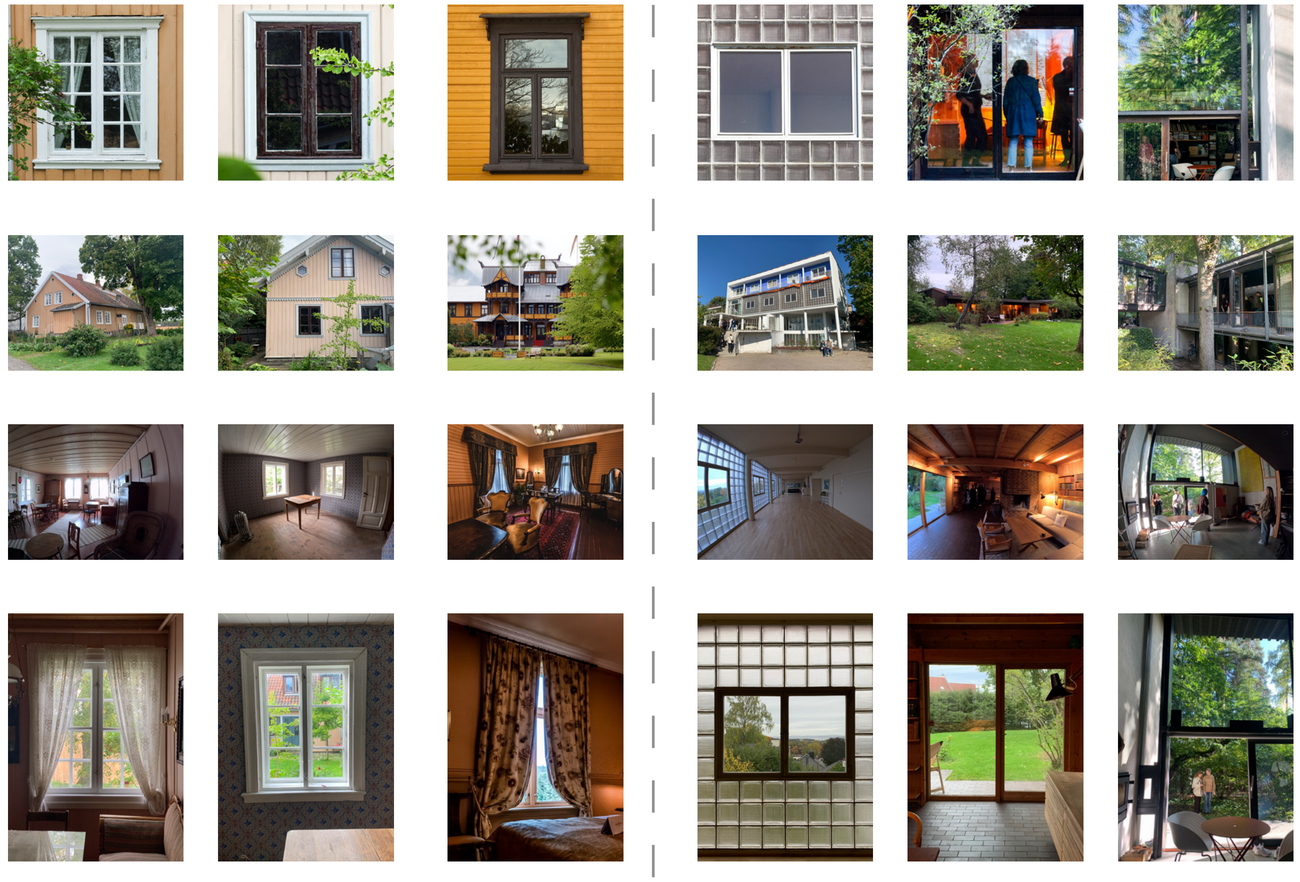
1000-800 BCE | 1000-800 | ca. 1650 (Common type 1200-1700) | ca. 1700 | ca. 1700 | 1728

Fig. 3.02 The selected case studies

NORWEGIAN DAYLIGHTING HISTORY

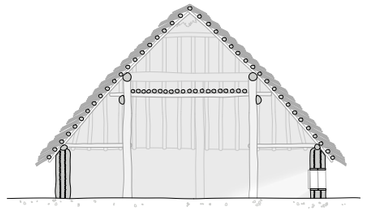
Healty | *Technology*

The Yellow building | SOTA-House "Swiss style" | Dalen Hotel "Dragon style" | Villa Stenersen | Villa Selmer | Villa Furulund



1820 | 1857 | 1894 | 1939 | 1963 | 1998

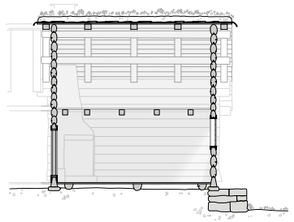
Symbiosis



1000-800 BCE

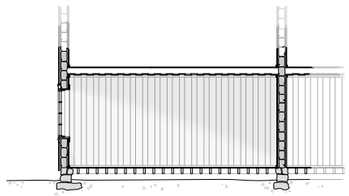
Mysterious

1200-1700



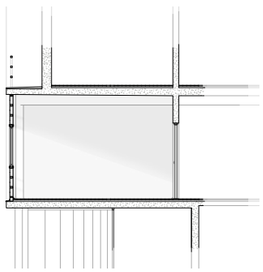
ca. 1700

Healty



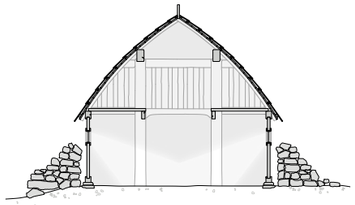
1820

Technology

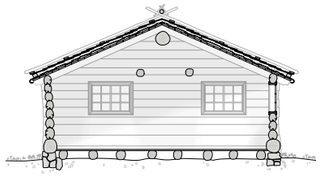


1939

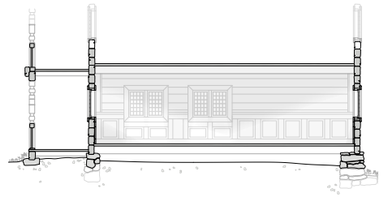
Fig. 3.03 Sections of the case studies



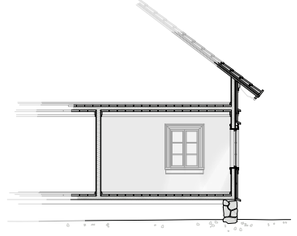
1000-800



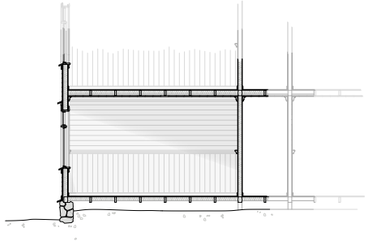
ca. 1700



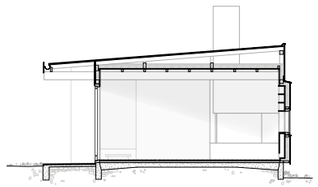
1728



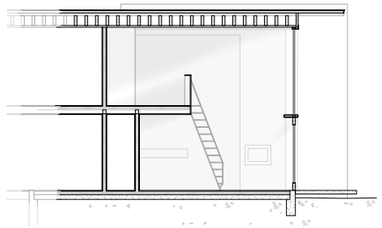
1857



1894



1963



1998

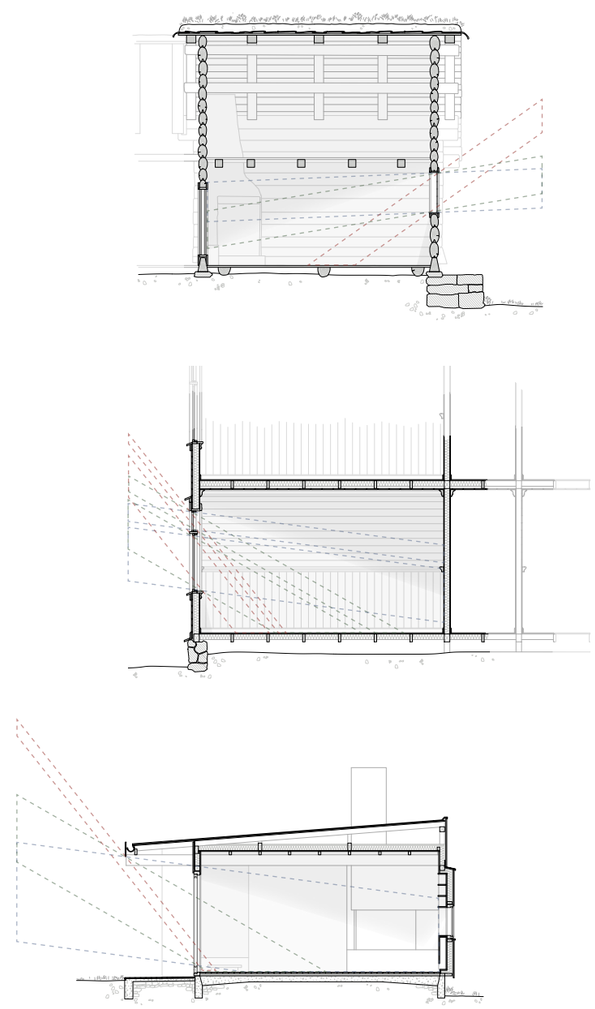


Fig. 3.04 Applying the angles of sunlight for further spatial understanding

MODELS OF DAYLIGHTING

WORKING METHOD 3

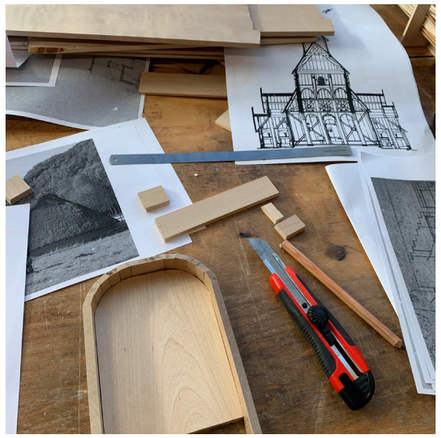


Fig. 4.01 Explorative modelmaking

What is the spatial geometry of daylight in Norwegian architecture?

" Physical model simplify the picture but their capacity to illustrate the play of light in space means their lessons can be interpreted with greater confidence. "[12]

This working method sought to delve deeper into the interplay between daylight and geometries within Norwegian architecture. In the previous method, *Norwegian Daylighting History,* the chosen format of case studies limits the historical framework for comparable assessments. However, there were many inspiring rooms of daylight discovered while reading about Norwegian architecture history, and this method wants to explore these further.

The format of this method is models of Norwegian rooms. The rooms chosen were simply chosen for the sole reason that I personally found them interesting and inspiring, and therefore worth exploring. While some of the models are made from rooms found in the case studies in the previous method, the majority are architectural spaces that did not align with the framework of the case studies.

The models were to be striped of details and crafted using only one material, so the research focus could solely be on the overall geometry of the spaces and the shape of daylight. Wood was chosen as material, due to its longstanding tradition as construction material in Norwegian architecture.

[12]Mary Ann Steane, "Circling Star: A Daylight Talk by Níall McLaughlin" p. 74

The baseline scale for these monochrome models were 1:50, with a reduction in scale for especially large rooms, ensuring that the resulting models had approximately the same size in the end. Some of the models are close representations of the rooms they represent, yet all of them were modified during the c afting process. It was an experimentation of different shapes during the modelmaking – to explore how that changes the geometry of the room and the light that entered it, transforming these models into exploratory geometries rather than mere replicas.

With the astonishing differences of daylight experienced in the first working method *(The Norwegian Room)* in mind, the aim of this method was to explore how the geometry of these monochrome and detail-stripped models visualize the shape of daylight in different situations. The outcome of the method mainly came from the modelmaking and looking into the models at multiple days during the semester. For documentational purposes, the models were brought outdoors for photography in different daylight, they were photographed on one cloudy day and one sunny day in mid-autumn.

Examining the geometry of daylight in models of bare geometry simplifies th framework, facilitating the detection of spatial changes made by the various daylight conditions in one room. Daylight draws lines of different sharpness in the room in different conditions. Daylight creates rooms within rooms, and different rooms entirely from one moment to the next.

MODELS OF DAYLIGHTING

Fig. 4.02 Models of daylighting

Proximate

Centered

Lifted

Aerial

Focused

Reflecte

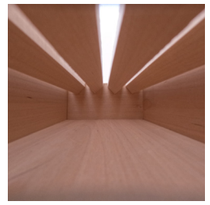
Fig. 4.03 The models

Proximate

Centered

Lifted

Aerial



Focused

Reflecte

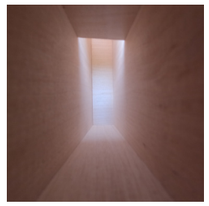
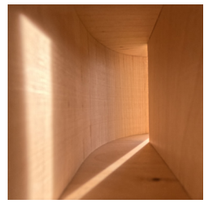
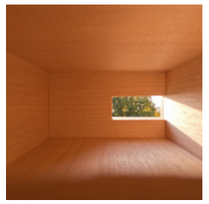


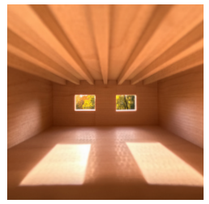
Fig. 4.04 In diffuse daylight, cloudy

Proximate

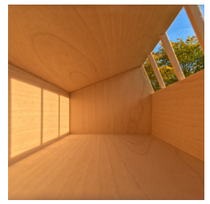




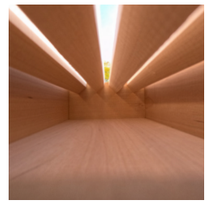
Centered



Lifted



Aerial



Focused

Reflecte

Fig. 4.05 In directed sunlight, sunny

NORWEGIAN DAYLIGHT ARCHITECTURE

In what ways can an approach of research and explorations in models assist in identifying critical elements for formulating a design strategy that reflect the ever-changing nature of the Norwegian daylight?

What is Norwegian daylight?

What is daylight in Norwegian architecture?

What can daylight be in Norwegian architecture?

Fig. 5.01 Research question and questions worked through during diploma

Norwegian Daylight in Architecture

"Northern space is not geometric but topological."[13]

Aftercarrying out the three working methods and engaging in theoretical readings, it becomes evident that Norway shares the same seasonal variations, predominantly cloudy days of diffuse light, the soft light brought by low sun altitudes and significant di ferences in daylight hours from winter to summer, as the rest of the Nordic region. However, what sets Norway apart is its diverse landscape, encompassing forests, mountains, oceanfronts, valleys, plateaus, fjords, and more. Each landscape contributes to a distinct daylight situation with unique reflections obstructions, or lack thereof. Therefore, Norwegian daylight has a special situatedness.

Daylight within Norwegian architecture presents a dynamic element, contributing to ever-shifting spatial encounters when given the opportunity. The experienced daylight in Norwegian architectural space varies from where the architecture is situated, one room is a different room in a different location. Furthermore, the room undergoes constant transformations from one moment to the next, for the daylight of one moment may never happen again.

Daylight can therefore be a source of shifting experiences in Norwegian architecture. The mere presence of a window in a building ensures the creation of experiences by daylight. However, if the architect pay caution to the special daylight situation, a multitude of spatial potential can be unlocked.

Through the various research and spatial explorations, I have a gained a foundation for making informed decisions when formulating design strategies of daylight in the context of Norwegian architecture. The acquired experiences has enhanced my understanding of how the geometry of architectural space can harmonize with the ever-changing geometry of Norwegian daylight, deviating from the present practice in architecture where it is often seen as a challenge to overcome.

[13] Christian Norberg-Schulz. *Nightlands*. (Cambridge, Massachusetts: MIT Press, 1996) p. 17

Fig. 5.02 Map of site locations

NORWEGIAN DAYLIGHT ARCHITECTURE

Daylight labs of Norwegian Daylight Architecture

After conducting the research methods, the final phase o this diploma involves utilizing and testing the findings f om the methods to uncover design possibilities based on the results and the knowledge attained. The objective of this design project is to engage in an explorative and playful design process, aiming to discover one - among the numerous - approach to creating Norwegian daylight architecture based on a qualitative objective.

As mentioned previously, the uniqueness of Norwegian daylight lies in its situatedness, shaped by the diverse landscape where each distinct environment contributes to its own specific daylight conditions To reflect how di ferent daylight situations generate different design, three different sites was chosen for this design – three distinctly different and typical Norwegian landscapes, all situated at same latitude, approximately 60° north, for comparability.

The design project is the fourth working method, being proposals for daylight laboratories of Norwegian daylight architecture, comprised of a sequence of 5 rooms of different daylight geometries. This is a proposal for the continuation of the work and spatial explorations in the three preceding working methods, testing the findings in 1:1 over a longer time period than one semester.

These daylight labs are to be temporary wooden constructions, mounted on poles for minimized obstruction to site. The wooden structures follow the common Norwegian construction principles of “bindingsverk” (timber framing), and are designed to stand for a few years, so that the yearly variations of daylight can be experienced, observed and documented. The construction, including wall thickness follow that near to normal for a house, so that the openings and the room dimensions are realistic and transferrable to another architectural program.

Fig. 5.03 The three sites

The geometry of each room in the sequences are to be selected from the models in working method 3, *Models of Daylighting*. Each model can only be used in one of the 15 rooms within the design proposal. Therefore, each model was specifically chosen for one site and not the other two. The selection of the rooms is based on my experiences of site and the special daylight situation there. The rooms were shaped and their orientation adjusted to suit the individual sites, and the design process incorporates considerations for daylight's three parts – sunlight, skylight and reflections

Each of the proposed daylight laboratories have one central room, and each of the five rooms is connected to at least two adjacent rooms. Sliding doors is selected to ensure no obstructing door within the room when open, while preserving the option to isolate the light conditions in each room.

Program overview

Reflecting the diverse landscapes o Norway, this project includes 3 different sites along the same latitude, approx. 60°N.
The sites represents:

THE FOREST , **THE MOUNTAINS** and **THE OCEAN FRONT**

The project considers:

- **The variability of the directed sunlight** caused by to the solar path at 60 degrees north
- **The diffuse light of the sky**
- **The reflection** from the specific topog aphy and nature
- **Findings from each working method**

Each of the 3 designs will:

- Showcase how **daylight makes architecture everchanging** and visualize that architecture can be shaped to enhance this fact.
- Include **a sequence of 5 rooms** of different sizes and dimensions within the **human scale.**
- The starting point for the geometry of each room in the sequences are to be chosen from the **models in working method 3**, *Models of Daylighting*.

The design proposal are the fourth working method of this diploma, *Daylight Labs of Norwegian Daylight Architecture*.

The chosen design framework:

- **5 sequencing rooms**
  - 1 central room
  - 4 rooms surrounding the central room

- Each room should be ajoined to at least two other rooms.

- Total square metres are **approx. 80 m²**.

- The designs are **temporary wooden structures**.

- The **shape and brightness of the surfaces** in each room will be considered for the specific daylight geometr .

- The placement of doors will allow the **separation of the daylight situation** of the individual rooms, while also **allowing these to merge** into the adjoining room.

Fig. 6.01 Situation model 1:1000

THE MOUNTAINS

The Mountains

The site at Ustaoset in the midland mountains is positioned at an elevated point in the landscape, devoid of obstructions such as trees, buildings, or other landscape features. Consequently, here lies a special potential for utilisation of various daylight conditions along the solar path throughout different seasons. Given that this site is covered in snow for approximately seven months each year, the luminance of the snow offers the potential to illuminate the ceiling, adding an intriguing dimension to the daylight experience.

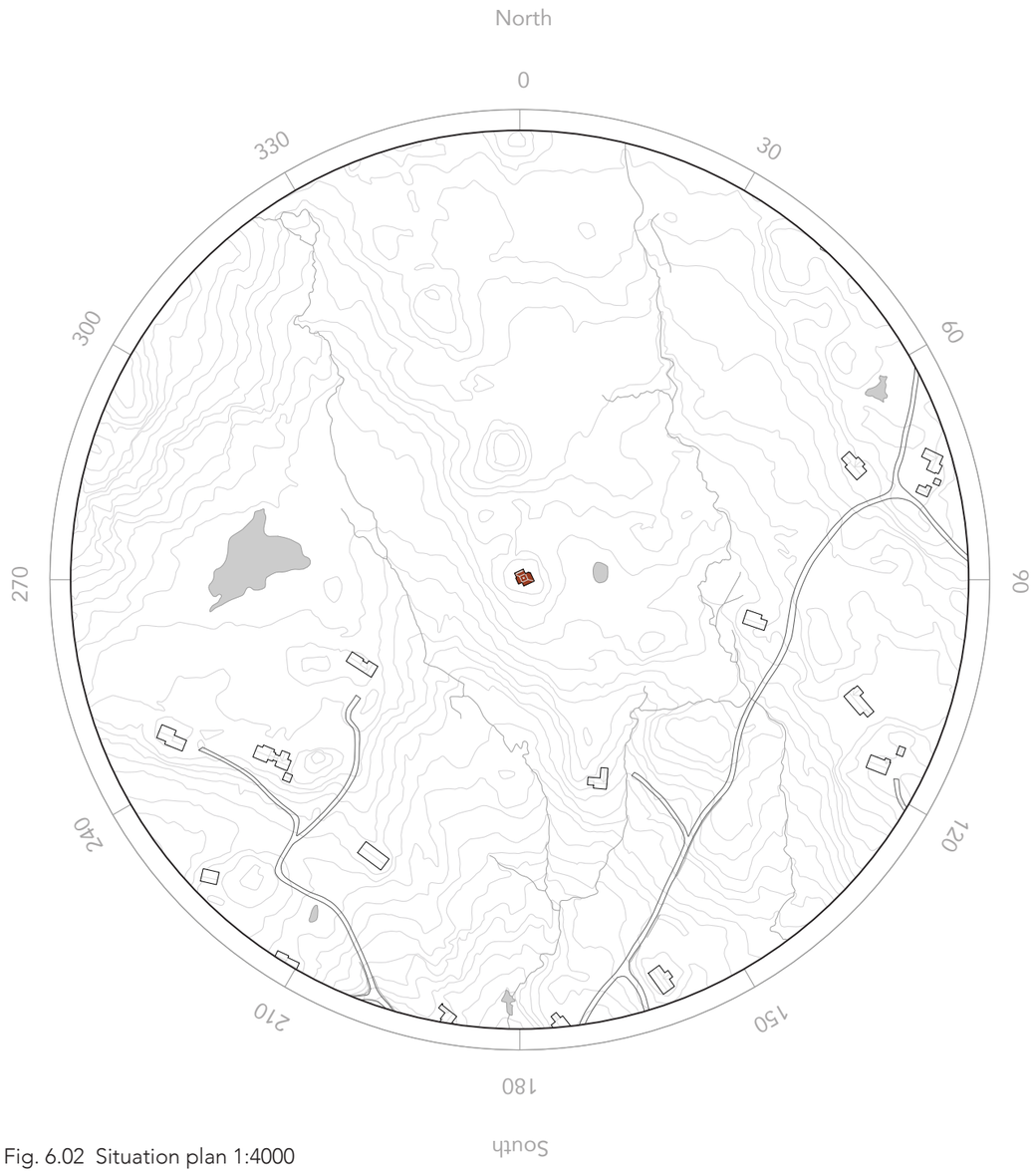


Fig. 6.02 Situation plan 1:4000

Fig. 6.03 Situation section 1:4000, west - east

Fig. 6.04 Situation section 1:4000, north - south

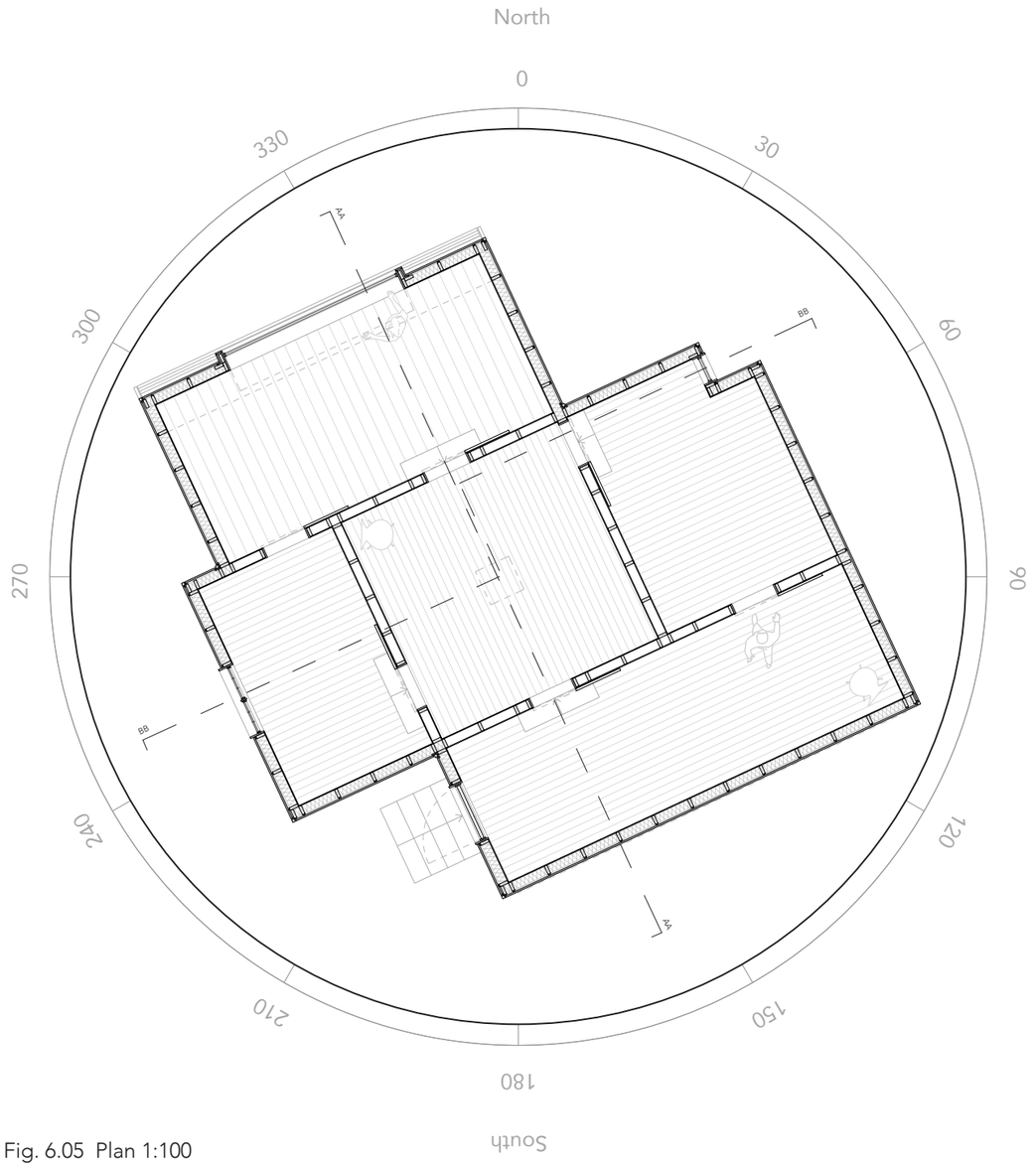


Fig. 6.05 Plan 1:100

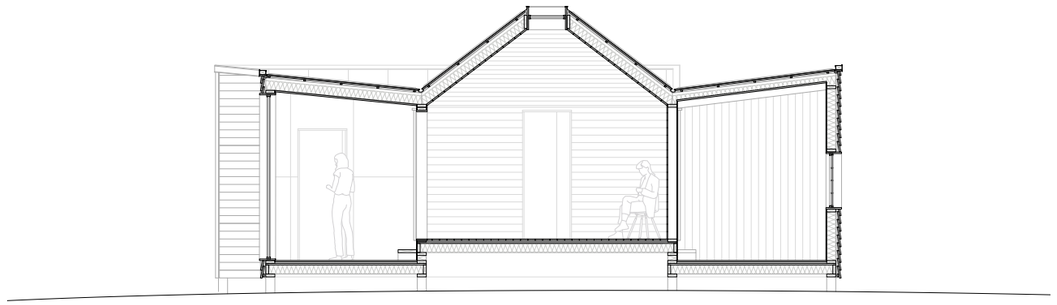


Fig. 6.06 Section BB 1:100, east - west

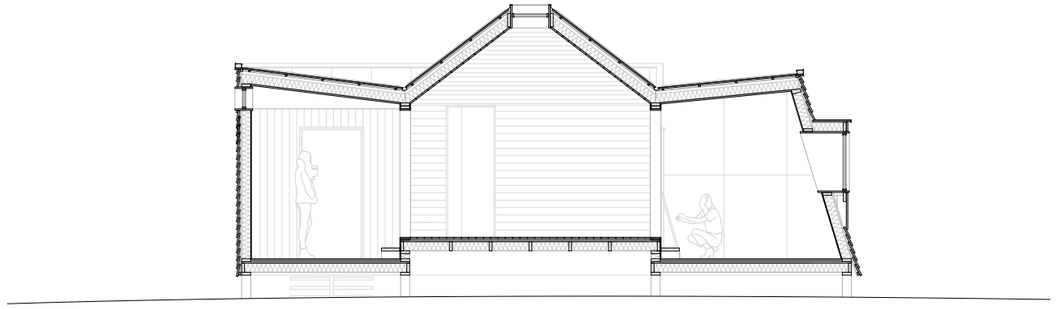


Fig. 6.07 Section AA 1:100, south - north

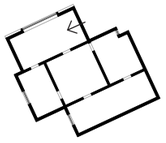


Fig. 6.08 Interior photo - Model 1:25

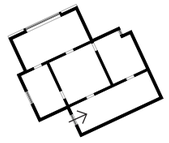


Fig. 6.09 Interior photo - Model 1:25

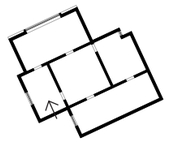
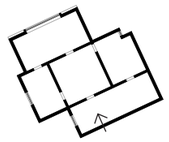


Fig. 6.10 Interior photo - Model 1:25



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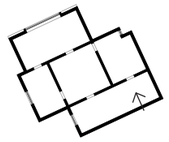


Fig. 6.12 Interior photo - Model 1:25

Fig. 6.13 Model 1:25

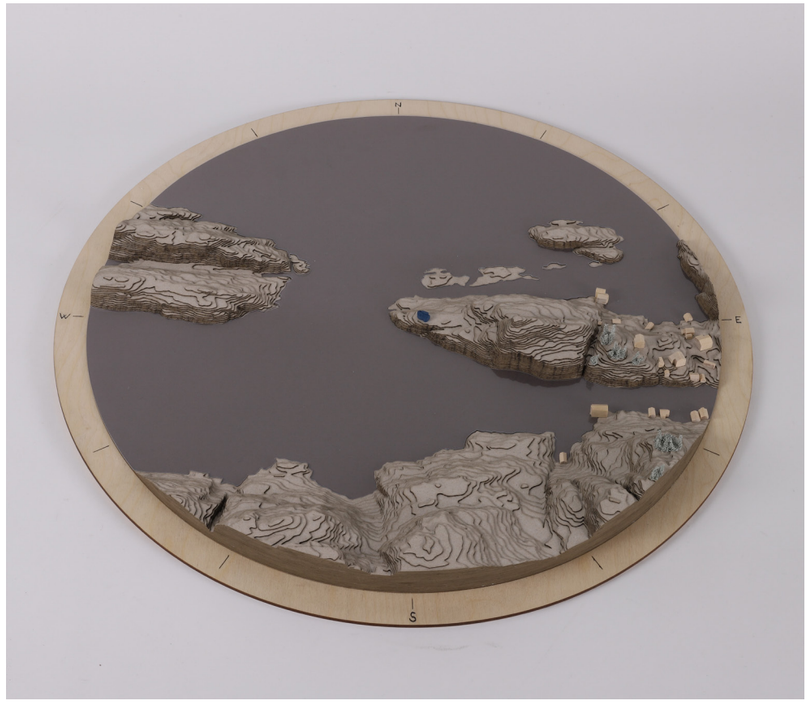


Fig. 7.01 Situation model 1:1000

THE OCEAN FRONT

The Ocean Front

During my visit to the ocean front site at Algrøy west of Bergen, I encountered an intense brightness. The existence of what can be described as "two suns" became a crucial consideration in the design process, this referring to the sun and its reflection in the surface of the water, resulting in glare from below as well as from above. The water further provides the potential for captivating reflections upon the ceiling Another attribute was the wide and open horizon on one side of the site, the west. The focus of the design was therefore on the angles of the nearly parallel sun rays from above and their reflection f om below, and the sites directional orientation towards west.

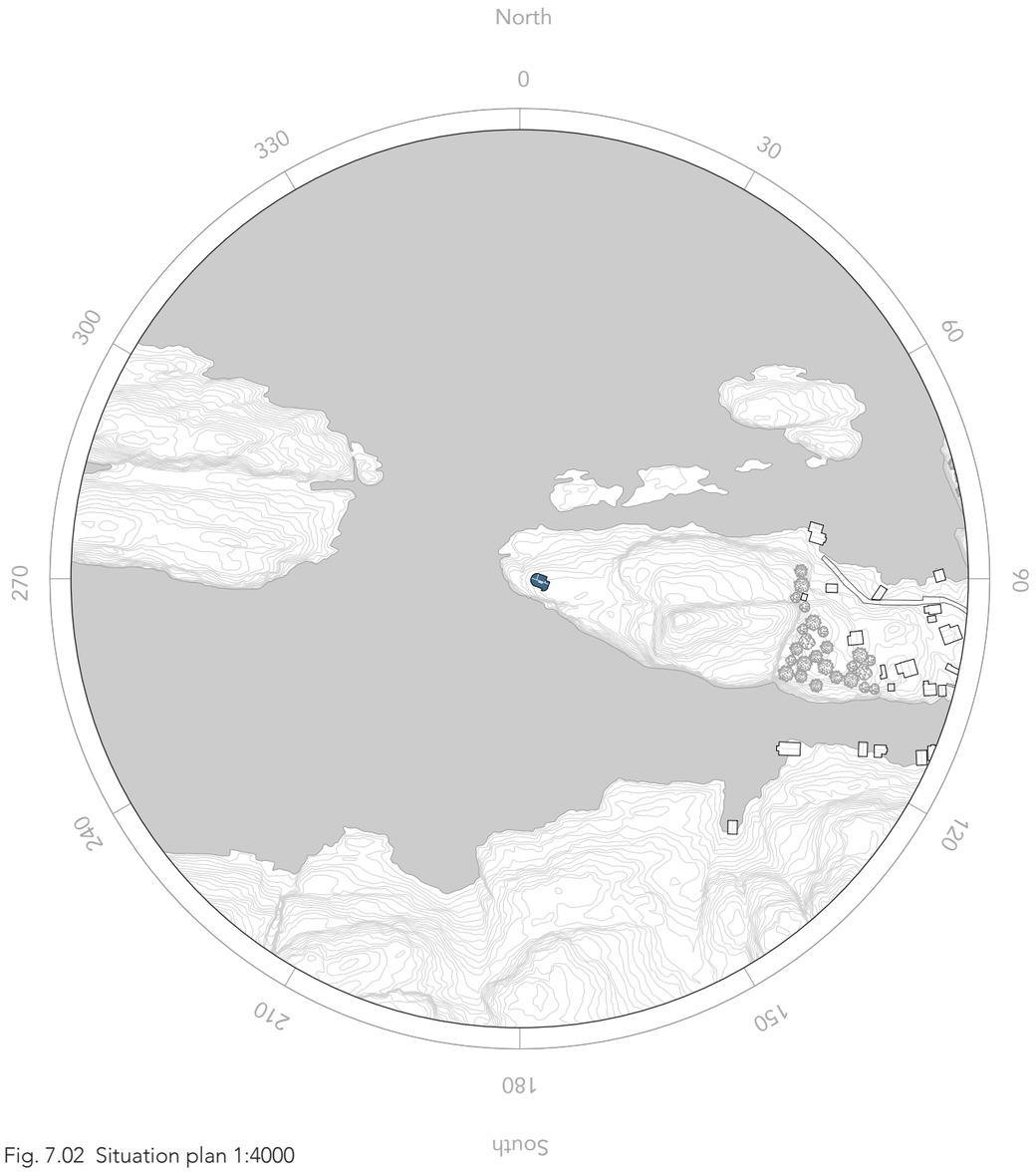


Fig. 7.02 Situation plan 1:4000

Fig. 7.03 Situation section 1:4000, west - east

Fig. 7.04 Situation section 1:4000, north - south

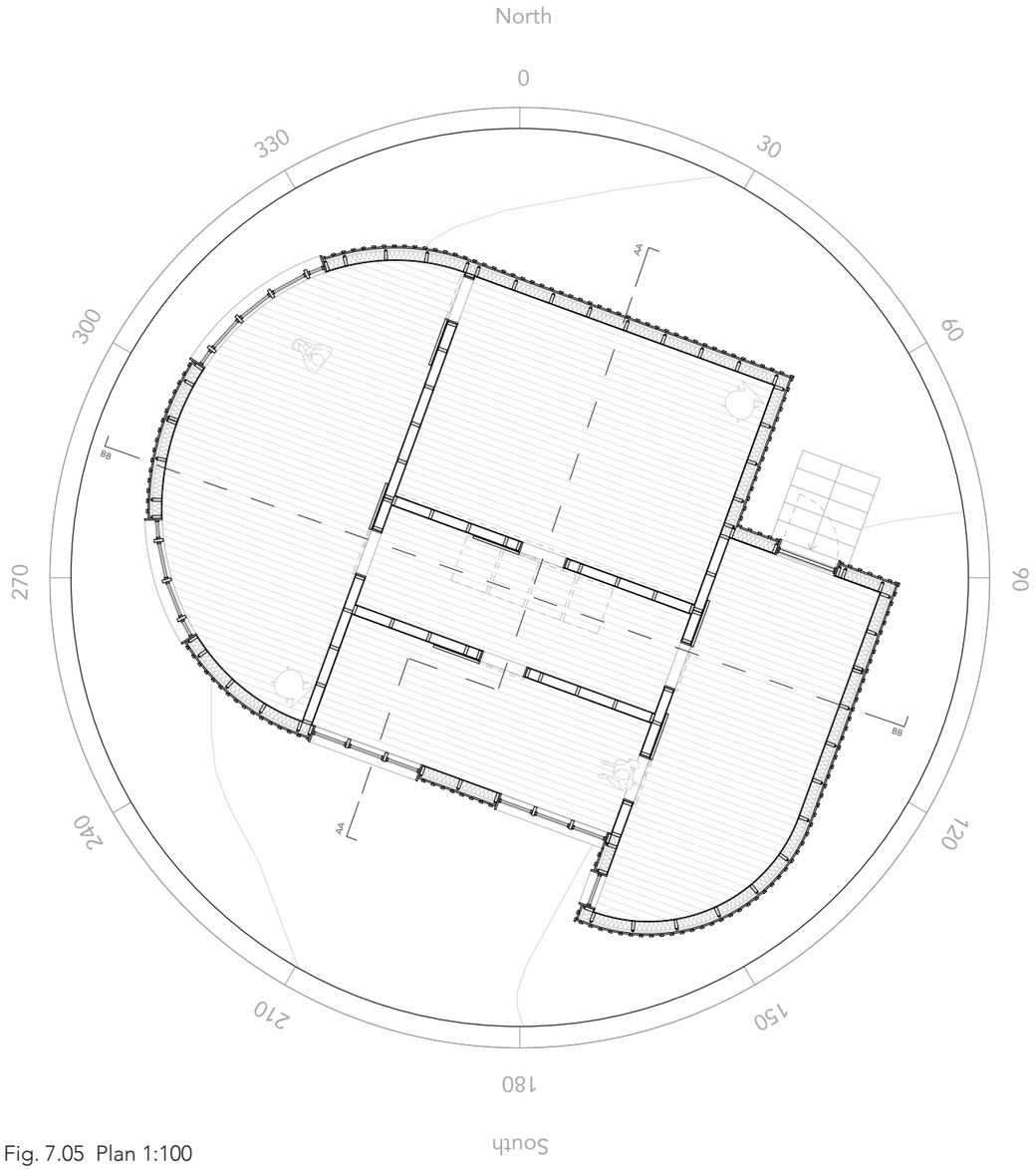


Fig. 7.05 Plan 1:100

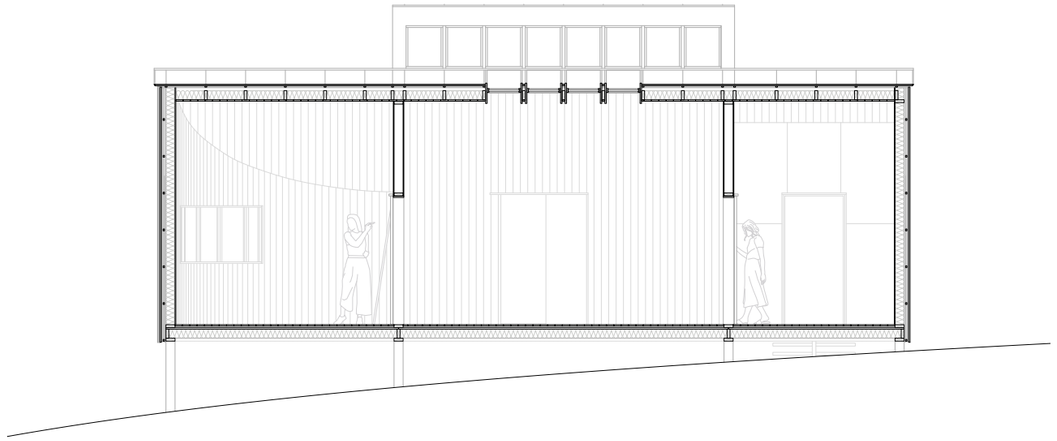


Fig. 7.06 Section BB 1:100, west - east

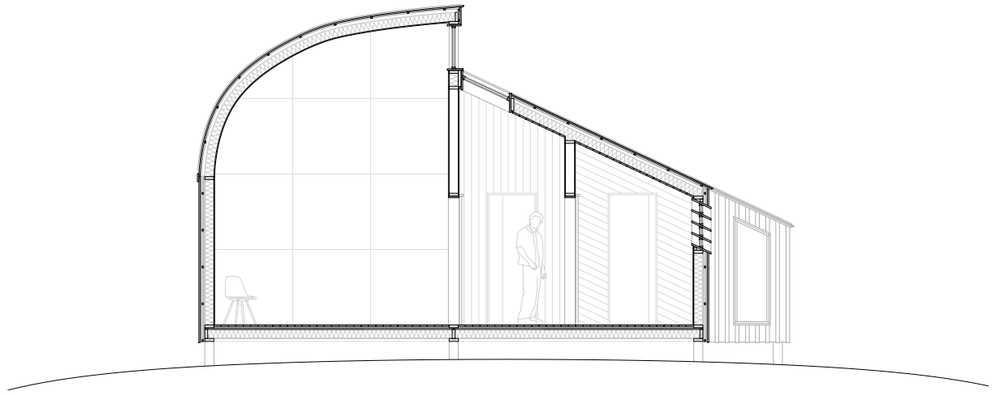


Fig. 7.07 Section AA 1:100, north - south

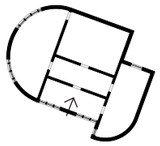
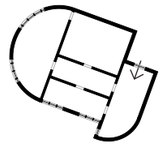


Fig.7.08 Interior photo - Model 1:25



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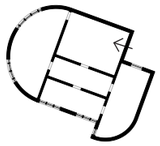

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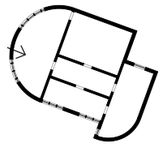

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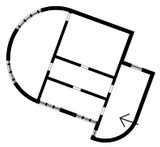

Fig. 7.12 Interior photo - Model 1:25

Fig. 7.13 Model 1:25

Fig. 8.01 Situation model 1:1000

The Forest

During my exploration of the forest site at Romeriksåsene north-east of Oslo, there was a sensation of already enclosed in a “room” among the threes. Given the substantial obstruction of direct sun-light by the thick tree cover, the consideration of skylight took precedence in the design process for this site. The obstructing threes also presented an opportunity for incorporating large windows to frame the surrounding nature without the risk of glare. The closeness of the threes also serve as close reflecting object transferring the hue and ambiance of the site inside. The overall atmosphere of the site has a subdued quality, influencing the design to work with nuances of dimness.

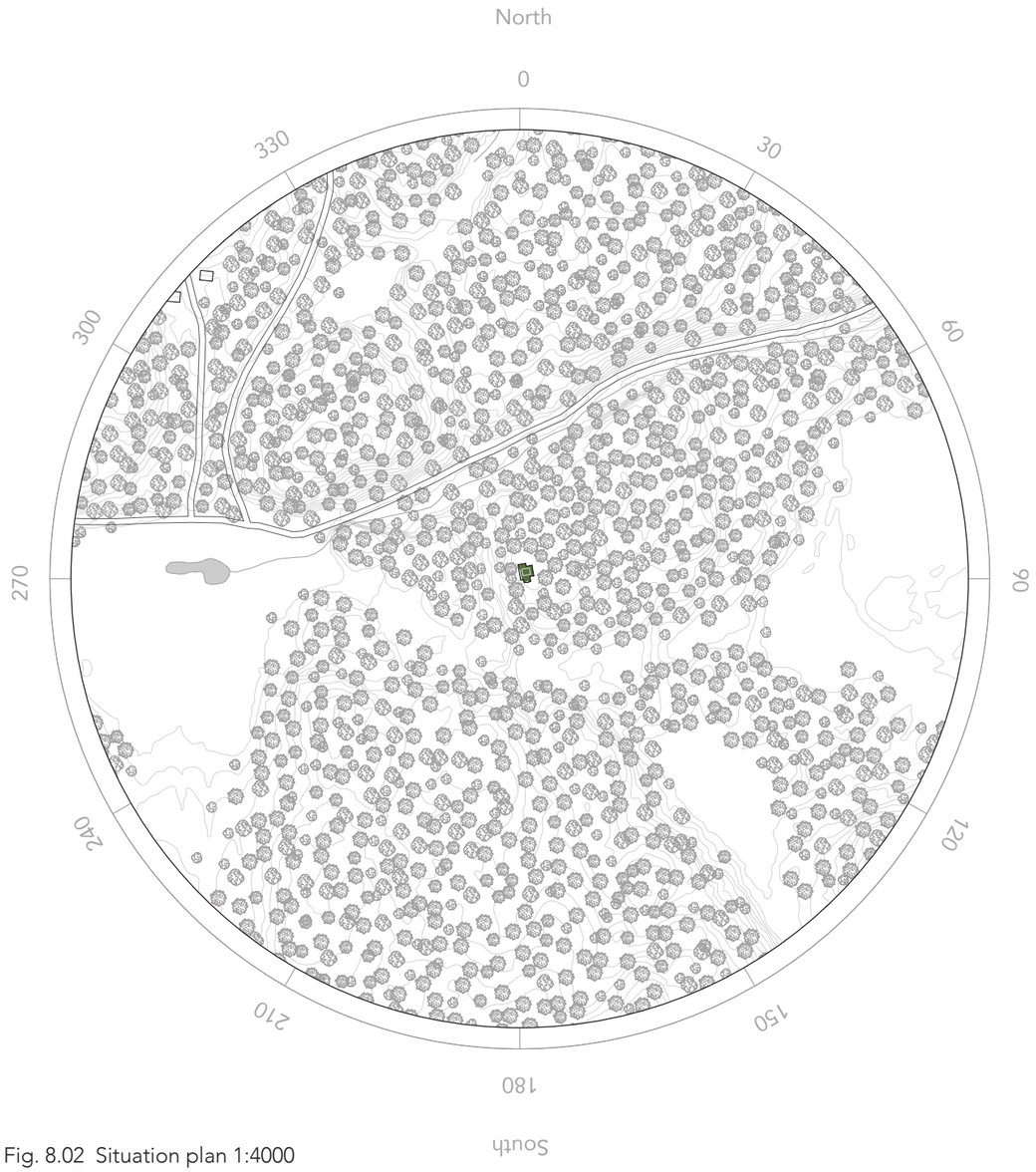

Fig. 8.02 Situation plan 1:4000

Fig. 8.03 Situation section 1:4000, west - east

Fig. 8.04 Situation section 1:4000, north - south

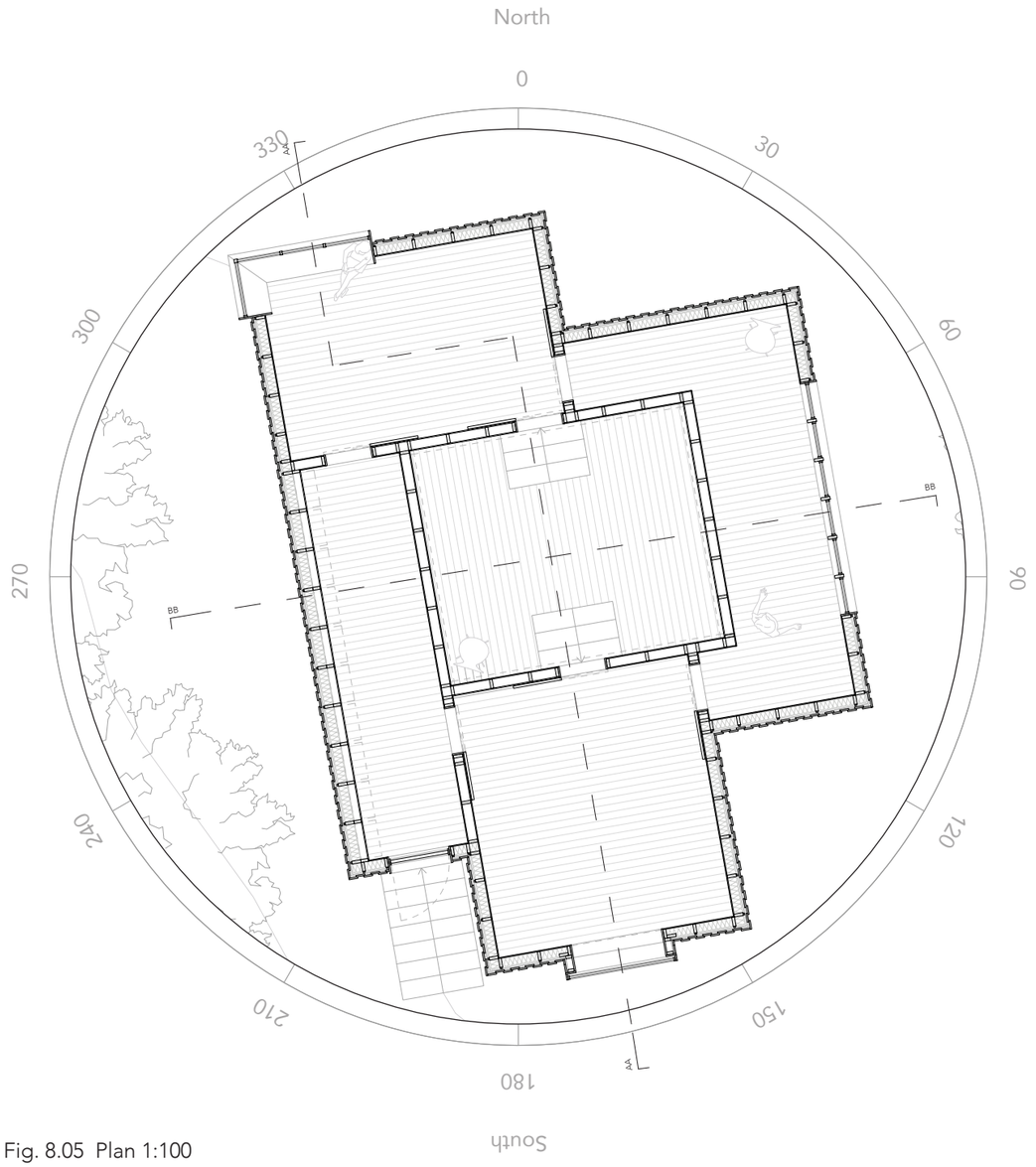

Fig. 8.05 Plan 1:100

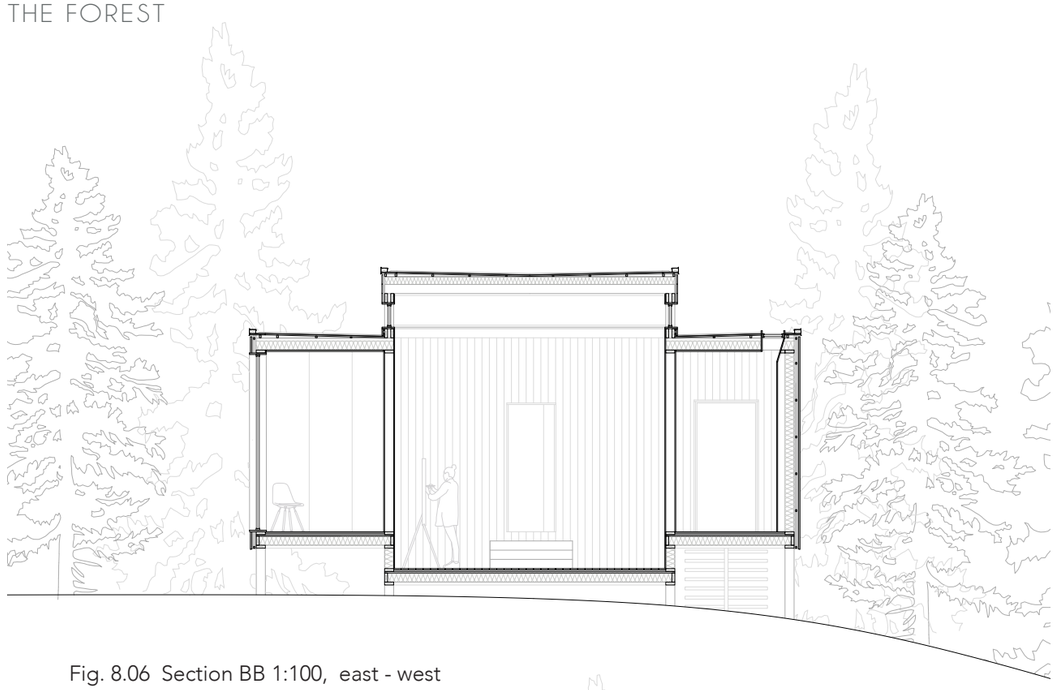

Fig. 8.06 Section BB 1:100, east - west

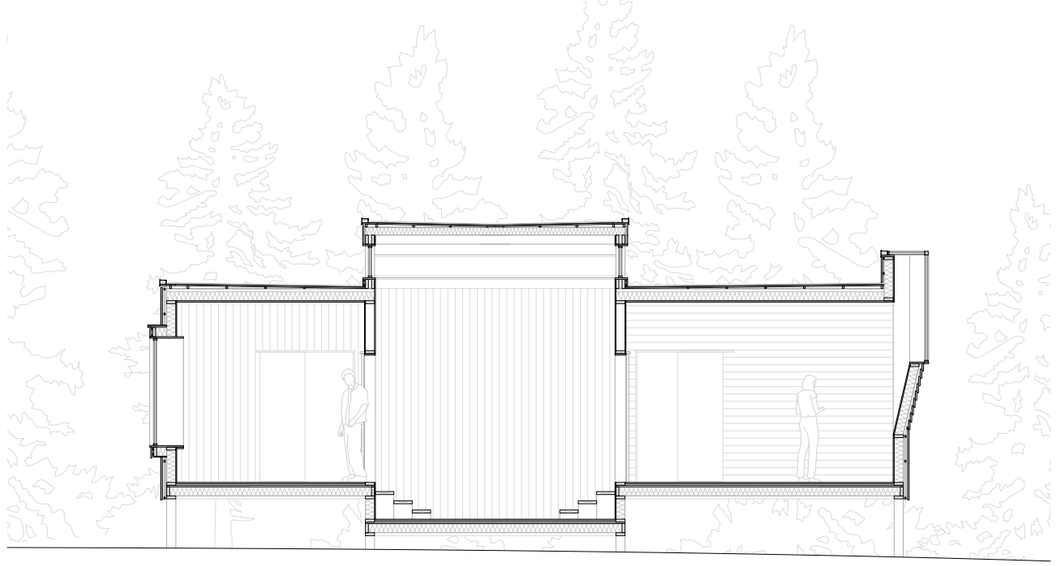

Fig. 8.07 Section AA 1:100, north - south

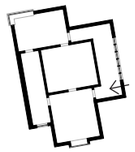

Fig. 8.08 Interior photo - Model 1:25

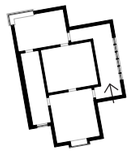

Fig. 8.09 Interior photo - Model 1:25

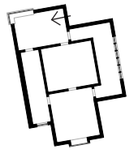

Fig. 8.10 Interior photo - Model 1:25

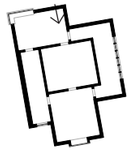

Fig. 8.11 Interior photo - Model 1:25

Fig. 8.12 Interior photo - Model 1:25

Fig. 8.13 Model 1:25

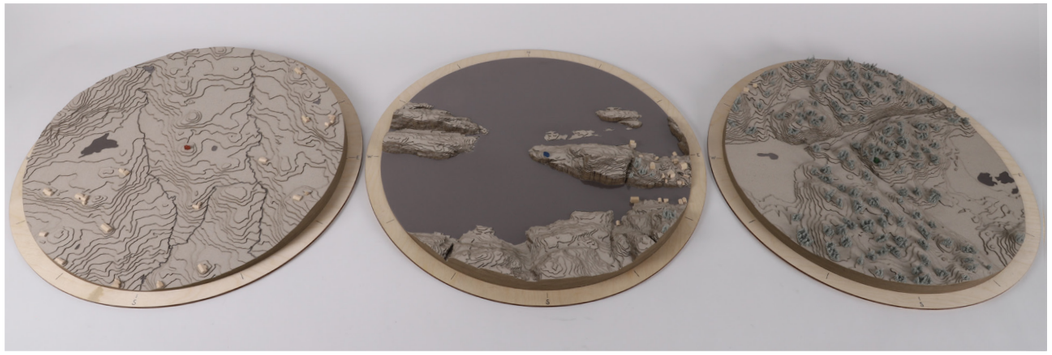

Fig. 9.01 Situation models 1:1000

Fig. 9.02 Models 1:25

Aknowledgements

I want to express my gratitude towards ...

*... my supervisor **Kathrine Næss**, for support and invaluable guidance throughout the entire process of the diploma. Thank you for the inspiring and helpful discussions we have had!*

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... friends and family.

Illustrations

Three satellite images in Fig. 5.03 on page 68 is collected from https://satellites.pro, 04.12.2023

Three images of Dalen hotel in Fig. 3.02 on page 45 was collected from dalenhotel.no 12.10.2023

Four images of Svalgangsbygningen in Fig. 3.02 on page 44 was provided by Gamle Hvam Museum 10.10.2023

All other images, illustrations, and drawings are by the author.

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