

New Museum Jorn



Ministry of Disruption

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New Museum Jorn

Program, Process, Presentation

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Pages

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Appendix

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A b s t r a c t

This master thesis will cover the genesis of a New Museum Jorn located at the lakefront of Silkeborg, Denmark. The report will focus on an integrated design solution that resolves the problem area on how to create a unifying landmark, that frames the artwork of Asger Jorn, Per Kirkeby, and more, at a location, characterized by a separation between the city centre and the idyllic surroundings. The solution takes its starting point in theory concerning: circulation, light, atmosphere, and flexibility as they are seen as critical factors for creating a modern renewable art museum that can adapt to changing exhibitions and trends and thereby keep its pertinence. The theory is interlinked with analysis of the site, materials, and daylight and simulations in LCA-byg and Climate Studio, to secure the architectural quality of the building. Furthermore, hand calculations concerning ventilation airflows and channel dimensions have been done to create a conceptual ventilation strategy. Finally, the completed design is summarized in a presentation chapter with a focus on design, atmospheres, integrated design solutions, and thermal comfort, which is terminated in a conclusion and reflection.



Reading Guidance

This master thesis consists of three sections: Program, Design Process, and Presentation. The sections are divided into nine chapters, which methods are based upon The Integrated Design Process. Preliminary research, initial thoughts, and several analyses are listed and presented in the Program to set the framework for the following Design Process. Throughout the sections, references to an appendix, in which supporting content to the thesis can be found. The chosen methodology is an iterative approach, continuously reflecting upon knowledge, using theories and different design tools throughout the entire Design Process. For the same reason, the design Process is chosen to be presented chronologically and divided into categories. Lastly the Presentation communicates the final design proposal for New Museum Jorn through floor plans, sections, and elevations as well as diagrams, and atmospheric visualizations.

References are listed in the bibliography using the Harvard-reference method. Illustrations are numbered and listed in the illustrations list, where the used sources can be found. If no source is given, the illustration is made by the students.

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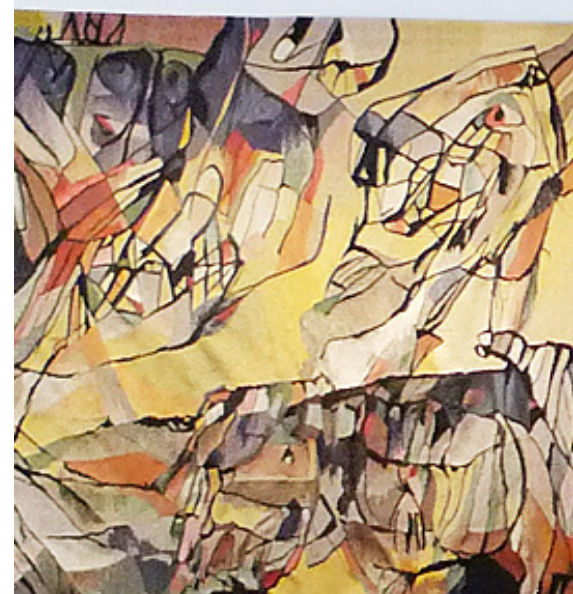
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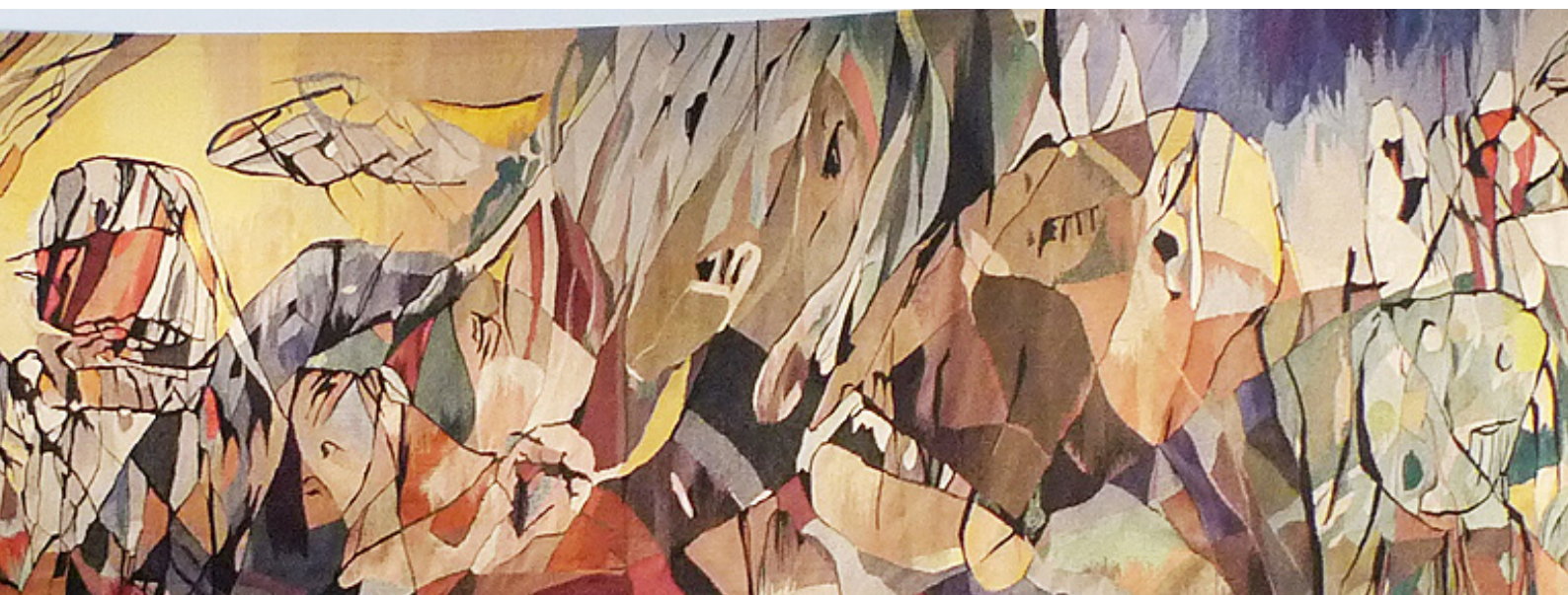
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"Museum, publicly available collection of visual art, natural history preparations or cultural-historical objects with accompanying documentation" (Den store Danske)



III.2. Asger Jorn, *Le Long Voyage*, 1960, 1400x14000 mm

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02 INTRODUCTION

The introduction helps to set the framework and form an overview of the initiating thoughts about the project. The chapter introduces why a New Museum Jorn should be created and what it should contain, what a museum typology has been in the past, present, and must be in the future, what facilities, qualities, and challenges the current Museum Jorn has, and the motivation for the project.

III 3. Silkeborg lakefront



P r e f a c e

Preliminary

Museum Jorn was established in 1982 and is located by Gudenåen in Silkeborg, Denmark. Asger Jorn's collection of art has over the years grown into the second-largest art collection in Denmark consisting of art made by artists from all over the world. By the international art expansion and the donation Per Kirkeby's achieves, the museum has outgrown its confines.

This calls for new architectural interventions for a visionary new Museum Jorn. The museum will be situated in a new location by the lakeside in the city center of Silkeborg, which invites an open and transparent idiom in touch with its surroundings. In addition, the museum can become an architectural landmark for Silkeborg and an international attraction in a class of its own that attracts guests from all over the world, unites culture and nature, and creates life, activity and communities in the heart of Silkeborg.

This master thesis is developed based on a concept program developed by Arkitema. The concept program will be used as an inspiration for user-meetings to Museum Jorn's vision about creating a museum in the spirit of Asger Jorn. (Arkitema, u.å.) New Museum Jorn must act as the frame around three departments concerning several aspects of the development of art in the past, present, and

future. The functionality of the departments is defined by the museum themselves. (Museum Jorn, u.å.)

Laboratories for process and creativity

"Open offers for all visitors - children and adults about participating in creative experiments and artistic manifestations in laboratories both within inside and outside the museum walls."

Centre of Art

"The museum's primary function of art exhibitions with introductions of dissemination initiatives, including and engaging activities and events and interaction with nature, urban space, and society."

Institute for vandalism

"An international and interdisciplinary research institute. Asger Jorn originally founded a Scandinavian Institute for Comparative Vandalism in Silkeborg for free and independent Nordic image research - an alternative to the existing art history."

Museum History

Development

III 4. Cueva de las Manos, Argentina: 1000 BC



Background

The way of receiving information is changing, but the people of the past had the same curiosity about knowledge and examination of the world as modern individuals, but without the luxury of online reference work the invention of the internet contributed with, therefore, availability and sharing of knowledge had to come elsewhere.

III 5. Capitoline Museum, Spain: 1471



Renaissance

Art, knowledge, and trinkets of all kinds, were a symbol of great power and wealth, therefore it was collected by royals and scholars for their private collections. With no clear narrative behind, it was more reminiscent of treasuries than museums, only to be admired by the owners.

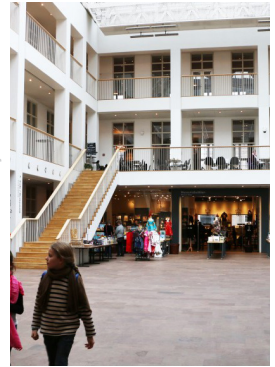
III 6. Vatican Museum, Italy: 1506



The Enlightenment

The state's transition to democracy changed the direction of the private collections. The change occurs in the mindset of what, how, and who the collection addresses. The biggest royal collections of Europe became state-owned, and the new mission of the collections was to make the citizens informed; museum.

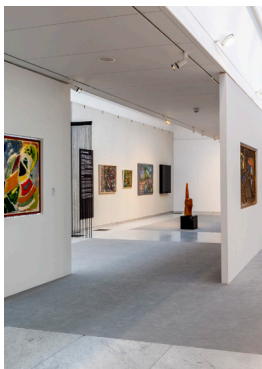
III 7. The Natural History Museum, Denmark: 2004



National Museum

After the French Revolution, Napoleon's vision was to create a greater feeling of community in France. He wishes to create a consciousness about how people are connected through common history, therefore, the vision about a museum being the national identity arose. The museum buildings of Europe became monumental to show the greatness of the nations, while also becoming more organized and categorised to create a more linear understanding of history compared to the rarity cabinets of the renaissance.

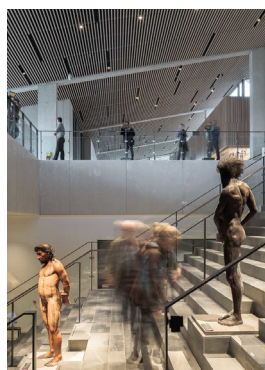
III 8. Louisiana Museum of Modern Art, Denmark: 1968



Modernism

The now and future became more important than the history, which was seen in the movement of modern art. Modern art was experimental and broke with tradition, the artists took distance from the museums and choose to exhibit their art in smaller minimalist galleries with white walls to put the art in focus. This became the main way to exhibit modern art and became the foundation for the modern art museums of today.

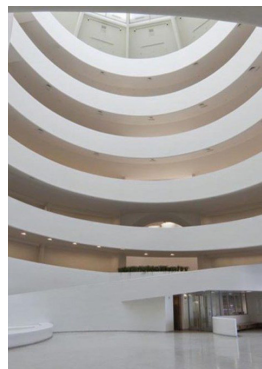
III 9. Moesgaard Museum, Denmark: 1970



Viewer to User

A newer remedy in the world of museums is the activation of visitors. The succession of a museum can be directly measured in the number of visitors and by creating more cultural offers the museum can attract a more diverse user assortment, which means the implementation of shops, cafés, cinemas, lectures, experiences, and dissemination to children and young people becomes more normal.

III 10. Guggenheim Museum, Bilbao: 1997



The Landmark

The arise of a tendency. The establishment of the Guggenheim Museum in Bilbao is a great example of how a prestigious construction can have an impact on the number of visitors, which also has a positive effect on the economy and number of tourists of a city. (Museet som sted | KUNSTEDER.DK, 2022)

New Danish Museologi

Danish museums are experiencing a decrease in visitors, the government is therefore investing in increasing the number of visitors by changing the dissemination plan to support a change of museums. Before, museums had a sender-oriented culture, which now needs to be changed to a recipient-oriented perspective focusing on learning and experiences to address modern society. The general transmittance of knowledge no longer fits modern communication, wherefore, the change involves easily understandable communication to create a foundation for cultural stimulation. (Kultur ministeriet: Slot- og kulturstyrelsen, 2018)

Museum Jorn

Case study

Architect: Niels Frithiof Truelsen

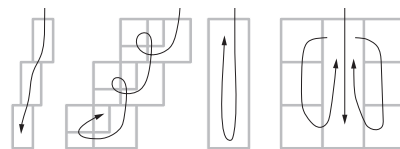
Placement: Near Gudenåen, Silkeborg

Year: Opened 1982

Area: 3200 m²

The existing Museum Jorn is located outside of Silkeborg centrum in a recreational place near Gudenåen, where different activities are rooted in nature. With a long walking distance, it is something users have the intent of visiting, rather than spontaneous visits. The museum was consecrated in 1982, 10 years after the death of Asger Jorn, and later got an extension in 1998. (Museum Jorn, u.å.)

In its current state, Museum Jorn houses two exhibitions on rotation, and one permanent Asger Jorn exhibition, which blends his artwork with other relevant artists of his era. The exhibitions are displayed in four distinct flows and spatialities, adding to different experiences of the displays which can be summarized in the following diagrams.



III 11. Flow diagram, Museum Jorn

The variation in circulation and paths creates a diverse museum experience, adding to the total experience of the current Museum Jorn. However, the circulation of the permanent Asger Jorn exhibition does not benefit from its current flow. Overlapping rooms and multiple paths leaves a chaotic and disorienting experience. Users must be aware of where they have been, and make

sure they do not enter a previous room. Another unfortunate experience occurs in the basement, where one of the rotary exhibitions is displayed. Here the path is straight, so there is little opportunity for exploration, but the issue lies in it being a dead end. Going back through an exhibition the user has already experienced, leaves a little impression, and seems more like a waste of time. Were it planned as is the case of diagram four it would leave a positive impression. The large rotary exhibition proves to be the most effective. Varying room scale helps guide the guest, while smaller side rooms invite exploration.

Although the Asger Jorn exhibition is permanent it is characterized as rotary due to adaptive functions such as window curtains. The cause of this could be either a need for adaptability within the permanent exhibition or a lack of direction when building the museum in 1982.

As mentioned, the Museum has some logistical problems, but also some spatial and circulation issues. The New Museum Jorn stands to benefit from a clear flow concept, to add to the exhibition experience. Awareness of the conditions in which the art thrives is also equally important in the New Museum Jorn since it would clearly emphasize the room as intended for either Asger Jorn or Per Kirkeby.

III 12. Exhibition pictures



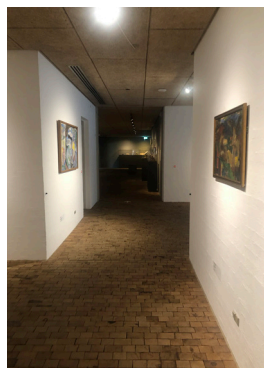
1: External exhibition



2: Changeable exhibition, metal sculpture



3: Changeable exhibition, long views



4: Combined exhibition, change of atmosphere



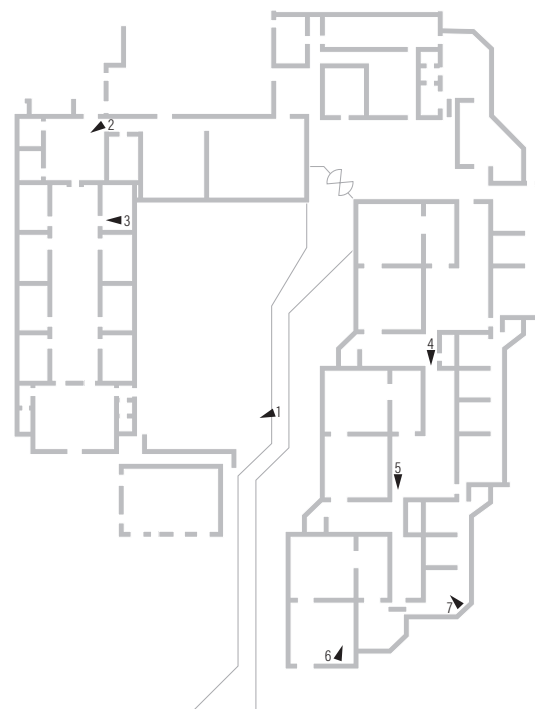
5: Combined exhibition, Asger Jorn ceramics



6: Combined exhibition, Per Kirkeby sculpture



7: Combined exhibition, Eks-skolen arvanguard art



III 13. Floor plan, Museum Jorn

Motivation

Delimitation

The primary motivation for designing a museum was the ability to work with a typology that, through its functionality, is constantly evolving. The new Museum Jorn's urban location in Silkeborg makes it possible to be challenged on how the building relates to its near context and at the same time functions on a local, national, and international level.

Working with the artist Asger Jorn opens the opportunity and challenges the creation of impactful atmospheres in harmony with the vision of Asger Jorn. In a similar fashion to Asger Jorn's playfulness, being able to play with the material compositions, and their impact on the atmospheric experience, thermal environment, and the unconscious circulation of space. This calls for awareness both in terms of engineering and architectural methods to create an integrated, qualitative, and articulated New Museum Jorn. The predominant subject in the education of Architecture and Design at Aalborg University is to develop and understand how to combine and find architectural qualities based on engineering aspects and the other way around, increasing the general experience and quality of the finalized New Museum Jorn.

For the same reason, positions from this education can create a sustainable, integrated bid for a museum typology of the unknown future, that respects the environment and the surrounding context, the people, and the unreplaceable artwork of Asger Jorn.



III 14.

Silkeborg atmosphere



DELIMITATION

This master thesis will cover a new design proposal for New Museum Jørn. The proposal will cover the detailed design of the "Centre of Art" including the belonging facilities defined as the exhibitions, office spaces, foyer, restaurant, bar, and museum shop. The requirements of the "Institut for vandalism" and "laboratories for process og kreativitet" will be acknowledged, but not further detailed than placement, size, and a conceptual translation of the thermal solutions made in the "Centre of Art". The surrounding urban environment will be conceptually designed to ensure synergy between the indoor and outdoor spaces.

Further, this master thesis focuses on achieving a good indoor environment in terms of the art conditions in the Centre of Art. Therefore, the international, parametric design tool Climate Studio is chosen as the primary environmental, evaluation tool for design choices and building performance throughout the Design Process. The Danish government demands a report concerning the final energy frame made in Be18 for new buildings (SBI 213). But due to the lack of knowledge to create a fully detailed Be18, the result will not despite accurate and therefore not be made.

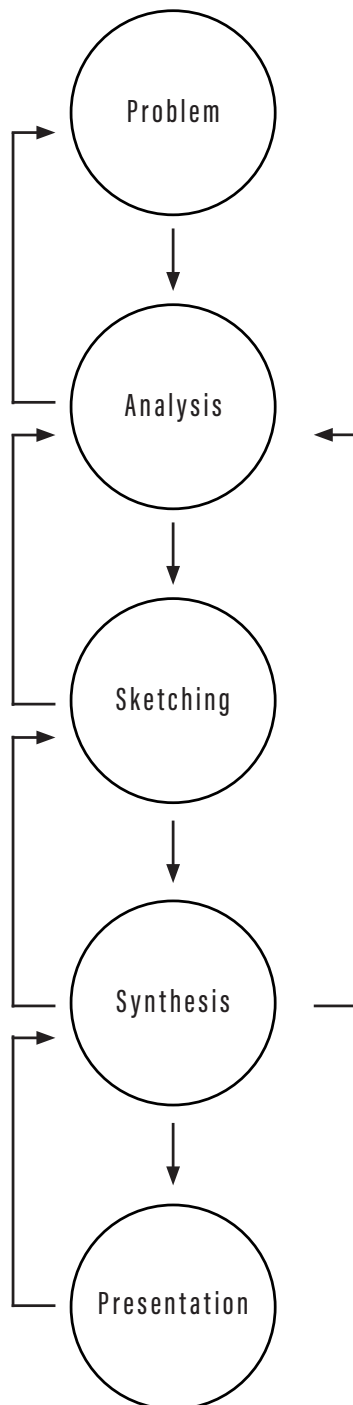


03 METHOD

The methods used in this master thesis are driving forces for the design process, architectural, engineering, and sustainability development. The method chapter is to help evaluate different aspects and processes of the project, enabling a more efficient and thorough development.

The Integrated Design Process

Method



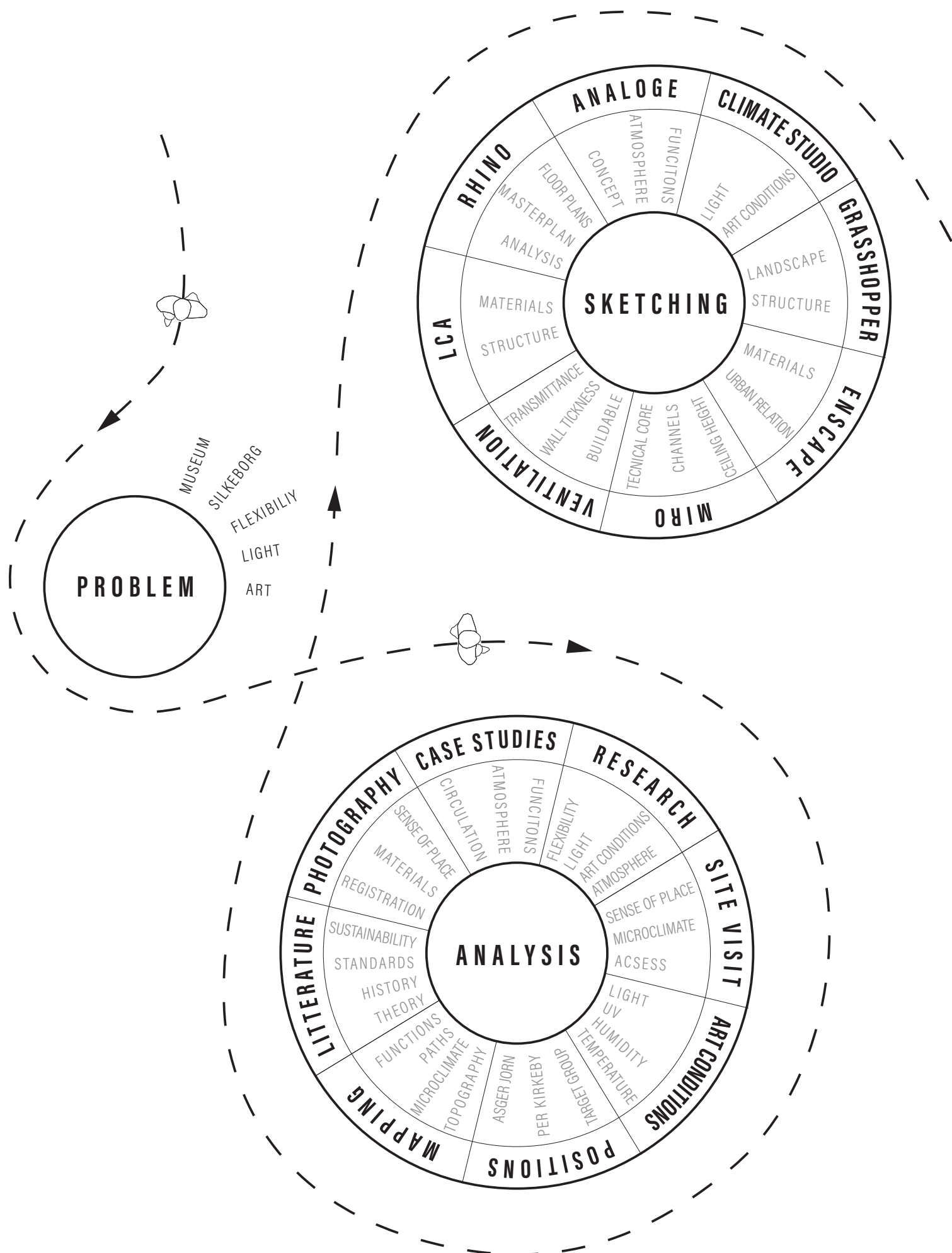
Vitruvius put into words the basic idea of integrated design already 2000 years before our time in his manifesto on architecture, *De Architectura Libri Decem*. In his first book, Vitruvius describes the importance of an architect acquiring broad knowledge and understanding within scientific and artistic disciplines. In the same way, the acquired knowledge must have been used both theoretically and practically to emphasize and reconcile the artistic approach with the scientific and thereby create an integrated design.

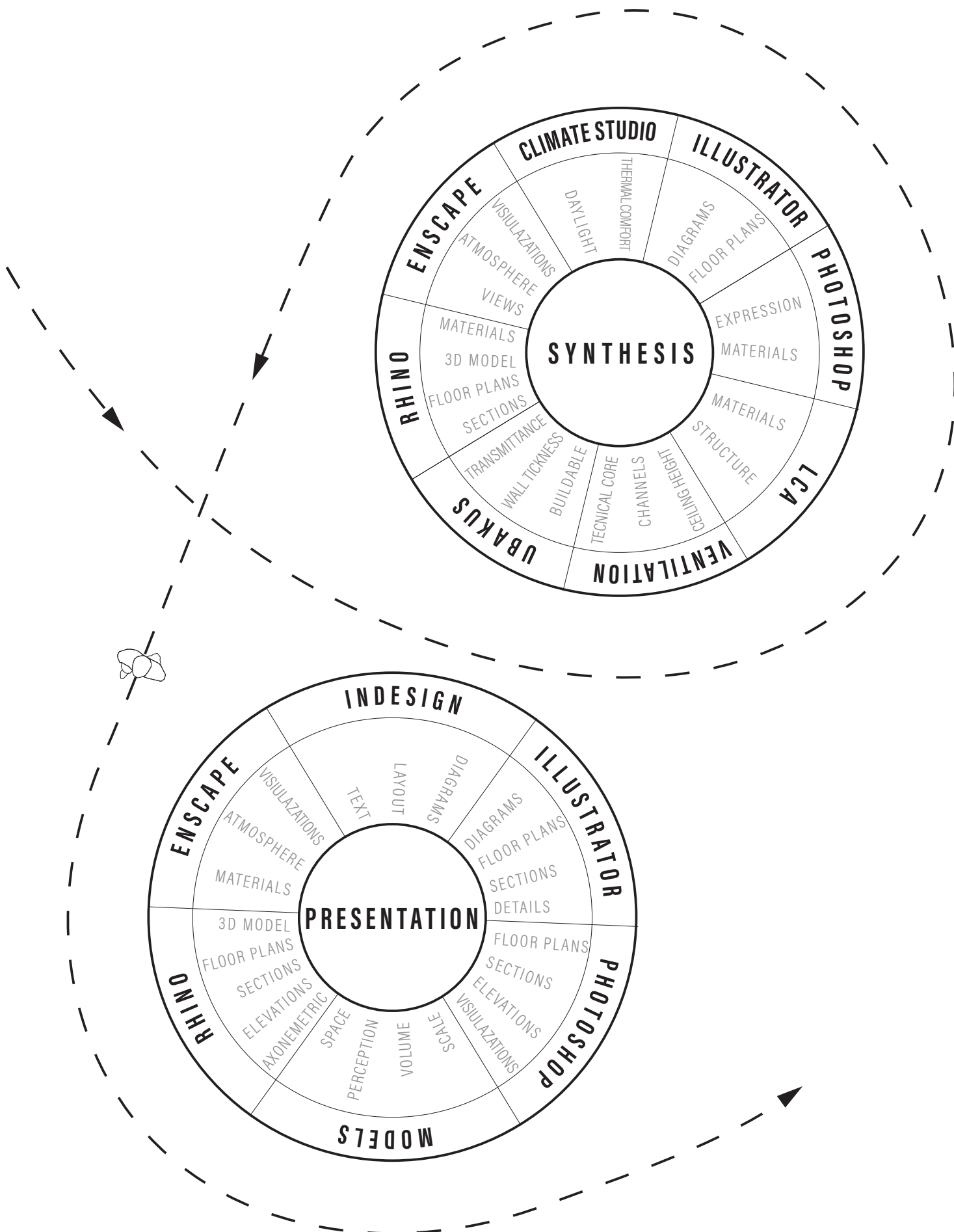
"... an architect ought to be able to accomplish much more in all the arts and sciences than the men who, by their own particular kinds of work and the practice of, have brought every single subject to the highest perfection" (Vitruvius, 1914, p. 11)

The integrated design process combines engineering and architectural knowledge to solve complex design problems. The method is a combination of a wide range of sub-methods divided into five phases: Problem, Analysis, Sketching, Synthesis, and Presentation. These phases are iterative and will structure the design process of the project. (Hansen & Knudstrup, 2005)

Problem

With the starting point in the concept program developed by Arkitema, a design problem will be determined. The problem will be a manifestation of architectural and engineering considerations that will challenge and examine different types of theoretical atmospheres. Scientific articles and empirical knowledge will create the foundation for the initial deskwork, focus area, and limits.





Analysis

The analysis phase will take the initial problem and deskwork even further. The project site will be analysed both in terms of empirical observations, field studies, and analytical workshops that can lead to sustainable sub-conclusions and design ideas. The design ideas can further be developed and investigated in 2D-sketching and 3D-modelling. 2D-sketching is seen as the shortest distance between an idea and something tangible. These can be initial thoughts, investigations, and different atmospheres. 3D modelling and sketching are used to solve more complex and scale-related design problems.

Desktop analysis

To get a quantitative overview and understanding of the project site and the surrounding context several desktop analyses are used to a gathering understanding of the history and conditions of the project site and the surrounding area. The initial desktop analysis aims to map functions, paths, line of sight, and microclimatic conditions, which all will be used as the frame for further investigations.

Field studies

For a more qualitative, atmospheric understanding of the project site, different field analyses are developed in correlation with the desktop analyses. The focus area is to understand the sense of place in Silkeborg, how the microclimatic environment is experienced on the project site, and to get an atmospheric and spatial understanding of the existing museum Jorn.

Case studies

To get inspiration and solve different arising problems throughout the project development, relevant case studies are selected. The chosen cases are chosen based on their functionality, architectural, and atmospheric quality, and to inspire the idea of how a museum should be perceived in the future.

Literature studies

Theoretical knowledge is used as the scientific framework around the design process of the project development, which gives the project a clear focus and direction.

Sketching

Through the third phase, different investigations are created and combined with the sub-conclusions from the analysis phase, design criteria, and the room program through sketches both in 2D and 3D to establish the framework for further design. Simple calculations, sketches, and models are used to compare and discuss different design proposals both analogical and digital. By implementing diverse calculations early in the design process, it would naturally be an integrated part of the concept.

Hand sketching

Sketching by hand is used as a communicative design tool to present different design proposals and conceptual ideas, both about form, - atmosphere -, thermal -, and constructive ideas. The ideas can be presented as floor plans, sections, elevations, diagrams, and spatial investigations.

Digital sketching

To get a more realistic perception of scale, atmosphere, materials, and spatiality, digital sketching is an efficient tool. This type of sketching aims to model concrete ideas and design solutions in a short amount of time, which can be implemented or altered for future iterations.

Physical model

Investigations of space and form can be made in physical models, which ensure the possibility of looking at the model both in scale, context, and eye level.

Technical sketching

To ensure the most optimal art conditions of the museum several, simple hand calculations are made about air change, ventilation rate, and channel dimensions.

III 19. Krydsedulekunst



III 20. Raw nature

Synthesis

Through the synthesis phase, the design proposal is getting closer to a final form that complies with the concept, vision, room program, and design criteria. Further qualitative sketching, calculations, and 3D-modeling will direct and shape the final design.

Climate studio

To ensure the optimal indoor environment for humans and art in terms of light and thermal comfort a plugin tool, Climate Studio, Grasshopper, and Rhino is used. The parametric plugin tool is mainly used for overheating and daylight hours investigations in the offices and the museum.

Life Cycle Assessment

A conceptual life cycle assessment can be used as a design tool to understand how different materials' Co2 emissions affect the environment depending of the raw material production, production, use, disposal, and transport.

Presentation

In the last phase, the final design proposal will be built both by hand in analogical models and in digital 3D software such as to present the project in spatial visualizations, simple diagrams, and technical drawings. This aims to present a given atmosphere, choice of materials, and the museum's relation to the city and the human scale.

Presentation text

The layout for the report is created in Adobe InDesign, which can combine both graphical work, pictures, and text.

Diagrams

Conceptual diagrams and illustrations are used for creating infographics to highlight a given function, detail, or overview of the project. The diagrams are made both in Rhino and Adobe Illustrator, which makes it easier for the reader to understand and perceive the building.

Visualizations

The final renders are conducted based on Rhino models, then rendered in EnScape and finalized in Adobe Photoshop. The renders are used to give the reader a realistic idea of how the project relates to its surroundings.

Sustainable Complexity

Method

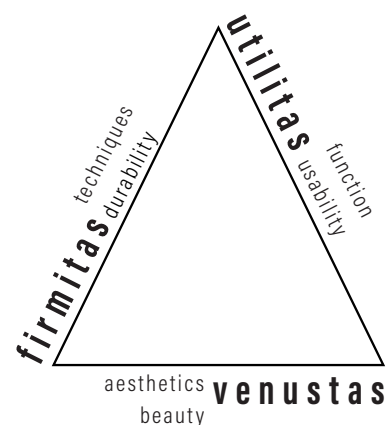
Architectural quality is a subjective concept that contains several facets that together create a whole. The whole consists of technical, functional, and aesthetic compositions that relate to the place, the surroundings, and the present. The architectural quality must therefore arise when engineering design initiatives articulate the human perception of architecture. Although good architecture seems complex in many respects, Vitruvius presents three fundamental principles of qualitative architecture.

Venustas is understood as beauty and is achieved when the appearance of the building is pleasant and appealing and where the sub-elements are proportioned based on basic symmetrical principles.

Utilitas is understood as utility and is achieved when the building is properly organized concerning its purpose and can be used without further inconvenience to its surroundings.

Firmitas is understood as durability and is achieved when the building's statics are dimensioned correctly, the materials carefully chosen and when the building is a natural part of the environment in which it is built.

The principles should not be perceived as an individual, but rather perceived in a formative synergy. This synergy unites engineering and architectural knowledge formative, which is the basis for integrated design. Vitruvius's view on architecture will be used as a guideline to ensure that the project covers all aspects of an integrated design. Thus, it is important to have time as a variable, which has created both increased technological benefits and environmental problems. To utilize the goal of sustainable solutions in the Vitruvian way of thinking architecture, design principles need to be implemented early in the design process.



III 21.

Vitruvian triangle

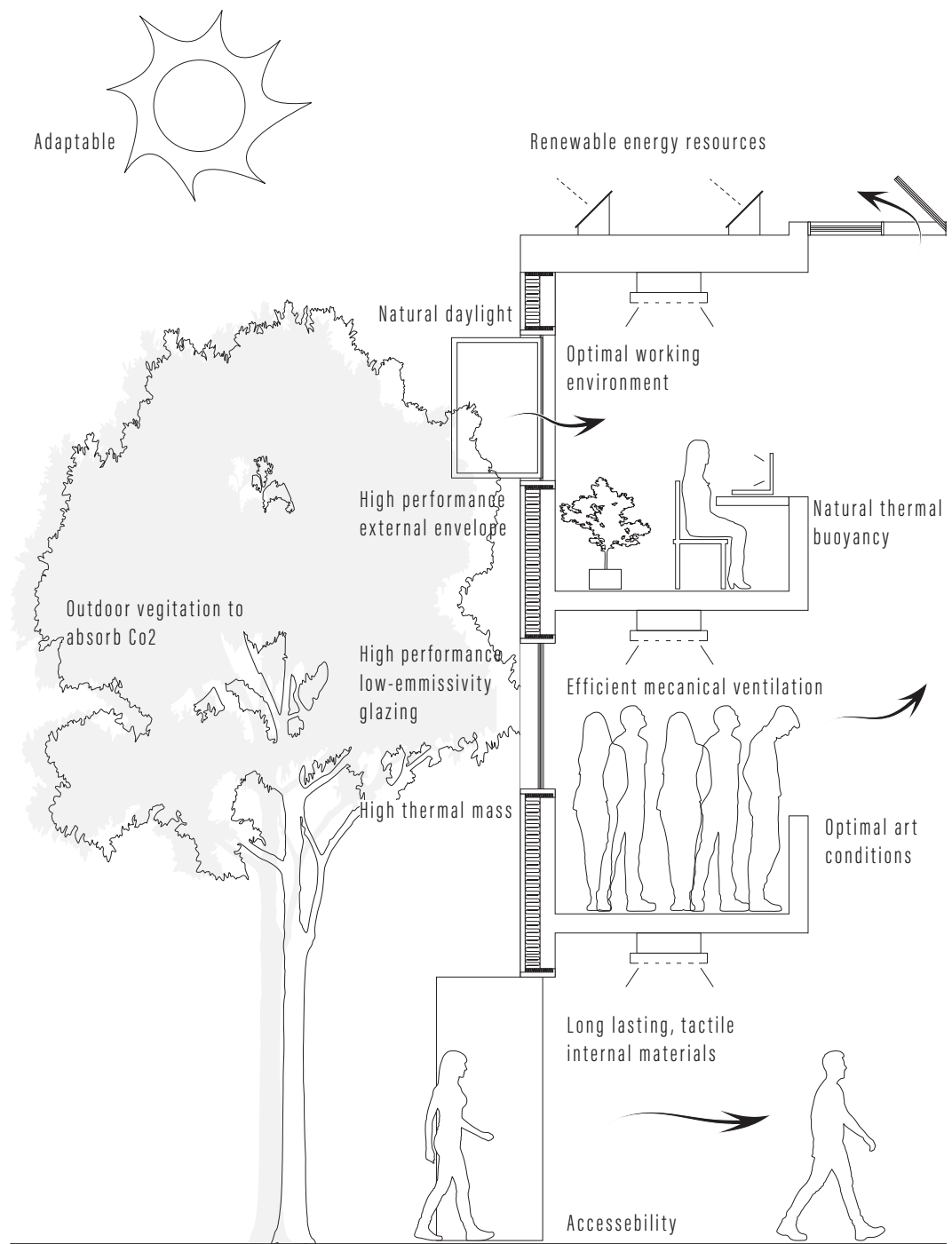
The modern definition of sustainability is defined in the Brundtland Report as a *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs"* (Unesco, 2021)

The common interpretation of the term is known as the three pillars of sustainability, defined as economic-, social-, and environmental sustainability. The terms are presented individually but are interconnected and require a systematic approach and an acknowledgment of complexity to accommodate and reach the goal of sustainability.

To accommodate the goal of sustainability and make the complexity tangible, the terms inside the three pillars can be used as methods to comply with the sustainable requirements. The methods themselves contain the same level of internal complexity, wherefore this master thesis aims to focus on selected methods of sustainability that combined with the Vitruvian way of thinking architecture, complies with the concept of New Museum Jorn with a focus on environmental- and social sustainability. (Purvis et al., 2019)



III 22. Line of sight



III 23. Sustainable principles

Economic sustainability

To acknowledge the importance of economic sustainability, the methods within are used conceptually. Economic sustainability is defined as long-term economic growth without negatively impacting social and environmental aspects of sustainability. In architecture, this can be translated into sustainable values and choices in terms of optimal use, recovery, and recycling of different aspects of the museum.

Environmental sustainability

To accommodate the need for a sustainable environmental intervention, several operative principles are used as a formative design tool, by acting in a way that ensures future generations have the natural resources available. The new Museum Jorn must comply with the Danish Standards and regulations in terms of the quality of the indoor environment. The methods will include integrating the simulation Climate Studio to evaluate the indoor environment. Regarding the economic part of material durability, a life cycle assessment is made to investigate the material's global warming potential concerning the demand for energy consumption.

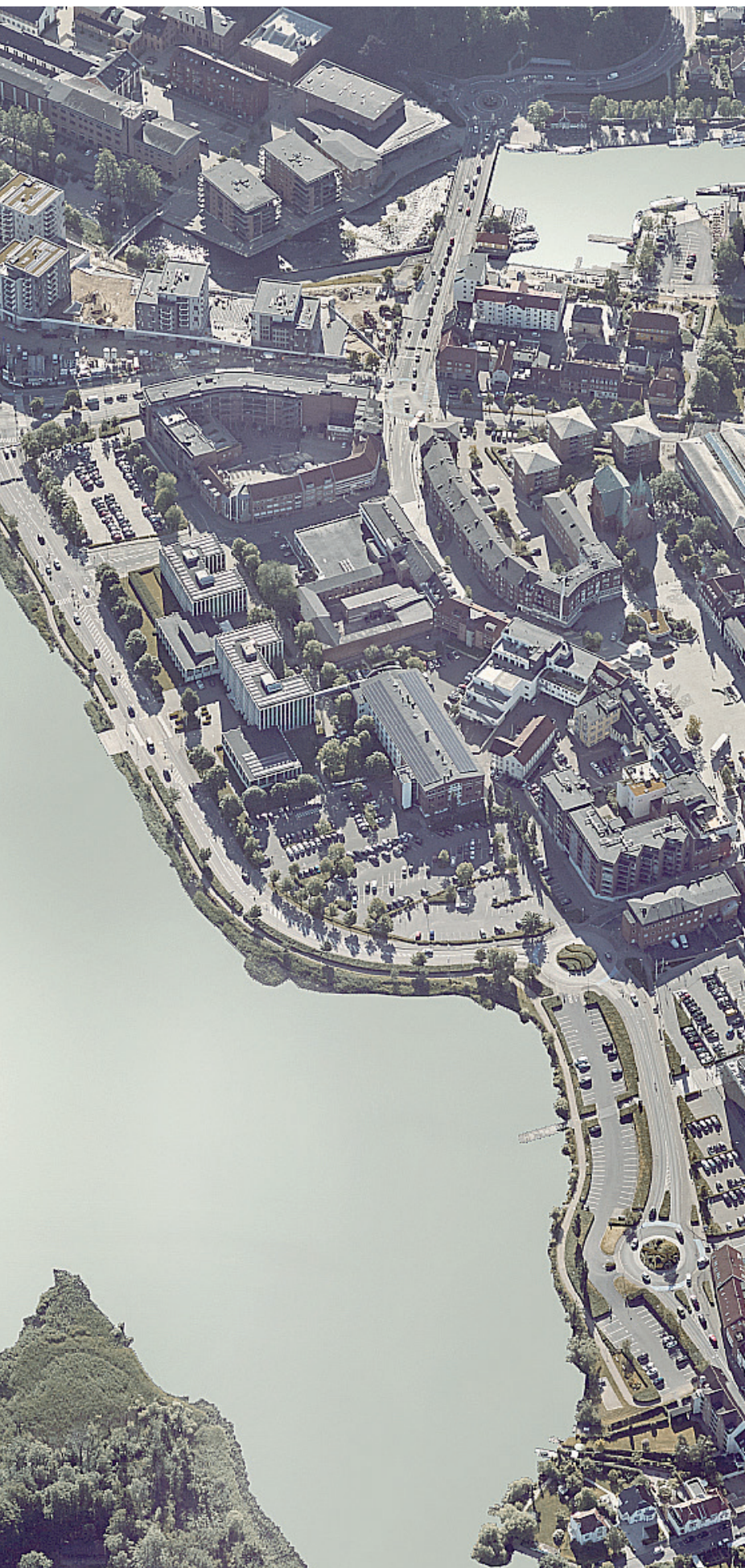
Social sustainability

Compared to the measurable methods in economic- and environmental sustainability, the social part of sustainability relates to unique individuals, which perception of the world is unmeasurable. In terms of architecture, this can be methodologically difficult to make tangible, wherefore the new Museum Jorn aims to comply with visionary principles. New Museum Jorn must be formative and inclusive and should functionally create more value for Silkeborg city. The methods will include different site analyses and theories. In terms of site analysis, scale in the cityscape, infrastructure, visibility, and near connections are investigated to ensure that the new Museum Jorn will create more value and be beneficial for the rest of the city. The theory will set up and present a median for principled, atmospheric solutions that influence individual movement.



04 SITE

To understand the context in which the project is placed, a range of analyses is conducted to achieve a deeper understanding of the site. Analysis on different scales provides design driving details of the context, which will be summarized in the design parameters for the project.



SILKEBORG

Silkeborg is a city in Midtjylland with almost 50.000 residents in the municipality. The city is especially known for its scenic surroundings due to the location next to Gudenåen and Silkeborg søerne, which in collaboration with Silkeborg-skovene, the largest forest area in Denmark, has highlighted Silkeborg as the capital of outdoor sports. Besides the impressive nature, Silkeborg also offers various cultural experiences such as festivals and museums, including the world-famous Museum Jorn, which has been placed in Jorn's spirit, by giving culture and art to everybody, by moving cultural experiences away from the biggest cities.

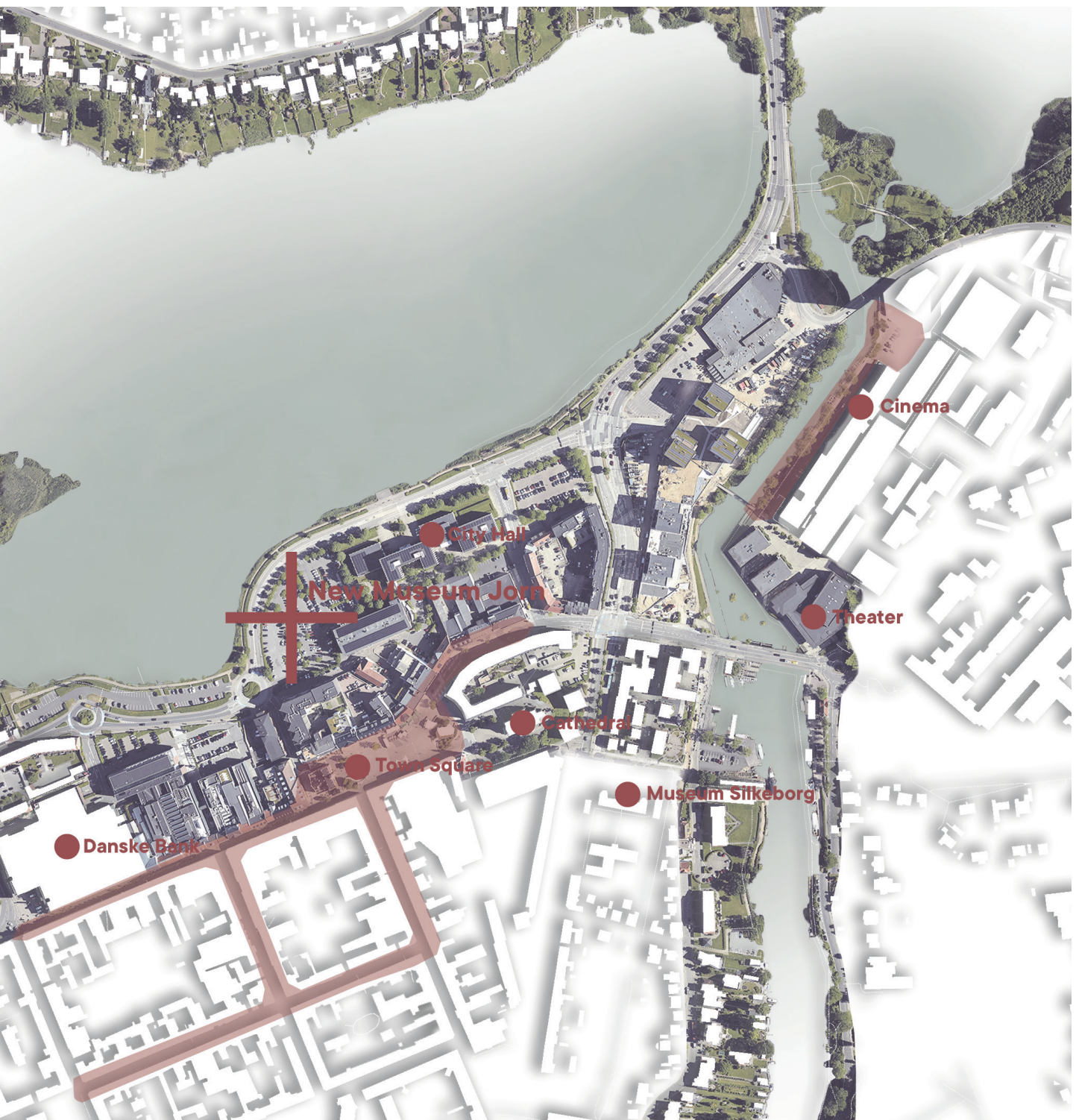
Location

Analysis

The new Museum Jorn is to be located on the lakefront in Silkeborg, Denmark, and will still act as an attraction on Silkeruten, an adventure route that combines culture and nature. The surrounding area is characterized by various functions containing everything from public, private, and urban functions to nature within walking distance.

Through its placement, The New Museum Jorn should respect and create more value for the existing context and Silkeruten. This will be determined through the establishment of a new cultural meeting point that should act as a landmark that combines the city and nature through form, landscape, materials, and cultural offers.





Sense of Place

Analysis

The project site is situated between the city and nature, which conflicts in a multitude of ways in its current constellation. To resolve this conflict, the New Museum Jorn must understand its given context and place itself in harmony amongst it.

The meeting

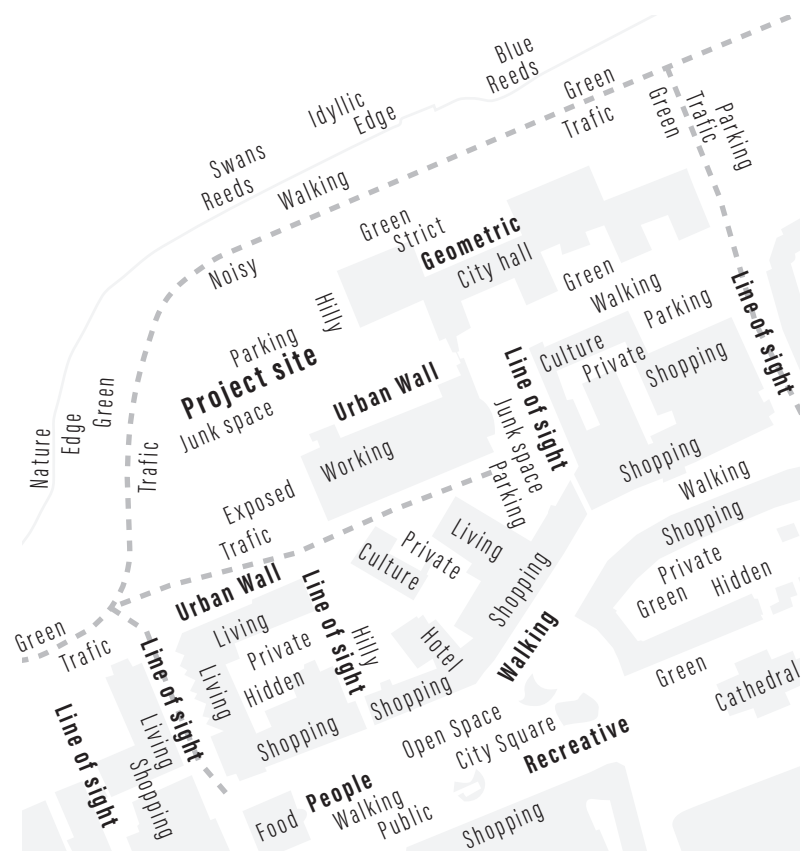
The city ends abruptly, with the monumental buildings creating a colossal wall between the city and nature, and adding to the massiveness of the buildings is their character of formality, structure, and immensity. Flat roads and parking lots separate the monumental buildings and lake resulting in a clear separation. Standing at the lakeside and looking up upon the city, it becomes apparent how it conceals everything happening behind it. The people, the shops, and everything it generates are separated from the idyl of the lake.

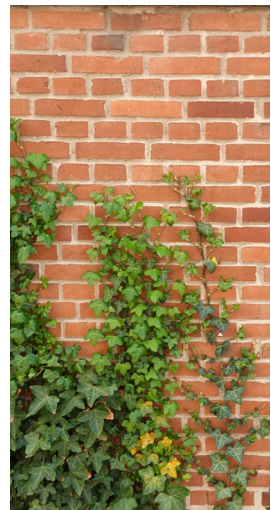
The contrast

Where the city places itself with massive scale and volume, the lake with its enveloping nature, lies calm and soft as a contrast. What Silkeborg envisions for its city, contradicts the characteristics of the lakeside. The buildings present themselves with a very strict and tight characteristic, opposing the freely growing nature on the bank of the lake as well as on the pro-

montory in the middle. Nature along the site helps elevate the diversity of the area, with different types of vegetation.

The New Museum Jorn must, through its design, scale, and choice of materials, find a formative way to relate to and respect the contrast between the enveloping nature and the existing, monumental buildings without compromising the human scale and experience, creating more value for the area.





III 27. Atmospheres

Paths

Analysis

The main infrastructure along the lakefront, defined as Søgade, and Søvej, is separating the new Museum Jorn from the lakefront. The lakefront is physically and visually connected to the city centre by smaller paths and roads that meet Silkeborg Torv and the shopping street, only interrupted for pedestrians by the streets and parking lot at the project site. By reorganizing Søvej to the south of the

project site, it is possible to rethink the lakefront as a recreative area in touch with nature. The new area will be solved conceptually but aims to create more value for the new Museum Jorn and attract the citizen of Silkeborg city. Furthermore, the reorganization enables the vision of making the new Museum Jorn the connection between nature and cityscape.



Visibility

Analysis

By reorganizing Søvej it is possible to become a visionary part of the existing Silkerute. Further, the infrastructure and the different paths of Silkeborg create natural lines of sight through the cityscape. Silkeruten and the line of sight ensure that the new Museum Jorn will be visible from a 360 degrees angle with no

backside. The new Museum will aim to be a visible landmark to attract tourists and citizens of Silkeborg by having an interesting expression and by being easily identifiable while offering a great cultural stay inside and outside.



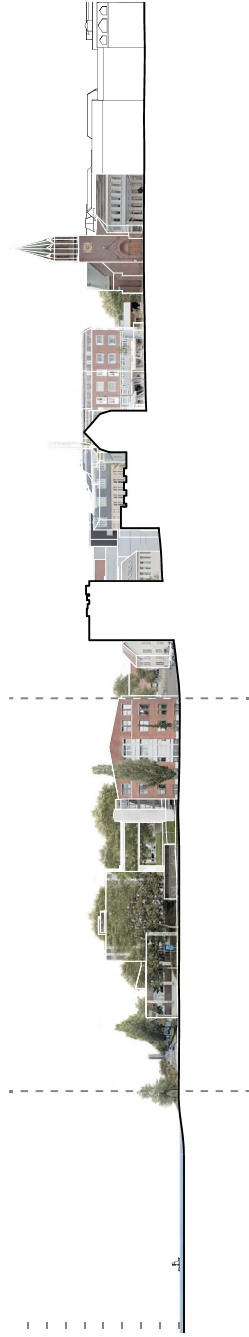
Topography

Analysis

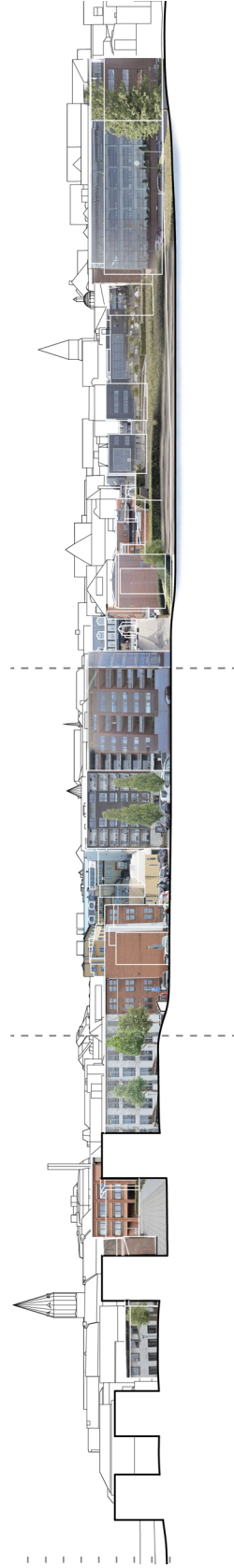
The project area is nearly flat, while the near context is characterized by a markedly varying terrain, which surroundings consist of both private and public functions. The building heights, varying from 9 to 30 meters, ensure that the variety of the topography is experienced uniform when experienced at a distance.

The New Museum Jorn will acknowledge both the human and city scale. This means that the scale of the museum should be no higher than 30 meters and be able to relate to and meet the human scale where it is beneficial. This can be done by differing in volume heights, choice of materials, and vegetation.





III 31. AA Section 1:1000



III 32. BB Section 1:1000

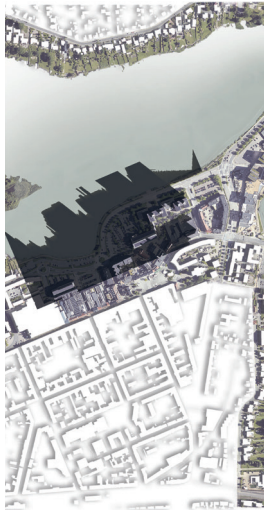
Sun

Analysis

There is a fine limit between the use of natural daylight and museum buildings, due to the demanding artwork in the exhibition areas. Using daylight is beneficial both in energy consumption and indoor comfort, but the majority of the exhibited artworks do not tolerate direct sunlight, wherefore a thorough investigation of the sun conditions is needed. Common for both winter

and summer is the presence of direct sun in the south, wherefore, windows toward the south can be problematic. Due to the sun's position being lower in the spring and autumn compared to the summer sun, and therefore reaching deeper into the building, windows placed toward the east and west should be placed carefully to avoid direct sunlight on exhibition areas.





10:00 21. December



12:00 21. December



14:00 21. December



10:00 21. June



12:00 21. June



14:00 21. June



10:00 21. March / September



12:00 21. March / September



14:00 21. March / September

05 POSITIONS

With Asger Jorn being the core identity of the museum and Per Kirkeby being one of the two main attractions, understanding their thought processes and art is an important part of carrying on the identity of Museum Jorn to the new museum. Cases of the current Museum Jorn and the never built proposal of Jørn Utzon will guide the project towards achieving the proper narrative of the museum and exhibitions. Portraits of respectively Asger Jorn and Per Kirkeby will further supplement core concepts and narratives of the total Museum Experience.

III 35. Artwork at Museum Jorn



Fatamorgana

Case Study

In 1964, the Danish internationally recognized architect Jørn Utzon made the first design proposal for The New Museum Jørn in Silkeborg, Fatamorgana. Fatamorgana means optical deception and should through its design match Asger Jørn's visionary and playful artwork.

The design proposal for the museum consisted of dynamic spaces with a cavernous character, leading the visitor two stories underground through a unique twisting course. The cavernous course vision was to create spectacularly spatial experiences through different light incidence, and soft, grandiose internal walls. The museum was not realized due to technical issues. (Kunsten.nu, 2016)

Although the architecture and the atmosphere of the museum would have been spectacular, the functional focus of the building seems forgotten. The discussion begins with the fine balance between well-presented art and unique, sensory architecture. How should the art collection of Asger Jørn and later Per Kirkeby be presented, when it should be hanging on curved walls?

The New Museum Jørn must find the fine balance between well-presented art, functionality, and unique, sensory architecture without compromising any of them. Further, inspiration

is drawn from Utzon's way of leading the visitors through the museum by working with light incidence and cavernous ceiling heights.

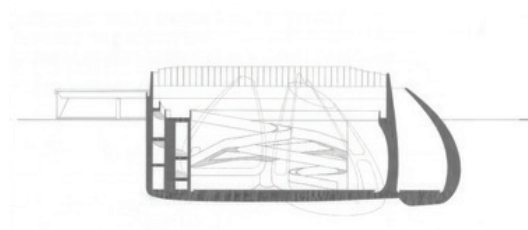
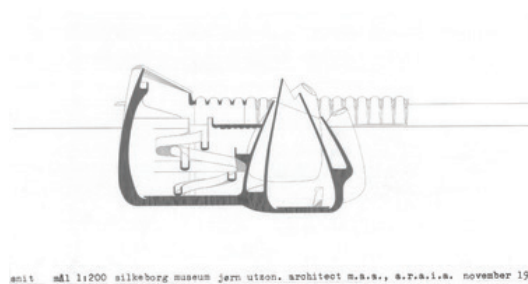
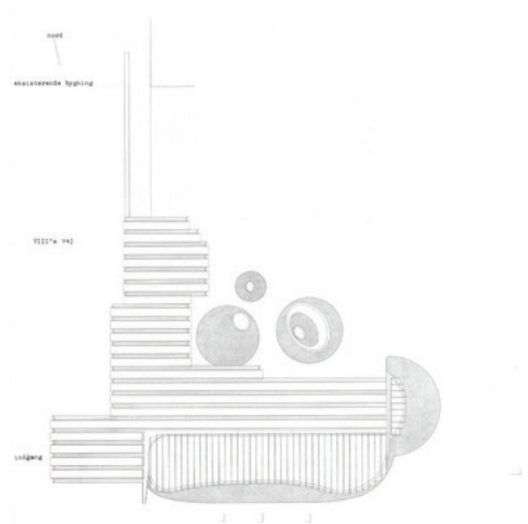
Design Proposal

Architect:
Jørn Utzon

Placement:
Silkeborg, Denmark

Year: 1964

Area: unknown



Conceptual sections of Fatamorgana

III 36.

Asger Jorn

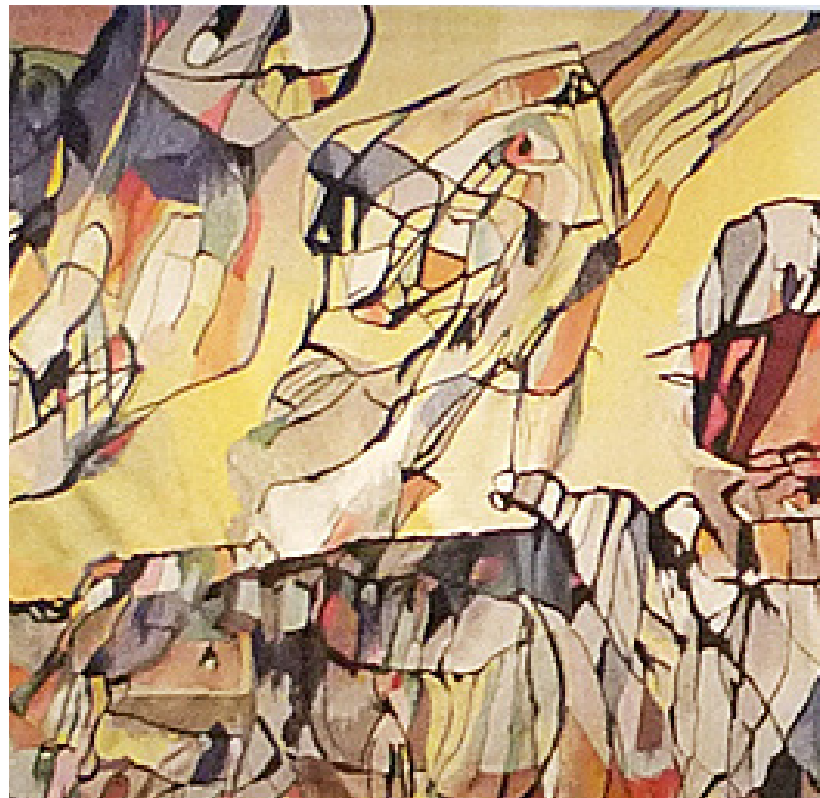
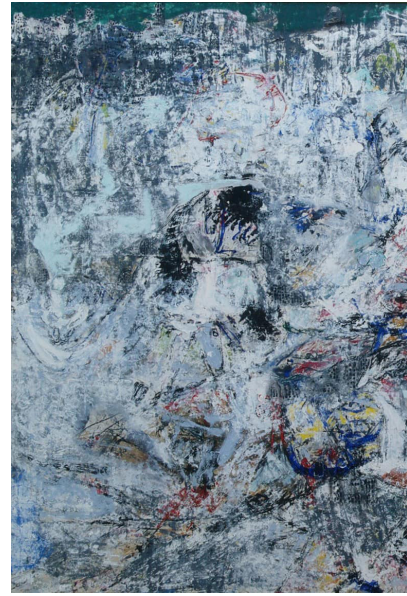
Portrait

Asger Jorn was born in 1914 in Vejrum, a small town in the western part of Jutland. When Jorn was only 12 years old, his father dies, which led to him moving to Silkeborg at the age of 15 with his mother and 5 siblings.

After he was educated as a teacher, he decided to become an artist and drove to Paris in 1936. He became an apprentice of the great modernist painter Fernand Léger, and the following year he helped bother Léger and Le Corbusier with their world exhibition in 1937.

Over the following years, Asger Jorn came to develop the spontaneous-abstract imagery. An artistic language in which the artist created purely based on instinct and without intent. Asger Jorn experimented with multiple art styles, which culminated in a tremendous amount of art, with 2200 pieces in paintings by themselves. His spontaneous approach is part of the reason he is perceived as playful. In Asger Jorns's opinion art should be for everyone, and not exclusively accessible and understandable for aristocrats. Being branded playful supports his views of art and opens it up for the average person. Amongst his most notable works are his tapestry, *Le Long voyage*, the painting, *Stalingrad*, and possibly most well know, the *Disturbed Duckling*.

The *Disturbed Duckling* excellently bridges the gap between high culture and everyday life through its abstraction. People can find joy in a duck painted crudely on top of an old picture, disturbing the imagery and artistic style of the image, whereas others will criticize him for the vandalism of art. This example encapsulates the essence of spontaneous-abstract imagery, by spontaneously adding to the narrative of the image, but leaving it up to viewers to decide on the takeaway.





III 38. Asger Jorn, Stalingrad, 1966, 3500x5000 mm



III 37. Asger Jorn, The Disturping Duckling, 1950: 530x645 mm



III 39. Asger Jorn, Le Long Voyage, 1960, 1400x14000 mm

Per Kirkeby

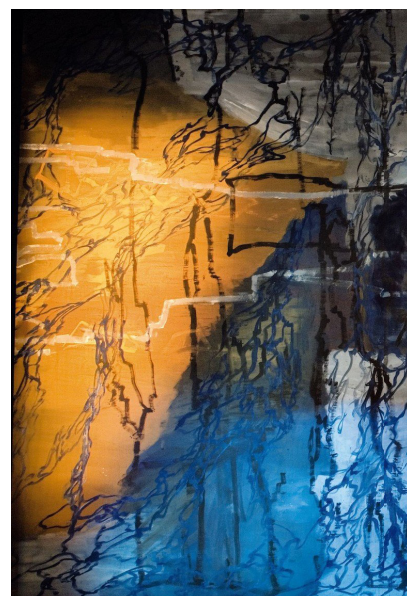
Portrait

Per Kirkeby was born in 1938 in Copenhagen, where he grew to love nature, literature, and art. Though he enjoyed art at an early age, it was later he devoted himself fully as an artist. He started out studying to become a geologist and would draw his sightings of nature in his notebook, which would have an impact on his artistic approach.

During his time at university, he approached the new art school, Eks-school, founded by Poul Gernes and Troels Andersen. At Eks-School he experimented with a range of methods from paints, film pictures collages, and more. After he finished university in 1964, his career as an artist started to pick up, and he devoted his time fully to art.

Kirkeby continued his experimental approach to art for many years, where amongst his most popular are paintings, brick sculptures, and erasures. He was then labelled as a Nordic expressionist, due to his interpretation of nature in accordance with his feelings. His portrayal of his surroundings remained the same throughout the years. In most of his paintings, he had an underlining structure, based on the nature he saw. He then proceeded to paint expressive colours on top, which sometimes seemed random, and he would then try to "tame" it again.

When looking at his art, the underlining might not be apparent at first glance, but it creates harmony and a sort of reminiscing, which spectators are to explore for themselves. Both Per Kirkeby and Asger Jorn agree that paintings are not just illustrations but create a narrative for viewers. Museum Jorn has been granted an enormous collection of Kirkeby's art pieces, among which the most important are his scenography for the Swan Lake ballet and the masonry painting pieces Triptykon.

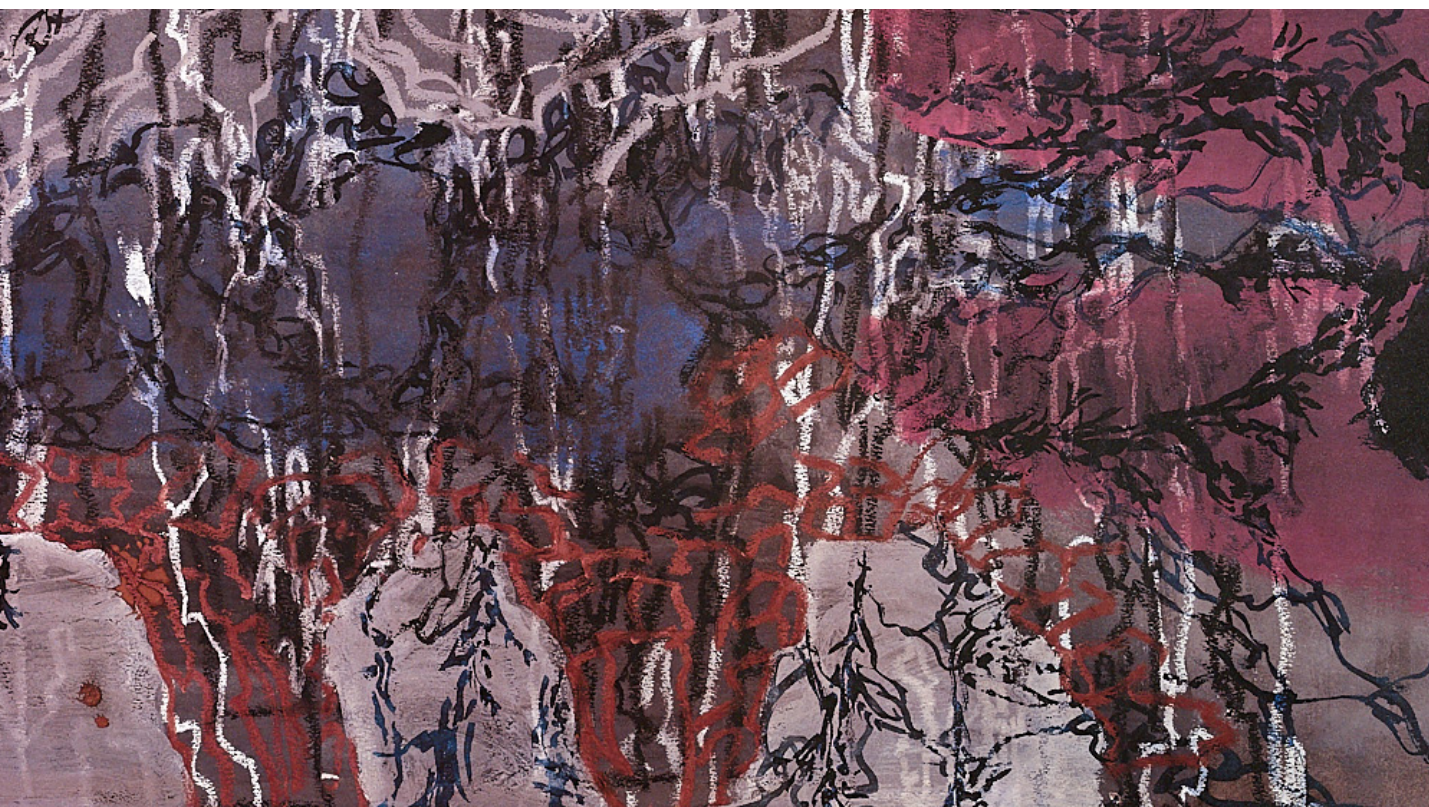




III 41. Per Kirkeby, *The Swan Lake Ballet*, 1996: 15000x10000 mm



III 42. Per Kirkeby, *Tryptikon*, 1973, 2500x3500 mm



III 40. Per Kirkeby, *The Swan Lake Ballet*, 1996: 20000x10000 mm

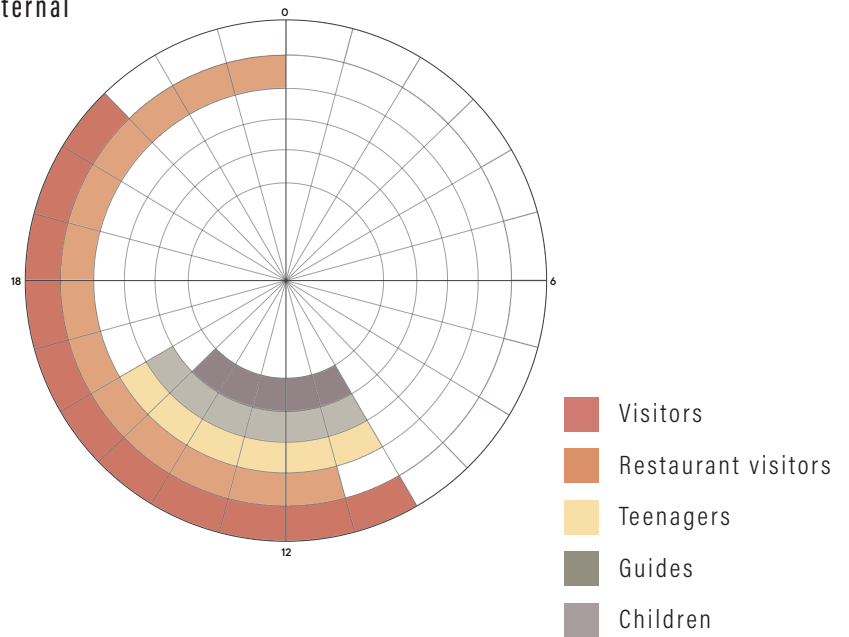
User Profile

Potrait

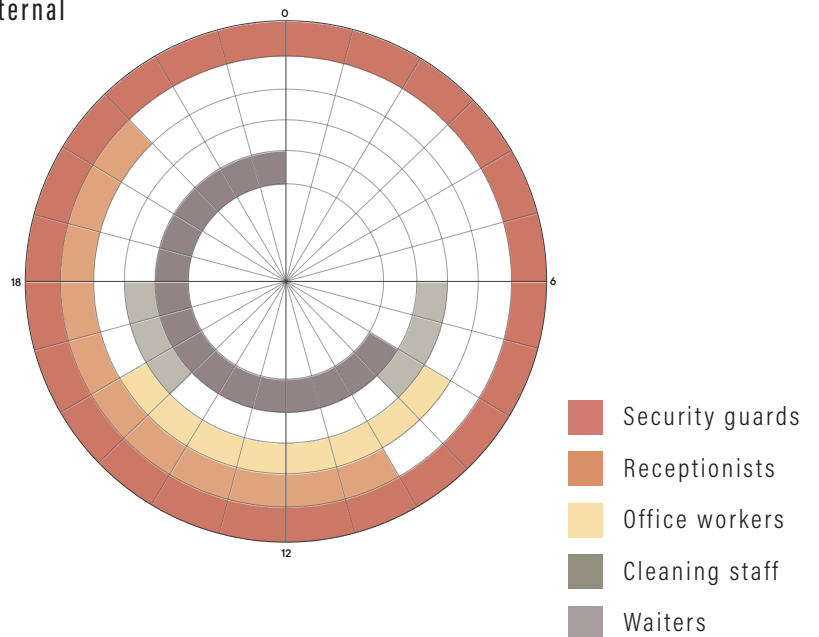
The general amount of people visiting the existing Museum Jorn is almost 40.000 visitors yearly. The museum has 1624 opening hours a, which means that the average amount of hourly visitors is 25 people (Danmarks Statestik, 2020.).

When designing a New Museum Jorn in the city center of Silkeborg, adding more functions and creating more value for the citizen, it can be expected that the number of visitors will rise. To get an overview and to create the best foundation for tailoring the experience of the building both thermal, atmospheric, and flow, a collection of the main expected users of the building has been made.

External



Internal





Visitors

Normal citizens or tourists visit the museum as an excursion due to curiosity or excitement about art, Jorn or Kirkeby or due to the attraction seen as an effect of being a landmark and cultural meeting place.



Restaurant Visitors

Visitors at the museum, together with non-museum visitors who spontaneously or planned take advantage of the additional offers of the museum building. Non-museum visitors will mostly use the restaurant around lunch or dinner.



Students

Children and teenagers use the museum and the belonging workshop as a part of their education, learning about art through the exhibition and the affiliated teacher or guide.



Guides

Their main task is to prepare and convey the exhibitions and knowledge to an audience, whether it is school field trips, scheduled daily trips or special events. Their job also consists of supervising creative workshops.



Receptionists

Will be available in the entire opening hours to answer questions and sell tickets. They also answer the phone, book appointments and has an overview of the museum calendar.



Waiters

Waiters and kitchen staff running the restaurant. The waiters welcome and take care of the visitors, while the kitchen staff prepare and cook the food while also handling the cleaning of the general kitchen and cutlery and dishes.



Office workers

Handles the "behind the scene"-tasks such as coordination, communication and strategies, while also keeping track of budgets and internal business as human resources.



Cleaning Staff

They collect their cleaning supplies at their base and circulate the building a couple of times a day, making sure the museum always is presented clean and tidy



Security Guards

Constantly circulating in opening hours to maintain optimal conditions for the art, making sure visitors does not touch, steal or in other ways jeopardize the safety of the art. Outside opening hours constant circulation is not necessary, wherefore, it will be reduced and more limited to surveillance from a separate room.

06 THEORY

The theory chapter delves into the theory of museums. Investigating art conditions, movement and spatiality, atmosphere, and materiality. Aspects will, when put together, be important parameters in ensuring a unique experience of the New Museum Jørn.



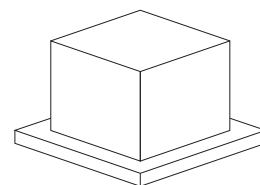
Flexible Architecture

Theory

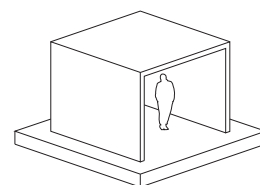
Architecture operates within a certain degree of indeterminacy, using the present context for the design of the unknown future. Robert Kronenburg argued that most architecture is static and nonadaptable, which is contradicting the natural world that adapts to its surroundings. Kronenburg's idea was that the built environment should be flexible like nature to meet and adapt to the shifting requirements for environmental sustainability and socially sustainable needs.

Flexible design principles are constructed to adapt. The principles are defined as structural, malleable, moveable, and multipurpose, which ensure the building's functional relevance over time. The built environment can conceptually be seen as a living organism, that can respond to changes in both the internal and external environment (Terramai, u.å.).

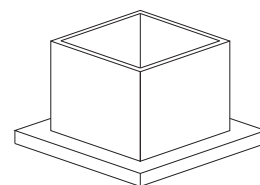
New Museum Jorn will, through its functionality, act as a long-term frame around the artwork of Asger Jorn, Per Kirkeby, and other artists. For the same reason, the internal exhibition area must strive for flexible solutions, having a static, structural system with light, moveable internal walls, that easily can adapt to new exhibitions without compromising the human perception of the space or the art conditions.



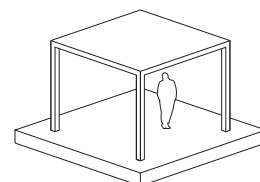
Closed box



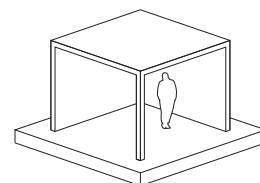
Side-open box



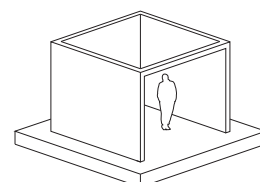
Top-open box



Open box



Two open-sided box



Two open-sided box

Circulation

Theory

"Whether we are conscious or innocent of this process, our bodies and our movement are in constant dialogue with our buildings" (Ching, 2014, p. 251)

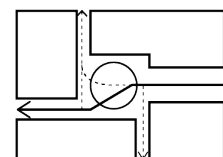
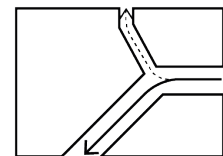
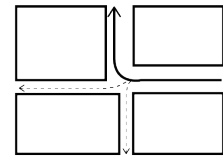
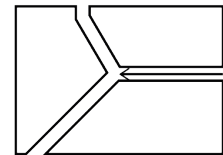
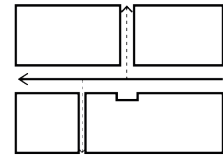
Movement in architecture can be divided into various aspects: kinetic architecture where a movement is not dependent on a spectator, movement where the spectator moves according to the build form and movement where the spectator moves according to the build space. Circulation is a product of movement in the built space, which introduces us to body movement. (Ahmadi, 2019)

When it comes to circulation and the body movement of museum visitors, museums often guide the visitors through a sequence of exhibitions making sure the observer is presented to the exhibitions most optimally or creating flexible spaces that let the visitor explore the exhibitions by themselves. When comparing museums with different circulations Kali Tzortzi concludes in her article "Movement in museums: mediating between museum intent and visitor experience" that even when comparing five museums on the scale from imposing a route to inviting to explore, each museum will have a sequence on a global level and a local diversified and intensified experience linked visually or by move-

ment. This implies that it is not a matter of following just one of the circulation methods, but a combination that shapes the movement through the relation between object and space, as well as enabling an individual visiting culture, which is a characteristic of contemporary museums. (Tzortzi, 2014)

"Since we move in Time through a Sequence of Spaces, we experience a space in relation to where we've been and where we anticipate going" (Ching, 2014, p.252)

In the book "Architecture - form, space and order" Ching refers to circulation as being defined by 5 elements: approach, entrance, configuration of the Path, path-Space Relationships and form of the Circulation Space. A path can be seen as a thread linking spaces of a building, both inside and outside, wherefore, it is seen as a major aspect of the composition of the museum of this thesis.



III 46. Points of decision-making

Path

The path always has a starting point and a sequence of spaces that leads to the destination. The amount of freedom varies significantly depending on the transportation form, while pedestrians are free to stop, rest, change direction at will, the cars are much more dependent on the roads. When two or more paths intersect it will always be a point for decision-making but differentiating in sizes can help to navigate between main paths and secondary paths. The paths should state the function, so service corridors are less prominent than public promenades. The path can be organized in various ways stated by Ching: linear, radial, spiral, grid, network and composite. The organization influences and is being influenced by the spatial experience and layout of the building or urban spaces, wherefore, when it is thoroughly planned the spectator also gain an understanding of the organization.

Approach

The approach is the start of the building circulation, which prepares the spectator for the experience and use of the building. There are many ways to organize the approach to a building, it can be direct or delayed, it can create deliberated views or an expectation that will or will not be redeemed at the termination.

Entrance

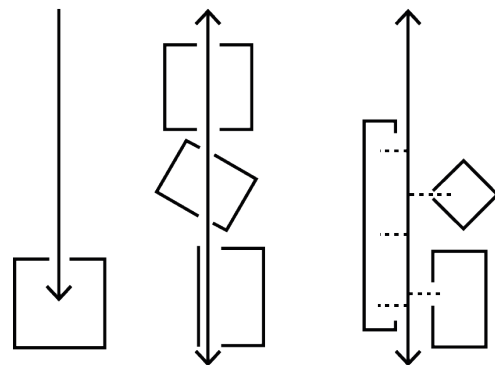
The entrance can be seen as a transition between "here" and "there". It can be the transition from outside to inside, from room to room or in the exterior space. An entrance is not limited to a wall but can be defined in many ways like a change in level or between pillars, but no matter the defined entrance, it is best implied when being perpendicular to the path of approach. The placement of the entrance in a room can be crucial for the following path and circulation in the room, which should be considered in this thesis when creating spaces for exhibitions, together with reinforcement resources as making the entrance wider, narrower, taller, lower, deeper than expected.

Path-space relationship

The path-space relationship is defined by how the path relates to the spaces around it. Ching refers to the relationships as either: pass by spaces, pass through spaces or terminate in a space. The pass-by spaces retain the integrity of each room, while the pass-through spaces create an experience of movement and rest along the path, while a termination in a space, highlights a functional and/or symbolic important space.

Circulation space

The circulation space should be seen as more than a functional linking device, otherwise, the paths would be endless corridors. The space should handle people promenading, resting and taking in views. A narrow corridor articulates forward-moving, while sections of widening invite to rest, wherefore, it is important to adapt the space in height and width to the function as well as the amount of openness. (Ching, 2014)



III 47. Spatial progress

The movement in the New Museum Jorn must consist of all five aspects of circulation to create an interesting and varying experience for the spectator. Further, the movement and the circulation must be flexible to ensure that the New Museum Jorn can adapt to future exhibitions.

Art Conditions

Theory

The artwork, paintings, sculptures of Asger Jorn and Per Kirkeby are unreplaceable, wherefore the management, storage, and treatments have special requirements according to thermal sensitivity and degree of degradation. Thermal sensitivity is defined by light, radiation, temperature, and humidity as these affect the conversation of the objects' directly (Museernes Arbejdsopgaver, 2021).

Humidity - relates to organic materials dimensioning stability, corrosion of metals, and the risk of mold and pests. The relative humidity must not exceed 70%.

Temperature - can affect the object's chemical decomposition. Low temperature can be efficient for a slow decomposition of some organic materials whereas other materials can be more damaged.

Radiation - in general, radiation must be avoided. Still, the maximum value for radiation is 75 $\mu\text{W}/\text{lumen}$. Today, the light sources will often filter out most of the UV light, so the values are typically 0-18 $\mu\text{W}/\text{lumen}$.

Light - the dose of light is defined by the amount of light an object can endure before it gets visibly damaged, bleached. For inorganic objects like ceramics, metals, etc. there is no upper limit for either radiation or dose of light, the values are made for the adaption of the human eye.

Light can be controlled and experienced very differently even when working in a regulated spectrum. The placement and type of light can have a big influence on the experience of a piece due to the shadow fold and warmth/cold of the light. Visual quality includes direction, color, and variation of natural daylight over time. Further, visual quality includes the ability for the visitor to look outside, where the best result will be found in an

Ill. 48.

Contrast between artificial and natural daylight. Museum Jorn





III 50.
Ceramics special art conditions, Museum Jørn

III 49.
Blides and artifical light, Museum Jørn



organic view. Light is one of the most important formative instruments when creating architecture. Illuminance creates different atmospheres and experiences throughout a built environment.

Therefore, light can be seen as the fourth dimension of architecture. Optimal lighting should provide both quantitative and qualitative adequate, that contains a balance between natural lighting requirements and the requirement for thermal comfort.

The lighting must further meet psychological and health requirements, consisting of optimum intensity, similar brightness, protection against glare, and adequate contrast (ERCO, 2022).

The wide range of everchanging exhibition concepts in a museum typology seeks a flexible lighting infrastructure, that complies with the strict art conditions, is suitable for changing atmospheres, and makes the architectural museum experience extraordinary for the visitors (ERCO, 2022).

The illumination of the built environment seeks to be natural, due to the visual comfort, energy consumption, and the general perception of the museum, with support from artificial light to maintain optimal lighting conditions for the exhibitions all year round. Further, the museum must have a flexible light infrastructure, that can combine

the different lighting principles to design different atmospheric experiences for the visitors. The various and changeable exhibitions on New Museum Jørn contain objects in different sizes, formats, and materials, wherefore, the New Museum Jørn must act as the frame around the artwork and must, therefore, strive for diffuse and tactically placed light, slow temperature fluctuations reflecting 18-20 degrees, and humidity of 40% that does not damage the artwork. (Museernes Arbejdsopgaver, 2021)

Atmospheric Experience

Theory

Between

Architecture has in its contribution of form and bodily presence always produced atmospheres. The term atmosphere is, in architecture, used to describe the mood of a certain space, therefore the definition is reflected in the relation between a subject and an object.

"Atmosphere is something between the subject and the object" (Böhme, 2016, p. 38)

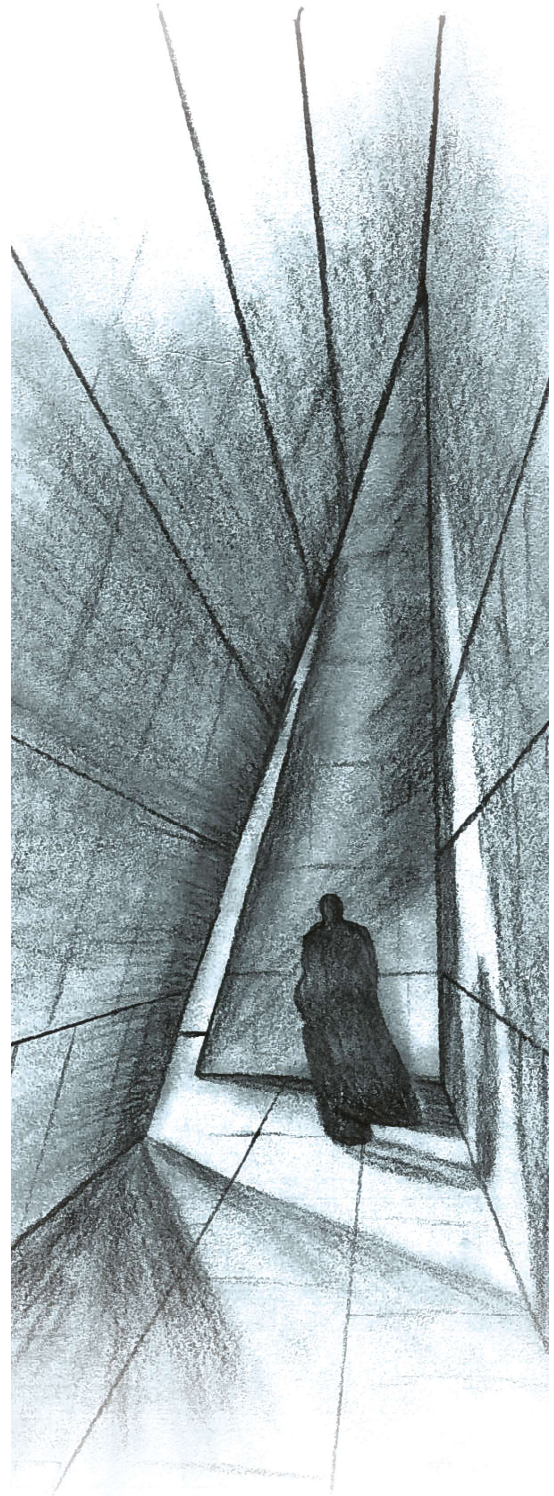
Between is a difficult term to define. The ambiguity is expressed in the opposites in a field of tension between being and non-being. Böhme describes this phenomenon as quasi-objective, which states that atmosphere neither belongs to the physical world nor the individual who experiences them (Böhme, 2016, p. 38).

Sensory experience

Good architecture is therefore seen as being the relationship between the human body and the built area. Juhani Pallasmaa argues that human senses create a greater consciousness around the surroundings. He believes that good architecture should stimulate the entire sensory system, as it imprints the clearest image in the viewer's memory.

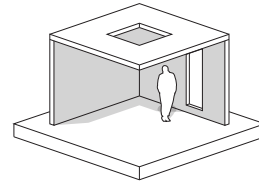
"We look, touch, smell, and measure with our whole existence, and the experienced world is organized and articulated with the body" (Pallasmaa, 2015, PP. 98-99).

In general, the human sensory makes the individual aware of being in the world. Seen from a biological perspective, human, sensory knowledge corresponds to, recognizes patterns in, and mutually manipulates nature, which has enjoyed evolutionary success. Therefore, it is possible to influence the experience of the new Museum Jorn through natural, recognizable design principles that affected the different sensory both individual and chelation.



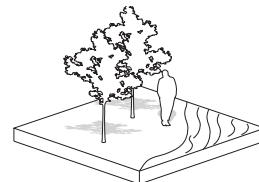
Vision

To accommodate the sense of vision, the new Museum Jorn must implement both natural, and artificial light, and implement completely darkness. The light and darkness must emphasize the desired, atmospheric color and temperature of the functionality of the given space.



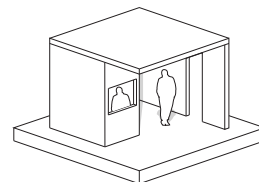
Sound

The sense of hearing makes humans able to be aware, the new Museum Jorn must implement different acoustics in terms of sound absorption, natural sounds reflected in running waters, and artificial sounds reflected in the music and sounds, which are adapted to the desired mood in the space.



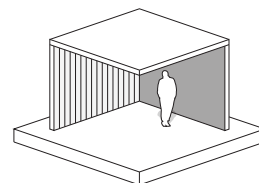
Taste

The sense of taste differs markedly from the other senses, as it is the only one that is not used as often. Therefore, this sense will be incorporated by the implementation of a café at the New Museum Jorn.



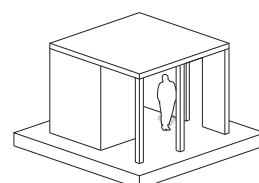
Touch

The sense of touch will be accommodated by the choice of materials. The new Museum Jorn must consist of materials chosen based on their tactile quality, Co2 emissions, and thermal value. Furthermore, the materials should, through their statics, be tectonically challenged to create extraordinary spaces.



Movement

The kinaesthetic sense is reflected in bodily movements and Ching's circulations. The new Museum Jorn must, through functionality, vertical movements, and the composition of open and closed spaces, challenge the common way of movement.



Material Durability

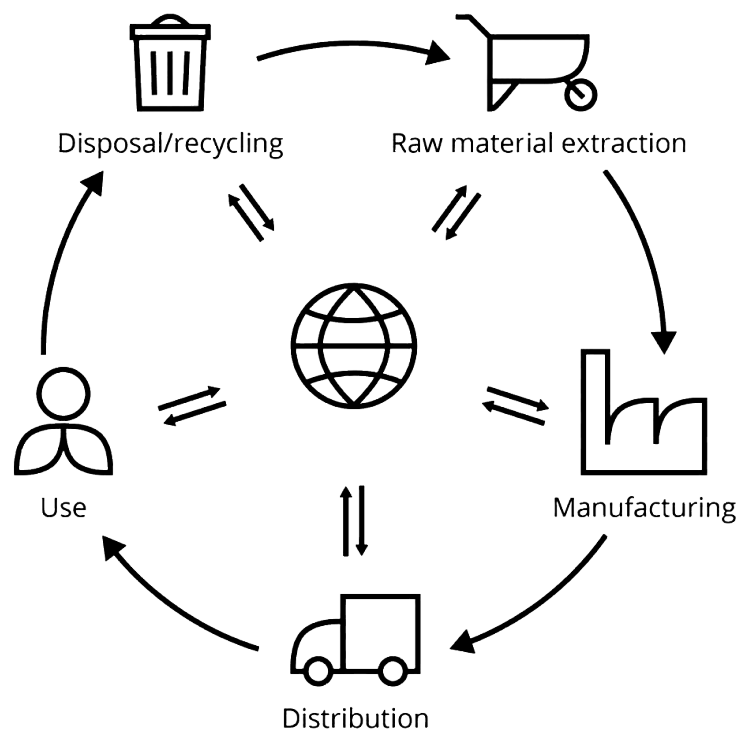
Theory

The potential embodied impact of a landmark in Silkeborg requires thorough considerations of material durability and lifespan in LCA (life cycle assessment). The utopia of LCA is the idea of materials being fully part of a cradle-to-cradle cycle, where the materials never wither or lose their value. LCA is a crucial design tool for the development of a sustainable future for architecture, but is it the right design tool when designing a museum meant to last?

Through LCA, the choice of materials and their embodied energy is compared through raw material extraction, manufacturing, distribution, use, and disposal with a short lifespan. Most museums have lasted or are intended to last for a long time. So, evaluating it based on a short lifespan, might not display the true impact, if there potentially will be no end to its life cycle. Treating and maintaining organic materials to last, will with current technologies have a high environmental impact over time. Whereas minerals and synthetic materials with a high impact at early phases, will require less treatment over time, therefore will have less of an impact.

When conducting LCA analysis, it would therefore be more comparative, if different lifespans are taken into consideration. Ultimately, the intended atmo-

sphere will dictate materiality, but awareness of environmental impact in this decision-making will serve as an indication. To find and select the best-suited materials for the project and the surrounding context, a deeper subjective, experienced-based investigation is conducted. Material tactility, soft properties, and durability with supplementation of LCA results are done, to gain a better understanding of various material properties in the context of Silkeborg.





Exterior facade

Materials chosen for the exterior cladding must fit the intentions and concept of The New Museum Jorn. Therefore, materials on the entire spectrum of durability are investigated, to lay the foundation for thorough design investigations.

Insulation

The analysis of insulation materials was conducted on the premise of achieving equal thermal conductivity across various materials. This has an impact on the amount of material used since the materials do not perform equally well. The results show that both straw and loose cellulose insulation perform very well, compared to other viable materials.

Interior facade

The tactility of interior materials has a high impact on the experienced atmosphere. Cataloging materials regarding their tactile properties, with supporting LCA results will establish an overview of potential interior materials.

Having investigated a broad selection of materials, a foundation for choosing materials in the design process has been laid. The results do not conclude on a decisive material since the material selection must be made in correlation with spatial experiences. It is a good indication of the different material properties, making it possible to compare them across different parameters. In the case of two materials having the same properties, LCA will be crucial in the decision-making, due to LCA results being indisputable. (LCA i Praksis, 2021)

LCA: A percentage of GWP compared to the worst performing material

Temperature: Perceived and tactile temperature of the material

Origin: Material production origin

Weight: Perceived weight of the material

In context: Material presence in the context

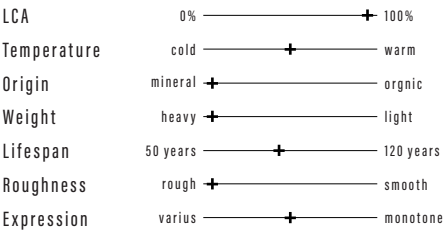
Lifespan: Lifespan data from LCA

Roughness: Perceived and tactile Roughness of the material

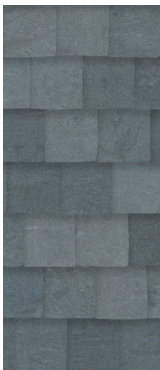
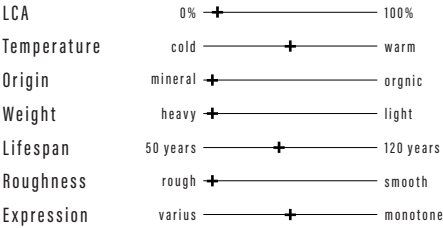
Expression: Material pattern at a close distance



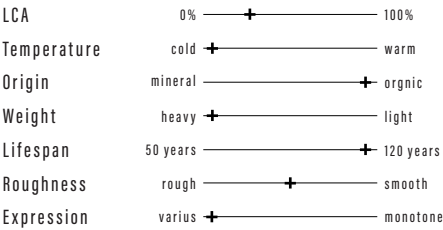
Brick



Reused Brick

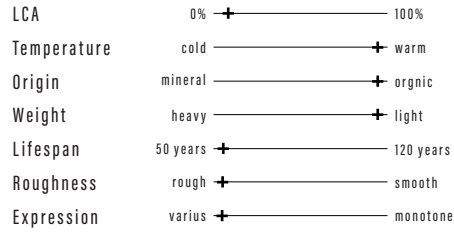


Slate

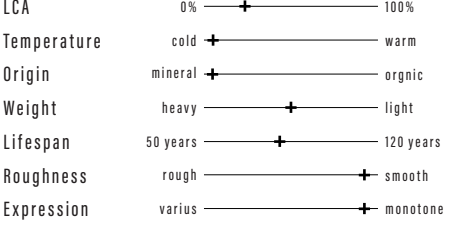




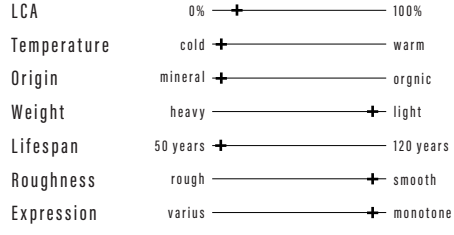
Wood



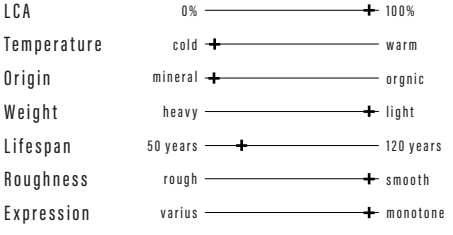
Concrete



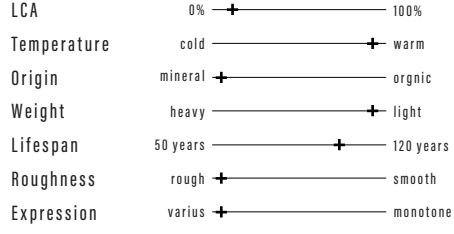
Gypsum



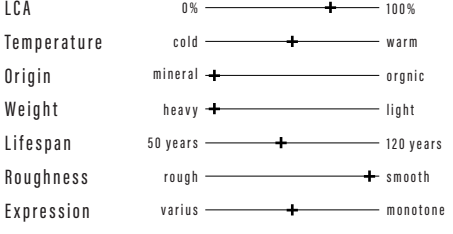
Aluminium



OSB



Screen Tiles



07 SUMMARY

The synthesis chapter combines gathered knowledge from the site analyses, positions, and theory into design generators, a schedule of accommodation, and a function diagram. The synthesis will, when put together be the foundation for solving the problem:

How can the New Museum Jorn act as a sustainable, unifying landmark connecting the lakeside with the city center of Silkeborg, creating the optimal conditions for the unreplaceable artwork of Asger Jorn and Per Kirkeby, while redefining the common interpretation of a multi-functional museum experience?



Design Generators

Synthesis



Site

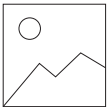
Soften the transition between the city and nature

Creating a recreative lakefront while relocating Søvej

Acknowledgement of the human scale

Visible, social sustainable cultural landmark

Optimized windows in the exhibition area



Positions

Balance between architecture and art

Reflect Asger Jorn and Per Kirkeby formative

Multifunctional building for every generation



Theory

Straight flow with space for curiosity

Flexible floorplan

Architecture for art conditions

Extraordinaire sensory experience

Tactile, durable materials

Schedule of Accommodation

Synthesis

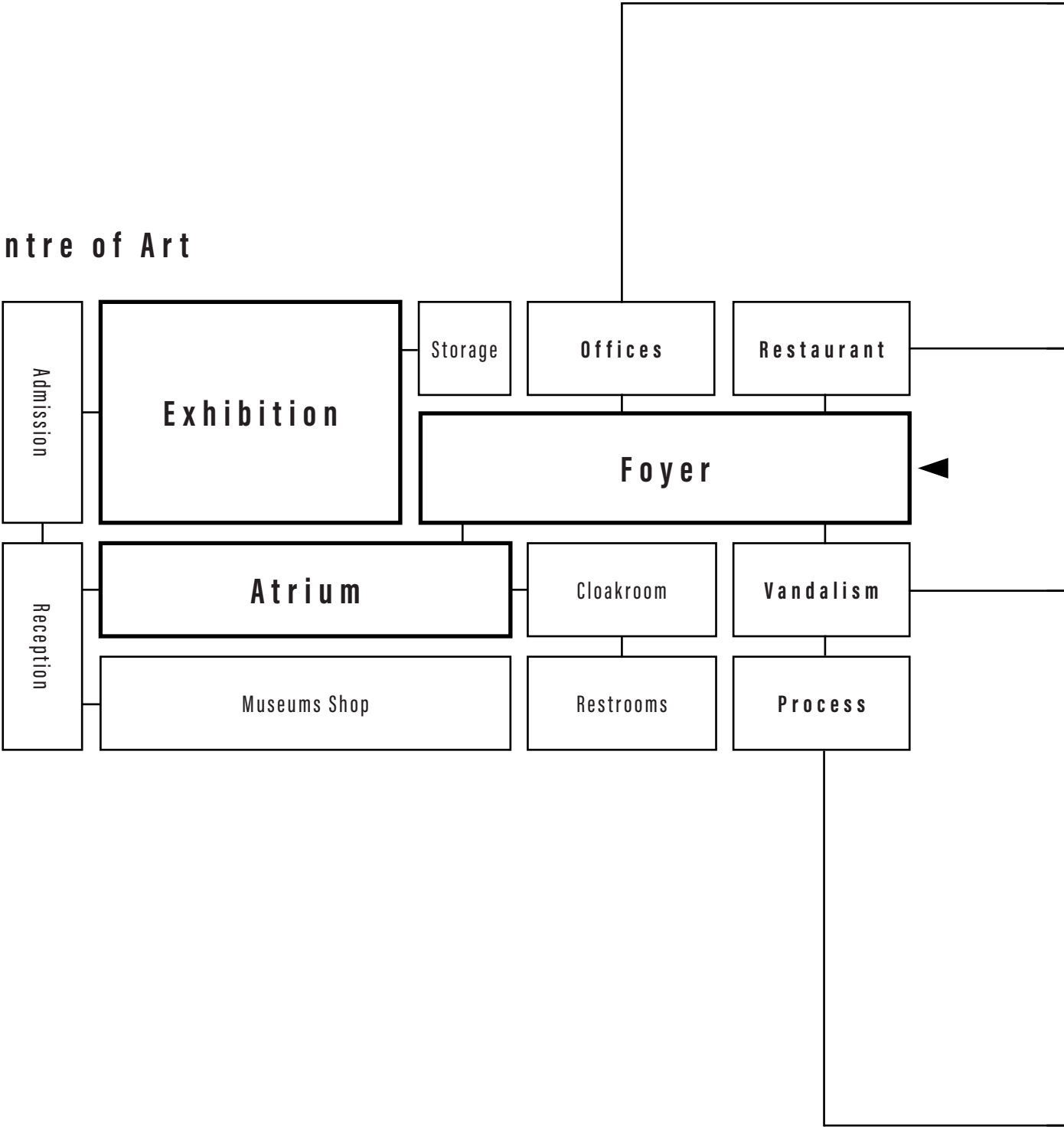
	Function	Area m ²	Unit	Total m ²	People max	Activity level 1 / 1.2 / 1.4 met
Centre of Art	Atrium / Foyer	1500	1	1500	100	□ □ ■
	Exhibition - Jorn	1000	1	1000	100	□ □ ■
	Exhibition - Kirkeby	1000	1	1000	100	□ □ ■
	Exhibition - Other	1000	1	1000	100	□ □ ■
	Admission	20	1	20	20	□ □ ■
	Reception	40	1	40	20	□ □ ■
	Cloakroom	60	1	60	20	□ ■ □
	Museum Shop	90	1	90	30	□ ■ □
	Storage	500	1	500	-	■ □ □
	Restrooms	5	20	100	20	■ □ □
Offices	Office Landscape	150	1	150	40	□ ■ □
	Curator office	15	1	15	1	□ ■ □
	Meeting room	20	1	20	8	□ ■ □
	Security room	20	1	20	2	□ ■ □
	Control panel	20	1	20	2	■ □ □
	Staff room	40	2	80	20	□ □ ■
	Restroom/changing	20	2	40	2	■ □ □
Restaurant	Restaurant	300	1	300	80	□ □ ■
	Bar	200	1	200	60	□ □ ■
	Kitchen	60	2	120	6	□ □ ■
	Storage	50	1	50	-	■ □ □
	Restroom	5	8	40	8	■ □ □
Vandalism	Conference Room	60	1	60	60	□ ■ □
	Working Space	600	1	600	100	□ ■ □
	Archives	70	1	70	5	■ □ □
	Restroom	5	5	25	6	■ □ □
Process	Workshop	20	5	100	30	□ ■ □
	Working space	700	1	700	30	□ □ ■
	Restroom	5	8	40	8	■ □ □
	Cleaning storage	5	8	40	1	■ □ □
	Technical storage	200	-	200	-	■ □ □
	Net			10.750		
	Gross					

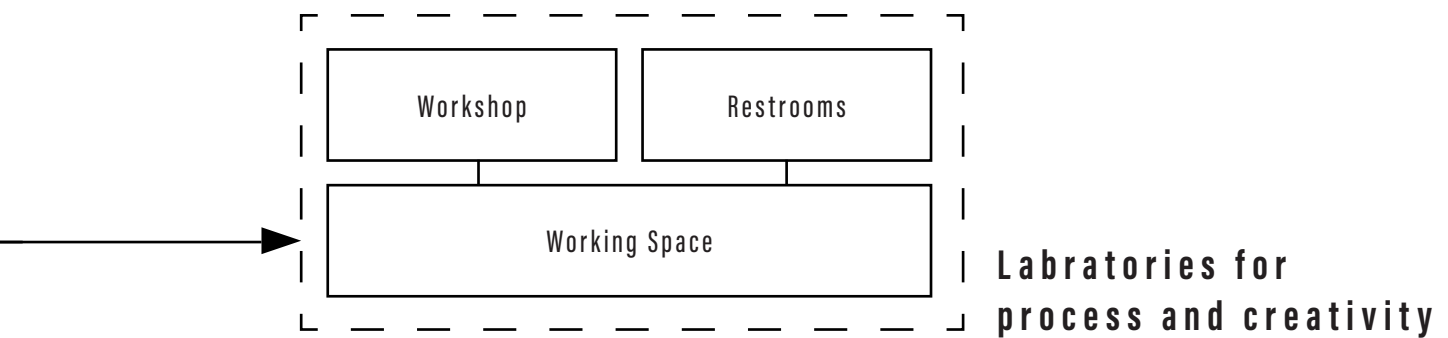
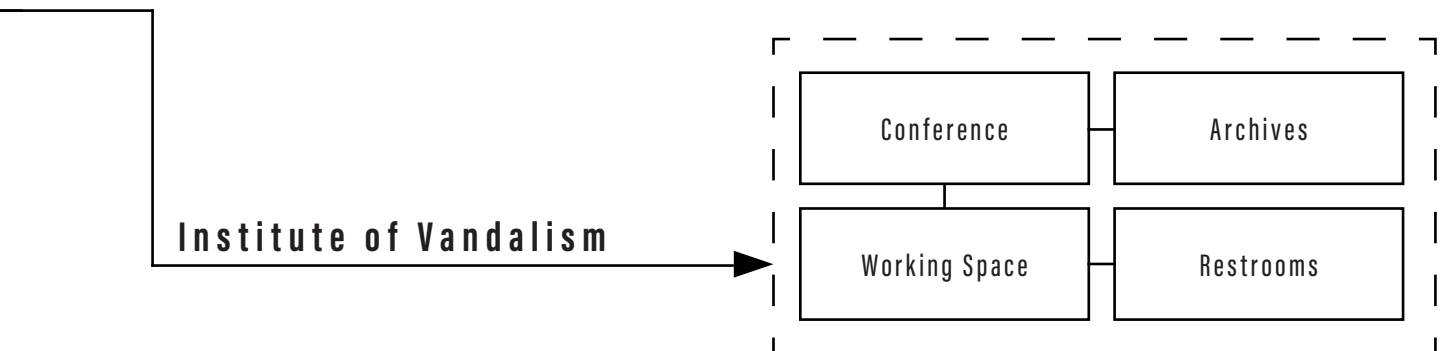
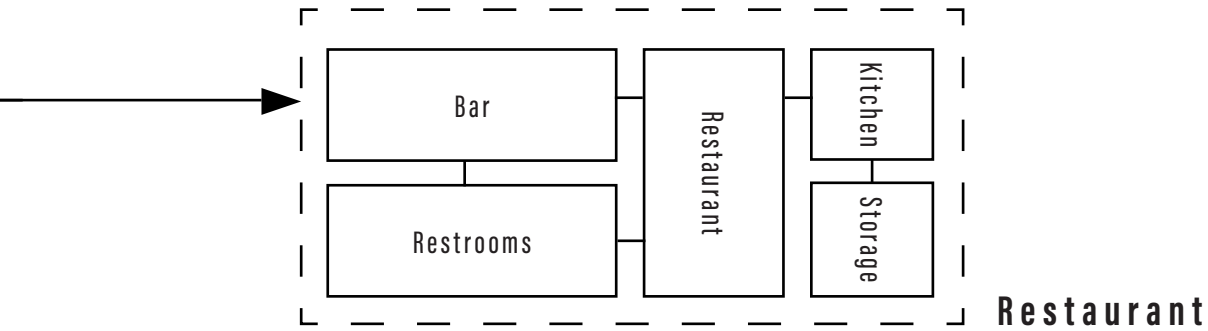
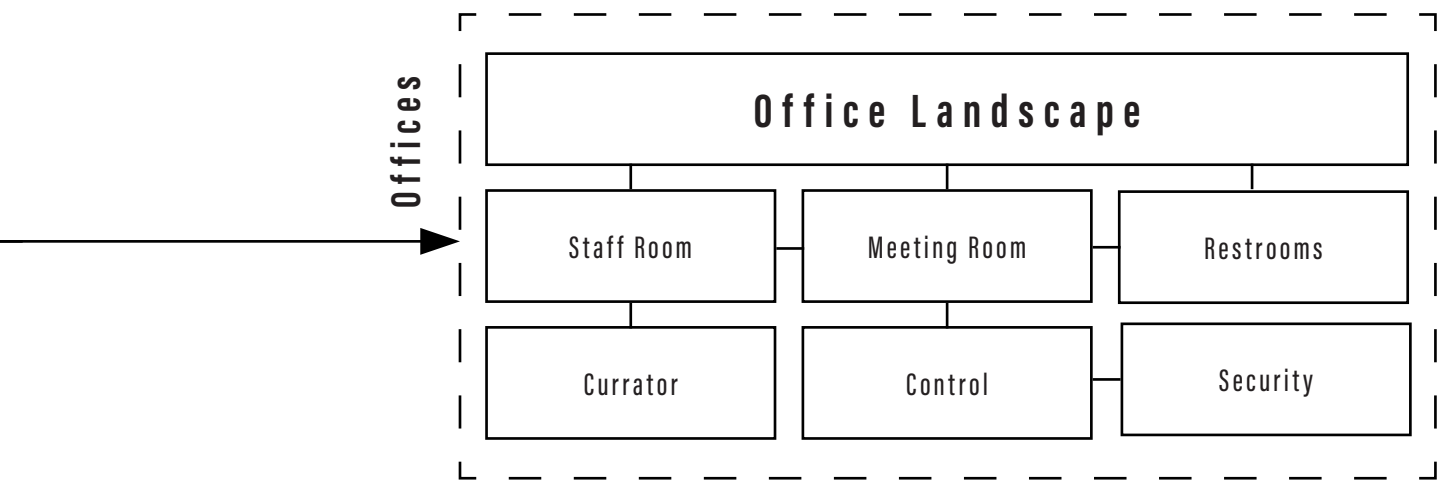
Light daylight / mix / artificial	Air mechanical / mix / natural	Availability private / mix / public	Notes
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Function Diagram

Synthesis

Centre of Art







08 PROCESS

The design process is divided into three sections: Chaos, structure and details. The purpose is to create an overview of the stages in the design process. The chaos section tries to unfold the obstacles that occur at the start of a project. The structure section tries to combine chaos with theory to distinguish between qualified ideas and non-qualified ideas. Lastly, the detail section establishes how different concepts have been elaborated and optimised.



Chaos

Initial sketching

Relation to context

Relation to scale

Architectural identity

Circulation spaces



Structure



Detailing



Initial sketching

Chaos

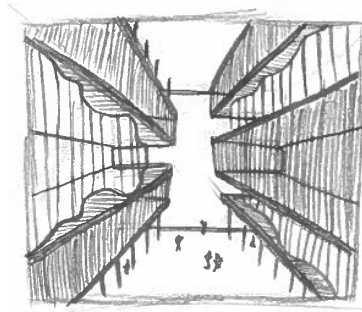
The first phase of the design process has been characterized by chaos. When designing a 10.000 square meter museum typology, the extent of possible architectural qualities magnifies. Taking a decision too early was harrowing, due to the fear of the impact on the final product, leaving many tasks unresolved but also many potentials to investigate.

To start the sketching phase the first sketches were drawn with little to no knowledge of museums, and mostly with spatial qualities in mind. When combining the drawings with the context and comparing them to the square meter requirement, it became clear that the volume of the required square meters took up significantly more space than firstly estimated, which together with newly discovered experiences highlighted new problems:

How to create a big, dense building that relates to and acknowledges the context?

How does a museum work? And how to create the best framework for a new museum?

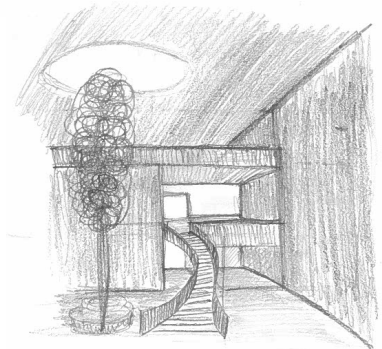
Who were Asger Jorn and Per Kirkeby and how should they influence the project?



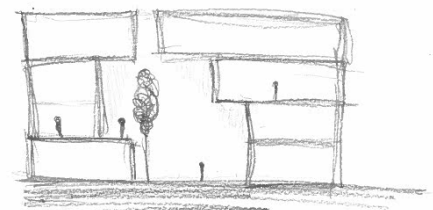
Big open space, focusing on organic shapes and materials



Greenery dividing the museum



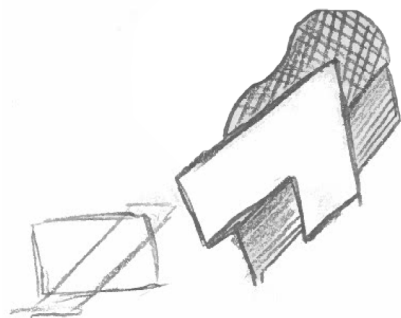
Hidden staircase for curiosity, skylights, and greenery



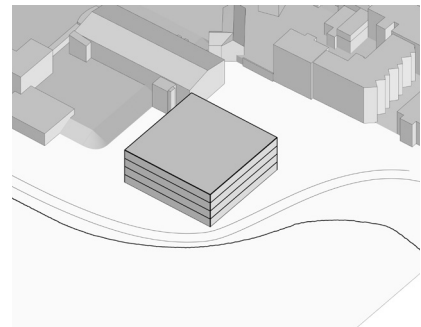
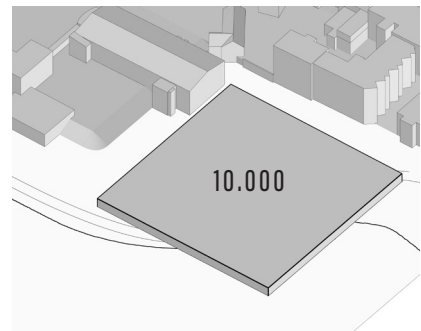
Varying ceiling heights to ensure visual contact



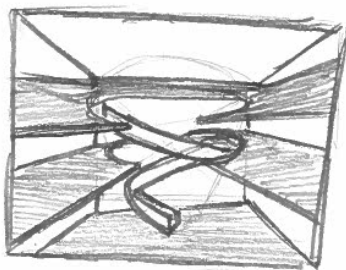
The new museum must act as a landmark for Silkeborg



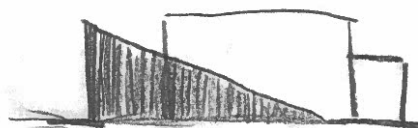
Building contrasting the landscape and the built environment of the city centre of Silkeborg



Volume distribution on site. How much is 10.000 sq.m?



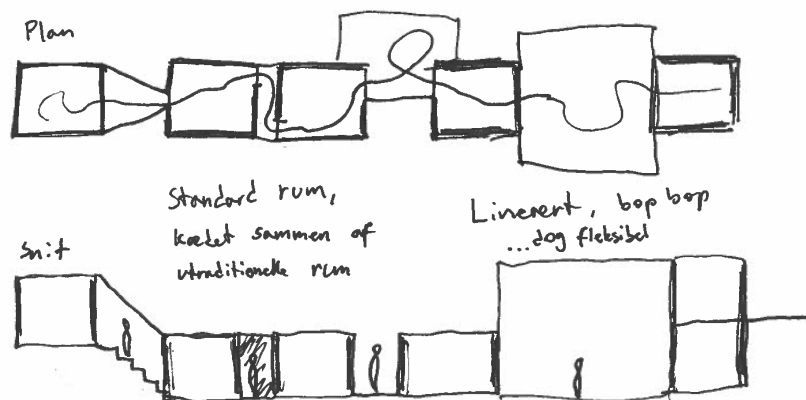
Central, organic staircase acting like a central artwork



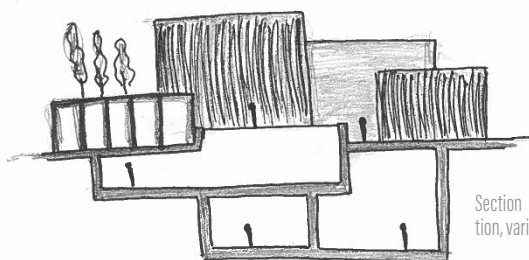
Roof merging with landscape, becoming an integrated part of the environment



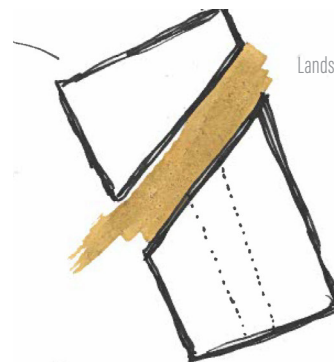
Smaller buildings on built landscape, connected under ground



Plan and section of exhibition path, with special contrasts



Section of underground exhibition, varying ceiling heights



Landscape cutting the building, creating a new flow

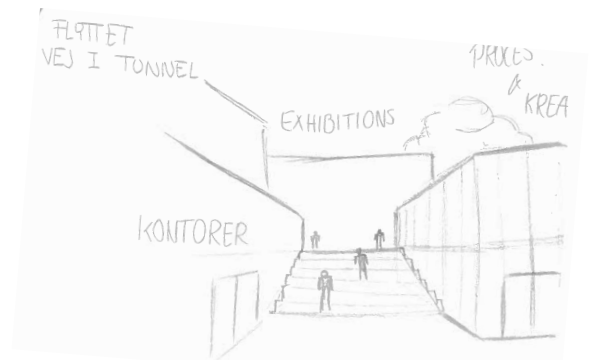
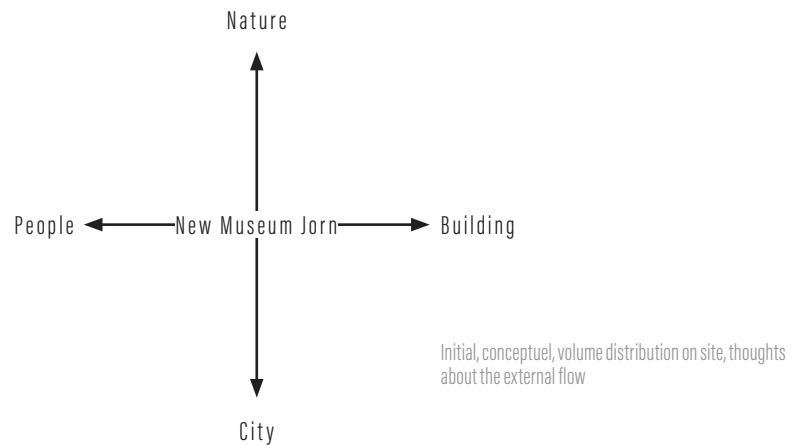
Relation to context

Chaos

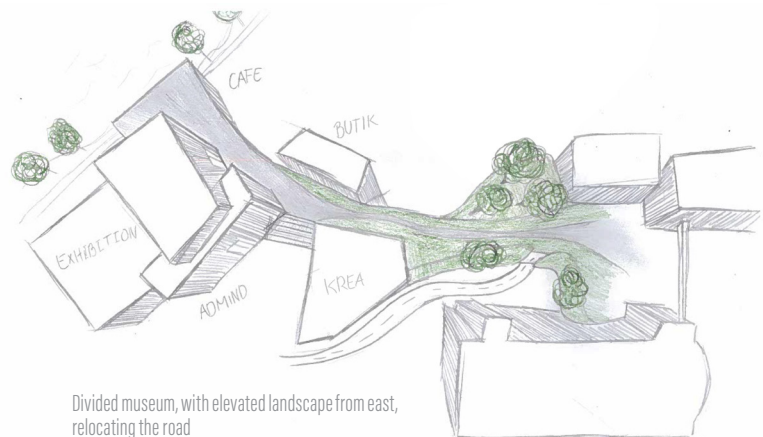
The new Museum Jorn will be placed just outside the centre of Silkeborg, making it important to maintain the relation to the city. Based on the site analysis, conceptual masterplans and building volumes were investigated, with the intent of creating a relation between the city centre and Silkeborg lakeside.

Functions

The building was divided into parts defined by its function. The first conceptual plans were made by placing the function into the context, where the functions could benefit from the existing environment, concerning different aspects such as sun orientation, view over nature, and the urban flow of people from the city centre. Throughout the different investigations, it became clear that the exhibition areas did not benefit notably from anything, due to the sensitiveness of the artwork. This was both good and bad, due to the other functions receiving an optimal placement, but it did not help shape the building because no placement could be rated better than others.



Point of view of museum relations, relating the the human scale



Divided museum, with elevated landscape from east, relocating the road

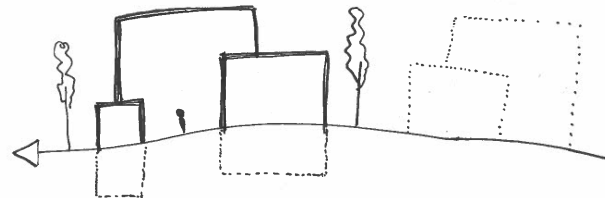
Relation to scale

Chaos

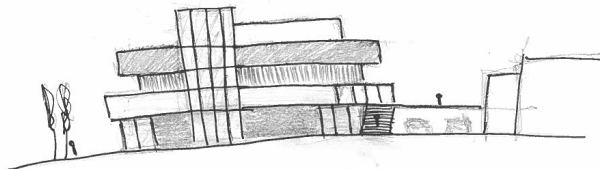
The main issue with the built environment at Silkeborg lakeside is the intimidating scale that stops abruptly towards the lake. Therefore, it was investigated how the museum could become an element, which dampens or softens the scale of the built environment.

The expected size of the museum and the wish for a pleasant outdoor area the perfect balance between the height and footprint of the building had to be found. To avoid the creation of the same situation as the existing one, the volume is parted into smaller pieces, creating a less massive volume even with the highest part matching the surrounding buildings. Also, the implementation of the artificial landscape in the south is beneficial for the experienced volume and the meeting with the building, wherefore, it is investigated how the landscape can be implemented in more places.

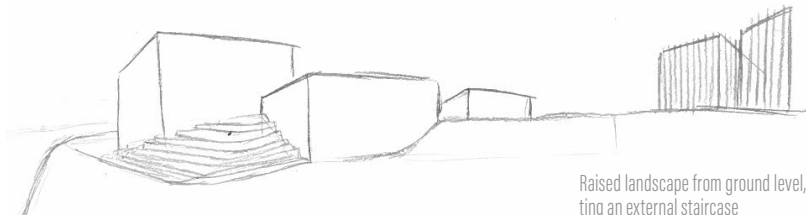
Extending the level of the landscape beyond the wall created by the context, the building would become an essential link for softening the scale of the context. Relating functions to the city also proved to be an important parameter, as it would establish a softer transition between the city and the lakeside.



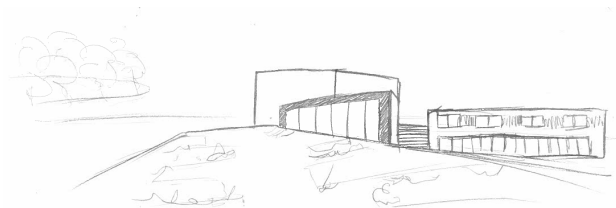
Downscaling the museum by digging the building down



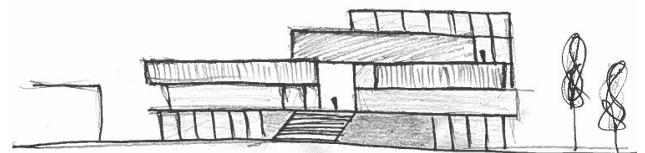
Downscaling the museum by dividing volume from west, disrupted materials



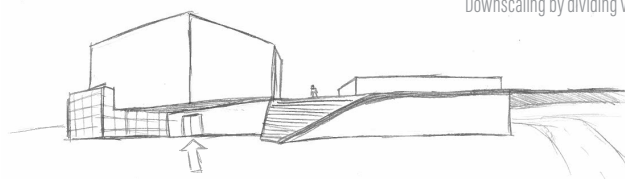
Raised landscape from ground level, creating an external staircase



Raised landscape, line of sight



Downscaling by dividing volume from south



Utilizing raised landscape to emphasize entrances

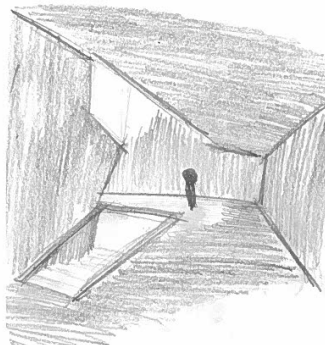
Architectural identity

Chaos

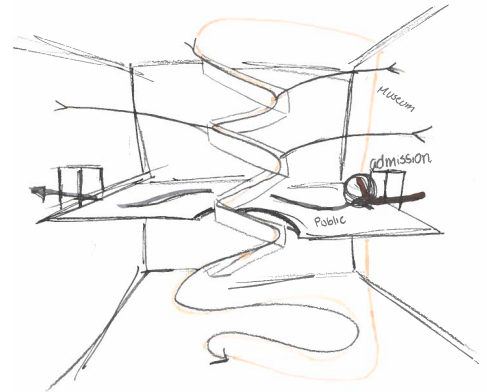
While the previous subjects were sketched upon, different architectural qualities would be tested to find a common identity for the building. They were spontaneous ideas or elements which were to be further investigated. The premise was that they could potentially steer the project towards a strong concept that could help find the overall shape.

The investigations and the conceptual plans led toward a mystique entrance/foyer that would make users of the building, whose purpose was not to go into the museum, would be intrigued and curious about the exhibitions. This idea was predicted a good spatial potential wherefore it was brought into further preparation.

The different proposals all had qualities and potential to elevate the project, but since they were designed outside of the building volume, introducing them to the different volumes proved difficult, wherefore the ideas with potential still had to be modeled into a building form, that still was not developed.



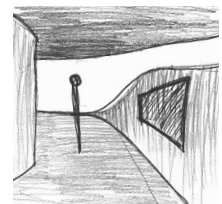
Atmosphere through light and geometric spaces



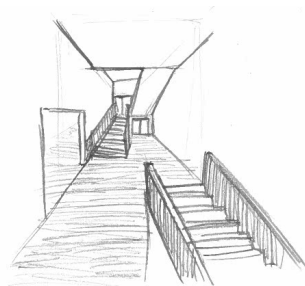
Concept of flow through building restricted to museum guests



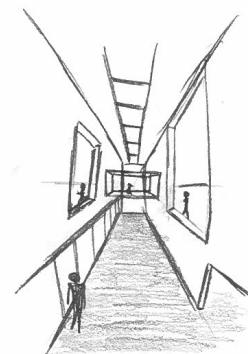
Atmosphere through light and organic spaces



Seamless transition between wall and window



Hallway with gradual staircases, thoughts on internal flow



Lowered museum with elevated openings to outdoor



Hallway with bridges creating mystery

Hovering platforms in the atrium



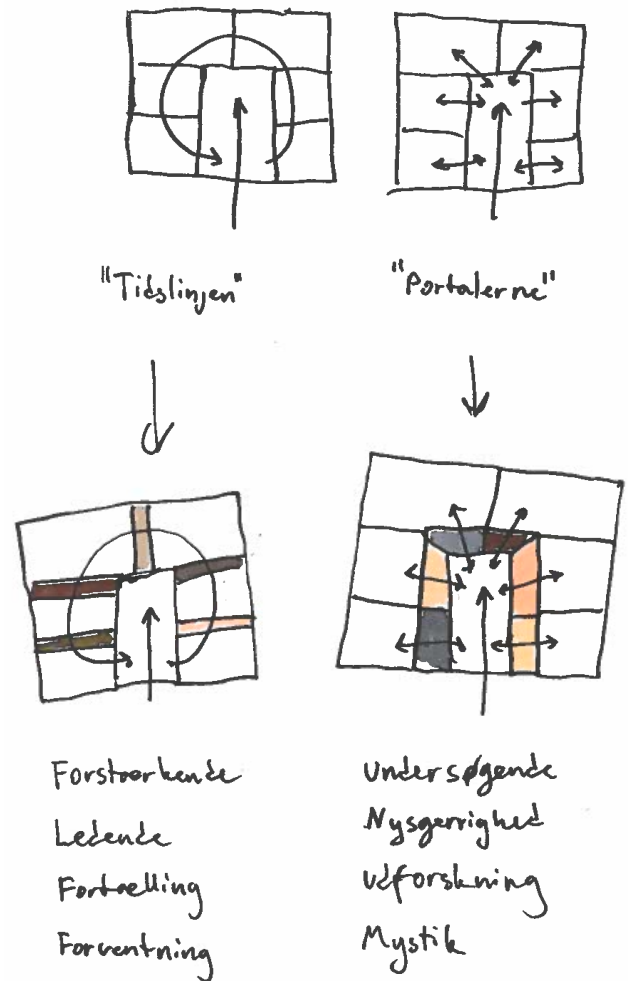
Circulation spaces

Chaos

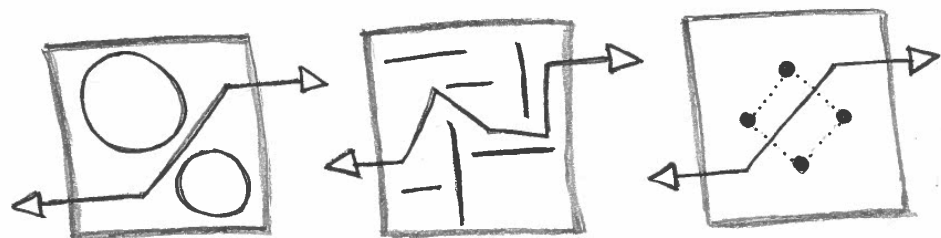
Based on theories of movement and circulation, investigations into how it would translate to spaces would commence. The goal was to achieve, in both plan and volume, good paths by the theory, for the best possible museum experience.

The vision of creating a new museum typology guided the process toward a dynamic museum experience. The new typology should be based on the new Danish museology and be more attractive to non-museum users by offering another experience than ordinary art museums, which was to be found in contrasted "portals" between exhibitions that should give the visitor the curiosity to explore the museum, by creating a visual attraction with colors, challenging shapes, and light. After several attempts, it was concluded that the portals conflicted with the optimal artwork setting in the exhibition, which is why the idea of colors and curved walls was let down.

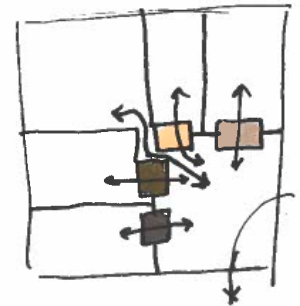
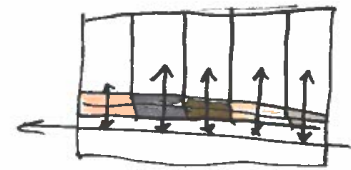
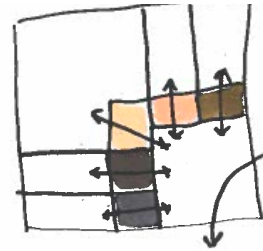
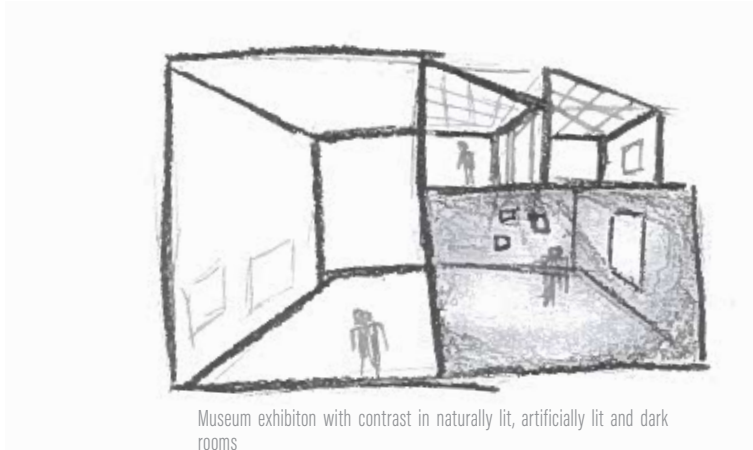
When looking into the existing Museum Jorn it became apparent that the museum has various exhibitions that are exhibited in a limited period, which could allude to the need for more flexible spaces. So instead of organizing a fixed plan solution, the focus was moved to create a flexible environment where the museum itself can arrange its exhibitions and where the contrast is to be found in room sizes and the use of light.



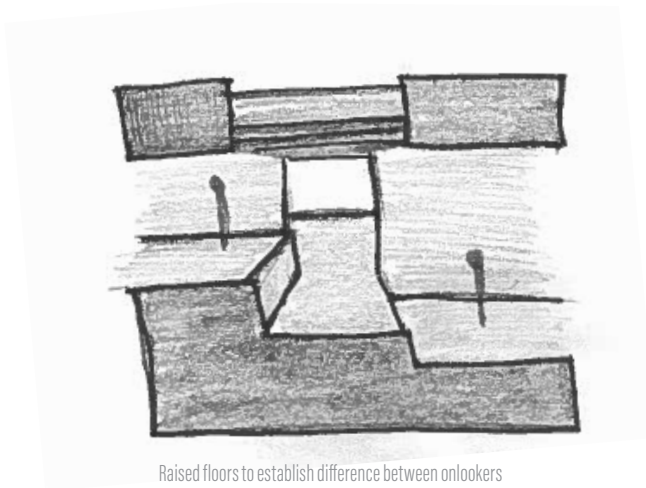
The "timeline" vs "portal" exhibition flows, with potential contrast rooms



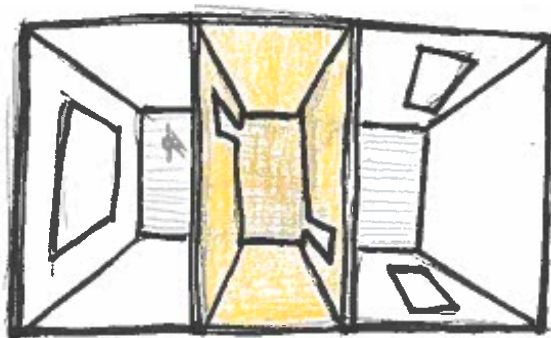
Different flow disruptions within identical boundaries



Contrasts as portals to exhibition rooms



Raised floors to establish difference between onlookers and museum guests



Light as contrast generator in portal to exhibition

The early iterations of spatial qualities created a guided path in which different contrasts and atmospheres could be explored. It later became apparent, that fixed plan solutions would not benefit the museum experience due to the lack of the possibility for renewal, which would create a less attractive museum over time. Therefore, the centre of art was to be left as flexible as possible, with the main attractions of Asger Jorn and Per Kirkeby as design parameters.



C h a o s **S t r u c t u r e**

Contrast

Designing with Kirkeby

Designing with Jorn

Grid and flexibility

•

D e t a i l i n g



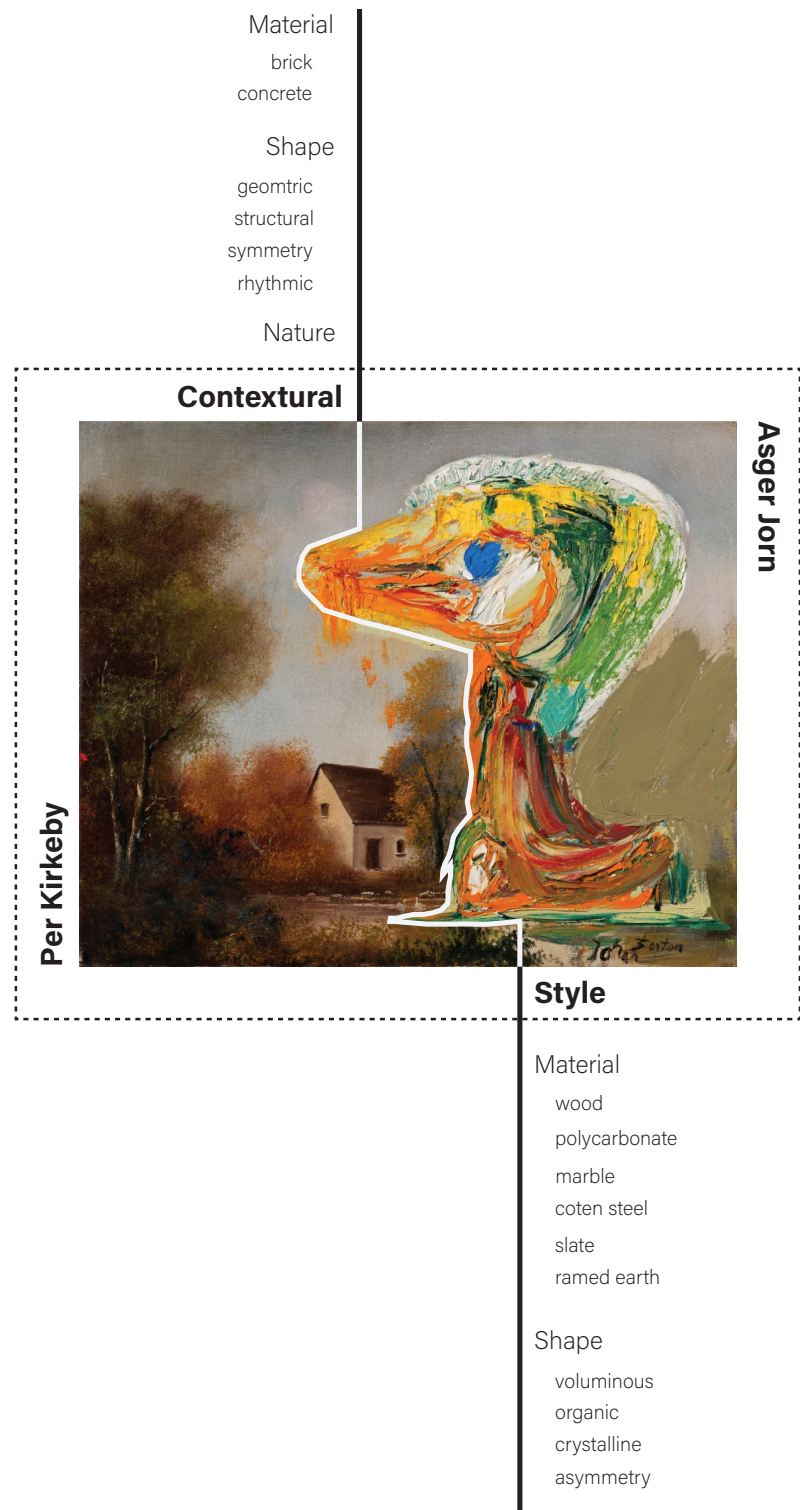
Contrasts

Structure

This phase in the design process was about creating more optimized and efficient solutions, that is trying to combine the previously chaos with knowledge and simulations to make qualified decisions.

Spatial qualities, Relation to context, Relation to scale, and Architectural qualities all provided a deeper understanding of how the building should be designed but lacked a method of how. The process was going in circles since there was not a clear overall concept.

The solution came to be the integration of Jorn and Kirkeby, by interpreting their artistic style. The concept bases itself on an analysis of the art piece, the disturbing duckling, in which there is a clear contrast between the existing and the added. This can be translated into the contrast between Jorn and the context. Per Kirkeby would perfectly suit the role of context, by using his artistic approach to analyse the surrounding nature and to utilize it as the premise for the building. As seen on Ill 65, it was cataloged which elements would fit Per Kirkeby and the context, and which elements would fit Asger Jorn and the contrast and disruption it would create.



Ill 65.

Concept diagram for implementation of Jorn and Kirkeby in New Museum Jorn

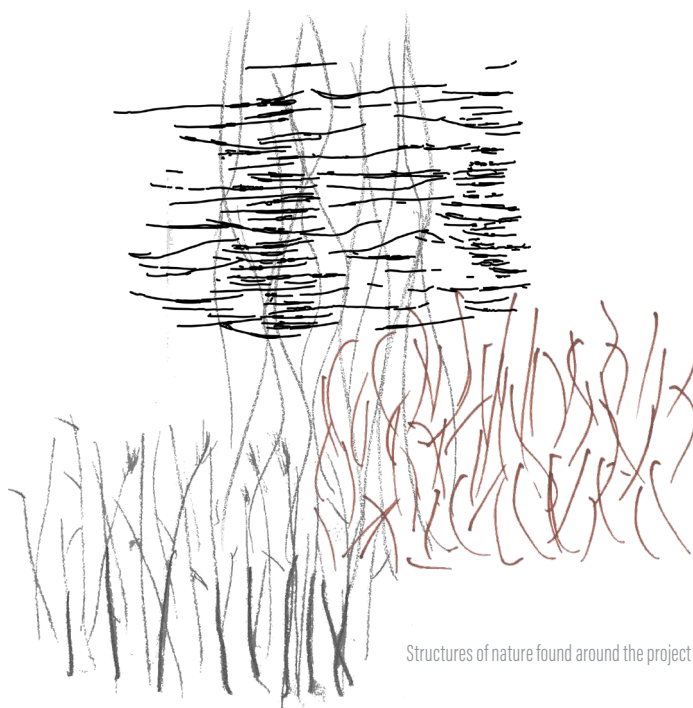
Designing with Kirkeby

Structure

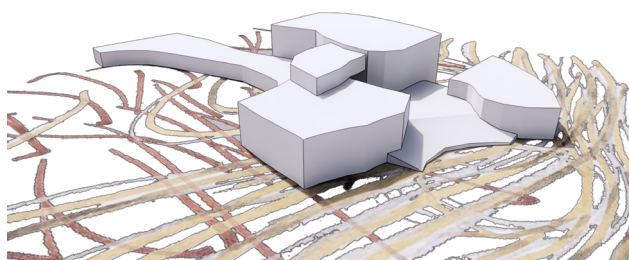
As it was difficult to collect the many design ideas an underlying structure created boundaries for the design, which was found in a structure based on Per Kirkeby's artistic approach. In a similar way to how Kirkeby sees structure in the world around him, nature in the context was interpreted in drawings of it. By overlapping the multiple drawings, the seemingly random lines would generate a multitude of random volumes.

The generated volumes were loosely based on the early iterations of functional distribution but were not created with function in mind. Therefore, the goal was to structure the random volumes, to achieve high functionality in the building.

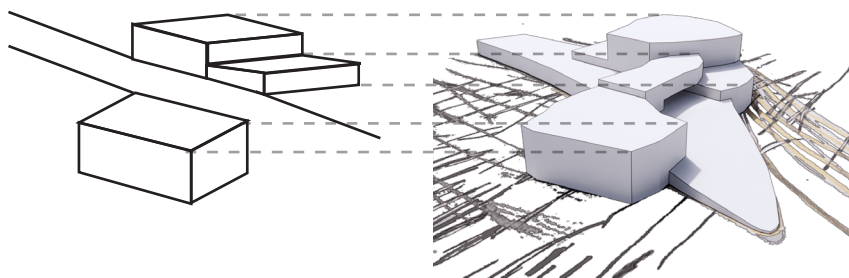
The functionality of the museum was achieved through a strict building shape, which fits the buildings in the context. This left the design without the intervention of Jorn, which would be required for furthering the design.



Structures of nature found around the project site



Example of volume generated based on Kirkeby principals



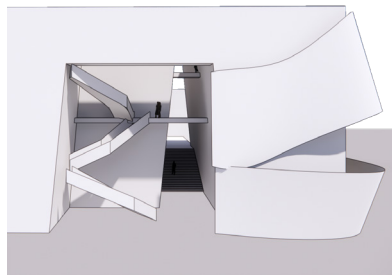
Example of volume generated based on Kirkeby principals, with placements of structured functions

Designing with Jorn

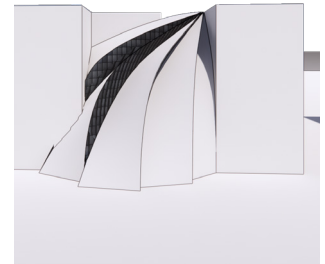
Structure

Jorn was intended to be an inspiration for the volumetric interlude in the building, and make the building stand out from and disrupt the context. But the scope of the disruption was yet to be determined. Therefore, investigations into what would disrupt, how it do it and the scale of disruption was to be investigated.

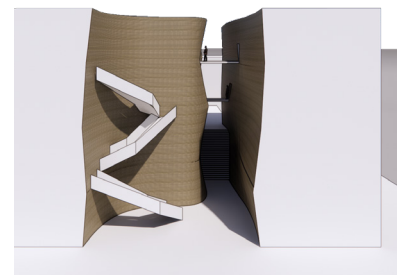
The many iterations span from the entire building being the disruptive element to a single detail disrupting the building and thereby the context. The relatively simple interventions proved to be most effective, as the contrast between building and intervention created tension and contrast in the design. Together with the knowledge about Kirkeby it was concluded that Jorn was to be found in a disruptive atrium and Kirkeby was to be found in the structure of the building.



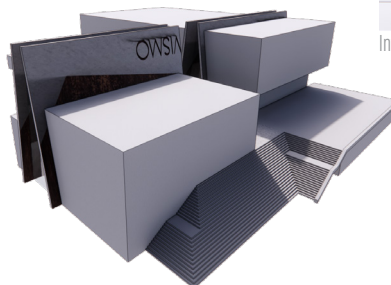
Atrium and staircase combined



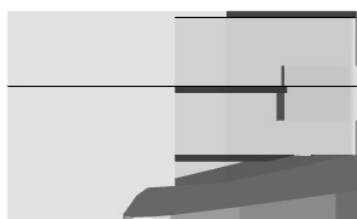
External expression of an organic disruptive atrium



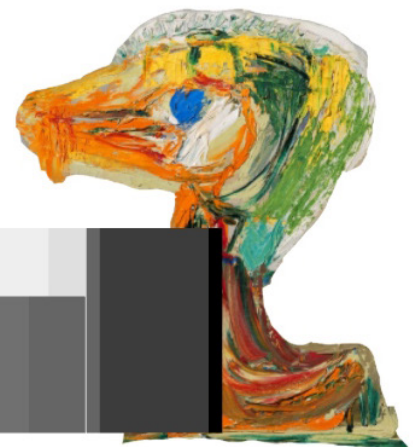
Internal organic atrium contrasting the geometric exterior



Atrium disrupting by dividing the building



Conceptual illustration of Atrium as disruptive element

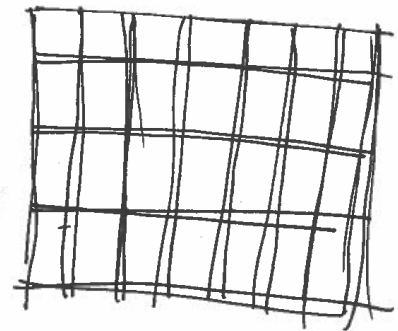


Grid and flexibility

Structure

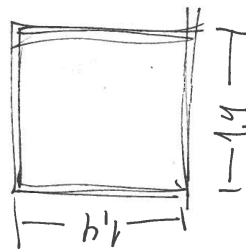
After deciding the building should have a strict structure, that should be disrupted by an atrium, it was evident that a grid solution should be investigated. The grid could have a beneficial effect on the practicability of the building both on the construction and the flexibility within. By constructing the building of columns and beams/plates of reinforced concrete, the weight is moved from the walls to the columns, which gives freedom to the placement of walls. This construction is simple and would be faster and cheaper to build than a specialized construction.

A high amount of flexibility is beneficial in the exhibition areas, due to the changing artworks and the possibility for the museum to adapt the building to their needs.

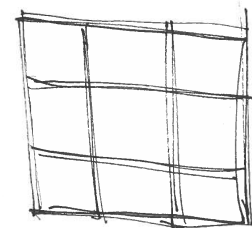


Initial grid as concept for structuring the museum, asymmetric

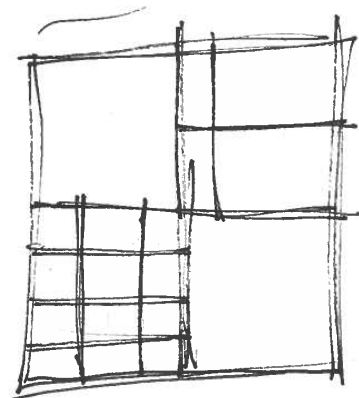
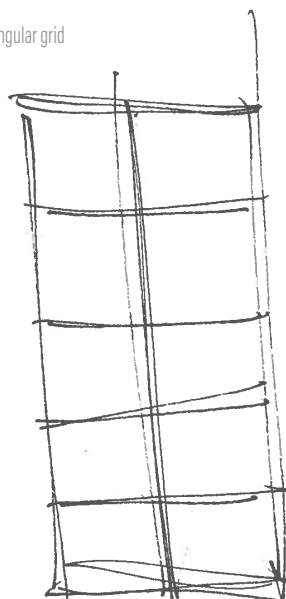
Buildability and standard dimensions



Square grid



Rectangular grid



Flexibility within master grid



C h a o s S t r u c t u r e D e t a i l s

Indoor environment

Ventilation rates

Daylight compliance

Ventilations rates/channels

Thermal comfort

Landscape

Materials



Indoor environment

Details

This phase summarises the previous phases, it combines design, investigations, simulations, and theory. It is important to highlight that the process is iterative and therefore has the technical aspect of this phase been done simultaneously with the early phases and been used as an evaluation tool.

The new Museum Jorn must ensure the requirements for the indoor environment set in the Danish Building Regulation in terms of temperature, airflow, and humidity. One of the challenges when designing a museum is how to handle the peak and non-peak hours energy-efficiently for the visitors concerning the strict requirements for the art condition.

Criteria for the thermal environment

The size of the ventilation system can in general be based on category II (DS/EN 16798-1:2019 DK NA:2021), which in most cases is recommended in Denmark.

The various internal functions of the museum seek different ventilation strategies. For the same reason, the investigations are preliminaries to the most critical functions which are chosen to be the office and the exhibition area. The art condition is decisive for the design criteria in terms of temperature range and lightning in the exhibition area.

Thermal environment	Category	Description
Use (DS/EN 16798-1:2019 DK NA:2021, table)	II	Normal use
Thermal dissatisfied (DS/EN 16798-1:2019 DK NA:2021, table NA. 1)	II	PPD%<10 -0,5<PMV<0,5
Building pollution (DS/EN 16798-1:2019 DK NA:2021, table NA.7)	II	Low pollution 0,7 l/s
People pollution (DS/EN 16798-1:2019 DK NA:2021, table NA.6)	II	Expected PPD%<20 Airflow: 0,7 l/s pr. person
Co2 pollution (DS/EN 16798-1:2019 DK NA:2021, table NA. 9)	II	800 ppm above outdoor

III 69. Designcriteria for thermal enviroment

Offices

Criteria of the indoor environment	Category	Design criteria
Temperature range (DS/EN 16798-1:2019 DK NA:2021, table NA. 5)	II	20-24 degrees
Air quality indicator, CO2	II	800 ppm
Ventilation rate	II	1 l/s m ²
Lighting		>500 Lux
Acoustic environment		< 35 dB
Humidity	II	50%

III 70. Designcriteria for indoor enviroment in offices

Museum

Criteria of the indoor environment	Category	Design criteria
Temperature range (DS/EN 16798-1:2019 DK NA:2021, table NA. 5)	II	18-20 degrees
Air quality indicator, CO2	II	800 ppm
Ventilation rate	II	1 l/s m ²
Lighting	Defined by art conditions	>200 Lux
Acoustic environment		< 35 dB
Humidity	II	50%

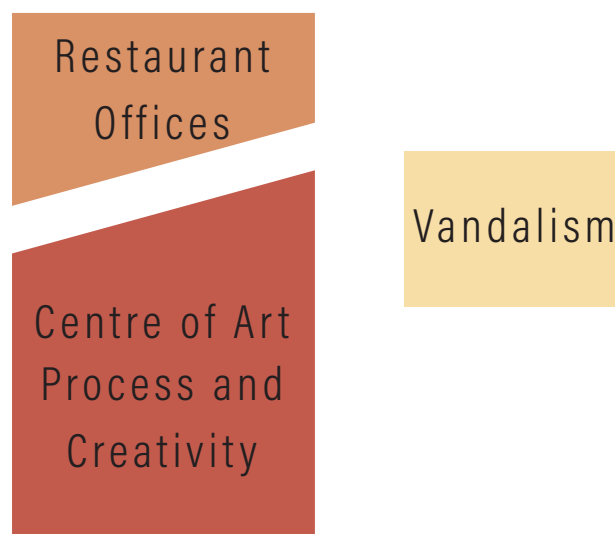
III 71. Designcriteria for indoor enviroment in museum

Ventilation rates

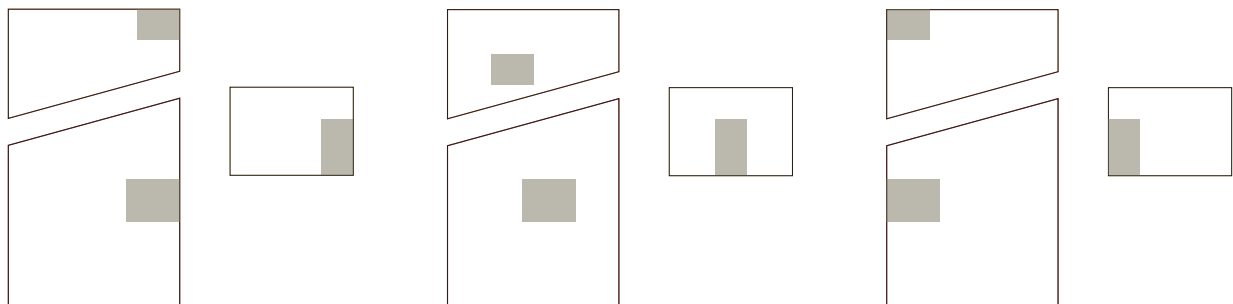
Details

Concerning the initial floor plans, different ventilation strategies were investigated. The chosen ventilation strategy for the museum is a decentral VAV system with displacement ventilation due to the various number of visitors during the day and the strict art requirements. The idea with a VAV system is to be able to adapt the air volume to the current ventilation needs so that only the required air volume is ventilated.

The buildings were divided into three ventilation zones with the same indoor environment requirements: the museum and the process and creativity zone, the restaurant, bar, and office zone, and the institute of vandalism zone. The division calls for an investigation of the size and placement of a technical core, which consists of toilets, an elevator, a cleaning room, and a technical room.



III 72. Distribution of ventilation zones



Flow, circulation, and initial static circumstances, the technical core was chosen to be placed in the middle of the building. About the further floor plan investigations, several calculations for the ventilation rate were made, to ensure optimal space for the technical room, the channel system, and the ventilation aggregate. The most critical ventilation zone of the building will, due to the strict art condition and the various number of visitors, be the museum part of the building. For the same reason, this zone is chosen as a guideline for the dimensioning of the other zones.

The total ventilation rate depends on the visitor density, floor area, and building type. The rate is calculated for the museum part of the building, including the exhibition, store, foyer, wardrobe, etc.

To ensure the optimal and desired indoor environment in the museum, the dimensioning is made concerning Danish Standards, Building Requirements, and CO₂ pollution defined in category II. By simplifying the iterations, the investigations were mainly made for the total part of the museum.

To the table and the hand calculation, the maximum in- and outtake for the ventilation rate are given by the Danish Standards. 3198,9 l/s and 0,7 h⁻¹. This means that the ventilation aggregate needs to handle 3,1 m³/s. Hand calculations and the chosen aggregate will be found in appendix 01.

Museum

Museum	Dimension			People load
Description	Floor area [m ²]	Ceiling height [m]	Volume [m ³]	People [Adult]
Exhibition +3	630	4,2	2646	30
Exhibition 2	1375	4,2	5775	30
Exhibition 1	1530	4,2	6426	30
Foyer	103	4,2	432,6	30
Store	90	4,2	378	30
Wardrobe	74	4,2	45	30
Total	3802	4,2	15968,4	300

III 76. Table of ventilation parameters

DS/EN 16798-1:2019 DK NA:2021					
Dimensioning	[l/s pr. person]	[l/s pr. m ²]	[l/s]	In [l/s]	Out [h ⁻¹]
Total	7	0,7	4761,4	4761,4	1,1
BR-requirements (minimum)					
Total	5	0,35	2830,7	2830,7	0,6
CO ₂					
	Activity [met]	Outdoor pollution [m ³ /m ³]	Desired indoor environment [m ³ /m ³]	In [l/s]	Out [h ⁻¹]
Total	1,4	0,000380	0,001	3198,9	0,7

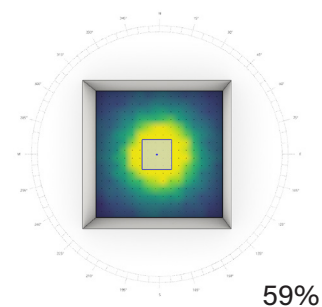
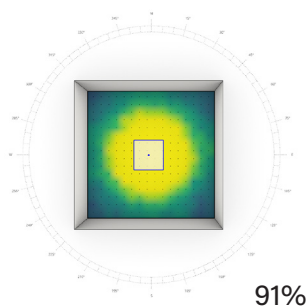
III 77. Table of key values for ventilation rate calculation

Daylight compliance

Details

Choosing the right type of window and window glass influences the amount of daylight penetrating the windowpane. When adding more layers of glass to achieve a better u-value and thus a better building envelope, the glass tends to gain a greenish tinge, due to the decrease in the light transmittance (LT) and total light energy transmittance (G). While the color tinge can change

the aesthetics of the room, the LT-value changes the amount of light reaching the room. The LT-value and G-value are linear and cohesive, which defines that when decreasing the daylight reaching the room, the passive energy reaching the room also decreases and causes a positive or negative impact on the energy frame depending on the need and orientation of the building.



Ill 78. Different transmittance

Offices

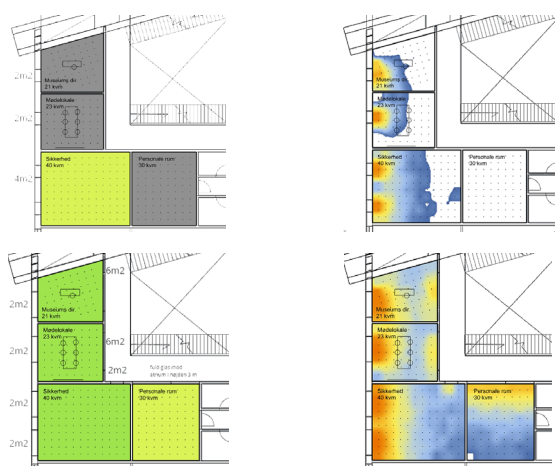
By utilizing daylight as an integrated design parameter, it is possible to optimize the experienced comfort and energy consumption within a building. The Danish building regulation determines the level of daylight depending on the specific use of the room, while ten percent of the relevant floor area often can be used as guidance for needed window areas, some rooms need a more in-depth calculation method, whereas the calculation for daylight provision defined in DS/EN17037 (Danish and European standard) is used to ensure the illuminance level reaches above the minimum. (Bygningsreglementet, 2022.)

The calculation method is based on two daylight aspects, which both need to be fulfilled (Daylight Provision, u.å.):

Target illuminance: 300 lux over 50% of floor area for at least 50% of daylight hours.

Minimum illuminance: 100 lux over 95% of floor area for at least 50% of daylight hours.

This method is especially relevant in the office department, due to the building regulation defining a workstation as achieving 300 lux at a desk height of 85 cm.



III 79. Generapass/fail for individual rooms

Description	Sqm	Spacing	Taget	Minimun
Curator	21,21	0,61	Fail	Minimun
Personal	31,5	0,61	Fail	Fail
Security	43,6	0,61	Minimun	Minimun
Meeting	23,1	0,61	Fail	Minimun

Description	Sqm	Spacing	Taget	Minimun
Curator	21,21	0,61	Medium	Medium
Personal	31,5	0,61	Minimun	Medium
Security	43,6	0,61	Medium	Medium
Meeting	23,1	0,61	Medium	Medium

III 80. Results of detailed daylight investigation

Museum

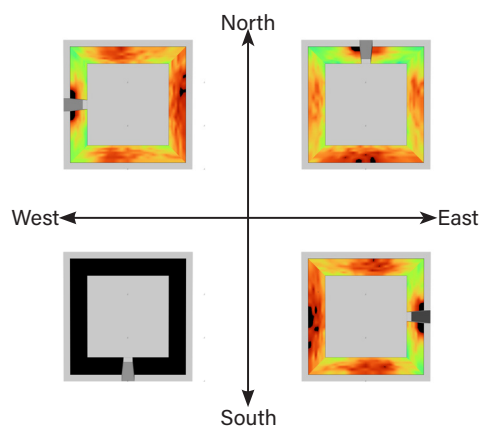
In contradistinction, to the offices, the building regulation does not dictate strict daylight levels for a museum typology, instead, it is the exhibition itself that resolves the need. The paintings are sensitive to light, wherefore, the achieved light can never reach 200 lux or be exposed to direct sunlight, which moves the focus area to exhibition areas on the vertical wall.

First, an investigation was made to compare the amount of light penetrating the window from all directions. It became clear that windows toward the south should be used very cautiously, if they should be used at all, due to the much larger amount of sun reaching the interior walls.

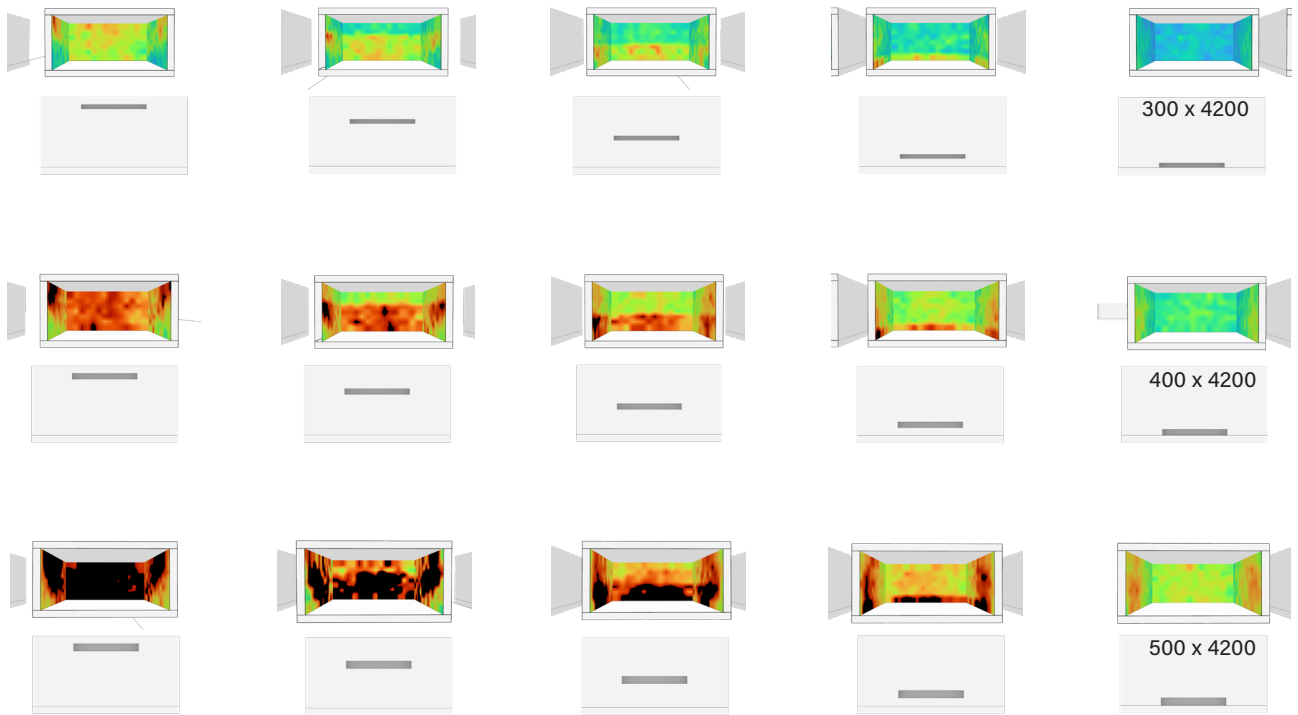
The placement of long and slender windows was investigated, which demonstrated that using horizontal windows instead of vertical windows would allow more glass in the building façade and more evenly distributed daylight in the room.

Skylights have been investigated, which, as expected, firstly gave overlit results. By working with size and orientation, it was possible to lower the lux level below the maximum on the sunniest day of the year. By working with mainly diffuse northern light, it was possible to eliminate the chances of direct sunlight.

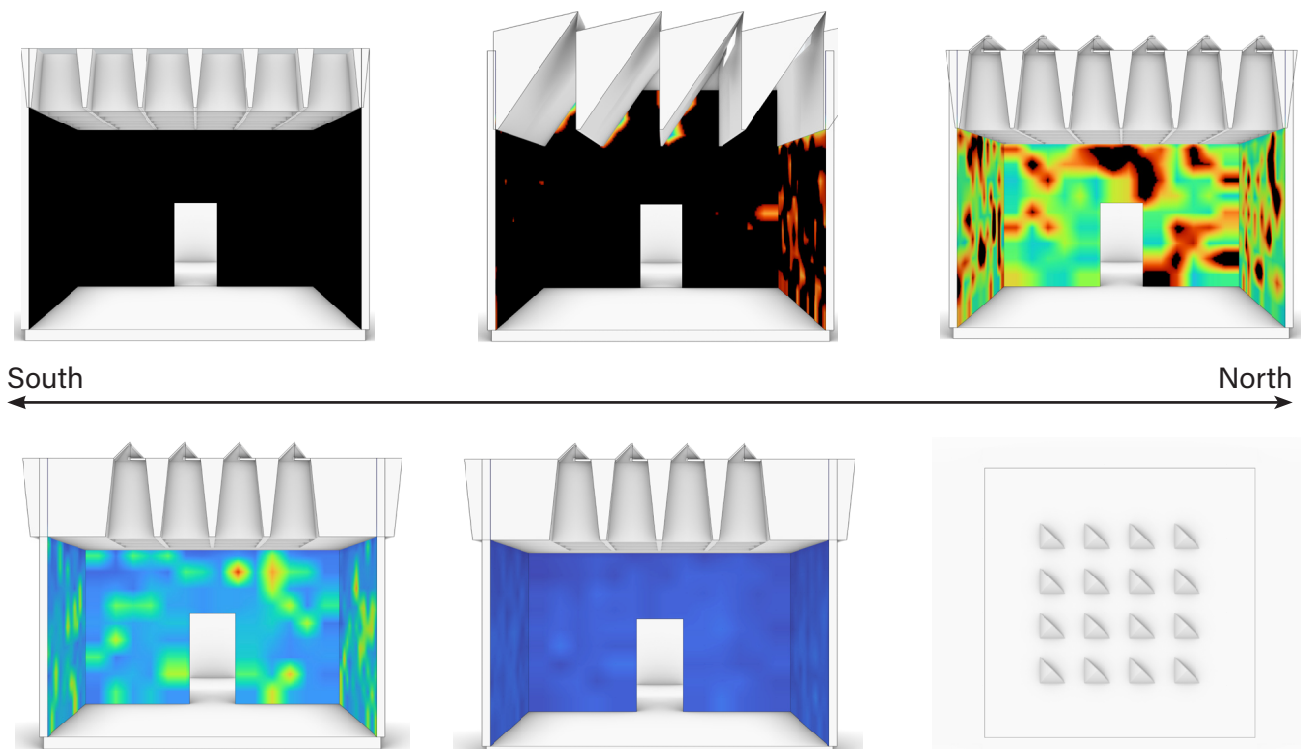
The ceramics will be displayed in exhibition cases in which optimal light conditions are controlled by artificial lights to avoid reflection glare.



III 81. Investigation of light distribution on exhibition wall in relation to orientation



III 82. Investigation of impact on exhibition walls for window size and placement on 2nd floor



III 83. Investigation of impact on exhibition walls for wedge design on 3rd floor

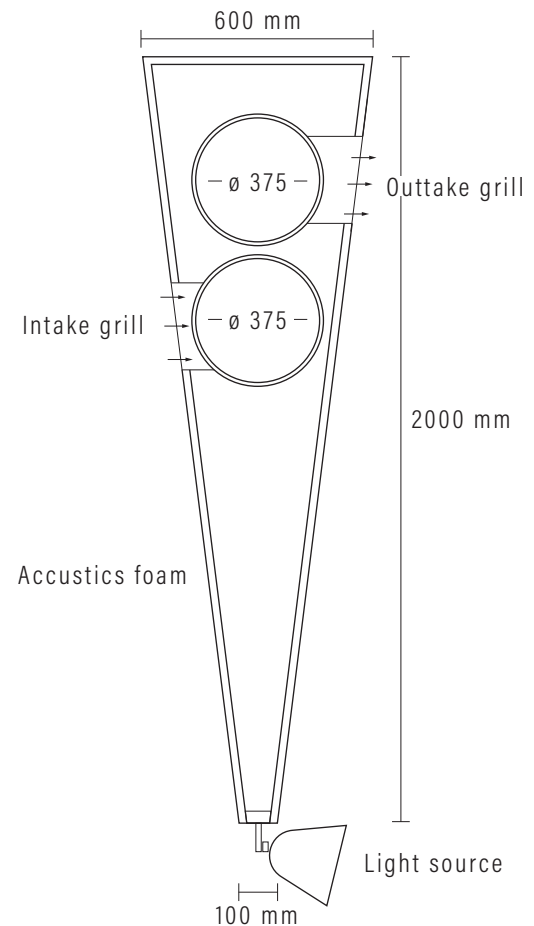
Ventilation rate/channels

Details

The invention of skylights and wedges opens new possibilities. The necessary “waste” area in the wedges is an ideal placement for ventilation channels, by placing the channels in the dropped ceiling, the channels will not interfere with the visual expression of the room and therefore not take away focus from the exhibition. The channel placement in the ceiling, also adds to the flexibility of the room since the placement of the replaceable exhibition walls will not interfere with the airflow to and from the room.

To ensure the channels fits into the gap between the skylights, a conceptual dimensioning of the main channel has been done simultaneously with the previously LUX investigation, to find an appropriate size for the gap, without deprioritizing the aesthetics and daylight. The wedge can be beneficial in terms of possibilities regarding the construction of the roof and the integration of acoustic panels.

The table shows the calculated ventilation rate for the main channel and the suitable channel sizes. To keep the calculation on a conceptual level the dimensioning is done pr. Floor and not pr. Room to make sure the channels will fit into the shafts combining the floors.



III 85. Multipurpose Wedge

Cross-section		3 level	2 level	1 level	0 level
[mm]	[m3/s]	1,06	1,06	1,06	0,99
200	0,03	33,94	33,94	10,18	31,57
225	0,04	26,83	26,83	8,05	24,95
250	0,05	21,73	21,73		20,21
275	0,06	17,96	17,96		16,70
300	0,07	15,09	15,09		14,04
325	0,08	12,86	12,86		11,96
350	0,10	11,08	11,08		10,31
375	0,11	9,67	9,67		8,98
400	0,12				

III 84. Central channel

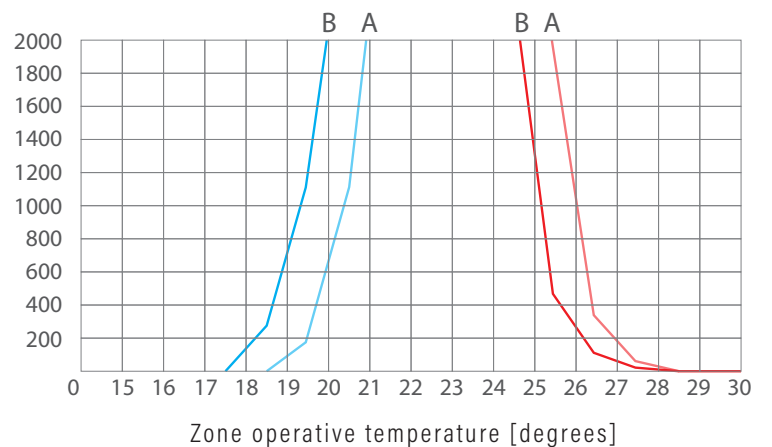
Thermal comfort

Details

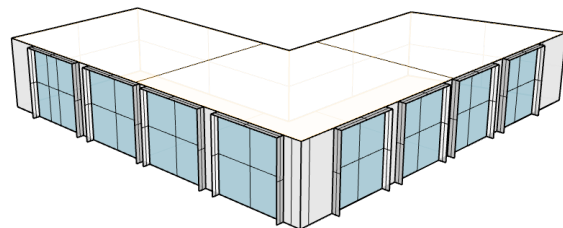
The museum is housing multiple functions, which have different thermal requirements. Therefore, a multizone model made in Climate Studio is utilized during the design process for an integrated evaluation of different proposals. The simulations are based on DRY 2013 for Denmark, providing a standardized depiction of thermal comfort.

The Centre of Art has very strict conditions which suggest a highly regulated system, which supports the preservation of the art. Whereas the office spaces, the bar, and the restaurant fall under standard regulations. For functions other than the museum, the temperatures must not exceed 26 degrees for more than 100 hours, and 25 hours over 27 degrees, during occupied hours. The process of designing for thermal comfort is about achieving the required comfort levels while maintaining the desired architectural expression and quality.

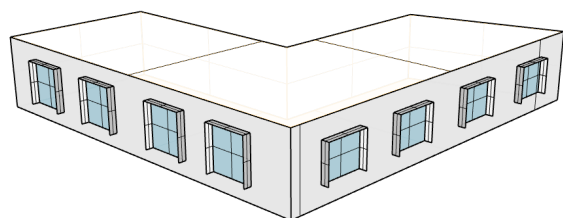
Restaurant



III 88. Cumulative hours above temperature



III 86. A: Northern facade 56 squaremeters of glass, Western facade 50 squaremeters of glass



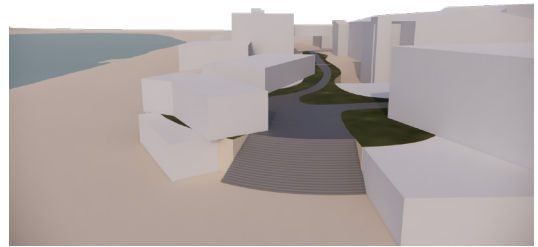
III 87. B: Northern facade 16 squaremeters of glass, Western facade 14 squaremeters of glass

Landscape

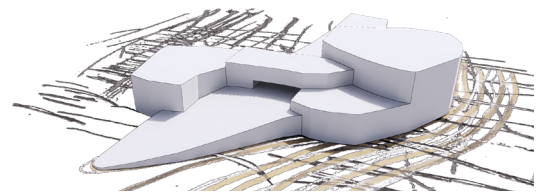
Details

A direct connection from the city centre to the museum is expected to be an advantage for the museum and the surrounding area. The entire lakefront could become an active part of the inner city if the new area is inviting and encourage the users to become an active part of it. An artificial landscape that combines the area through a gradual transition can be embellishment using greenery. A random seemed landscape can also be beneficial when it comes to integrating accessibility as an integrated part of the outdoor environment compared to an add-on ramp, which was investigated beforehand. A normal accessibility ramp looked tremendous and massive compared to the area, due to the necessary length of over 100m, when raising a level, if the ramp had to comply with the Danish Building Regulation. The ramp should be a more natural part of the area, when using local greenery, the artificial landscape can draw parallels to the greenery in the city centre and the nature surrounding the site.

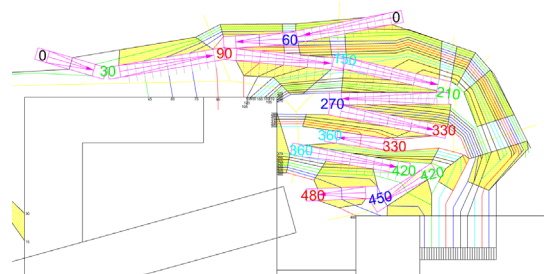
The cavity beneath the landscape, created the possibility of creating an exhibition room with a very special atmosphere with no daylight, which is the optimal condition to exhibit sculptures and ceramic in glass displays, that due to the reflections and durability of the artworks are displayed best with artificial lights.



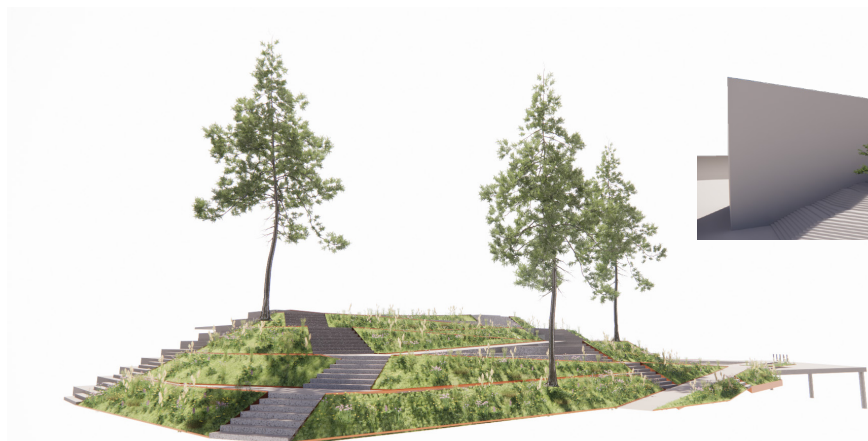
Early concept of raised landscape, internal flow



Raised landscape based on Kirkeby structure



Ramp design for landscape



Vegetation and detailing koncept for landscape



Landscape as disruptive element

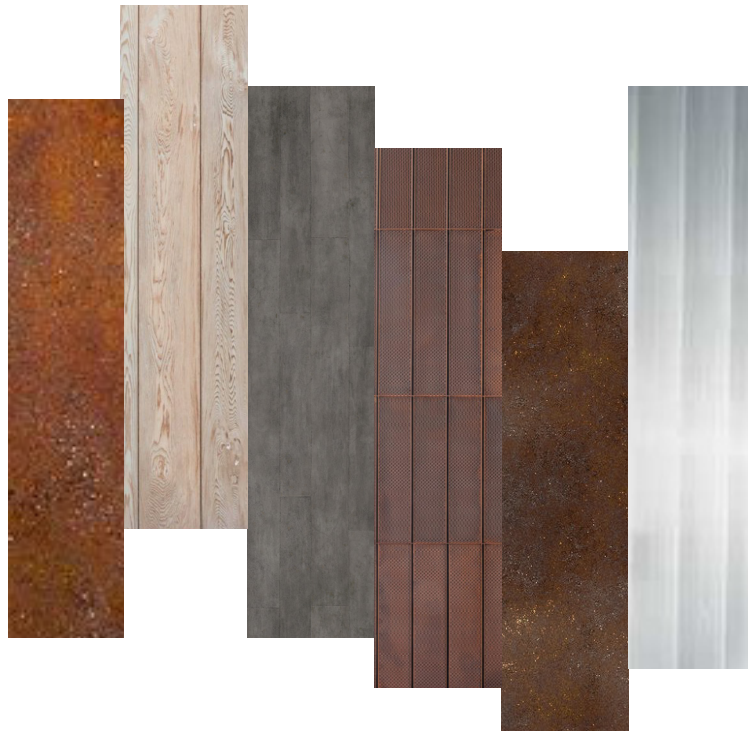
Materials

Details

Materials were investigated in both aesthetics and LCA. Based on the Jorn/Kirkeby concept, contrast and disruption, the material became part of the narrative. It was a matter of placing the contrast as intended, but investigations into where that was were required. The question of contrast/relation in the material choice was discussed, and proposals of materials fitting to the context, and distancing themselves from it, were investigated.

Conclusion

Based on the investigations, the materials worked best when relating to the intentions of the element it was part of. Wherefore, the base of the building, which is made to fit the context, would have materials enhancing this detail. The atrium would contrary to this, be made with materials, underlining its disruption, which emphasized the overall concept for the form of the building: If everything disturbs, nothing disturbs.





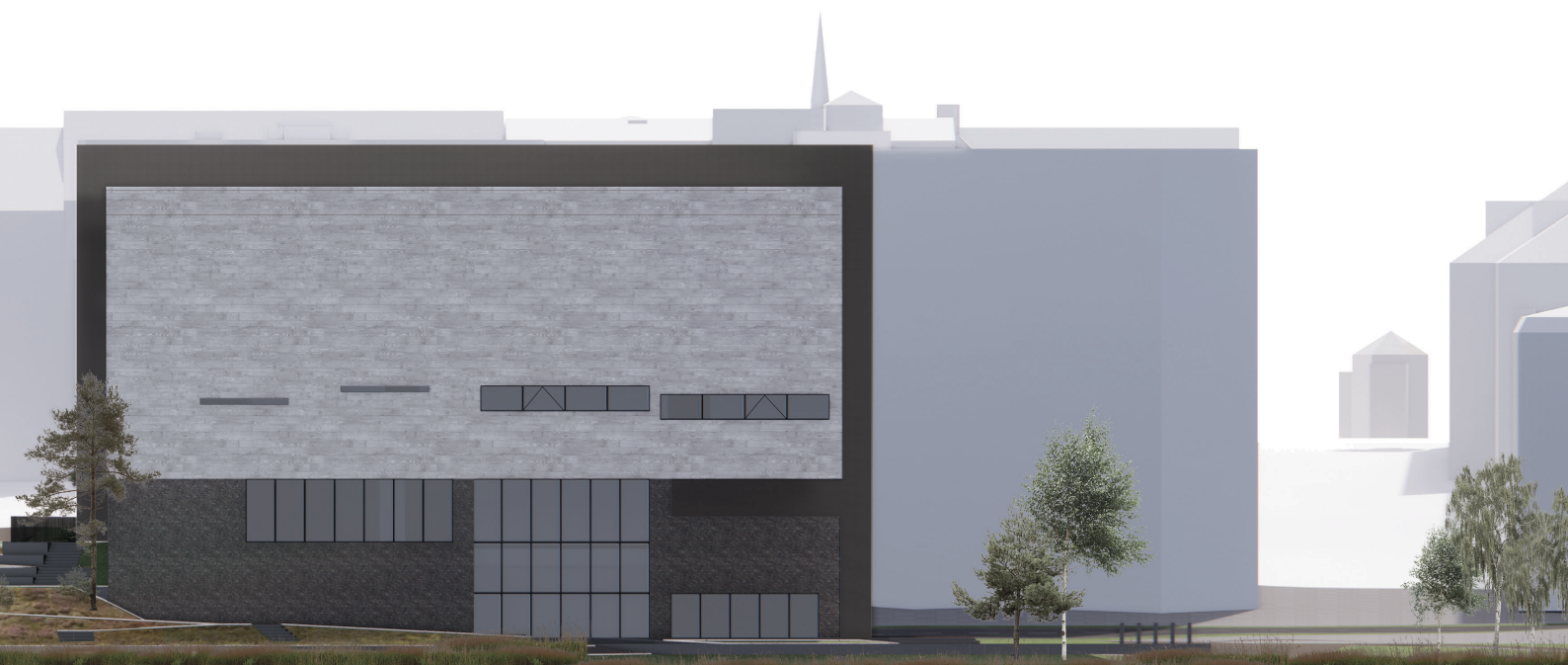


09 PRENSTATION

This master thesis will rethink the New Museum Jorn as a multifunctional, cultural institution, by creating a new kind of experience and perception of an art museum. The New Museum Jorn shall, through its architecture, accommodate and emphasize wild and untamed kinds of experimental creativity, while creating more value in the urban context of Silkeborg city.

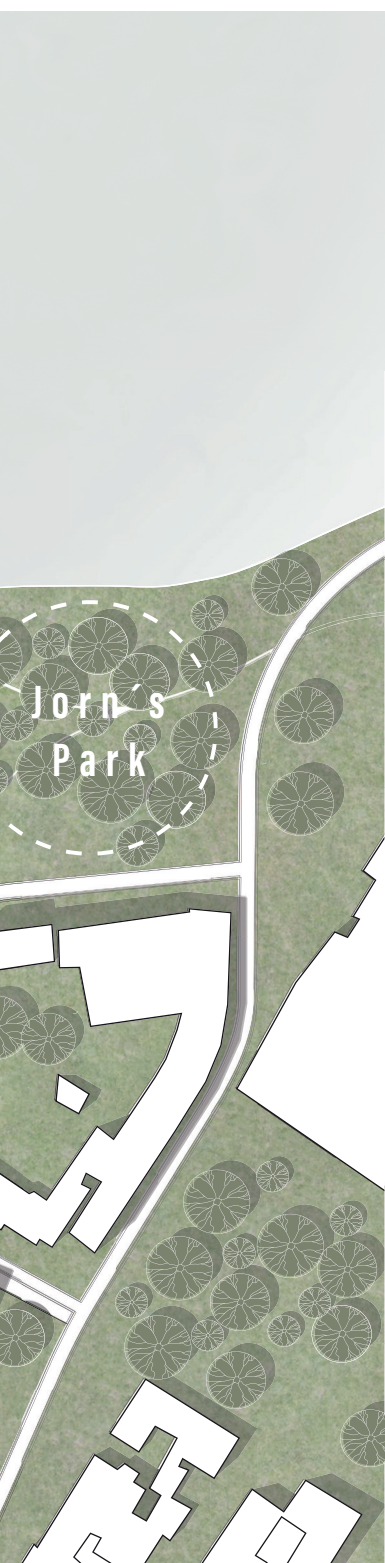
By utilizing aspects of sustainability and the Vitruvian way of thinking architecture, the New Museum Jorn seeks to create a unique sensory experience by making static and thermal engineering solutions articulate the architectural quality by challenging the human perception of the atmosphere.







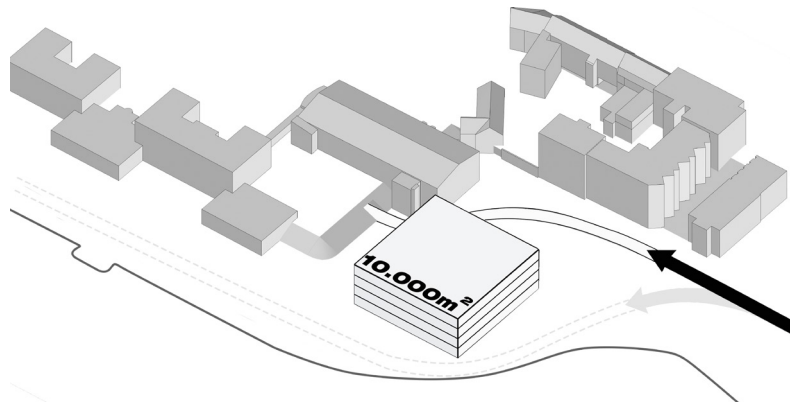
III 93. Masterplan 1:2000 ☉



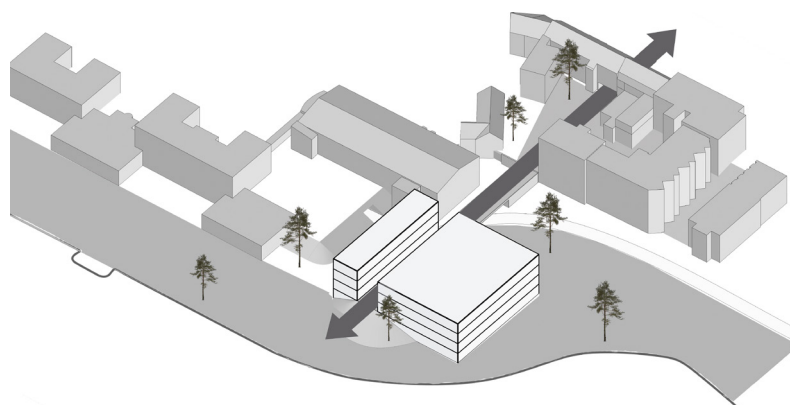
M a s t e r p l a n

The lakeside of Silkeborg city has been re-envisioned as an area combining urban activities with nature. The masterplan of the area enables citizens and visitors of Silkeborg, more integrated the use of nature more during their visit to the city. Smooth transitions between the elevated city center and the lakeside, allow people unhindered access to the lakeside regardless of physical capabilities.

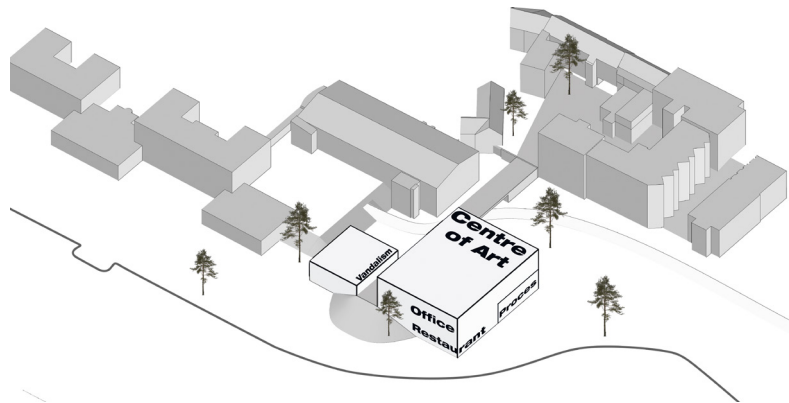
Concept



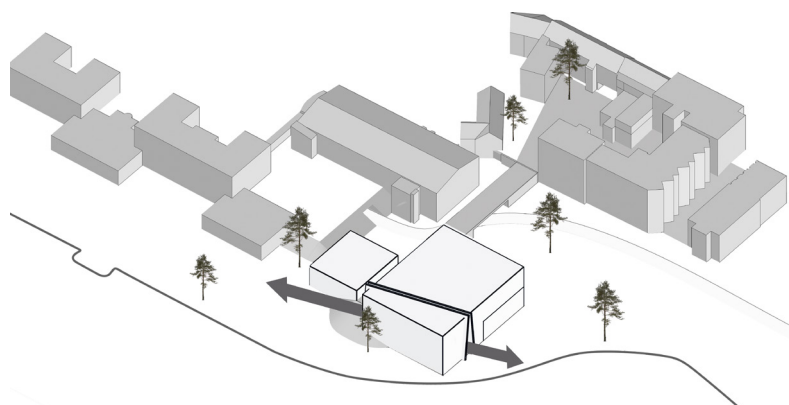
Relocating Søvej going south of the project site, creating a recreative lakeside



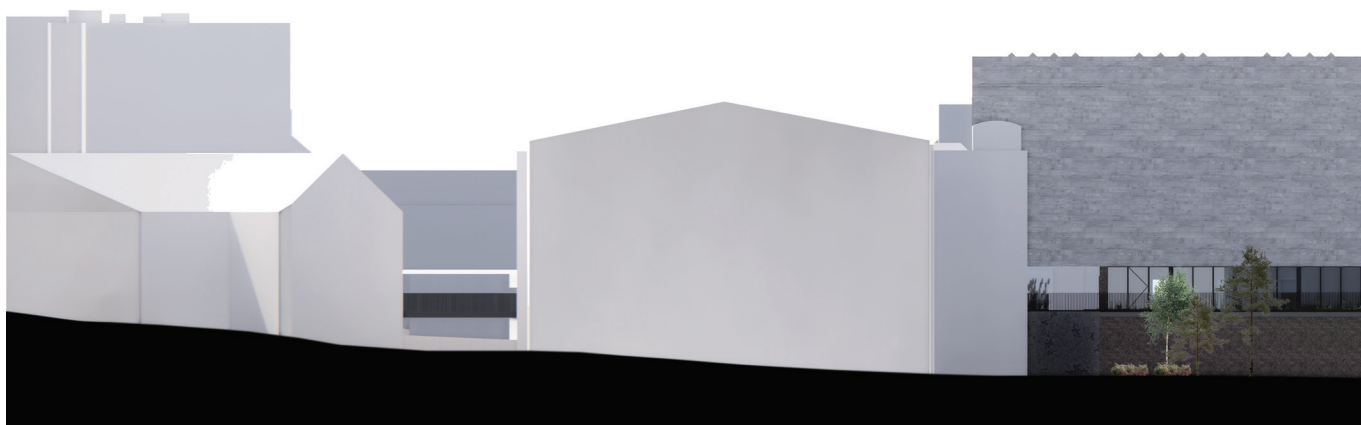
Urban connection from the city centre to nature through line of sight



Function placement for optimal thermal comfort and internal relations



Architectural disruption



III 95. Eastern facade 1:500

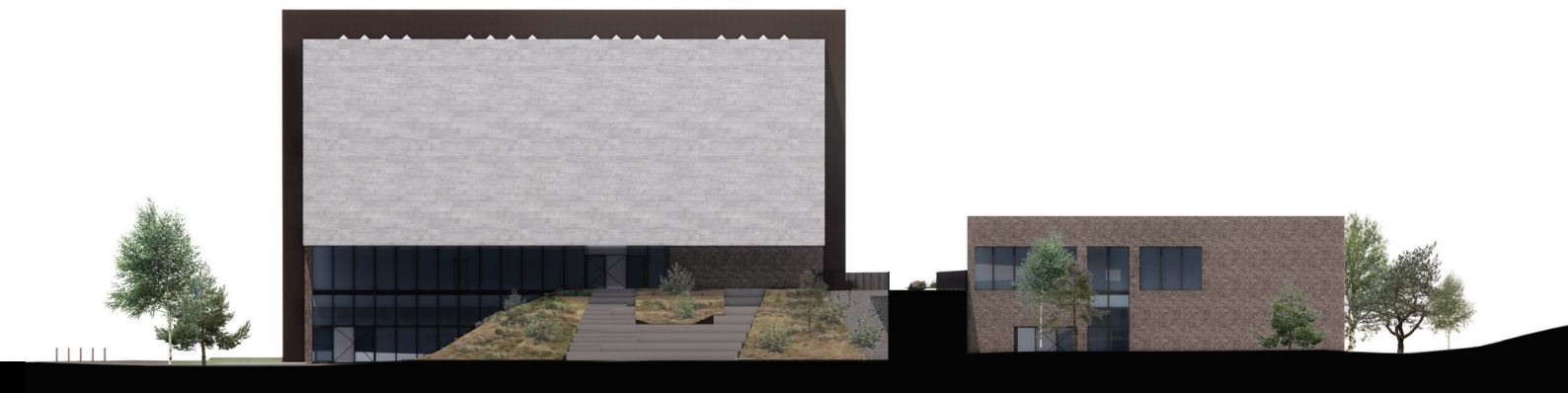


III 96. Eastern facade 1:500



Urban Connection

When arriving at the museum from the city, people are led by a straight and clear path, with the lake and nature unfolding themselves at the end. Nature is visible for the entire path and becomes an attractive frame for visitors. The elevated landscape serves as a downscaling of the built environment while allowing the museum to resemble the context in volume.

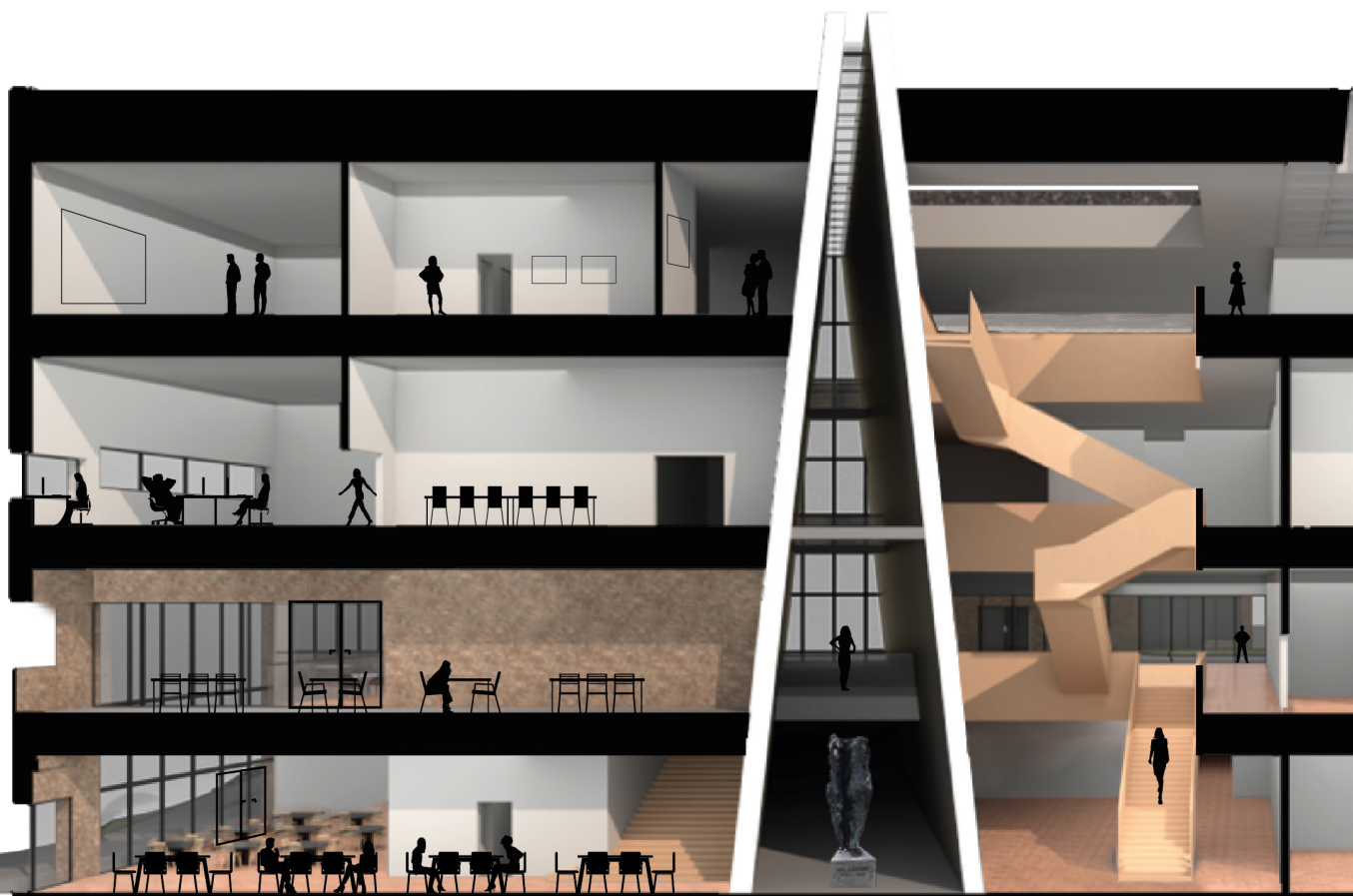


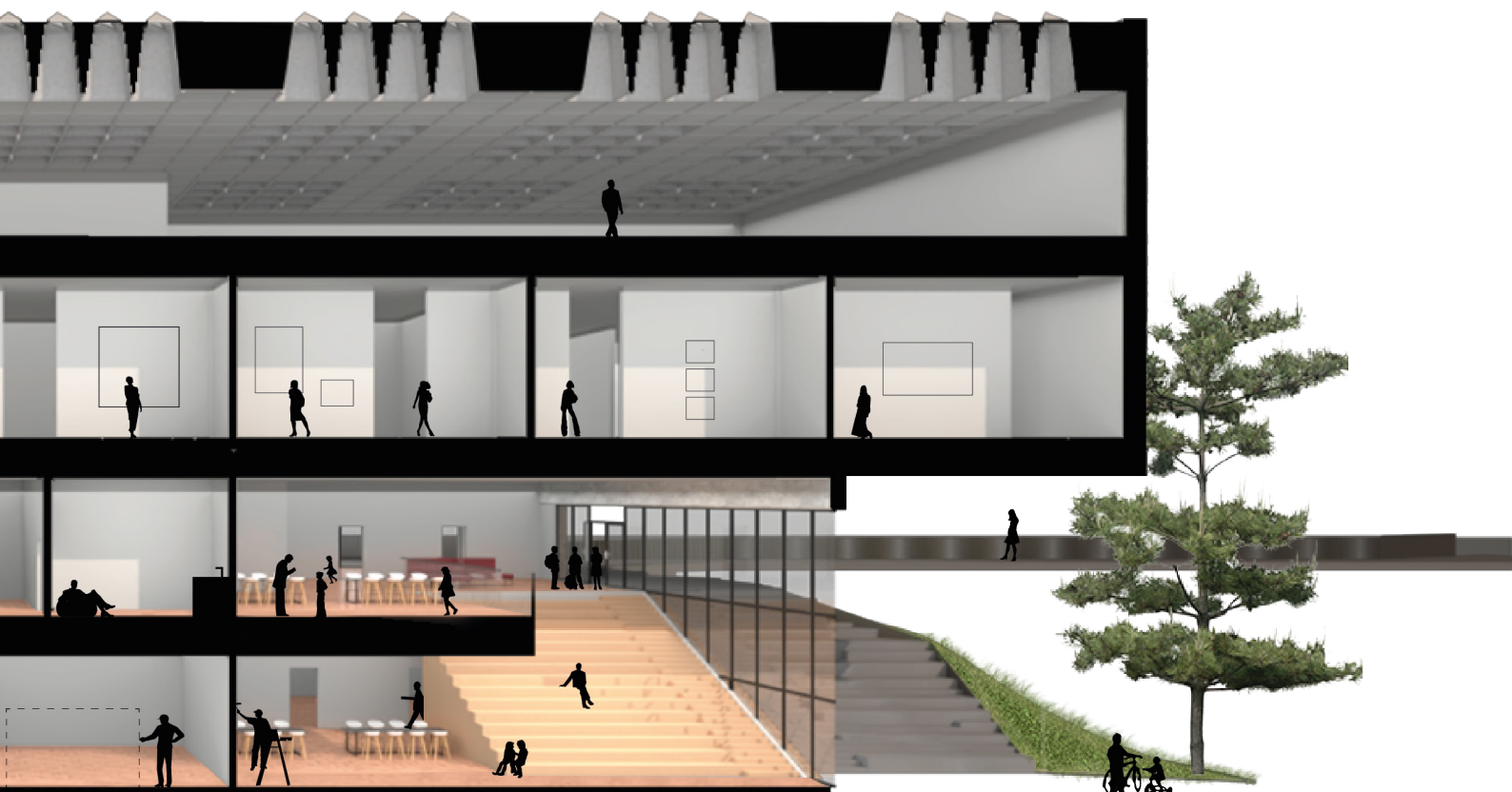
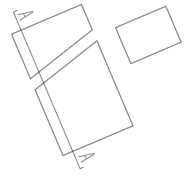
III 97.

Southern facade 1:500



III 98. Urban Connection

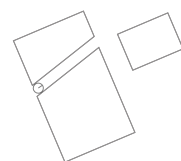






A t r i u m

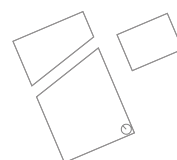
When standing at ground level in the atrium, its grandeur shines. Light from the top of the atrium, bounces softly on the corten steel surface, emphasizing the tactility of the material. The light from the windows, stands in harmonious contrast with the gloomy dark of the cave exhibition, inviting exploration and discovery for the guests.

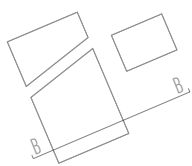






III 101. Dobbelt height exhibition





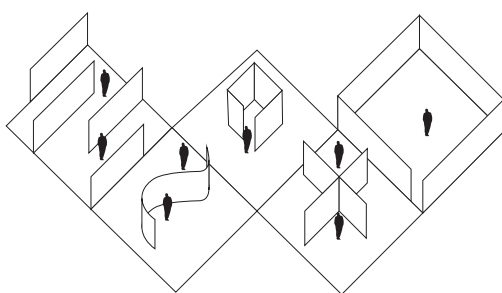
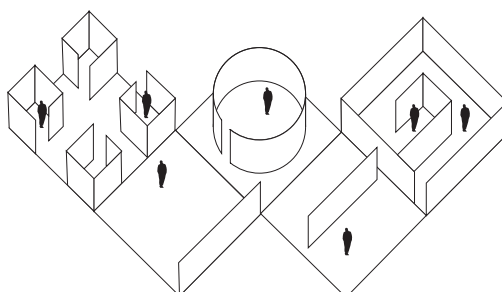
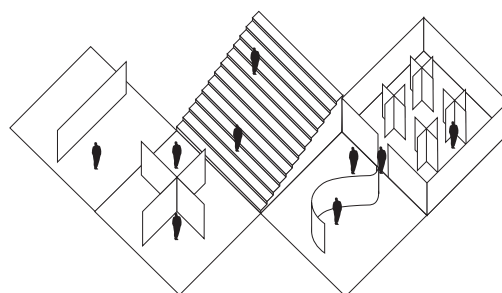
Space defining Art

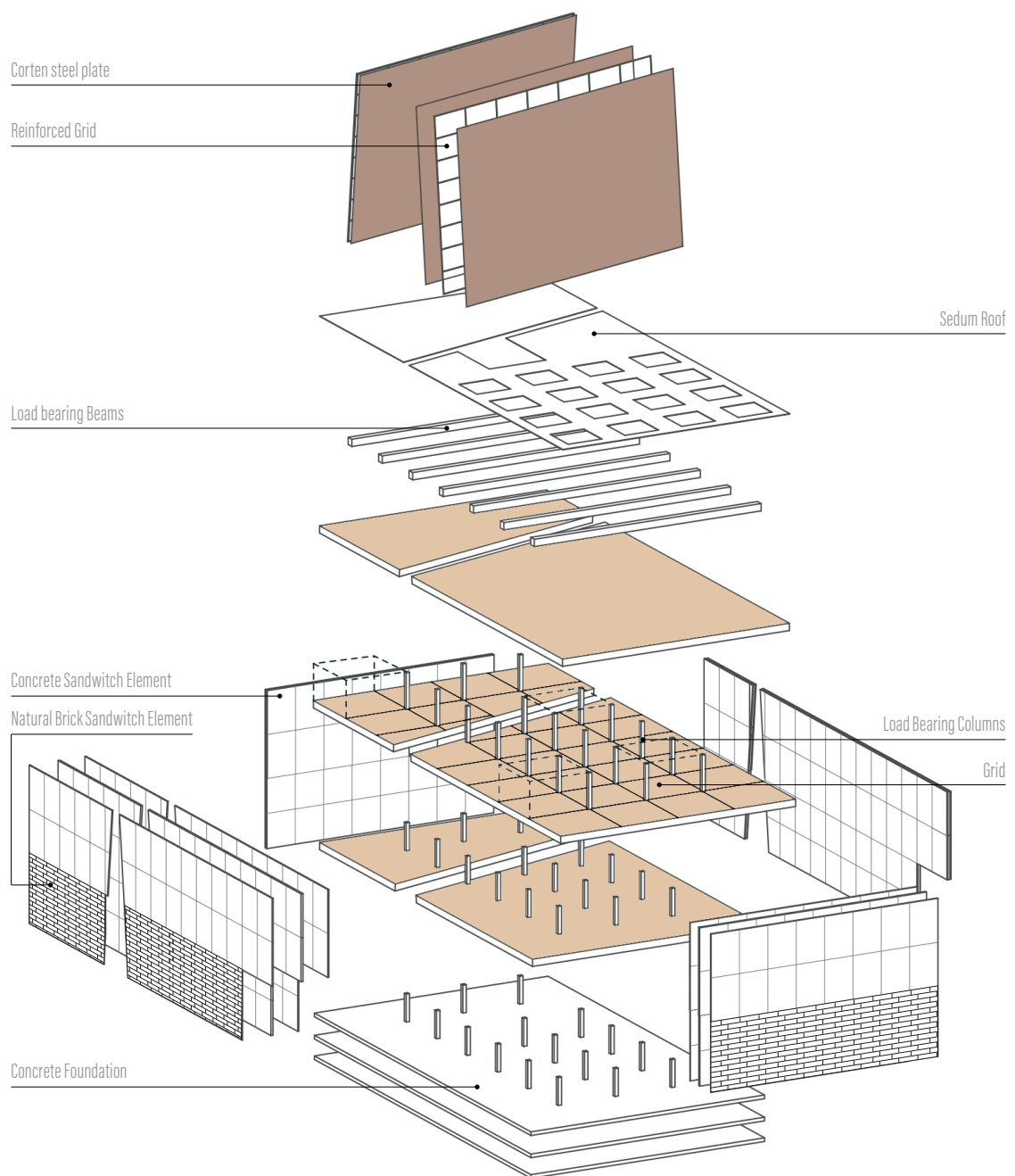
Asger Jorn and Per Kirkeby have both made artworks beyond the scale of conventional rooms. Resulting in art pieces fit to be called national treasures, their scale requires drastic space to be expressed unrestricted. Allowing art their rightful presentation has been a key part of the New Museum Jorn and has resulted in rooms as majestic as the art pieces it houses.

Constructive flexibility

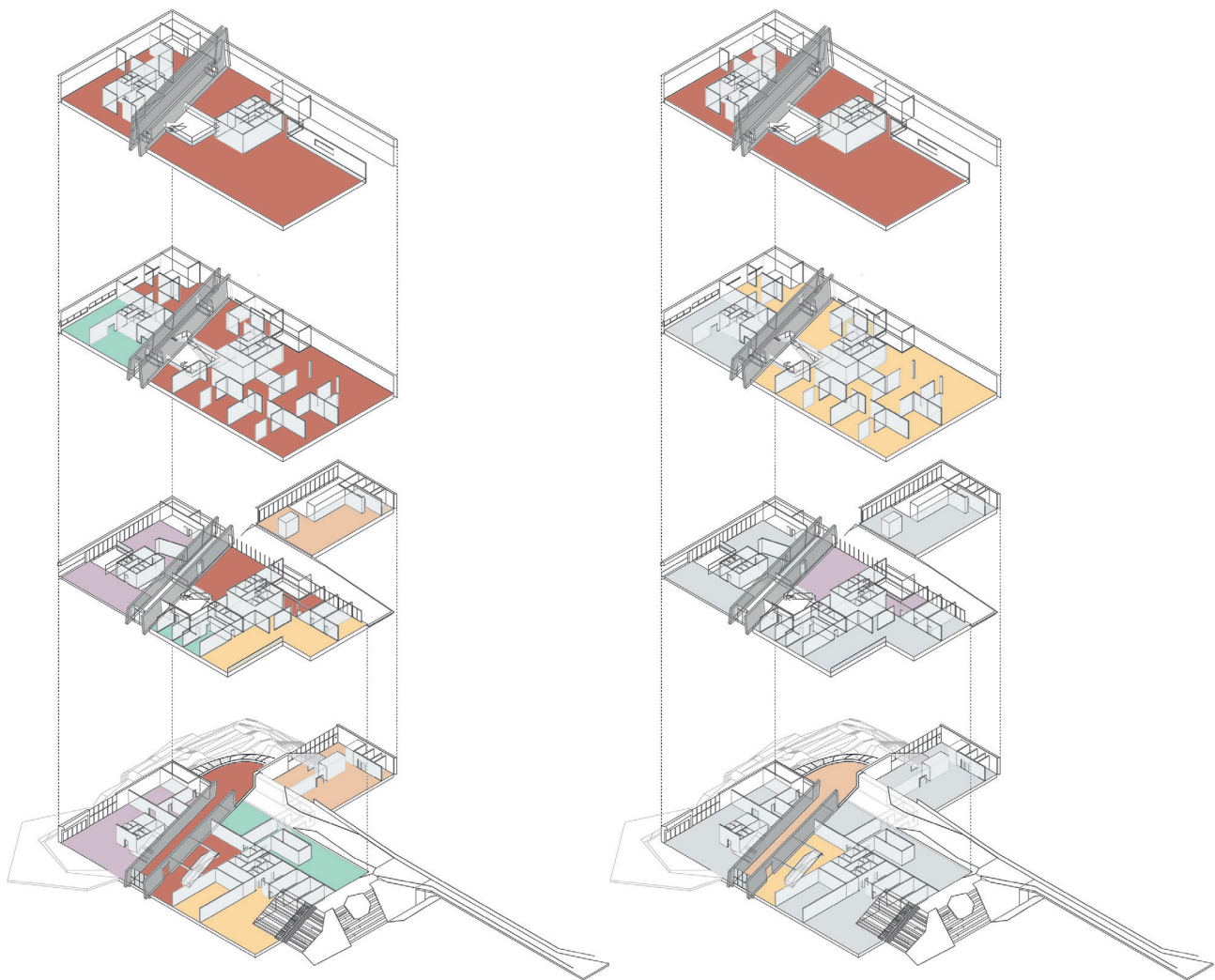
The construction of the New Museum Jörn is made with Durability, longevity, and flexibility in mind. Façade claddings are chosen to last as long as, possible with as little maintenance as possible, as an environmentally sustainable intervention. The envelope is clad with highly tactile materials such as natural stone and board marked concrete and serves as a loadbearing element in the construction. Utilizing the envelope as a loadbearing element, allows for columns to be placed, providing the museum with the desired flexibility.

The constructed grid allows for placement between the columns, enabling the museum to construct the exhibition to their desire. With a dimension of 8400 mm x 8400 mm, there is plenty of space to be utilized within a single square, while even creating smaller paths within the boundaries. The 3rd floor provides ultimate freedom for exhibitions, as the beam frees the floor up for columns, providing space for the biggest of exhibitions.





Functionality

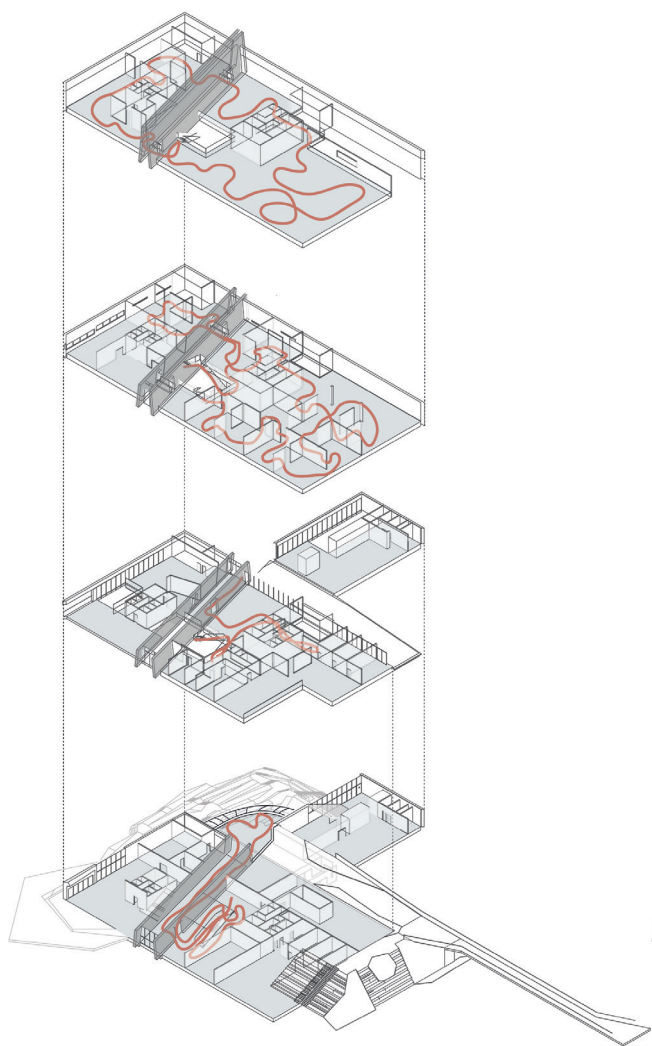


Building Anatomy

- Bar and Restaurant
- Centre of Art
- Process and Creativity
- Institute of Vandalism
- Office

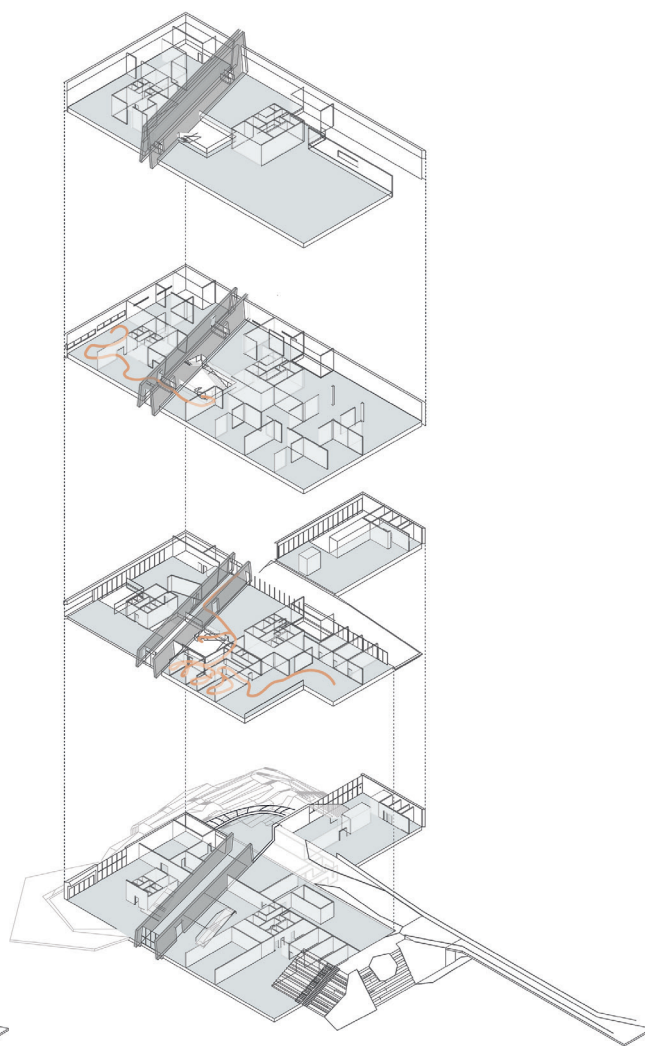
Centre of Art

- Foyer
- Open Exhibition
- Flexible Exhibition
- The Cave
- Other Exhibition



External Circulation

■ Museum Visitor

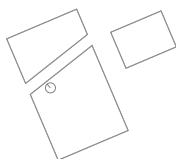


Internal Circulation

■ Staff

A t m o s p h e r e

The permanent atmosphere of the museum has a bearing on the experience of the art. Tactility, views, and careful play with daylight are some of the aspects envisioned in the New Museum Jorn. Guests will experience the warmth of wood on surfaces with which they will physically interact. Daylight will throughout the day, accentuate the tactility of both wooden and corten surfaces, highlighting the depth of the materials.









14 Bar
15 Terrace
02 Kitchen

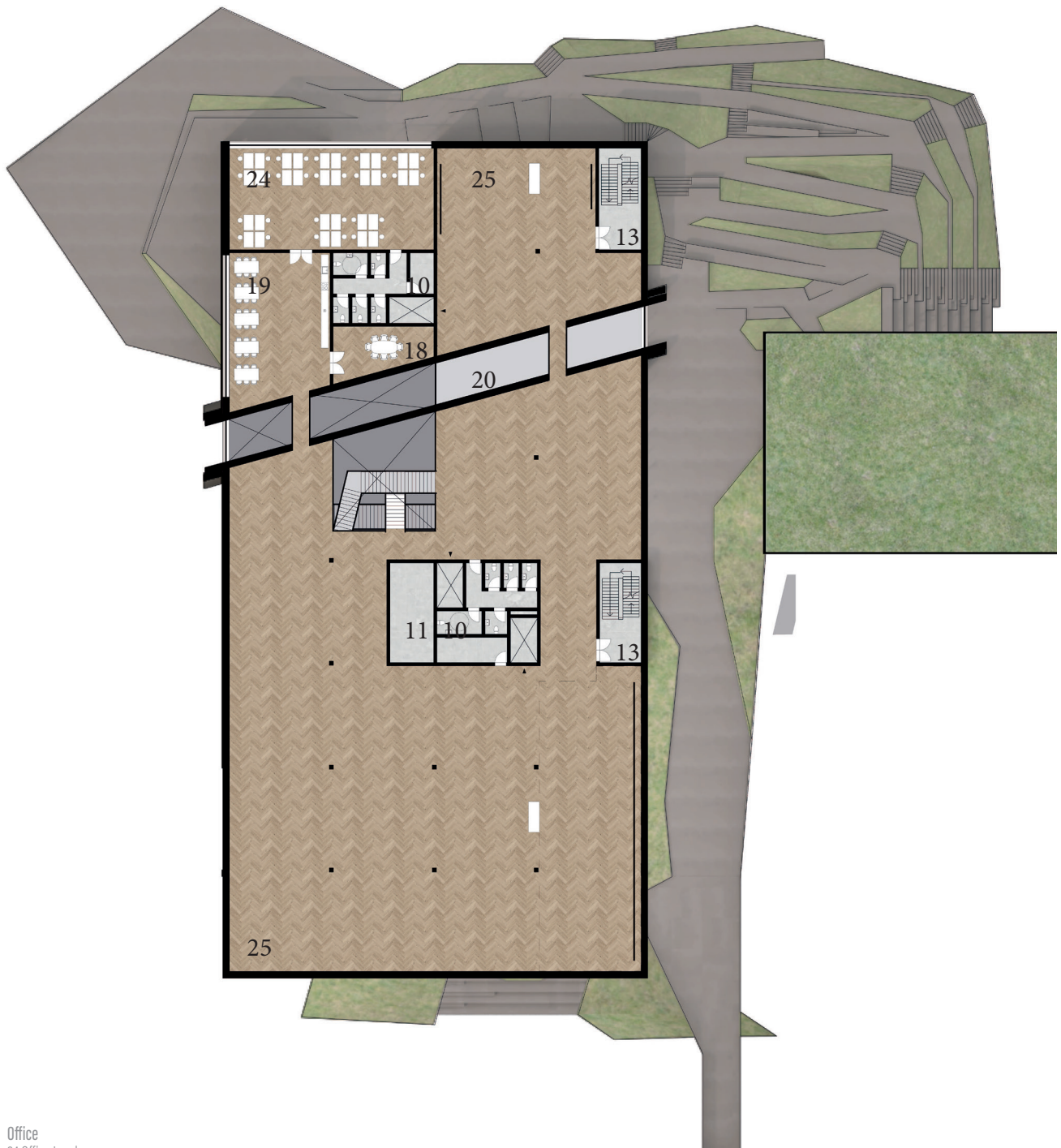
Office
16 Curator
17 Security
18 Meeting Room
19 Staff Area

Centre of Art
20 Atrium
21 Foyer
22 Museum Shop
23 Reception

Process and Creativity
05 Working Space
06 Workshop

Institute of Vandalism
05 Working Space
08 Archives

09 Wardrobe
10 Technical core
11 Technical room
13 Fire exit



Office
 24 Office Landscape
 18 Meeting Room
 19 Staff Area

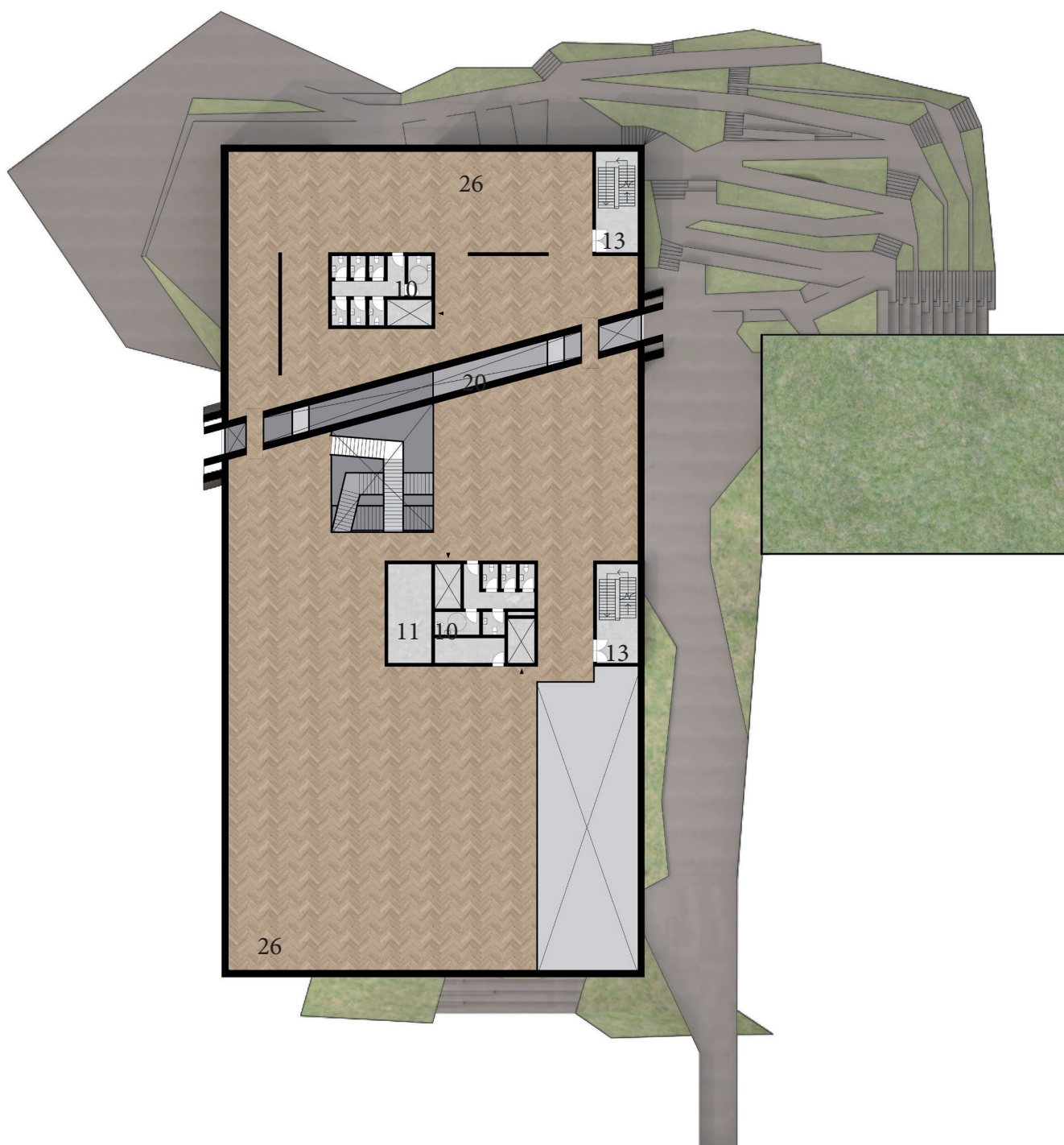
Centre of Art
 20 Atrium
 25 Flexible Exhibition

10 Technical core
 11 Technical room
 13 Fire exit

III 109.

2 Level 1:250





Cenré of Art
 20 Atrium
 26 Open Exhibition

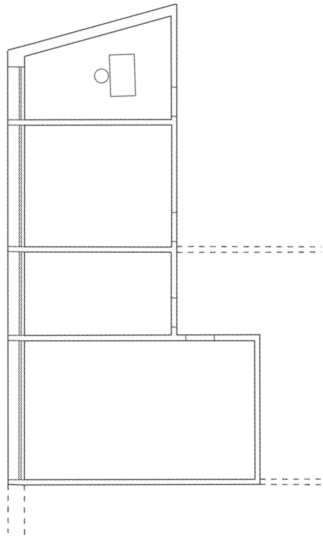
10 Tecnical core
 11 Technical room
 13 Fire exit

III 110.

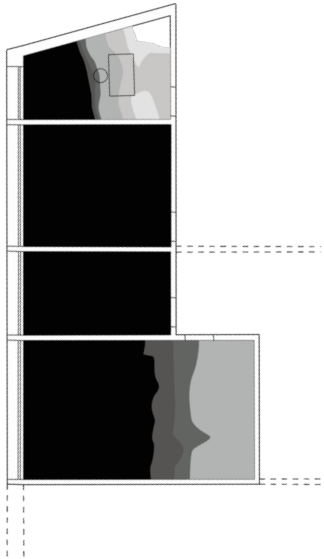
3 Level 1:250



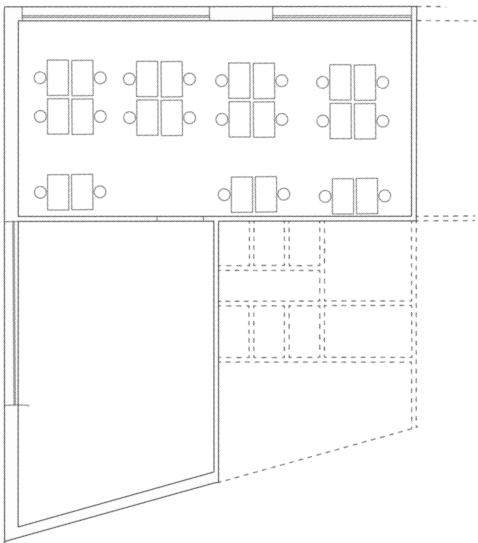
Western Office ☉



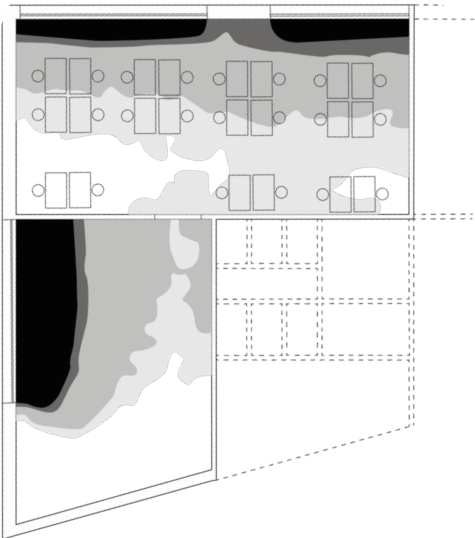
Daylight



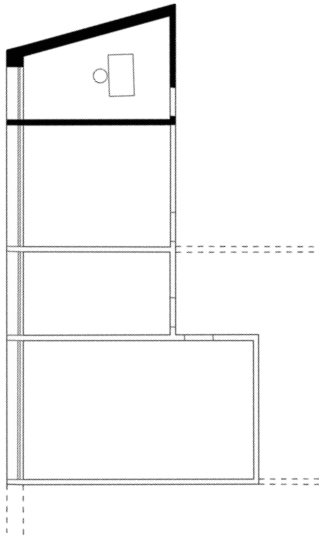
Northern Office ☉



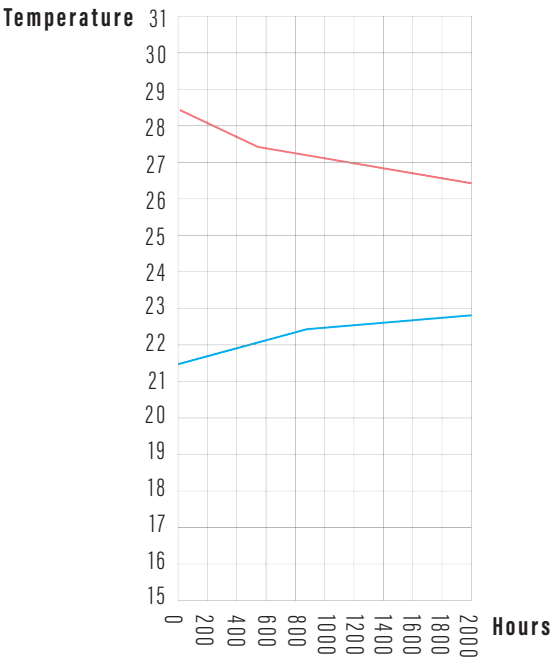
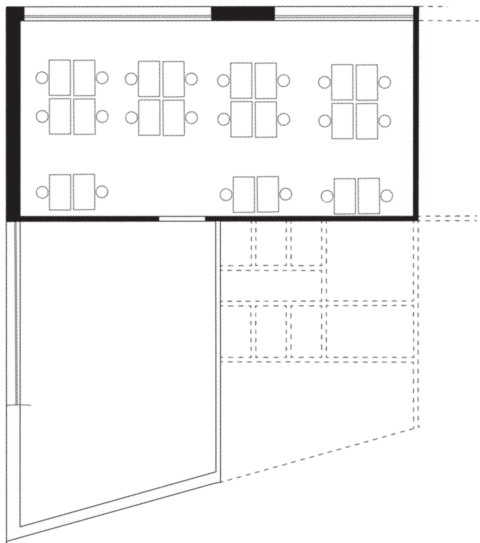
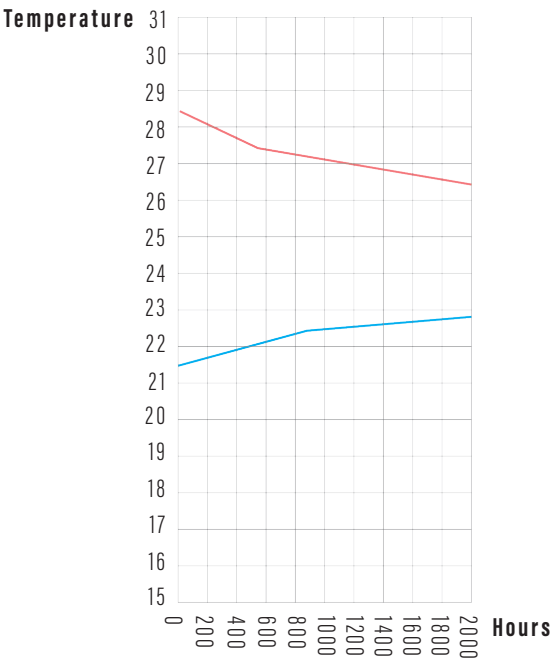
Daylight



Currator



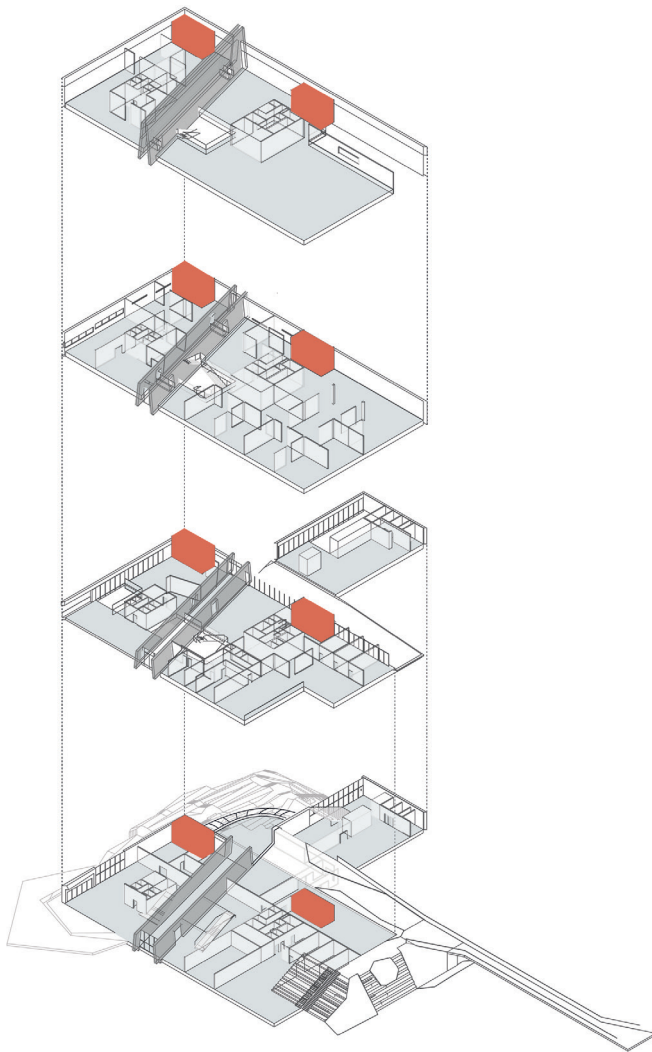
Thermal comfort



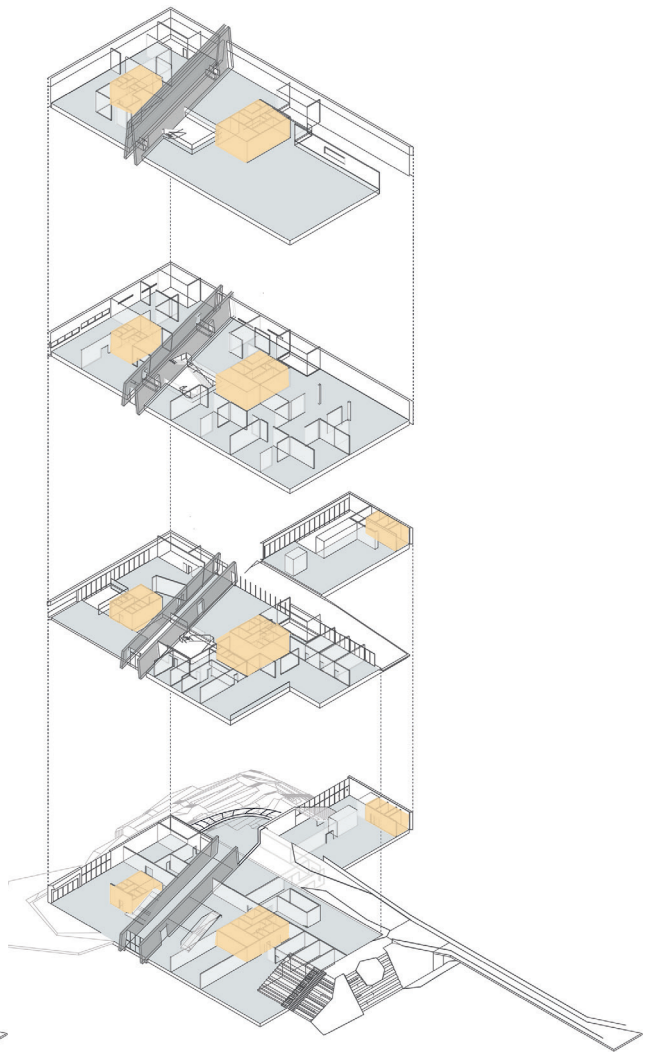
Office Landscape

Thermal comfort

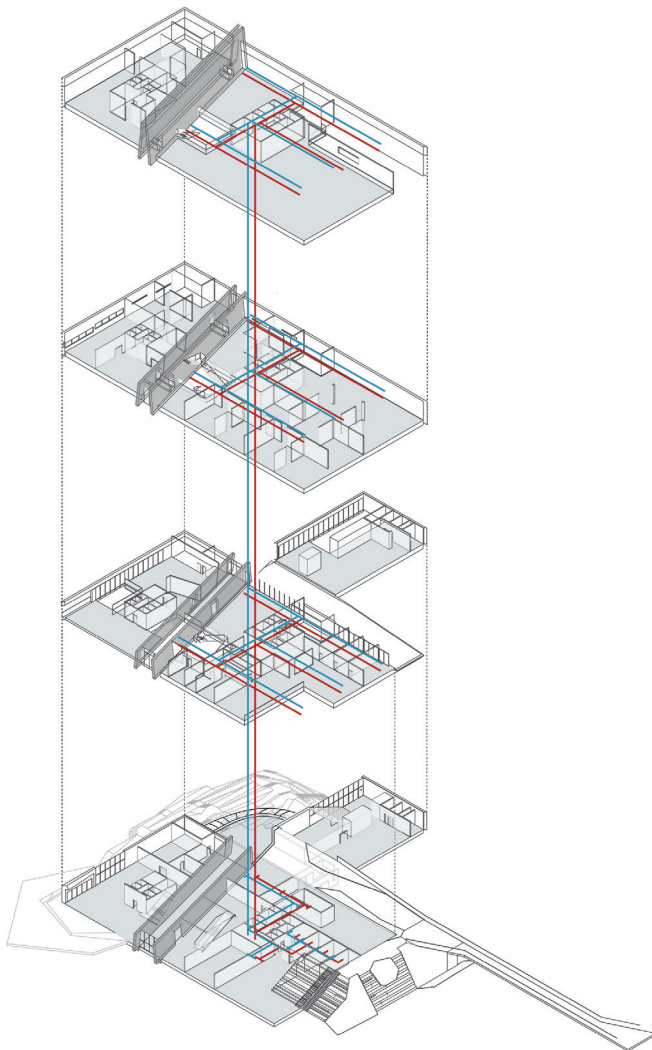
Conceptualized Strategies



Fire Exit



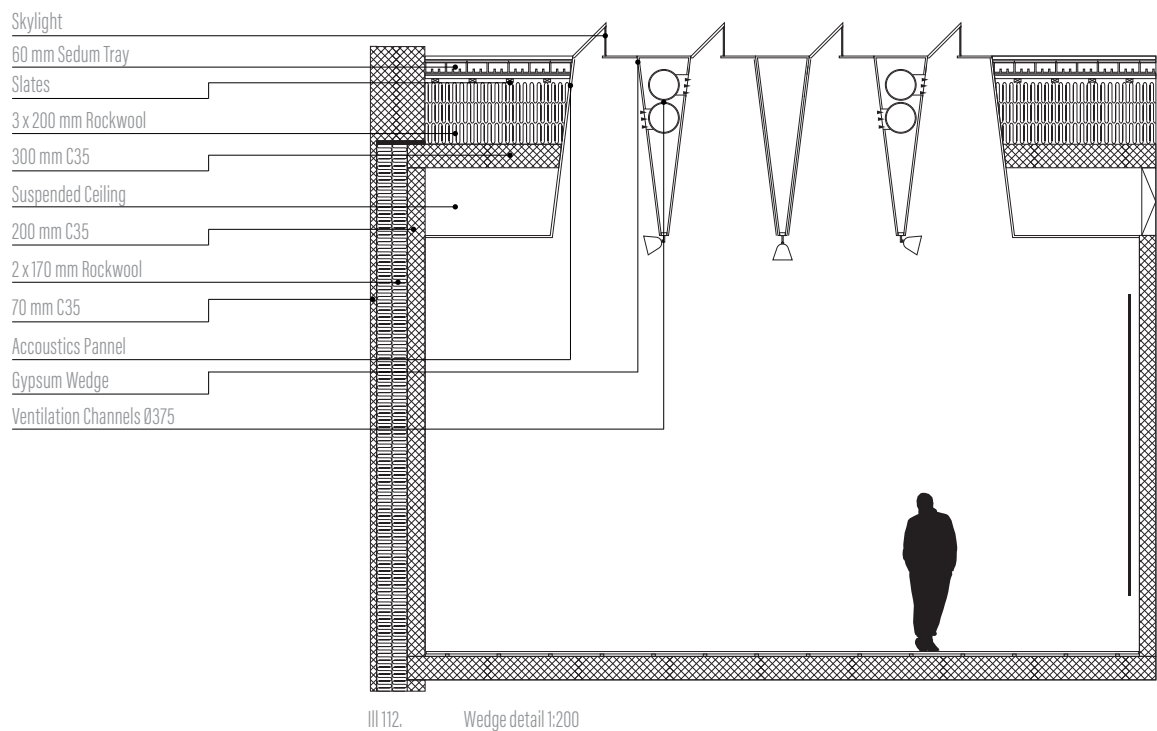
Technical Core

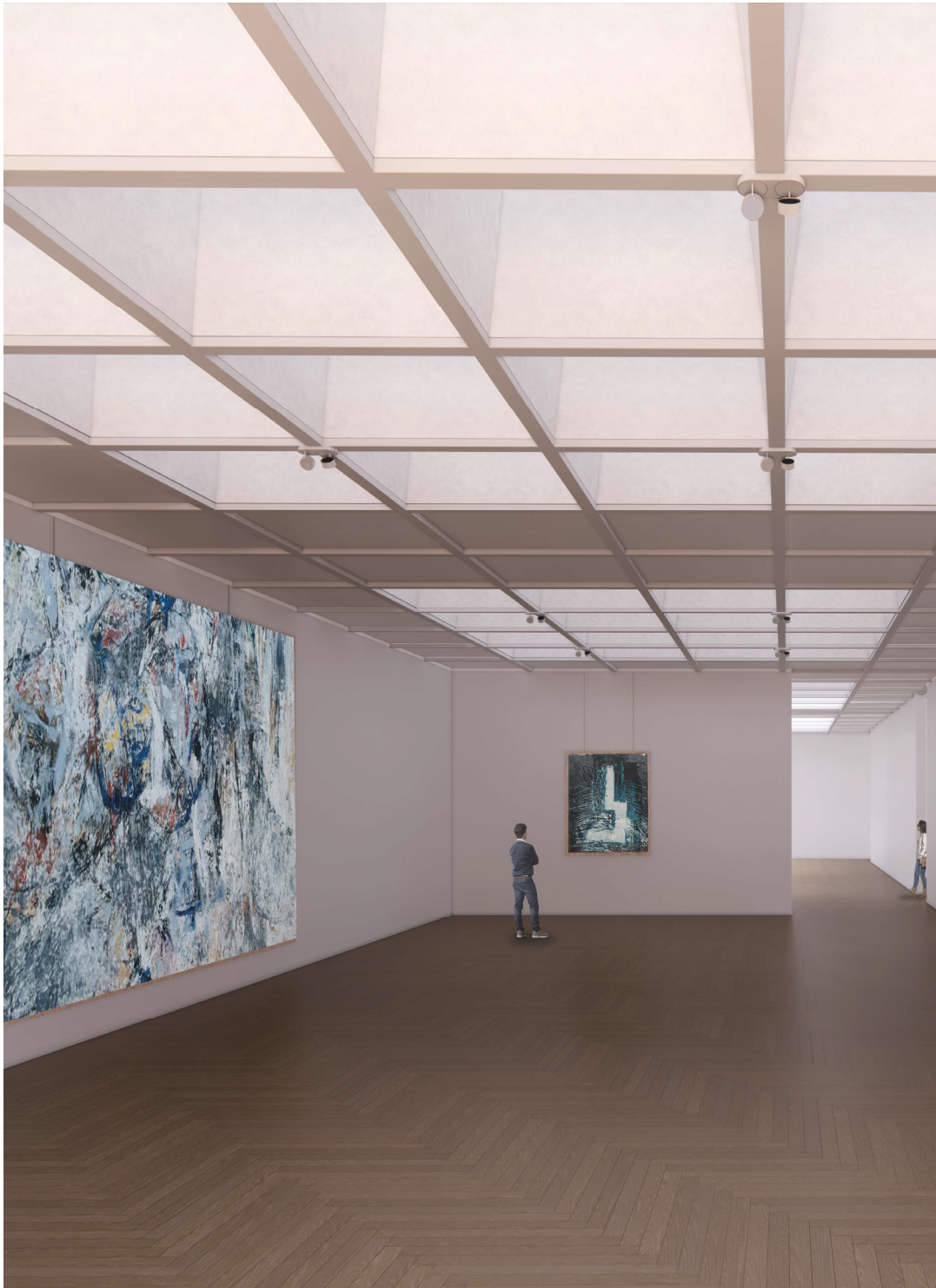


Ventilation Channels

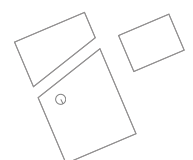
Aesthetic Technicality

The result of a highly integrated element merged with an architectural design is the wedge in the roof. They provide the roof with a light aesthetic by softly dissolving the otherwise cubic rooms, all while housing both ventilation, load bearing beams, skylights, and acoustic panels. Allowing daylight into the exhibition is a task of balance, but mastering it, results in daylight providing a daily shift in warm and cool colors.





III 113.
Flexible exhibition



10 EPILOUGE

The epilogue of the report will conclude on the final design of New Museum Jorn, as well as reflect upon the process and final design of the project. A summary of illustrations and literature are listed to complement the rapport.





Conclusion

Epilouge

New Museum Jorn provides Silkeborg with a new cultural attraction, providing quality, locally, nationally, and globally. The Museum puts Silkeborg on the global map, by providing both exhibitions on a high level, as well as an architectural landmark for tourists to enjoy. Denmark benefits from a cultural institution with a focus on two highly acknowledged Danish artists, who have in their own way defined an era in national and international art.

New Museum Jorn has truly taken the artist into consideration in its design, where the museum provides perfect art settings, both physically as well as for the experience. Light is a key part of providing a unique experience of the museum, creating the optimal conditions for the artwork, by carefully working with natural daylight. As the seasons, days and even hours pass by, so changes the atmospheric experience of the museum. Change and the passing of time are not only restricted to the atmosphere, but also the physical setting. The New Museum Jorn is designed with flexibility of the physical boundaries for the exhibition halls, as it enables the renewal of the exhibitions, letting artist and professionals tell their stories in their own conditions now, before, and in the future.

Through the design of New Museum Jorn, Silkeborg has received a renovation of the beautiful lakeside, which was challenged by hard traffic, and unproportionate scale. The landscape intervention stretches up and creates a renewed connection between the city centre and the lakeside, providing more quality for visitors and citizens of Silkeborg, as they can seamlessly experience nature during their urban stay. The formative disturbing, selected materials, and sense of direction create an alluring effect towards the atrium and herby the entrance of New Museum Jorn.



III 114. Sådan var du (Tu étais tel), Asger Jorn, 1956



All used works of art, paintings and material in this master's thesis are approved by Museum Jorn, Per Kirkeby Estate and Utzon Centeret.

Reflection

Epilogue

Museum as art?

The design of New Museum Jorn has through its iterative and educational process developed into a completely different project than first imagined. At the start of the assignment, the intention was to create a completely new way of exploring a museum. This included several static, thermal interventions that could vary in ceiling height, temperatures, colours, and lighting, appealing directly to the human perception of space. This could give the museum visitor an extraordinary museum experience directly related to the spirit of the artist Asger Jorn. Along the way, it became clear that there is a delicate balance between art and applied art, translated to architecture. For what does New Museum Jorn need? Should it, in the same spirit as the Guggenheim in Bilbao, be a completely crazy and static, pragmatic landmark that, through its design, put Silkeborg on the world map, but at the same time underplay its function as a museum and neglect the artwork? Or should the building act as the optimal framework for the dissemination of art both before, now, and in the future? The design proposal provides flexibility for the museum to set up exhibitions in a way they deem best for the decided narrative, which is based on the conclusion that a fixed narrative

of the group, could prove to be unsustainable for the future. A dialogue with Museum Jorn, or people working with museum décor, could potentially have enabled the design to be explorable in a new way, with fixed areas of atmospheric contrast. The question of how it would neglect the artwork, and presentation of it, still stands as a potential conflict of a more fixed plan solution.

Architectural disturbance

New Museum Jorn is designed to house the artwork created by Asger Jorn and Per Kirkeby, which should be reflected in the museum's design. As an artist, it is possible to incur a certain form of artistic freedom and abstraction that is independent of time and place, which is why most of Jorn's and Kirkeby's paintings contain wild shapes, colours, and compositions. Based on the disturbing duckling, New Museum Jorn should in the same way be a disturbance in the cityscape of Silkeborg. But what is a disturbance in an architectural sense and is it the entire building or individual elements that are supposed to act as the disturbance? And will individual elements be perceived as disruptive if they become part of a larger disruption? In the same way, there is a delicate

te balance between the architect and the place that is worth discussing. A matter worth equal consideration is the buildability and functionality of the final design. A shift towards a more functional design was made during the process, as functionality are important, if not more, in relation to the architectural disturbance. With a limited time, frame and work force, a choice were made to pivot towards a more functional design were made, fitting with the discussed subject of the scale of disturbance, which potentially could have less strict, given more time.

Multifunctional sustainability

Based on a sustainable starting point and with the awareness that New Museum Jorn will be built for an unknown future, the museum contains a grid with a certain degree of internal structural flexibility, externally protected by long-lasting and maintenance-free materials, evaluated in LCA. The flexibility allows the building to adapt to different temporary functions with different usage patterns and needs. The trinity of the concept of sustainability is a complex quantity to work with, as the actors involved have different agendas with the potential of the New Museum

Jorn. The requirements of the functions have been evaluated in various simulation programs to substantiate the project's architectural quality. However, it is essential to emphasize that the tools are evaluation tools and not definitive design tools. In this matter, it is not possible to say anything definitive about the building's energy consumption, CO2 emissions, or specific heating or cooling demands. Instead, it is possible to compare and evaluate different design proposals to shape the design in a more sustainable direction.

Architectural complexity

The complexity of the New museum Jorn is designed by three architectural engineers during a master's degree in four months, which in comparison will take years for plenty more people to design in reality. Therefore, the project contains a certain degree of conceptual deviation, which is based on engineering estimates and principal design proposals. However, the engineering demonstration of critical spaces has shown that the education has contributed the students with a large number of engineering tools that can articulate the architectural quality, as they have been an integrated part of the design development from the begin-

ning of the project based on intuition. This is clearly expressed through the thermal quality of the offices, where orientation, window placement, design, and location have created the optimal working conditions. This project is ultimately a reflection of the groups architectural position after five years of education. This is shown in the intuitive understanding and conceptual approach of technical aspects applied to a building of high architectural quality. The process and approach therefore reflect from where the members will further develop themselves as architects in the building industry.

Bibliography

Epilouge

Books

Böhme, Gernot. 2016. *The Aesthetics of Atmospheres*. 0 udg. redigeret af J.-P. Thibaud. New York : Routledge, 2016.: Routledge.

CHING, F. D. K. u.å. *Architecture: Form, Space & Order*. Bd. 2014. Hoboken, N.J: John Wiley & Sons.

Pallasmaa, Juhani. 2015. *Arkitekturen og sanserne*. 2. oplag. Arkitektens Forlag.

Vitruvius. 1914. *The Ten Books On Architecture*. London: Harvard University Press.

Papers

Ahmadi, Mosleh. u.å. "The experience of movement in the built form and space: A framework for movement evaluation in architecture". *Cogent Arts & Humanities* 6.

ERCO CLUSTER CULTURE. u.å. "Culture - light for art: Planning principles and design"

Hansen, Hanne Tine Ring, og Mary-Ann Knudstrup. 2005. "The Integrated Design Process (IDP): A More Holistic Approach to Sustainable Architecture". S. 894–901 i *Action for sustainability : The 2005 World Sustainable Building Conference*. Tokyo, Japan: Tokyo National Conference Board.

Kanafani, Kai, og Harpa Birgisdottir. 2021. "LCA i praksis: Introduktion og eksempler på livscyklus-vurderinger i byggeprojekter". Trafik-, bygge- og boligstyrelsen.

Lundgaard, Ida Brændholt. u.å. "Atmosfære som åbning". Slots- og kulturstyrelsen.

Museernes Arbejdsopgaver. 2021. "Skema over anbefalet lysintensitet (lux), temperatur og relativ luftfugtighed (RF) for en række genstandstyper".

Purvis, Ben, Yong Mao, og Darren Robinson. 2019. "Three Pillars of Sustainability: In Search of Conceptual Origins". *Sustainability Science* 14(3):681–95. doi: 10.1007/s11625-018-0627-5.

Søndergaard, Helle, og Mette Simonsen Nielsen. 2010. "Asger Jorn og Samlingen". *Louisiana Museum* 10.

Terramai. u.å. "Flexible Architecture". Hentet 9. maj 2022 (<https://www.terramai.com/blog/flexible-architecture/>).

Tzortzi, Kali. u.å. "Movement in museums: mediating between museum intent and visitor experience". *Museum management and curatorship* 2014. doi: <https://doi.org/10.1080/09647775.2014.939844>.

WEB

Anon. u.å.-a. "*Daylight Provision*". Hentet (<https://climatestudiodocs.com/docs/daylightEN17037.html>).

Anon. u.å.-b. "*Glasfakta*". Hentet 19. maj 2022 (<https://www.glasfakta.dk/viden/solafskaermning/solafskaermende-glas/g-vaerdi-og-lt-vaerdi-i-solafskaermende-glas/>).

ArchDaily. 2019. "*121 Definitions of Architecture*". Hentet (<https://www.archdaily.com/773971/architecture-is-121-definitions-of-architecture>).

Arkitema. u.å. "*Nyt Museum Jorn*".

Bygningsreglementet. u.å. "*Lys og udsyn*". Hentet (<https://bygningsreglementet.dk/Tekniske-bestemmelser/18/Krav>).

Danmarks Statestik. 2020. "*Aktivitet på danske museer*". Aktivitet på danske museer. Hentet 18. maj 2022 (<https://www.dst.dk/da/Statistik/emner/kultur-og-fritid/museer-og-zoologiske-haver/museer>).

Kunsteder.dk. u.å. "*Museet som sted*". <https://www.kunsteder.dk/tema/museet-som-sted>.

Kunsten.nu. 2016. "*Utzons fantastiske fatamorgana-museum var uegnet til Jorn*". Hentet (<https://kunsten.nu/journal/utzons-fantastiske-fatamorgana-museum-uegnet-jorn/>).

Museum Jorn. u.å.-a. "*Nyt Museum Jorn*". Hentet 7. maj 1922 (<https://museumjorn.dk/nyt-museum/>).

Museum Jorn. u.å.-b. "*Om Asger Jorn*". Hentet (<https://museumjorn.dk/om-asger-jorn/>).

Museum Jorn. u.å.-c. "*Om Per Kirkeby*". Hentet (<https://museumjorn.dk/om-per-kirkeby/>).

Semantika. u.å. "*Museums of the World*". The world's oldest museums. Hentet 7. maj 2022 (<https://museu.ms/highlight/details/105317/the-worlds-oldest-museums>).

Unesco. 2021. "*Sustainable Development*". Hentet (<https://en.unesco.org/themes/education-sustainable-development/what-is-esd/sd>).

Vasström, Annette, og Ole Strandgaard. u.å. "*Museum*". Den store danske på Lex.dk.

Video

Wagner, March-Christoph. 2008. Per Kirkeby Interview: We build upon ruins.

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- III 5. Capitoline Museum, Spain: 1471; Semantika. u.å. "Museums of the World". The world's oldest museums. Hentet 7. maj 2022 (<https://museu.ms/highlight/details/105317/the-worlds-oldest-museums>). 10
- III 6. Vatican Museum, Italy: 1506; Semantika. u.å. "Museums of the World". The world's oldest museums. Hentet 7. maj 2022 (<https://museu.ms/highlight/details/105317/the-worlds-oldest-museums>). 10
- III 7. The Natural History Museum, Denmark: 2004; University of Copenhagen. u.å. "About Natural History Museum of Denmark". Hentet (https://snm.ku.dk/english/about_the_museum/museetshistorie/). 10
- III 8. Louisiana Museum of Modern Art, Denmark: 1958; Louisiana Museum of Modern Art. u.å. "About Louisiana". Hentet (<https://louisiana.dk/museet/louisianas-historie/>). 11
- III 9. Moesgaard Museum, Denmark: 1970; MOMU. u.å. "About Moesgaard Museum". Hentet 7. maj 2022 (<https://www.moesgaardmuseum.dk/>). 11
- III 10. Guggenheim Museum, Bilbao: 1997; Guggenheim. u.å. "About Guggenheim Bilbao". Hentet 7. maj 2022 (<https://www.guggenheim-bilbao.eus/en/about-the-museum>). 11
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11 APPENDIX

Appendix 01

Ventilation

The atmospheric ceiling intervention calls for investigations concerning light and ventilation channel dimensions. The initial thought is to hide all mechanical systems in the suspended ceiling and the atmospheric panels. To simplify the calculation, the different functions are divided

into levels to get an idea of how much air to transfer from the aggregate in level 0 to the exhibition in level +3, as seen in the table. The process is the same

Museum	Dimension			People load
Description	Floor area [m2]	Ceiling height [m]	Volume [m3]	People [adult]
Exhibition +3	1350	4	5400	100
Exhibition +2	1340	4	5360	100
Exhibition 0	246	4	984	30
Foyer	91	4	364	30
Store	95	4	380	30
Wardrobe	72	4	288	30
Curator	16	4	64	1
Security	23	4	92	2
Meeting Room	16	4	64	6
Break Room	40	4	160	8
Total +1	3194	4	12776	93

To ensure the optimal and desired indoor environment in the museum, the dimensioning is made concerning Danish Standards, Building Requirements, and Co2 pollution defined in ca-

tegory II. By simplifying the iterations, the investigations were mainly made for the total part of the museum.

DS/EN 16798-1:2019 DK NA:2021					
Dimensioning	[l/s pr. Person]	[l/s pr. M2]	[l/s]	In [l/s]	Out [h ⁻¹]
+3	7	0,7	1645	1645	1,1
+2	7	0,7	1638	1638	1,1
+1	7	0,7	382,2	382,2	1,4
0	7	0,7	2886,8	2886,8	0,8

BR-requirements (minimum)					
Dimensioning	[l/s pr. Person]	[l/s pr. M2]	[l/s]	In [l/s]	Out [h ⁻¹]
+3	5	0,35	972,5	972,5	0,6
+2	5	0,35	969	969	0,7
+1	5	0,35	236,1	236,1	0,9
0	5	0,35	1582,9	1582,9	0,4
Co2					
Dimensioning	Activity	Outdoor pollution	Desired indoor environmen t	In	Out
	[met]	[m3/m3]	[m3/m3]	[l/s]	[h ⁻¹]
+3	1,4	0,000380	0,001	1066,3	0,7
+2	1,4	0,000380	0,001	1066,3	0,7
+1	1,4	0,000380	0,001	319,9	1,2
0	1,4	0,000380	0,001	991,7	0,3

To the tables, the maximum in- and outtake for the ventilation rate are given by the Co2 pollution. Therefore, the dimension of the vertical channels must be investigated. When the result must be

under 10. The channel dimensions can be seen in the table. The cross-area will be found with the equation:

$$\frac{\text{Air Change } \frac{\text{m}^3}{\text{s}}}{\left(\frac{\text{cross-area mm}}{1000} \right)^2 * 3,14}$$

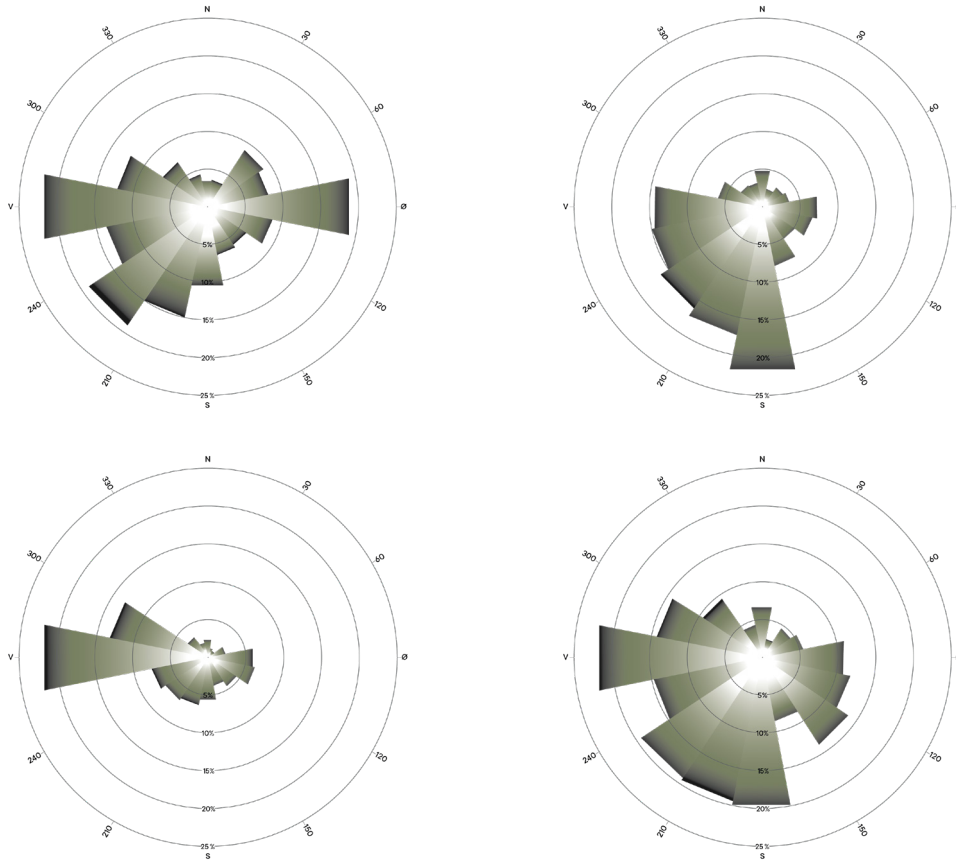
To the tables, the maximum in- and outtake for the ventilation rate are given by the Co2 pollution. Therefore, the dimension of the vertical chan-

nels must be investigated. The cross-area will be found with the equation:

Cross-area		+3 [m3/s]	+2 [m3/s]	+1 [m3/s]	0 [m3/s]
[mm]		1,06	1,06	0,32	0,99
200	0,03	33,94	33,94	10,18	31,57
225	0,03	26,83	26,83	8,05	24,95
250	0,04	21,73	21,73		20,21
275	0,05	17,96	17,96		16,70
300	0,07	15,09	15,09		14,04
325	0,08	12,86	12,86		11,96
350	0,09	11,08	11,08		10,31
375	0,11	9,65	9,65		8,98
400	0,12				

Appendix 02

Wind

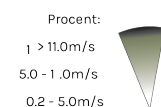


Windrose 1:1000

With the location along the lakefront in Silkeborg, the most representative measurement of wind strength and direction will be found in Karup 30 km northeast of Silkeborg. As expected, the most notable winds from the west. In summer from west-north-west and during winter west-south-west.

and the citizen of Silkeborg all year round. For the same reason, the Museum should be shielded mainly from the west without compromising the scenic views. Furthermore, the wind can be beneficial according to passive strategies in terms of natural ventilation in terms of thermal buoyancy and cross ventilation.

The new Museum Jorn must invite for outdoor stay for tourists



Appendix 03

Trapholt, case study

Trapholt Museum in Kolding is a museum for modern art and design. When entering the museum the guests are forced into the museum shop, where the cashier also works as the ticket office, after which the information and admission stand is placed.

The museum is built around a central "Museum street" that works both as an exhibition and as a central flow line through the building. The Museum street leads the flow downwards by creating an opposite funnel effect as a result of the descending ramp and raising ceiling height.

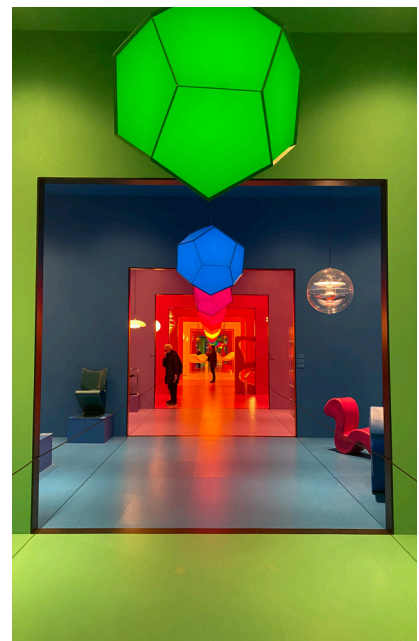
The atmosphere and chosen material are bright and raw interrupted by coloured light, doorframes and walls which can be sensed from the parallel exhibition rooms. The colours arouse curiosity and invite the guests to explore secondary flow lines and take detours from the main flow. Common for the Museum street and the detours are the descending, where the main flow is a ramp, the detours are connected by downward going stairs, but for every staircase, the detours are connected to the museum street, which creates a very disability friendly environment.

The detours are characterized by changing room sizes and ceiling heights creating a dynamic atmosphere and flow which retains the guests' curiosity. In detours with a discontinued circulation, (going back and forth in the same room) the rooms are organized with a circular flow that leads the guests back to the main flow.

When reaching the end of the Museum street the guests are directed directly toward the Museum café and the beautiful view of Kolding fjord. If the guest wants to leave the museum, then they must walk up the Museum street toward the more closed and denser atmosphere again, where they also pass by the museum shop again.



When looking into the experienced flow and atmosphere of Trapholt, it becomes clear that a thought-out flow is key when it comes to the clarity and organization of a museum, but also the implementation of changing dynamics and eye-catchers are alluring. Also, small means as downward going flows and daylight has a great psychological influence on where the guest is dawn.



Appendix 04

Window Detail

