ALICE PERSSON
Bachelor Thesis Report
Spring 25

Architecture in the Contemporary AAHF30
Lund School of Architecture
LTH, Lund University
Sweden

COURSE

The AAHF30 Architecture in the Contemporary course experiments with digital design processes aimed at developing novel spatial and structural typologies through the use of surface modeling, simulation, animation, and digital fabrication. The course is focused on contemporary architectural discourse and practice, through research and readings, which examines prospects and opportunities of digital design and fabrication processes.

Students will engage in design experiments driven by digital methods and technologies, critically examine how these methods are evaluated in practice and theory. The course will raise questions of relevance for the development of architectural discipline in the contemporary world, such as: how will the role of the architect evolve as the design process becomes more automated?; how can we use spatial and structural design to communicate the urgency of environmental crisis? (Dahl, Kirdekis, 2025)

CourseTeachers:
Gediminas Kirdekis
Per-Johan Dahl

DESIGN TASK

The design task is to develop an architectural proposal for a Naturum; each student will select one site for intervention at Limhamns kalkbrott, Malmo. The individual project should evolve in correlation with aspects of the Agenda 2030, taking one of the Sustainable Development Goals as the engine for innovation; as a point of departure for critical reflection, creating a foundation for design experimentation which is rooted in the urgency of environmental crisis. (Dahl, Kirdekis, 2025)

ABSTRACT

This project proposes a Naturum located in Limhamns kalkbrott, Malmö. The Naturum explores the architectural potential of a decommissioned limestone quarry in Malmö. Grounded in SDG 1.5, which focuses on resilience and reduced vulnerability in relation to climate-related events, the proposal investigates duality as a spatial concept. Two contrasting structures embody the qualities found in the site's geology: flint and porous limestone. Through materiality, movement and light, the project aims to create an experiential journey through strength and fragility.

CONTENT

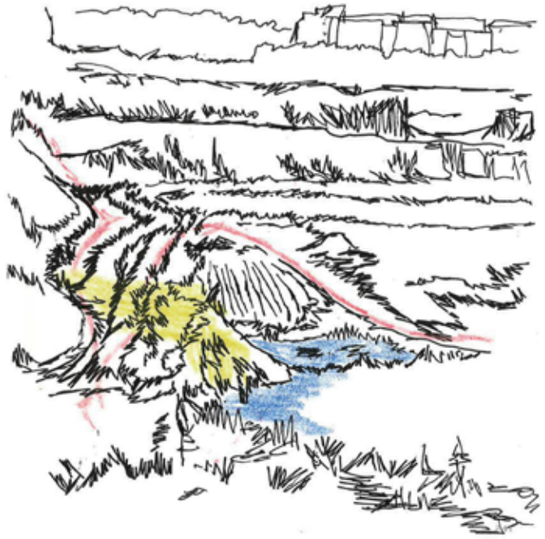
SITE ANALYSIS

Limhamns kalkbrott is a vast, hidden landscape nestled between a major highway and a quiet residential area. Despite its proximity to urban life, entering the quarry feels like stepping into another world. From the bus stop just outside the edge, one is immediately struck by the blinding white light that reflects off the chalky terrain. The air itself seems filled with mineral dust, casting a pale haze over the landscape.

MALMÖ C
QUARRY
HYLLIE C

The quarry is approximately 1 km² (Länstyrelsen Skåne, n.d.). Even on clear days, it is difficult to see its full extent. Terraced limestone walls rise in layers, resembling ribbons from a distance they glare in the southern sunlight. The site is both monumental and fragile, with towering white cliffs, vast dunes of crushed limestone, and turquoise water ponds at the bottom. These elements, combined with a rich biodiversity and strict access limitations due to the area's ecological sensitivity, create a unique and protected environment.

Several old industrial roads wind down into the quarry in serpentine-like paths, offering a way to reach lower levels. My chosen site in the quarry is on a limestone ledge set slightly in from the edge, a place that allows the visitor to experience the full height of the quarry wall behind, observe the largest dunes at close range, and full view across the quarry. The presence of water at the base of the cliff further enriches the spatial and conceptual potential of the design.



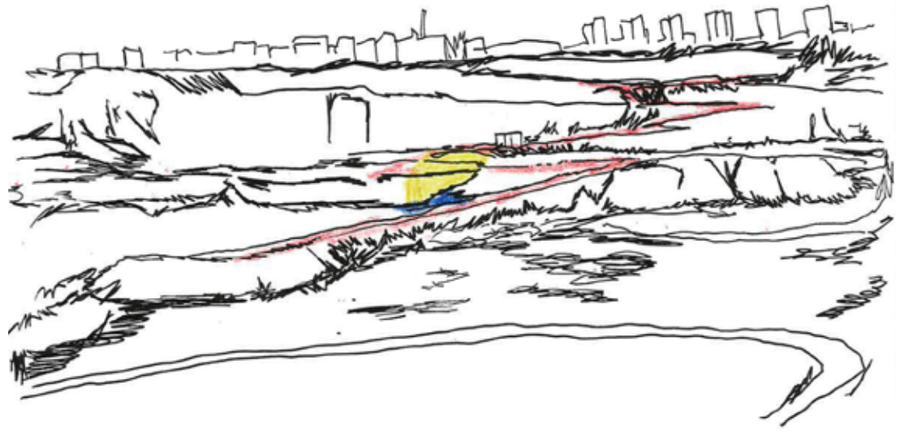
Access road

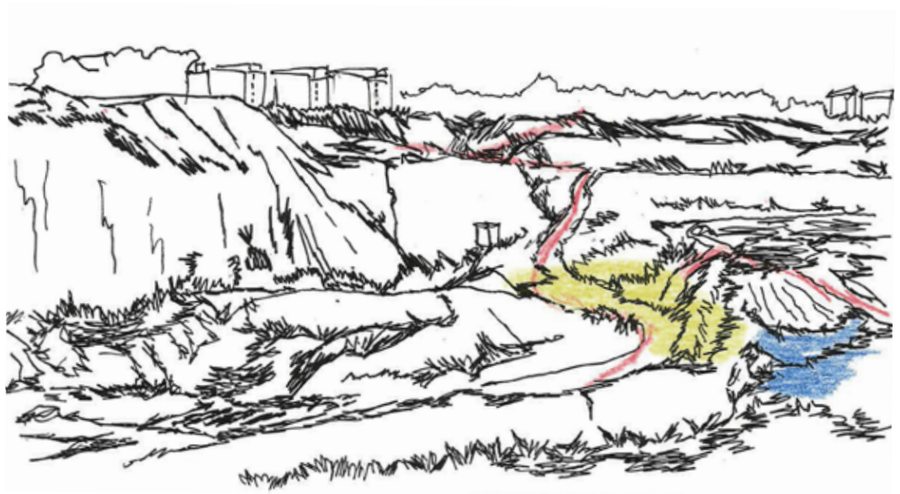
Site (50x50 m²)

Water

SITE PLAN

1 : 10 000





Materiality also played a key role in the site analysis. The limestone found throughout the quarry is visually striking, composed of both jet-black flint and soft, porous chalkstone. Over centuries, these two materials have fused together, creating a tactile contrast that speaks of both resilience and fragility. The sharp, fractured surfaces of the flint contrast with the almost crumbly softness of the limestone, a duality that later became central to my design concept.

SDG Goal

1. No Poverty

1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters (United Nations, n.d).

The initial spark for this project came from the impact of the site. The quarry's vast scale, mineral-saturated air, at once fragile and monumental. When studying the UN Sustainable Development Goals, SDG 1.5 stood out for its use of concepts such as resilience, vulnerability, and exposure. These terms resonated strongly with both the human scale I wanted to implement and the material characteristics of the site itself.

SDG 1.5 mainly focuses on social issues and building resilience in vulnerable groups affected by climate-related disasters. The language of the goal inspired me to see the site and its materials in a symbolic way. The quarry is shaped by two dominant stones: flint, dark and sharp, a symbol of strength and resistance; and limestone, pale and porous, easily crumbled, a metaphor for fragility. These contrasting materials have been pressed together over millennia, creating a geological narrative of dualism, something I wanted to translate into architecture.

Moreover, the concept of exposure, both to natural elements and to the human impact on nature, is physically embodied by the quarry. Although located in Malmö, a city where climate change might not yet be tangibly felt on a daily basis, this site offers a stark reminder of environmental transformation. The carved landscape, the artificial lake, and the mineral dunes are direct evidence of human intervention in nature.

By using SDG 1.5 as a conceptual foundation, the project explores how themes of resilience and vulnerability can be experienced through architecture. Through spatial contrasts in weight, light, and movement. The building encourages reflection on our relationship with the environment and highlights the importance of protecting it.

DESIGN PROCESS

Conceptual Models

MODEL 1

MODEL 2

In the early stages of the design process, I used physical models as a way to explore the material and formal qualities of the project. By casting my models in plaster, a material that shares characteristics with the chalky limestone found on site, I aimed to stay close to the geological identity of the quarry. Plaster, while solid, remains slightly workable during its setting phase, allowing me to carve into it and test different formal expressions directly in the material.

Through this process, I investigated how the architecture might either merge with the landscape or intentionally break from it. Some models explored shapes that appeared as though they had been formed over time, echoing the organic presence of flint embedded in the quarry walls. Others experimented with more rational geometries, like cubes and rectangular prisms, highlighting a deliberate contrast between the built and the natural.

I also tested erosion as a conceptual tool, imagining a structure whose facade could appear shaped or worn down by environmental forces.

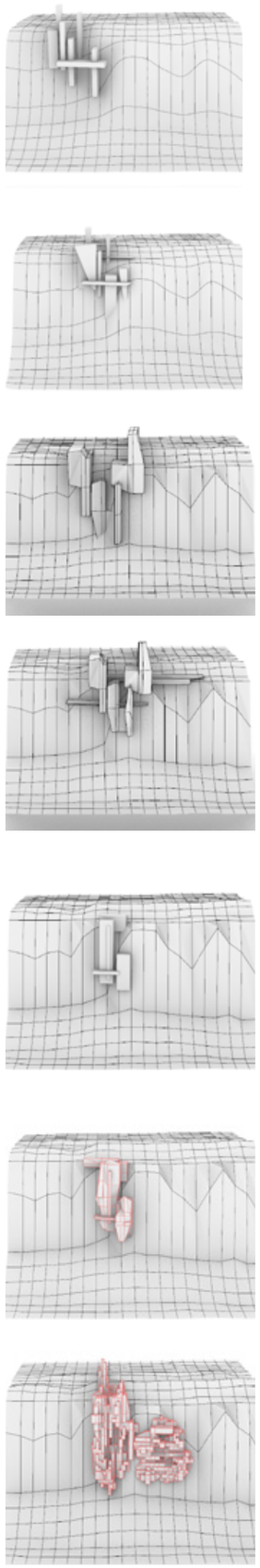
DESIGN PROCESS

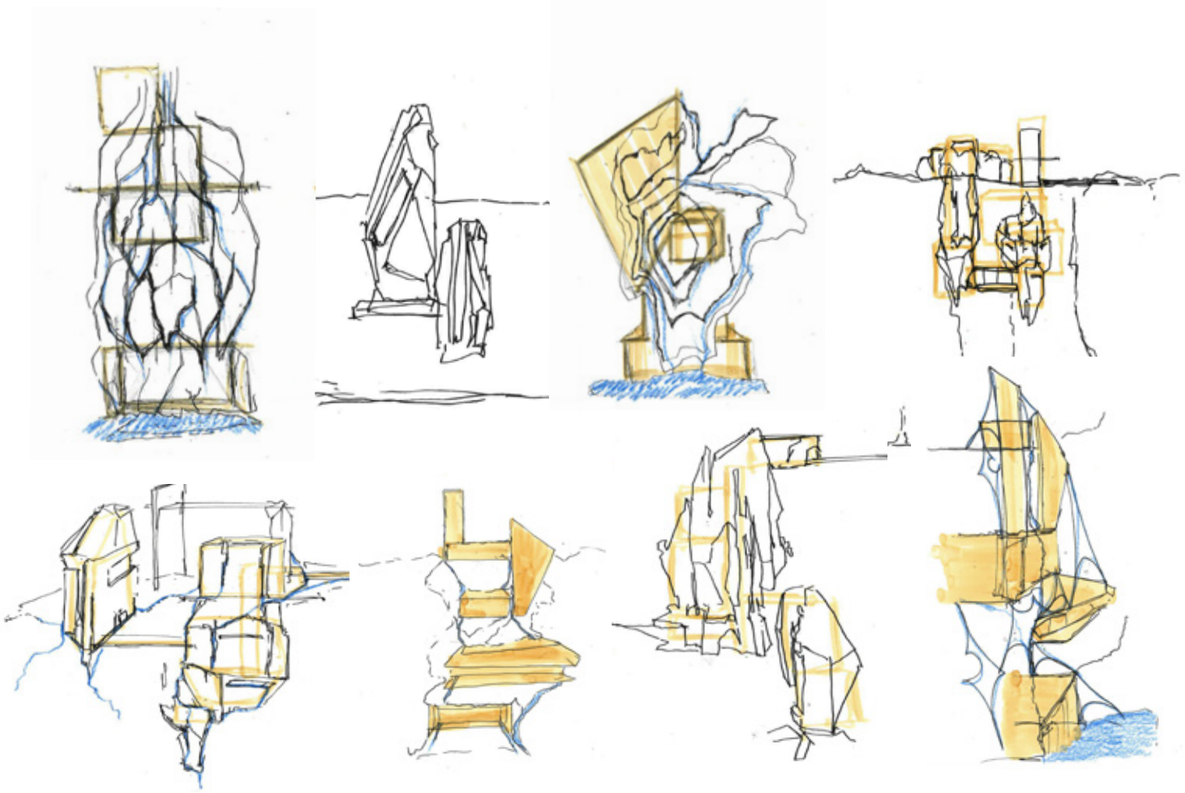
Digital tools

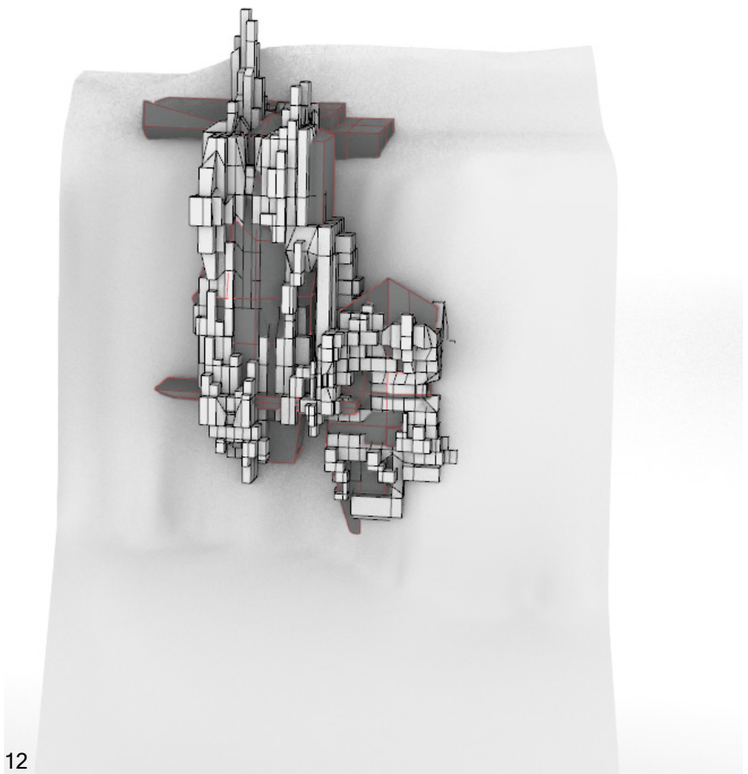
Transitioning from physical modeling to digital tools, I continued to explore the formal language and scale of the building. A central question during this stage was whether the architecture should consist of one continuous volume or a composition of several separate spaces connected through movement.

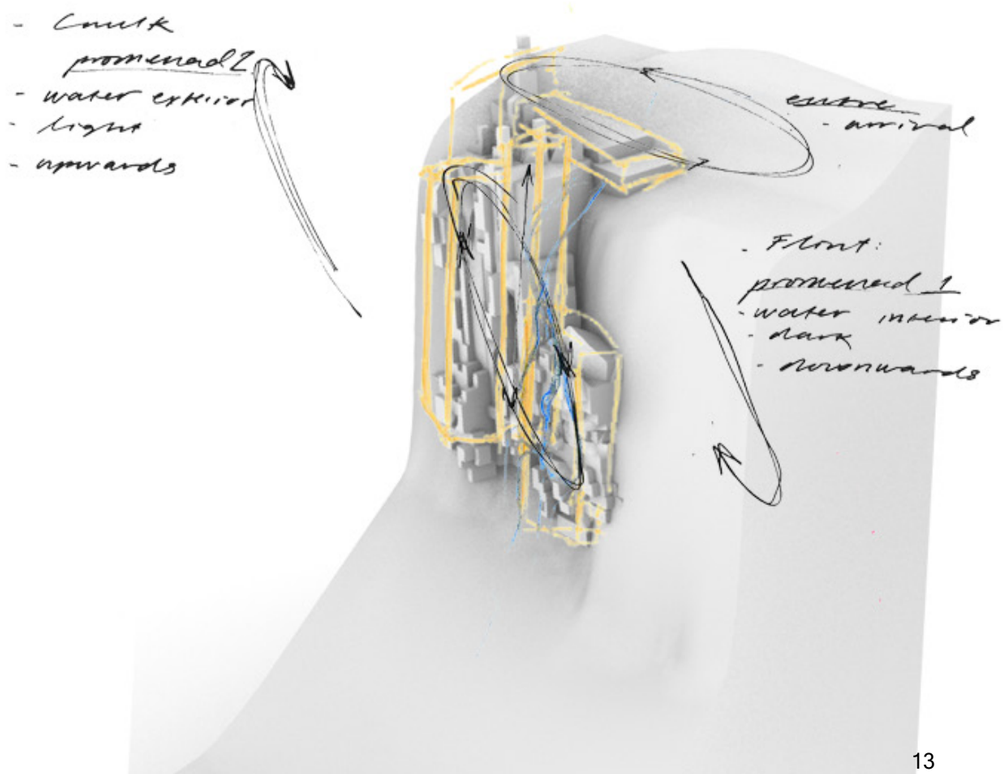
Working iteratively between hand sketches and digital modeling allowed me to gradually shape the primary massing of the building. These tools helped me evaluate proportions, spatial relationships, and how the volumes would sit within the landscape.

At this stage, however, the role of limestone in the architectural expression was still unresolved. I had yet to decide whether its presence would be manifested through the facade language or integrated as a part of the landscape architecture. And water was still a big part of the exterior.







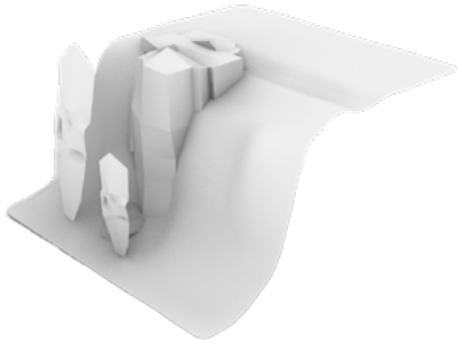


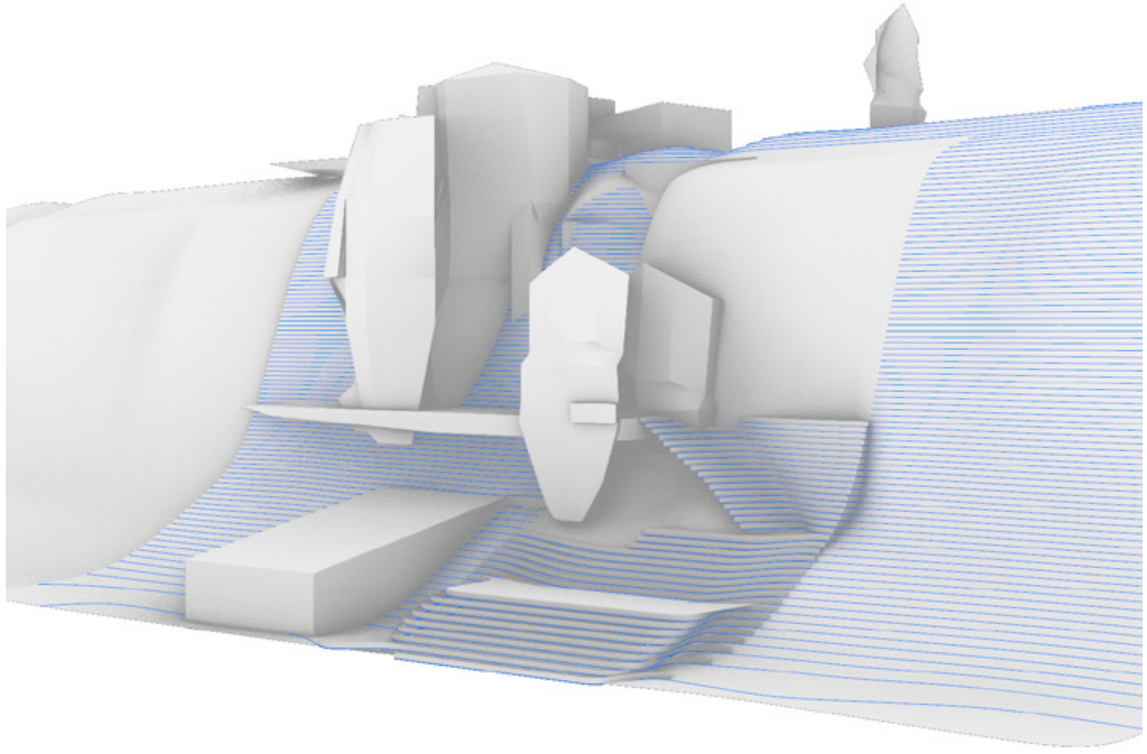
DESIGN PROCESS

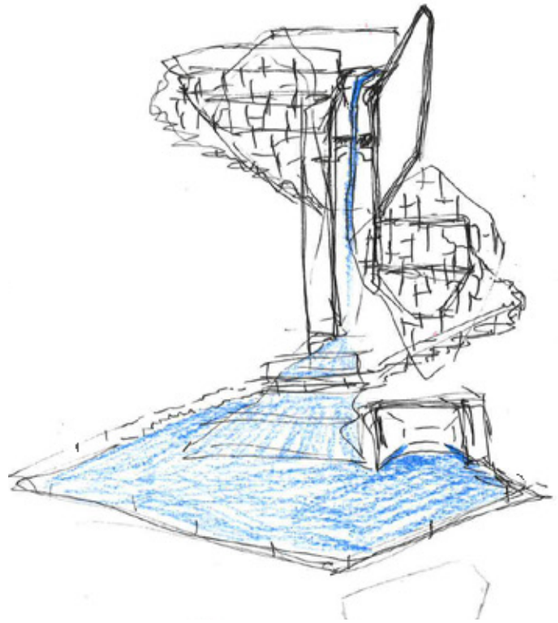
The Walk

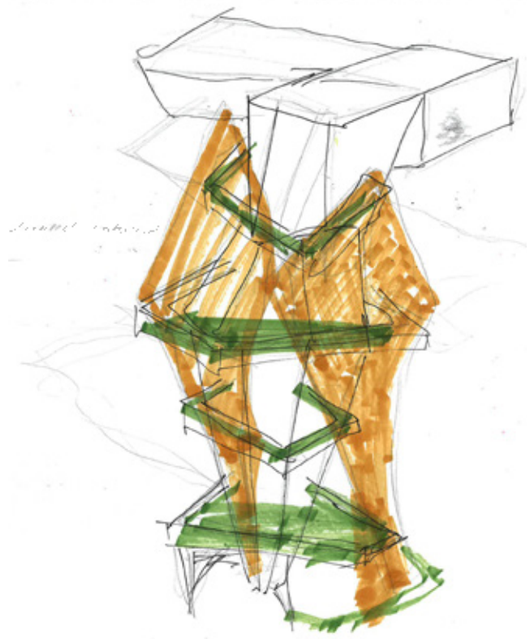
As the volumes of the building began to take form, I could start imagining how visitors would move through the architecture. The idea of two contrasting walks gradually emerged, one dark, enclosed, and embedded within the mass of the structure, and the other light, exposed, and situated on the outside, offering sweeping views across the quarry landscape.

These parallel paths became a spatial translation of the conceptual dualism, two materials, two walks, and eventually, two volumes. The light walk, representing the porous quality of the limestone, evolved into its own open structure. Rather than designing a linear transition from darkness to light, the visitor is continuously invited to move between the two spatial experiences throughout the visit.









The formation of the light, elevated structure gave rise to the idea of ramps and shells. These shell-like elements encase the visitor, creating an intermediate spatial condition, a semi-enclosure that plays with perception and exposure. The ramps not only provide access but also orchestrate views. By partially blocking and framing sightlines, they offer distinct outdoor spatial experiences depending on level and perspective. This sequencing enhances the contrast between light and dark, open and enclosed, while also enriching the architectural narrative of duality.

DESIGN PROCESS

Tectonics

At this stage in the design process, the ramps and shell structures were envisioned as floating elements, suspended in the air without defined supports. A key reference in shaping their final articulation was Eduard F. Sekler's essay Structure, Construction, Tectonics, in which he discusses tectonics not merely as the act of construction, but as a cultural and architectural expression, how structure shapes the perception of form (Sekler, 1965).

This led to a careful consideration of how the ramps and shells would meet the ground, or rather, how they would appear to barely touch it. I wanted to maintain a sense of lightness and suspension, where these elements seem almost weightless. The structural design therefore relied on tensioned cables, slender rods, and angled steel beams that support the ramps from below, out of direct sightlines. The result, I believe, successfully communicates a visual lightness, as if the structures are gently held in place, or might drift away if not anchored.

This expression of fragility is further reinforced by material choices. The ramps are clad in thin sheets of aluminium, which reflect light and heighten the impression of airiness. Similarly, the shell structures are built from lightweight steel frames and wrapped in a fine mesh, enhancing their translucency and ephemeral quality. The tectonic articulation thus becomes part of the conceptual narrative, support and exposure rendered in structural form.

SDG Goal

1. No Poverty

1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters.

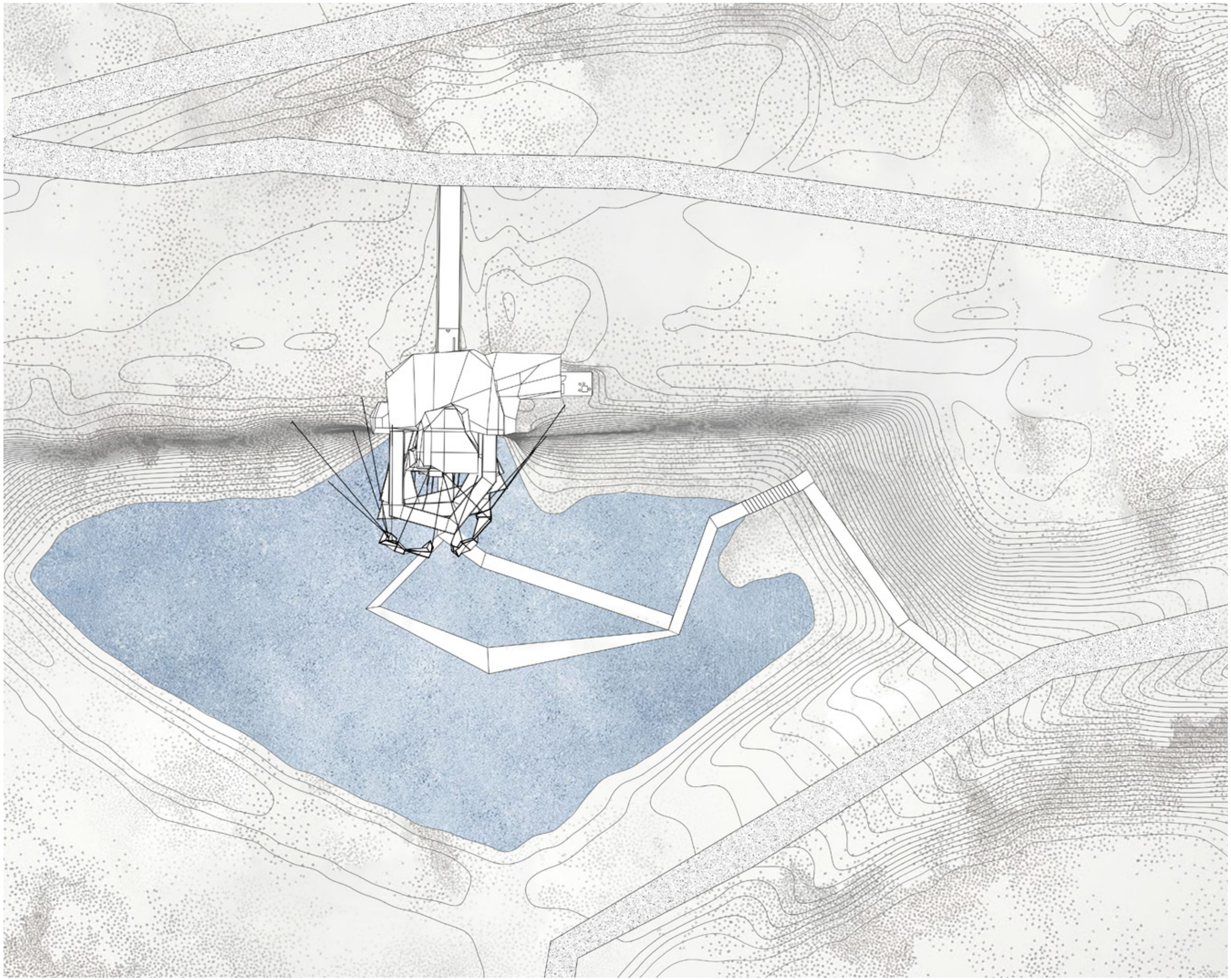
CONCEPT

Dualism

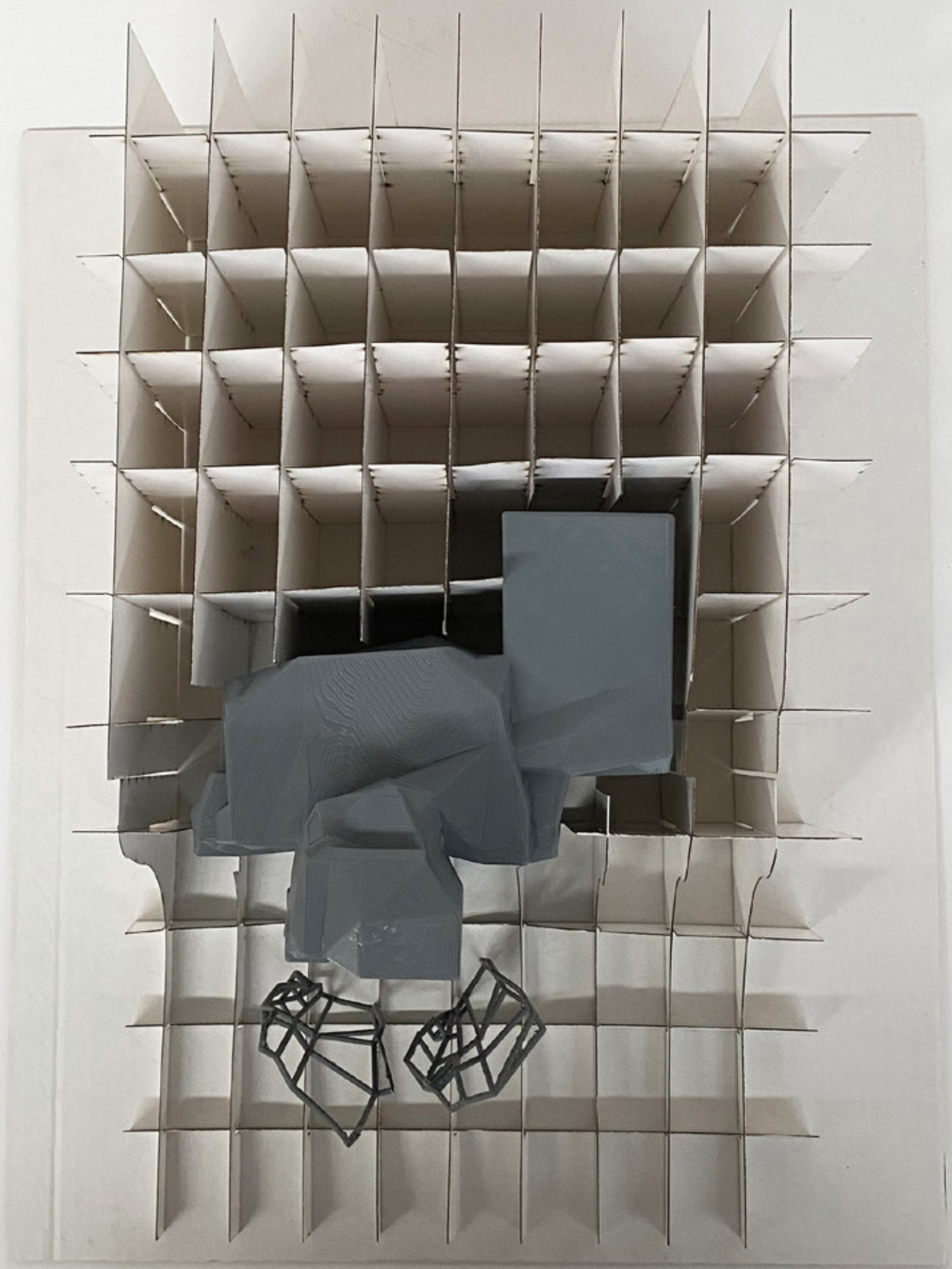
This project draws inspiration from the dual nature of the limestone quarry. Within the stone, two contrasting materials coexist: porous limestone and sharp, resilient flint. These materials represent two opposing characteristics, the fragile and the resistant, which are embodied in the architecture through two distinct structures and spatial experiences.

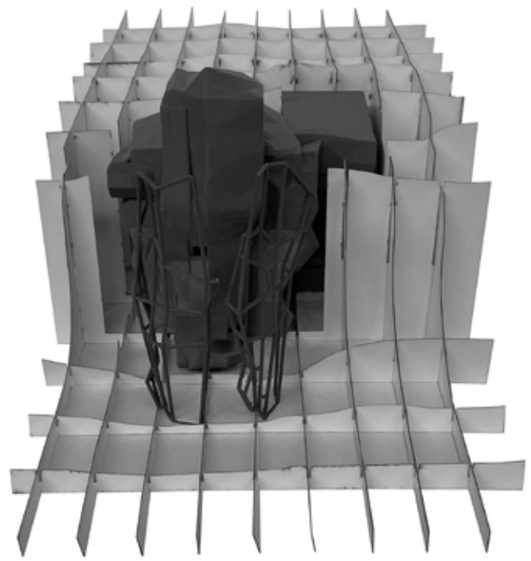
One structure, cast in concrete, creates enclosed interior spaces that are dark, heavy, and raw, evoking the feeling of being underground.

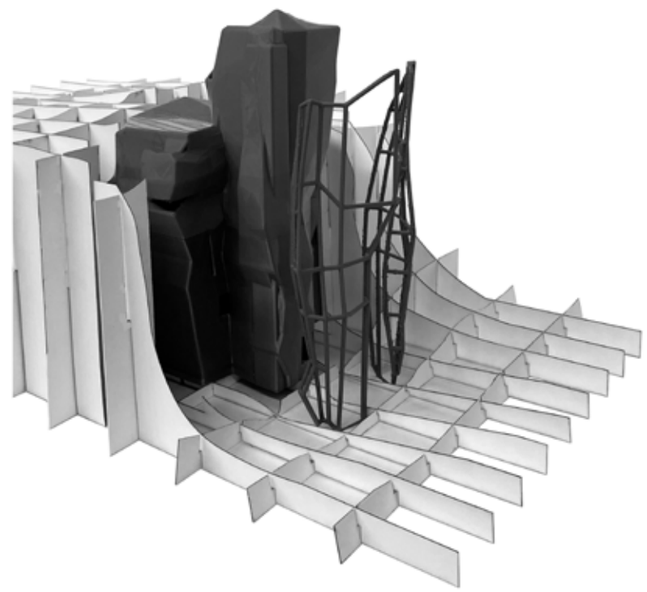
In contrast, the second structure is made of slender ramps and a light metal frame, held in place by tensioned cables as if it might be lifted by the wind. This elevated, airy path opens up expansive views over the quarry, offering a sense of lightness and exposure that contrasts sharply with the interior’s enclosure. Together, these two elements explore the relationship between resilience and vulnerability.



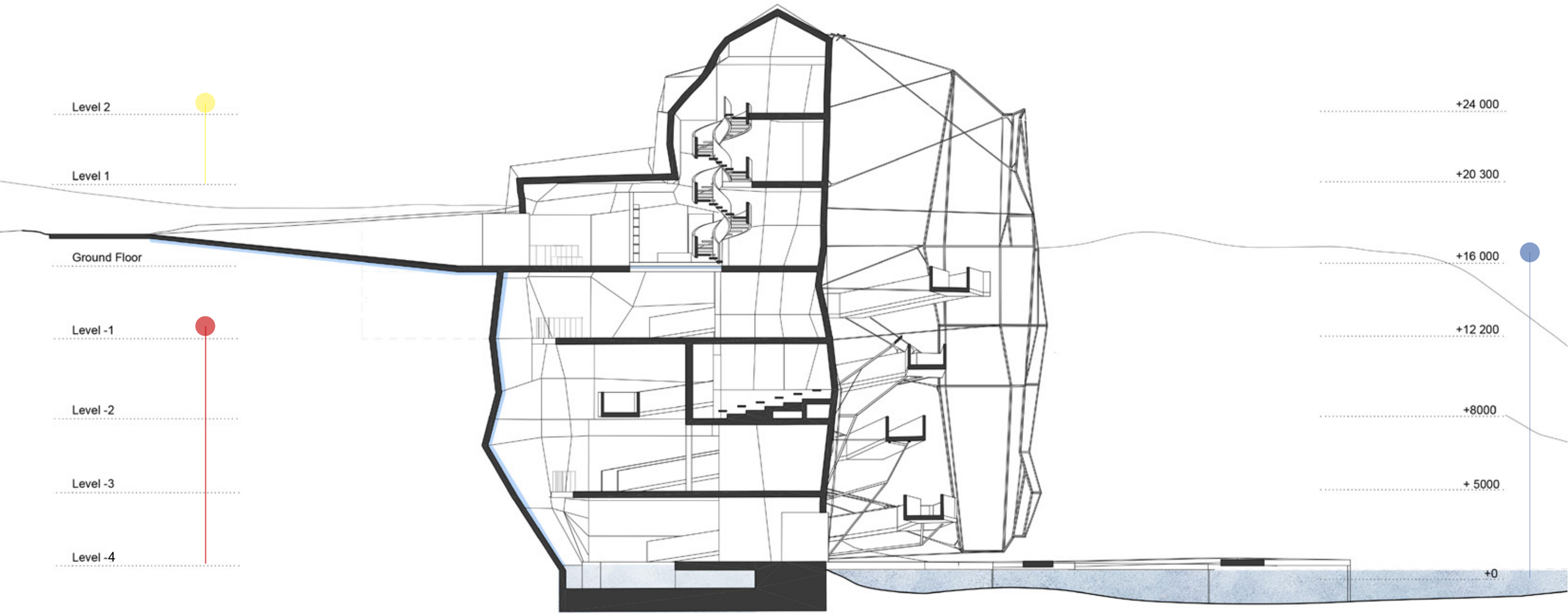
SITE PLAN
1 : 500







MODEL
1 : 100



EXHIBITION
GALLERY / ROTATING EXHIBITION
WATER

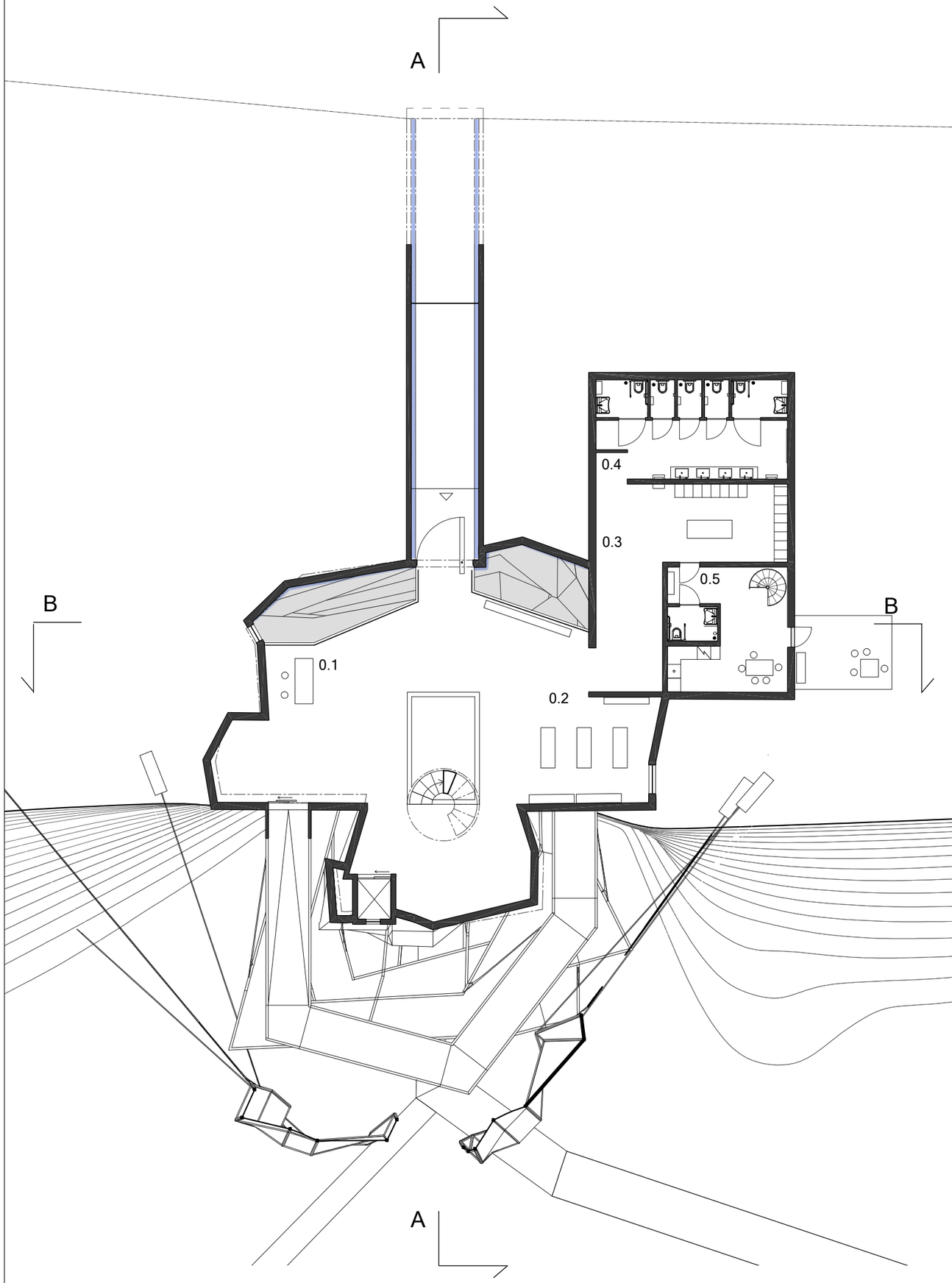
SEKTION A - A
1 : 200

LEVEL 0

Ground Floor

1 : 200

0.1 Reception	100 m²
0.2 Shop	30 m²
0.3 Lockers	20 m²
0.4 WC	40 m²
0.5 Staff Room	30 m²

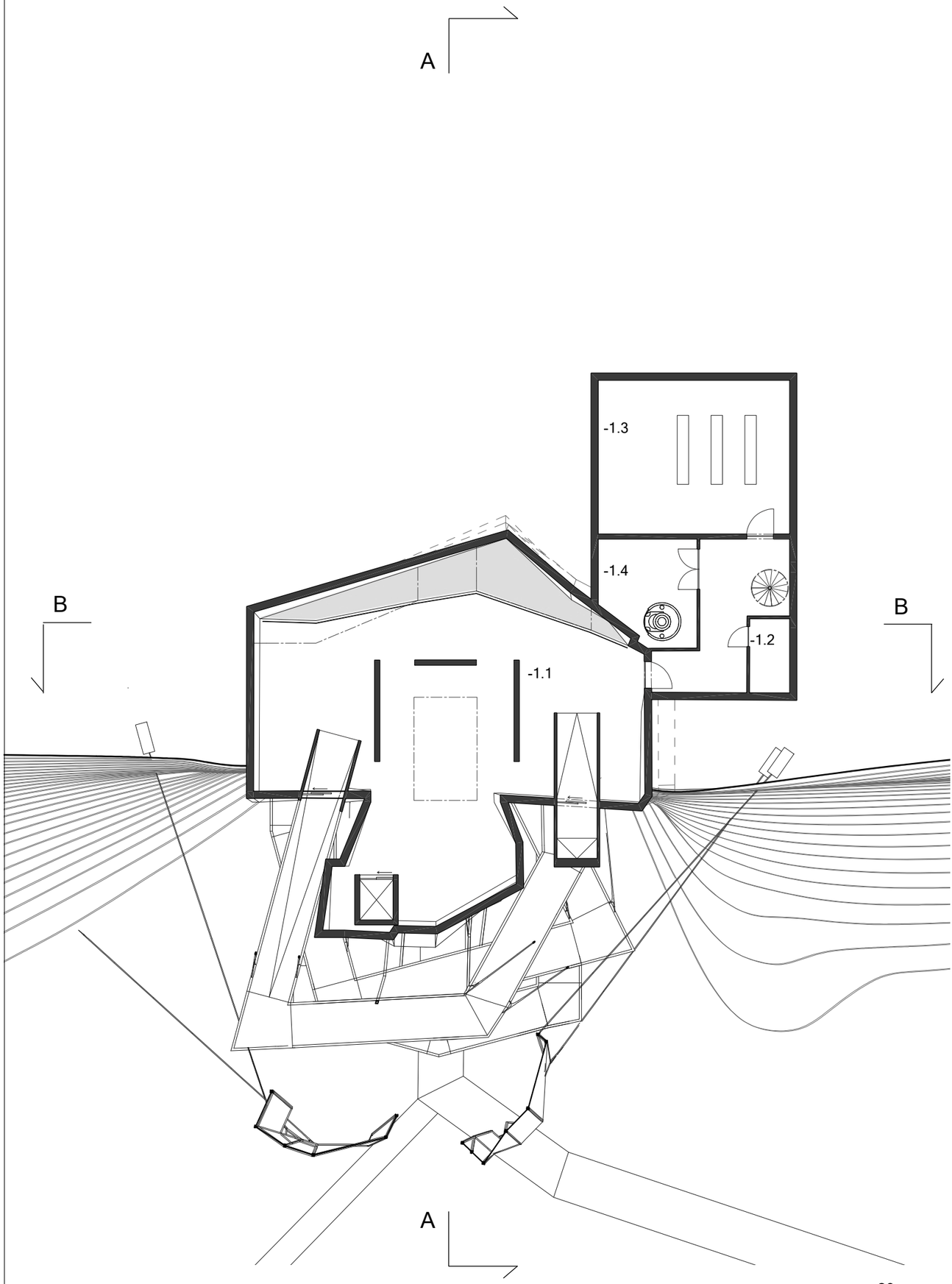


FLOOR PLANS

LEVEL -1

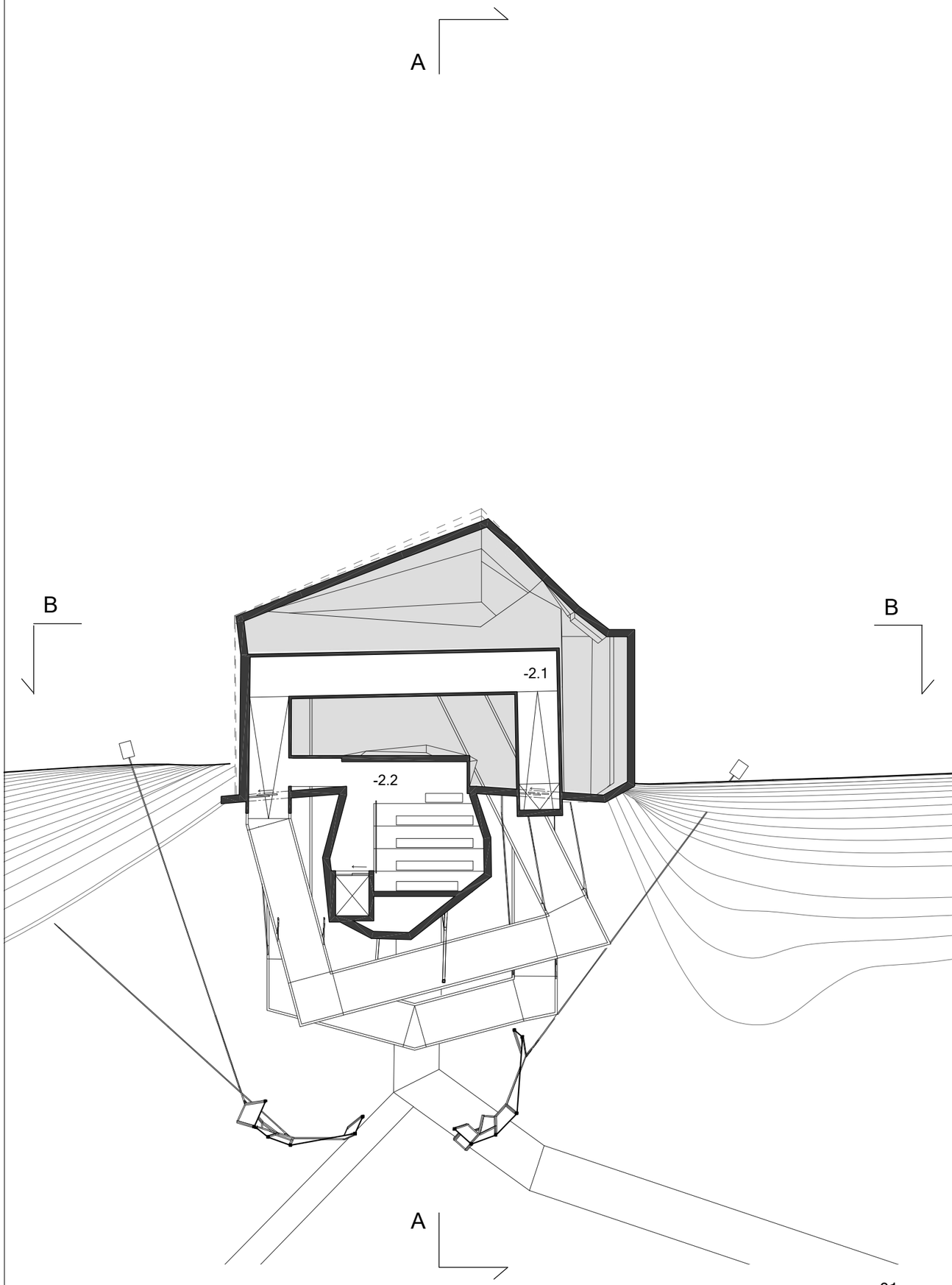
1 : 200

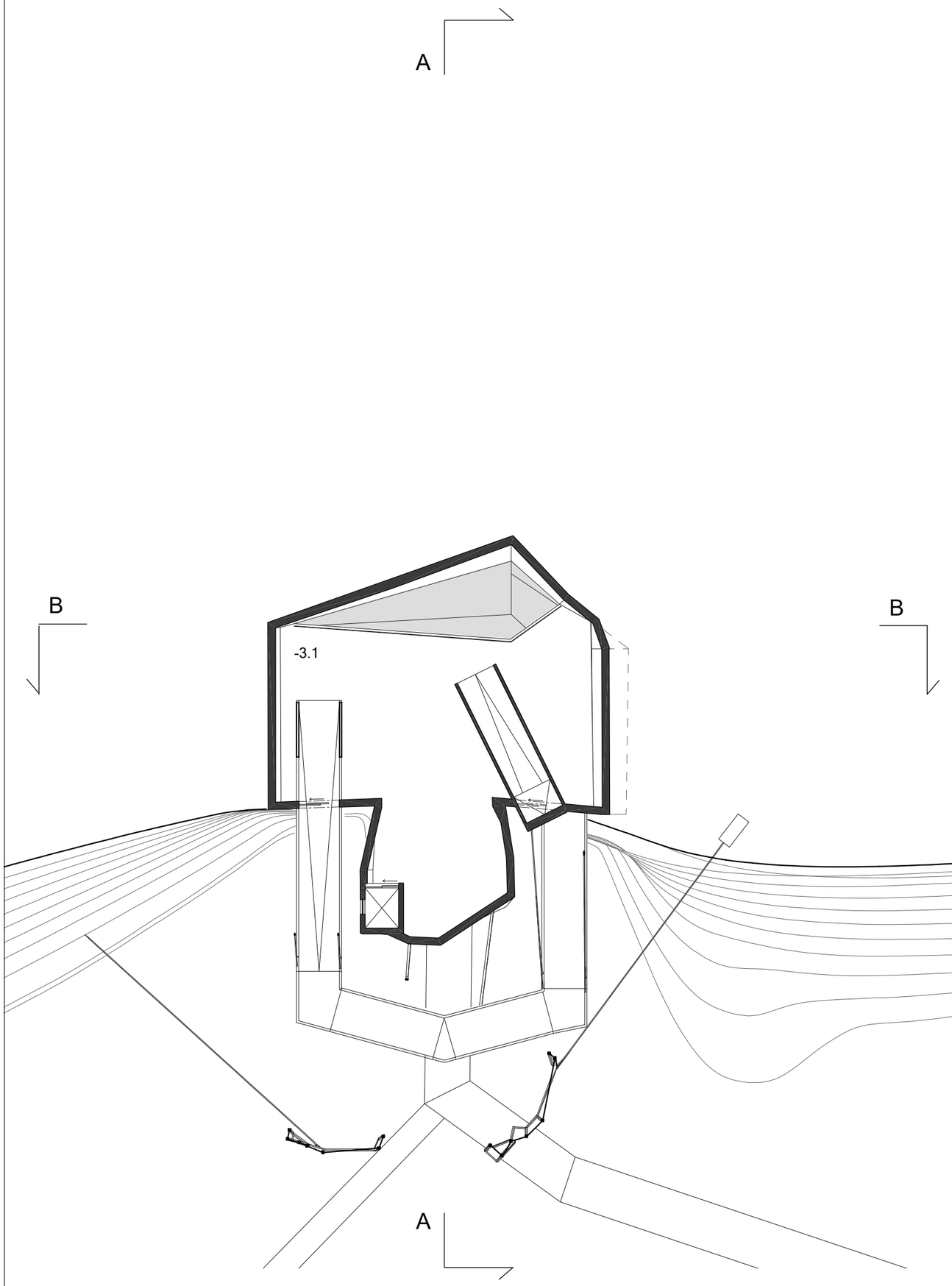
-1.1 Exhibition	180 m²
-1.2 Service	20 m²
-1.3 Storage	40 m²
-1.4 Water pump	15 m²



LEVEL -2
1 : 200

-2.1 Exhibition 160 m²
-2.2 Movie Room 35 m²





LEVEL -3

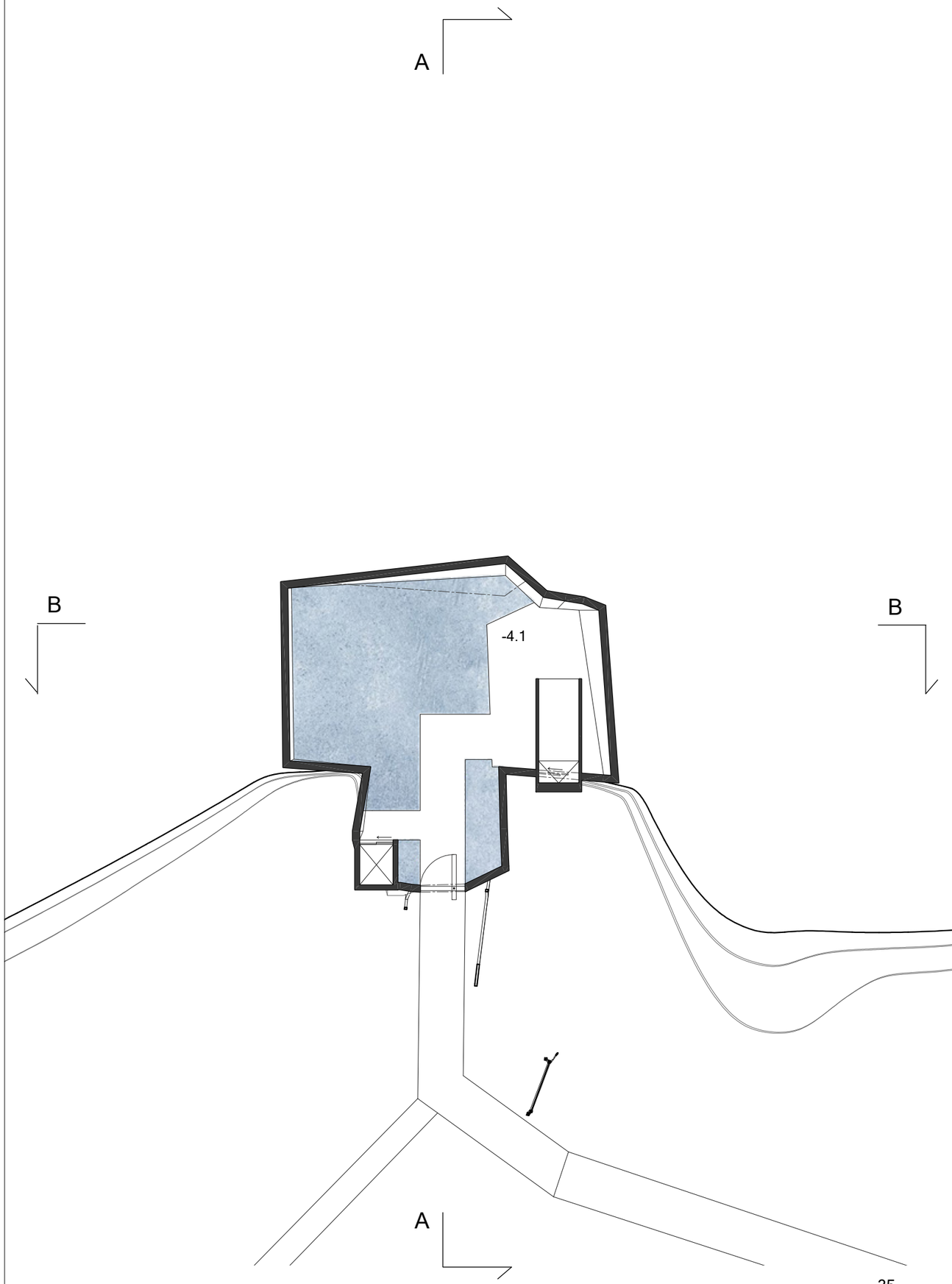
1 : 200

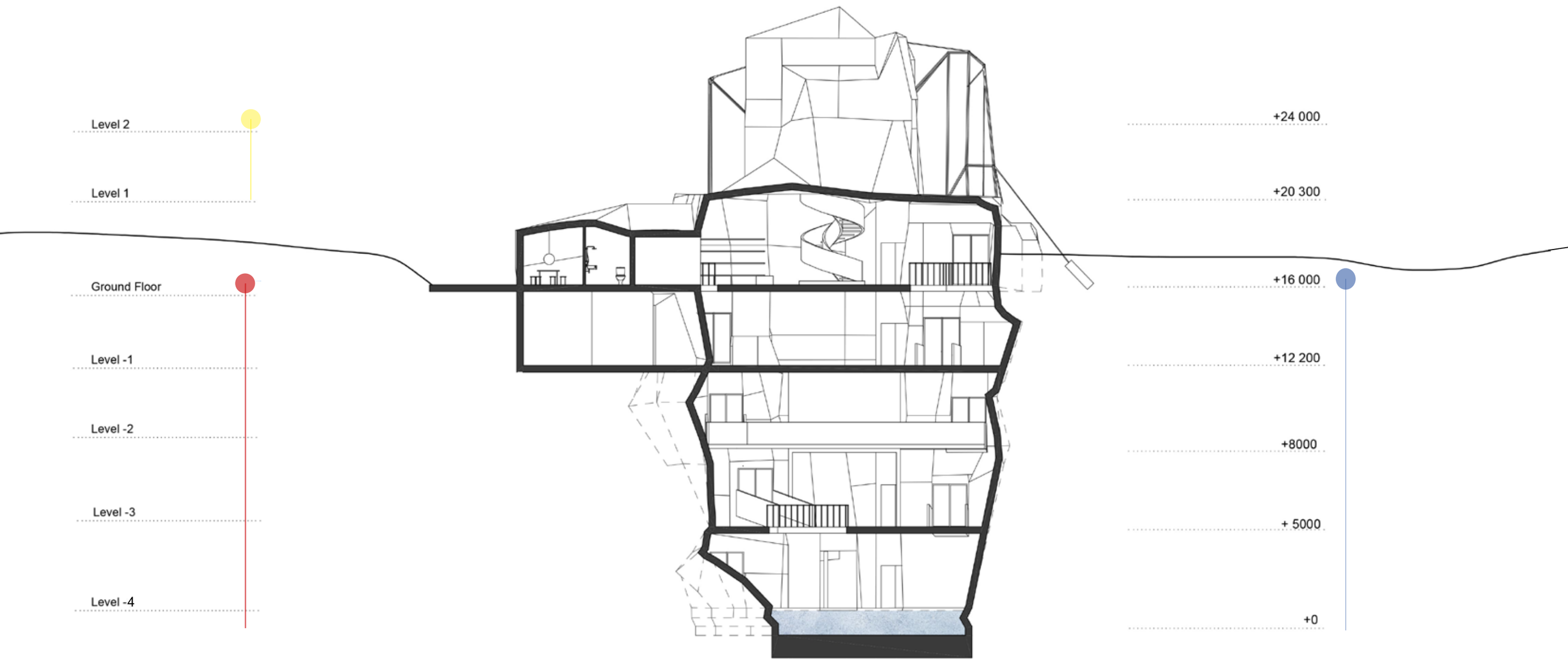
-3.1 Exhibition 140 m²

LEVEL -4

1 : 200

-4.1 Exhibition 100 m²





EXHIBITION
GALLERY / ROTATING EXHIBITION
WATER

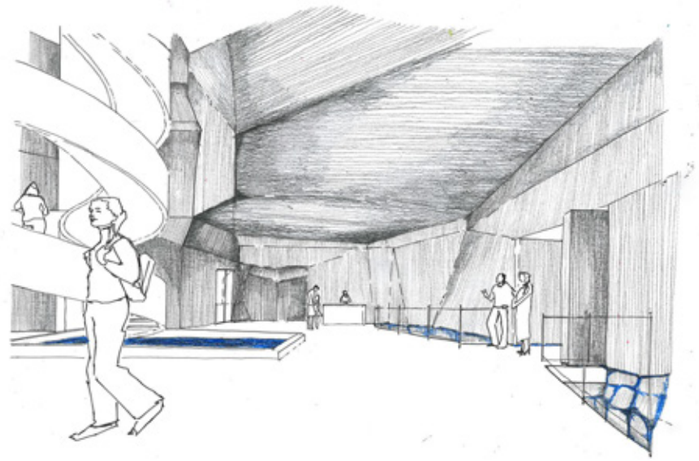
SEKTION B - B
1 : 200

INTERIOR DESIGN

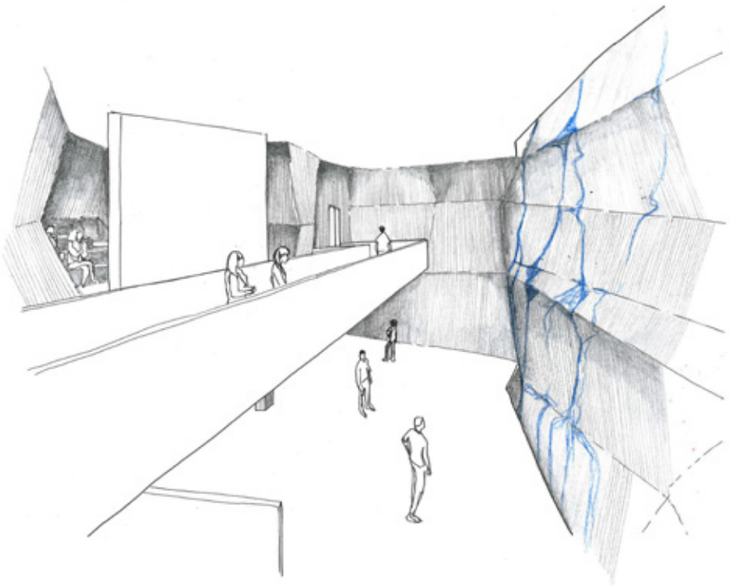
In the development of the concrete interior, the ideas from In Praise of Shadows by Jun'ichirō Tanizaki have been a relevant reference. The text emphasizes how darkness, shadows and indirect light can enhance material qualities and create a deeper spatial experience (Tanizaki, 1933). This approach aligned well with the design ambitions for the darker part of the building, where the goal was to create a raw and grounded atmosphere that resonates with the sense of being underground.

Natural light is introduced in a controlled way. It enters indirectly through narrow horizontal gaps between the floor slabs and the outer wall, never directly illuminating the space. Instead, it is reflected by the water that flows along the inner vertical wall, a continuous element that spans all floors. This water wall becomes both a spatial and visual guide, helping to orient the visitor throughout the building. This moving element also adds atmospheric moisture, sound, and visual depth to the concrete environment. At the lowest level, the interior water surface connects with the pond outside, forming a continuous path that leads the visitor out.

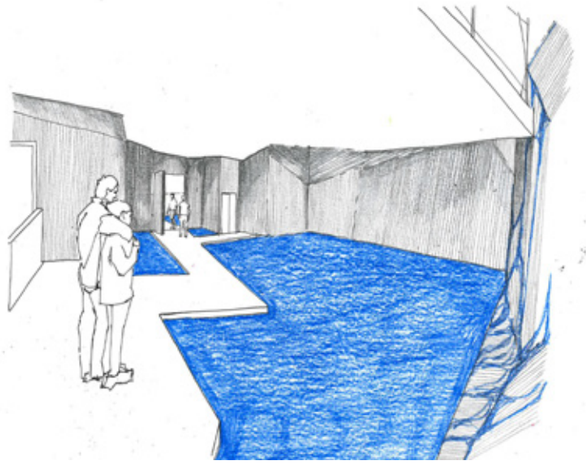
Material expression is carefully considered. The concrete walls and slabs are cast with different levels of precision: the side walls and slabs are smooth and even, while the central wall with water is intentionally rough, uneven, and fractured, echoing the texture of natural flint stone. The presence of shadow, texture, and water all contribute to an interior that embraces stillness and weight. By reducing visual stimuli and emphasizing material qualities, the space invites a slower experience where each floor, each shift in light, and each surface plays a distinct role in how the visitor moves through and perceives the building.



GROUND FLOOR



LEVEL -2

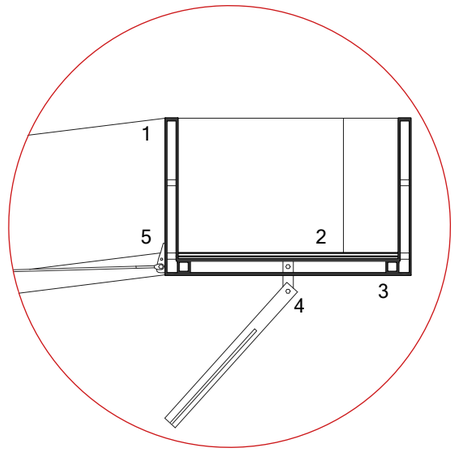


LEVEL -4

The architectural structure of the project consists of two primary systems: a monolithic cast-in-place concrete core, and a lighter framework of ramps and external shells. These systems are designed to work both visually and structurally in contrast with one another, emphasizing themes of mass and lightness, permanence and exposure.

The concrete core functions as both spatial anchor and load-bearing structure. Cast using smooth plywood formwork, the material is left untreated to emphasize its natural texture and tone. Internally, the surface varies in finish: while most walls are smooth and sharply defined, a single continuous wall has been left raw and uneven. Water flows down this wall from top to bottom, circulating through a closed system. A pump on level-2 recirculates water through embedded pipes up to the entrance level, where it is released again to cascade downward.

The lighter system comprises a series of ramps and shells suspended from and anchored into the concrete structure and the quarry wall itself. Each ramp is supported by a central steel beam, diagonally fixed into the concrete core. To reduce visible mass and enhance the sensation of hovering, the ramps are also stabilized and lifted by steel cables. These cables are connected vertically between ramps and horizontally toward anchor points on the concrete and quarry walls, balancing loads and resisting lateral movement. The walking surface is made of open-grid metal flooring, with outer surfaces finished in thin aluminium cladding to reflect light and reinforce the impression of lightness.



1. Aluminium Cladding
The exterior shell of the ramp, covered in folded aluminium sheets.

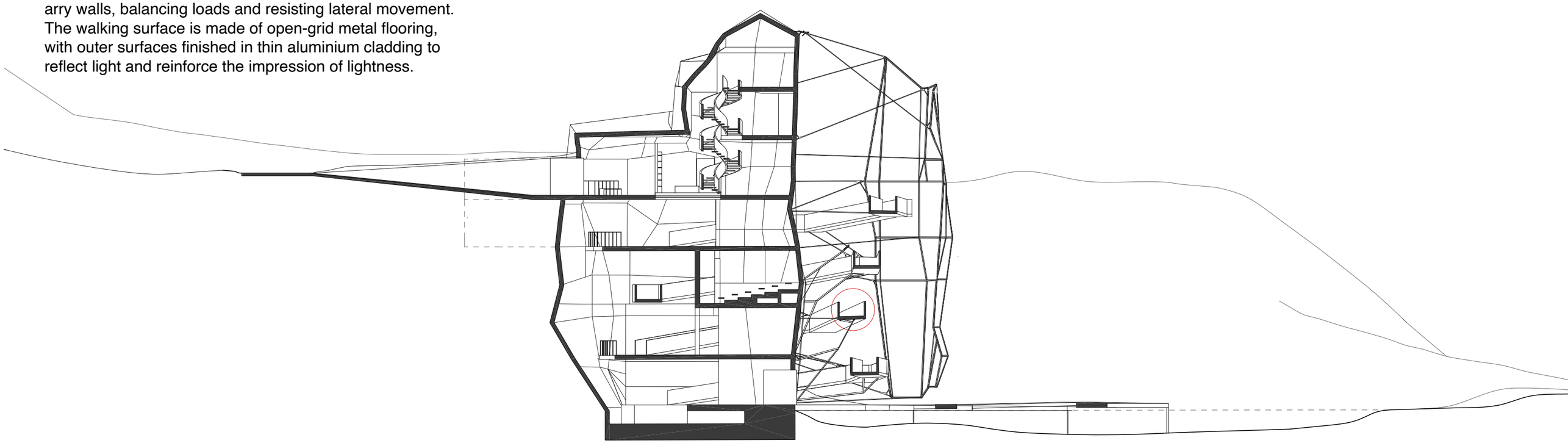
2. Perforated Aluminum Grating
The upper walking surface made of light-permeable aluminium grating.

3. Steel Truss Floor Structure
A structural truss integrated into the floor, preventing bending and providing stiffness.

4. Central Steel beam
The main load-bearing element beneath the ramp, slightly loosened to allow minimal movement.

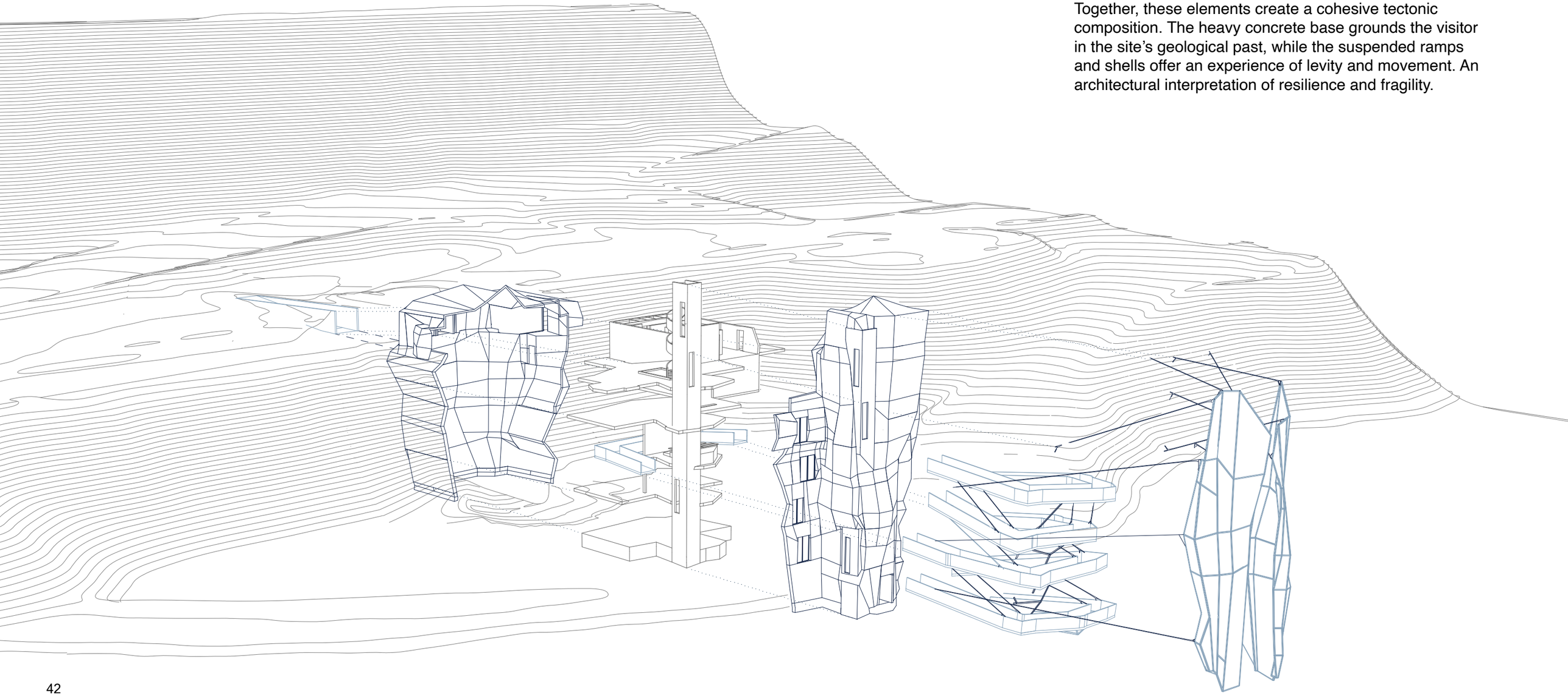
5. Tension Cables to Retaing Wall
Cables that anchor the ramp back to the quarry wall, keeping it in place.

RAMP STRUCTURE
SECTION DETAIL
1 : 50



Surrounding the ramps, a series of open shells provide spatial orientation and visual framing. These are constructed with a lightweight steel skeleton and clad in semi-transparent metal mesh with small perforations. This mesh creates a controlled balance between opacity and visibility, allowing filtered views of the quarry landscape. The shells are fixed at key structural points, partially to the concrete core and partially to deep-set anchor bolts in the quarry wall. Cables and tie rods are used to keep the shells rigid and spatially stable without adding excessive mass.

Together, these elements create a cohesive tectonic composition. The heavy concrete base grounds the visitor in the site's geological past, while the suspended ramps and shells offer an experience of levity and movement. An architectural interpretation of resilience and fragility.



CRITICAL REFLECTION

Upon revisiting the project with a critical and objective lens, several areas emerge where the architectural proposal could be further developed to enhance its clarity, functionality, and experiential depth.

One of the main areas for improvement lies in the level of interior detailing, particularly in relation to the exhibition function. While the spatial organisation and conceptual framework provide a strong foundation, the interior lacks a refined strategy for accommodating diverse exhibition typologies. More attention could have been directed toward integrating flexible or site-specific display systems, seating, lighting elements, and material junctions, details that collectively support the building's narrative while increasing its usability.

In the darker, concrete-based volume, the interplay of light and shadow remains underexplored. The current scarcity of openings limits the potential for a rich, atmospheric experience, particularly at the entrance level and in the upper levels of the tower. A more nuanced choreography of indirect light through narrow slits, light wells, or strategically placed apertures could have intensified the spatial drama and aligned more closely with the ideas discussed in In Praise of Shadows. This would also have created opportunities for vertical or diagonal light movement that enriches the sensory experience throughout the building.

From a structural standpoint, the design intention to create a sense of lightness and suspension in the ramps and shell structures is conceptually strong. However, the technical development of this strategy could benefit from further refinement and validation. While the central steel beams and stabilising cables provide a logical starting point, the project would be strengthened by deeper investigation into structural forces, load paths, and connections, ideally through calculations or simulations. Exploring the use of counter-cables extending over the water could have enhanced both stability and spatial directionality, potentially transforming the ramps into more expressive architectural elements.

Finally, while the water system is conceptually elegant, guiding the visitor through the building and reconnecting with the landscape, it could be articulated more clearly through detailed technical drawings and section studies. Its presence as a guiding and reflecting element is strong, but the actual material integration, maintenance, and performance in different seasons could be further considered.

In conclusion, the project presents a powerful architectural response to site, concept, and context, but it leaves room for further development in technical resolution, interior articulation, and experiential refinement. These additions would not only ground the project more firmly in reality but also elevate its spatial richness.

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